State Fauna Series - 9

FAUNA OF
SIKKIM

(PART-2)

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State Fauna Series 9

FAUNA OF SIKKIM

PART-2

Edited by

The Director
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IXODID TICKS (ACARI : IXODIDAE)

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INTRODUCTION

The ixodid ticks belong to the order Acarina and suborder Metastigmata. These are commonly known as hard bodied ticks and distributed throughout the world. These ticks inhabit animals and man as ectoparasite and cause several dreadly diseases. They also spend a period of their life in vegetation.

The immense medical and veterinary importance of this group of tick has initiated the interest of acarologists of the world to study these parasitic arthropods. The Indian ixodids have also been studied by many scientists, but most of the states of India have not yet been thoroughly surveyed for this group of tick.

Before the present work was initiated 17 species under 7 genera were known from the State of Sikkim. The ixodid tick was first collected from Sikkim by Hermond and that was recorded by Neumann in 1901. Later, Sharif (1928) while studying the collection of ixodid ticks in the Indian Museum reported one species *Amblyomma testudinarium* from the State. Morel (1963) recorded *Ixodes ovatus* from Sikkim. In the next year Dhanda and Rao (1964) reported four species from Syriani, Sikkim. Later, Hoogstraal, Dhanda and Bhat (1970), Hoogstraal and Mitchell (1971) and Rao, Dhanda, Bhat and Kulkarni (1973) studied the ixodid tick fauna of Sikkim based on the specimens collected by themselves and by Major R.K.G. Hingston in 1924 and Varma, Mahadevan and Desmukh during 1968-1970.

The present work is based on a series of collection of ixodid ticks made from Sikkim by the authors and the specimens collected by other survey parties of the Zoological Survey of India, which are available in the National Zoological Collection. The work also includes the species which have not been studied by the authors but are reported from the State by the earlier workers.

A brief account of the Surveys undertaken for the present study and collection of ticks from other surveys is given below :

1. Sikkim Survey – Dr. H. S. Sharma (April, 1973)
2. Sikkim Survey – Sri S. K. De. (August—September, 1978)
3. Sikkim Survey – Dr. A. K. Sanyal (February, 1990)
4. Sikkim Survey – Sri A. Ahmed (September, 1992)
5. Sikkim Survey – Dr. A. K. Sanyal & Sri S. K. De (May, 1998).

The paper presents a list of 19 species including 3 unidentified species, under 7 genera of ixodid ticks hitherto known from Sikkim. The first and most important references, agnostic features of each species, key to the identification of genera and species have been incorporated in the paper. The species studied by the present authors are deposited in the National Zoological Collection, Zoological Survey of India.

SYSTEMATIC ACCOUNT

Material and Methods : The two methods *viz.*, "Hand picking" and "Flag-dragging" were mainly employed for collecting ticks. The details have been given in Sanyal and De (1992).

General Morpholgy and Terminology : The external features of ixodid ticks which are of taxonomic importance are grouped into capitulum, dorsum and venter.

Capitulum : It is the anterior most part of the body of ticks. The capitulum is made of basis capituli, palps, chelicerae or mandible, hypostome and tongue.

Dorsum : The dorsum of ixodid ticks contains the features like scutum or shield, pseudoscutum, scapulae, eyes, porose areas or foveae, fields, spots and stripes, grooves, punctations, festoons, and caudal process. All of these features may not be present in a single species of tick.

Venter : The venter or the ventral surface of the body of ticks shows the structures like genital aperture, anus, groove, shield and plaque and leg.

The details of morphological features have been discussed in Sanyal and De (1992).

LIST OF TAXA KNOWN FROM SIKKIM

Family IXODIDAE

1. Genus ***Amblyomma*** Koch

1. *A. testudinarium* Koch

2. Genus ***Boophilus*** Curtice

2. *B. microplus* (Canestrini)

3. Genus ***Dermacentor***

3. *Dermacentor* sp.

4. Genus ***Haemaphysalis*** Koch

4. *H. aponommoides* Warburton
5. *H. bispinosa* Neumann
6. *H. cornigera* Neumann
7. *H. davisi* Hoogstraal, Dhanda and Bhat
8. *H. montgomeryi* Nuttall
9. *H. nepalensis* Hoogstraal
10. *H. ramachandrai* Dhanda, Hoogstraal and Bhat
11. *H. sundrai* Sharif
12. *Haemaphysalis* sp.

5. Genus ***Hyalomma*** Koch

13. *H. anatolicum anatolicum* Koch
14. *H. hussaini* Sharif
15. *Hyalomma* sp.

6. Genus ***Ixodes*** Latreille

16. *I. acutitarsus* (Karsch)
17. *I. ovatus* Neumann
18. *Ixodes* sp.

7. Genus ***Rhipicephalus*** Koch

19. *R. haemaphysaloides* Supino

Key to the genera of IXODID TICKS from Sikkim

1. Eyes absent, anal groove extending anteriorly around anus ..... *Ixodes* Latreille

– Eyes present or absent; anal groove extending posteriorly or absent 2

2. Eyes absent; capitulum short with lateral salience on palpal article II ..... *Haemaphysalis* Koch

– Eyes present; capitulum long or short.....3

3. Capitulum long with long narrow palps ...4

– Capitulum short with short broad palps 5

4. Ventral shields present in male; scutum usually inornate; eyes spherical and orbital ..... *Hyalomma* Koch

– Ventral shields absent in male; scutum usually ornate; eyes usually flat and non-orbital ..... *Amblyomma* Koch

5. Basis capituli rectangular dorsally, lateral saliences absent; scutum ornate; ventral shields absent in male; coxa IV much longer than others ..... *Dermacentor* Koch

6. Spiracle oval; festoons and groove faint or obsolete; setiferous ventral plate on palpal article I absent ..... *Boophilus* Curtice

– Spiracle sub-triangular or comma-shaped; festoons and anal groove well developed; setiferous ventral plate on palpal article I present ..... *Rhipicephalus* Koch

1. Genus ***Amblyomma*** Koch

1844. *Amblyomma* Koch, *Arch. Naturgesch.* **10** : 223-231.

1. ***Amblyomma testudinarium*** Koch

1844. *Amblyomma testudinarium* Koch. *Arch. Naturgesch.*, **10**(1) : 226.

1926. *Amblyomma testudinarium*, Robinson, *Ticks-Mongr. Ixodoidea* pt. **4** (Cambridge University Press) : 257.

1928. *Amblyomma testudinarium*, Sharif, *Rec. Indian Mus.*, **30**(3) : 330.

Diagnosis : Male—Ornamented pale coloured scutum with dark brown markings; falciform stripe large and thick; deep punctations numerous; porose areas moderately large; dentition 4/4; coxa I with moderately stout spurs.

Host : Unknown.

Distribution : Sikkim, Arunachal Pradesh, Assam, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Punjab, Orissa, West Bengal.

Remarks : The species was earlier reported from Sikkim by Sharif (1928) from unknown host. It is not a commonly occuring species.

2. Genus ***Boophilus*** Curtice

1891. *Boophilus* Curtice, *Journ. Compar. Med. Veter. Arch.* **12** : 313.

2. ***Boophilus microplus*** (Canestrini)

1887. *Haemaphysalis micropla* Canestrini, *Atti. Soc. Veneto. trent. Sci. nat.*, **11** : 104.

1890 *Rhipicephalus micropla* Canestrini, *Padova*, **4** : 493.

1899. *Rhipicephalus australis* Fuller, *Od. Agric. J.*, **4**(5) : 389-394.

1901. *Boophilus australis* Stiles and Hassall, *Bur. Anim. Ind. U. S. Dept., Agric.*, Washington, D. C. Circ No. **34** (3) : 2-3.

1943. *Boophilus microplus*, Fairchild, *Am. J. Trop. Mes.*, **23**(6) : 586.

1956. *Boophilus microplus*, Hoogstraal, *African Ixodoidea*, **1**: 295-296.

1964. *Boophilus microplus*, Dhanda and Rao, *Indian, J. Med. Res.*, **52**(11) : 1151.

Material examined : 21(F), 21(M), Samdur, Gangtok, from cattle, 4.ix.1978, coll. S. K. De; 18(F), 15(M), Rumtek, Gangtok, from cattle, 1.ix.1978. coll S. K. De; 15(F), 12(M), Syori, Gangtok, from cattle, 3.ix.1978, coll. S. K. De; 62(F), 5(M), Phensong, Gangtok, from goat, 5.ix.1978, coll. S. K. De; 8(F), 6(M), Kumbre, Rangpo, from cattle, 1.ix.1978, coll. S. K. De; 21(F), 14(M), Yangtang, Gezzing, from cattle, 12.ii.1990, coll. A. K. Sanyal; 22(F), 1(M), Jogidara, Dentum, from cattle, 20.ii.1990. coll. A. K. Sanyal; 26(F), 1(M), Lingching, from cattle, 22.ii.1990, coll. A. K. Sanyal; 5(F), towards Dzengu, Mangan, from cattle, 23.ix.1992, coll. S. Ahmed; 6(F), 1(M), Charanbari, Gangtok, from cattle, 17.ix.1993, coll. S. Ahmed; 15(F), Saem, 20 kms. away from mangan, from cattle, 28.ix.1993, coll. T. K. Pal; 17(F), 3(M), Jorethung, from cattle, 1.ix.1990, coll. A. K. Sanyal, 4(F), 1(M), Rabangla, from cow, 2.vi.1998, coll. A. K. Sanyal and S. K. De; 66(F), 16(M), Rangpo, from cow, 4.vi.1998, coll. A. K. Sanyal and S. K. De.

Diagnosis : Male—Hirsute scutum; short and tapering caudal appendage; dentition 4/4; inner margin of basal palpal segment ventrally concave.

Female : Coxa I with deep inverted 'V'-shaped cleft; inner margin of basal palpal segment ventrally short, deeply concave; dentition 4/4.

Hosts : Cattle, goat.

Distribution : Sikkim (Dentum, Gangtok, Gezzing, Jorethang, Mangan, Rabangla, Rangpo, Siriyani), Arunachal Pradesh, Andaman & Nicobar Islands, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Maharashtra, Madhya Pradesh, Meghalaya, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal.

Remark : This is a very common ixodid tick found to attack cattle in Sikkim.

3. Genus ***Dermacentor*** Koch

1844. *Dermacentor* Koch, *Arch, Naturgesh*, **10**(1) : 235.

3. ***Dermacentor*** sp.

Remark : The unidentified species of *Dermacentor* was reported by Rao *et al.* (1973) from Sikkim.

4. Genus *Haemaphysalis* Koch

1844. *Haemaphysalis* Koch, *Arch. Naturgesh,* **19**(1) : 217-239.

Key to the species of *Haemaphysalis*

Male

1(2) Palps salient laterally ..... *cornigera* Neumann

2(1) Palps moderately or not salient laterally

3(14) Palps moderately salient laterally

4(9) Palpal segment 3 with distinct dorsal spur

5(8) Palpal segment 2 and 3 of equal length

6(7) Ventral spur or trochanter large; lateral groove shallow, ventral spur on palpal segment 3 large ..... *ramachandrai* Dhanda *et. al*

7(6) Ventral spur of trochanter lacking; lateral groove long; ventral spur on palpal segment 3 small ..... *bispinosa* Neumann

8(5) Palpal segment 2 longer than segment 3; ventral spur of trochanter moderate in size; latral groove narrow; ventral spur on palpal segment 3 moderately large ..... *davisi* Hoogstraal *et al.*

9(4) Palpal segment 3 without distinct dorsal spur

10(13) Lateral grove shallow

11(12) Ventral spur on trochanter small; hypostome dentition 4/4 ..... *nepalensis* Hoogstraal

12(11) Ventral spur on trochanter large, triangular; hypostome dentition 6/6 ..... *montgomeryi* Nuttall

13(10) Lateral groove obsolete; ventral spur on trochanter small; hypostome dentition 5/5 ..... *sundrai* Sharif

14(3) Palps not salient laterally; ventral spur on palpal segment 3 absent ..... *aponommoides* Warburton

Female

1(2) Palps salient latrally ..... *cornigera* Neumann

2(1) Palps moderately or not salient laterally

3(14) Palps moderately salient laterally

4(5) Trochantal spur distinct; large ..... *montgomeryi* Nuttall

5(4) Trochantal spur small

6(11) Palpal segment 3 with dorsal spur

7(10) Hypostome dentition 4/4

8(9) Lateral groove distinct, long; spurs on coxae II-IV reduced ..... *bispinosa* Neumann

9(8) Lateral groove shallow; spurs on coxae II-IV reduced to short rounded ridges ... *ramachandrai* Dhanda *et al.*

10(7) Hypostome dentition 5/5 ..... *davisi* Hoogstraal *et al.*

11(6) Palpal segment 3 without dorsal spur

12(13) Hypostome dentition 4/4 ..... *nepalensis* Hoogstraal

13(12) Hypostome dentition 7/7 ..... *sundrai* Sharif

14(3) Palps not salient laterally ..... *aponommoides* Warburton

4. ***Haemaphysalis aponommoides*** Warburton

1913. *Haemaphysalis aponommoides* Warburton, *Parasitology,* **6** : 128-130.

1962. *Haemaphysalis aponommoides,* Hoogstraal, *J. Parasit.,* **48** : 195-203.

1970. *Haemaphysalis aponommoides,* Varma and Mahadevan. *Indian J. Med. Res.,* **58** : 693-706.

1971. *Haemaphysalis (Alloceraea)) aponommoides,* Hoogstraal and Mitchell, *J. Parasit,* **57**(3) : 635-645.

Diagnosis : Male—Numerous punctations; festoons 11; segment 3 ventrally lacking retrograde spur; spiracular plate narrowly elongate; posterior integument forming two leathery pseudoshield pitted by numerous large punctations each bearing a short seta.

Female—Scutum broader than long; palpal segment 3 without any spur or projection; spurs on coxae I-IV subequal; spiracular plate short, comma-shaped.

Hosts : Cattle, vegetation.

Distribution : Sikkim (Lanchen, Thahamachi, Lima, Gangtok, Pedong, Rhenok-Rongolly), Arunachal Pradesh, West Bengal.

Remark : This species was recorded from Sikkim by H.R. Bhat (1969), Varma and Mahadevan, 1970 and then by Hoogstraal and Mitchell (1971) which were collected by Major R.W.C. Hingsion in 1924. The species causes Himalayan hemorrhagic disease (Hoogstraal, 1967).

5. ***Haemaphysalis bispinosa*** Neumann

1897. *Haemaphysalis bispinosa* Neumann, *Men. Soc., Zool. France,* **10** : 341.

1895. *Haemaphysalis bispinosa,* Nuttall and Warburton, *Ticks,* Part **3** : 426.

1928. *Haemaphysalis bispinosa* Sharif, *Rec. Indian Mus.,* **30**(3) : 255.

1964. *Haemaphysalis bispinosa,* Dhanda and Rao, *Indian J. Med., Res.,* **52** (11) : 1139.

1966. *Haemaphysalis* (Kaiseriana) *bispinosa,* Hoogstraal and Trapido, *J. Parasit.* **52** : 1188.

Material examined : 5(F), Burdong, Rangpo, from goat, 31.viii.1978, coll. S. K. De; 3(F), 6(M), Singtam, from goat, 31.viii.1978. coll. S. K. De; 1(F) Kumbre, Rangpo, from cattle, 1.ix.1978, coll. S. K. De; 1(M), Jeetlang basti, Rangpo from dog, 31.viii.1978, coll. S. K. De; 2(F), 3(M), Tangtang near Mangan, from goat, 30.v.1998. coll. A. K. Sanyal & S. K. Dey.

Diagnosis : Male—Shape of scutum elongate-oval; cervical grooves with convergent depressions; lateral grooves long; festoons twice as long as broad; palps slightly salient, segment 2 and 3 subequal, segment 3 bluntly conical; dentition 4/4; coxa I with a sharp spur; coxa II and IV with a small protuburance.

Female—Sub cordiform scutum, punctations little larger than male; basis capituli broad; cornua short; oval porose areas.

Hosts : Cattle, goat, dog.

Distribution : Sikkim (Siriyani, Rangpo, Mangan, Rabangla, Singtam), Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal.

Remark : The species is recorded here for the second time from Sikkim.

6. ***Haemaphysalis cornigera*** Neumann

1897 *Haemaphysalis cornigera* Neumann, *Mem. Soc. Zool. France,* **10** : 324-420.

1915. *Haemaphysalis cornigera,* Nuttall and Warburton, *Ticks,* Part **3** : 500-504.

1964. *Haemaphysalis cornigera,* Dhanda and Rao, *Indian J. Med., Res.* **52**(11) : 1139-1153.

Diagnosis : Male—Basis capituli rectangular; shallow lateral grooves; cervical grooves deep, short; punctations small, numerous; palpi short, widely salient, segment 2 with prominent ventro-lateral spur which is wide, pointed, posteriorly directed; dentition 5/5; coxa I with a long triangular spur; caxa 2 with spur bigger than spur 3; coxa 4 with two elongated spurs, inner spur much longer than outer spur.

Female—Cervical grooves deep, narrow; punctations numerous, small in lateral fields; palpi widely salient; dentition 4/4; coxa w to 3 as in male, coxa 4 with one or two very small spurs, inner spur sometimes absent.

Hosts : Cattle, deer.

Distribution : Sikkim (Siriyani), Arunachal Pradesh, Assam, Himachal Pradesh.

Remark ; The species was first reported from the state by Dhanda and Rao (1964).

7. ***Haemaphysalis davisi*** Hoogstraal, Dhanda & Bhat

1970. *Haemaphysalis davisi* Hoogstraal, Dhanda and Bhat, *J. Parasit.,* **56**(3) : 588.

1973. *Haemaphysalis davisi.* Rao, Dhanda, Bhat and Kulkarni, *Indian J. Med., Res.,* **61**(10) : 1421.

Diagnosis : Male—External margin of basis capituli externally straight, ventrally bulging externally; palpi moderately salient; scutum broadly oval; cervical grooves short, obscure; punctations small, numerous; coxae long, thin, each with a prominent triangular spur; coxa I lanceolate; dentition 5/5.

Female—Cervical grooves deep, linear, slightly converging extending beyond scutal midlength; dentition 5/5; coxa I spur shorter than male, spur II pointed apically, spurs' III and IV rounded apically; all other characters same as in male.

Hosts : Cattle, goat, sheep, vegetation.

Distribution : Sikkim (Siriyani, Chungthang, Lachung); Arunachal Pradesh.

Remark : This is not a commonly occuring species in Sikkim.

8. ***Haemaphysalis montgomeryi*** Nuttall

1912. *Haemaphysalis montgomeryi* Nuttall, *Parasitology*, **5** : 57.

1915. *Haemaphysalis montgomeryi*, Nuttall and Warburton, *Ticks* part **3** : 395.

1973. *Haemaphysalis montgomeryi* Rao, Dhanda, Bhat and Kulkarni, *Indian J. Med. Res.*, **61**(10) : 1421.

Material examined : 1(F), 1(M), Burdong, Rangpo, from goat, 31.viii.1978, coll. S. K. De; 11(M) Siyori, Gangtok, from goat, 3.ix.1978, coll. S. K. De; 4(M), Samdar Gangtok, from goat, 4.ix.1978. coll. S. K. De; 2(F), 3(M), Lingdong near Mangan, from goat, 30.v.1998, coll. A. K. Sanyal & S. K. De.

Diagnosis : Male—Elongate Scutum; shallow punctations; palpal segment 2 with blade—like dorsal spur; coxae each with a spur; dentition 6/6.

Female—Palpal segment 2 without blade—like dorso-basal spur, all other characters almost same as in male.

Host : Goat.

Distribution : Sikkim (Gangtok, Mangan, Rangpo), Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Uttar Pradesh, West Bengal.

Remark : This is the second record for the species from the State of Sikkim.

9. ***Haemaphysalis nepalensis*** Hoogstraal

1992. *Haemaphysalis nepalensis* Hoogstraal. *J. Parasit.*, **48** : 195.

1973. *Haemaphysalis nepalensis*, Rao, Dhanda, Bhat and Kulkarni, *Indian J. Med., Res.*, **61**(10) : 1421.

Diagnosis : Male—Basis capituli dorsally 1.5 times as wide as long; cornua triangular, lateral grooves short; cervical grooves short; punctations fine, numerous; legs long and robust; coxae each with a very small triangular spur.

Female—Basis capituli with straight, lateral and posterior margin, twice as wide as long; porose areas deep, triangular; palpi as in male; cervical grooves narrow, shallow, converging to scutal midlength, other characters almost similar as in male.

Hosts : Cattle, goat, sheep, yak.

Distribution : Sikkim, Arunachal Pradesh.

Remark : The species is not common in occurrance in Sikkim.

10. ***Haemaphysalis ramachandrai*** Dhanda, Hoogstraal and Bhat.

1970. *Haemaphysalis ramachandrai* Dhanda, Hoogstraal and Bhat, *J. Parasit.*, **56**(4) : 823.

1973. *Haemaphysalis ramachandrai*, Rao, Dhanda, Bhat and Kulkarni, *Indian J. Med., Res.* **61**(10) : 1421.

Diagnosis : Male—Basis capituli dorsally 1.5 times as broad as long; palpi moderately salient posteriorly; scutum broadly oval, margins broadly rounded; cervical grooves short, obscure; lateral grooves shallow, obscure; dentition 4/4 or 5/5; coxal spur I lanceolate, extending to beyond anterior margin of coxal spur II, coxae II to IV broadly triangular.

Female—Basis capituli dorsally 2.2 times as broad as long; palpi as in male; cervical grooves shallow; other characters as in male.

Hosts : Cattle, goat, sheep, man, vegetation.

Distribution : Sikkim, Himachal Preadesh, West Bengal.

Remark : This is a rarely occuring species in Sikkim.

11. ***Haemaphysalis sundrai*** Sharif

1928. *Haemaphysalis sundrai* Sharif, *Rec. Indian Mus.*, **30**(3) : 245.

Material examined : 5(F), 4(M), Lower Gezzing from cattle, 17.ii.1990, coll. A. K. Sanyal.

Diagnosis : Male—Basis capituli dorsally as long as broad; margin essentially straight; palpi compact; scutum 1.45 times as long as broad; cervical grooves narrow, short coverging lateral grooves obsolete; punctations few, small, coxal spur I elongate, II to IV braod.

Female—Basis capituli dorsally two times as broad as long; palpi intermediate between compact and irregularly companulate; scutum 1.25 times as long as broad; cervical grooves as narrow arcs extending to scutal midlength; coxal spur I and II slightly smaller, III and IV shorter.

Hosts ; Cattle, sheep.

Distribution : Sikkim (Gezzing), Uttar Pradesh.

Remark :The species is recorded here for the first time from Sikkim.

12. ***Haemaphysalis*** sp.

Remark : The unidentified species was recorded from Sikkim by Rao, Dhanda, Bhat and Kulkarni (1973).

5. Genus ***Hyalomma*** Koch

1984. *Hyalomma* Koch, *Arch. Naturgesch,* **10**(1) : 220.

Key to the species of *Hyalomma*

Male

1(2) Median and paramedian grooves deep; spiracular plates elongate oval; adanal shields broad; subanal shields absent .... *hussaini* Sharif.

2(1) Lateral grooves short or absent; cervical grooves deep or shallow; adanal shields elongate; subanal shields present, legs with rings ..... *anatolicum anatolicum* Koch

Female

1(2) Operculum wide, depressed medio-posteriorly; adanal shields broad; subanal shields absent; legs usually with rings .... *hussaini* Sharif

2(1) Operculum knob-like; adanal shields elongate; subanal shields present; legs usually without rings .... *anatolicum anatolicum* Koch

13. ***Hyalomma anatolicum anatolicum*** Koch

1944. *Hyalomma anatolicum anatolicum* Koch. *Arch. Naturgesch,* **19**(1) : 220.

Material examined : 1(M), Towards Dzongu, Mangan, from cattle, 23.ix.1992, coll. S. Ahmed.

Diagnosis : Male—Highly punctated scutum; lateral grooves distinct, short; posteromedian groove not reaching the parma; subanal shields small, situated directly posterior of adanals, basis capituli dorsally with slightly concave posterior margin, legs without ring.

Female—Scutum longer than wide with narrowly rounded posterior margin punctations large in scapular areas; operculum short, small.

Host : Cattle.

Distribution : Sikkim (Mangan), Andhra Predesh, Assam, Delhi, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal.

Remark : This paper reports the species for the first time from Sikkim.

14. ***Hyalimma hussaini*** Sharif

1928. *Hyalomma hussaini* Sharif *Rec. Indian Mus.*, **30**(3) : 314.

1973. *Hyalomma hussaini*, Rao, Dhanda, Bhat and Kulkarni, *Indian J. Med., Res.*, **61**(10) : 1421.

1987. *Hyalomma hussaini*, Geeverghese and Dhanda, *The Indian Hyalomma ticks* (Ixodoidea : Ixodidae), ICAR, 98.

Diagnosis : Male—Scapular and cervical areas with large punctations, central and caudal areas

rarely with punctations; lateral grooves deep and well developed; cervical grooves shallow, rounded; basis capituli broader than long dorsally, adanal shields broad; subanal shields absent.

Female—Scutum longer than wide, smooth, glossy, punctations, few, large in scapular and cervical areas; cervical grooves smooth, shallow, distinct; shield—shaped genital operculum.

Host : Sheep.

Distribution : Sikkim, Andhra Pradesh, Bihar, Goa, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Orissa Punjab, Rajasthan, Tamil Nadu, West Bengal.

Remark : The species was first reported from the State by Rao, Dhanda, Bhat and Kulkarni (1973).

15. ***Halomma*** sp.

Remark : The genus was reported from Sikkim with unidentified species by Rao, Dhanda, Bhat and Kulkarni (1973)

6. Genus ***Ixodes*** Latreille

1795 *Ixodes* Latreille, *Mag. Encyl. J. Sci., Lett. Arts.*, **4** : 15-20.

Key to the species of Ixodes

Male

1(2) Coxa I with a thick, long external spur; dentition 2/2 ..... *acutitarsus* ((Karsch)

2(1) Coxa I with a single short, blunt internal spur; dentition 4/4..... *ovatus* Neumann

Female

1(2) Coxa I with a thick, long external spur,.. ..... *acutitarsus* (Karsch)

2(1) Coxa I with a single, short internal spur ..... *ovatus* Neumann

16. ***Ixodes acutitarsus*** (Karsch)

1880. *Haemalastor acutitarsus* Karsch, *Mittcheil, Munchener Entomol, Vereine*, **4** : 142.

1899. *Ixodes laevis* Neumann, *Mem. Soc., Zool. France*, **12** : 148.

1901. *Ixodes acutitarsus*, Neumann, *Mem. Soc., Zool., France*, **14** : 285

1928. *Ixodes acutitarsus*, Sharif, *Rec. Indian Mus.*, **30**(3) : 234.

1964. *Ixodes acutitarsus*, Dhanda and Rao, *Indian J. Med., Res.*, **52**(11) : 1151.

1973 *Ixodes acutitarsus*, Rao, Dhanda, Bhat and Kulkarni, *Indian J. Med. Res.*, **61**(10) : 1421.

Diagnosis : Male—Scutum smooth, very fine punctations; lateral groves continuous; dentition 2/2; coxa I with two very long spurs.

Female—Capitulum longer than in male; palps four times as long as broad; article II twice as long as article III; coxa I bidentate; internal spur thick; other characters as in male.

Host : Cattle.

Distribution : Sikkim (Siriyani) Arunachal Pradesh, Assam, Himachal Pradesh, West Bengal.

Remark : Neumann (1901) first reported the species from Sikkim.

17. ***Ixodes ovatus*** Neumann

1899. *Ixodes ovatus* Neumann, *Mem. Soc. Zool., France*, **12** : 116.

1963. *Ixodes ovatus*, Morel, *Ann. Parasit. Hum. Com.*, **38**(6) : 925

1973. *Ixodes ovatus*, Rao, Dhanda, Bhat and Kulkarni, *Indian J. Med. Res.*, **61** (10) : 1421.

Material examined : 1(F), 1(M), Gezzing town, from dog, 12.ii.1990. coll. A. K. Sanyal.

Diagnosis : Male—Palpi pointed apically; auriculae absent; coxa I with short internal spur; syncoxae present on I and II; dentition 4/4.

Female—Basis capituli with well developed cornua; coxa I with a short, blunt internal spur, coxa II without spur.

Hosts : Dog, cattle, goat,. sheep, small mammals, yak, vegetation.

Distribution : Sikkim (Gezzing), Arunachal Pradesh, Himachal Pradesh, Uttar Pradesh, West Bengal.

Remark :The species was first recorded from Sikkim by Morel (1963).

18. ***Ixodes*** sp.

Remark : The unidentified species was recorded from the State by Rao *et al.* (1973).

7. Genus ***Rhipicephalus*** Koch

1897. *Rhipicephalus* Koch, *Arch. Naturgesch,* **10**(1) : 238

19. ***Rhipicephalus haemaphysaloides*** Supino

1897. *Rhipicephalus haemaphysaloides* Supino, *Atti Soc. Veneto. trent. Sci., nat.,* 2s **3**(1) : 234.

1971. *Rhipicephalus haemaphysaloides,* Hoogstraal, Saito, Dhanda and Bhat, *J. Parasit.,* **57**(1) : 182.

1973. *Rhipicephalus haemaphysaloides,* Rao, Dhanda, Bhat and Kulkarni *Indian J. Med. Res.,* **61** (10) : 1421.

Material examined : 2(F), 8(M), Namprikdeng near Mangan, from dog, 30.v.1998, coll. A. K. Sanyal & S. K. De; 1(F), 3(M), Veterinary complex, Namchi from goat, 1.vi.1998, coll. A. K. Sanyal & S. K. De; 2(F), 2(M), Veterinary complex, Namchi, from dog, 1.vi.1998, Coll. A. K. Sanyal & S. K. De; 1(F), Veterinary Complex, Namchi from cow, 1.vi.1998, coll. A. K. Sanyal & S. K. De; 1(F), 1(M), Rangpo, from dog, 4.vi.1998, coll. A. K. Sanyal & S. K. De.

Diagnosis : Male—Cervical grooves short converging pits; lateral grooves narrow, deep; punctation few; basis capituli as broad as long; palpi longer than broad; adanal shields sickle—shaped; spiracle comma-shaped; dentition 3/3.

Female—Cervical grooves deep; punctations few; spiracle subtriangular with a large mecula; cornua short; other characters as in male.

Hosts : Buffalo, cattle, goat, sheep, dog, man, small mammals.

Distribution : Sikkim (Siriyani, Namchi, Rangpo), Arunachal Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal.

Remark : The species is recorded here for the second time from Sikkim.

SUMMARY

This is an account of ixodid tick fauna of Sikkim. 19 species under 7 genera hitherto known from the state have been recorded in the paper. Of these two genera and two species are reported here as the first record from the State. The species of *Haemaphysalis* may be considered as most common as abundant tick and are found to attack catle and goat. The first and important references, diagnostic features of the species and their hosts in the state, distribution of the species in India and key to the identification of genera and species have been presented in the paper.

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The authors are grateful to Dr. J.R.B. Alfred, Director, Zoological Survey of India.

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HOOGSTRAAL, H., DHANDA V. AND BHAT, H. R. 1990. *Haemaphysalis (Kaiseriana) davisi* sp. n. (Ixodoidea : Ixodidae), a parasite of domestic and wild mammals in northeastern India, Sikkim and Burma. *J Parasit.* **56**(3) : 588-595.

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ACARI : PLANT MITE

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INTRODUCTION

The plant mite fauna of Sikkim was unknown till 1985 (Gupta, 1985) and till date no published information is available. On the contrary, Sikkim, a small Himalayan state of India, is endowed with luxuriant vegetation and in view of this it is most likely that the plant mite fauna will also be very rich and varied.

The part of Sikkim situated in the Terai region is having a dense forest of miscellaneous nature while as the height increases, the vegetation gradually declines as is seen in north district of Sikkim. However, agricultural crops, fruit trees and ornamental plants were met with almost at all the places wherever surveys were conducted and the main thrust of plant mite collection was laid upon those plants.

The Sikkim is divided into four districts, *viz.* East Sikkim, West Sikkim, North Sikkim and South Sikkim and all the four districts could be covered during the two survey trips conducted by the author in 1981 and 1994. In addition, a couple of specimens collected earlier in 1979 by one of the ZSI colleagues was also made available to the author and the present paper is based upon all these material.

A total of 65 species belonging to 29 genera and 14 families under 3 orders are treated here giving their selected synonymies, collection data, host/habitat records, distribution in India and abroad, economic importance wherever noted along with keys to various taxonomic categories involved. Besides, a general discussion on plant mite fauna of Sikkim in relation to the same from neighbouring areas, along with their economic importance is also given. Lastly, a districtwise distribution of species is also included. Since diagnosis of most of the species dealt with here has been given in Gupta (1985, 1986, 1987, 1991, 1992a), the same is not included for any of the species treated here.

The material dealt with here is deposited in the National Zoological Collection of the Zoological Survey of India, Calcutta. Unless otherwise mentioned, the entire collection was made by the author himself.

MATERIALS AND METHODS

The collection of plant mites made by the author during his Survey of Sikkim in 1981 and 1994 in addition to a couple of specimens collected by one of the ZSI colleagues during 1979 were all studied and examined and this paper is based upon the results of that study. The collection, preservation and mounting techniques followed here were same as given in Gupta (1985). Most of the host plants were identified by the author in the field itself but wherever required, the help of the experts was taken for confirmation of identities.

SYSTEMATIC ACCOUNT

A total of 65 species belonging to 29 genera, 14 families under 3 orders are dealt with here. Among these, 21 species belong to phytophagous group while 44 belong to predatory group. Incidentally, all are new records for the state while one forms a new record from India. The selected synonymies, collection records, host/habitat records, distribution in India and abroad

and economic importance, wherever noted, have been given for each species along with keys to the various taxnomic categories involved. At the end, a general discussion about the plant mite fauna of Sikkim in relation to the same in the neighbouring areas, economic importance, wherever noted, and districtwise distribution of species in Sikkim are given.

Key to the Orders of plant mite fauna of Sikkim

1. Pedipalpal apotele represented by a tined seta situated near the inner basal angle of the tarsus; stigma situated dorsal to coxae II-IV and usually with elongated peritreme; tritosternum usually with lacinia or lacineae; tectum roofs gnathosoma ..... Order MESOSTIGMATA

– Apotele completely absent on pedipalp; stigma never situated dorsal to coxae II-IV 2

2. Ambulacrum of legs comprising a median claw with a prominent tarsus or an associated membranous pad or a stalked sucker–like organ; chelicera invariably chelate trichobothria never present on idiosoma; straight and tracheae absent ..... Order ASTIGMATA

– Ambulacrum of legs not as above; chelicera rarely chelate or variously modified into piercing stylet or hooklike organs; pedipalp sometimes modified into thumb claw complex; idiosoma often with trichobothria, or respiratory system usually present and trachea often opens through paired stigma situated between the chelicerae or on to the dorsal surface of the propodosoma; often with associated peritremes; usually weakly sclerotized..... Order PROSTIGMATA

Order MESOSTIGMATA

Key to the families of Order MESOSTIGMATA known to occur on plants in Sikkim

1. Normally with fewer than 20 pairs of dorsal setae except in Gnoriminae where there are upto 23 pairs of setae .... Fam. PHYTOSEIIDAE

– Always with more than 20 pairs of dorsal setae .....Fam. ASCIDAE

Family PHYTOSEIIDAE Berlese

Key to the subfamilies, genera, subgenera, species of PHYTOSEIIDAE known to occur in Sikkim.

1. Prolateral setae 4 pairs, in all 6 9 pairs of lateral setae, preanal setae 3 pairs .... Subfam. Amblyseiinae, 2.

– Prolateral setae 5 or more pairs, in all 9-12 pairs of lateral setae, preanal setae 3-7 pairs ..... Subfam. Phytoseiinae,5

2. Ventrianal shield absent or indistinctly demarcated, only preanal setae distinctly present ..... *Indoseiulus, I. ricini*

– Ventrianal shield distinctly present.....3

3. Lateral integument sclerotized so that r3 and RI though on usual lateral position appear to be on lateroventral extension of dorsal shield ..... *Iphiseius,* 6

– Lateroventral integument not sclerotized as above 4

4. Metapodal plates large, single paired, triangular, genital shield very broad and punctate, ventrianal shield massive, genu II with 6 setae ..... *Paraamblyseius,* 7

– Metapodal plates 2 paired, slender, elongate, genital and ventrianal shields usually narrow, genu II with 7 setae ....: *Amblyseius,* 8.

5. Seta r_3 on dorsal shield, genu II with 7 setae, genu III with 6 setae .... *Phytoseius,* 24

– Seta r_3 on lateral integument, genu II with 7 or 8 setae, genu III with 6 or 7 setae ..... *Typhlodromus*, 25

6. Seta Z_5 very long (over 30 microns) and stout considerably longer than other setae on dorsal shield ..... *I. andamanicus*

– Seta Z_5 short (much less than 30 microns, only 12 microns) and almost as long as other setae on dorsal shield ..... *I. hapoli*

7. Metasternal plate round, J_2 longer than Z_1, Z_4 shorter than the distance between Z_4 and Z_5 ..... *P. mumai*

– Metasternal plate kidney shaped, J_2 subequal to Z_1, Z_4 reaches base of Z_5 ..... *P. fragariae*

8. Dorsal shield with 5 pairs of postlateral setae 9

– Dorsal shield with less than 5 pairs of postlateral setae ..... *A.(Paraphytoseius)*

– Dorsal setae J_1, J_3, s_4, Z_4, Z_5 long, thick, serrate ..... *A. (P.) multidentatus*

9. Setae Z_5, s_4, Z_4, long and whiplike, longer than distance between their bases, leg IV with macrosetae on genu and erect seta on tarsus ..... *A.(Amblyseius)*, 13

– Setae Z_5 shorter, at most as long as distance between their bases, leg I with no macroseta, or only one on genu, no erect seta on tarsus 10

10. Sternal shield distinct and straight or concave posteriorly, ventrianal shield approximately shield shaped or pentagonal 11

– Sternal shield indistinct, may be trilobate posteriorly, ventrianal shield elongate, vase shaped or concave laterally 12

11. Setae Z_5 and Z_4 distinctly serrate, sternal shield as wide as or wider than long, macroseta may be present on genu I and also on genu II and III ..... *A. (Typhlodromips)*, 17

– Setae Z_5 and Z_4 mostly smooth, sternal shield longer than wide, genu I, II, III without macrosetae ..... *A.(Neoseiulus)* ..... *A. (N.) longispinosus*

12. Peritreme extends anteriorly upto J_3, anterior pair of preanal setae adjacent to anterior margin of ventrianal shield ..... *A.(Typhlodromalus)* ..... *A.(T.) kalimpongensis.*

– Peritreme not extends upto J_3, anterior pair of preanal setae removed from anterior margin of ventrianal shield ..... *A. (Euseius)*, 19

13. Ventrianal shield vase shaped with lateral margins concave 14

– Ventrianal shield pentagonal or squarish 15

14. Cervix of spermatheca elongated and of parallel diameter ..... *A.(A.) largoensis*

– Cervix of spermatheca fundibuliform ..... *A.(A.) herbicolus*

15. Z_5 over 200 microns in length 16

– Z_5 much less than 200 microns in length.. ..... *A.(A.) neorykei*

16. Cervix of spermatheca looped ..... *A.(A.) paraaerialis*

– Cervix of spermatheca not looped ..... *A.(A.) channabasavannai*

17. Besides setae Z_5 and Z_4 other setae being subequal 18

– Besides Z_5 and Z_4 there are other long setae ..... *A.(T.) officinaria*

18. Cervix of spermatheca saucer shaped ..... *A.(T.) syzygii*

– Cervix of spermatheca elongated, flask shaped ..... *A.(T.) suknaensis*

19. All setae on dorsal shield minute, excepting J_1 and Z_5 20

– Besides Z_5 and j_1 some other setae also long 21

20. Setae S_2–S_5 equal ..... *A.(E.) ovalis*

– Setae S_2–S_5 unequal ..... *A(E). rhododendronis*

21. Setae J_1 – J_3 either equal or J_3 longer than J_1 22

– Seta J_1 longer than J_3 23

22. Seta J_3 longer than J_1 ..... *A.(E.) delhiensis*

– Seta J_3 as long as J_1 ..... *A.(E.)coccineae*

23. Spermatheca and spermatophoral process as illustrated in figs 1 and 2 ..... *A.(E.) pruni*

– Spermatheca and spermatophoral process as in figs 3 and 4 ..... *A.(E.)finlandicus*

24. Seta S_4 longer than S_6 ..... *P.(P.)macropilis*

– Seta S_4 shorter than S_6 ..... *P.(P.)meyerae*

25. Setae Z_5 and Z_4 normally serrate and the former knobbed ..... *T.(Amblydromella), 26*

– Setae Z_5 and Z_4 never serrate, Z_5 always smooth ..... *T.(Orientiseius)*, 27

26. Macroseta present only on basitarsus IV ... . *T.(A.) homalii*

– Macroseta present on other leg segments besides basitarsus IV ..... *T.(A.)darjeelingensis*

27. Length of setae J_4-J_6 vary between 8-10 microns ..... *T.(O.)pruni*

– Length of setae J_4-J_6 vary between 26-60 microns ..... *T.(O.) rickeri*

1. *Amblyseius (Amblyseius) channabasavannai* Gupta & Daniel

1978. *Amblyseius channabasavanni* Gupta & Daniel, *Oriental Ins.* **12** : 328-329.

1986. *Amblyseius (Amblyseius) channabasavannai*, Gupta, *Fauna of India (Acari : Mesotigmata) family Phytoseiidae*, p. 41.

1987. *Amblyseius (Amblyseius) channabasavannai*, Gupta, *Rec. zool. Surv. India. Occ.* Pap. No. **95**, p. 8.

1992. *Amblyseius (Amblyseius) channabasavannai*, Gupta *State Fauna Series* **3** : *Fauna of West Bengal*, Part 3 : p. 152.

Material examined : 2 female, India : Sikkim, Dist. East Sikkim, Middle camp., ex Champa, 10.11.1981, 1 female, Kanikhola, ex *Shorea robusta*, 11.11.81; 5 female, Dist. North Sikkim, Phodong, ex guava, 25.2.1994; 1 female, Phodong, Mangan, ex undet, plant 24.2.1994; 1 female, Meli ex cardamom, 25.2.1994: 1 female, Singhik, ex *Lantana*, 26.2.1994.

Distribution : India : Sikkim (Dists. East Sikkim, North Sikkim, South Sikkim), Meghalaya, Arunachal Pradesh, Tamil Nadu, Kerala.

Remarks : This mite was found actively feeding upon an undet. species of *Eotetranychus* (mostly upon the eggs and nymphs) infesting cardamom in Phodong. In fact, this was quite a dominant predator of cardamom mite and most likely it may bring about effective check of this pest.

2. *Amblyseius (Amblyseius) herbicolus* (Chant)

1959. *Typhlodromus (Amblyseius) herbicolus* Chant, *Can. Ent.*, **91** : 84-85.

1970. *Amblyseius deleoni* Muma & Denmark, *Arthropods of Florida*, **6** : 68-69.

1983. *Amblysseius deleoni*, Gupta & Ray, *Rec. zool. Surv. India*, **80** : 305-306.

1986. *Amblyseius (Amblyseius) herbicolus*, Gupta, *Fauna of India (Acari : Mesostigmata) family Phytoseiidae*, p. 45-47.

1987. *Amblyseius (Amblyseius) herbicolus*, Gupta, *Rec. zool. Surv. India. Occ. pap.*, No. **95**, p. 9.

1992. *Amblyseius (Amblyseius) herbicolus*, Gupta, *State Fauna Ser.* **3** : *Fauna of West Bengal, Part 3*, p. 152-153.

Material examined : 1 female, 1 male, India : Sikkim, Dist. East Sikkim, Tadong, ex. undet. plant, 10.7.1979 (coll. S. K. Ghosh), 1 female, 1 male, Rongpo, ex *Shorea robusta*, 8.11.1981 ; 2 Female, middle camp, ex. Champa, 10.11.1981; 5 Female, Gangtok, ex. bamboo, 9.10.1981; 2 Female, Kanikhola, ex. guava, 11.11.1981; 2 Female, 1 male; Dist. South Sikkim. Bhanjyang. ex. papaya, 6.3.1994; 1 female, Bhanjyang, ex. *Dolichos lalalab*, 6.3.1994; 3 female, Dist. South Sikkim, Jorethang, ex. undet. plant, 7.3.1994; 1 female, Dist. South Sikkim, Melli, ex *Citrus sinensis*, 4.3.1994; 2 female, Melli, ex undet plant, 5.3.1994; 4 female, Dist. North Sikkim, Singhik, ex undet plant, 26.2.1994; 3 female, Dist. North Sikkim, ex Citrus lemon 25.2.1994, 1 female, Dist. South Sikkim, Ravangla, ex. 28.2.94; 2 Female, Phodong, ex brinjal 25.2.1994; 1 male, Dist. East Sikkim, Deorali, ex Orchild, 22.2.1994; 2 Female, dist. North Sikkim, Singhik, ex. undet plant, 26.2.1994.

Distribution : India: Sikkim, (Dists. East Sikkim, North Sikkim, South Sikkim), Tripura, Arunachal Pradesh, Meghalaya. Elsewhere : Portugal, North America, South America Mexico, Philippines, British West Indies, Taiwan, Thailand, Madagascar, Brazil, Japan.

Remarks : This has been seen to be one of the most efficient predators known from India and found feeding voraceously on *Brevipapus phoenicis* on citrus, *Eotetranychus* sp. on bamboo. The extent of feeding was so high on cardamom that these mites were almost reddish due to feeding. *Brevipalus phoenicis* is a serious pest of cardamom in Sikkim area causing reddening and drying of leaves. This predatory mite will prove to be useful in controlling this pest mite.

3. ***Amblyseius (Amblyseius) largoensis*** (Muma)

1955. *Amblyseiopsis largoensis* Muma, *Ann. ent. Soc. Amer.*, **48** : 266.

1969. *Amblyseius anitai* Bhattacharyya, *J. Bombay. Nat. Hist. Soc.*, **65**(3) : 677-679.

1986. *Amblyseius (Amblyseius) largoensis*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytosiidae*, p. 51-55.

1992. *Amblyseius (Amblyseius) largoensis*, Gupta, *Rec. zool. Surv. India. Occ. Pap.* No. **95** : 10-12.

Material examined : 1 female, India : Dist. East Sikkim, Deorali, ex. an undet. species of Orchid, 22.2.1994.

Distribution : India : Sikkim (Dist. East Sikkim), West Bengal, Manipur, Tripura, Nagaland, Arunachal Pradesh, Assam, Meghalaya, Orissa, Andhra Pradesh, Kerala, Tamil Nadu, Pondicherry, Bihar, Uttar Pradesh, Punjab, Himachal Pradesh, Gujarat, Andaman Nicobar Islands. Elsewhere : Japan, Guatemala, Hondurus, Puerto Rico, Brazil, Costa Rica, New Zealand, Mexico, Jamaica, Trinidad, South Africa, Kenya, California, Florida, Hawaii, Israel, West & Northern Iran, Hong Kong, Philippines, Taiwan, Thailand.

Remarks : Through this mite is met with frequently in many parts of the country but in Sikkim this appeared to be rather uncommon in comparison to *A.(A.)herbicolus* which was abundant. Its predatory importance was not noticed due to its poor population.

4. ***Amblyseius (Amblyseius) neorykei*** Gupta

1977. *Amblyseius neorykei* Gupta, *Entomologists' mon. mag.*, **112** : 56-57.

1986. *Amblyseius (Amblyseius) neorykei*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 59-61.

1987. *Amblyseius (Amblyseius) neorykei*, Gupta, *Rec. zool. Surv. India, Occ. Pap.* No. **95** : p. 12.

1992. *Amblyseius (Amblyseius) neorykei*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part 3*, p.154.

Material examined : 1F, India : Sikkim, Dist. East Sikkim, Middle camp., ex Champa, 10.11.1981; 1 female, Dist. South Sikkim, Melli, ex. banana, 4.3.1994.

Distribution : India : Sikkim (Dists. South Sikkim, East Sikkim), West Bengal, Arunachal Pradesh.

5. ***Amblyseius (Amblyseius) paraaerialis*** Muma

1967. *Amblyseius paraaerialis* Muma, *Fla. Ent.*, 50 : 270-271.

1986. *Amblyseius (Amblyseius) paraaerialis*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 63-65.

1987. *Amblyseius (Amblyseius) paraaerialis*, *Rec. zool. Surv. India, Occ. Pap.* No. **95**, p.13.

Material examined : 1 female, India : Sikkim, Dist. East Sikkim, Gangtok, ex. undet. plant, 21.2.1994; 2 female; Dist. South Sikkim, Ravangla, ex. bamboo, 28.2.1994; 1 female; Dist. West Sikkim, Legship, ex. undet. plant, 2.3.1994.

Distribution : India : Sikkim (Dists. East Sikkim, West Sikkim, South Sikkim). Assam, Tripura, Meghalaya, Arunachal Pradesh. Elsewhere : Thailand.

6. ***Amblyseius (Euseius) coccineae*** Gupta

1975. *Amblyseius (Euseius) coccineae* Gupta, *Internat. J. Acarol.*, **1**(2) : 33.

1986. *Amblyseius (Euseius) coccineae*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*; p. 78-80.

1987. *Amblyseius (Euseius) coccineae*, Gupta, *Rec. zool. Surv. India, Occ. Pap*, No. **95**, p. 22-23.

1992. *Amblyseius (Euseius) coccineae*, Gupta, *State Fauna Ser.* **3**, *Fauna of West Bengal, Part* **3**, p. 156.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Phodong, ex. China rose, 25.2.1994.

Distribution : India; Sikkim (Dist. North Sikkim), West Bengal, Orissa, Meghalaya, Bihar, Tripura, Pondicherry, Tamil Nadu, Andhra Pradesh, Gujarat, Madhya Pradesh, Jammu & Kashmir, Uttar Pradesh.

7. *Amblyseius (Euseius) delhiensis* (Narayanan & Kaur)

1960. *Typhlodromus (Amblyseius) delhiensis* Narayanan & Kaur, *Proc. Indian Acad. Sci.*, **51** : 5-7.

1986. *Amblyseius (Euseius) delhiensis*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 82-84.

1987. *Amblyseius (Euseius) delhiensis*, Gupta, *Rec. zool. Surv. India, Occ. Pap.* No. **95**, p. 23-24.

1992. *Amblysius (Euseius) delhiensis*, Gupta, *State Fauna Ser. 3, Fauna West Bengal*, Part 3, p. 157.

Material examined : 2 female, India : Sikkim, Dist. East Sikkim, ex. an undet. plant, 9.11.1981.

Distribution : India : Sikkim (Dist. East Sikkim), West Bengal, Uttar Pradesh.

Remarks : The occurrence of this species in Sikkim is rather interesting as so far this has not been reported from any other northeast Indian states.

8. *Amblyseius (Euseius) finlandicus* (Oudemans)

1915. *Seiulus finlandicus* Oudemans, *Ent. Ber.*, **4** : 183.

1958. *Amblyseius finlandicus*, Athias-Henriot, *Bull. Soc., Hist. Nat. Afr. Nord.*, **49** : 34-36.

1967. *Amblyseius finlandicus*, Ghai & Menon, *Oriental Ins.*, **1** : 70.

1986. *Amblyseius (Euseius) finlandicus*, Gupta, *Fauna of India. (Acari : Mesostigmata) Family Phytoseiidae*, p. 86-88.

1987. *Amblyseius (Euseius) finlandicus*, *Rec. zool. Surv. India, Occ. pap.*, No. **95**, p. 24-28.

1992. *Amblyseius (Euseius) finlandicus*, Gupta, *State Fauna Ser.* **3**, *Fauna of West Bengal*, Part **3**, p. 157-158.

Material examined : 2 female; India, Sikkim, Dist. South Sikkim, Samsing, ex. undet. plant, 27.3.1981; 2 female, Dist. East Sikkim, Middle camp, ex. undet Plant, 10.10.1981; 1 female, Dist. South Sikkim, Bhanjyang, ex. papaya, 6.3.1994; 1 female, Jorthang, ex. banana, 7.3.1994; 1 female, Dist. West Sikkim, Legship, ex. an undet plant, 2.3.1994; 5 female, Dist. East Sikkim, Gangtok, ex. undet. plant, 21.2.1994; 1 female, Dist. North Sikkim, Singhik, ex. an undet. plant, 26.2.1994; 4 female, Dist. East Sikkim, Deorali, ex an undet species of orchid, 22.2.1994; 1 female, Dist. North Sikkim, Phodong, ex. cardamom. 1 female, Dist. North Sikkim, Mangan, ex peach 23.2.1994.

Distribution : India : Sikkim (Dists. East Sikkim, North Sikkim, South Sikkim, West Sikkim), Karnataka, Bihar, Punjab, Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal, Tripura, Meghalaya. Elsewhere : Pakistan, Western & Northern Iran, Europe (England, Algeria, Israel, Greece, Italy, Netherlands, Scandinavian countries), Canada (British Columbia, Nova Scotia, Ontario), Mexico, Hawaii, Japan (Hokkaido, Honshu), Russia, Africa, North America, South America.

Remarks : This is a cosmopolitan species with wide distribution in India and was often found to be efficient predator. During the present study this mite was found feeding upon *Eutetranychus orientalis* and *Brevipalpus phoenicis*, infesting papaya and cardamom, respectively. This species appears to be of great use in biological control for these two important pest species.

9. *Amblyseius (Euseius) ovalis* (Evans)

1953. *Typhlodromus ovalis* Evans, *Ann. mag. Nat. Hist.*, **6** : 458-461.

1970. *Amblyseius ovalis*, Gupta, *Sci & Cult.*, *36* : 98.

1986. *Amblyseius (Euseius) ovalis*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 92-94.

1987. *Amblyseius (Euseius) ovalis*, Gupta, *Rec. zool. Surv. India, Occ. Pap.* No. **95**, p. 27-28.

1992. *Amblyseius (Euseius) ovalis*, Gupta, *State Fauna of Ser.* **3**, *Fauna of West Bengal, Part* **3**, p. 158.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Rongpo, ex. undet plant, 6.4.1981; 1 female, Kanikhola, ex. *Bougainvillea* 11.11.1981.

Distribution : India : Sikkim (Dist. South Sikkim), West Bengal, Meghalaya, Tripura, Manipur, Bihar, Maharashtra, Gujarat, Karnataka, Tamil Nadu, Pondicherry, Kerala, Andaman Islands. Elsewhere : Philippines, Taiwan, Hawaii, Mauritius, Malayasia, Hong Kong, Okinawa Islands, Indonesia, New Zealand. Mexico.

Remarks : Although this mite is a good predator elsewhere but in Sikkim its population was very poor.

10. *Amblyseius (Euseius) pruni* Gupta

1975. *Amblyseius pruni* Gupta, *Internat. J. Acarol.*, **1** (2): 40-42.

1986. *Amblyseius (Euseius) pruni*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 94-95.

1987. *Amblyseius (Euseius) pruni, Rec. zool. Surv. India, Occ. Pap.* No. **95**, p. 94-96.

1992. *Amblyseius (Euseius) pruni, State Fauna Ser.* **3**, *Fauna of West Bengal Part* **3**, p. 158-160.

Material examined : 1 female, India : Sikkim, Dist. East Sikkim, Gangtok, ex. an undet. Plant, 3.7.1979. (coll. S.K.Ghosh); 1 female, Kanikhola, ex. undet. plant, 30.6.1979 (coll. S.K.Ghosh); 1 female, Dist. South Sikkim, Rongpo, ex. undet. plant. 8.11.1981; 2 female, Dist. East Sikkim, Middle camp, ex. undet plant, 10.11.1981; 5 females, Dist. East Sikkim, Gangtok, arum, 8.11.1981. 1 female, Deorali, ex. an undet. species of orchid, 22.2.1994; 1 female, Dist. South Sikkim, Ravangla, ex. undet plant, 1.3.1994; 1 female, Dist. North Sikkim, ex. cardamom, 23.2.1994; 1 female, Mangan, ex. guava, 24.2.1994; 1 female, Mangan, ex. mango, 24.2.1994.

Distribution : India : Sikkim, (Dist. East Sikkim, North Sikkim, South Sikkim), West Bengal, Assam, Meghalaya, Tripura, Jammu & Kashmir, Himachal Pradesh.

11. *Amblyseius (Euseius) rhododendronis* Gupta

1990. *Amblyseius (Euseius) rhododendronis* Gupta, *Oriental Ins.*, **4** : 187-188.

1986. *Amblyseius (Euseius) rhododendronis*, Gupta, *Fauna of India, (Acari : Mesostigmata)* Family *Phytoseiidae*, p. 96-98.

1987. *Amblyseius (Euseius) rhododendronis*, Gupta, *Rec. zool. Surv. India, Occ. Paper, No.* **95**, p. 29.

1992. *Amblyseius (Euseius) rhododendronis*, Gupta, *Rec. zool. Surv. India, Occ. Pap.* No. **95**, p. 160.

Material examined : 4 female, India, Sikkim, Dist. South Sikkim, Kanikhola, ex. Coffee, 11.11.1981; 4 female, locality same, ex. *Shorea robusta*, 11.11.1981.

Distribution : India : Sikkim (Dist. South Sikkim), West Bengal, Tripura, Karnataka.

12. *Amblyseius (Paraphytoseius) multidentatus* (Swirski & Shechter)

1960. *Typhlodromus (Amblyseius) orientalis* Narayanan, Kaur & Ghai, *Proc. Nat. Inst. Sci.*, **26B** : 394.

1961. *Paraphytoseius multidentatus* Swirski & Shechter, *Israel J. Agric. Res.*, **11(2)** : 114-116.

1986. *Amblyseius (Paraphytoseius) multidentatus*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 123-126.

1987. *Amblyseius (Paraphytoseius) multidentatus*, Gupta, *Rec. zool. Surv. India, Occ. Pap.* No. **95**, p.46-47.

Material examined : 1 female, India : Sikkim, Dist. East Sikkim, Kanikhola, ex. *Lantana*, 11.11.1981; 4 female, 1 male, Kanikhola, *ex Shorea robusta*, 11.11.1981; 2 female, Dist. East Sikkim, Deorali, ex an undet species of orchid. 22.2.1994.

Distribution : India : Sikkim (Dist. East Sikkim), Tripura, West Bengal, Meghalaya, Assam, Bihar, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka. Elsewhere : Hong Kong, Thailand, Malagassy, Nigeria, Madagascar.

Remarks : This mite in several parts of India has been found to be active predator of *Tetranychus urticae* and *T. ludeni* infesting vegetables but in the present survey, such predatory importance was not noticed.

13. *Amblyseius (Neoseiulus) longispinosus* (Evans)

1952. *Typhlodromus longispinosus Evans, Ann. Mag. Nat. Hist.,* (12) **5** : 413-414.

1970. *Amblyseius longispinosus,* Gupta, *Sci. & Cult.,* **36** : 98.

1986. *Amblyseius (Neoseiulus) longispinosus,* Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae,* : 116-117.

1987. *Amblyseius (Neoseiulus) longispinosus,* Gupta, *Rec. zool. Surv. India, Occ. pap. No.* **95**, p. 39-40.

1992. *Amblyseius (Neoseiulus) longispinosus,* Gupta, *State Fauna Ser.* **3**, *Fauna of West Bengal, Part* **3**, p.162-163.

Material examined : 1female, India : Sikkim, Dist. East Sikkim, ex. an undet. species of orchid, 22.2.1994.

Distribution : India : Sikkim (Dist. East Sikkim), West Bengal, Bihar, Orissa, Tripura, Andaman & Nicobar Islands., Pondicherry, Tamil Nadu, Uttar Pradesh. Elsewhere : Philippines, Taiwan, Indonesia, Malayasia, Japan, Hongkong, New Zealand, Jamaica, Hawaii, South America.

14. *Amblyseius (Typhlodromalus) kalimpongensis* Gupta

1969. *Amblyseius kalimpongensis* Gupta, *Bull. Ent., Ent. Soc. India,* **10** : 128-129.

1986. *Amblyseius (Typhlodromalus) kalimpongensis,* Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae,* p. 150-152.

1987. *Amblyseius (Typhlodromalus) Kalimpongensis,* Gupta, *Fauna of India, (Acari : Mesostigmata) Family Phytoseiidae,* p. 150-152.

1987. *Amblyseius (Typhlodromalus) Kalimpongensis, Rec. zool. Surv. India, Occ. Pap, No.* **95**, p. 53-54

1992. *Amblyseius (Typhlodromalus) Kalimpongensis,* Gupta *State Fauna Ser.* 3, *Fauna of West Bengal, Part* **3**, p. 164-165.

Material examined : 1 Female, India : Sikkim : Dist. North Sikkim, Mangan, ex. guava, 24.2.1994; 5 females, Dist. East Sikkim, Deorali, ex. an undet. species of orchid, 22.2.1994.

Distribution : India : Sikkim (Dist. North Sikkim, East Sikkim), Assam, West Bengal, Tripura, Meghalaya, Bihar, Orissa, Gujarat, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka.

15. *Amblyseius (Typhlodromips) officinaria* Gupta

1975. *Amblyseius officinaria* Gupta, *Internat. J. Acarol,* **1** (2) : 39.

1986. *Amblyseius (Typhlodromips) officinaria,* Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae,* p. 176.

1987. *Amblyseius (Typhlodromips) officinaria,* Gupta, *Rec. zool. Surv. India, Occ. Pap.* No. **95**, p. 65.

1992. *Amblyseius (Typhlodromips) officinaria,* Gupta, State *Fauna Ser. 3, Fauna of West Bengal, Part* **3**, p. 167.

Material examined : 4 Females, India : Sikkim (Dist. East Sikkim), ex. an undet plant, 8.11.1981; 1 Female, Middle camp, ex. sweet potato, 18.11.1981; 2 Females, Dist. East Sikkim, Gangtok, ex. undet Plant, 9.11.1981.

Distribution : India : Sikkim (Dist. East Sikkim), West Bengal, Tripura.

16. *Amblyseius (Typhlodromips) suknaensis* Gupta

1970. *Amblyseius suknaensis* Gupta, *Oriental Ins.,* **4** : 185-186.

1986. *Amblyseius (Typhlodromips) suknaensis,* Gupta *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae,* p. 185-188.

1987. *Amblyseius (Typhlodromips) suknaensis,* Gupta, *Rec. zool. Surv. India Occ. Pap. No.* **95**, p. 67.

1992. *Amblyseius (Typhlodromips) suknaensis,* Gupta, *State Fauna Ser. 3, Fauna of West Bengal,* Part **3**, p. 168.

Material examined : 1 female, India : Sikkim, Dist. East Sikkim, Pagla Jhora, ex. an undet plant, 19.7.1979 (Coll. S.K. Ghosh); 3 females, Middle camp, ex maize, 11.11.1981.

Distribution : India : Sikkim (Dist. East Sikkim), West Bengal, Assam, Meghalaya, Tripura, Andaman & Nicobar Isls, Kerala.

Remarks : This mite is very widely distributed in Eastern India and often has been seen to predate upon spider mites but in the present study no such observation was made.

17. ***Amblyseius (Typhlodromips) syzygii*** Gupta

1975. *Amblyseius syzygii* Gupta, *Internat. J. Acarol.*, **1**(2) : 44-45.

1986. *Amblyseius (Typhlodromips) syzygii*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 188-190.

1987. *Amblyseius (Typhlodromips) syzygii*, Gupta, *Rec. zool. Surv. India, Occ. Pap. No.* **95**, p. 68.

1992. *Amblyseius (Typhlodromips) syzygii*, Gupta, *State Fauna Ser. 3. Fauna of West Bengal, Part* **3**, p. 169.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Melli, ex. *Dolichos lablab*, 4.3.1994; 1 female, Dist. West Sikkim, Legshep, ex. an undet. plant, 2.3.1994; 2 females, Dist. East Sikkim, Deorali, ex. an undet species of Orchid, 22.2.1994.

Distribution : India : Sikkim (Dist. East Sikkim, West Sikkim, South Sikkim), West Bengal, Tripura, Meghalaya, Bihar, Orissa.

Remarks : This is a well distributed species in eastern India and often found predating upon spider mites. In the present field study, the predator population was never found to be of any significant level.

18. ***Indoseiulus ricini*** (Ghai & Menon)

1969. *Indoseius ricini* Ghai & Menon, *Oriental Ins.*, **3** : *348.*

1986. *Indoseiulus ricini*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 195-196.

1987. *Indoseiulus ricini*, Gupta, *Rec. zool. Surv. India, Occ. Pap. No.* **95**, *p. 72.*

1992. *Indoseiulus ricini*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part* **3**, p. 169

Material examined : 2 females, India : Sikkim, Dist. East Sikkim, Middle camp, ex papaya, 10.11.1981; 3 females, Gangtok, ex. arum, 9.11.1981.

Distribution : India : Sikkim (Dist. East Sikkim), Arunachal Pradesh, Tripura, West Bengal, Bihar, Uttar Pradesh, Himachal Pradesh, Gujarat, Tamil Nadu.

Remarks : This mite was seen voraceously feeding upon *Tetranychus urticae* infesting arum. A fully fed female became reddish with highly convex bodies.

19. ***Iphiseius andamanicus*** Gupta

1980. *Iphiseius andamanicus* Gupta, *Entomologists, mon. Mag.*, **115** : 213-214.

1986. *Iphiseius (Iphiseius) andamanicus*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 198-200.

1987. *Iphiseius andamanicus*, Gupta, *Rec. zool. Surv. India, Occ. Paper No.* **95**, *p. 73.*

1992. *Iphiseius andamanicus*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part* **3**, p. 170.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Phodong ex. China rose, 25.2.1994.

Distribution : India : Sikkim, (Dist. North Sikkim), Tripura, West Bengal, Andaman Isl. Karnataka, West Bengal.

Remarks : Though this species was originally described from Andaman & Nicobar Isls. but later it was found in several other parts of India specially in the north eastern part and this indicates that it is a well destributed species.

20. ***Iphiseius hapoli*** Gupta

1986. *Iphiseius (Iphiseius) hapoli* Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 200-201.

1987. *Iphiseius hapoli*, Gupta, *Rec. zool. Surv. India, Occ. Paper No.* **95**, p. 73.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Singhik, ex. undet plant, 26.2.1994.

Distribution : India : Sikkim (Dist. North Sikkim), Andaman Islands, Karnataka, West Bengal.

Remarks : Though this species was originally described from Andaman & Nicobar Islands but later it was found in several other parts of India specially in north-eastern parts.

21. *Paraamblyseius fragariae* Gupta

1980. *Paraamblyseius fragariae* Gupta, *Entomoligists' mon. Mag* **115** : 215-216.

1986. *Paraamblyseius fragariae*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 204-206.

1987. *Paraamblyseius fragariae*, Gupta, *Rec. zool. Surv. India, Occ. Pap.* No. **95**, p. 74.

1992. *Paraamblyseius fragariae*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part* **3**, ; p. 170.

Material examined : 2 female, India : Sikkim, Dist. North Sikkim, Singhik, ex. undet plant, 26.2.1994. 1 female, Dist. South Sikkim, Ravangla, Ex. cardamom, 25.2.1994.

Distribution : India : Sikkim (Dist. North Sikkim, South Sikkim), West Bengal, Arunachal Pradesh.

22. *Paraamblyseius mumai* Gupta

1980. *Paraamblyseius mumai* Gupta, *Entomologists' mom. Mag.*, **116** : 33-34.

1986. *Paraamblyseius mumai*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 206.

1987. *Paraamblyseius mumai*, Gupta, *Rec. zool. Surv. India, Occ. Pap.* No. **95** : 74.

1992. *Paraamblyseius mumai*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal Part* **3**, p. 170-171.

Material examined : 1 female, India : Sikkim, Dist. East Sikkim, Middle Camp, ex. cucurbits, 10.11.1981; 1 female, Gangtok, ex. undet. plant, 21.2.1994.

Distribution : India : Sikkim (Dist. East Sikkim), Meghalaya.

23. *Phytoseius (Phytoseius) macropilis* (Banks)

1909. *Seius macropilis* Banks, *Proc. ent. Soc. Wash.*, **11** : 135.

1953. *Phytoseius macropilis, Cunliffe & Baker, Pinellas Biol. Lab. Pub.* No. **4** : 22.

1964. *Phytoseius macropilis*, Ghai, In : *Entomology in India, Ent. Soc. of India*, p. 390.

1986. *Phytoseius (Phytoseius) macropilis*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 240-242.

1987. *Phytoseius (Phytoseius) macropilis*, Gupta, *Rec. zool. Surv. India, Occ. Paper*, No. **95** : p. 90.

1992. *Phytoseius (Phytoseius) macropilis*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part 3*, p. 174.

Material examined : 6 female, India : Sikkim, Dist. South Sikkim, Rongpo, ex. an undet. plant, 8.11.1981; 1 female, Dist. East Sikkim, Gangtok, ex. bamboo, 9.11.1981; 2 female, Middle camp, ex undet plant, 10.11.1981; 1 female, Gangtok, ex rose, 21.2.1994.

Distribution : India : Sikkim (Dist. South Sikkim, East Sikkim), Arunachal Pradesh, West Bengal, Orissa, Delhi. Elsewhere : Caribbean Islands., U.S.A., Hawaii, Canada, Mexico, England, Russia, British, West Indies. Australia, Canary Islands, Panama canal zone, New Burnswick.

24. *Phytoseius (Phytoseius) meyerae* Gupta

1977. *Phytoseius (Dubiniellus) meyerae* Gupta, *Indian J Acar.*, **2** : 7.

1986. *Phytoseius (Phytoseius) meyerae*, Gupta, *Fauna of India, (Acari : Mesostigmata) Family Phytoseiidae*, p. 244.

1987. *Phytoseius (Phytoseius) meyerae*, Gupta, *Rec. zool. Surv. India, Occ. Paper* No. **95** : p. 91-92.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Jorthang, ex. bamboo, 7.3.1994.

Distribution : India : Sikkim (Dists. South Sikkim), Assam, Meghalaya, West Bengal.

Remarks : This species is a most common one on bamboo in eastern India and many a times it was found associated with *Aponychus* sp., though its actual feeding upon it was not observed.

25. *Typhlodromus (Amblydromella) darjeelingensis* Gupta

1978. *Typhlodromus eharai* Gupta, *Bull. zool. Surv. India*, **1** : 54.

1986. *Typhlodromus (Amblydromella) darjeelingensis* Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 270-272.

1987. *Typhlodromus (Amblydromella) darjeelingensis*, Gupta, *Rec. zool. Surv. India, Occ. Paper* No. **95**, p. 105-106.

1992. *Typhlodromus (Amblydromella) darjeelingensis*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part* **3**, p. 179.

Material examined : 2 female, India : Sikkim, Dist. East Sikkim, Middle Camp, ex. cucurbits, 10.11.1981; 1 female, Dist. West Sikkim, Legship, ex. undet, plant, 1.3.1994.

Distribution : India : Sikkim (Dists. East Sikkim, West Sikkim), West Bengal, Tripura, Karnataka, Tamil Nadu, Uttar Pradesh, Punjab.

26. *Typhlodromus (Amblydromella) homalii* Gupta

1970. *Tyhlodromus homalii* Gupta, Oriental ins., : **4** : 188-189.

1986. *Typhlodromus homalii*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 278-280.

1987. *Typhlodromus homalii*, Gupta, *Rec. zool. Surv. India, Occ. Paper* No. **95** : 109.

1992. *Typhlodromus homalii*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal*, Part **3**, p. 179.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, ex. a shrub, 1.3.1994.

Distribution : India : Sikkim (Dist. South Sikkim), West Bengal, Meghalaya, West Bengal, Bihar, Orissa, Punjab, Himachal Pradesh, Uttar Pradesh, Kerala, Tamil Nadu. Elsewhere : Pakistan.

Remarks : Though this species was described from West Bengal but it appears now that it has wide distribution in India.

27. *Typhlodromus (Orientiseius) pruni* Gupta

1970. *Typhlodromus pruni* Gupta, *Oriental Ins.*, **4** : 189-190.

1986. *Typhlodromus (Orientiseius) pruni*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 305-307.

1987. *Typhlodromus (Orientiseius) pruni, Rec. zool. Surv. India, Occ. Paper, No.* **95**, p. 125-126.

1992. *Typhlodromus (Orientiseius) pruni, State Fauna Ser. 3, Fauna of West Bengal, Part* **3**, p. 182.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Dugan, ex. an undet plant, 3.7.1979 (coll. S. K. Ghosh); 2 female, Dist. East Sikkim, Middle Camp, ex. undet plant, 10.11.1981.

Distribution : India : Sikkim (Dists. North Sikkim, East Sikkim), Meghalaya, Arunachal Pradesh, West Bengal.

28. *Typhlodromus (Orientiseius) rickeri* Chant

1960. *Typhlodromus (Typhlodromus) rickeri* Chant, *Can. Ent.*, **92** : 62-64.

1986. *Typhlodromus (Orientiseius) rickeri*, Gupta, *Fauna of India (Acari : Mesostigmata) Family Phytoseiidae*, p. 307-310.

1987. *Typhlodromus (Orientiseius) rickeri*, Gupta, *Rec. Zool. Surv. India, Occ. Pap.* No. **95**, p. 126.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Mangan, ex. banana, 24. 2.1994; 1 female, Dist. East Sikkim, Gangtok, ex. citrus, 21.2.1994; 4 female, Deorali, ex. an undet species of orchid, 22.2.1994; 1 female, Dist. North Sikkim, Phodong, ex. cardamom, 25.2.1994.

Distribution : India : Sikkim(Dist. East Sikkim, North Sikkim), Meghalaya, Karnataka, Elsewhere : U. S. A. (introduced).

Remarks : This species was found to be one of the most active predators of tenuipalpid mites, specially on cardamom and a good number of this mite was seen feeding upon *Brevipalpus phoenicis* infesting cardamom in Mongan. The fully fed mites assumed reddish colours.

Family ASCIDAE Voigts & Oudemans

29. *Lasioseius quadrisetosus* Chant

1960. *Lasioseius quadrisetosus* Chant, *Can. Ent.*, **92** : 64.

1985. *Lasioseius quadrisetosus*, Gupta, *Handbk. Plant Mites of India.*, p. 330-331.

Material examined : 1 female, India : Sikkim, Dist. East Sikkim, Pagla Jhora, ex. an undet. plant, 19.7.1979 (coll. S. K. Ghosh).

Distribution : India : Sikkim (Dist. East Sikkim), Assam.

Order PROSTIGMATA

Key to the families of Order PROSTIGMATA known to occur on plants in Sikkim

1. Body worm-like or annulate with 2 pairs of legs ..... ERIOPHYIDAE

   Body rounded, not worm-like 2

2. Gnathosoma with minute palpi lying closely appressed laterally; chelicera tiny and stylet like with 4 pairs of legs or less, stigma of female opening behind gnathosoma or on propodosoma, male without stigmata or tracheae, empodium usually membranous flap-like organ attached to claws ..... TARSONEMIDAE

   Gnathosoma usually conspicuous with large chelicerae; palp usually well developed; rarely with 4 pairs of legs; stigmata opens at base of chelicera; empodium free, pad like or claw like arising from tarsus 3

3. With palp thumb claw process, in some cases the claw may be small or obsolate, it is replaced by a relatively long seta 8

   Without palp thumb claw process 4

4. Rod-like solenidion on tarsus I usually lying flush with tarsus in a specialised membranous depression; anteriorly the propodosoma with a tubercle bearing one pair of setae ..... EUPODIDAE

   Rod like solenidion on tarsus I erect, arising from a small circular membranous base .. 5

5. Cheliceral bases fused, or if not fused, not capable of lateral scissors like movement over gnathosoma 6

   Chalicerae free, attached at base and free to move scissors-like laterally across gnathosoma 7

6. Propodosoma without obvious pseudostigmata and pseudostigmatid organs ..... TENUIPALPIDAE

   Propodosoma with one or two pairs of distinct pseudostigmatid and pseudostigmatid organs ..... TYDEIDAE

7. With 2 pairs of genital suckers, the relatively long palpi turned inwards, distal segment usually claw like ..... CUNAXIDAE

   With 3 pairs of genital suckers, the relatively long palpi elbowed with distal long setae ..... BDELLIDAE

8. Body densely clothed with setae; larvae usually heteromorphic ... ERYTHRAEIDAE

   Body setae relatively few, arranged in transverse rows; larvae homomorphic 8

9. Chelicera free, hinged at base so that they are capable of lateral scissors-like movement in a horizontal direction ..... ANYSTIDAE

   Cheliceral bases fused or partly fused with needle or hook - like movable chelae .. 10

10. Chelicera forming a long, whip like stylet occurring within the body, cheliceral bases fused to form stylophore, tarsus I and II with duplex setae ..... TETRANYCHIDAE

    Movable chelae straight, stiff and relatively short, no stylophore, no duplex setae on tarsus I and II ..... STIGMAEIDAE

Family TYDEIDAE

Key to the genera of TYDEIDAE known to occur on plants in Sikkim

1. Hysterosomal seta L_2 in normal lateral position ..... *Tydeus*

   Hysterosomal seta L_2 in dorsal position ... 2

2. Femora III and IV with forked seta ..... *Parapronematus*

   Femora III and IV without forked seta ..... *Pronematus.*

Genus ***Parapronematus*** Baker

30. ***Parapronematus murshidabadensis*** Gupta

1992. *Parapronematus murshidabadensis* Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part* **3**, p. 126.

Material examined : 3 female, India : Sikkim, Dist. South Sikkim, Melli, ex. chatim, 7.3.1994; 1 female, Melli, ex. arum, 5.3.1994.

Distribution : India : Sikkim (Dist. South Sikkim), West Bengal.

Genus ***Pronematus*** Canestrini

31. ***Pronematus fleschneri*** Baker

1968. *Pronematus fleschneri* Baker, *Ann. Ent. Soc. Amer.*, **61** : 10.

1974. *Pronematus fleschneri*, Gupta & Dhooria, *Proc. Indian Sci. Congr.*, **61** : 69.

1985. *Pronematus fleschneri*, Gupta, *Handbk. Plant Mites of India*, p. 308.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Melli, ex rose, 5.3.1994.

Distribution : India : Sikkim (Dist. South Sikkim), Tripura, Bihar, Delhi, Punjab.

Outside India : Belgian Congo.

Genus ***Tydeus*** Koch

Key to the species of *Tydeus* known to occur on plants in Sikkim

1. Setae D_3 and D_4 of same length .... *T. gossabaensis*

   Setae D_3 much longer (slightly less than double) than D_4 ..... *T. ornamentalicus*

32. ***Tydeus gossabaensis*** Gupta

1992. *Tydeus gossabaensis* Gupta, *State Fauna Ser. 3. Fauna of West Bengal, Part* **3**, p. 131-133.

Material examined : 1 female, India : (Dist. South Sikkim), Bhanjyang, ex. sugarcane, 6.3.1994.

Distribution : India : Sikkim (South Sikkim), West Bengal.

33. ***Tydeus ornamentalicus*** Gupta

1992. *Tydeus ornamentalicus* Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part* **3**, p. 131.

Material examined : 9 female, India : Sikkim, Dist. South Sikkim, Ravangla, ex an undet. plant, 1.3.1994.

Distribution : India : Sikkim (Dist. South Sikkim), West Bengal.

34. ***Tydeus*** sp.

Material examined : 1 female, India : Sikkim, Dist. East Sikkim, Deorali, 22.2.1994.

Remarks : Because of bad condition of the specimen, the identification upto species level was not possible.

Family ANYSTIDAE Oudemans

35. ***Walzia darjeelingensis*** Gupta

1992. *Walzia darjeelingensis* Gupta, In : *State Fauna Ser. 3, Fauna of West Bengal*, Part **3**, p. 148.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Bhanjyang, ex. *Doliohos lablab*, 6.2.1924; 1 female, Dist. East Sikkim, Gangtok, ex. an undet. plant, 21.2.1994.

Distribution : India : Sikkim (Dists. South Sikkim, East Sikkim), West Bengal.

Family EUPODIDAE Koch

36. ***Eupodes sigmoidensis*** Strandtmann & Goff.

1978. *Eupodes signoidensis* Strandtmann & Goff., *Pacific Insects*, **19** : 123-124.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Singhik, ex Bougainvillea, 26.2.1994.

Distribution : India : Sikkim (Dist. North Sikkim), Tripura, West Bengal.

Elsewhere : U.S.A.

Family BDELLIDAE Duges

37. ***Bdellodes*** sp.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Pagla Jhora, ex an undet. plant 19.7.1979 (coll. S. K. Ghosh).

Remarks : The specimen was in damaged condition which prevented its specific identity.

Family ERYTHRAEIDAE Robineau-Desvoidy

1828. Erythraeidae Robineau Desvoidy, KHOA, IIID : 144.

38. *Balaustium* sp.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Jorthang, ex an undet. plant, 7.5.1994.

Remarks : The lack of adequate literature in this group made it unable to identify upto species.

Family CUNAXIDAE Thor

Key to the genera of *Cunaxidae* known to occur on plants in Sikkim

1. Palpus 3 segmented..... *Cunaxoides*

   Palpus 5 segmented..... *Cunaxa*

39. *Cunaxa setirostris* (Hermann)

1804. *Scirus setirostris* Hermann, *Mem. Aptelogique*, p. 60-62.

1971. *Cunaxa setirostris*, Singh & Mukherjee, *Oriental Ins.*, **5** : 488.

1985. *Cunaxa setirostris*, Gupta, *Handbk. Plant Mites of India*, p. 316.

1992. *Cunaxa setirostris*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, part* **3**, p.140.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Pagla Jhora, ex an undet plant, 19.7.1979 (coll. S. K. Ghosh); 1 female, Dist. South Sikkim, Jorthang, ex an undet plant, 7.3.1994.

Distribution : India : Sikkim (Dists. North Sikkim, South Sikkim), West Bengal, Tripura, Meghalaya, Andaman Isls., Uttar Pradesh. *Elsewhere* : Cosmopolitan.

Remarks : The fully fed female assuming reddish colour was collected in the field and probably it fed upon the tetranychid mites which infested the plant.

40. *Cunaxa* sp.

Material examined : 1 female, India : Sikkim: Dist. East Sikkim, Kanikhola, ex coffee, 11.11.1981; 1 female, Dist. East Sikkim, Gangtok, ex an undet plant, 8.11.1981.

41. *Cunaxoides croceus* (Koch)

1838. *Eupalus croceus* Koch, fasc. 20.

1948. *Cunaxoides croceus*, Baker & Hoffmann, *An. Esc. Nac. Cionc. Biol. Men.* **5** : 241.

1970. *Cunaxoides croceus*, Smiley, *Ann. Ent. Soc. Amer.* **68** : 235-237.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Jorthang, ex an ornamental plant, 7.3.1994, 1 female, Dist. East Sikkim, Kanikhoda, ex coffee, 11.11.1981, 1 female, Dist. East Sikkim, Gangtok, ex undet plant, 8.11.1981.

Distribution : India : Sikkim (Dist. South Sikkim. East Sikkim).

Remarks : This is the first record of this species from India and incidentally the second species from India of this genus.

Family STIGMAEIDAE Oudemans

1931. Stigmaeidae Oudemans, *Ent. Ber.*, *8* (179) : 251-263.

42. *Agistemus fleschneri* Summers

1960. *Agistemus fleschneri* Summers, *Proc. ent. Soc. Wash*, *62* : 237-240.

1971. *Agistemus fleschneri*, Gupta, *Sci. & Cult.*, *37* : 296-299.

1985. *Agistemus fleschneri*, Gupta, *Handbk. Plant Mites of India*, p. 304-305.

1992. *Agistemus fleschneri*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part 3*, p. 117-118.

Material examined : 1 female, India : Sikkim, Dist. East Sikkim, Rongpo, ex citrus, 8.11.1981.

Distribution : India : Sikkim (Dist. East Sikkim), West Bengal, Meghalaya, Tripura, Punjab. *Elsewhere* : Mexico, Chile, U. S. A.

43. *Agistemus terminalis* (Quayle)

1912. *Caligonalus terminalis* Quayle, *Univ. Calif. Agr. Exp. Stn. Bull. No.* **234**, p. 499.

1946. *Mediolata terminalis*, Nesbitt, *Cant. Ent.*, **78** : 15.

1960. *Agistemus terminalis*, Summers, *Proc. ent. Soc. Wash.*, **62** : 134.

1992. *Agistemus terminalis*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part* 3, p. 118.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Bhanjyang, ex sugarcane, 6.3.1994; 6 female, Melli, ex areca palm and papaya, 5.3.1994.

Distribution : India : Sikkim (Dist. South Sikkim), West Bengal, Tripura. Elsewhere : Japan, Cyprus, U.S.A., Guatemale.

44. ***Agistemus*** sp.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, ex an undet plant, 5.3.1994.

PHYTOPHAGOUS MITES

Family TETRANYCHIDAE Donnadieu

Key to the subfamilies, genera and species of TETRANYCHIDAE reported to occur on plants in Sikkim

1. Tarsus I dorsally with a single set of usually loosely associated duplex setae or duplex setae absent ..... EUTETRANYCHINI, 2

   Tarsus I dorsally with two sets of closely associated duplex setae ..... TETRANYCHINI, 3

2. Female with two pairs of anal setae, 4 pairs of dorsocentral setae in normal position .... *Eutetranychus*

   Empodium rudimentary consisting of a rounded knob; 3rd and 4th dorsocentral hysterosomal setae forming a square ..... *E. orientalis*

   Female with 1 pair of anal setae, 4th pair of dorsocentral setae marginal ..... *Aponychus*

   First to 3rd dorsocentral setae narrow and spatulate ..... *Aponychus corpuzae*

3. With two pairs of paraanal setae 4

   With 1 pair of paraanal setae 6

4. Empodium claw-like, entire or splits bilaterally into 2 claw-like structures 5

   Empodium ending into a tuft of hairs..... ..... *Eotetranychus*, 7

5. Empodium a single claw-like structure .... *Panonychus*

   4th pair of dorsocentrals and 4th pair of dorsolateral equal in length ..... *P.citri*

   Empodium splits bilaterally into 2 claw-like structures, usually with appendant hairs .... *Schizotetranychus* sp

6. Tarsus I with duplex seate distal and approximate ..... *Oligonychus*, 8

   Tarsus I with duplex setae well separated dividing segments into 3 more or less equal parts ..... *Tetranychus*, 9

7. Aedeagus narrow, rod-forming, finger like distal and slender and rounded at tip .... *E. ranikhetensis*

   Aedeagus narrow, rod-forming, pointed at distal end ..... *E. indicus*

8. Aedeagus bent ventrad, tarsus I with not more than single tactile seta on venter just distad of duplex setae ..... *O. punicae*

   Aedeagus bent dorsad; although the distal end may be directed ventrad, tarsus I and 2 tactile setae on venter just distad of duplex setae ..... *O. indicus*

9. Aedeagal knob with one or both projections acute 10

   Aedeagal knob with anterior or posterior projections rounded, dorsum of knob indented medially ..... *T.neocaledonicus*

10. Aedeagal knob with no posterior projection, axis of aedeagal knob parallel to axis of shaft ..... *T. ludeni*

    Axis of aedeagal knob forms a small angle with axis of shaft, aedeagal knob with posterior projection ..... *T. urticae*

45. ***Aponychus corpuzae*** Rimando

1966. *Aponychus corpuzae* Rimando, *Philip Agrl.*, *50* : 107.

1976. *Aponychus corpuzae*, Gupta, *Oriental Ins.*, **10** : 332-333.

1985. *Aponychus corpuzae*, Gupta, *Handbook, Plant Mites of India*, p. 59.

1992. *Aponychus corpuzae*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal*, Part **3**, p. 79.

Material examined : 5 female, India : Sikkim, Dist. East Sikkim, Gangtok, ex bamboo, 9.10.1981; 1 female, Dist. South Sikkim, Melli, ex bamboo, 5.3.1994.

Distribution : India : Sikkim (Dists. East Sikkim, South Sikkim), Assam, Meghalaya, Tripura, West Bengal, Andaman & Nicobar Isls., Orissa.

Elsewhere : Philippines, Thailand, Japan.

Remarks : This is a very common species infesting bamboo specially in north east India and Andaman Nicobar Islands producing white specks on the upper surface of leaves. A heavily infested leaf looked unhealthy but defoliation was not common.

46. ***Eotetranychus indicus*** Gupta & Gupta

1990. *Eotetranychus indicus* Gupta & Gupta, *Rec. zool. Surv. India*, **88** : 20.

Material examined : 10 female, 1 male, India : Sikkim, Dist. West Sikkim, Legship, ex an undet. plant, 2.3.1994; 6 female, 1 male, Dist. South Sikkim, Ravangla, ex cardamom, 28.2.1994.

Distribution : India : Sikkim (Dist. West Sikkim, South Sikkim), Arunachal Pradesh.

47. ***Eotetranychus ranikhetensis*** Gupta & Gupta,

1994. *Eotetranychus ranikhetensis* Gupta & Gupta, *Memoirs zool. Surv. India*, **18(1)** : 80-81.

Material examined : 3 female, 1 male, India : Sikkim, Dist. North Sikkim, Mangan, ex rose 24.2.1994.

Distribution : India : Sikkim (Dist. North Sikkim), Uttar Pradesh.

48. ***Eotetranychus*** spp.

Material examined : 1 female, Sikkim, Dist. North Sikkim, Singhik, ex an undet plant, 26.2.1994; 3 female, Phodong, ex cardamom, 25.2.1994; 1 female, Dist. West Sikkim, Legship, ex an undet plant 2.3.1994.

Remarks : Because of non-availability of male specimens the specific determination was not possible.

49. ***Eutetranychus orientalis*** (Klein)

1936. *Anychus orientalis* Klein, *Bull. agric. Res. Stn., Rehovoth*, **21** : 3

1940. *Anychus ricini* Rahman & Sapra, *Proc. Indian Acad. Sci.*, **11** : 184.

1985. *Eutetranychus orientalis*, Gupta, *Handbk., Plant Mites of India*, p. 66-67.

1992. *Eutetranychus orientalis*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal*, Part **3**, p. 80.

Material examined : 5 female, Sikkim, Dist. East Sikkim, Rongpo, ex citrus, 6.4.1981; 2 female, Dist. South Sikkim, Melli, ex citrus, 4.3.1994.

Distribution : India : Sikkim (Dist. East Sikkim, South Sikkim), Assam, Tripura, Meghalaya, West Bengal, Delhi, Gujarat, Haryana, Jammu & Kashmir, Karnataka, Punjab, Uttar Pradesh.

Elsewhere : Pakistan, Taiwan, Israel, Turkey, Jordan, Iran, Afghanistan, Cyprus, South Africa, East Transvaal, Sudan, Egypt.

Remarks : Though this mite is a serious pest of citrus, papaya etc. in different parts of the country but yet the infestation of this mite on citrus, wherever examined in Sikkim, was never in pest form except in a kitchen garden of Melli where a serious infestation on citrus was seen.

50. ***Oligonychus indicus*** (Hirst)

1923. *Paratetranychus indicus* Hirst, *Proc. Zool. Soc. Lond.*, p. 990.

1955. *Oligonychus indicus*, Pritchard & Baker, *Pacific Coast Ent. Soc. Mem. Ser.*, **2** : 354-355.

1985. *Oligonychus indicus*, Gupta, *Hanbk. Plant mites of India*, p. 84-86.

1922. *Oligonychus indicus, State Fauna Ser. 3, Fauna of West Bengal*, Part **3**, p. 85.

Material examined : 1 female, India : Sikkim, Dist. East Sikkim, Middle camp, ex. maize, 11.11.1981; 2 female, Dist. South Sikkim, Bhanjyang, ex banana, 5.3.1994.

Distribution : India : Sikkim (Dists. East Sikkim, South Sikkim), West Bengal, Bihar, Orissa, Delhi, Punjab, Haryana, Andhra Pradesh, Tamil Nadu and Karnataka.

Elsewhere : Pakistan.

Remarks : Although this mite is a serious pest of sugarcane and maize specially in north India but it was never seen in pest form in any of these two crops in Sikkim.

51. ***Oligonychus punicae*** (Hirst)

1926. *Paratetranychus punicae* Hirst, *Proc. Zool. Soc. Lond.*, p. 830.

1955. *Oligonychus punicae*, Pritchard & Baker, *Pacific coast Ent. Soc. Mem. Ser.* **2** : 235-236.

1985. *Oligomychus punicae*, Gupta, *Handbk. Plant mites of India*, p. 89-90.

1992. *Oligonychus punicae*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal*, Part **3**, p. 86.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Mangan, ex peach, 23.2.1994.

Distribution : India : Sikkim (Dist. North Sikkim), West Bengal, Tamil Nadu.

Elsewhere : Central and South America.

52. ***Oligonychus*** sp.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Ravangla, ex cardamom, 28.2.1994.

Remarks : Due to non-availability of male specimens. the specific determination was not possible.

53. ***Panonychus citri*** (McGregor)

1916. *Tetranychus citri* McGregor, *Ann. Ent. Soc. Amer.*, **9** : 284.

1955. *Metatetranychus citri*, Pritchard & Baker, *Pacific coast Ent. Soc. Mem. Ser.*, **2** : 133-136.

1966. *Panonychus citri*, Bindra, *Punjab Hort. J.*, **6** : 121.

1985. *Panonychus citri*, Gupta, *Handbk. Plant Mites of India*, p. 92-93.

1992. *Panonychus citri*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part* **3**, p. 82-83.

Material examined : 3 female, India : Sikkim, Dist. South Sikkim, Bhanjyang, ex. papaya, 6.5.1994; 1 female, Jorethang, ex. China-rose, 7.3.1994; 1 female, Jorethang, ex. banana, 7.3.1994; 1 female, Melli, ex. banana, 4.3.1994; 1 female, Dist. North Sikkim, Mangan, ex. apricot, 23.3.1994.

Distribution : India : Sikkim (Dists. North Sikkim, South Sikkim), Assam, Tripura, Meghalaya, West Bengal, Andaman and Nicobar Isls., Jammu & Kashmir.

Elsewhere : Thailand, New Zealand, China, Middle-East, Japan, South Africa, U.S.A., Argentina, Bermuda, Cuba.

54. ***Schizotetranychus*** sp.

Material examined : 1 female, India : Sikkim, Dist. North Sikkim, Mangan, ex. banana, 24.2.1994.

Remarks : Non-availability of male specimen prevented its specific identity.

55. ***Tetranychus ludeni*** Zacher

1913. *Tetranychus ludeni* Zacher, *Mitt. Kais bid. Anst. Land. U. forstw*, **14** : 40.

1959. *Tetranychus ludeni*, Puttarudriah and Channa Basavanna, *Proc. 1st All India Congr. Zool.*, **1** : 530.

1985. *Tetranychus ludeni*, Gupta, *Handbk. Plant Mites of India*, p. 110-112.

1992. *Tetranychus ludeni*, Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part* **3**, p. 90.

Material examined : 2 female, 1 male, India : Sikkim, Dist. South Sikkim, Melli, ex. *Dolichos lablab*, 4.3.1994; 1 female, 1 male, Melli ex banana, 2.3.1994; 1 female, Melli ex China rose, 2.3.1994.

Distribution : India : Sikkim (Dist. South Sikkim), Meghalaya, West Bengal, Delhi, Punjab, Haryana, Bihar, Karnataka, Tamil Nadu.

Elsewhere : South Africa, New Zealand, U.S.A., South America.

Remarks : Inspite of being the fact that this is a serious pest in different parts of the world including India but in Sikkim the seriousness of this mite as pest was never seen.

56. ***Tetranychus neocaledonicus*** Andre

1933. *Tetranychus neocaledonicus* Andre, *Bull. Hist. Nat. Paris,* (2) **5** : 302.

1940. *Tetranychus cucurbitae* Rahman and Sapra, *Proc. Indian Acad. Sci.,* **11B** : 179.

1985. *Tetranychus neocaledonicus,* Gupta, *Handbk. Plant Mites of India,* 123-126.

1992. *Tetranychus neocaledonicus,* Gupta, *State Fauna Ser. 3, Fauna of West Bengal,* Part **3**, p. 91.

Material examined : 5 female, India : Sikkim, Dist. South Sikkim, Melli, ex. Chatim, 5.11.1981.

Distribution : India : Sikkim (Dist. South Sikkim), besides in all states of India.

Elsewhere : Cosmopolitan.

Remarks : The infestation of this mite was never seen as serious in Sikkim.

57. ***Tetranychus urticae*** Koch

1836. *Tetranychus urticae* Koch, *Deutshe Crustacea Myriapoda Arachnida,* Fasc-**1** : 10.

1977. *Tetranychus urticae,* Lal & Mukherjee, *Sci & Cult.,* **43** : 313-316.

1985. *Tetranychus urticae,* Gupta, *State Fauna Ser., 3, Fauna of West Bengal,* Part **3**, p. 91.

Material examined : 5 female, India : Sikkim, Dist. North Sikkim, Mangan, ex. undet plant, 12.4.1981; 1 female, Singhik, ex guava, 14.4.1981; 2 female, Singhik, ex. undet plant, 26.2.1994; 1 female, Dist. East Sikkim, Gangtok, ex undet plant, 24.2.1994.

Distribution : India : Sikkim (Dists. North Sikkim, East Sikkim), also in most of the States in India.

Elsewhere : Cosmopolitan.

Remarks : This was found infesting a large number of hosts including those listed under Material examined above and in some cases it was found to be causing yellowing and crumpling of leaves.

58. ***Tetranychus*** sp.

Material examined : 2 female, India : Sikkim, Dist. South Sikkim, Melli., ex banana, 4.3.1994; 1 female, Melli ex arum, 5.4.1991; 2 female, Melli, ex undet. plant, 5.3.1994; 1 female, Ravangla ex undet. plant, 1.3.1994; 1 female, Dist. North Sikkim, Mangan, ex banana, 24.3.1994, 1 female, Mangan, ex cardamom, 23.3.1994, 1 female, Dist. East Sikkim, Deoraly, ex orchard, 22.3.1994.

Family TENUIPALPIDAE Berlese

Key to the genera and species of TENUIPALPIDAE known to occur on plants in Sikkim

1. Palpus with 4 or 5 segments .... *Brevipalpus,* 2

   Palpus with 3 or less segments .... *Tenuipalpus* sp.

2. Propodosoma with irregular broken striations mediodorsally ..... *B.rugulosus*

   Propodosoma without reticulation on dorsomedian region..... *B. phoenicis*

59. ***Brevipalpus phoenicis*** (Geijskes)

1939. *Brevipalpus phoenicis* Geijskes, *Meded, Lanbd Hooqesch Wagenengen,* **42** : 230.

1974. *Brevipalpus phoenicis,* Das, *Two & Bud,* **8** : 3-4.

1985. *Brevipalpus phoenicis,* Gupta, *Handbk. Plant Mites of India,* p. 130-131.

1992. *Brevipalpus phoenicis,* Gupta, *State Fauna Ser. 3, Fauna of West Bengal, Part 3,* p. 93.

Material examined : 2 female, India : Sikkim, Dist. South Sikkim, Bhanjyang, ex citrus, 6.3.1994; 2 female, Jorthang, ex *Lantana,* 7.3.1994; 1 female, Dist. North Sikkim, Mangan, ex undet plant, 24.2.1994; 3 female, Singhik, ex undet plant, 26.2.1994; 1 female, Mangan, ex banana, 24.2.1994; 2 female, Mangan, ex cardamom, 24.2.1994, 3 female, Mangan, ex guava, 24.2.1994.

Distribution : India : Sikkim (Dists. South Sikkim, North Sikkim), Tripura, Meghalaya, Assam, West Bengal, Orissa, Bihar, Himachal Pradesh, Punjab, Karnataka, Maharashtra, Tamil Nadu.

Elsewhere : Cosmopolitan.

Remarks : This mite was seen infesting cardamom in most of the cardamom orchards and the infested leaves turned reddish, dried up and fall off.

60. ***Brevipalpus rugulosus*** Chaudhri, Akbar & Rasool

1974. *Brevipalpus rugulosus* Chaudhri, Akbar & Rasool, p. 45-48.

1980. *Brevipalpus rugulosus,* Sadana & Chhabra, *Sci. & Cult.,* **46** : 369-370.

1985. *Brevipalpus phoenicis, Handbk. Plant Mites of India,* p. 132.

Material examined : 4 female, India : Sikkim, Dist. North Sikkim, Phodong, ex citrus, 25.2.1994.

Distribution : India : Sikkim (Dist. North Sikkim), Punjab.

Elsewhere : Pakistan.

61. ***Tenuipalpus crassus*** Andre

1953. *Tenuipalpus orchidarum carssums* Andre, *Bull. Mus. Hist. Nat. paris, Ser.* 2 : **25(5)** ; 466.

1974. *Tenuipalpus crassus,* Nagesha Chandra & Channa Basavanna, *IV Int. Congr. Acarology, Austria.*

1985. *Tenuipalpus crassus,* Gupta, *Handbk. Plant Mites of India,* p. 142.

Material examined : 2 female, India : Sikkim, Dist. North Sikkim, Singhik, ex an undet plant, 26.2.1994.

Distribution : India : Sikkim (Dist. North Sikkim), Karnataka.

Elsewhere : U.S.A. (California, Oregon).

Family ERIOPHYIDAE Nalepa

62. ***Aceria ficus*** (Cotte)

1920. *Eriophyes ficus* Cotte, *Bull. soc. Path. Veg.,* **7** : 16.

1966. *Aceria ficus,* Channa Basavanna, *Univ. Agr. Sci. Bull.,* pp. 71-72.

1985. *Aceria ficus,* Gupta, *Handbk. Plant Mites of India,* p.193.

Material examined : 5 female : India : Sikkim, Dist. South Sikkim, Ravangla, *ex Ficus*, 28.2.1994.

Distribution : India : Sikkim (Dist. South Sikkim), Delhi, Himachal Pradesh.

63. ***Aceria*** sp.

Material examined : 2 female, India : Dist. South Sikkim, Ravangla, ex undet plant 1.3.1994.

Family TARSONEMIDAE Kramer

64. ***Polyphagotarsonemus latus*** (Banks)

1904. *Tarsonemus latus* Banks, *Proc. U.S.Nat. Mus.,* **32** (1953) : 615.

1958. *Hemitarsonemus latus,* Dutt, *India Farm.,* **8** : 10-12.

1985. *Polyphagotarsonemus latus, Handbk., Plant Mites of India,* p. 292-294.

Material examined : 3 female : India : Sikkim, Dist. South Sikkim, Jorthang, ex banana, 7.3.1994.

Distribution : India : Sikkim (Dist. South Sikkim), West Bengal, Birbhum, Tripura, Karnataka, Maharashtra, Punjab, Uttar Pradesh.

Elsewhere : Cosmopolitan.

Remarks : Through it is a major pest of a number of crops in India but in Sikkim, it was never found in serious form.

Family ACARIDAE Ewing & Nesbitt

65. ***Tyrophagus putrescentiae*** (Schrank)

1781. *Acarus putrescentiae* Schrank, *Enum. Ins. Aust. Indig.* 512.

1924. *Tyrophagus putrescentiae,* Oudemans, *Ent. Ber.,* **6** : 136-250.

1955. *Tyrophagus putrescentiae,* Pillai, 1955, *J. Zool. Soc.* **7** : 141-144.

1985. *Tyrophagus putrescentiae,* Gupta, *Handbk. Plant Mites of India,* p. 409-410.

1992. *Tyrophagus putrescentiae,* Gupta, *State Fauna Ser. 3 Fauna of West Bengal part* **3**, p. 186.

Material examined : 1 female, India : Sikkim, Dist. South Sikkim, Melli, ex citrus, 4.3.1994.

Distribution : India : Sikkim (Dist. South Sikkim), also in most of the states in India.

Elsewhere : Cosmopolitan.

DISCUSSION

Among the plant mites known from Sikkim, Phytoseiidae forms the single largest group represented by 28 species and this is followed by Tetranychidae being known by 14 species and Tydeidae by 5 species. The other 12 families of plant mites are very poorly known and are represented by a couple of species only.

Comparison of plant mite fauna of Sikkim with the same from other neighbouring areas reveals that while 28 species of Phytoseiidae are known from Sikkim, the corresponding figures from West Bengal, Meghalaya, Tripura, Arunachal Pradesh, Assam and Manipur are 56,33,33, 37,18 and 7 respectively. However, this figure no way reflects that Sikkim phytoseiid fauna is poor in comparison to that of West Bengal. Rather, in all likelihood, more thorough exploration will definitely reveal many more species. A glance at Phytoseiid species composition of Sikkim indicates that excepting *Iphiseius hapoli, Amblyseius (A) paraaerialis* and *Typhlodromus (O.) rickeri,* all the other species reported from Sikkim have not been recorded from any of the other neighbouring states while *Amblyseius neorykei, Iphiseius hapoli* have not been recorded from Meghalaya, Tripura and Assam.

Among other species that are known from Sikkim but not known in the neighbouring areas are A. (E.) *rhododendronis, A.(T.) officinaria, I. andamanicus, P. (P.) macropilis* from Meghalaya; *A. (A.). channabasavannai, A.(A.) paraaerials, A.(E.). delhiensis, A.(E.) finlandicus A.(T.) syzygii, P. mumai, T.(A.), darjeelingensis and T.(O.). rickeri* from Arunachal Pradesh.

Some of the species which are quite common in northeast India and described from Assam, for example *A.(P.). salebrosus, A.(A.). mcmurtryi. T.(A.) fleschneri,* could not be recorded from Sikkim. Likewise, species like *A.(E.). alstoniae, A.(T.). crotalariae, P.(P.). Kapuri* which could be recorded from the Himalayan foot hills of West Bengal adjacent to Sikkim also could not be recorded from Sikkim. The overall picture reveals that in general the Phytoseiid fauna of Sikkim is more akin to that of West Bengal and Meghalaya than to the other neighbouring states.

The Family Ascidae is represented by a single species which, in fact, was described from Assam though, of course, it has so far not been reported from any of the other neighbouring states.

Besides Phytoseiidae, the mites belonging to other predatory groups from Sikkim are Erythraeidae (1 sp.), Cunaxidae (3 spp.), Stigmaeidae (3 spp.), Bdellidae (1 sp.), Tydeidae (5 spp.) and Anystidae (1 sp.). Though the same families of predatory group are also known from West Bengal as well as from Meghalaya, Tripura and Arunachal Pradesh but the number of species known from West Bengal in these families far exceed the number known from Sikkim and species from Anystidae and Tydeidae are the same reported from West Bengal. No member of Cheyletidae, though known in other neighbouring states, could be collected from Sikkim. *Cunaxoides croceus,* earlier known from Europe is being reported for the first time from India. Some of the common species which have also been reported from other neighbouring states are *Pronematus fleschneri* under Tydeidae (also known from West Bengal and Tripura) and *Cunaxa setirostris* under Cunaxidae (also known from Arunachal Pradesh, Tripura and W.Bengal). However, all the families belonging to predatory group utterly lacked novelty as is evident from the fact that while several new species in these families, specially in Stigmaeidae, Tydeidae, Anystidae, etc. could be described from West Bengal and from Arunachal Pradesh, none of the species of these families from Sikkim yielded any new species. Among the Phytophagous group, the plant mite fauna of Sikkim represents all the four families, *viz.* Tetranychidae (14 spp.), Tenuipalpidae (3 spp.), Eriophyidae (2 spp.) and Tarsonemidae (1 sp.).

The corresponding figures from India are 100, 55, 350 and 1 respectively and from neighbouring states are : 33, 6, 57 and 1 from West Bengal. (Gupta, 1992a), 20, 4, 3, 1 from Tripura (Gupta 2000), 17, 3, 1 and nil from Meghalaya (Gupta) 1995 and 11, 1, nil, nil from Arunachal Pradesh (Gupta, 1991, 1992). All these indicate that the Phytophagous species group needs further exploration from Sikkim.

Among the tetranychids, the species which are reported from this region but unknown from most of the neighbouring states are *Eotetranychus indicus, Eotetranychus ranikhetensis* and *Oligonychus punicae.* Expecting the first two, all the other tetranychids are common with West Bengal and five of those are common with Arunachal Pradesh. The occurrence of *E.indicus* in Sikkim is not unlikely as it was described from Arunachal Pradesh but the occurrence of *E. ranikhetensis* is little interesting since it was described from Uttar Pradesh and not so far known from other Indian regions.

Among the tenuipalpids, *B. phoenicis,* which is one of the commonest mites in India and is well known in other north eastern states has been seen to be quite common in Sikkim also. However, the record of the other two species from Sikkim, *viz. B. rugulosus* and *T. crassus* (earlier Indian records of both species are from Punjab) is rather interesting.

The family Eriophyidae which is known from Sikkim by only 2 species needs thorough exploration. It may be mentioned here that the knowledge regarding this family from other north eastern states is also very poor.

ECONOMIC IMPORTANCE

Among the 44 species belonging to 7 families of the predatory group the species under Phytoseiidae which have shown potentiality as useful predators in Sikkim are : *A.(A.). channabasavannai* feeding upon *Brevipalpus phoenicis* and *Eotetranychus* sp. infesting cardamom, citrus respectively; *A finlandicus* feeding upon *P. citri* infesting papaya, *I. ricini* feeding upon *T. urticae, T. rickeri* feeding upon *B. phoenicis* infesting cardamom and *C. setirostris* under Cunaxidae feeding upon *Tetranychus* sp. on an undet plant. None of the other mites belonging to Bdellidae, Erythraeidae, Tydeidae and Stigmaeidae had shown during the present investigation any promising predatory species.

From the observation made so far in the field, the proper utilisation of *A. herbicolus, A. channabasavannai, T. rickeri* against tetranychids and tenuipalpids infesting cardamom and *A.(A.). finlandicus* against *P. citri* on papaya will prove useful. Although *A.(A.). largoensis, A. ovalis* and *A. multidentatus* have been found to be very useful as predators against various pest mites in different parts of India but in Sikkim none of them had shown any promise.

Among 20 species of phytophagous mites being reported from Sikkim, excepting *Aponychus corpuzae* on bamboo, *Panonychus citri* upon papaya and *T. urticae* on vegetables and fruit trees producing noticeable damage symptoms, surprisingly none of the other species like *E. orientalis, O. indicus, T ludeni* and *T. neocaledonicus,* known to be serious pests elsewhere, did appear in the pest form anythere. This indicates that tetranychids specially during the period of survey did not pose to be a problem. May be, if surveys are undertaken in hot summer months, a different picture may emerge. Among tenuipalpids *B. phoenicis* appeared to be a serious pest on cardamom causing reddening and drying of leaves. Plants with such leaves suffered defoliation. This type of damage symptom was noticed in most of the cardamom plantation in Sikkim. Since very little is known from Sikkim about Eriophyidae and Tarsonemidae, it is very difficult to comment anything about the economic importance of these mite species and their families.

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Districtwise distribution of plant mite species from Sikkim

Name of species	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
Fam. PHYTOSEIIDAE				
1. *Amblyseius (A.) channabasavannai*	+	–	+	+
2. *A. (A.) herbicolus*	+	–	+	+
3. *A. (A.) largoensis*	+	–	–	–
4. *A.(A.) neorykei*	+	+	–	+
5. *A. (A.) paraaerialis*	+	+	–	+
6. *A. (Euseius) coccineae*	–	–	+	–
7. *A.(E.) delhiensis*	+	–	–	–
8. *A.(E.) finlandicus*	+	+	+	+
9. *A.(E.) ovalis*	–	–	–	+
10. *A.(E.) pruni*	+	–	+	+
11. *A.(E.) rhododendronis*	–	–	–	+
12. *A.(Paraphytoseius) multidentatus*	+	–	–	–
13. *A.(Neoseiulus) longispinosus*	+	–	–	–
14. *A.(Typhlodromalus) kalimpongensis*	+	–	+	–
15. *A.(Typhlodromips) officinaria*	+	–	–	–
16. *A.(T.) suknaensis*	+	–	–	–
17. *A.(T.) syzygii*	+	+	–	+
18. *Indoseiulus ricini*	+	–	–	–
19. *Iphiseius andamanicus*	–	–	+	–
20. *I. hapoli*	–	–	+	–
21. *Paraamblyseius fragariae*	–	–	+	+
22. *P. mumai*	+	–	–	–
23. *Phytoseius (Phytoseius) macropilis*	+	–	–	+
24. *P.(P.) meyerae*	–	–	–	+
25. *Typhlodromus (Amblydromella) darjeelingensis*	+	+	–	–
26. *T.(A.) homalii*	–	–	–	+
27. *T.(Orientiseius) pruni*	+	–	+	–
28. *T.(O.) rickeri*	+	–	+	–

Name of species	East Sikkim	West Sikkim	North Sikkim	South Sikkim
Fam. ASCIDAE				
29. *Lasioseius quadrisetosus*	+	–	–	–
Fam. TYDEIDAE				
30. *Parapronematus murshidabadensis*	–	–	–	+
31. *Pronematus fleschneri*	–	–	–	+
32. *Tydeus gossabaensis*	–	–	–	+
33. *T. ornamentalicus*	–	–	–	+
34. *Tydeus* sp.	+	–	–	–
Fam. ANYSTIDAE				
35. *Walzia darjeelingensis*	+	–	–	+
Fam. EUPODIDAE				
36. *Eupodes sigmoidensis*	–	–	+	–
Fam. BDELLIDAE				
37. *Bdellodes* sp.	–	–	+	–
Fam. ERYTHRAEIDAE				
38. *Balaustium* sp.	–	–	–	+
Fam. CUNAXIDAE				
39. *Cunaxa setirostris*	–	–	+	+
40. *Cunaxa* sp.	+	–	–	–
41. *Cunaxoides croceus*	+	–	–	+
Fam. STIGMAEIDAE				
42. *Agistemus fleschneri*	+	–	–	–
43. *Agistemus terminalis*	–	–	–	+
44. *Agistenus* sp.	–	–	–	+
Fam. TETRANYCHIDAE				
45. *Aponychus corpuzae*	+	–	–	+
46. *Eotetranychus indicus*	–	+	–	+
47. *E. ranikhetensis*	–	–	+	–
48. *E. spp.*	–	+	+	–
49. *Eutetranychus orientalis*	+	–	–	+
50. *Oligonychus indicus*	+	–	–	+

Name of species	East Sikkim	West Sikkim	North Sikkim	South Sikkim
51. *O. punicae*	–	–	+	–
52. *O.* sp.–	–	+	–	
53. *Panonychus citri*	–	–	+	+
54. *Schizotetranychus* sp.	–	–	+	–
55. *Tetranychus ludeni*	–	–	–	+
56. *T. neocaledonicus*	–	–	–	+
57. *T. urticae*	+	–	+	–
58. *T.* sp.	+	–	+	+
Fam. TENUIPALPIDAE				
59. *Brevipalpus phoenicis*	–	–	+	+
60. *B. rugulosus*	–	–	+	–
61. *Tenuipalpus crassus*	–	–	+	–
Fam. ERIOPHYIDAE				
62. *Aceria ficus*	–	–	–	+
63. *Aceria* sp.	–	–	–	+
Fam. TARSONEMIDAE				
64. *Polyphagotarsonemus latus*	–	–	–	+
Fam. ACARIDAE				
65. *Tyrophagus putrescentiae*	–	–	–	+

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ORIBATID MITES (ACARI : ORIBATIDA)

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INTRODUCTION

Oribatid mites commonly called "moss" mites or "beetle" mites are one of the predominant groups amongst the acari. These mites having sizes from 100 to 1000 µm live in almost all possible habitats including soil, litter, compost heaps, lichens, mosses, leaf, bark of trees, bird nest and house dust, nests of small mammals and various other places *viz.*, pasture soils, coniferous taiga forest, arctic tundra and even in Antarctica. In fact they occur in all ecological niches, especially where vegetative material decay in sufficient moisture and are penetrated by mycelia.

Oribatid mites are of considerable importance due to their direct and indirect effect on man and animal. These mites play a vital role to promote soil fertility through humification of organic matter. Some of the oribatid species are known to transmit various helminth diseases to domestic animals. Some of these mites feed on higher plants. A few of the oribatids are also used as biological control agent.

Information on the group from the world

The first attempt to study the oribatid mite was made by Hermann in 1804. He first reported few oribatid species from European soils. Later C.L.Koch (1836–1841) and A.D. Michael (1880–1884) made valuable contributions on the European oribatid mites. The most extensive and monumental work on this group was done by Berlese (1887–1916) and Oudemans (1896–1937). There are hundreds of acarologists whose contributions had enriched the knowledge of oribatid taxonomy, but the pioneer workers are Willmann (1925–1951), Grandjean (1928–1972), Vander Hammen (1952–1973), Hammer (1952–1979), Balogh (1958–1989), Aoki (1959–1989), Wallwork (1960–1977), Mahunka (1965–1989), Perez-Inigo (1964–1976), Engelbrecht (1969–1990), Norton (1978–1992), Fujikawa (1980–1998) and others. Presently the Oribatei are represented by more them 6000 species under about 800 genera from the world.

Information on the group from India

The European acarologist Pearce (1906) first made faunistic studies on the oribatid mites from soils of the Sikkim Himalaya. Later the knowledge was enriched to some extent by the works of Ewing (1910), Jacot (1933), Baker (1945), Anantharaman (1951) and Prasad (1965). Later under the guidance of late Professor D.N. Raychaudhuri, Calcutta University, the team of acarologists like Bhaduri, Chakraborti, Bhattacharya, Sanyal, Mishra, Sarkar, Dhali, Deb, Ghosh, Misra, Mondal and Kundu during 1967–1986 described and reported several species of oribatid mites from West Bengal. Haq and Prabhoo (1976), Haq (1978a, 1978b, 1979), Haq and Adolph (1980), Balakrishana (1986, 1986a, 1986b), Balakrishna and Haq (1982), Mahunka (1985), Bayoumi and Mahunka (1979a, 1979b), Sarkar (1983, 1985, 1986), Sarkar and Subias (1982, 1983, 1984), Sanyal and Bhaduri (1981, 1983, 1985, 1986), Sanyal (1984–1998), Sanyal and Sengupta (1990), Sanyal and Saha (1986), Saha and Sanyal (1996), Subias and Sarkar (1982, 1983, 1984) and others made extensive studies on this group of mites and published several papers. Till date, 80 families are represented in India by a total number of 425 species and sub-species under 180 genera of oribatid mites.

Information on the group from Sikkim

In Sikkim the first faunistic studies on oribatid mites dates back to the year 1906 when Pearce for the first time described and reported 20 species of soil inhabiting oribatid mite. Of the 20 species eighteen species were actually known from the Sikkim Himalaya, as some localities recorded by Pearce were included in the Darjeeling district of West Bengal. After this work the study of oribatid mites from Sikkim had long been unattended and only in 1980 Dhali and Bhaduri made a study on this group of mite from Sikkim and recorded four species belonging to three genera under three families. Of these, three species *viz., Scheloribates sikkimensis, S. saswatii* and *Chaunoproctus longisetosus* were described as new to science and *Paralamellobates bengalensis* Bhaduri and Raychaudhuri, 1968 was recorded as new to the state. The present paper happens to be the third consolidated and extensive work on oribatid mites of Sikkim.

Brief account of the collection and surveys done

The present work is based on a series of collection of oribatid mites made from Sikkim by the author. The work also includes the species which were studied and published by the earlier workers.

A brief account of the surveys undertaken for the study is given below :

1. Sikkim Survey – Dr. A.K. Sanyal and Party (1990)
2. Sikkim Survey – Dr. A.K. Sanyal and party (1998)

The most important habitats like litter, soil, moss, semi decomposed cow dung, plants were thoroughly surveyed for collection of oribatid mites.

The contents of the present paper

The paper deals with the oribatid fauna collected from Sikkim. Altogether 85 oribatid species belonging to 63 genera and 45 families have been incorporated in the paper. It records 3 species and 2 genera for the first time from India and 64 species, 53 genera and 33 families as the first record from the state of Sikkim. The original and most recent references, diagnostic features where available and needed, distribution of each species and key to the identification of families, genera and species known from Sikkim have also been provided. The brief information on the group from world, India and Sikkim with relevant references, general morphology and collection and preservation methods in brief were also dealt with. The species studied by the present author are deposited in the National Zoological Collection, Zoological Survey of India.

GENERAL MORPHOLOGY AND TERMINOLOGY

The morphological features in different taxa of oribatid mites show a great diversity in shape and size. The important features and terms, broadly necessary for understanding these mites and for their identification are discussed here in brief. For details Sanyal (1992) may be consulted.

The body size varies from 100 300 µm in length, while a large number of species are in 300 900 µm in size range. Only rarely the oribatids exceed 1000 µm.

The oribatids are generally dorsoventrally flattened but rarely they may be cylindrical or laterally compressed. The body is covered with thin or hard cuticle. The body colour is of various types. The body surface may be dotted, pitted, tuberculate, striolate, rugose, polygonal or reticulate.

Body regions : The body is divided into two parts – the proterosoma and hysterosoma.

Prodorsum : Dorsally the proterosoma is covered by the shield called prodorsum. It consists of rostrum, lamellae or costulae, translamellae, pedotects, tubercles, bothridial and other tubercles, condyles, etc. The prodorsum may bear 4 – 6 pairs of setae *viz.*, rostral *(ro)* lamellar *(la)*, interlamellar *(in)*, anterior exobothridial *(exa)*, posterior exobothridial *(exp)* and sensillus *(ss)*. The prodorsum is separated from the hysterosoma by dorsosejugal *(dsej)* and sejugal *(sej)* sutures.

Notogaster : It is a coalesced form of a total of 10 segments but only six segments (C,D,E,F,H and Ps) can be traced in the adults. The notogaster may bear chitinous excrescens and also some wing like extensions – the pteromorphae. The notogaster bears setae which are generally constant in number. In the primitive groups these are 15–16 setae. In some groups neotrichy is noticed. The notogastral surface often displays octotaxic organs like glands *(gla)*, stigmata and other sense organs (laryfissure), are a porosae, pori, sacculi, etc.

Gnathosoma : It is formed of chelicerea, pedipalpi, hypostomal and epistomal structures.

Epimeral region : The epimeral fields of epimeres *(ep1-ep4)* are separated from one another by epimeral furrows and their continuations – the apodemes *(ap1–ap5)*. The sejugal furrow is backed by sejugal apodeme *(ap.sej)*, and often connected longitudinally by sternal apodeme *(ap. at)*. The epimeres bear setae.

Anogenital region : The region accomodates the genital and anal plates and openings. The types and subtypes of anogenital region are mentioned in Sanyal (1992).

Legs : The legs are usually divided into 5 free segments *viz.*, trochanter, femur, genu, tibia and tarsus. In some cases when coxa does not fuse with the body, 6 free segments of leg are noticed.

MATERIAL AND METHODS

For taxonomic studies of oribatid mites, litter, soil and humus samples from all possible habitats from the districts of Sikkim were collected. The samples collected by shovel from upper 10 cm soil profile were kept in polythene bags. The samples were extracted by using modified Tullgren funnels and extracted mite specimens were collected in glass tules containing 70% alcohol.

The body of most of the oribatid mite is heavily sclerotized and opaque. The extracted material were made ready for taxonomic study following the usual procedure of keeping the specimen in solution of 90% alcohol and lactic acid (v/v) as advocated by Balogh (1965). For microscopic observations, Balogh's (1965) method of temporary mounting in lactic acid was followed. After necessary microscopic observations the specimen was transferred in small glass vials containing 90% alcohol. The vials were then properly laveled and stored.

The measurements provided in the text were taken with the help of ocular and stage micrometers. The measurements of the specimens have been given in micron (μm). The keys for identification prepared by Balogh (1972), Balogh and Mahunka (1983), Balogh and Balogh (1988), Subias and Balogh (1989) and Balogh and Balogh (1990) have been followed.

LIST OF ORIBATID TAXA KNOWN FROM SIKKIM

Family COSMOCHTHONIIDAE

1. Genus ***Phyllozetes*** Gordeeva

1. *P. emmae* (Berlese)

Family HAPLOCHTHONIIDAE

2. Genus ***Haplochthonius*** Willmann

2. *H. simplex* Willmann

Family BRACHYCHTHONIIDAE

3. Genus ***Brachychthonius*** Berlese

3. *B. cricoides* Weis-Fogh

Family PROTHOPLOPHORIDAE

4. Genus ***Apoplophora*** Aoki

4. *A. pantotrema* (Berlese)

Family PHTHIRACARIDAE

5. Genus ***Atropacarus*** Ewing

Atropacarus (Hoplophorella) Niedbala

5. *A. H. africana* Wallwork
6. *A. H. scapellatus* (Aoki)
7. *A. H. singularis* Sellnick

6. Genus ***Hoplophthiracarus*** Jacot

8. *H. pakistanensis* (Hammer)
9. *H. punctatus* Mondal and Kundu

7. Genus ***Phthiracarus*** Perty

10. *P. claviger* Pearce

8. Genus ***Steganacarus*** *Ewing*

11. *S. stilifer* Hammer

Family EUPHTHIRACARIDAE

9. Genus ***Rhysotritia*** Markel and Meyer

12. *R. ardua ardua* (Koch)

13. *R. ardua* var. *othatensis* Hammer

Family LOHMANNIIDAE

10. Genus ***Haplacarus*** Wallwork

14. *H. foliatus* Wallwork

11. Genus ***Paulianacarus*** Balogh

15. *P.foliatus* Mondal and Chakrabarti

Family NOTHRIDAE

12. Genus ***Nothrus*** Koch

16. *N. monticola* Hammer

Family CAMISIIDAE

13. Genus ***Sigmonothrus*** Chakraborti and Kundu

17. *S. ovatus* Kundu and Mondal

14. Genus ***Heminothrus*** *(Platynothrus)*

18. *H. (P) thori* (Berlese)

Family TRHYPOCHTHONIIDAE

15. Genus ***Allonothrus*** Hammen

19. *A.russeolus* Wallwork

16. Genus ***Archegozetes*** Grandjean

20. *A. longisetosus* Aoki

17. Genus ***Trhypochthonius*** Berlese

21. *T. tectorum* Pearce

Family MALACONOTHRIDAE

18. Genus ***Malaconothrus*** Berlese

22. *M. geminus* Hammer

Family NANHERMANNIIDAE

19. Genus ***Masthermannia*** Berlese

23. *M. mammillaris* Berlese

20. Genus ***Nanhermannia*** Berlese

24. *N. himalayensis* Chakrabarti and Raychaudhuri

Family HERMANNIIDAE

21. Genus ***Hermannia*** Nicolet

25. *H. bistriata* Pearce

26. *H. convexa* Pearce

22. Genus ***Phyllhermannia*** Berlese

27. *P. berlesi* Mondal

Family LIODIDAE

23. Genus ***Liodes*** von Heyden

28. *L. ocellatus* Pearce

Family PLATEREMAEIDAE

24. Genus ***Allodamaeus*** Banks

29. *A. adpressus* Aoki and Fujikawa

Family DAMAEIDAE

25. Genus ***Metabelba*** Grandjean

30. *Metabelba* sp.

Family CEPHEIDAE

26. Genus ***Ommatocepheus*** Berlese

31. *O. ocellatus* Michael

Family MICROTEGEIDAE

27. Genus ***Microtegeus*** Berlese

32. *M. reticulatus* Aoki

Family EREMAEOZETIDAE

28. Genus ***Eremaeozetes*** Berlese

33. *E. himalayensis* Sanyal

Family MICROZETIDAE

29. Genus ***Berlesezetes*** Mahunka

34. *B. auxiliaris* (Grandjean)

Family AMERIDAE

30. Genus ***Amerus*** Berlese

35. *A. speciosus* Pearce

Family HETEROBELBIDAE

31. Genus ***Heterobelba*** Berlese

36. *H. rostrata* Mondal and Kundu

Family BASILOBELBIDAE Balogh

32. Genus ***Basilobelba***

37. *B. barbata* Mondal and Kundu

Family EREMAEIDAE

33. Genus ***Eremaeus*** Koch

38. *Eremaeus* sp.

Family ZETORCHESTIDAE

34. Genus ***Zetorchestes*** Berlese

39. *Z. saltator* Oudemans

Family LIACARIDAE

35. Genus ***Liacarus*** Michael

40. *L. nigrescens* Pearce

Family PELOPPIIDAE

36. Genus ***Ceratoppia*** Berlese

41. *C. bipilis* Hermann

Family GUSTAVIIDAE

37. Genus ***Gustavia*** Kramer

42. *G. palmicinctus*

Family NIPPOBODIDAE

38. Genus ***Leobodes*** Aoki

43. *L. mirabilis* Aoki

Family TECTOCEPHEIDAE

39. Genus ***Tectocepheus*** Berlese

44. *T. velatus* (Michael)

Family OTOCEPHEIDAE

40. Genus ***Acrotocepheus*** Aoki

45. *Acrotocepheus* sp.

41. Genus ***Dolicheremaeus*** Jacot

46. *D.coronarius* Chakrabarti *et al.*

47. *D.himalayensis* Chakrabarti *et al.*

48. *Dolicheremaeus* sp.

Family OPPIIDAE

42. Genus ***Multioppia*** Hammer

49. *Multioppia* sp.

43. Genus ***Oppia***

50. *O. orientalis* Sanyal and Bhaduri

51. *O. yodai* Aoki

52. *Oppia* sp.

Family SUCTOBELBIDAE

44. Genus ***Flagrosuctobelba*** Hammer

53. *Flagrosuctobelba* sp.

45. Genus ***Suctobelba*** Paoli

54. *S. subcornigera* Hammer

Family CYMBAEREMAEIDAE

46. Genus ***Cymbaeremaeus*** Berlese

55. *C. cymba* Nicolet

Family CHAUNOPROCTIDAE

47. Genus ***Chaunoproctus*** Pearce

56. *C. asperulus* Pearce

57. *C. cancellatus* Pearce

58. *C. longisetosus* Dhali and Bhaduri

59. *Chaunoproctus* sp.

Family PROTORIBATIDAE

48. Genus ***Liebstadia*** Oudemans

60. *L. similis* Michael

Family ORIBATULIDAE

49. Genus ***Lucoppia*** Berlese

61. *L. alata* var. *major*

62. *L. fallax* Pearce, 1906

63. *L. oralis* Nicolet, 1885

50. Genus ***Oribatula*** Berlese

64. *O. tibialis* (Nicolet)

Family SCHELORIBATIDAE

51. Genus ***Scheloribates*** Berlese

65. *S. albialatus* Hammer

66. *S. huancayensis* Hammer

67. *S. natalensis* Pletzen

68. *S. rectus* Hammer

69. *S. saswatii* Dhali and Bhaduri

70. *S. sikkimensis* Dhali and Bhaduri

71. *S. thermophilus* Hammer

Family HAPLOZETIDAE

52. Genus ***Haplozetes*** Willmann

72. *Haplozetes* sp.

53. Genus ***Peloribates*** Berlese

73. *P. intermedius* Mondal

54. Genus ***Rostrozetes*** Sellnick

74. *R. foveolatus* Sellnick

Family XYLOBATIDAE

55. Genus ***Setoxylobates*** Balogh and Mahunka

75. *S.foveolatus* Balogh and Mahunka

56. Genus ***Xylobates*** Jacot

76. *X. seminudus* Hammer

Family CERATOZETIDAE

57. Genus ***Ceratozetes*** Berlese

77. *C. gracilis* Michael

58. Genus ***Hypozetes*** Balogh

78. *Hypozetes* sp.

Family MOCHLOZETIDAE

59. Genus ***Unguizetes*** Sellnick

79. *U. clavatus* Aoki

Family AUSTRACHIPTERIIDAE

60. Genus ***Lamellobates*** Hammer

80. *L. palustris* Hammer

61. Genus ***Paralamellobates*** Bhaduri and Raychaudhuri

81. *P. bengalensis* Bhaduri and Raychaudhuri

Family PHENOPELOPIDAE

62. Genus ***Eupelops*** Ewing

82. *E. acromis* (Hermann)

83. *E. longisetosus* Chakrabarti and Mondal

Family GALUMNIDAE

63. Genus ***Galumna*** von Heyden

84. *G.crenata* Deb and Raychaudhuri

85. *G. flabellifera orientalis* Aoki

SYSTEMATIC ACCOUNT

Family COSMOCHTHONIIDAE Grandjean, 1947

1. Genus ***Phyllozetes*** Gordeeva

1978. *Phyllozetes* Gordeeva, *Zool. Zh.*, **57** : 1099.

1. ***Phyllozetes emmae*** (Berlese)

1910. *Cosmochthonius emmae* Berlese, *Redia*, **6** (2):222.

1980. *Phyllozetes emmae* (Berlese) : Gordeeva, *Zool. Zh.*, 59 : 849.

Diagnosis : Hysterosomal shield appears to lack sculpturing; rostral, lamellar and interlamellar setae bifurcate, "T"–shaped; sensillus long, club-shaped, densely setose at distal end; c_1, c_2, f_1, f_2 very long, leaf-shaped, dense to medium spaced cilia along margin, 10 pairs of genital setae; legs I–II bidactylous, IV tridactylous.

Material examined : East Sikkim : 1female, Dunga, 5.vi.1998, from litter and soil, coll. A.K.Sanyal.

Distribution : India : Sikkim (East Sikkim), West Bengal.

Remark : The species is reported for the first time from the state.

Family HAPLOCHTHONIIDAE Hammen, 1959

2. Genus ***Haplochthonius*** Willmann

1930. *Haplochthonius* Willmann, *Abh. natur. Ver. Bremen*, **28** (1) : 2.

2. ***Haplochthonius simplex*** Willmann

1930. *Haplochthonius simplex* Willmann, *Abh. natur. Ver. Bromen*, **28**(1) : 2.

Diagnosis : Prodorsal setae short, thin, setiform; rostral and lamellar setae turning towards each other; sensillus eliptical; 15 pairs of notogastral setae, thin, setiform.

Material examined : West Sikkim : 1 female, Neyangthang, 22.ii.1990, from soil, coll. A.K. Sanyal. North Sikkim : 2 female, Chungthang, 28.v.1998, from soil, coll. A.K. Sanyal. East Sikkim : 1 female, Rangpoo, 6.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, North Sikkim, East Sikkim), Tripura, West Bengal.

Remark : The species is reported for the first time from the state.

Family BRACHYCHTHONIIDAE Balogh, 1943

3. Genus ***Brachychthonius*** Berlese

1910. *Brachychthonius* Berlese, *Redia*, **6** (2) :219.

3. ***Brachychthonius cricoides*** Weis-Fogh

1947-48. *Brachychthonius cricoides* Weis-Fogh, *Nature Jutlandica*, **1** : 220.

Diagnosis : Faceted appearance of prodorsum with lateral and semicircular vertex ridges; all setae minute and simple; sensillus speciform, covered with short spikes; interlamellar setae situated just behind the pseudostigmata; two pairs of lateral

light reflecting places behind the pseudostigmata, the pair of pores situated laterally on the medial longitudinal ridges between the first and second pair of notogastral setae surrounded by ring.

Material examined : East Sikkim : 2(female), Phensong, 23.v.1998, from litter and soil, coll. A.K.Sanyal. North Sikkim : 1(female), Lachung, 29.v.1998, from soil, coll. A.K.Sanyal.

Distribution : India : Sikkim (East Sikkim, North Sikkim), West Bengal.

Remark : This is the first record of the species from Sikkim.

Family PROTHOPLOPHORIDAE Ewing, 1917

4. Genus ***Apoplophora*** Aoki

1980. *Apoplophora* Aoki, *Proc. Soc. Syst. Zool.*, No. **18** : 13.

4. ***Apoplophora pantotrema*** (Berlese)

1913. *Mesoplophora pantotrema* Berlese, *Redia*, **9** : 97.

1980. *Apoplophora remota* Aoki, *Proc. Soc. Syst. Zool.*, No. **18** : 13.

1983. *Apoplophora pantotrema* Syn. nov., Niedbala, *Bull. Pol. Acad. Sci.* (Biol. Sci.), **32** (3-4) : 140.

Diagnosis : Fine longitudinal striations on prodorsum; thick prodorsal setae, barbed on one side; sensillus sparsely barbed on one side, slightly swelled near the basal part; genital setae six pairs, simple, minute; anal setae 4 pairs, simple, smooth; ventral plate with seven pairs of setae, anterior most pair fine and shorter, the remaining setae weakly barbed.

Material examined : East Sikkim : 2(female), Gangtok near Raj Bhavan, 22.v.1998, from humus, coll. A.K.Sanyal.

Distribution : India : Sikkim (East Sikkim), Goa, West Bengal.

Remark : The species is reported for the first time from Sikkim.

Family PHTHIRACARIDAE Perty, 1841

Key to the genera of PHTHIRACARIDAE

1(4) Inner margin of anoadanal plate with 2–3 pairs of setae placed far from each other; notogaster usually smooth.

2(3) Interlamellar setae documbent and not so differ in shape from lamellar setae; three pairs of anal setae ..... *Atropacarus* ..... *(Hoplophorella)* Niedbala, 1986

3(2) Interlamellar setae erect, usually much longer and thicker than lamellar setae; two pairs of anal setae .... *Hoplophthiracarus* Jacot, 1933

4(1) Inner margin of anoadanal plate with 3-4 pairs of setae placed near each other; notogaster with tubercles and pits .... *Steganacarus* Ewing, 1917

5. Genus ***Atropacarus*** Ewing

1917. *Atropacarus* Ewing, *J. Economic Ent. Concord*, **10** : 131.

Atropacarus (Hoplophorella) Niedbala

1986. *Atropacarus (Heplophorella)* Niedbala, *Acarologia*, **27** (1) : 80.

Key to the species of *Atropacarus (Hoplophorella)*

1(4) Notogastral setae and ad_2 spatulate

2(3) Interlamellar setae long, spatulate; head of sensillus uneven .... *scapellatus* (Aoki, 1965)

3(2) Interlamellar setae thick but not spatulate; head of sensillus beset with short bristles ..... *africana* Wallwork, 1967

4(1) Notogastral setae long, erect, barbed; ad_2 long, fine smooth; interlamellar and notogastral setae distinctly barbed .... *singularis* Sellnick, 1959

5. **Atropacarus *(Hoplophorella) africana*** Wallwork

1967. *Hoplophorella africana* Wallwork, *Rev. Zool. Bot. Afr.*, **75** : 36.

1992. *Atropacarus (Hoplophorella) africana*, Niedbala, In : *Phthiracaroidea (Acari, Oribatida) Systematic Studies*, Amsterdam, 226.

Diagnosis : Integument with pock-marks; rostral and lamellar setae moderately long; minute lamellar setae; long sensillus, curved in a sigmoid-shape with slightly expanded distal region bearing short bristles; no notogastral hood; 15 pairs of notogastral setae, strong, thick, spatulate; ad_2 longer than the median setae.

Material examined : West Sikkim : 2(female), Lower Gezzing, 17.11.1990, from soil and litter, coll. A.K.Sanyal. East Sikkim, 2(female), Ranipool, 25.v.1998, from humus, coll. A.K.Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), Assam, Manipur, Orissa, Tripura, West Bengal.

Remark : The species is reported for the first time from the state.

6. *Atropacarus (Hoplophorella) scapellatus* (Aoki)

1965. *Hoplophorella scapellata* Aoki, *Nat. Life Southeast Asia,* **4** : 131.

1992. *Atropacarus (Hoplophorella) scapellatus,* Niedbala, In : *Phthiracaroidea (Acari, Oribatia) Systematic Studies,* Amsterdam, 226.

Diagnosis : Minutely pitted integument; rostral setae well developed, strong; lamellar setae minute, fine; long interlamellar setae, directed upward; sensillus almost equally thick throughout its length except distal half which is hyaline and uneven; notogastral hood absent; 15 pairs of notogastral setae, broad, spatulate; ad_1 similar to notogastral setae; ad_2 minute.

Material examined : West Sikkim : 1(female), Dentum, near F.R.H., 19.11.1990, from litter and soil, coll. A.K.Sanyal. East Sikkim: 2(female), Penlong forest, 27.v.1998. from humus, coll. A.K. Sanyal; South Sikkim : 2(female), Namchi, 1.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, South Sikkim), Bihar, Manipur, Meghalaya, Tripura, West Bengal.

Remark : This is the first report of the species from Sikkim.

7. *Atropacarus (Hoplophorella) singularis* Sellnick

1959. *Hoplophorella singularis* Sellnick, *Occas. Pap. Bishop Mus.,* **22** (9) : 149.

1992. *Atropacarus (Hoplophorella) singularis,* Niedbala, In : *Phthiracaroidea (Acari, Oribatida) Systematic Studies,* Amsterdam, 226.

Diagnosis : Integument with shallow pits; aspis truncated behind; no carina; rostral and lamellar setae smooth; interlamellar setae long, distally barbed; sensillus thickened gradually to rounded knob-like head; 15 pairs of notogastral setae, barbed.

Material examined : West Sikkim : 2(female), Pelling, near monastry, 15.ii.1990, from humus, coll. A.K. Sanyal. NorthSikkim : 2(female), Mangan, near P.S., 31.v.1998, from litter, coll. A.K. Sanyal. East Sikkim : 1(female), Pongla forest, 4.vi.1998, from soil. coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, North Sikkim, East Sikkim), Manipur, West Bengal.

6. Genus ***Hoplophthiracarus*** Jacot

1933. *Hoplophthiracarus* Jacot, *J. Elisha Mitchell Sci. Soc.,* **48** : 239.

Key to the species of *Hoplophthiracarus*

1(2) Lamellar setae not foliate; integument punctated .... *punctatus* Mondal and Kundu, 1988

2(1) Lamellar setae foliate; integument foveolated .... *pakistanensis* (Hammer, 1977)

8. ***Hoplophthiracarus pakistanensis*** (Hammer)

1977. *Hoplophorella pakistanensis* Hammer, *Biol. Skr. Dan. Vid. Selsk.,* **21** (4) : 35.

1984. *Hoplophthiracarus pakistanensis,* Niedbala, *Ann. Zool., Warszawa,* **38** (8) : 177.

Diagnosis : Integument fairly foveolated; aspis with well developed keel forming a right angle; rostral setae short, foliate; lamellar setae short, stiff, smooth; interlamellar setae erect and bent

forwards, barbed distally; sensillus widens towards the tip, surrounded by a brim; notogastral collar narrow dorsally; 15 pairs of notogastral setae, equally long, erect, stiff, barbed distally; 9 pairs of genital setae, smooth, minute; anal and adanal setae smooth.

Material examined : South Sikkim : 2(female), Rabangla, 1.vi.1998, from litter and soil, coll. A.K. Sanyal. East Sikkim; 1(female), Rangpoo, near F.R.H., 3.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (South Sikkim, East Sikkim), Himachal Pradesh, Kashmir, West Bengal.

Remark : This is the first record of the species from Sikkim.

9. ***Hoplophthiracarus punctatus*** Mondal and Kundu

1988. *Hoplophthiracarus punctatus* Mondal and Kundu, *Rec. zool. Surv. India,* **85** (1) : 111.

Diagnosis : Integument densely punctate, aspis anterodorsally foveolate; rostral setae smooth, simple; lamellar setae finely barbed distally; interlamellar setae long, erect, stout, distally barbed; sensillus with slender stalk, anteriorly wide, distal part with uneven rounded brims; 15 pairs of notogastral setae, stiff, erect, distal one third finely barbed; 9 pairs of genital setae, apically barbed; anal and adanal setae barbed distally.

Material examined : West Sikkim : 3(female), Khecheoperi forest, 16.ii.1990, from humus and soil, coil. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim), Himachal Pradesh, Kashmir, West Bengal.

Remark : The species is reported here for the first time from the state.

7. Genus ***Phthiracarus*** Perty

1841. *Phthiracarus* Perty, Allgemeine Naturges chichte, als Philosophische and Humanitatswissenschaft fur Naturforscher, Philosophen and das hoher gebildete publikum, **3**, Bern.

10. ***Phthiracarus claviger*** Pearce

1906. *Phthiracarus claviger* Pearce, *Journ. Roy. Micr. Soc.*, 271.

Diagnosis : Light brown, coarsely areolated; aspis with carina; sensillus moderately long, thin, slightly clavate; a few fine setae on notogaster; legs monodactylous.

Distribution : India : Sikkim.

Remark : The details of collection data are not mentioned in the publication.

8. Genus ***Steganacarus*** Ewing

1917. *Steganacarus* Ewing. *Ann. Ent. Soc. Amer.*, **10** : 130.

11. ***Steganacarus stilifer*** Hammer

1961. *Steganacarus stilifer* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **13** (1) : 132.

Diagnosis : Aspis smooth; rostral setae small, directed forward; lamellar setae minute; interlamellar setae stiff, pointed, smooth, as long as rortral setae; sensillus sickle-shaped, anterior border with dense brim of fine bristles; notogaster finely foveolate; notogastral setae smooth, pointed.

Material examined : West Sikkim : 2 female, Uttery forest, 24.ii.1990, from litter and soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim), West Bengal.

Remark : The species is reported here for the first time from the state.

Family EUPHTHIRACARIDAE Jacot, 1930

9. Genus ***Rhysotritia*** Markel and Meyer

1959. *Rhysotritia* Markel and Meyer, *Zool. Anz.*, **163** : 329.

Key to the species of *Rhysotritia*

1(2) Sensillus setiform, only distally ciliate, stalk not thickened; leg I bi-and II-V tridactylous ..... *ardua ardua* (Koch, 1841)

2(1) Sensillus dilated distally into a flat head set with coarse bristles on its surface; legs mono-or tridactylous .... *ardua* var. *otaheitensis* Hammer, 1972

12. ***Rhysotritia ardua ardua*** (Koch)

1841. *Hoplophora ardua* Koch, *Deutschlands Crustaceen, Myriapoden und Arachniden*, **32** : 615.

1923. *Tritia ardua,* Sellnick, *Acari, Blatter fur Milben Kunde,* **3** : 12.

1928. *Oribotritia ardua,* Sellnick, *Tierw. Mitteleur,* **3** (9) : 39.

1930. *Pseudotritia ardua,* Jacot, *Proc. Boston Soc. Nat. Hist.,* **39** : 243.

1959. *Rhysotritia ardua,* Markel and Meyer, *Zool. Anz.,* **163** : 329.

Diagnosis : Anterior part of aspis with minute granules, with single lateral carina on each side; rostral setae weakly barbed; thick and barbed lamellar and interlamellar setae; sensillus thick, pointed, finely barbed; minutely punctate notogaster; 14 pairs of notogastral setae, strong, apically barbed; 9 pairs of genital setae; an_3 very minute.

Material examined : West Sikkim : 2 (female), Lower Gezzing, 17.ii.1990, from humus, coll. A.K. Sanyal; 3(female), Linching, 22.ii.1990, from humus, coll. A.K. Sanyal; Kaluk, 2(female), 21.ii.1990, from litter, coll. A.K. Sanyal. South Sikkim, 3(female), Namchi, 2.vi.1998, from humus, coll. A.K.Sanyal.

Distribution : India : Sikkim (West Sikkim, South Sikkim), Himachal Pradesh, Orissa, Uttar Pradesh, West Bengal.

Remark : The species is reported here for the first time from Sikkim.

13. ***Rhysotritia ardua*** (Koch) var. ***otaheitensis*** Hammer

1972. *Rhysotritia ardua* (Koch) var. *otaheitensis* Hammer, *Biol. Skr. Dan. Vid. Selsk.,* **19** (3) : 12.

Diagnosis : The variety differ from the main form by the shape of pseudostigmatic organ and number of claws. Here the pseudostigmatic organ is dilated distally into a flat head set with coarse bristles on its surface. This variety possesses one or three claws.

Material examined : West Sikkim : 2(female), Songfu, 23.ii.1990, from soil, coll. A.K. Sanyal. East Sikkim : 1(female), Rumtek, 24.v.1998, from humus, coll. A.K. Sanyal; 3(female), Tsangu Lake, 26.v.1998, from soil, coll. A.K. Sanyal. South Sikkim : 2(female), Temi, 2.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, South Sikkim), Meghalaya, West Bengal.

Remark : This is the first record of species from the state.

Family LOHMANNIIDAE Berlese, 1916

Key to the genera of LOHMANNIIDAE

1(2) Five pairs of setae in the ano-adanal plates ..... *Haplacarus,* Wallwork, 1962

2(1) Six pairs of setae in the ano-adanal plates ..... *Paulianacarus* Balogh, 1960

10. Genus ***Haplacarus*** Wallwork

1962. *Haplacarus* Wallwork, *Acarologia,* **4** : 465.

14. ***Haplacarus foliatus*** Wallwork

1962. *Haplacarus foliatus* Wallwork, *Acarologia,* **4** : 465.

Diagnosis : Integument bears fine microsculpture of regular punctations; all prodorsal setae foliate with short barbs; sensillus pectinate with 10–12 branches; 10 pairs of notogastral setae, foliate, usually smooth; notogaster with 10 transverse bands; adanal setae foliate, thin, transparent; genital setae 10 pairs.

Material examined : West Sikkim : 2(female), Nursery near Jorthang, 27.ii.1990, from soil, coll. A.K. Sanyal. North Sikkim : 1(female), Namprikdam, 30.v.1998, from soil, coll. A.K. Sanyal. South Sikkim : 2(female), Temi, 2.vi.1998, from litter and soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, North Sikkim, South Sikkim), Tripura, West Bengal.

Remark : The species is recorded for the first time from the state.

11. Genus ***Paulianacarus*** Balogh

1960. *Paulianacarus* Balogh, *Mem. Inst. Sci. Madagascar,* **14A** : 8.

15. ***Paulianacarus foliatus*** Mondal and Chakrabarti

1982. *Paulianacarus foliatus* Mondal and Chakrabarti, *Indian J. Acar.*, **7** (2) : 79.

Diagnosis : Dorsum with protruding ring-shaped structures; prodorsal setae foliate with mid-rib; rostral and lamellar setae finely barbed proximally; sensillus pectinate with 8–10 secondary branches; 5 notogastral barbs; 16 pairs of notogastral setae, smooth, foliate; 10 pairs of genital setae.

Material examined : West Sikkim : 2(female), Soreng, 2.iii.1990, from soil, coll. A.K. Sanyal. East Sikkim : 2(F), Gangtok, 22.v.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), Tripura, West Bengal.

Remark : The species is recorded for the first time from the state.

Family NOTHRIDAE Berlese, 1986

12. Genus ***Nothrus*** Koch

1836. *Nothrus* Koch. *Deutschlands Crustaceen, Myriapoden und Arachniden,* **2** : 17.

16. ***Nothrus monticola*** Hammer

1961. *Nothrus monticola* Hammer, *Biol. Skr. Dan. Vid. Selsk.,* **13**(1) : 26.

Diagnosis : Rostral setae rough; lamellar setae densely feathered, bushy; a chitinous V-shaped ridge connects the lamellar setae; interlamellar setae scaly; cuticle densely punctate; notogastral seate short and thick; distance between c_1-c_1 about one third longer than c_1-c_2; two longitudinal grooves on dorsal side; monodactylous.

Material examined : East Sikkim : 2(female), Phensong, 23.v.1998, from soil, coll. A.K. Sanyal. North Sikkim : 1(female), Chungthang, 28.v.1998, from litter and soil, coll. A.K. Sanyal. South Sikkim : 3(female), Namchi, 1.vi.1995, from soil, coll. A.K. Sanyal; 2(female), Rabangla, 1.vi.1998, from soil, coll. A. K. Sanyal.

Distribution : India : Sikkim (East Sikkim, North Sikkim, South Sikkim).

Remark : The species is first record from India.

Family CAMISIIDAE Oudemans, 1900

Key to the genera of CAMISIIDAE

1(2) A sigmoid chitinous ridge at the posteromedian margin of prodorsum; genital setae 14 pairs .....

Sigmonothrus Chakrabarti and Kundu, 1978

2(1) No sigmoid chitinous ridge at the posteromedian margin of prodorsum; .....

Heminothrus (Platynothrus) Berlese, 1913

13. Genus ***Sigmonothrus*** Chakrabarti and Kundu

1978. *Sigmonothrus* Chakrabarti and Kundu, *Indian J. Acar.,* **3** (2) : 58.

17. ***Sigmonothrus Ovatus*** Kundu and Mondal

1978. *Sigmonothrus ovatus* Kundu and Mondal, *Indian J. Acar.,* **3** (2) : 62.

Diagnosis : Slightly foveolated body; rostral setae simple; lamellar setae bilaterally barbed; anteriorly hook-like; interlamellar setae simple; sensillus smaller than interlamellar setae, head with fine bristles; notogaster with four longitudinal chitinous ridges and five oval hollows; notogastral setae simple, apices blunt; 14 pairs of simple genital setae.

Material examined : West Sikkim : 2(female), Yangthang, 12.11.1990, from litter and soil, coll. A.K. Sanyal; 1(female), Legship, 13.ii.1990, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim), West Bengal.

Remark : The species is recorded for the first time from the state.

14. Genus ***Heminothrus (Platynothrus)*** Berlese

1913. *Heminothrus (Platynothrus), Redia,* **9** : 98.

18. ***Heminothrus (Platynothrus) thori*** (Berlese)

1904. *Heminothrus (Platynothrus) thori* (Berlese), *Redia,* **2** : 10-32.

Diagnosis : Short interlamellar seate, reaching only to insertion point of lamellar seate; sensillus bacilliform; notogastral setae, especially c_2 and d_2 shorter than posterior ones.

Material examined : West Sikkim : 1 (female),

Gezzing P.W.D. R.H. Campus, 11.ii.1990, from litter and soil, coll. A.K. Sanyal. East Sikkim : 2 (female), Rumtek, 24.v.1998, from litter and soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (East Sikkim, West Sikkim).

Remark : The species is recorded for the first time from India.

Family TRHYPOCHTHONIIDAE Willmann, 1931

Key to the genera of TRHYPOCHTHONIIDAE

1(2) Notogaster quadrangular, notogastral setae simple; 7 pairs of genital setae; legs monodactylous .... *Archegozetes* Grandjean, 1931

2(1) Notogaster pentagonal, notogastral setae flabelliform; 7–14 pairs of genital setae; legs tridactylous ... *Allonothrus* Hammen, 1953

15. Genus ***Allonothrus*** Hammen

1953. *Allonothrus* Hammen, *Proc. Acad. Sci. Amst.*, **56c** : 244.

19. ***Allonothrus russeolus*** Wallwork

1960. *Allonothrus russeolus* Wallwork, *Acarologia*, **2** (4) : 571.

Diagnosis : Minutely punctated prodorsum; lateral prodorsal ridges strongly curved, central ridges fused anteriorly; rostral setae pointed, barbed; an interrupted transverse ridge behind the interlamellar setae; other dorsal setae fan-shaped; notogaster with circular or polygonal areolae surrounded by reddish-brown ridges; 13 pairs of genital setae.

Material examined : West Sikkim : 1(female), Jogidara, Dentum, 20.ii.1990, from soil, coll. A.K. Sanyal; 2(female), Rabond, 28.ii.1990, from soil, coll. A.K. Sanyal. South Sikkim : 2(female), Namchi, 2.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, South Sikkim), Assam, West Bengal.

Remark : The species is recorded for the first time from the state.

16. Genus ***Archegozetes*** Grandjean

1931. *Archegozetes* Grandjean, *Bull. Mus. Hist. Nat. Paris.*, **3** (2) : 144.

20. ***Archegozetes longisetosus*** Aoki

1965. *Archegozetes longisetosus* Aoki, *Nat. Life Southest Asia*, **4** : 147.

Diagnosis : Punctated prodorsum; prodorsal and notogastral setae long, fine, densely beset with fine bristles; sensillus long, fine, densely beset with bristles, d_1 longer than their mutual distance; genital setae 7 pairs.

Material examined : West Sikkim : 2(female), Gezzing P.W.D. R.H. Campus, 11.ii.1990, from litter and soil, coll. A.K. Sanyal; 2(female), Sombare, 1.iii.1990, from soil, coll. A.K. Sanyal. East Sikkim : 1(female), Rumtek, 24.v.1998, from litter and soil, coll. A.K. Sanyal; 2(female), Ranipool, 25.v.1998, from soil, coll. A.K. Sanyal; 1(female), Tsangu lake, 26.v.1998, from soil, coll. A.K. Sanyal. North Sikkim : 2(female), Sintham, 31.v.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, North Sikkim), Assam, Kerala, Tripura, West Bengal.

Remark : This is the first record of the species from Sikkim.

17. Genus ***Trhypochthonius*** Berlese

1904. *Trhypochthonius* Berlese, *Redia*, **2** : 27.

21. ***Trhypochthonius tectorum*** (Berlese)

1986. Trhypochthonius tectorum, Acari, Myriopoda et scorpiones hucus in Italia reperta, 1-98.

1906. *Trhypochthonius (Nothrus) tectorum*, Pearce, *Journ. Roy. Micr. Soc.*, 270.

Material examined : West Sikkim : 1(female), Pelling, 15.ii.1990, from litter and soil coll. A.K. Sanyal. South Sikkim : 2(female), Mamchi, 2.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, South Sikkim, East Sikkim).

Family MALACONOTHRIDAE Berlese, 1916

18. Genus ***Malaconothrus*** Berlese

1904. *Malaconothrus geminus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **19** (3) : 20.

Diagnosis : Very thin and smooth rostral setae; lamellar setae smooth; interlamellar setae very fine; flexible, smooth; notogaster with two medial longitudinal ridges, two indistinct brown bands between the longitudinal ridges; notogaster punctate; 13 pairs of smooth notogastral setae, very long; 4(5) pairs of genital setae.

Material examined : West Sikkim : 2(female), Khecheopuri, 16.ii.1990, from litter and soil, coll. A.K. Sanyal. East Sikkim : 1(female), Rangpoo, 6.vi.1998, from coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), West Bengal.

Remark : This is the first record of species from the state.

Family NANHERMANNIIDAE Sellnick, 1928

Key to the genera of NANHERMANNIIDAE

1(2) Notogastral setae 'T'-shaped, branches distally flagellate; sensillus simple, never pilose; epimeral setal formula 3–1–3–4 ... . *Masthermannia* Berlese, 1913

2(1) Notogastral setae simple, setiform; sensillus with dilated densely pilose head; epimeral setal formula 3–1–3–3 ....*Nanhermannia* Berlese, 1913

19. Genus ***Masthermannia*** Berlese

1913. *Masthermannia* Berlese, *Redia*, **9** : 100.

23. ***Masthermannia mammillaris*** Berlese

1913. *Masthermannia mammillaris* Berlese, *Redia*, **9** : 100.

Diagnosis : Finely punctate prodorsum, laterally a robust lath on each side; sensillus long, hardly discernible, incrassate, setiform, finely feathered; weak prodorsal condyles connected by transverse lath; notogaster foveolated; notogastral profile uneven due to tubercles; notogastral setae with very long branches, all originating from tubercles.

Material examined : East Sikkim : 2(female), Ranipool, 25.v.1998, from soil, coll. A.K. Sanyal; 1(female), Dunga, 5.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (East Sikkim), Tripura, West Bengal.

Remark : The species is reported for the first time from the state.

20. Genus ***Nanhermannia*** Berlese

1913. *Nanhermannia* Berlese, *Redia*, **9** : 100.

24. ***Nanhermannia himalayensis*** Chakrabarti and Raychaudhuri

1977. *Nanhermannia himalayensis* Chakrabarti and Raychaudhuri, *Indian J. Acar.*, **2** (2) : 51.

Diagnosis : Prodorsum crown-shaped; rostral setae simple, lamellar setae thick, reaching tip of rostrum; interlamellar setae simple, long; sensillus with dilated club-shaped head beset with bristles; five horn-like processes or cornu at posterior extremity of prodorsum; notogastral setae 14 pairs, simple, long, tips slightly curved; ad_1 absent; genital setae 7 pairs, simple; epimeral setae *1b* and *3b* setose.

Material examined : West Sikkim : 2(female), 11.ii.1990, from litter and soil, coll. A.K. Sanyal. East Sikkim: 1(female), Penlong, 27.5.1998, from litter and soil, coll. A.K. Sanyal. South Sikkim : 1(female), Namchi, 1.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, South Sikkim), West Bengal.

Remark : The species is recorded for the first time from the state.

Family HERMANNIIDAE Sellnick, 1928

21. Genus ***Hermannia*** Nicolet

25. ***Hermannia bistriata***

1906. *Hermannia bistriata*, Pearce, *Journ. Roy. Micr. Soc.*, 270.

Remark : The species was first recorded by Pearce (1906) from Sikkim.

26. ***Hermannia convexa***

1906. *Hermannia convexa,* Pearce, *Jour. Roy. Micr. Soc.,* 270.

Remark : The species was first recorded by Pearce (1906) from Sikkim.

22. Genus ***Phyllhermannia*** Berlese

1916. *Phyllhermannia* Berlese, Redia, **12** : 65.

27. ***Phyllhermannia berlesi*** Mondal

1984. *Phyllhermannia berlesi* Mondal, *Rec. Zool. Surv. India,* **8** (3 & 4) : 175.

Diagnosis : An arch between the pseudostigmata; rostral and lamellar setae finely barbed; interlamellar setae distinctly barbed; sensillus rod-shaped, smooth; notogaster coarsely punctate with an anterior undulating transverse ridge; 15 pairs of notogastral setae, distinctly barbed bilaterally; genital setae 18 pairs, smooth.

Material examined : East Sikkim : 2(female), Rumtek, 24.v.1998, from litter and soil, coll. A.K. Sanyal; 3(female), Rangpoo, 6.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (East Sikkim), West Bengal.

Remark : This is the first record of the species from the state.

14. Family LIODIDAE Grandjean, 1954

23. Genus ***Liodes*** von Heyden

1826 *Liodes* voh Heyden, Isis (*von Oken*), 18.

28. ***Liodes ocellatus*** Pearce

1906. *Liodes ocellatus* Pearce, *Journ. Roy. Micr. Soc.,* 272.

Diagnosis : Roughly hexagonal in shape; prodorsum broadly pyramidal, with a few indistinct markings; sensillus small, with thin peduncle and clavate-shaped head; notogaster pentagonal with a rounded projection at posterior extremity; legs monodactyle.

Distribution : India : Sikkim (East Sikkim).

Family PLATEREMAEIDAE Tragardh, 1931

24. Genus ***Allodamaeus*** Banks

1947. *Allodamaeus* Banks, *Psyche, cambridge, Mass.,* **54** (2) : 118.

29. ***Allodamaeus adpressus*** Aoki and Fujikawa

1971. *Allodamaeus adpressus* Aoki and Fujikawa, *Annot. Zool. Jap.,* **44** : 115.

Diagnosis : Prodorsum with six transverse or longitudinal ridges; the meral end of the posteriormost ridge on each side bears an insertion for interlamellar setae, sensillus long with barbed head; posterior part of notogaster bears two pairs of setae which are deumbent along the curvature of notogaster, the anterior pair of setae about three times as long as the posterior.

Material examined : West Sikkim : 3(female), Dentum, 19.ii.1990, from litter and soil, coll. A.K. Sanyal. North Sikkim, 2(female), Lachung, 29.v.1998, from litter and soil, coll. A.K.Sanyal.

Distribution : India : Sikkim (West Sikkim, North Sikkim), West Bengal.

Remark : The species is recorded for the first time from the state.

16. Family DAMAEIDAE Berlese, 1896

25. Genus ***Metabelba*** Grandjean

1936. *Metabelba* Grandjean, *Ann. Ent. Soc. Fr.,* **105** : 67.

30. ***Metabelba*** sp.

Material examined : West Sikkim : 2(female), Lingching, 22.ii.1990, from litter and soil, coll. A.K.Sanyal.

Remark : The specimens are not in good condition, so the identification was done upto generic level.

Family CEPHEIDAE Berlese, 1896

26. Genus ***Ommatocepheus*** Berlese

1913. *Ommatocepheus* Berlese, *Redia,* **9** : 98.

31. ***Ommatocepheus ocellatus*** Michael

1906. *Ommatocepheus ocellatus,* Pearce, *Journ. Roy. Micr. Soc.,* 269.

Remark : The species was first recorded by Pearce (1906) from Sikkim.

18. Family MICROTEGEIDAE Balogh, 1972

27. Genus ***Microtegeus*** Berlese

1917. *Microtegeus* Berlese, *Documents Scientifiques*, **5**.

32. ***Microtegeus reticulatus*** Aoki

1965. *Microtegeus reticulatus* Aoki, *Nat. Life Southeast Asia*, **4** : 156.

Diagnosis : The middle and psoterior part of prodorsum with reticulation pattern, proximal part with long stria; lamellar setae placed on apophyses; sensillus with fusiform head beset with several strong spines and with rhomboid-shaped hollow area; narrow trapeze like outgrowths on the notogaster; 9 pairs of notogastral setae, smooth; 5 pairs of genital setae.

Material examined : West Sikkim : 1(female), Songfu, 23.ii.1990, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim), Tripura, West Bengal.

Remark : This is the first record of species from Sikkim.

Family EREMAEOZETIDAE Balogh, 1962

28. Genus ***Eremaeozetes*** Berlese

1913. *Eremaeozetes* Berlese, *Redia*, **9** : 92.

33. ***Eremaeozetes himalayensis*** Sanyal

1992. *Eremaeozetes himalayensis* Sanyal, *State Fauna Series* 3 : *Fauna of West Bengal*, Part **3** : 277.

Diagnosis : Prodorsum broader than long; lamellae completely fused covering whole surface of prodorsum, lamellae covered with reticulation; rostral, lamellar and interlamellar setae absent; sensillus club-shaped, beset with black scales; notogaster with three thick dark brown lines having reticulation of different sizes; lenticulus oval-shaped; 10 pairs of minute, simple notogastral setae; 6 pairs of genital setae.

Material examined : West Sikkim : 1(female), Neyangthang, 22.ii.1990, from litter and soil, coll. A.K. Sanyal. North Sikkim : 1(female), Namprikdam, 30.v.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, North Sikkim), West Bengal.

Remark : The species is reported here for the first time from the state.

Family MICROZETIDAE Grandjean, 1936

29. Genus ***Berlesezetes*** Mahunka

1980. *Berlesezetes* Mahunka, *Acta zool. Hung.*, **26** (4) : 397.

34. ***Berlesezetes auxiliaris*** (Grandjean)

1936. *Microzetes auxiliaris* Grandjean, *Bull. Mus. Hist. Nat. Paris*, **8** (2) : 138.

1980. *Berlesezetes auxiliaris* (Grandjean) Mahunka, *Acta zool. Hung.*, **26** (4) : 397.

Diagnosis : Lamellae long, folded to a sharp angle along the paraxial crest, not reaching the tip of rostrum; well developed translamella; rostral setae long, fine, smooth; apex of cuspis with incision; lamellar setae not extending behond the tip of cuspis; interlamellar setae very long, stout, extended beyond the tip of rostrum, notogaster granulated.

Material examined : East Sikkim : 1female, Tsangulake, 26.v.1998, from litter and soil, coll. A.K. Sanyal. North Sikkim : 2female, Mangan, 31.v.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (East Sikkim, North Sikkim), Orissa, Tripura, West Bengal.

Remark : The species is reported for the first time from Sikkim.

Family AMERIDAE Grandijean, 1965

30. Genus ***Amerus*** Berlese

1896. *Amerus* Berlese, Acari, Myriopoda et Scorpiones hucusque in Italia reperta, 1-98.

35. ***Amerus speciosus*** Pearce

1906. *Amerus speciosus* Pearce, *Journ. Roy. Micr. Soc.*, 272.

Diagnosis : Body minutely granulated; rostral

setae long, curved, arise below the lamellae near their anterior end; lamellae start from sensillus and turn inwards then run parallel nearly the whole length of prodorsum; a curious long triangular mark on prodorsum; interlamellar setae arise from small apophyses, long, setiform; notogaster long, rounded posteriorly, with two rows of long, setiform, dorsal setae, and a similar sparse marginal row; chitinous projections at side of body between legs 1,2; 2,3; 3,4; the second much the largest; anal plates larger than genital plates; legs monodactyle.

Distribution : India : Sikkim (East Sikkim).

Remark : The species was described by Pearce (1906) from Sikkim.

Family HETEROBELBIDAE Balogh, 1961

31. Genus ***Heterobelba*** Berlese

1913. *Heterobelba* Berlese, *Redia,* **9** : 97.

36. ***Heterobelba rostrata*** Mondal and Kundu

1984. *Heterobelba rostrata* Mondal and Kundu, *Bull. zool. Surv. India,* **6** (1–3) : 223.

Diagnosis : Rostral setae stout, densely barbed, proximal part smooth; a faint transversely arched ridge behind rostrum; lamellar setae stout, barbed; interlamellar setae very long, barbed; sensillus flagelliform, barbed; notogastral setae 3 pairs at the posterior margin; tritonymphal scalp with polygonal reticulation; setae long, stout, barbed; ventral plate with 8 pairs of barbed setae; 7 pairs of genital setae, finely barbed; barbed epimeral setae.

Material examined : West Sikkim : 2 female, Rabong, 28.ii.1990, from litter and soil, coll. A.K. Sanyal. East Sikkim : 1 female Penlong, 27.v.1998, from soil, coll. A.K. Sanyal. North Sikkim: 2 female, Sintham, 31.v.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, North Sikkim), West Bengal.

Remark : This is the first report of the species from the state of Sikkim.

Family BASILOBELBIDAE Balogh, 1961

32. Genus ***Basilobelba*** Balogh

1958. *Basilobelba* Balogh, *Rev. Zool. Bot. Afr.,* **58** : 9.

37. ***Basilobelba barbata*** Mondal and Kundu

1984. *Basilobelba barbata* Mondal and Kundu, *Bull. Zool. Surv. India,* **6** (1–3) : 223.

Diagnosis : Rostral setae smooth, incurved; lamellar setae with long barbs at proximal 1/3rd; interlamellar setae with small unilateral barbs; tritonymphal scalp with polygonal reticulation; arms of the buckle long and broad; tritonymphal scalp with 7 pairs of bushy setae posteromarginally; genital setae 6 pairs, simple.

Material examined : West Sikkim : 2(female), Chakung, 3.iii.1990, from soil, coll. A.K. Sanyal. East Sikkim : 2(female), Rangpoo, 3.vi.1998, from liteer and soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), West Bengal.

Remark : The species is the first record from the state.

Family EREMAEIDAE Sellnick, 1928

33. Genus ***Eremaeus*** Koch

1836. *Eremaeus* Koch, *Deutsehlands crustaceen, Myriapoden und Arachniden,* **3** :

38. ***Eremaeus*** sp.

Material examined : East Sikkim : 2(female), Pongla, 4.vi.1998, from litter and soil, coll. A.K. Sanyal.

Remark : The specimens are identified upto generic level due to lack of literature. This is the first record of the genus from the state.

Family ZETORCHESTIDAE Michael, 1898

34. Genus ***Zetorchestes*** Berlese

1888. *Zetorchestes* Berlese, *Acari, Myriapoden et Scorpiones hucuesque in Italia reperta, Padova.*

39. ***Zetorchestes saltator*** Oudemans

1915. *Zetorchestes saltator* Oudemans, *Ber. Ned. Ent. Ver.,* **4** : 194.

Diagnosis : Rostral setae thick, long, bifurcated distally, placed on two small tubercles; setae phylliform, medium length, directed medially; sensillus long, head flattened in lateral view, distinctly barbed; 10 pairs of notogastral setae, phylliform; 6 pairs of genital setae.

Material examined : West Sikkim : 2(female), Uttery, 24.ii.1990, from litter and soil, coll. A.K. Sanyal. South Sikkim : 1(female), Rabongla, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, South Sikkim), Tripura, West Bengal.

Remark : This is the first record of the species from the state.

26. Family LIACARIDAE Sellnick, 1928

35. Genus ***Liacarus*** Michael

1898. *Liacarus* Michael, Das Tierreich : Oribatidae, **4** : 40.

40. ***Liacarus nigrescens*** Pearce

1906. *Liacarus nigrescens* Pearce, *Journ. Roy. Micr. Soc.*, 270.

Diagnosis : Black coloured large species; lamellae distinct, which blades on edge, widest apart posteriorly, narrower and closely approximate anteriorly, do not touch each other; lamellar cusps short, rounded; sensillus sessile.

Distribution : India : Sikkim (East Sikkim).

Remark : The species was described from Sikkim by Pearce (1906).

27. Family PELOPPIIDAE Balogh, 1943

36. Genus ***Ceratoppia*** Berlese

1908. *Ceratoppia* Berlese, *Redia*, **5** (1) : 7.

41. ***Ceratoppia bipilis*** Hermann

1804. *Ceratoppia bipilis* Hermann, *Memoire Apterologique.*

Diagnosis : Rostrum with 5–6 lateral teeth on each side; all prodorsal setae barbed; rostral setae relatively short; lamellar setae as long as rostral setae; sensillus filiform, finely barbed; notogastral setae P_1 and P_2 situated on the posterior part of notogaster, two pairs of hypostomal setae.

Material examined : North Sikkim : 3 female, Chungthung, 28.v.1998, from litter and soil, coll. A.K. Sanyal; 1 female, Sintham, 31.5.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (North Sikkim), Himachal Pradesh, Meghalaya, Tripura, West Bengal.

Remark : The species is recorded here for the first time from Sikkim.

Family GUSTAVIIDAE Oudemans, 1900

37. Genus ***Gustavia*** Kramer

42. ***Gustavia palmicinctus***

1906. *Gustavia Palmicinctus*, Pearce, *Journ. Roy. Micr. Soc.*, 269.

Remark : The species was recorded by Pearce (1906) from Sikkim.

Family NIPPOBODIDAE Aoki, 1961

38. Genus ***Leobodes*** Aoki

1965. *Leobodes* Aoki, *Nat. Life Southeast Asia*, **4** : 166.

43. ***Leobodes mirabilis*** Aoki

1965. *Leobodes mirabilis* Aoki, *Nat. Life Southeast Asia*, **4** : 167.

Diagnosis : Lamellae narrow, carina 'S'–shaped, rostral and lamellar setae 'S' – shaped; interlamellar setae stout, long; sensillus sickle-shaped; notogaster with one pair strong anterior hump; 9 pairs of notogastral setae, long; notogastral surface with one ridge; 4 pairs of genital setae.

Material examined : West Sikkim : 1(female), Jorthang, near nursery, 27.ii.1990, from humus, coll. A.K. Sanyal; 1(female), Gezzing P.W.D.R.H. campus, 11.ii.1990, from humus, coll. A.K.Sanyal.

Distribution : India : Sikkim (West Sikkim), West Bengal.

Remark : This is the first record of the species from the state.

Family TECTOCEPHEIDAE Grandjean, 1954

39. Genus ***Tectocepheus*** Berlese

1913. *Tectocepheus* Berlese, *Redia*, **9** : 91.

44. *Tectocepheus velatus* (Michael)

1888. *Tectocepheus velatus* (Michael), *Ray Soc.*, **65**.

Diagnosis : Rostrum trifid; lamellae large detached blades, extend beyond the lateral margin of the cephalothorax, median portion broad, cusps narrow or thick, reaching almost the tip of rostrum; translamella distinct; rostral and lamellar setae curved inward and barbed unilaterally, interlamellar setae minute, smooth inserted near the base of lamellae; sensillus long with slender stalk, head licheniform; dorsesejugal suture interrupted; paired *iad* large, placed parallel to the anterior part of the lateral side of anal field.

Material examined : West Sikkim : 1(female), Kaluk, 21.ii.1990, from decomposed litter, col. A.K. Sanyal. East Sikkim : 2(female), Gangtok, 22.v.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), Bihar, Himachal Pradesh, Meghalaya, Orissa, Tripura, West Bengal.

Family OTOCEPHEIDAE Balogh, 1961

Key to the genera of Otocepheidae

1(2) Pedotecta 2 + 3 conspicuously developed, axe-shaped in ventral view .... *Acrotocepheus* Aoki, 1965

2(1) Pedotecta 2 + 3 distinct but not so conspicuous, triangular in shape .... *Dolicheremaeus* Jacot, 1938

40. Genus *Acrotocepheus* Aoki

1965. *Acrotocepheus* Aoki, *Bull. natn. Sci. Mus., Tokyo,* 8(3) : 260

45. *Acrotocepheus* sp.

Material examined : West Sikkim : 4 female, Yongthang, 12.ii.1990, from litter, coll. A.K. Sanyal; 2 female, Soreng, 2.iii.1990, from litter, coll. A.K. Sanyal. East Sikkim : 2 female, Temi, 2.vi.1998, from humus, coll. A.K. Sanyal.

Remark : The specimens are identified upto generic level. The specific identification needs further studies.

41. Genus *Dolicheremaeus* Jacot

1938. *Dolicheremaeus* Jacot, *Florida Ent.*, **21** (4) : 51.

Key to the species of *Dolicheremaeus*

1(2) Interlamellar and notogastral setae simple ..... *coronarius* Chakrabarti, Bhaduri and Kundu, 1981

2(1) Interlamellar and notogastral setae finely barbed ..... *himalayensis* Chakrabarti, Bhaduri and Kundu, 1981

46. *Dolicheremaeus coronarius* Chakrabarti, Bhaduri and Kundu

1981. *Dolicheremaeus coronarius* Chakrabarti, Bhaduri and Kundu, *Mitt. Zool. Mus. Berlin,* **57** (1) : 15.

Diagnosis : Rostral setae barbed on outer side; lamellar setae unilaterally barbed on outer side; interlamellar setae simple; sensillus lanceolate; *co. pm.* and *co. nm.* overlaping; notogaster with two indistinct, irregular, double line ridges on outer two third portion; 10 pairs of notogastral setae; 4 pairs of genital setae.

Material examined : West Sikkim : 3(female), Legship, 13.ii.1990, from humus, coll. A.K. Sanyal; 2(female), Jodidara, Dentum, 20.ii.1990, from litter and soil, coll. A.K. Sanyal. East Sikkim : 2(female), Rangpoo, 3.vi.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), Meghalaya, West Bengal.

Remark : The species is reported for the first time from Sikkim.

47. *Dolicheremaeus himalayensis* Chakrabarti, Bhaduri and Kundu

1981. *Dolicheremaeus himalayensis* Chakrabarti, Bhaduri and Kundu, *Mitt. Zool. Mus. Berlin,* **57** (1) : 15.

Diagnosis : Rostral and lamellar setae unilaterally barbed on outerside; interlamellar setae bilaterally barbed; sensillus slender, lanceolate; 10 pairs of notogastral setae, bilaterally finely barbed; 4 pairs of genital setae.

Material examined : North Sikkim : 4(female),

Mangan, 31.v.1998, from litter and soil, coll. A.K.Sanyal. South Sikkim : 2(female), Rabangla, 1.vi.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (North Sikkim, South Sikkim), West Bengal.

Remark : The species is reported for the first time from Sikkim.

48. ***Dolicheremaeus*** sp.

Material examined : West Sikkim : 2(female), Sombare, 1.iii.1990, from litter and soil, coll. A.K. Sanyal. East Sikkim : 9(female), Rangpoo, 6.vi.1998, from humus, coll. A.K. Sanyal.

Remark : The specimens are interesting and need further studies.

Family OPPIIDAE Grandjean, 1954

Key to the genera of OPPIIDAE

1(2) 12 pairs of notogastral setae; sensillus pectinate ..... *Multioppia* Hammer, 1961

2(1) 10 pairs of notogastral setae; sensillus not pectinate ..... *Oppia* Koch, 1936

42. Genus ***Multioppia*** Hammer

1961. *Multioppia* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **13** (1) : 61.

49. ***Multioppia*** sp.

Material examined : East Sikkim : 2(female), Phensong, 23.v.1998, from litter and soil, coll. A.K. Sanyal. South Sikkim : 1(female), Namchi, 1.vi.1998, from humus, coll. A.K. Sanyal.

Remark : The specimens are expected to be new to science and need further studies.

43. Genus ***Oppia*** Koch

1836. *Oppia* Koch, *Deutschlands Crustaceen, Myriapoden und Arachniden*, 1–9.

Key to the species of *Oppia*

1(2) Interlamellar setae longer than rostral and lamellar setae; *ta* minutely barbed .... *orientalis* Sanyal and Bhaduri, 1985

2(1) Interlamellar setae not longer than other prodorsal setae; *ta* smooth .... *yodai* Aoki, 1965

50. ***Oppia orientalis*** Sanyal and Bhaduri

1985. *Oppia orientalis* Sanyal and Bhaduri, *Indian J. Acar.*, ***10*** (1&2) : 15.

Diagnosis : All prodorsal setae barbed; rostral and lamellar setae small; interlamellar setae long; sensillus lanceolate; notogaster foveolated; 11 pairs of notogastral setae, spine-like; *ta* finely barbed; anal setae smooth.

Material examined : West Sikkim : 2(female), Rabong, 28.ii.1990, from humus, coll. A.K. Sanyal; 2(female), Chakung, 3.iii.1990, from soil, coll. A.K. Sanyal. East Sikkim, 1(female), Pongla, 4.vi.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), West Bengal.

Remark : The species is new to the state.

51. ***Oppia Yodai*** Aoki

1965. *Oppia yodai* Aoki, *Nat. Life Southeast Asia*, **4** : 169.

Diagnosis : Finely feathered prodorsal setae; lamellar setae twice as long as their mutual distance; inter-lamellar setae directed backward; sensillus spindle-shaped, beset with fine bristles; one pointed protrusion behind the bothridium; 10 pairs of notogastral setae, finely serrated; 5 pairs of genital setae.

Material examined : West Sikkim : 2(female), Lower Gezzing, 17.ii.1990, from humus, coll. A.K. Sanyal; 1(female), Soreng, 2.iii.1990, from soil, coll. A.K. Sanyal. East Sikkim : 1(female), Ranipool, 25.v.1998, from humus, coll. A.K. Sanyal. South Sikkim : 2(female), Namchi, 2.vi.1998, from humus, coll. A.K. Sanyal; 2(female), Namchi, 2.vi.1998, from litter and soil, coll. A.K.Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, South Sikkim), Tripura, West Bengal.

Remark : The species is new to Sikkim.

52. ***Oppia*** sp.

Material examined : West Sikkim : 2(female), Pelling, 15.ii.1990, from humus, coll. A.K.Sanyal. East Sikkim : 1(female), Rumtek, 24.v.1998, from soil, coll. A.K. Sanyal.

Remark : The specimens are expected to be new to science and will be published later after further studies.

Family SUCTOBELBIDAE Grandjean, 1954

Key to the genera of SUCTOBELBIDAE

1(2) Sensillus flagellate, set with cilia .... *Flagrosuctobelba* Hammer; 1979

2(1) Sensillus not flagellate ....*Suctobelba* Paoli, 1908

44. Genus *Flagrosuctobelba* Hammer

1979. *Flagrosuctobelba* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **22** (9) : 37.

53. ***Flagrosuctobelba*** sp.

Material examined : East Sikkim : 2(female), Penlong, 27.v.1998, from humus, coll. A.K.Sanyal.

Remark : The specimens are not in a condition to determine the species.

45. Genus ***Suctobelba*** Paoli

1908. *Suctobelba* Paoli, *Redia*, **5** (1) : 72.

54. ***Suctobelba subcornigera*** Hammer

1958. *Suctobelba* subcornigera Forsslund, *Zool. Bidr. Uppsala*, **20** : 292.

Diagnosis : Rostrum with four teeth, teeth 1–3 very broad, teeth 4 small; centre of prodorsum with 5–10 tubercles; sensillus club-shaped, long, slender, pointed with fine setae on the outside; notogastral setae thin, smooth.

Material examined : East Sikkim : 3(female), Dunga, 5.vi.1998, from humus, coll. A.K.Sanyal.

Distribution : India : Sikkim (East Sikkim), West Bengal.

Remark : The species is reported for the first time from Sikkim.

Family CYMBAEREMAEIDAE Sellnick, 1928

46. Genus ***Cymbaeremaeus*** Berlese

1896. *Cymbaeremaeus* Berlese, Acari, Myriopoda et Scorpiones hucusque in Italia reperta, 1-98.

55. ***Cymbaeremaeus cymba*** Nicolet

1906. *Cymbaeremaeus cymba*, Pearce, *Journ. Roy. Micr. Soc.*, 270.

Remark : The species was recorded from Sikkim by Pearce (1906).

Family CHAUNOPROCTIDAE Balogh, 1961

47. Genus ***Chaunoproctus*** Pearce

1906. *Chaunoproctus* Pearce, *Journ. Roy. Micr. Soc.*, 271.

Key to the species of *Chaunoproctus*

1(4) Body pitted.

2(3) Lamella with long cusps; sensillus distally slightly enlarged.. *asperulus* Pearce, 1906

3(2) Lamella without cusp; sensillus clavate-shaped..... *cancellatus* Pearce, 1906

4(1) Body foveolated; notogastral setae exceptionally long..... ..... *longisetosus* Dhali and Bhaduri, 1980

56. ***Chaunoproctus asperulus*** Pearce

1906. *Chaunoproctus asperulus* Pearce, *Journ. Roy. Micr. Soc.* 271.

Diagnosis : Body rough, very slightly pitted; lamella broad, extending more than two-thirds of the length of cephalotherax, lamella with long cusps; sensillus long, almost rod-like, distally slightly enlarged, notogastral setae long.

Distribution : India : Sikkim (East Sikkim), West Bengal.

Remark : The species was first recorded from Baghghora (1800 m.), Sikkim by Pearce (1906).

57. ***Chaunoproctus cancellatus*** Pearce

1906. *Chaunoproctus cancellatus* Pearce, *Journ. Roy. Micr. Soc.*, 271.

Diagnosis : Body pitted or areolated; cephalothorax small in proportion; lamellae narrow bar, extending two-thirds of the length of the cephalofhorax; no lamellar cusp; lamellar setae long, fine; sensillus short with thin penduncle, head clavate-shaped; notogastral setae long.

Distribution : India : Sikkim (East Sikkim).

Remark : The species was first recorded from Baghghora, (1800 m), Sikkim by Pearce (1906).

58. ***Chaunoproctus longisetosus*** Dhali and Bhaduri

1980. *Chaunoproctus longisetosus* Dhali and Bhaduri, *Indian J. Acar.*, **5** : 53.

Diagnosis : Rostral setae placed laterally on apophyses, thin, set with minute setae; lamellae narrow, bar-like, joined by thin translamella; lamellar setae rough, slightly thicker than the rostral setae, curved inward and extend beyond the tip of rostrum; interlamellar setae barbed, slightly larger than lamellar setae; sensillus with club-shaped head and thin stalk directed outward; notogastral surface rough and foveolated; 10 pairs of notogastral setae, except *ta* which is short, all other setae exceptionally long, barbed; p_2 and p_3 shorter than p_1; five pairs of small area porosae present on notogaster; 6 pairs of genital setae.

Material examined : West Sikkim : 2(female), Gezzing, 11.ii.1990, from litter and soil, coll. A.K. Sanyal; 1(female), Uttery, 24.ii.1990, from humus, coll. A.K. Sanyal. East Sikkim : 2(female), Chungthung, 28.v.1998, from humus, coll. A.K. Sanyal. South Sikkim : 2(female), Namchi, 2.vi.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, South Sikkim, North Sikkim), Tripura.

Remark : The species was first described by Dhali and Bhaduri from Namchi and Mongan, Sikkim in 1980.

59. ***Chaunoproctus*** sp.

Material examined : East Sikkim : 3(female) : Rangpoo, 3.vi.1998, from decomposed litter, coll. A.K. Sanyal.

Remark : The specimens are interesting and need further studies for species identification.

Family PROTORIBATIDAE J. Balogh and P. Balogh, 1984

48. Genus ***Liebstadia*** OUDEMANS

1906. *Liebstadia* Oudemans, *Ber. Ned. Ent. Ver.*, **2**, 101.

60. ***Liebstadia similis*** Michael

1906. *Liebstadia similis*, Pearce, *Journ. Roy. Micr. Soc.*, 270.

Remark : The species was recorded from Sikkim by Pearce (1906).

Family ORIBATULIDAE Thor, 1929

Key to the genera of ORIBATULIDAE

1(2) Prodorsum with translamellar line .... *Lucoppia* Berlese, 1908

2(1) Prodorsum without translamellar line ....*Oribatula* Berlese, 1896

49. Genus ***Lucoppia*** Berlese

1908. *Lucoppia* Berlese, *Redia*, **5** : 8.

61. ***Lucoppia alata*** var. ***major***

1906. *Lucoppia (=Oribata) alata* var. *major*, Pearce, *Journ. Roy. Micr. Soc.*, 269.

Remark : The species was recorded by Pearce (1906) from Sikkim.

62. ***Lucoppia fallax*** Pearce

1906. *Lucoppia (=Oribata) fallax* Pearce, *Journ. Roy. Micr. Soc.*, 270.

Diagnosis : Prodorsum blunt; body yellowish-brown, smooth; lamellae narrow blades on edge, no cusps, no translamella; notogaster broadly piriform, rounded posteriorly, without setae; pteromorph almost obsolete; sensillus short with thin peduncles, head globular; legs tridactylous.

Distribution : India : Sikkim (East Sikkim).

63. ***Lucoppia oralis*** Nicolet

1906. *Lucoppia (=oribata) oralis*, Pearce, *Journ. Roy. Micr. Soc.*, 269.

Remark : The species was recorded by Pearce (1906) from Sikkim.

50. Genus ***Oribatula*** Berlese

1896. *Oribatula* Berlese, Acari, Myriopoda et Scorpiones hucusque in Italia reperta, 1-98.

64. ***Oribatula tibialis*** (Nicolet)

1906. *Oribatula (=Notaspis) tibialis*, Pearce, *Journ. Roy. Micr. Soc.*, 270.

Remark : The species was first recorded from Sikkim by Pearce (1906).

Family SCHELORIBATIDAE Grandjean, 1953

51. Genus ***Scheloribates*** Berlese

1908. *Scheloribates* Berlese, *Redia*, **5** : 2.

Key to the species of *Scheloribates*

1(2) All tarsi monodactylous; apodemata III and IV meet each other and abutting anterior rim of genital capsule.....

.....*natalensis* Pletzen, 1963

2(1) All tarsi tridactylous; apodemata III and IV never meet each other

3(8) Hysterosoma as broad as long

4(5) Rostral and interlamellar setae as long as their mutual distance; sensillus with lanceolate heads with pointed tips.....

..... *rectus* Hammer,1958

5(4) Rostral and interlamellar setae one and half times longer than their mutual distance; sensillus not with lanceolate head

6(7) Lamellar setae thiner than rostral setae; sensillus with short stalk and disc-shaped head, directed forward.....

..... *albialatus* Hammer,1961

7(6) Lamellar setae is thick as rostral setae; sensillus with long slender stalk and spear-shaped head, directed outwards and backwards... *huancayensis* Hammer, 1961

8(3) Hysterosoma longer than broad; sensillus with lanceolate head .....

..... *thermophilus* Hammer, 1961

65. ***Scheloribates albialatus*** Hammer

1961. *Scheloribates albialatus* Hammer, *Biol. Skr. Dan. Vad. Selsk.*, **13** (1) : 94.

Diagnosis : Rostral and lamellar setae barbed; interlamellar setae smooth; sensillus with short, round, disc-shaped head set with fine scales; no setae on notogaster; chitinous pores on notogaster; 4 pairs of genital setae.

Material examined : East Sikkim : 4(female), Ranipool, 25.v.1998, from humus, coll. A.K. Sanyal; 3(female), Penlong, 27.v.1998, from humus, coll. A.K. Sanyal. North Sikkim : 4(female), Lachung, 29.v.1998, from litter and soil, coll. A.K.Sanyal; 2(female), Sintham, 31.v.1998, from humus, coll. A.K. Sanyal. South Sikkim : 3(female), Temi, 2.vi.1998, from litter and soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (East Sikkim, North Sikkim, South Sikkim), West Bengal.

Remark : The species is reported for the first time from Sikkim.

66. ***Scheloribates huancayensis*** Hammer

1961. *Scheloribates huancayensis* Hammer, *Biol. Skr. Dan. Viel. Selsk.*, **13** (1) : 94.

Diagnosis : Prodorsal setae long, distinctly feathered, about one and half times longer than their mutual distance; sensillus very slender, with narrowly spear-shaped head, pointed at the tip, set with short bristles in four longitudinal rows; notogastral setae absent, instead chitinous pores present.

Material examined : West Sikkim : 3(female), Yangthang, 12.ii.1990, from decomposed litter, coll. A.K. Sanyal. East Sikkim: 2(female), Rangpoo, 3.vi.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), Assam, Tripura, West Bengal.

Remark : This is the first record of the species from the state.

67. ***Scheloribates natalensis*** Pletzon

1963. *Scheloribates natalensis* Pletzen, *Acarologia*, **5** (4) : 700.

Diagnosis : Prodorsal setae short, fine; lamellar and dorsal setae barbed throughout; distal halves of interlamellar setae unilaterally barbed; sensillus very long, with slightly thickened heads, unilaterally barbed on the anterior side; notogastral setae minute; ad_3 very small; genital setae 5 pairs; monodactylous tarsi.

Material examined : North Sikkim : 4(female), Namprikdam, 30.v.1998, from litter and soil, coll. A.K. Sanyal. South Sikkim : 2(female), Rabangla, 1.vi.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (North Sikkim, South Sikkim), West Bengal.

Remark : The species is reported for the first time from Sikkim.

68. ***Scheloribates rectus*** Hammer

1958. *Scheloribates rectus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **10**(1) : 77.

Diagnosis : All prodorsal setae finely barbed; lamellar and interlamellar setae not much longer than lamellae; sensillus with lanceolate head, pointed at tip and anterior margin set with fine setae; notogastral setae not discernible except at the posterior end of notogaster; all tarsi with 3 claws.

Material examined : East Sikkim : 4(female), Rangpoo, 6.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (East Sikkim), Tripura, West Bengal.

Remark : The species is reported for the first time from the state.

69. ***Scheloribates saswatii*** Dhali and Bhaduri

1980. *Scheloribates saswatii* Dhali and Bhaduri, *Indian J. Acar.*, **5** : 52

Diagnosis : Prodorsum broad at the base; all prodorsal setae barbed; lamellar setae extend beyond the tip of rostrum; interlamellar setae equal to the length of lamellar setae; faint interlamellar line present; sensillus with club-shaped head backwardly directed, reaches beyond the lateral margin of pteromorph, dorsosejugal suture arched; 10 pairs of notogastral setae except postero-lateral setae all represented by alveoli; light spots of glandular tissues present along the lateral border of notogaster; fissures *ia, im* and *ip* found on dorsal side; 4 pairs of genital setae; distance between aggenital setae greater than width of genital plate; legs tridactylous.

Material examined : West Sikkim : 2(female), Kaluk, 21.ii.1990, from humus, coll. A.K. Sanyal. East Sikkim : 4(female), Gangtok, 22.v.1998, from litter and soil, coll. A.K. Sanyal. North Sikkim : 2(female), Mangan, 31.v.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, North Sikkim), Tripura.

70. ***Scheloribates sikkimensis*** Dhali and Bhaduri

1980. *Scheloribates sikkimensis* Dhali and Bhaduri, *Indian J. Acar.*, **5** : 50.

Diagnosis : Prodorsum broad at the base; rostral setae placed on apophyses, mintely barbed, lamellar and interlamellar setae long, barbed; sensillus with lanceolate head; anterior margin of pteromorph concave; 10 pairs of nogotastral setae represented by their alveoli except thin and small P_1–P_3; fissure *ia, im* and *ip* visible in dorsal view; genital setae 4 pairs; legs tridactylous.

Material examined : South Sikkim : 4(female), Namchi, 2.vi.1998, from litter and soil, coll. A.K. Sanyal. East Sikkim; 4(female), Rangpoo, 6.vi.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (South Sikkim, East Sikkim), Tripura.

Remark : The species was described from Sikkim by Dhali and Bhaduri (1980).

71. ***Scheloribates thermophilus*** Hammer

1961. *Scheloribates thermophilus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **13** (1) : 95.

Diagnosis : All prodorsal setae barbed; rostral setae about twice as long as their mutual distance; lamellar setae thick; unusually short, slightly longer than their mutual distance, interlamellar setae thick; sensillus slender with lanceolate head; notogastral setae minute; all tarsi tridactylous.

Material examined : West Sikkim : 3(female), Gezzing, 11.ii.1990, from litter and soil, coll. A.K. Sanyal. North Sikkim : 2(female), Chungthang, 28.v.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, North Sikkim), Meghalaya, West Bengal.

Remark : The species is reported for the first time from the state.

Family HAPLOZETIDAE Grandjean, 1936

Key to the genera of HAPLOZETIDAE

1(2) Legs monodactylous; 6 pairs of notogastral setae; dorsosejugal suture with three arches ..... *Rostrozetes* Sellnick, 1925

2(1) Legs tridactylous; 10 or 14 pairs of notogastral setae, dorsosejugal suture one arched.

3(4) 10 pairs of notogastral setae present .... *Haplozetes* Willmann, 1935

4(3) 14 pairs of notogastral setae present .... *Peloribates* Berlese, 1908

52. Genus ***Haplozetes*** Willmann

1935. *Haplozetes* Willmann, *Zool. Jahrb., Syst.*, **66** : 333.

72. ***Haplozetes*** sp.

Material examined : South Sikkim : 3(female), Namchi, 1.vi.1998, from humus, coll. A.K. Sanyal. East Sikkim : 2(female), Dungh, 5.vi.1998, from litter and soil, coll. A.K. Sanyal.

Remark : The specimens are damaged and not in a position to identify upto species level.

53. Genus ***Peloribates*** Berlese

1908. *Peloribates* Berlese, *Redia*, **5** : 3.

73. ***Peloribates intermedius*** Mondal

1984. *Peloribates intermedius* Mondal, *Rec. zool. Surv. India*, **81** (3–4) : 153.

Diagnosis : Rostral and lamellar setae unilaterally barbed outside; interlamellar setae short, beset with minute bristles; sensillus with club-shaped head set with pseudoscales; 14 pairs of notogastral setae, short, stiff, setose; 5 pairs of genital setae.

Material examined : East Sikkim : 3(female), Rumtek, 24.v.1998, from litter and soil, coll. A.K. Sanyal; 2(female), Rangpoo, 6.vi.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (East Sikkim), West Bengal.

Remark : The species is recorded for the first time from Sikkim.

54. Genus ***Rostrozetes*** Sellnick

1925. *Rostrozetes* Sellnick, *Suppl. Ent. Berlin*, **11** : 84.

74. ***Rostrozetes foveolatus*** Sellnick

1925. *Rostrozetes foveolatus* Sellnick, *Suppl. Ent. Berlin*, **11** : 84.

Diagnosis : Foveolated body; all prodorsal setae long, thin, unilaterally finely barbed; head of sensillus swollen brush-like, 10 pairs of notogastral setae, minute; distance between t_1 – *ms* and *ms* – h_3 almost same; 5 pairs of minute genital setae.

Material examined : West Sikkim : 2(female), Khechepuri, 16.ii.1990, from litter and soil, coll. A.K. Sanyal. East Sikkim : 1(female), Ranipool, 25.v.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), Bihar, Meghalaya, Tripura, West Bengal.

Remark : This is the first record of the species from Sikkim.

Family XYLOBATIDAE J.Balogh and P. Balogh, 1984

Key to the genera of XYLOBATIDAE

1(2) 14 pairs of notogastral setae ..... *Setoxylobates* Balogh and Mahunka, 1967

2(1) 10 pairs of notogastral setae .... *Xylobates* Jacot, 1929

55. Genus ***Setoxylobates*** Balogh and Mahunka

1967. *Setoxylobates* Balogh and Mahunka, *Acta Zool. Acad. Sci. Hung.*, **23** (1–2) : 59.

75. ***Setoxylobates foveolatus*** Balogh and Mahunka

1967. *Setoxylobates foveolatus* Balogh and Mahunka, *Acta Zool. Acad. Sci. Hung.*, **23** (1–2) : 59.

Diagnosis : Body foveolated; the whole rostral and interlamellar setae and apical half of lamellar setae weakly barbed; sensillus reclinate, apically fusiform, unilaterally barbed; 4 pairs of areae porosae; notogastral setae 14 pairs, minute; genital setae 5 pairs; epimeral setal formula 3-1-2-2.

Material examined : North Sikkim : 3 female, Mangan, 31.v.1998, from decomposed leaf litter, coll. A.K. Sanyal; 2 female, Sintham, 31.v.1998, from decomposed leaf litter, coll. A.K. Sanyal. South Sikkim : 2 female, Namchi, 2.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (North Sikkim, South Sikkim), Tripura, West Bengal.

Remark : The species is reported for the first time from the state.

56. Genus ***Xylobates*** Jacot

1929. *Xylobates* Jacot, *Trans. Amer. Micr. Soc. Menasha*, **48** : 429.

76. ***Xylobates seminudus*** Hammer

1971. *Xylobates seminudus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **16** (6) : 38.

Diagnosis : Unilaterally barbed rostral setae; lamellar and interlamellar setae also barbed; sensillus with long stalk and lanceolate head, beset with long bristles on outer border; 10 pairs of notogastral setae represented by pores on dorsum; 5 pairs of genital setae.

Material examined : West Sikkim : 4(female), Legship, 13.ii.1990, from decomposed leaf-litter, coll. A.K. Sanyal; 2(female), Rabong, 28.ii.1990, from soil, coll. A.K. Sanyal. North Sikkim : 2(female), Sintham, 31.v.1998, from litter and soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, North Sikkim), Meghalaya, Tripura, West Bengal.

Remark : The species is recorded for the first time from the state.

Family CERATOZETIDAE Jacot, 1925

Key to the genera of CERATOZETIDAE

1(2) Sensillus setiform, lanceolate, or slightly fusiform; legs monodactylous .... *Ceratozetes* Berlese, 1908

2(1) Sensillus fusiform or club-shaped; legs tridactylous .....*Hypozetes* Balogh, 1959

57. Genus ***Ceratozetes*** Berlese

1908. *Ceratozetes* Berlese, *Redia*, **5** : 4.

77. ***Ceratozetes gracilis*** Michael

1884. *Ceratozetes gracilis* Michael, *Ray. Soc.*, **61** : 225.

Diagnosis : Rostral setae long, stout, unilaterally finely barbed; lamellae long; no translamella; lamellar setae stiff, slightly rough; interlamellar setae long, stout, unilaterally barbed; sensillus long, slender, head swollen with fine setae; notogastral setae represented by pores; 6 pairs of genital setae.

Material examined : West Sikkim : 2(female), Songfu, 23.ii.1990, from humus, coll. A.K. Sanyal. East Sikkim : 2(female), Dunga, 5.vi.1998, from litter and soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim), West Bengal.

Remark : This is the first record of the species from the state.

58. Genus ***Hypozetes*** Balogh

1959.*Hypozetes* Balogh, *Acta Zool. Acad. Sci. Hung.*, **5** : 15.

78. ***Hypozetes*** sp.

Material examined : East Sikkim : 2(female), Gangtok, 22.v.1998, from humus, coll. A.K. Sanyal.

Remark : The specimens are interesting and need further studies.

Family MOCHLOZETIDAE Grandjean, 1960

59. Genus ***Unguizetes*** Sellnick

1925. *Unguizetes* Sellnick, *Treubia*, **6** : 473.

79. *Unguizetes clavatus* Aoki

1967. *Unguizetes clavatus* Aoki, *Nat. Life Southeast Asia,* **5** : 195.

Diagnosis : Lateral side of rostrum with crest; translamella carries a projection in the middle and one crest behind; prodorsal setae rough; sensillus clavate-shaped with few fine bristles on the head; 4 pairs of areae porosae; notogastral setae represented by 7 pairs of alveoli, 6 pairs of genital setae.

Material examined : West Sikkim : 3(female), Dentum, 19.ii.1990, from soil, coll. A.K. Sanyal; 3(female), Uttery, 24.ii.1990, from humus, coll. A.K. Sanyal. North Sikkim : 3(female), Mangan, 31.v.1998, from humus, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, North Sikkim), Meghalaya, Tripura, West Bengal.

Remark : The species is reported for the first time from the state.

Family AUSTRACHIPTERIIDAE Luxton, 1985

Key to the genera of ORIBATELLIDAE

1(2) Interlamellar area large; lamellae with free tips; one pair of anal and one pair of adanal setae ..... *Paralamellobates* Bhaduri and Raychaudhuri, 1968

2(1) Interlamellar area small, lamellae without free tips; two pairs of anal and 2 pairs of adanal setae .... *Lamellobates* Hammer, 1968

60. Genus *Lamellobates* Hammer

1958. *Lamellobates* Hammer, *Biol. Skr. Dan. Vid. Selsk.,* **10** (1) : 100

80. *Lamellobates palustris* Hammer

1958. *Lamellobates palustris* Hammer, *Biol. Skr. Dan. Vid. Selsk.,* **10** (1) : 100.

Diagnosis : Rostrum pointed with concave sides; rostral setae very long reaching far beyond the tip of rostrum, unilaterally feathered; inner cuspides of lamellae convexly rounded, outer lamellar cuspides extremely long and narrow; lamellar setae situated a short distance behind anterior border nearest to median side; interlamellar setae situated where lamellae and anterior border of hysterosoma meet, very long, rough, tip reaches beyond lamellar setae; sensillus spatulate, heavily barbed; 9 pairs of notogastral setae; 6 pairs of genital setae.

Material examined : West Sikkim : 2(female), Pelling, 15.ii.1990, from litter and soil, coll. A.K. Sanyal; 2(female), Rabong, 28.ii.1990, from humus, coll. A.K. Sanyal. East Sikkim, 1(female), Ranipool, 25.v.1998, from decomposed wood litter, coll. A.K. Sanyal. South Sikkim : 2(female), Namchi, 2.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, South Sikkim), Bihar, Meghalaya, Tripura, West Bengal.

Remark : This is the first record of the species from the state.

61. Genus *Paralamellobates* Bhaduri and Raychaudhuri

1968. *Paralamellobates* Bhaduri and Raychaudhuri, *Oriental Ins.,* **2** (2) : 197.

81. *Paralamellobates bengalensis* Bhaduri and Raychaudhuri

1968. *Paralamellobates bengalensis* Bhaduri and Raychaudhuri, *Oriental Ins.,* **2** (2) : 197.

1980. *Paralamellobates bengalensis*, Dhali and Bhaduri, *Indian J. Acar,* **5** : 50.

Diagnosis : The lamellar cuspis, prodorsal and notogastral setae and sensillus similar to *Lamellobates palustris.* The main diagnostic feature of *P. bengalensis* is presence of one pair of anal setae.

Material examined : North Sikkim : 2(female), Sintham, 31.v.1998, from litter and soil, coll. A.K. Sanyal. South Sikkim : 1(female), Rabangla, 1.vi.1998, from soil, coll. A. K. Sanyal.

Distribution : India : Sikkim (North Sikkim, South Sikkim), Meghalaya, Tripura, West Bengal.

Remark : The species was recorded by Dhali and Bhaduri (1980) from North Sikkim.

Family PHENOPELOPIDAE Petrunkevitch, 1955

62. Genus ***Eupelops*** Ewing

1917. *Eupelops* Ewing, *Ann. Ent. Soc. Amer.*, **10** : 126.

Key to the species of *Eupelops*

1(2) Sensillus laceolate; notogastral setae with thick distal part; lenticulus large .... *acromis* (Hermann, 1804)

2(1) Sensillus with club-shaped head; notogastral setae long, equally thick throughout, lenticulus small ..... *longisetosus* Chakrabarti and Mondal, 1981

82. ***Eupelops acromis*** (Hermann)

1906. *Eupelops (=Pelops) acromis*, Pearce, *Journ. Roy. Micr. Soc.*, 269.

Remark : The species was reported from Sikkim by Pearce (1906)

83. ***Eupelops longisetosus*** Chakrabarti and Mondal

1981. *Eupelops longisetosus* Chakrabarti and Mondal, *Sci. & Cult.*, **47** (5) : 181.

Diagnosis : Lamellar setae finely barbed bilaterally; interlamellar setae phylliform; interspace between lamellar cusps 'U' – shaped; sensillus with club-shaped head, beset with fine setae; 10 pairs of notogastral setae, long, bilaterally barbed; lenticulus small; 6 pairs of genital setae.

Material examined : East Sikkim : 2(female), Gangtok, 22.v.1998, from humus, coll. A.K. Sanyal; 1(female), Rangpoo, 6.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (East Sikkim), West Bengal.

Remark : The species is reported for the first time from the state.

Family GALUMNIDAE Jacot, 1925

63. Genus ***Galumna*** von Heyden

1826. *Galumna* von Heyden, *Isis Oken*, **18** : 611.

Key to the species of *Galumna*

1(2) Sensillus with club-shaped head; *im* curved and directed anteroposteriorly; a crenate line runs across the hypostome; gen_1 and gen_2 placed on the anterior border of genital plate ..... *crenata* Deb and Raychaudhuri, 1975

2(1) Sensillus with long broad head, *im* straight and placed obliquely, no crenate line; gen_1 – gen_2 placed on the anterior border of left part of genital plates ....*flabellifera orientalis* Aoki, 1965

84. ***Galumna crenata*** Deb and Raychaudhuri

1975. *Galumna crenata* Deb and Raychaudhuri, *Annot. Zool. Japan*, **48** (3) : 167.

Diagnosis : Rostral setae not found; lamellar and interlamellar setae represented by pits; sensillus club-shaped with short but stout bristles; *Ad* gattiform, provided with comma-like slit on the inner end; *hy* leaf-like; *Aa* placed obliquely; *im* slightly curved, directed anteroposteriorly; notogastral setae represented by 10 pairs of pits; a crenate line runs across the hypostome; 6 pairs of genital setae.

Material examined : West Sikkim : 4(female), Dentum, 19.ii.1990, from decomposed cow-dung and soil, coll. A.K. Sanyal; 4(female), Soreng, 2.iii.1990, from soil, coll. A. K. Sanyal. East Sikkim : 2(female), Rumtek, 24.v.1998, from soil, coll. A.K. Sanyal. South Sikkim : 2(female), Rabangla, 1.vi.1998, from soil, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, South Sikkim), Meghalaya, West Bengal.

Remark : The species is reported for the first time from the state.

85. ***Galumna flabellifera orientalis*** Aoki

1965. *Galumna flabellifera orientalis* Aoki, *Nat. Life Southeast Asia*, **4** : 187.

Diagnosis : Rostral and interlamellar setae thin, short, lanellar setae very minute; sensillus with long broad head, anterior margin round and beset with spur-like bristles, posterior margin flat, without britles; *ia* placed obliquely to the longitudinal axis of the body; areae porosae large; gen_1 – gen_3 placed on the anterior border of left genital plate.

Material examined : West Sikkim : 3(female), Gezzing, 11.ii.1990, from humus, coll. A.K. Sanyal; 2(female), Kaluk, 21.ii.1990, from soil, coll. A.K. Sanyal. East Sikkim; 3(female), Ranipool, 25.v.1998, from litter and soil, coll. A.K. Sanyal. North Sikkim : 3(female), Mangan, 31.v.1998, from decomposed leaf-litter, coll. A.K. Sanyal.

Distribution : India : Sikkim (West Sikkim, East Sikkim, North Sikkim), Kerala, West Bengal.

Remark : This is the first record of the species from the state.

DISCUSSION

It is observed that Pearce (1906) first studied the oribatid fauna of Sikkim. Later Dhali, Bhaduri and Raychaudhuri (1980) studied this group of mites of Sikkim. Till then during the last 20 years no further attempt was made. The present work is an overall assessment of oribatid fauna of Sikkim which shows that only 22 species under 16 genera and 15 families were known before the present work was started. The paper includes 85 species under 63 genera and 45 families. Of these 64 species, 53 genera and 33 families are reported here the first time from Sikkim.

The analysis of the present account shows that 20% of Indian oribatid fauna are known from the state.

It is also noted that the 14 genera and 18 species are recorded as endemic to the state.

SUMMARY

The paper deals with the oribatid fauna collected from Sikkim. Altogether 85 species of oribatid mites belonging to 63 genera and 45 families have been recorded. Before undertaking the present work only 22 species under 16 genera and 15 families were known from the state. The work records 64 species, 53 genera and 33 families as the first record from Sikkim. Keys to identification of families, genera and species are dealt in the paper. The important references, diagnostic features and distribution in India for each species have also been incorporated.

ACKNOWLEDGEMENTS

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Table 1. Distribution of Oribatid species in different district of Sikkim

Name of the species	East district	West district	North district	South district
Phyllozetes emmae	+	–	–	–
Haplochthonius simplex	+	+	+	–
Brachychthonius cricoides	+	–	+	–
Apoplophora pantotrema	+	–	–	–
Atropacarus (Hoplophorella) africana	+	+	–	–
A. (H.) scapellatus	+	+	–	–
A. (H.) singularis	+	+	+	–
Hoplophthiracarus pakistanensis	+	–	–	+
H. punctatus	–	+	–	–
Phthiracarus claviger	+	–	–	–
Steganacarus stilifer	–	+	–	–
Rhysotritia ardua ardua	–	+	–	+
R. a. var. otaheitensis	+	+	–	+

Name of the species	East district	West district	North district	South district
Haplacarus foliatus	–	+	+	+
Paulianacarus foliatus	+	+	–	–
Nothrus monticola	+	–	+	+
Sigmonothrus ovatus	–	+	–	–
Heminothrus (Platynothrus) thori	+	+	–	–
Allonothrus russeolus	–	+	–	+
Archegozetes longisetosus	+	+	+	–
Liodes ocellatus	+	–	–	–
Allodamaeus adpressus	–	+	+	–
Metabelba sp.	–	+	–	–
Ommatocepheus ocellatus	+	–	–	–
Microtegeus reticulatus	–	+	–	–
Eremaeozetes himalayensis	–	+	+	–
Berlesezetes auxiliaris	+	–	+	–
Amerus speciosus	+	–	–	–
Heterobelba rostrata	+	+	+	–
Basilobelba barbata	+	+	–	–
Eremaeus sp.	+	–	–	–
Zetorchestes saltator	–	+	–	+
Liacarus nigrescens	+	–	–	–
Ceratoppia bipilis	–	–	+	–
Gustavia palmicinctus	+	–	–	–
Leobodes mirabilis	–	+	–	–
Tectocepheus velatus	+	+	–	–
Acrotocepheus sp.	+	+	–	–
Dolicheremaeus coronarius	+	+	–	–
D. himalayensis	–	–	+	+
Dolicheremaeus sp.	+	+	–	–
Multioppia sp.	+	–	–	+
Oppia orientalis	+	+	–	–
O. yodai	+	+	–	+
Oppia sp.	+	+	–	–
Flagrosuctobelba sp.	+	–	–	–
Suctobelba subcornigera	+	–	–	–
Cymbaeremaeus cymba	+	–	–	–
Chaunoproctus asperulus	+	–	–	–
C. cancellatus	+	–	–	–
Chaunoproctus longisetosus	+	+	+	+
Chaunoproctus sp.	+	–	–	–
Liebstadia similis	+	–	–	–
Lucoppia alata var. *major*	+	–	–	–
L. fallax	+	–	–	–
L. oralis	+	–	–	–
Oribatula tibialis	+	–	–	–

Name of the species	East district	West district	North district	South district
Scheloribates albialatus	+	–	+	+
S. huancayensis	+	+	–	–
S. natalensis	–	–	+	+
S. rectus	+	–	–	–
S. saswatii	+	+	+	–
S. sikkimensis	+	–	–	+
S. thermophilus	–	+	+	–
Haplozetes sp.	+	–	–	+
Peloribates intermedius	+	–	–	–
Rostrozetes foveolatus	+	+	–	–
Setoxylobates foveolatus	–	–	+	+
Xylobates seminudus	–	+	+	–
Ceratozetes gracilis	+	+	–	–
Hypozetes sp.	+	–	–	–
Unguizetes clavatus	–	+	+	–
Eupelops acromis	+	–	–	–
E. longisetosus	+	–	–	–
Lamellobates palustris	+	+	–	+
Paralamellobates bengalensis	–	–	+	+
Galumna crenata	+	+	–	+
G. flabellifera orientalis	+	+	+	–

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ARANEAE : SPIDERS

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INTRODUCTION

The spider fauna of Sikkim was earlier known through the work of Tikader (1970) who worked out this group collected mainly from East and West Sikkim and reported 67 species belonging to the families Homalonychidae, Uloboridae, Lyssomanidae, Salticidae, Thomisidae, Hahniidae, Oxyopidae, Theridiidae, Agelenidae, Lycosidae, Pisauridae, Araneidae and Linyphiidae. The present paper is based upon the specimens collected from different parts of Sikkim and present in the Zoological Survey of India collection. Altogether, a total of 91 species belonging to 48 genera under 19 families are dealt with here, of these, 17 species under 13 genera and 9 families form new records for the state. The entire material is deposited in the National Collection of the Zoological Survey of India, Calcutta.

Family HOMALONYCHIDAE Simon

1. Genus ***Homalonychus*** Marx

1891. *Homalonychus* Marx, *Proceed. Ent. Soc.*, Wash., **2**(1) : 2.

1895. *Homalonychus* : Simon, *Hist. Nat. Araignees*, **1** : 413.

1940. *Homalonychus* : Comstock, *The Spider Book, New York*, : 338.

1980. *Homalonychus* : Kaston, *How to know spiders*, : 209.

Diagnosis : Cephalothorax longer than wide, two rows of eyes; the anterier row of eyes recurved and closed to each other. The posterior row strongly recurved and much wider than the anterior row. Tarsal claws two, similar and smooth, completely lacking denticles. The tarsi provided with a brush of tenent hair and a pair of spurious claws.

Type-species : *Homalonychus selenopoides* Marx.

Distribution: India, America.

1. ***Homalonychus joyaus*** Tikader

1970. *Homalonychus joyaus* Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 6.

Diagnosis : Cephalothorax and abdomen black, legs brownish in front, mid-orsal provided with a broad longitudinal brown patch; lateral margins of thorax also provided with longitudinal brown patch. Eyes are dark. Clypeus is high. First and second pair of legs are longer than third and fourth. Abdomen is longer than wide, clothed with thick hair. Male is similar colour like female.

Distribution : India : Sikkim (Dist. West Sikkim); type locality only.

Family THERAPHOSIDAE Thorell

2. Genus ***Plesiophrictus*** Pocock

1899. *Plesiophrictus* Pocock, *J. Bombay nat. Hist. Soc.*, : 749.

1990. *Plesiophrictus* : Pocock, *Fauna Brit. India, Arachn.* : 181.

1978. *Plesiophrictus* : Tikader, *J. Bombay nat. Hist. Soc.*, **74**(2) : 314.

Diagnosis : Cephalothorax black, legs and abdomen are deep brown. Eyes of anterior row slightly procurved. Sternum with marginal sigilla. Legs are entire or scarcely divided, third and fourth divided by band of setae. Tibia of anterior leg in male with a strong spur.

Type-species : *Plesiophrictus millardi* Pocock

Distribution : South and West India, Sri Lanka.

2. ***Plesiophrictus meghalayaensis*** Tikader

1978. *Plesiophrictus meghalayaensis* Tikader, *J. Bombay nat. Hist. Soc.*, **74**(2) : 314.

Diagnosis : Cephalothorax longer than wide, low and nearly elliptical in shape, clothed with fine hair. Eyes are eight, pale in colour, situated in a group on a slightly elevated tubercle. Anterior eyes are slightly procurved and lateral eyes larger than the medians; posterior row nearly straight or slightly recurved. Chelicera strong, clothed with thick hair and rostellum absent. Inner margin of Maxillae provided with thick pale scopulae and base provided with small black tooth-like tubercles. Sternum nearly round, clothed with spine-like hair. Abdomen longer than wide, clothed with fine hair. Dorsum of the abdomen provided with five pairs of inconspicuous longitudinal pale patches.

Material examined : 1**F**, Namchi, Dist. South Sikkim, Sikkim, 12.v.1995, coll. *P.H.Roy & party.*

Distribution : India : Sikkim, Dist. South Sikkim (New record); Meghalaya.

Family ULOBORIDAE Thorell

3. Genus ***Uloborus*** Latreille

1806. *Uloborus* Latreille, *Gen. Crust. Ins. etc.*, **1** : 109.

1981. *Uloborus* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 15.

Diagnosis : Anal tubercle prominent in the female, diminished in male. Legs of first pair much longer and stronger than the rest. Male tibiae of first with six to seven dorsal spines, almost in the form of teeth.

Type-species : *Uloborus walckenaerius* Latreille

Distribution : Cosmopolitan except Australia.

3. ***Uloborus krishnae*** Tikader

1970. *Uloborus krishnae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 5.

1992. *Uloborus krishnae* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 379.

Diagnosis : Cephalothorax and abdomen deep-brown to black, legs are brownish-green in colour. Cephalic region is slightly high. Eyes are pearly white, both rows recurved. Sternum oval pointed behind, clothed with fine hair. Upper side of metatarsi of fourth provided with distinct calamistrum. Abdomen slightly longer than wide, clothed with fine pubescence. A conspicuous white patch is in the mid-dorsal region.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal.

Family PHOLCIDAE C. L. Koch

4. Genus ***Crossopriza*** Simon

1893. *Crossopriza* Simon, *Hist. Nat. Arign.*, **1** : 476.

1935. *Crossopriza* : Dyal, *Bull. zool. Punjab Univ.*, **1** : 168.

1981. *Crossopriza* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 18.

Diagnosis : Anterior eyes are recurved, narrowly spaced; chelicerae depressed at the inner margin and each provided with an oblique apical tooth. Sternum broadly truncate posteriorly. Abdomen slightly ovate, abruptly declined posteriorly raised much above the spinnerets.

Type-species : *Crossopriza pristina* Simon

Distribution : India, Arabia, Egypt.

4. ***Crossopriza lyoni*** (Blackwall)

1867. *Pholcus lyoni* Blackwall, *Ann. Mag. Nat. Hist.*, **19**(3) : 302.

1981. *Crossopriza lyoni* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 18.

1992. *Crossopriza lyoni* : Biswas and Biswas, *Fauna of West Bengal,* Part III. Araneae : Spiders, State Fauna Series No. **3** : 383.

Diagnosis : *Crossopriza lyoni* is a common house spider. It spins an extremely fine irregular cob-web, form which it hangs upside down. It prefers old dark and abandoned houses. No cocoon is made but the eggs are glued together and carried by the chelicerae of the mother till hatching; generally nocturnal in habit. Cephalothorax marked with median brown stripe, legs spotted

and streaked with black, extremities of femora and tibiae paler, abdomen yellowish brown.

Material examined : 1 Female, Malli near Rampo, Dist. South Sikkim, Sikkim, 13.iv.1994, coll. *P. H. Roy & party.*

Distribution : India : Sikkim, Dist. South Sikkim (New record); West Bengal; Punjab; Rajasthan; Tamil Nadu; Uttar Pradesh. Elsewhere: Burma.

Family LYSSOMANIDAE Peck. & Wheel

5. Genus ***Lyssomanes*** Hentz

1944. *Lyssomanes* Hentz, *J. Bost, Soc. Nat. Hist.*, **11** : 48.

1967. *Lyssomanes* : Tikader, *Proc. Indian Acad. Sci.*, **66**(4) : 120.

1978. *Lyssomanes* : Tikader & Biswas, *Proc. Indian Acad. Sci.*, **87**(9) : 257.

1992. *Lyssomanes* : Biswas and Biswas, *Fauna of West Bengal*, Part III, Araneae : Spiders, State Fauna Series No. **3** : 385.

Diagnosis : Cephalothorax moderately high, longer than wide. Eyes are in four rows of two each. Eyes of first row is close to each other and two to three times as large as those of second row. Second row is situated just behind the first row. The third of eyes are very small. Fourth row of eyes are as large as those of the second row. Quadrangle formed by second and fourth rows as wide as long.

Type-species : *Lyssomanes viridis* (Wabckenaer)

Distribution : India, North America.

5. ***Lyssomanes sikkimensis*** Tikader

1967. *Lyssomanes sikkimensis* Tikader, *Proc. Indian Acad. Sci.*, **66**(4) : 120.

Diagnosis : Cephalothorax slightly longer than wide, clothed with fine grey hair; thoracic region abruptly bend behind. Eyes four rows, pearly white and base encircled by black patch. Ocular quad nearly square. Sternum oval, narrowed in front clothed with hair. Chelicerae strong, provided with one tooth on outer margin. Legs are long and stout. Tibiae and metatarsi of first and second provided with three and two pairs robust ventral spines respectively. Abdomen longer than wide, nearly egg-shaped, dorsum provided with minute patches.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

Family SALTICIDAE Blackwall

Key to the genera of the family SALTICIDAE Blackwall

1. Eyes are small in proportion to the spiders. ..... *Phidippus*

   Eyes are not small in proportion to the spiders 2

2. The ocular trapezium is about one third broader than long ..... *Salticus*

   The ocular trapeziumis not about one third broader than long 3

3. Labium little longer than wide; coxae of the first leg separated by less than the width of the labium ..... *Plexippus*

   Labium not longer than width; coxae of the first leg not separated by less than the width of the labium 4

4. The coxae of the first legs being nearly contiguous ..... *Maevia*

6. Genus ***Phidippus*** Koch

1846. *Phidippus* Koch, *Die. Arachn.*, **73** : 125.

1981. *Phidippus* : Tikader & Biswas, *Rec. zool. Surv. India*, occ. pap. No. **30**(1) : 90.

1992. *Phidippus* : Biswas and Biswas, *Fauna of West Bengal*, Part III, Araneae : Spiders, State Fauna Series No. **3** : 395.

Type-species : *Phidippus variegatus* (Lucas)

Distribution : All tropical and sub-tropical countries of the world.

6. ***Phidippus bengalensis*** Tikader

1976. *Phidippus bengalensis* Tikader, *Entomon*, **2** (1) : 97.

1987. *Phidippus bengalensis* : Biswas, *Fauna of Orissa*, Part I, Araneae : Spiders, State Fauna Series No. **1** : 264.

1992. *Phidippus bengalensis* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 395.

Diagnosis : Cephalothorax, legs and abdomen light brown in female but in male brownish red and deep brown. Cephalic region flat, clothed with fine and some long hair. Cephalothorax longer than wide and lateral side sloping. Anterior medium and lateral eyes milky-white and other eyes pearly white. Anterior rows of eyes recurved. Anterior laterals and posterior eyes are more or less same size; second pair of eyes very small and situated near the anterior lateral. Chelicerae with one moderate tooth on inner margin and two small teeth on outer margin. Sternum nearly oval, longer than wide, narrowing in front. Tibiae and metatarsi first and second provided with three and two pairs of ventral spines respectively. Abdomen longer than wide and pointed behind. Anterior lateral half of abdomen provided with deep brown patches. A pair of sigilla are enclosed by a v-shaped black or brown marking on the dorsum.

Material examined : 1Female, Phensang, West Sikkim, Sikkim, 8.ix.1993, coll. *S. K. Chatterjee.*

Distribution : India : Sikkim, Dist. West Sikkim (New record), West Bengal; Gujarat.

7. Genus *Salticus* Latreille

1804. *Salticus* Latreille, *Nouv. Dict. H. N.,* **24** : 135.

1981. *Salticus* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 89.

Type-species : *Salticus scenicus* Clerck

Distribution : Cosmopolitan except Australia.

7. *Salticus ranjitus* Tikader

1967. *Salticus ranjitus* Tikader, *Proc. Indian Acad. Sci.,* **66**(4) : 117.

1981. *Salticus ranjitus* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 89.

1992. *Salticus ranjitus* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 400.

Diagnosis : Cephalothorax longer than wide, somewhat rectangular, clothed with fine black hair, cephalic and anterior thoracic region high and flat, posterior thoracic region abruptly bend behind. Eyes pearly white; anterior row slightly recurved, and anterior median eyes larger than laterals by more than four times. Middle row of eyes very small and situated nearly equidistant from anterior and posterior rows. Chelicerae provided with one larger tooth on inner and two smaller teeth on outer margin. Sternum oval, black clothed with hair. Abdomen nearly egg-shaped, dorsum provided with irregular minute white dots, posterior end with transverse conspicuous white band.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Maharashtra; Punjab.

8. Genus *Plexippus* Koch

1846. *Plexippus Koch, Die. Arachn.,* **13** : 107.

1967. *Plexippus* : Tikader, *Proc. Indian Acad. Sci.,* **66**(4) : 118.

1981. *Plexippus* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 101.

1987. *Plexippus* : Biswas, Fauna of Orissa, Araneae : Spiders, State Fauna Series No. **1** : 265.

Type-species : *Plexippus paykullii* (Audouin)

Distribution : Cosmopolitan.

8. *Plexippus paykullii* (Audouin)

1825. *Attus paykullii* Audouin, *Descr. Egypte, 2nd Ed.,* **22** : 172.

1981. *Plexippus paykullii* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 101.

1992. *Plexippus paykullii* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae :Spiders, State Fauna Series No. **3** : 397.

1995. *Plexippus paykullii* : Biswas & Majumder, *Fauna of Meghalaya,* Part II, Araneae : Spiders, State Fauna Series No. **4** : 124.

Diagnosis : Cephalothorax dark brown or black, legs olive brown, abdomen deep brown in colour. Cephalothorax longer than wide, clothed with fine grey black hair. Cephalic region flat and metalic black. Anterior row of eyes recurved and anterior middle eyes very large and milky-white, anterior lateral eyes pearly-white and smaller than middle eyes about half, posterior row of eyes

median size and pearly-white. A pale longitudinal patch on the middle of thorax and centre provided with fovea. Sternum oval and narrowed in front, clothed with hair. Abdomen longer than wide, narrowing posteriorly. Mid-dorsal with a longitudinal light patch extending from base to near end of abdomen.

Material examined : 1Female, Samsrs garden, Dist. South Sikkim, Sikkim, 7.iv.1994, coll. *P. H. Roy & party.*

Distribution : India : Sikkim, Dist. South Sikkim; West Bengal.

Elsewhere : Africa, Burma, Europe, Sri Lanka and in all of the warmer regions of the world.

9. Genus *Maevia* Koch

1848. *Maevia* Koch, *Die Arachniden. Dreizehnter Band.* Nurnberg, **14** : 1-210.

1940. *Maevia* : Comstock, *Spider Book,* New York, : 702.

Type-species : *Maevia tibialis* Koch

Distribution : Cosmopolitan.

9. *Maevia himalaya* Tikader

1967. *Maevia himalaya* Tikader, *Proc. Indian Acad. Sci.*, **66**(4) : 117.

Diagnosis : Cephalothorax longer than wide, convex, cephalic area flat, clothed with hair and few spines. Eyes are encircled by black patch. Mid-dorsally with a fine fovea present. Upper margin of chelicerae with three teeth. Legs of I pair shorter than the others. Abdomen longer than wide, narrowing in behind, clothed with thick hair. Mid-dorsally with a conspicuous broad longitudinal white patch, extending from base to end of abdomen.

Distributors : India : Sikkim, Dist. West Sikkim (Type locality only).

Family CTENIDAE Keyserling

10. Genus *Ctenus* Walckenaer

1805. *Ctenus* Walckenaer, *Tab. Aran.*, **18** *Arachn.*

1897. *Ctenus* : Simon, *Mem, Soc. zool. Fr.*, **10** : 252.

1973. *Ctenus :* Tikader, *Curr. Sci.*, **42** (24) : 862-863.

1976. *Ctenus :* Tikader, J. Bombay nat. Hist. Soc., **72** (3) : 791-793.

Diagnosis : Both the rows of eyes are recurved but anterior row strongly recurved so that the anterior laterals come in line with posterior median eyes then forming three of eyes. Anterior lateral eyes are smaller than anterior medians. Tarsi bears two claws. Retromargin of chelicerae armed with four or sometimes with five teeth. Labium longer than broad. Trochantor of legs show a notch ventrally.

Type-species : Ctenus dubirus Walckenaer

Distribution : Cosmopolitan and cosmosub-tropical.

10. *Ctenus indicus* Gravely

1931. *Ctenus indicus* Gravely, *Rec. Indian Mus.*, **33** (3) : 234,

1981. *Ctenus indicus :* Tikader & Malhotra, *Rec. zool. Surv. India*, **79** : 114.

Diagnosis : Cephalothorax and legs are reddish brown in colour. Cephalic region longer than wide, clothed with pubescence, margin of clypeus with many fine long hair directed forwarded. Posterior median biggest. Both rows of eyes are recurved but anterior row strongly recurved. Chelicerae chocalate brown hairy and strong with four teeth. Abdomen oval, greyish brown, clothed with pubescence, dorsally with pairs of sigillae.

Material examined : 1Female, Jalipool, South of Gangtok, Dist. South Sikkim, Sikkim, 6.iv.1994, coll. *P.H.Roy & party.*

Distribution : India : Sikkim, Dist. South Sikkim (New record); Kerala; Tamil Nadu.

Family THOMISIDAE Sundevall

Key to the genera of the family THOMISIDAE Sundevall

1. Lateral eyes on conical protuberance; abdomen not broadened and truncated behind ..... *Thomisus*

   Lateral eyes not on conical protuberance; abdomen not broadened and truncated behind 2

2. Abdomen long; lateral sides with longitudinal muscular corrugation .... *Runcinia*

Abdomen not long; lateral sides without longitudinal muscular corrugation 3

3. Cephalic region as wide as thoracic region ..... *Camaricus*

Cephalic region not wide as thoracic region 4

4. Anterior median eyes closer to the lateral eyes than to each other ..... *Xysticus*

Anterior median eyes not closer to the lateral eyes than to each other.....5.

5. Both rows of eyes are nearly straight, black and tuberculated ..... *Platythomisus*

11. Genus ***Thomisus*** Walckenaer

1805. *Thomisus* Walckenaer, *Tabl. Aron.*, : 28

1962. *Thomisus* : Tikader, *J. Linn. Soc.*, **44**(300) : 569.

1981. *Thomisus* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 75.

Type-species : *Thomisus albus* (Gmelin)

Distribution : Cosmopolitan.

Key to the species of the genus *Thomisus* Walckenacer

1. Abdomen with a transverse black band ... . *sikkimensis*

Abdomen without transverse black band.. ..... *rishus*

11. ***Thomisus sikkimensis*** Tikader

1962. *Thomisus sikkimensis* Tikader, *J. Linn. Soc.*, London, **44** (300) : 569.

1980. *Thomisus sikkimensis* : Tikader, *Fauna of India,* Araneae : Spiders **1**(1) : 32.

Distribution : India : Sikkim, Dist; West Sikkim (Type-locality only).

12. ***Thomisus rishus*** Tikader

1970. *Thomisus rishus* Tikader, *Rec. zool. Surv. India,* **64** (1-4) : 48.

1980. *Thomisus rishus* : Tikader, *Fauna of India,* Araneae : Spiders, **1**(1) : 45.

Distribution : India : Sikkim, Dist. West Sikkim (Type-locality only).

12. Genus ***Runcinia*** Simon

1875. *Runcinia* Simon. *Ar. Fr.* **2** : 254.

1965. *Runcinia* : Tikader, *Proc. Indian Acad. Sci.*, **61**(5) : 277.

1971. *Runcinia* : Tikader, *Mem. zool. Surv. India,* **15**(3) : 26.

Type-species : *Runcinia lateralis* (Koch)

Distribution : Cosmopolitan except America.

13. ***Runcinia escheri*** Reimoser

1934. *Runcinia escheri* Reimoser, *Revue suisse Zool.*, **41**(32) : 487.

1980. *Runcinia escheri* : Tikader, *Fauna of India,* Araneae : Spiders, **1**(1) : 59.

Diagnosis : Cephalothorax nearly as long as wide, clothed with short hair and few spines. Lateral sides provided with deep brown longitudinal patch. Legs long, clothed with hair and spines. Tibiae and metatarsi of first and second provided with five and six pairs of ventral spines respectively. Dorsum provided with five pairs parallel longitudinal muscular ridges on both sides, mid-dorsally with a pair of brown spots.

Material examined : 1 Female, Topokhani, Dist. South Sikkim, Sikkim, 21.v.1995, coll. *P. H. Roy & party.*

Distribution : India : Sikkim Dist. South Sikkim (New record) ; Andhra Pradesh.

13. Genus ***Camaricus*** Thorell

1887. *Camaricus* Thorell, *Ann. Mus. Civ. stor. nat. Gen.*, **5**(2) : 261.

1980. *Camaricus* : Tikader, *Fauna of India,* Araneae : Spiders **1**(1) : 174.

Type-species : *Camaricus maugei* (Walckenaer)

Distribution : Tropical Africa, India, Malayasia.

14. ***Camaricus formosus*** Thorell

1887. *Camaricus formosus* Thorell, *Ann. Mus. Civ. sotr. nat. Gen.*, **5**(2) : 261.

1981. *Camaricus formosus* : Tikader & Biswas, *Rec. zool. Surv. India*, occ. pap. No. **30**(1) : 83.

1992. *Camaricus formosus* : Biswas and Biswas, *Fauna of West Bengal* Part III, Araneae : Spiders, State Fauna Series No. **3** : 404.

Diagnosis : Cephalothorax clothed with black hair, wider in front, anterior portion and lateral sides provided with conspicuous deep brown or black patches. Legs are robust clothed with hair and spines and ornamented with black patches. Tibiae and methtansi of first and second provided with three pairs of ventral spines. Abdomen larger and wide, widest the middle, clothed with black hair.

Material examined : 1 Female, 1 Male, kurme, Dist. South Sikkim, Sikkim, 17.ix.1993, coll. *T. K. Paul & party.*

Distribution : India, Sikkim, Dist. South Sikkim (New record); West Bengal; Karnataka; Maharashtra; Andaman Islands.

14. Genus *Xysticus* Koch

1835. *Xysticus* Koch, *H. Schaeff. Deutshl. Ins.*, : 35.

1962. *Xysticus* : Tikader, *J. Linn. Soc., London*, **44** (300) : 576.

1981. *Xysticus* : Tikader & Biswas, *Rec. zool. Surv. India*, occ. pap. No. **30**(1) : 80.

Type-species : *Xysticus critatus* (Clerck)

Distribution : Cosmopolitan except Australia.

Key to the species of the genus *Xysticus* Koch

1. Abdomen without deep brown patches .... *roonwali*

   Abdomen with longitudinal deep brown or black patches 2

2. Abdomen of male laterally with deep brown broad bars extending from base to end.... ..... *sikkimus*

   Abdomen of male laterally without deep brown broad bars and not extending from base to end 3

3. Abdomen with complete transverse white or pale lines ..... *sujatai*

15. *Xysticus roonwali* Tikader

1964. *Xysticus roonwali* Tikader, *Rec. Indian Mus.*, **59**(3) : 264.

1980. *Xysticus roonwali* : Tikader, *Fauna of India*, Araneae : Spiders **1**(1) : 112.

Distribution : India : Sikkim, Dist. East Sikkim; Nepal.

16. *Xysticus sikkimus* Tikader

1970. *Xysticus sikkimus* Tikader, *Rec. zool. Surv. India*, **64** (1-4) : 51.

1980. *Xysticus sikkimus* : Tikader, *Fauna of India*, Araneae : Spiders **1**(1) : 115.

Material examined : 1 Male, Phorlong, Dist. North Sikkim, Sikkim, 24.iv.1994, coll. *S. K. Saha & party;* 1 Male, Dickling, Hooker's Trail Expedition, Dist. East Sikkim, Sikkim, 20.v.1964, coll. *S. K. Chatterjee.*

Distribution : India : Sikkim (Dists. East & North Sikkim).

17. *Xysticus sujatai* Tikader

1962. *Xysticus sujatai* Tikader, *J. Linn. Soc.*, London, **44**(300) : 577.

1995. *Xysticus sujatai* : Biswas & Majumder, *Fauna of Meghalaya*, Part II, Araneae : Spiders, State Fauna Series No. **4** : 119.

Material examined : 1 Female, Mangan Road, Dist. North Sikkim, Sikkim, 23.iv.1991, coll. *K. P. S. & party.*

Distribution : India : Sikkim, Dist. North Sikkim (New record) : Meghalaya ; Arunachal Pradesh.

15. Genus *Platythomisus* Doleschall

1859. *Platythomisus* Doleschall, *Acta. Soc. Ind. Neerl.*, **5**(5) : 59.

1977. *Platythomisus* : Biswas, *J. Bombay nat. Hist. Soc.*, **74** (2) : 332.

Type-species : *Platythomisus octamaculatus* (Koch)

Distribution : India, Africa, Malaysia.

18. *Platythomisus bazarus* Tikader

1970. *Platythomisus bazarus* Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 50.

1980. *Platythomisus bazarus* : Tikader, *Fauna of India,* Araneae : Spiders **1**(1) : 171.

Diagnosis : Cephalothorax longer than wide, cephalic region high. Eyes are black with prominent tubercle, both rows straight. Ocular quad longer than wide and narrow in front. Legs are long and stout, first and second longer than third and fourth. Tibiae and metatarsi of first and second provided with five and three pairs of ventral robust spines respectively. Abdomen longer than wide, posterior half wide and end tapering, irregular chalk-white small patches all over the dorsum.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

Family HETEROPODIDAE Thorell

16. Genus ***Heteropoda*** Latreille

1804. *Heteropoda* Latreille, *Nouv. Diet. d'Hist. Nat.*, **34** : 135.

1977. *Heteropoda* : Tikader, *Rec. zool. Surv. India,* **72** : 189.

1992. *Heteropoda* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 413.

Diagnosis : Cephalothorax nearly as wide as long, moderate or very high, posterior line recurved, the laterals larger and prominent; eyes of anterior line straight or procurved, laterals larger than medians; quadrangle longer than wide, narrow in front. Maxillae not creasted. Vulva consisting of pair of lobes, usually separated by a median skeletal piece, rarely in contact.

Type-species : *Heteropoda venatoria* Linn.

Distribution : From India eastward to Australia.

19. ***Heteropoda fabrei*** Simon

1885. *Heteropoda fabrei* Simon, *Bull. Soc. Zool.*, France, **10** : 32.

1988. *Heteropoda fabrei* : Sethi & Tikader, *Rec. zool. Surv. India,* occ. pap. No. **93** : 14.

Diagnosis : Cephalic region longer than wide, flat on the tip with the thoracic region. Ocular quad longer than wide, slightly narrow in front. Chelicerae strong and stout, both inner and outer margins of fang furrow armed with four teeth on each side. Abdomen oval but anteriorly truncated. Dorsum provided with three pairs of sigilla and a distinct white horizontal band at the posterior end.

Material examined : 1 Female, Rangpo, Dist. South Sikkim, Sikkim, 19.iv.1994, coll. *P. H. Roy & party.*

Distribution : India : Sikkim, Dist. South Sikkim (New record); Tamil Nadu.

Family CLUBIONIDAE Wagner

17. Genus ***Cheiracanthium*** Koch, C.L.

1839. *Cheiracanthium* Koch, C.L., *Die, Arach. Sechster Band,* **6** : 9.

1981. *Cheiracanthium*: : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 69.

Diagnosis : Cephalothorax ovoid in shape, longer than wide, convex anteriorly, with one median fovea if present very inconspicuous. Eyes are nearly uniform size. Ocular quad relatively narrower anteriorly. Legs are long and slender, moderately stout, the first leg longer than fourth leg. Abdomen elongated, oval and pointed posteriorly; dull yellow or pale green in colour. Epigyne with flat or concave plate. The spiders of this genus are swift nocturnal hunters. They are found on plant foliage or on buildings.

Type-species : *Cheiracanthium punctorium* Villers

Distribution : All tropical parts of the world.

Key to the species of the genus *Cheiracanthium* Koch, C.L.

1. Cymbium with long stout spur at its base, extending almost at the middle of the tibia ..... *indicum*

   Cymbium with rudimentary spur, not extending to the middle of the tibia.....2

2. Tarsi comparatively longer and less scopulated ..... *sikkimensis*

   Tarsi comparatively shorter and more scopulated 3

3. Genital bulb or male palpus broad anteriorly, membrane of the palpal organ well developed ..... *trivialis*

20. ***Cheiracanthium indicum*** Cambridge

1874. *Cheiracanthium indicum* Cambridge, *Proc. zool. Soc.*, London, : 411.

1931. *Cheiracanthium indicum* : Gravely, *Rec. Indian Mus.*, **33**(3) : 266.

1991. *Cheiracanthium indicum* : Majumder & Tikader, *Rec. zool. Surv. India*, occ. pap. No. **102** : 58.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Gujarat; Maharashtra; Assam.

21. ***Cheiracanthium sikkimensis*** Majumder & Tikader

1991. *Cheiracanthium sikkimensis* Majumder & Tikader, *Rec. zool. Surv. India*, occ. pap. No. **102** : 77.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

22. ***Cheiracanthium trivialis*** (Thorell)

1895. *Eutitha trivialis* Thorell, *Spider of Burma*, : 40.

1931. *Cheiracanthinum trivialis* : Gravely, *Rec. Indian Mus.*, **33** : 265.

1981. *Cheiracanthium trivialis* : Tikader & Biswas, *Rec. zool. Surv. India*, occ. pap. No. **30**(1) : 71.

1991. *Cheiracanthium trivialis* : Majumder & Tikader, *Rec., zool. Surv. India*, occ. pap. No. **102** : 56.

1992. *Cheiracanthium trivialis* : Biswas and Biswas, *Fauna of West Bengal*, Part III, Araneae : Spiders, State Fauna Series No. **3** : 421

Material examined : 1 Female, Namli, Dist. East Sikkim, Sikkim, 11.iii.1994. coll. *L. K. Ghosh;* 1 Female, Rangpo, Dist. East Sikkim, Sikkim, 15.iv.1994, coll. *P. H. Roy & party;* 1 Female, Pedang, Dist. South Sikkim, Sikkim, 11.x.1995, coll. *S. C. Mitra & party.*

Distribution : India : Sikkim, Dists. East Sikkim, South Sikkim (New record); West Bengal; Madhya Pradesh; Maharashtra; Goa; Tamil Nadu.

Elsewhere : Burma.

Family HAHNIIDAE Bertkau

18. Genus ***Hahnia*** Koch

1841. *Hahnia* Koch, *Ar.*, **8** : 61

1953. *Hahnia* : Locket and Millidge, *British Spiders*, London, **2** : 27.

1970. *Hahnia* : Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 58.

Diagnosis : Cephalothorax oval, narrowed in front, fovea clear. Anterior median eyes smaller than that of anterior laterals. Sternum heart-shaped. Labium wider than long. Legs are stout and robust with a few spines.

Type-species : *Hahnia pusilla* Koch

Distribution : Cosmopolitan except Australia.

23. ***Hahnia mridulae*** Tikader

1970. *Hahnia mridulae* Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 58.

Diagnosis : Cephalothorax deep brown, abdomen light brown and legs are brownish in colour. Cephalic region slightly narrowing in front; thoracic region flat with a dark fovea. Both rows of eyes are straight. Ocular area provided with black patches. Stennum heart-shaped. Legs are stout, clothed with stift hair and a few spines. Abdomen oval in shape and clothed with fine hair, dorsum provided with a row of inverted 'v' shaped white chevrons.

Distribution : India : Sikkim, Dist. North Sikkim (Type locality only).

Family OXYOPIDAE Thorell

Key to the genera of the family OXYOPIDAE Thorell

1. Posterior row of eyes are strongly procurved and equidistant from each other .... *Oxyopes*

   Posterior row of eyes are not strongly procurved and equidistant from each other 2

2. Cephalic region not high, male palp with paracymbial process ..... *Peucetia*

19. Genus *Oxyopes* Latreille

1804. *Oxyopes* Latreille, *Hist. Nat. Arach.*, France, **14** : 144.

1970. *Oxyopes* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 70.

1992. *Oxyopes* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 432.

Type-species : *Oxyopes heterophthalmus* Latreille

Distribution : Cosmopolitan.

Key to the species of the genus *Oxyopes* Latreille

1. Upper side of the femora of all legs provided with a longitudinal black line ... . *ratnae*

   Upper side of the femora of all the legs are not provided with a longitudinal black line 2

2. Abdomen broad at the middle not provided with patches at the middle ..... *sakuntalae*

   Abdomen not broad at the middle and provided with patches at the middle 3

3. Cephalothorax narrow in front..... *shweta*

   Cephalothorax not narrow in front 4

4. Abdomen provided with irregular dirty white and deep brown bars.... *sikkimensis*

   Abdomen not provided with irregular dirty white and deep brown bars 5

5. Lower side of femora of legs provided with two conspicuous black lines ..... *sitae*

   Lower side of femora of legs not provided with two conspicuous black lines 6

6. Cephalothorax clothed with fine hair, abdomen provided with irregular net-like white minute patches ..... *subhadrae*

   Cephalothorax without hair, abdomen not provided with irregular net-like white minute patches 7

7. Lower side of femora of all the legs provided with a longitudinal black line ... . *sunandae*

24. *Oxyopes ratnae* Tikader

1970. *Oxyopes ratnae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 70.

1992. *Oxyopes ratnae* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 433.

Material examined : 1**F**, Legship, Dist. North Sikkim, Sikkim, 3.v.1994, coll. *S. K. Saha & party.*

Distribution : India : Sikkim, Dists. North Sikkim, West Sikkim; West Bengal.

25. *Oxyopes sakuntalae* Tikader

1970. *Oxyopes sakuntalae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 73.

1992. *Oxyopes sakuntalae* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 434.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal.

26. *Oxyopes shweta* Tikader

1970. *Oxyopes shweta* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 78.

1992. *Oxyopes shweta* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 434.

Material examined : 2**F**, Sombaria, Dist. West Sikkim, Sikkim, 19.ix.1993, coll. *S. K. Chatterjee;* 1**F**, Ramtek, Dist. East Sikkim, Sikkim, 11.ix.1993, coll. *S. K. Chatterjee;* 2**F**, Temi, Dist. South Sikkim, Sikkim, 24.ix.1993, coll. *T. K. Paul & party.*

Distribution : India : Sikkim, Dists. West Sikkim, East Sikkim, South Sikkim; West Bengal.

27. *Oxyopes sikkimensis* Tikader

1970. *Oxyopes sikkimensis* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 76.

1992. *Oxyopes sikkimensis* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 434.

Material examined : 1 Female, Resibazar, Dist. South Sikkim, Sikkim, 19.x.1995, coll. *S. C. Mitra & party.*

Distribution : India : Sikkim, Dists. West Sikkim, South Sikkim; West Bengal.

28. ***Oxyopes sitae*** Tikader

1970. *Oxyopes sitae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 75.

1992. *Oxyopes sitae* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Aranear : Spiders, State Fauna Series No. **3** : 435.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal.

29. ***Oxyopes subhadrae*** Tikader

1970. *Oxyopes subhadrae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 71.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

30. ***Oxyopes sunandae*** Tikader

1970. *Oxyopes sunandae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 74.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

20. Genus ***Peucetia*** Thorell

1869. *Peucetia* Thorell, *On European Spiders,* Uppsala, **7** : 196.

1981. *Peucetia* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 64.

Type-species : *Peucetia viridis* Blackwall

Distribution : Cosmopolitan except Australia.

31. ***Peucetia latikae*** Tikader

1970. *Peucetia latikae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 80.

1992. *Peucetia latikae* : Biswas and Biswas, *Fauna of West Bengal,* Part III. Araneae : Spiders, State Fauna Series No. **3** : 435.

Diagnosis : Cephalothorax, legs and abdomen are green in colour, moderately high provided with conspicuous black spots with few spines, centre provided with a sharp fovea. Anterior row of eyes are strongly recurved and middle eyes small. Clypeus long and provided with four black lines extending from ocular area to near the base of fang of chelicerae. Dorsum provided with a longitudinal broad brown band and this band encircled by a white line.

Material examined : 1 Female, Chakung, Dist. West Sikkim, Sikkim, 21.ix.1993. coll. *S. K. Chatterjee.*

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal.

Family : THERIDIIDAE Sundevall

Key to the genera of the family THERIDIIDAE Sundevall

1. Median apophysis broadly attached to tegulum or to embolus, never separated sclerite, abdomen usually higher than long, often with dark patches on sides .... *Achaearanea*

   Median apophysis broadly attached to tegulum, sclerite separated, no patches on the abdomen 2

2. Colulus present or colulus replaced by two sitae ..... *Argyrodes*

   Colulus absent and not replaced by two sitae 3

3. Lower margin of furrow of the chelicerae with a very small tooth ..... *Theridion*

   Lower margin of furrow of the chelicerae with no tooth 4

4. Male palpus without conductor, no median apophysis ..... *Theridula*

21. Genus ***Achaaranea*** Strand

1929. *Achaearanea* Strand, *Acta. Univ. Latviensis,* **20** : 11.

1963. *Achaearanea* : Levi, *Bull. Mus. camp. Zool.,* Harvard, **129**(3) : 190.

1992. *Achaearanea* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 436.

Type-species : *Achaearanea trapezoidalis* (Taczanowski)

Distribution : India, America.

Key to the species of the genus *Achaearanea* Strand

1. Abdomen dark brown with lateral irregular green patches; posterior end elevated..... ..... *budana*

   Abdomen light without lateral irregular green patches; posterior end not elevated 2

2. Abdomen provided with irregular white patches ..... *durgae*

32. ***Achaearanea budana*** Tikader

1970. *Achaearanea budana* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 16.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

33. ***Achaearanea durgae*** Tikader

1970. *Achaearanea durgae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 17.

1992. *Achaearanea durgae* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, States Fauna Series No. **3** : 436.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal.

22. Genus ***Argyrodes*** Simon

1864. *Argyrodes* Simon, *Hist. Nat. Araignees,* **1** : 253.

1970. *Argyrodes* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 9.

Type-species : *Argyrodes argyrodes* Walckenaer

Distribution : Cosmopolitan.

Key to the species of the genus *Argyrodes* Simon

1. Abdomen very long worm-like, extensively prolonged beyond the spinners .... *ambalikae*

   Abdomen not very long, nearly as long as wide, not extensively prolonged beyond the spinners 2

2. Posterior end of abdomen without tubercle, but with a conspicuous black patch .... *gazedes*

   Posterior end of abdomen with tubercle, but without a conspicuous black patch 3

3. Posterior end of abdomen with prominent and white patch ..... *gazingensis*

   Posterior end of abdomen without prominent tubercle and white patch 4

4. Posterior end of abdomen with a triangular-shaped projection ..... *projeles*

34. ***Argyrodes ambalikae*** Tikader

1970. *Argyrodes ambalikae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 10.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

35. ***Argyrodes gazedes*** Tikader

1970. *Argyrodes gazedes* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 11.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

36. ***Argyrodes gazingensis*** Tikader

1970. *Argyrodes gazingensis* Tikader, *Rec. zool. Surv. India.* **64**(1-4) : 11.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

23. Genus ***Theridion*** Walckenaer

1805. *Theridion* Walckenaer, *Tabl. Araneides,* : 72.

1963. *Theridion* : Levi, *Bull. Mus. comp. Zool., Harvard,* **129**(10) : 483.

1992. *Theridion* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 436.

Type-species : *Theridion lunatum* Clerck

Distribution : Cosmopolitan.

37. ***Theridion manjithar*** Tikader

1970. *Theridion manjithar* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 8.

Diagnosis : Cephalothorax and legs are light brownish in colour. Cephalic region slightly longer than wide, clothed with fine hair. Eyes are pearly white. Legs are stout and strong, clothed with hair, with deep brown transverse band. Dorsum with beautifully coloured with admixture of irregular white and black spots.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

24. Genus ***Theridula*** Emerton

1882. *Theridula* Emerton, *Trans. Conn. Acad.*, **6** : 25.

1962. *Theridula* : Levi & Levi, *Bull. Mus. comp. Zool.*, Harvard, **127**(1) : 42.

Type-species : *Theridula opulenta* Walckenaer

Distribution : Cosmopolitan except Australia.

38. ***Theridula angula*** Tikader

1970. *Theridula angula* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 15.

Diagnosis : Cephalothorax and legs are reddish yellow, abdomen yellow in colour. Cephalic region slightly wider than long, clothed with fine pubescence. Eyes are pearly white except anterior medians. Legs are long and slender, clothed with hair and spines. Abdomen rhomboidal in shape provided with conspicuous black spots. Male coloured like female but legs are longer and smaller in size.

Distribution : India : Sikkim, Dist. West Sikkim (Type-locality only).

Family AGELENIDAE C.L. Koch

Key to the genera of the family AGELENIDAE C.L. Koch

1. Posterior lateral and anterior median eyes forming straight line; posterior spinners with two segments ..... *Agelena*

   Posterior and median eyes are not forming straight line; posterior spinners are not segmented 2

2. Lower margin of chelicerae usually armed with four to six teeth..... *Tegenaria*

25. *Genus* : ***Agelena*** Walckenaer

1805. *Agelena* Walckenaer, *Tabl. Aran.*, : 51.

1953. *Agelena* : Locket and Millidge, *British Spiders,* London, *2* : 6.

1970. *Agelena* : Tikader, *Rec. zool. Surv. India, 64*(1-4) : 53.

Type-species : *Agelena labyrinthica* Clerk

Distribution : Cosmopolitan.

Key to the species of the genus *Agelena* Clerk

1. Anterior median eyes larger than laterals; abdomen dark brown, clothed with brown and grey hair ..... *barunae*

   Anterior median eyes smaller than laterals, abdomen provided with deep brown chevrons and fine hair..... *satmila*

39. ***Agelena barunae*** Tikader

1970. *Agelena barunae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 54.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

40. ***Agelena satmila*** Tikader

1970. *Agelena satmila* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 53.

Distribution : India : Sikkim, Dist. East Sikkim (Type locality only).

26. Genus ***Tegenaria*** Latreille

1804. *Tegenaria* Latreille, *Nouv. Dict. Hist. Nat.*, **24** : 134.

1953. *Tegenaria* : Locket and Millidge, *British Spiders,* London, **2** : 8.

1970. *Tegenaria* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 56.

Type-species : *Tegenaria domistica* Clerck

Distribution : Cosmopolitan.

41. ***Tegenaria chhaguensis*** Tikader

1970. *Tegenaria chhaguensis* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 56.

Diagnosis : Cephalothorax longer than wide, relatively broad in front, convex, clothed with fine and stiff hair; cephalic region high, thoracic region with a deep fovea and radiating striae. Anterior row of eyes slightly procurved, medians slightly smaller than laterals. Clypeus narrow. Sternum oval, pointed behind, clothed with spiny hair. Chelicerae deep brown, strong, inner margin without tooth but outer margin provided with a large tooth. Legs are robust, clothed with hair and spines. Abdomen longer than wide, clothed with thick hair, narrowing in front, slightly overlapping the posterior region of cephalothorax, dorsum provided with dark brown patches.

Distribution : India : Sikkim, Dist. East Sikkim (Type locality only).

Family LYCOSIDAE Sundevall

Key to the genera of the family LYCOSIDAE Sundevall

1. Posterior spinnerets distinctly longer than the anterior, with apical segment, conical and as long as the basal. Anterior row of eyes little wider than the second row. Sternum generally provided with mid-longitudinal dark markings..... *Hippasa*

   Posterior spinnerets at most only slightly longer than the anterior and apical segment hemispherical and very short. Anterior row of eyes short than the second row. Sternum without longitudinal markins 2

2. Cephalic region not much elevated from thoracic region. Superior claws not long and slender and tooth all over the length .... *Pardosa*

   Cephalic region much elevated from thoracic region. Superior claws long and slender and not tooth all over the length. 3

3. Anterior row of eyes straight or slightly procurved. Anterior median eyes never smaller than anterior laterals..... *Lycosa*

27. Genus : ***Hippasa*** Simon

1885. *Hippasa* Simon, *Bull. Soc. Zool. Fr.*, **10** : 31.

1924. *Hippasa* : Gravely, *Rec. Indian Mus.*, **26** : 588.

1952. *Hippasa* : Sinha, *Rec. Indian Mus.*, **48**(2) : 11.

1980. *Hippasa* : Tikader & Malhotra, *Fauna of India,* Araneae Spiders, **1**(2) : 272.

Type-species : *Hippasa agelenoides* (Simon)

Distribution : Cosmopolitan except Australia.

Key to the species of the genus *Hippasa* Simon

1. Chitinous plate covering the pit of vulva bifurcated posteriorly, producting a pair of large elevated triangular plate .... *greenalliae*

   Chitinous plate not covering the pit of vulva and not producing a pair of large elevated triangular plate 2

2. Abdomen provided with irregular black or deep brown dots and also provided with withish chevrons ..... *pantherina*

42. ***Hippasa greenalliae*** (Blackwall)

1867. *Lycosa greenalliae* Blackwall, *Ann. Mag. Nat. Hist.* **19**(3) : 327.

1980. *Hippasa greenalliae* : Tikader & Malhotra, *Fauna of India,* Araneae : Spiders **1**(2) : 277.

1992. *Hippasa greenalliae* : Biswas and Biswas, *Fauna of West Bengal.* Part III. Araneae : Spiders, State Fauna Series No. **3** : 439.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Orissa; Tamil Nadu; Maharashtra; Karnataka; Kerala.

43. ***Hippasa pantherina*** Pocock

1899. *Hippasa pantherina* Pocock, *J. Bombay nat. Hist. Soc.*, **12** : 752.

1970. *Hippasa pantherina* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 62.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Orissa; Tamil Nadu; Maharashtra; Karnataka.

28. Genus ***Pardosa*** Koch

1848. *Pardosa* Koch, *Die. Arachnide,* **14** : 100.

1951. *Pardosa* : Sinha, *Rec. Indian Mus.*, **48**(2) : 45.

1981. *Pardosa* : Tikader & Biswas, *Rec. zool. Surv. India*, occ. pap. No. **30**(1) : 52.

Type-species : *Pardosa striatipes* Koch

Distribution : Cosmopolitan except Australia.

Key to the species of the genus *Pardosa* Koch

1. No longitudinal black streak present on the dorsal side of patella; chelicerae uniform in colour ..... *birmanica*

   Longitudinal black streak present on the dorsal side of patella; chelicerae not uniform in colour 2

2. Dorsal side of cephalothorax provided with a very broad mid-longitudinal pale band and posterior quadrangle much behind than in front ..... *fletcheri*

   Dorsal of the cephalothorax provided with narrow mid-longitudinal light brown band and posterior quadrangle not much wider behind 3

3. Sternum uniform dark brown in colour. Legs are reddish brown, coxae of all legs provided with dark brown patches ..... *kupupa*

   Sternum pale. Legs pale, coxae of legs not provided with patches 4

4. Sternum with a 'V' shaped mark ..... *minutus*

   Sternum without 'V' shaped mark 5

5. Dorsal side of abdomen dark brown with minute spots and mid-longitudinal area pale ..... *pusiola*

   Dorsum of abdomen not provided with much dark brown and pale area 6

6. Ventral side of abdomen unform pale and dorsal side with greenish black pale patches ..... *rhenockensis*

   Ventral side not uniform and dorsum with brown black patches 7

7. Maxillae provided with conspicuous scopulae; ocular area without black hairy ..... *sumatrana*

44. *Pardosa birmanica* Simon

1884. *Pardosa birmanica* Simon, *Ann. Mus. civ. stor.nat. Geneva*, **20** : 333.

1980. *Pardosa birmanica* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders **1**(2) : 329.

1992. *Pardosa birmanica* : Biswas and Biswas, *Fauna of West Bengal*, Part III, Araneae : Spiders, State Fauna Series No. **3** : 444.

Material examined : 10 Female, Youmthang Road, Dist. North Sikkim, Sikkim, 26.iv.1991, coll. K.P.S. & party; 2 Female, 1 Male, Sawrini, Dist. North Sikkim, Sikkim, 22.ii.1994, coll. *L. K. Ghosh.*

Distribution : India : Sikkim, Dist. North Sikkim (New record); West Bengal; Bihar; Orissa; Punjab; Gujarat; Himachal Pradesh; Madhya Pradesh; Meghalaya; Uttar Pradesh; Madras; Andhra Pradesh; Tamil Nadu.

Elsewhere : Burma, Java, Pakistan.

45. *Pardosa fletcheri* (Gravely)

1924. *Lycosa fletcheri* Gravely, *Rec. Indian Mus.*, **26** : 606.

1980. *Pardosa fletcheri* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders **1**(2) : 355.

Distribution : India : Sikkim, Dist. West Sikkim; Punjab; Himachal Pradesh; Uttar Pradesh; Arunachal Pradesh.

Elsewhere : Pakistan.

46. *Pardosa kupupa* (Tikader)

1970. *Lycosa kupupa* Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 66.

1980. *Pardosa kupupa* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, **1**(2) : 333.

Material examined : 25 Female, Mangan Road, Dist. North Sikkim, Sikkim, 23.iv.1991. coll. *K.P.S. & party;* 8 Female, Laching to Chungthang, Dist. North Sikkim, Sikkim, 27.iv.1991, coll. *K.P.S. & party.*

Distribution : India : Sikkim, Dists. North Sikkim & East Sikkim.

47. ***Pardosa minutus*** Tikader & Malhotra

1976. *Pardosa minutus* Tikader & Malhotra, *Proc. Indian Acad. Sci.*, **83**(3) : 126.

Material examined : 1 Female, Ramtek, Dist. East Sikkim, Sikkim, 11.ix.1993, coll. *S. K. Chatterjee.*

Distribution : India : Sikkim, Dist. East Sikkim (New record); Himachal Pradesh; Maharashtra; Meghalaya.

48. ***Pardosa pusiola*** (Thorell)

1891. *Lycosa pusiola* Thorell, *Sv. Ak. Handl.*, **24**(2) : 65.

1951. *Pardosa pusiola* : Sinha, *Rec. Indian Mus.*, **48**(2) : 45.

1980. *Pardosa pusiola* : Tikader & Malhotra, *Fauna of India,* Araneae : Spiders, **1**(2) : 323.

Material examined : 1**F**, Ranipool, Dist. East Sikkim, Sikkim, 5.iv.1994, coll. *P.H.Roy & party.*

Distribution : India : Sikkim, Dist. East Sikkim (New record); West Bengal.

Elsewhere : Burma, Indonesia, Sri Lanka, Java, Sumatra, Borneo.

49. ***Pardosa rhenockensis*** (Tikader)

1970. *Lycosa rhenockensis* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 68.

1980. *Pardosa rhenockensis* : Tikader & Malhotra, *Fauna of India,* Araneae : Spiders **1**(2) : 342.

Distribution : India : Sikkim, Dist. East Sikkim; Gujarat.

50. ***Pardosa sumatrana*** (Thorell)

1890. *Lycosa sumatrana* Thorell, *Ann. Mus. Stor. nat. Genova,* **30** : 136.

1951. *Pardosa sumatrana* : Sinha, *Rec. Indian Mus.*, **48**(2) : 33.

1980. *Pardosa sumatrana* : Tikader & Malhotra, *Fauna of India,* Araneae : Spiders, **1**(2) : 353.

1992. *Pardosa sumatrana* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 445.

1995. *Pardosa sumatrana* : Biswas & Majumder, *Fauna of Meghalaya,* Part II, Araneae : Spiders, State Fauna Series No. **4** : 111.

Material examined : 2 Female, Rabangla, Dist. South Sikkim, Sikkim, 7.x.1998, coll. *V.C.Agarwal;* 2 Female,, 1 Male, Sawrini, Dist. North Sikkim, Sikkim, 22.ii.1994, coll. *L. K. Ghosh;* 1 Female, 1 Male, Darpmdin, Dist. North Sikkim, Sikkim, 24.ii.1994, coll. *L. K. Ghosh.*

Distribution : India : Sikkim, Dists. South Sikkim, North Sikkim (New record); West Bengal; Karnataka; Tamil Nadu; Andhra Pradesh; and all over India. Elsewhere : Bangla Desh, Pakistan, Sri Lanka, Sumatra.

29. Genus ***Lycosa*** Latreille

1804. *Lycosa* Latereille, *Nouv. Dist. d'Hist. Nat.*, **24** : 135.

1970. *Lycosa* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 63.

1980. *Lycosa* : Tikader & Malhotra, *Fauna of India,* Araneae : Spiders, **1**(2) : 377.

1992. *Lycosa* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 440.

1995. *Lycosa* : Biswas & Majumder, *Fauna of Meghalaya,* Part II, Araneae : Spiders, State Fauna Series No. **4** : 111.

Type-species : *Lycosa tarantula* Rossi

Distribution : Cosmopolitan.

Key to the species of the genus *Lycosa* Latreille

1. Coxae of all legs pale ventrally and extremeties of ventral side of IV tibia without any band ..... *carmichaeli*

   Coxae of all legs not pale ventrally and extremeties of ventral side of IV tibia provided with band 2

2. Carapace reddish brown and the femora of legs provided with light green patches .... *kempi*

   Carapace not reddish brown and the femora of the legs not provided with light green patches 3

3. Ventral side of the tivia IV not provided with broad dark brown band..... ..... *nigrotibialis*

Ventral side of the tibia IV provided with dark brown band 4

4. Anterior portion of median piece of vulva exposed throughout ..... *rothaka*

Anterior portion of median piece of vulva not exposed throughout 5

5. Coxae of all legs provided with brown patches, dorsum of abdomen dark brown with small pale patches ..... *tista*

51. *Lycosa carmichaeli* Gravely

1924. *Lycosa carmichaeli* Gravely, *Rec. Indian Mus.*, **26** : 604.

1951. *Lycosa carmichaeli* : Sinha, *Rec. Indian Mus.*, **48**(2) : 32.

1980. *Lycosa carmichaeli* : Tikader & Malhotra, *Fauna of India, Araneae* : Spiders **1**(2) : 407.

1992. *Lycosa carmichaeli* : Biswas and Biswas, *Fauna of West Bengal*, Part III, Araneae : Spiders, State Fauna Series No. **3** : 441.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Assam; Uttar Pradesh.

52. *Lycosa kempi* Gravely

1924. *Lycosa kempi* Gravely, *Rec. Indian Mus.*, **26** : 602.

1970. *Lycosa kempi* : Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 65.

1980. *Lycosa kempi* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, **1**(2) : 389.

1995. *Lycosa kempi* : Biswas & Majumder, *Fauna of Meghalaya*, Part II, Araneae : Spiders, State Fauna Series No. **4** : 112.

Distribution : India : Sikkim, Dist. West Sikkim; Assam; West Bengal. Elsewhere : Bhutan, Pakistan.

53. *Lycosa nigrotibialis* Simon

1884. *Lycosa nigrotibialis* Simon, *Ann. Mus. stor. Nat.*, Genova, **20** : 330.

1900. *Lycosa nigrotibialis* : Pocock, *Fauna of British India Archn.*, : 253.

1964. *Lycosa nigrotibialis* : Tikader, *Rec. Indian Mus.*, **59**(3) : 266.

1980. *Lycosa nigrotibialis* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders **1**(2) : 405.

1995. *Lycosa nigrotibialis* : Biswas & Majumder, *Fauna of Meghalaya*, Part II, Araneae : Spiders, State Fauna Series No. **4** : 112.

Distribution : India : Sikkim, Dist. West Sikkim; Assam; Bihar, Himachal Pradesh; Gujarat; Maharashtra; Meghalaya; West Bengal. Elsewhere : Afganisthan, Burma, Pakistan.

54. *Lycosa rothaka* Tikader

1970. *Lycosa rothaka* : Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 64.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

55. *Lycosa tista* Tikader

1970. *Lycosa tista* Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 67.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

Family PISAURIDAE Simon

Key to the genera of the family PISAURIDAE Simon

1. Ocular area longer than wide, anterior eyes short, recurved and similar in size .... *Pisaura*

Ocular area not longer than wide, anterior eyes not short and in same size 2

2. Anterior row of eyes slightly procurved, middle eyes larger and little close to laterals ..... *Tinus*

30. Genus *Pisaura* Simon

1885. *Pisaura* Simon, Ann. Soc. Ent., *France*, : 254.

1992. *Pisaura* : Biswas and Biswas, *Fauna of West Bengal*, Part III, Araneae : Spiders, State Fauna Series No. **3** : 447.

Type-species : *Pisaura mirabillis* (Clerck)

Distribution : Cosmopolitan except Australia.

56. *Pisaura gitae* Tikader

1970. *Pisaura gitae* Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 59.

1992. *Pisaura gitae* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 447.

Diagnosis : Cephalothorax and abdomen light to deep brown, legs green in colour. Cephalic region slightly high, clothed with thick fine hair. Base of each eye encirecled with black patch. The lower margin of furrow of the chelicerae armed with three teeth. Legs are long, strong, clothed with hair and spines. Dorsum with two longitudinal white lines extending from base to end of abdomen.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal.

31. Genus ***Tinus*** Cambridge

1901. *Tinus* Cambridge, *Biol. Centn. Amer. Ar.*, **2** : 310.

1940. *Tinus* : Comstock, *The Spider Book,* New York, : 631.

Type species : Tinus nigrinus Cambridge

Distribution : Cosmopolitan except Australia.

57. ***Tinus sikkimus*** Tikader

1970. *Tinus sikkimus* Tikader, *Rec. zool. Surv. India.*, **64** (1-4) : 61.

Diagnosis : Cephalothorax brown, legs green and abdomen deep brown in colour. Cephalic region slightly high narrowing in front, longer than wide, middle with a longitudinal brown patch. Anterion eyes are slightly procurved, middle large and little close to the laterals. Posterior row strongly recurved and nearly equal in size. Sternum heart-shaped, pointed behind, pale in colour. Legs are very long and strong. Abdomen longer than wide, lateral sides provided with a longitudinal whitish band and middle on the anterior half of abdomen with a lance-shaped light brown patch.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

Family TETRAGNATHIDAE Menge

32. Genus ***Eucta*** Simon

1881. *Eucta* Simon, *Ar. Fr.*, **5** : 5.

1921. *Eucta* : Gravely, *Rec. Indian Mus.*, Calcutta, **22** : 446.

Diagnosis : The genus *Eucta* is abundant at near water, differs from *Tegragnatha* only having the abdomen produced beyond the spinnerets into a pointed tail.

Type-species : *Eucta gallica* Simon

Distribution : India, Europe, Japan, Malaysia.

58. ***Eucta javana*** Thorell

1895. *Eucta javana* Thorell, *Spiders of Burma,* : 146.

1970. *Eucta javana* : Tikader, *Rec. zool. Surv. India,* **64** (1-4) : 37.

1981. *Eucta javana* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 46.

1992. *Eucta javana* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 447.

Diagnosis : Cephalothorax and legs are greenish, abdomen silvery white in colour. Cephalic region slightly high with prominent cephalic groove. Anterior row of eyes straight, posterior row strongly recurved. In female the tooth on either side of the fang-groove situated far from the first tooth; second dorsal tooth opposite the third ventral, third opposite the fourth ventral and so on. Each row consists of about six to eight teeth, but usually one or two lesser in the dorsal row than ventral. In the well developed specimen in addition to these teeth a conical denticle at about the middle of the dorsal surface on the inner side. Legs long, slender, clothed with hair and few spines, first pair of legs very long and stout. Abdomen very long, pointed behind, slightly over-lapping the posterior region of cephalothorax. Abdomen produced beyond the spinnerets into a pointed tail.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Orissa; Bihar; Karnataka; Tamil Nadu.

Family ARANEIDAE Latreille

Key to the Sub-family of the family ARANEIDAE Latreille

1. Posterior row of eyes nearly straight or recurved; lateral eyes subequal .... *Araneinae*

Posterior row of eyes not straight or recurved; lateral eyes not subequal 2

2. Spinnerets situated on an elevated circular space surounded by a thick flange in the form of a ring; abdomen hard flattened dorsally and provided with conical humps and spines ..... Gasteracanthinae

Spinnerets not surrounded by thick flange in the form of a ring; abdomen not hard and not provided with conical humps and spines 3

3. Epigastric plates with transverse furrow; chelicerae with rudimentary boss .... Metinae

Epigastric plates not provided with transverse furrow; chelicerae usually having well developed boss 4

4. Labium longer than wide; abdomen two and one half to three times as long as wide; tarsus IV not provided with subtentaculum ..... Nephilinae

Sub-family ARANEINAE

Key to the genera of the Sub-family ARANEINAE

1. Thoracic groove transverse; epigyne with distinct scape, often wrinkled, not provided with any lateral lobes ..... *Araneus*

Thoracic groove not transverse, epigyne without scape, and with lateral lobes 2

2. Eyes of anterior row not evenly spaced or medians closer to each other than laterals .....*Argiope*

Eyes of anterior row evenly spaced or medians not closer to each other than to laterals 3

3. Tail of abdomen pointed; with branches and anteriorly with large sharp shoulder..... ..... *Arachnura*

Tail of abdomen not pointed and without branches and anteriorly without large sharp shoulder 4

4. Spinnerets not encircled by horny ring; abdomen high in front, irregularly tuberculated on the dorsum..... *Caerostris*

Spinnerets encircled by horny ring; abdomen not high in front and not irregularly tuberculated on the dorsum 5

5. Posterior median eyes very close, nearly touching, carapace provided with 'U' shaped junction between cephalic and thoracic region ..... *Cyclosa*

Posterior median eyes not very close, carapace not having any 'U' shaped junction between cephalic and thoracic region 6

6. Carapace flat with distinct thoracic furrow; abdomen anteriorly very high and provided with at least one pair shoulder humps .... *Cyrtophora*

There is no distinct thoracic furrow and flat carapace; abdomen not high and not provided with shoulder humps.....7

7. Thoracic groove longitudinal epigyne with unwrinkled scape and provided with one or two pairs of lateral lobes ..... *Neoscona*

Thoracic groove not longitudinal and not provided with lateral lobes.....8

8. Carapace with cephalic region bulging behind the ocular area, also provided with granules; anterior row of eyes procurved; epigyne with short beak like scape .... *Parawixia*

Carapace with cephalic region not bulging and granules; no beak like scape on epigyne 9

9. Abdomen a high behind its middle as at its base, and elliptical in outline or boarder behind the middle; small species with short legs ..... *Singa*

Abdomen not high at its base, outline is not broader and elliptical 10

10. Cephalic region buna of West Bengan light coloured and provided with very few hair; dorsum of abdomen with distinct folium. ..... *Zygeilla*

33. Genus *Araneus* Clerck

1757. *Araneus* Clerck, *Argn. Suec.*, : 15.

1982. *Araneus* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 219.

Type-species : *Araneus angulatus* Clerck

Distribution : Cosmopolitan.

59. *Araneus dehhanii* (Doleschall)

1859. *Epeira dehhanii* Doleschall, *Yerh. Nat. verem. Nederland Indie,* **5**(5) : 33.

1970. *Araneus dehhanii* : Tikader, *Rec. zool. Surv. India,* **64** (1-4) : 30.

1992. *Araneus dehhanii* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 452.

Diagnosis : Cephalothorax, legs and abdomen reddish brown to dark brown in colour; longer than wide, narrowing in front, clothed with white pubescence, hair and spines with granular base. Thoracic region provided with transverse groove. Anterior median eyes larger than that of the posterior medians. Lateral eyes both the rows nearly same size, close and situated on the base of horn like projection. Chelicerae strong, provided with moderate boss. Legs long and stout, clothed with pubescence; hair and spines. Abdomen triangular, longer than wide, provided with two conspicuous pointed shoulder humps. Epigyne provided with a stout beak like scape bent at rightangle to the base.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Mysore; Assam. Elsewhere : Burma, Indo and Austro-Malaysia, Malay Peninsula, Sri Lanka.

34. Genus *Argiope* Audouin

1826. *Argiope* Audouin, in Savigny, *Descriptions de l'Egypte,* **1** (4) : 121.

1982. *Argiope* : Tikader, *Fauna of India,* Araneae : Spiders **2** (1) : 111.

Type-species : Argiope lobata (Thorell)

Distribution : Tropical and temperate countries of the world.

Key to the species of the genus *Argiope* Audouin

1. Abdomen broadly oval and conspicuously truncated anteriorly; dorsum provided with black transverse stripes and forming a net-work on the posterior half ..... *aemula*

   Abdomen elongated oval with no truncated anteriorly; dorsum with no net-work of black stripes 2

2. Maxillae roundish in shape, dark brown at the proximal part ..... *pulchella*

   Maxillae not roundish in shape, not dark brown at the proximal part 3

3. Legs are black and without band .... *sikkimensis*

60. *Argiope aemula* (Walckenaer)

1841. *Epeira aemula* Walckenaer, *Hist. Nat. Ins. Apt.,* **2** : 118.

1970. *Argiope aemula* : Tikader, *Rec. zool. Surv. India,* **64** (1-4) : 29.

1982. *Argiope aemula* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 119.

1992. *Argiope aemula* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae: Spiders, State Fauna Series No. **3** : 452.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Andaman Nicobar Islands; Gujarat ; Maharashtra; Tamil Nadu. Elsewhere : Burma, Sri Lanka, Indo and Austro-Malaysia.

61. *Argiope pulchella* Thorell

1881. *Argiope pulchella* Thorell, *Annali. Mus. civ. Geneva,* **18** : 74.

1982. *Argiope pulchella* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 129.

1992. *Argiope pulchella* : Biswas and Biswas, *Fauna of West Bengal, Part III,* Araneae : Spiders, State Fauna Series No. **3** : 445.

Material examined : 1 Female, Around Lachung, Dist. North Sikkim, Sikkim, 25.iv.1991, coll. *K.P. S. & party;* 1 Female, Ranikhota, Dist. East Sikkim, Sikkim, 30.x.1992, coll. *A. K. Hazra & party;* 2 Female, ICAR Rest House, Tadong,

Dist. East Sikkim, Sikkim, 30.x.1994, coll. *G. Sen;* 2 Female, Namchi, Dist. East Sikkim, Sikkim, 13.v.1995, coll. *P. H. Roy & party*; 1 Female, Jalipool, Dist. East Sikkim, Sikkim, 6.iv.1995, coll. *P. H. Roy & party;* 1 Female, Malli, Dist. South Sikkim, Sikkim, 13.iv.1995, coll. *P. H. Roy & party;* 1 Female, Signtom, Dist. South Sikkim, Sikkim, 9.x.1995, coll. *S. C. Mitra & party;* 1 Female, Tin Tin, Dist. South Sikkim, Sikkim, 20.x.1995, coll. *S. C. Mitra & party.*

Distribution : India : Sikkim, Dists. East Sikkim, West Sikkim, North Sikkim, South Sikkim; West Bengal; Assam; Orissa; Tamil Nadu. Elsewhere : Burma, Malaya Peninsula.

62. *Argiope sikkimensis* Tikader

1970. Argiope sikkimensis *Tikader,* Rec. zool. Surv. India, **64** (1-4) : 28.

Distribution : India : Sikkim, Dist. East Sikkim (Type locality only).

35. *Genus* ***Arachnura*** Vinson

1863. *Arachnura* Vinson, *Aran. Reun.,* : 287.

1970. *Arachnura* : Tikader, *Rec. zool. Surv. India,* **64** (1-4) : 30.

1982. *Arachnura* : Tikader, *Fauna of India,* Araneae : Spiders **2**(1) : 210.

Type-species : *Arachnura scorpionides* Vinson

Distribution : Tropical and sub-tropical region of the world except America and Australia.

63. *Arachnura angura* Tikader

1970. *Arachnura angura* Tikader, *Rec. zool. Surv. India,* **64** (1-4) : 30.

1982. *Arachnura angura* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 210.

Diagnosis : Cephalothorax and legs are yellowish with brownish patches, abdomen greyish with white and brown patches; narrowing in front, a mid-longitudinal brown line from behind the occular quad to the posterior end. Ocular quad much longer than wide and wider in front. Both rows of eyes are recurved but posterior row very narrowly recurved. Chelicerae weak, yellowish, provided with moderate boss. Legs are rather short and stout, clothed with pubescence and hair. Abdomen elongated provided with two very prominent shoulder humps. Dorsum brownish laterally and a pair of submedian light greenish lines from the shoulder humps to the posterior end.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

36. Genus ***Caerostris*** Thorell

1868. *Caerostris* Thorell, *Eug. Resa. Arachn.,*: 3.

1982. *Caerostris* : Tikader, *Fauna of India,* Araneae : Spiders, **2** (1) : 131.

Type-species : *Caerostris mitralis* (Vinson)

Distribution : Tropical Africa, Asia, Madagascar.

64. *Caerostris bhabanii* Tikader

1970. *Caerostris bhabanii* Tikader, *Rec. zool. Surv. India,* **64** (1-4) : 34.

Diagnosis : Cephalothorax, legs and abdomen are reddish to deep brown, very much narrowing in front, clothed with fine hair; cephalic region raised and pointed behind. Eyes are small and pearly white, lateral eyes not contiguous and situated far away from each other. Ocular quad longer than wide. Abdomen longer than wide, clothed with small and fine hair. Anterior lateral border raised in front into a pair of large pointed probuberances and lateral side of abdomen provided with four pairs of small tubercles, arranged longitudinally.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

37. Genus ***Cyclosa*** Menge

1866. *Cyclosa* Menge, *Preuss. Spinn.,* **1** : 73.

1982. *Cyclosa* : Tikader, *Fauna of India,* Araneae : Spiders, **2** (1) : 183.

Type-species : *Cyclosa conica* (Pallas)

Distribution: Cosmopolitan.

Key to the species of the genus *Cyclosa* Menge

1. Less prominent tubercles present anteriorly;

two median caudal tubercles arranged vertically; epigyne having thin narrow scape ..... *fissicauda*

Caudal tubercle may or may not bifurcated; epigyne without thin scape but a bulding structure 2

2. Caudal tubercle short and blunt; bent tip of the scape rather long ..... *insulana*

65. *Cyclosa fissicauda* Simon

1889. *Cyclosa fissicauda* Simon, *J. Asiat. Soc. Bengal,* **58** : 338.

1982. *Cyclosa fissicauda :* Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 189.

Material examined : 1 Female, Tumin, Dist. East Sikkim, Sikkim, 28.ix.1988. coll. *V.C. Agarwal.*

Distribution : India : Sikkim, Dists. East Sikkim, West Sikkim.

66. *Cyclosa insulana* (Costa)

1834. *Epeira insulana* Costa, *Ann. Zool.,* : 65.

1892. *Cyclosa insulana* : Thorell, *Ann. Mag. nat. Hist.,* **9**(6) : 232.

1982. *Cyclosa insulana* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 201.

1992. *Cyclosa insulana* : Biswas and Biswas, Fauna of West Bengal, Part III, Araneae : Spiders, State Fauna Series No. **3** : 457.

1995. *Cyclosa insulana* : Biswas & Majumder, *Fauna of Meghalaya,* Part II, Araneae : Spiders, State Fauna Series No. **4** : 102.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Meghalaya; Maharashtra. Elsewhere : Burma, Nepal, Sri Lanka.

38. Genus *Cyrtophora* Simon

1864. *Cyrtophora* Simon, *Hist. Nat. des Araign.,* **1** : 261.

1962. *Cyrtophora* : Tikader, *J. Linn. Soc.,* London, **44**(300) : 561.

1982. *Cyrtophora* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 171.

Type-species : *Cyrtophora citricola* (Forskal)

Distribution : Tropical and sub-tropical countries of the world.

Key to the species of the genus *Cyrtophora* Simon

1. Abdomen sub-oval; carapace having blackish patches laterally as well as mid-longitudinally; epigyne with no median septum ..... *bidenta*

Abdomen elongated; carapace not having blackish patches; epigyne provided with a distinct median septum 2

2. Abdomen oval; dorsum of abdomen decorated with numerous small white spots and no black patches; carapace uniformly blackish..... *moluccensis*

67. *Cyrtophora bidenta* Tikader

1970. *Cyrtophora bidenta* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 32.

1982. *Cyrtophora bidenta* : Tikader, *Fauna of India,* Araneae : Spiders **2**(1) : 174.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

68. *Cyrtophora moluccensis* (Doleschall)

1857. *Epeira moluccensis* Doleschall, *Natuurw. Tijdschr. Ned. Indie,* **13** : 418.

1970. *Cyrtophora moluccensis* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 32.

1982. *Cyrtophora moluccensis* : Tikader, *Fauna of India,* Araneae : Spiders **2**(1) : 172.

1992. *Cyrtophora moluccensis* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 461.

Distribution : India : Sikkim, Dist. East Sikkim; West Bengal; Andaman Nicobar Islands; Kerala; Karnataka; Madhya Pradesh. Elsewhere : Burma, Nepal, Sri Lanka, Austro-Malaysia.

39. Genus *Neoscona* Simon

1864. *Neoscona* Simon, *Hist. Nat. des Araign,* **1** : 261.

1971. *Neoscona* : Levi, *Bull. Mus. comp. Zool.,* **141**(8) : 465.

1981. *Neoscona* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 22.

Type-species : *Neoscona anabesca* (Walckenaer)

Distribution : Cosmopolitan.

Key to the species of the genus *Neoscona* Simon

1. Cephalothorax provided with a conspicuous dark brown 'V' shaped patch; epigynal scape with deep constriction ..... *mukerjei*

   Cephalic region not having any 'V' shaped patch; epigynal scape without deep constriction 2

2. Sternum dark brown with longitudinal white-band; epigynal scape with no prominent rim, constriction present behind the lateral lobe ..... *theis*

69. *Neoscona mukerjei* Tikader

1980. *Neoscona mukerjei* Tikader, *Proc. Indian Acad. Sci.*, **89**(3) : 247.

1982. *Neoscona mukerjei* : Tikader, *Fauna of India*, Araneae : Spiders, **2**(1) : 248.

1992. *Neoscona mukerjei* : Biswas and Biswas, *Fauna of West Bengal*, Part III, Araneae : Spiders, State Fauna Series No. **3** : 467.

1995. *Neoscona mukerjei* : Biswas & Majumder, *Fauna of Meghalaya*, Part II, Araneae : Spiders, State Fauna Series No. **4** : 98.

Material examined : 1 Female, R.P.H. compound, Dist. South Sikkim, Sikkim, 10.x.1994, coll. *G. C. Sen & party;* 1 Female, Tadong, Dist. East Sikkim, Sikkim, 11.iii.1994, coll. *L. K. Ghosh;* 5 Female, Tumin, Dist. East Sikkim, Sikkim, 23.ix.1988, coll. *V. C. Agarwal;* 1 Female, Rabangla, Dist. South Sikkim, Sikkim, 6.x.1988, coll. *V. C. Agarwal.*

Distribution : India : Sikkim, Dists. East Sikkim, South Sikkim (New record); West Bengal; Maharashtra; Meghalaya.

70. *Neoscona theis* (Walckenaer)

1841. *Epeira theis* Walckenaer, *Hist. Nat. Ins. Apt.*, **2** : 53.

1982. *Neoscona theis* : Tikader, *Fauna of India*, Araneae : Spiders, **2**(1) : 269.

1992. *Neoscona theis* : Biswas and Biswas, *Fauna of West Bengal*, Part III, Araneae : Spiders, State Fauna Series No. **3** : 468.

1995. *Neoscona theis* : Biswas and Majumder, *Fauna of Meghalaya*, Part II, Araneae : Spiders, State Fauna Series No. **4** : 98.

Material examined : 3 Female, Rabangla, Dist. South Sikkim, Sikkim, 6.x.1988, coll. *V. C. Agarwal;* 1 Female, Tumin, Dist. East Sikkim, Sikkim, 28.ix.1988, coll. *V. C. Agarwal;* 1 Female, Tumin, Dist. East Sikkim, Sikkim, 23.ix.1988, coll. *V. C. Agarwal.*

Distribution : India : Sikkim, Dists. East Sikkim, South Sikkim (New record); West Bengal; Meghalaya; Orissa; Maharashtra; Gujarat. Elsewhere : South New Guinea.

40. Genus *Parawixia* F.O.P. Cambridge

1904. *Parawixia* F. O. P. Cambridge, *Biologia cent. am. (Zool.).*, **2** : 487.

1936. *Parawixia* : Chamberline & Ive, *Bull. Univ. Utah. Biol.*, **27**(5) : 52.

Type-species : *Parawixia destricta* (O.P.Cambridge)

Distribution : Cosmopolitan except Australia.

71. *Parawixia dehaanii* (Doleschall)

1859. *Epeira dehaanii* Doleschall, *Act. Soc. Ind. Neerl.*, **5**(5) : 33.

1970. *Parawixia dehaanii* : Tikader, Rec. zool. Surv. India, **64**(1-4) : 30.

1982. *Parawixia dehaanii* : Tikader, *Fauna of India*, Araneae : Spiders, **2**(1) : 212.

1992. *Parawixia dehaanii* : Biswas and Biswas, *Fauna of West Bengal*, Part III, Araneae : Spiders, State Fauna Series No. **3** : 463.

Diagnosis : Cephalothorax and legs are reddish brown, abdomen dark brown in colour. Cephalic region longer than wide, narrowing in front, clothed with white pubescence, hair and spines and granular base. Cephalothorax much elevated in the middle then forming a ridge behind the ocular area. Thoracic region provided with transverse groove. Ocular quad situated on an elevation, slightly wider in front that behind. Anterior median eyes larger than the posterior medians. Lateral eyes of both the rows nearly same size, close and situated on the base of horn-like projection. Anterior row of eyes procurved and

posterior row of eyes are recurved. Sternum heart-shaped pointed behind, reddish brown in colour, clothed with pubescence and hair with granular base. Chelicerae strong, reddish brown, provided with the moderate base. Abdomen triangular, longer than wide, clothed with two pointed tail hump at the posterior end. Five pairs of sigilla on the dorsum.

Material examined : 1 Female, Ramtek, Dist. East Sikkim, Sikkim, 11.ix.1993, coll. *S. K. Chatterjee.*

Distribution : India : Sikkim, Dists. East Sikkim, West Sikkim; West Bengal; Karnataka. Elsewhere : Burma, Java, Japan, Indo and Austro-Malaysia, Sumatra.

41. Genus ***Singa*** Koch

1836. *Singa* Koch, *Ar.*, **3** : 42.

1970. *Singa* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 35.

1981. *Singa* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30**(1) : 43.

1992. *Singa* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 464.

Type-species : *Singa hamata* Koch

Distribution : Asia, America and Europe.

72. ***Singa chota*** Tikader

1970. *Singa chota* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 35.

1992. *Singa chota* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 464.

Diagnosis : Cephalothorax and legs are light green, abdomen shiny white. Cephalic region slightly narrow and high, provided with conspicuous reddish brown colour. Eyes are pearly white, anterior row recurved, lateral eyes almost contiguous. Ocular quad longer than wide and narrowing behind. Legs are long and strong, clothed with hair and few spines. Abdomen is elliptical in outline, dorsal side with shiny white, provided with a longitudinal brown cracked line or lines.

Distribution : India : Sikkim, Dist. west Sikkim; West Bengal; Maharashtra.

42. Genus ***Zygeilla*** F.O.P. Cambridge

1902. *Zygeilla* F.O.P. Cambridge, *Ann. Mag. nat. Hist.,* **9**(7) : 15.

1982. *Zygeilla* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 214.

Type-species : *Zygeilla atrica* (C.L.Koch)

Distribution : Cosmopolitan.

73. ***Zygeilla melanocrania*** (Thorell)

1887. *Epeira melanocrania* Thorell, *Annali. Mus. civ. Genova,* **25** : 209.

1982. *Zygeilla melanocrania* : Tikader, *Fauna of India,* Araneae : Spiders **2**(1) : 215.

1992. *Zygeilla melanocrania* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 465.

Diagnosis : Cephalothorax longer than wide, narrowing in front; cephalic region with very few hair and darker in colour. Ocular quad slightly longer than wide and wider in front than behind. Anterior median eyes larger than posterior medians. Sternum heart-shaped, pointed behind. Chelicerae moderately strong, deep brownish, provided with distinct boss. Abdomen oval, longer than wide, no humps and clothed with hair. Epigyne with no scape, having semicircular openings on the ventral side.

Material examined : 2 Female, Rabangla, Dist. South Sikkim, Sikkim, 7.x.1988, coll. *V. C. Agarwal.*

Distribution : India : Sikkim, Dist. South Sikkim (New record); West Bengal; Orissa. Elsewhere : Burma, Pakistan.

Sub-Family GASTERACANTHINAE

43. Genus ***Gasteracantha*** Sundevall

1833. *Gasteracantha* Sundevall, *Conspectus Arachniden,* : 14.

1982. *Gasteracantha* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 52.

Type-species : *Gasteracantha caneriformis* (Linn.)

Distribution : Tropical countries of the world.

Key to the species of the genus *Gasteracantha* Sundevall

1. Median spines minute and simple .... *brevispina*

   Median spines not minute and simple 2

2. Dorsum of abdomen provided with three conspicuous transverse yellowish bars .... *diadesmia*

   Dorsum of abdomen not provided with three conspicuous transverse yellowish bars 3

3. Length of median spines slightly less than half the width of abdomen at the base of anterior spines ..... *hasselti*

   Length of median spines greater than width of abdomen at the base of the anterior spines 4

4. Posterior spines not abruptly narrowed at the apex ..... *leucomelaena*

   Posterior spines abruptly narrowed at the apex 5

5. Spines provided with conspicuous bulge base and abruptly narrowed at the apex .. .. *unguifera*

74. *Gasteracantha brevispina* (Doleschall)

1857. *Plectana brevispina* Doleschall, *Nat. Tij. Nederland Indie,* **13** : 423.

1970. *Gasteracantha brevispina* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 38.

1992. *Gasteracantha brevispina* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 470.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Andaman and Nicobar Islands; Tamil Nadu; Uttar Pradesh. Elsewhere : Burma, Austro-Malaysia.

75. *Gasteracantha diadesmia* Thorell

1887. *Gasteracantha diadesmia* Thorell, *Ann. Mus. civ. Genova,* **25** : 225.

1970. *Gasteracantha diadesmia* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 40.

1992. *Gasteracantha diadesmia* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 470.

1995. *Gasteracantha diadesmia* : Biswas & Majumder, Fauna of Meghalaya, Part II, Araneae : Spiders, State Fauna No. **4** : 96.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Andaman and Nicobar Islands. Elsewhere : Burma.

76. *Gasteracantha hasselti* C. L. Koch

1838. *Gasteracantha hasselti* C.L.Koch, *Die, Arachniden,* **4** : 29.

1970. *Gasteracantha hasselti* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 41.

1992. *Gasteracantha hasselti* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 470.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Andaman and Nicobar Islands. Elsewhere : Burma.

77. *Gasteracantha leucomelaena* (Doleschall)

1857. *Plectana leucomelaena* Doleschall, *Verh. Nat. Vereen. Nederland Indie,* **5**(5) : 42.

1970. *Gasteracantha leucomelaena* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 40.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal; Assam; Bihar; Andaman and Nicobar Islands. Elsewhere : Bhutan, Burma, Japan, Malaysia.

78. *Gasteracantha unguifera* Simon

1839. *Gasteracantha unguifera* Simon, *J. Asiat. Soc.* Bengal, **58** : 336.

1970. *Gasteracantha unguifera* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 38.

1992. *Gasteracantha unguifera* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 471.

Distribution : India : Sikkim, Dist. West Sikkim; West Bengal.

Sub-family METINAE

44. Genus ***Leucauge*** White

1841. *Leucauge* White, *Ann. Mag. nat. Hist.*, **7**(1) : 473.

1982. *Leucauge* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 71.

Type-species : *Leucauge hortorum* (Hentz)

Distribution : Tropical and sub-tropical countries of the world.

Key to the species of the genus *Leucauge* White

1. Abdomen uniformly silver white and decorated with longitudinal black bands; mid-anteriorly provided with a shallow depression ..... *celebesiana*

   Abdomen having some silver white speaks and not decorated with longitudinal black bands; no depression anteriorly 2

2. Both paired tubercles and median caudal tubercle are highly prominent.... *decorata*

   Both paired tubercles and median caudal tubercle are not present 3

3. One paired black spots at the posterior end of abdomen ..... *pondae*

   No black spots at the posterior end of abdomen 4

4. Abdomen with two blunt rounded prominences and blunt caudal hump at the posterior end ..... *tessellata*

79. ***Leucauge celebesiana*** (Walckenaer)

1841. *Tetragnatha celebesiana* Walckenaer, *Hist. Nat. Ins. Apt.*, **2** : 222.

1970. *Leucauge celebesiana* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 42.

1992. *Leucauge celebesiana* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 472.

1995. *Leucauge celebesiana* : Biswas & Majumder, *Fauna of Meghalaya,* Part II, Araneae : Spiders, State Fauna Series No. **4** : 100.

Material examined : 19 Female, Mangan, Dist. North Sikkim, Sikkim, 11.iv.1992, coll. *A. K. Lahiri & party;* 6 Female, P.W.D. banglow, Mangan, Dist. North Sikkim, Sikkim, 10.iv.1992, coll. *A. K. Lahiri & party;* 5 Female, Rongram, Dist. North Sikkim, Sikkim, 12.iv.1992, coll. *A. K. Lahiri & party;* 2 Female, Rabangla, Dist. South Sikkim, Sikkim, 7.x.1988, coll. *V.C.Agarwal,* 1 Female, Singlik, Dist. South Sikkim, Sikkim, 3.xi.1992, coll. *A. K. Hazra and party;* 1 Female, Chungthang, Dist. North Sikkim, Sikkim, 1.x.1993, coll. *T. K. Pal & party;* 4 Female, Lachung, Dist. North Sikkim, Sikkim, 25.iv.1991, coll. *K. P. S. & party;* 2 Female, Tista river, on the jungle, Dist. North Sikkim, Sikkim, 21.iv.1991, coll. *K. P. S. & party;* 4 Female, Mangan Road, Dist. North Sikkim, Sikkim, 23.iv.1991, coll. *K.P.S. & Party;* 4 Female, River side of Lachung, Dist. North Sikkim, Sikkim, 22.iv.1991, coll. *K.P.S. & Party;* 2 Female, Rabangla, Dist. South Sikkim, Sikkim, 8.x.1988, coll. *V.C.Agarwal;* 3 Female, Gayzing, Dist. South Sikkim, Sikkim, 17.x.1995, coll. *S.C.Mitra & party;* 5 Female, Resibazar, Dist. South Sikkim, Sikkim, 19.x.1995, coll. *S.C.Mitra & party.*

Distribution : India : Sikkim, Dists. North Sikkim, South Sikkim; Assam; West Bengal; Meghalaya; Maharashtra; Tamil Nadu. Elsewhere : Burma, China, Sri Lanka.

80. ***Leucauge decorata*** (Blackwall)

1864. *Tetragnatha decorata* Blackwall, *Ann. Mag. nat. Hist.* **14**(3) : 44.

1970. *Leucauge decorata* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 41.

1992. *Leucauge decorata* : Biswas and Biswas, *Fauna of West Bengal,* Part.III, Araneae : Spiders, State Fauna Series No. **3** : 472.

1995. *Leucauge decorata* : Biswas & Majumder, *Fauna of Meghalaya,* Part II, Araneae : Spiders, State Fauna Series No. **4** : 100.

Distribution : India : Sikkim, Dists. East Sikkim, West Sikkim; Assam; West Bengal; Bihar, Meghalaya; Pondicheri; Gujarat; Karnataka; Kerala. Elsewhere : Burma, Pakistan, Sri Lanka.

81. *Leucauge pondae* Tikader

1970. *Leucauge pondae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 44.

1982. *Leucauge pondae* : Tikader, *Fauna of India,* Araneae : Spiders. **2**(1) : 89.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

82. *Leucauge tessellata* (Thorell)

1887. *Callinethis tessellata* Thorell, *Ann. Mus. civ. Genova,* **25** : 135.

1970. *Leucauge tessellata* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 43.

1992. *Leucauge tessellata* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna series No. **3** : 473.

Distribution : India : Sikkim, Dist. East Sikkim; Assam; West Bengal; Gujarat; Karnataka; Kerala. Elsewhere : Burma, Bhutan.

Sub-family NEPHILINAE

45. Genus *Nephila* Leach

1815. *Nephila* Leach, *Zoological Miscellany,* : 133.

1981. *Nephila* : Tikader & Biswas, *Rec. zool. Surv. India,* occ. pap. No. **30** (1) : 37.

1982. *Nephila* : Tikader, *Fauna of India,* Araneae : Spiders, **2**(1) : 94.

Diagnosis : Cephalic region convex and moderately high, generally armed posteriorly with two tubercles; ocular quad nearly square. Legs are very long, clothed with spines, metatarsi longer than tibiae and patella. Vulva not well developed. Male very small, with simple palpus.

Type-species : *Nephila maculata* (Fabricious)

Distribution : Tropical and rarely sub-tropical countries of the world.

Key to the species of the genus *Nephila* Leach

1. Carapace provided with 'V' shaped yellow patch ..... *clavata*

   Carapace without 'V' shaped yellow patch 2

2. Cephalothorax relatively broad in front; a deep groove in the middle; with sharp pair of tubercles ..... *maculata*

   Cephalothorax not broad in front; no deep groove and sharp pair of tubercles 3

3. Abdomen oval; carapace provided with very strong and stout spines with prominent boss; epigyne having distinct semicircular rim ..... *malabarensis*

83. *Nephila clavata* L. Koch

1878. *Nephila clavata* L. Koch. *Verh. zool.- bot. Ges. Wien.,* **27** : 741.

1970. *Nephila clavata* : Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 46.

1992. *Nephila clavata* : Biswas and Biswas, *Fauna of West Bengal,* Part III, Araneae : Spiders, State Fauna Series No. **3** : 474.

Material examined : 1 Female, Resi bazar, Dist. South Sikkim, Sikkim, 19.x.1995, coll. *S. C. Mitra & party.*

Distribution : India : Sikkim, Dists. West Sikkim, South Sikkim; West Bengal; Meghalaya; Andaman and Nicobar Islands; Laccadive. Elsewhere : Burma, Bhutan, China, Japan. Formosa, Pakistan, Thailand.

84. *Nephila maculata* (Fabricious)

1793. *Aranea maculata* Fabricious, Ent. Syst., **2** : 425.

1970. *Nephila maculata :* Tikader, *Rec. zool. Shrv. India,* **64** *(1-4) : 45.*

1992. *Nephila maculata :* Biswas and Biswas, *Fauna of West Bengal, Part III,* Araneae : Spiders, State Fauna Series No. **3** : 474.

Material examined : 2 Female, Tumin, Dist. East Sikkim, Sikkim, 23.ix.1988,coll. *V.C. Agarwal;* 2F, Tashitong, Dist. South Sikkim, Sikkim, 28.x.1992, coll. *A.K. Hazra & Party;* I Female, Ranikhola, Dist. South Sikkim, Sikkim, 30.x.1992, coll. *A.K. Hozra & party* 4F, Tadong, Dist. East Sikkim, Sikkim, 30.x.1994, coll. *G.C. Sen & party;* 1 Female, South Karfeklar, Dist. South Sikkim, Sikkim,, 20.x.1994, coll. *T.K. Pal & party.*

Distribution : India : Sikkim, Dists. East Sikkim, South Sikkim; West Bengal; Uttar Pradesh; Assam; Madhya Pradesh; Karnataka; Meghalaya; Maharashtra; Gujarat; Andaman and Nicober Islands; Tamil Nadu. Elsewhere : Australia, Burma, China, Japan, Malayasia, New Guinea, Sri Lanka.

85. *Nephila malabarensis* (Walckenaer)

1837. *Epeira malabarensis* Walckenaer, *Hist. Nat. Ins. Apt.*, **1** : 103.

1900. *Nephila malabarensis :* Pocock, *Fauna of Brit. India, Arachn.*, : 219.

1982. *Nephila malabarensis :* Tikader, *Fauna of India, Araneae :* Spiders, **2** (1) : 95.

1992. *Nephila malabarensis :* Biswas and Biswas, Fauna of West Bengal, Part III, Araneae : Spiders, State Fauna Series No. **3** : 475.

Material examined : 3F, Tashilong, Dist. West Sikkim, Sikkim, 28.x.1992, coll. *A.K. Hazra & party;* 2F, Singhir, Dist. West Sikkim, 4.xi.1992, coll. *A.K. Hazra & party.*

Distribution : India : Sikkim, Dist. West Sikkim (New record); West Bengal; Bihar; Andaman and Nicobar Islands; Maharashtra; Kerala; Tamil Nadu. Elsewhere : Burma, Australia, Malya Peninsula, New Guinea, Sri Lanka, Thailand.

19. Family : LINYPHIIDAE Blackwall

Key to the genera of the family LINYPHIIDAE Blackwall

1. Eyes are large and equal in size ...*Labulla*

   Eyes are small and not equal in size 2

2. Cephalothorax narrowed anteriorly .... *Lephthyphantes*

   Cephalothorax broad anteriorly 3

3. Posterior eyes not closely set. Median ocular area not longer than wide ..... *Linyphia*

46. Genus *Labulla* Simon

1884. *Labulla* Simon, *Ar. Fr.*, **5**: 261.

1953. *Labulla* : Locket and Milliadge, *Brit, Spiders, London,* **2** : 375.

Type-species : *Labulla thoracica* Wider

Distribution : Cosmopolitan except Australia.

86. *Labulla nepula* Tikader

1970. *Labulla nepula* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 21.

Diagnosis : Cephalothorax and legs are brown, abdomen dirty white in colour, cephalic region slightly high, broadest on the middle and lateral sides provided with longitudinal deep broad lines. Eyes are pearly white, posterior row of eyes are straight. Legs are long, clothed with fine long hair and spines. Abdomen nearly egg-shaped, dorsally provided with minute white dots. Male longer in size, legs very strong.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

47. Genus *Lephthyphantes* Menge

1866. *Lephthyphantes* Menge, *Preuss, Spinn.*, **1** : 95.

1895. *Lephthyphantes* : Simon, *Hist. Nat. Araig.*, **1** : 705.

Type-species : *Lephthyphantes nebulosus* Sundevall

Distribution : Cosmopolitan.

Key to the species of the genus *Lephthyphantes* Menge

1. Anterior portion of abdomen is high .... *bhudbari*

   Anterior portion of abdomen is not high. 2

2. Posterior portion of abdomen is high..... ..... *lingsoka*

   Posterior portion of abdomen is not high 3

3. Abdomen is not triangular when viewed laterally ..... *rudrai*

87. *Lephthyphantes bhudbari* Tikader

1970. *Lephthyphantes bhudbari* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 23.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

88. *Lephthyphantes lingsoka* Tikader

1970. *Lephthyphantes lingsoka* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 24.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

89. *Lephthyphantes rudrai* Tikader

1970. *Lephthyphantes rudrai* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 25.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

48. Genus *Linyphia* Latreille

1804. *Linyphia* Latreille, *Nouv. Dict. Hist. Nat.,* **24**: 134.

1884. *Linyphia* : Simon, *Ar. Fr.* **5** : 262.

Type-species : *Linyphia triangularis* Clerck

Distribution : Cosmopolitan.

Key to the species of the genus *Linyphia* Latreille

1. Cephalothorax uniformly brown; dorsum of the abdomen marked with a longitudinal and two transverse black bars..... *urbasae*

   Cephalothorax not uniform, dorsum of abdomen not marked with a longitudinal and two transverse bars.....2

2. Anterior half of abdomen provided with two longitudinal broad black lines..... ..... *sikkimensis*

90. *Linyphia urbasae* Tikader

1970. *Linyphia urbasae* Tikader, *Rec. zool. Surv. India,* **64**(1-4) : 19.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

91. *Linyphia sikkimensis* Tikader

1970. *Linyphia sikkimensis* Tikader, *Rec. zool. Surv. India,* **64**(1-4): 20.

Distribution : India : Sikkim, Dist. West Sikkim (Type locality only).

DISCUSSION

A total of 91 species 48 genera belonging to 19 families have been reported in this paper of which 17 species 13 genera 9 families form new record for the state. Among these, there are 32 species which have been reported only from Sikkim and their distribution and record have not been known outside this state.

So far as Zoo-geographical distribution of species concerned, there are 32 species which are known from Oriental region, 6 are known from Oriental and Palaearctic region and 2 are known from both Oriental and Ethiopian regions. There are 7 species which have been reported from Sikkim are known to be Australian region and their occurance in Sikkim rather is interesting. Among these 7 species are cosmopolitan in distribution when there is none from Nearctic and Neotropical regions.

So far as the distribution of genera are concern there are 20 genera which have been cosmopolitan in distribution, 6 are known from other region of Oriental region beside India. The number of genera which are known to occur in regions, that Zoo-geographical regions other than Oriental, there are 2 from Palaearctic 3 from Ethiopian, 6 from Nearetic and none from Neotropical region. There are 4 genera which are also known from Australian region besides Oriental region.

SUMMARY

This paper provides an exhaustive account of the Spider Fauna of Sikkim and reports a total of 91 species belonging to 48 genera under 19 families representing all the four districts of Sikkim. Among these, 17 species under 13 genera and 9 families are recorded here for the first time from Sikkim.

Synonymies, distributional records both in India and abroad, detailed collection data are provided in addition to keys to all the taxonomic categories dealt with in this paper.

At the end, a discussion is made regarding the species composition of Sikkim in relation to adjoining states.

Chart showing species distribution of adjoining states out of 91 species from Sikkim state

Sl. No.	Species name	West Bengal	Meghalaya	Assam	Bihar
1.	*Plesiophrictus meghalaya* Tikader	–	+	–	–
2.	*Uloborus krishnae* Tikader	+	–	–	–
3.	*Crossopriza lyoni* (Blackwall)	+	–	–	–
4.	*Phidippus bengalensis* Tikader	+	–	–	–
5.	*Salticus ranjitus* Tikader	+	–	–	–
6.	*Plexippus paykullii* (Audouin)	+	+	–	–
7.	*Camaricus formosus* Thorell	+	–	–	–
8.	*Xysticus roonwali* Tikader	–	–	+	–
9.	*Xysticus sujatai* Tikader	–	+	–	–
10.	*Cheiracanthium indicum* Cambridge	+	–	+	–
11.	*Cheiracanthium trivialis* (Thorell)	+	–	–	–
12.	*Oxyopes ratnae* Tikader	+	–	–	–
13.	*Oxyopes sakuntalae* Tikader	+	–	–	–
14.	*Oxyopes shweta* Tikader	+	–	–	–
15.	*Oxyopes sikkimensis* Tikader	+	–	–	–
16.	*Oxyopes sitae* Tikader	+	–	–	–
17.	*Peucetia latikae* Tikader	+	–	–	–
18.	*Achaearanea durgae* Tikader	+	–	–	–
19.	*Hippasa greenalliae* (Blackwall)	+	–	–	–
20.	*Hippasa pantherina* Pocock	+	–	–	–
21.	*Pardosa birmanica* Simon	+	+	–	–
22.	*Pardosa minutus* Tikader & Malhotra	–	+	–	–
23.	*Pardosa pusiola* (Thorell)	+	–	–	–
24.	*Pardosa sumatrana* (Thorell)	+	–	–	–
25.	*Lycosa carmichaeli* Gravely	+	–	+	–
26.	*Lycosa kempi* Greavely	+	–	+	–
27.	*Lycosa nigrotibialis* Simon	+	+	+	–
28.	*Eucta javana* Thorell	+	–	–	–
29.	*Pisaura gitae* Tikader	+	–	–	–
30.	*Araneus dehhanii* (Doleschall)	+	–	–	–
31.	*Argiope aemula* (Walckenaer)	+	–	–	–
32.	*Argiope pulchella* Thorell	+	+	+	–
33.	*Cyclosa insulana* (Costa)	+	+	–	+
34.	*Cyrtophora moluccensis* (Doleschall)	+	–	–	+
35.	*Neoscona mukerjei* Tikader	+	+	–	–
36.	*Neoscona theis* (Walckenaer)	+	+	–	–
37.	*Parawixia dehaanii* (Doleschall)	+	–	–	–
38.	*Singa chota* Tikader	+	–	–	–
39.	*Zygeilla melanocrania* (Thorell)	+	–	–	–
40.	*Gasteracantha brevispina* (Doleschall)	+	–	–	–
41.	*Gasteracantha diadesmia* Thorell	+	–	–	–
42.	*Gasteracantha hasselti* C. L. Koch	+	–	–	–
43.	*Gasteracantha leucomelaena* (Doleschall)	+	–	–	+
44.	*Gasteracantha unguifera* Simon	+	–	–	–
45.	*Leucauge celebesiana* (Walckenaer)	+	+	+	–
46.	*Leucauge decorata* (Blackwall)	+	+	+	+
47.	*Leucauge tessellata* (Thorell)	+	–	+	–
48.	*Nephila clavata* L. Koch	+	+	–	–
49.	*Nephila maculata* (Fabricious)	+	+	+	+
50.	*Nephila malabarensis* (Walckenaer)	+	–	–	–

CHART NO. 1

Chart Showing districtwise distribution of species

Sl.No.	Species name	North Sikkim	South Sikkim	East Sikkim	West Sikkim
1.	*Homalonychus joyaus* Tikader	–	–	–	+
2.	*Plesiophrictus meghalayaensis* Tikader	–	+	–	–
3.	*Uloborus krishnae* Tikader	–	–	–	+
4.	*Crossopriza lyoni* (Blackwall)	–	+	–	–
5.	*Lyssomanes sikkimensis* Tikader	–	–	–	+
6.	*Phidippus bengalensis* Tikader	–	–	–	+
7.	*Salticus ranjitus* Tikader	–	–	–	+
8.	*Plexippus paykullii* (Audouin)	–	+	–	–
9.	*Maevia himalaya* Tikader	–	–	–	+
10.	*Ctenus indicus* Gravely	–	+	–	–
11.	*Thomisus sikkimensis* Tikader	–	–	–	+
12.	*Thomisus rishus* Tikader	–	–	–	+
13.	*Runcinia escheri* Reimoser	–	+	–	–
14.	*Camaricus formosus* Thorell	–	+	–	–
15.	*Xysticus roonwali* Tikader	–	–	+	–
16.	*Xysticus sikkimus* Tikader	+	–	+	–
17.	*Xysticus sujatai* Tikader	+	–	–	–
18.	*Platythomisus bazarus* Tikader	–	–	–	+
19.	*Heteropoda fabrei* Simon	–	+	–	–
20.	*Cheiracanthium indicum Cambridge*	–	–	–	+
21.	*Cheiracanthium sikkimensis* Majumder & Tikader	–	–	–	+
22.	*Cheiracanthium* trivialis (Thorell)	–	–	+	–
23.	*Hahnia mridulae* Tikader	+	–	–	–
24.	*Oxyopes ratnae* Tikader	+	–	–	+
25.	*Oxyopes sakuntalae* Tikader	–	–	–	+
26.	*Oxyopes shweta* Tikader	–	+	+	+
27.	*Oxyopes sikkimensis* Tikader	–	+	–	–
28.	*Oxyopes sitae* Tikader	–	–	–	+
29.	*Oxyopes subhadrae* Tikader	–	–	–	+
30.	*Oxyopes sunadae* Tikader	–	–	–	+
31.	*Peucetia latikae* Tikader	–	–	–	+
32.	*Achaearanea budana* Tikader	–	–	–	+
33.	*Achaearanea durgae* Tikader	–	–	–	+
34.	*Argyrodes ambalikae* Tikader	–	–	–	+
35.	*Argyrodes gazedes* Tikader	–	–	–	+

Sl.No.	Species name	North Sikkim	South Sikkim	East Sikkim	West Sikkim
36.	*Argyrodes gazingensis* Tikader	–	–	–	+
37.	*Theridion manjithar* Tikader	–	–	–	+
38.	*Theridula angula* Tikader	–	–	–	+
39.	*Agelena barunae* Tikader	–	–	+	–
40.	*Agelena satmila* Tikader	–	–	+	–
41.	*Tegenaria chhaguensis* Tikader	–	–	–	+
42.	*Hippasa greenalliae* (Blackwall)	–	–	–	+
43.	*Hippasa pantherina* Pocock	–	–	–	+
44.	*Pardosa birmanica* Simon	+	–	–	+
45.	*Pardosa fletcheri* (Gravely)	–	–	+	–
46.	*Pardosa kupupa* (Tikader)	+	–	+	–
47.	*Pardosa minutus* Tikader & Malhotra	–	–	+	–
48.	*Pardosa pusiola* (Thorell)	–	–	+	–
49.	*Pardosa rhenockensis* (Tikader)	–	–	+	–
50.	*Pardosa sumatrana* (Thorell)	+	+	–	–
51.	*Lycosa carmichaeli* Gravely	–	–	–	+
52.	*Lycosa kempi* Gravely	–	–	–	+
53.	*Lycosa nigrotibialis* Simon	–	–	–	+
54.	*Lycosa rothaka* Tikader	–	–	–	+
55.	*Lycosa tista* Tikader	–	–	–	+
56.	*Pisaura gitae* Tikader	–	–	–	+
57.	*Tinus sikkimus* Tikader	–	–	–	+
58.	*Eucta javana* Thorell	–	–	–	+
59.	*Araneus dehhanii* (Doleschall)	–	–	–	+
60.	*Argiope aemula* (Walckenaer)	–	–	–	+
61.	*Argiope pulchella* Thorell	+	+	+	+
62.	*Argiope sikkimensis* Tikader	–	–	+	–
63.	*Arachnura angura* Tikader	–	–	–	+
64.	*Caerostris bhabanii* Tikader	–	–	–	+
65.	*Cyclosa fissicauda* Simon	–	–	+	+
66.	*Cyclosa insulana* (Costa)	–	–	–	+
67.	*Cyrtophora bidenta* Tikader	–	–	–	+
68.	*Cyrtophora moluccensis* (Doleschall)	–	–	+	–
69.	*Neoscona mukerjei* Tikader	–	+	+	–
70.	*Neoscona theis* (Walckenaer)	–	+	+	–
71.	*Parawixia dehaanii* (Doleschall)	–	–	+	+
72.	*Singa chota* Tikader	–	–	–	+
73.	*Zygeilla melanocrania* (Thorell)	–	+	–	+

Sl.No.	Species name	North Sikkim	South Sikkim	East Sikkim	West Sikkim
74.	*Gasteracantha brevispina* (Doleschall)	–	–	–	+
75.	*Gasteracantha diadesmia* Thorell	–	–	–	+
76.	*Gasteracantha hasselti* C.L.Koch	–	–	–	+
77.	*Gasteracantha leucomelaena* (Doleschall)	–	–	–	+
78.	*Gasteracantha unguifera* Simon	–	–	–	+
79.	*Leucauge celebesiana (Walekenaen)*	+	+	–	–
80.	*Leucauge decorata* (Blackwall)	–	–	+	+
81.	*Leucauge pondae* Tikader	–	–	–	+
82.	*Leucauge tessellata* (Thorell)	–	–	+	–
83.	*Nephila clavata* L. Koch	–	+	–	+
84.	*Nephila maculata* (Fabricious)	–	–	–	+
85.	*Nephila malabarensis* (Walckenaer)	–	–	–	+
86.	*Labulla nepula* Tikader	–	–	–	+
87.	*Lephthyphantes bhudbari* Tikader	–	–	–	+
88.	*Lephthyphantes lingsoka* Tikader	–	–	–	+
89.	*Lephthyphantes rudrai* Tikader	–	–	–	+
90.	*Linyphia urbasae* Tikader	–	–	–	+
91.	*Linyphia sikkimensis* Tikader	–	–	–	+

\+ = Recorded
– = Not yet recorded.

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Zool. Surv. India
State Fauna Series 9 : Fauna of Sikkim (Part 2) :101-107, 2003

INSECTA : THYSANURA (APTERYGOTA)

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INTRODUCTION

The order Thysanura comprises insects with "fish-like" silvery shining body due to presence of scales and hence commonly known as 'Silverfish'. Silverfish frequently harbours in the human abode where they may cause considerable damage to books, photographs, and household articles. The members of the order are small, soft bodied, mostly scaled, wingless insects. They are easily distinguishible from the other closely related orders by long many segmented antennae, 2 anal cerci and a single median telson projecting posteriorly from the terminal part of abdomen. They are blind as well as eyed and most species are heavily clothed with scales which give these insects a mottled black, brown, silver or golden appearance. The free living species are found in the forest floor, under bark of trees, under rocks, in the rests of ants and termites. The members of the family Machilidae representing "bristle tail" occur mostly in the decomposing litter of the forest floor and capable of jumping by means of their apical ventral stylets. The synanthropic species may secondarily become free living again. Several of these synanthropic species have been used for laboratory culture for researches on physiology, biology etc.

HISTORICAL BACKGROUND

The history of studies on the Indian Thysanura dates back to 1903, when Escherich first recorded the Thysanura from India and described the species *Lepisma indica* and *L. gyriniformis*. The first important work of significance on the order Thysanura comes from the efforts of Escherich in 1905 in the 'Das System der Lepismatiden' Thereafter Silvestri (1913, 1938, 1948), Wygodzinsky (1954, 1972) and Hazra *et al.* (1980, 1993, 1996, 1999) contributed significantly to our knowledge of Indian fauna. Mendes (1990) published on zoogeographic affinites of Indian Thysanura and pointed out the poverty of knowledge of Indian fauna. He attributed it to their concealing habit and emphasised the need of special efforts for their collection.

PRESENT STATE OF KNOWLEDGE

The Indian fauna of Thysanura can be grouped under two sub-orders, viz., Microcoryphia and Zygentoma. Two families Machilidae and Meinertellidae can be recognised under Microcoryphia, while sub-order Zygentoma has three families viz., Lepismatidae, Ateluridae and Nicoletiidae. The study of Indian Thysanuran fauna has been neglected for a long time and our knowledge of these order from India is far from perfection in contrast to world fauna. The Indian fauna of Thysanura is presently represented by 31 species belonging to 21 genera and 5 families.

As regards the study of Thysanura fauna from Sikkim there is only one species namely *Lepisma saccharina* Lineu recorded earlier and the species was described by Wygodzinisky in 1954. The present study is based on a small collection of 35 exs. made during 1975-76, 1988, 1992, 1994, 1995 and 1998 faunistic exploration by various scientists of Zoological Survey of India. Thus this report does not reflect the total fauna of this order from Sikkim and extensive exploration might enrich our knowledge further from this area.

The paper deals with only 5 species of Thysanura under 2 families and 3 genera under

the sub-order Microcoryphia and Zygentoma; of these genera *Ctenolepisma* and *Machilanus* are being recorded for the first time from Sikkim. Further *Ctenolepisma longicaudata, Clenolepisma, Ciliata, Ctenolepisma dubitalis* not known earlier from Sikkim are being recorded for the first time from this state along with *Machilanus lapidicola,* first recorded from Sikkim.

The work also provides key to families, genera and species. The distribution of each species of Sikkim has been plotted on the map. The classification followed in the present study is after Paclt, 1967.

SYSTEMATIC ACCOUNT

Order THYSANURA

Key to the families of THYSANURA in Sikkim

1. Compound eyes large, Ocelli Present, abdominal segments I–VII usually with one or two pairsof exsertile vesicles, stylets generally present on second and third thoracic coxae and on abdominal sternites II–IX. Thorax dorsally not flattened. Body always scaled .... MACHILIDAE (Bristle tails)

2. Compound eyes small or wanting. Ocelli absent, Abdomen usually with stylets and exsertile vesicles on some sterrites. Thoracic coxal stylets absent. Body much flattened and fish like or elongate and parallel sided. Scales Present or absent .... LEPISMATIDAE (Silverfish)

Bristle tails of the sub-order Microcoryphia are among the few insects that have successfully colonized very high altitudes in various parts of India.

Silver fish of the sub-order zygentoma comprehend the most commonly encountered species. All species are tropical or subtropical.

The taxonomy of Machilids and Lepismatids is based to a large extent on the structure and distribution of large, regularly arranged setae, the macrochaetae. These may not extant in poorly preserved specimens but sockets indicates the place of their insertion. Some experience and adequate optical equipment are necessary to analyze the arrangements of the macrochaetae, in case of doubt, a slide mount of the critical structure must be prepared.

Family MACHILIDAE

1. Genus ***Machilanus*** Silvestri

1. ***Machilanus lapidicola*** Wygodzinsky

1974. *Machilanus lapidicola* Wygodzinsky Amer. Mus. Nov. no. 2555 pg. 3-21.

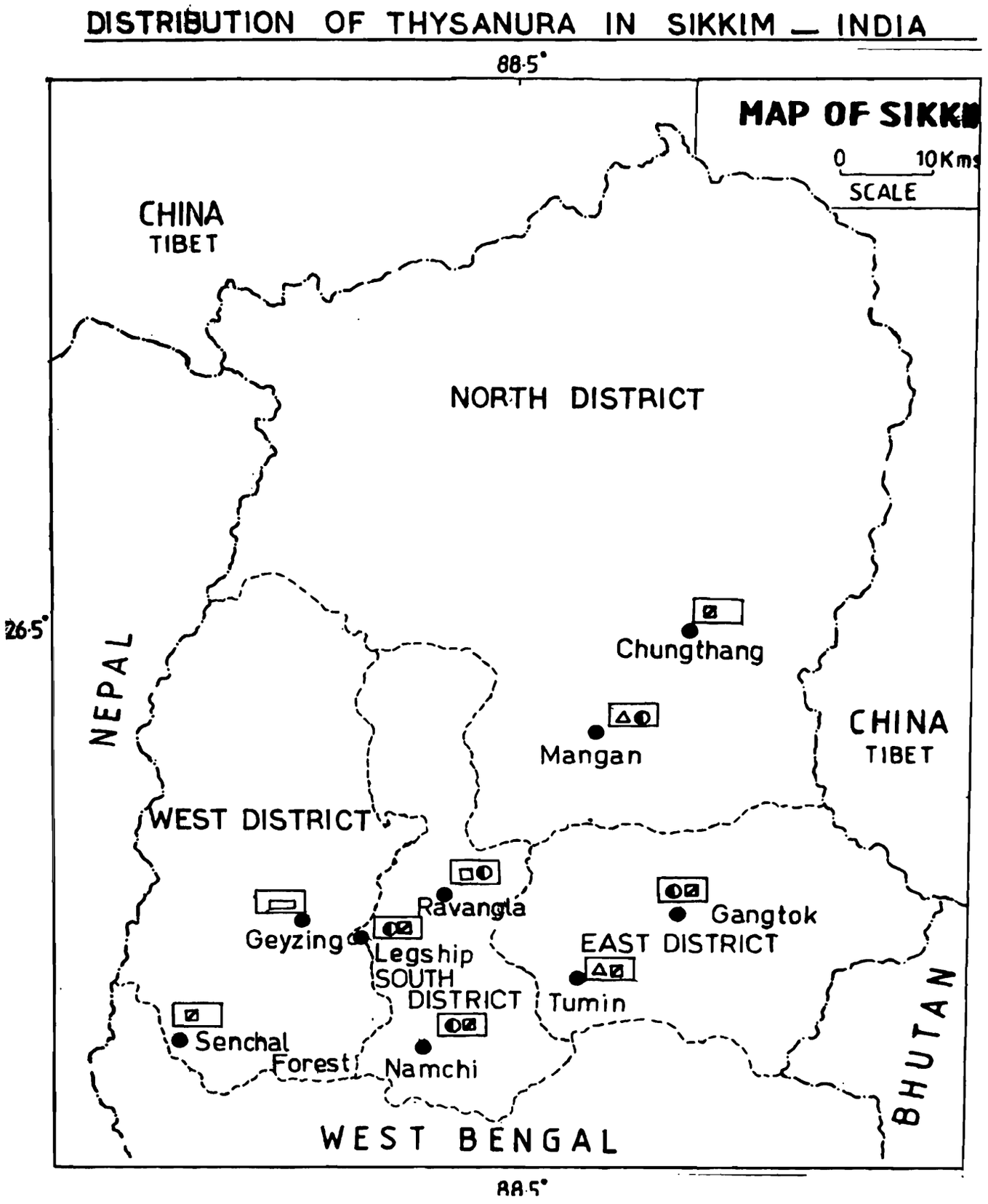
Diagnosis : Maximum body length observed 13 mm in female. Body colour yellowish-white, compound eyes large, below the anterior margin of eyes a pair of ocelli. Thorax dorsally not flattened and convexed. Apical segment of maxillary palp of female 7 segmented, subcylindrical and pointed distally, II–VII segments of maxillary palp with abundant setulae; apical segmentof labial palp moderately widened, labial palp 3 segmented, 2nd and 3rd segment with setulae occupying entire disc; femora of all pairs of legs of female without spine like setae; abdomen with II–VI with a pair of stylets; 2+2 exsertile vesiele found between in II–V segment; posterior angle of sternum V approximately 110 degrees; ovipositor stout, secondary type, attaining level of middle of styli IX.

The description given by Wygodzinsky (1974) should be consulted for further taxonomic data.

Material examined : INDIA : 1F:Sikkim (South East) Ravangla, 2 Kms. South of Forest Rest house, 28.ii.1989, Coll. D.K. Mondal, Specimen preserved in alcohol.

Geographical distribution : INDIA : Sikkim (Ravangla) : Kashmir.

Remarks : This species is the first record from the State of Sikkim, earlier recorded only from Kashmir.



1. *Ctenolepisma ciliata*
2. *Ctenolepisma longicaudata*
3. *Machilanus lapidicola*
4. *Lepisma saccharina*
5. *Ctenolepisma dubitalis*

Family LEPISMATIDAE

Key to the genera of Lepismatidae

Dorsal and abdominal setae or bristle arranged singly. Tergite X of abdomen mostly longer than broad at base without any trace of bristle combs ..... *Lepisma* Linnaeus

Dorsal and abdominal setae or bristle arranged in 1+1 or 2+2 bristle combs. Tergite Xof abdomen is not as long as wide at base with only 1+1 bristle combs .... *Ctenolepisma* Escherich.

2. Genus ***Lepisma*** Linnaeus 1756

2. ***Lepisma saccharina*** Linnaeus 1758.

1758. *Lepisma saccharina* Linnaeus, *Syst. Naur.*, (ed. 10) **1** : 806.

1984. *Lepisma saccharina*, Mendes, *Stuff. Beit. Naturk*, A (372 : 9)

Diagnosis : Body colour Silvery gray; Length – 1/2 inch; Body long, narrow and slightly tapering. Head narrower than thorax without distinct neck; eyes present but not much protruding; prothorax the longest; maxillary Palpi 5 segmented, long; labial palpi 4 segmented with swollen apical segment, which is wider than long. Stylets in two pairs on abdomen VIII and IX; addominal tergite with 1+1 bristle combs; tenth abdominal tergum rather elongate, distinctly longer than wide; abdominal sterna with median bristle combs in addition to sublateral ones; ovipositor of female hardly extends beyond apex of inner process of coxites IX.

Material examined : INDIA : (Z.S.I. Sikkim Survey, 1994), 10 (M) Sikkim, Mangun (Wall of the rest house), F.C. No. R/6, Stn.-2, 2.iv.1994, Coll. P.H. Roy; 8 (M), 4 (F), 2 juvenile (ZSI Sikkim Survey, 1988) Tumin, East Sikkim, Alt. 1800m. (from Books), 29.x.1988, Coll. V.C. Agarwal.

Geographical distribution : INDIA : Sikkim.

Remarks : The above species is normally domestic and widely distributed in palsearctic, Ethiopian and Indian Regions. Good illustrated redescriptions of *Lepisma saccharina* are found in Vchida (1943) and Wygodzinsky (1941).

3. Genus ***Ctenolepisma*** Escherich

Key to the species of Genus *Ctenolepisma* Escherich

1. Abdominal terga II–VI with 3+3 bristle Comb 2

– Abdominal terga II–VII with 3+3 bristle comb. Length within 10 mm. Ovipositor of female with fossorial spine apically .... *Ctenolepisma dubitalis* Wygodzinsky

2. Maximum length about 10 mm; antennae and caudal filaments not longer than body; distinct violaceous hypodermal pigment on head, body and appendages .... *Ctenolepisma ciliata* (Dufour)

– Length 13-15 mm; antennae and caudal appendages longer than body; head, body and appendages practically without hypodermal pigment .....*Ctenolepisma* ..... *Longicaudata* Escherich

3. ***Ctenolepisma dubitalis*** Wygodzinsky

1959. *Ctenolepisma dubitalis* Wygodzinsky : In studies on the fauna of curacao and other caribbean Island, 9., No. **36** : 35.

Diagnosis : Body length 9 mm; body yellowish-white; antennae faintly and caudal appendages distinctly violaceous; thorax almost as long as abdomen, slightly wider than abdomen; antennae longer than body; Maxillary palp slender; labial palp with apical segment slightly wider than long, bearing 5 sensary papillae. Abdominal tergite II–VII with 3+3 bristle combs tergite X shorter than wide, broadly truncate, with 1+1 bristle comb; two pair of stylets present on VIII and IX segments; ovipositor of female short and stout with fossorial spine.

Material examined : INDIA : (ZSI Sikkim Survey, 1998) 10(M) Sikkim, Geyzing, P.W.D. Rest house (at night fromwall) 4.iv.1998. Coll. A.K. Hazra.

Geographical distribution : INDIA : Sikkim, (Geyzing), Manipur.

Remarks : This speciesis recorded for the first time from Sikkim, earlier recorded only from Manipur.

4. ***Ctenolepisma ciliata*** (Dufour)

1831. *Lepisma ciliata* Dufour *Ann. Sci. Nat.*, **22** : 420.

1890. *Lepisma ciliata* : Grassi et Rovelli, *Nat. Sci.*, **9** : 80.

1905. *Ctenolepisma ciliata,* Escherich, *Zoologica (Stuttgart)* **83** : 80.

Diagnosis : Body elongated, head broad, eyes clearly projecting; thorax broader than the abdomen; tergite IX small, half the length of tergite VIII; tergite X is as long as those of IX and VII together, trapizoidal shape, Hypodermal pigment on head, body and appendages; antennae and cerci shorter than body; abdominal terga II–VI with 3+3 bristle combs; stylets 2 pairs on VIII and IX. ovipositor long and slender. Body length: 10 mm.

Material examined : INDIA : (ZSI Sikkim Survey, 1976), 1F Sikkim, Legship, Nayabazar, Stn. 16, Alt. -400 m. 4.1.1976, Coll. G.K. Srivastava; ZSI Sikkim Survey, 1994, 1F, Mangan, wall of the Rest house, F.C. no. R/6, Stn. 2, 2. iv. 1994, Col. P.H.Roy; ZSI Sikkim Survey, 1995, 2 FF Rabangla, Stn. 12, 16.x.1995, Coll. S.C. Mitra; ZSI Sikkim Survey, 1998 2MM, 3FF, Gangtok Power Rest house, (at night, from wall), Stn. 5, 25.iv.1998, Coll. A.K. Hazra; 1F Namchi, P.W.D. Rest house, (at night, from wall), Stn. 13A, 28.iv.1998, Coll. A.K. Hazra.

Geographical distribution : INDIA : Sikkim, West Bengal, Delhi, Bihar and Manipur.

Remarks : This species is the first record from the State of Sikkim. It is widely distributed in Mediteranean. The best description of this species are given by Escherich (1905).

5. ***Clenolepisma longicaudata*** Escherich

1905. *Clenolepisma longicaudata* Escherich *Zoological (Stuttgart),* **43** : 83.

1940. *Clenolepisma* urbana, Slabaugh, *Ent. News;* **51** *: 95 (Sensu, Wygodzinsky, 1972).*

Diagnosis : Body long; the thorax is very little broader than the abdomen which is gradually tapering with relatively short segments; length ranges from 13 mm to 15 mm,whitish in colour without marked silvery shun; antennae, cerci, and median tail appendages are distinctly longer than the body length; abdominal tergum II–VI with 3+3 bristle combs, tergum X twice as long as tergite IX, and wide at base; Posteriorly last abdominal tergum distinctly truncate; long stylets are present on sternum VIII-IX, ovipositor long and slender.

Material examined : INDIA : (ZSI Sikkim Survey, 1975), 1M, Sikkim (West) Senchal forest, Stn. 13, Alt. -2350 m. 31.xii.1975, Coll. G.K. Srivastava; 1F, legship, Nayabazar, Stn. 16, Alt 400 m. 4.1.1976, Coll. G.K. Srivastava; (ZSI Sikkim Survey, 1988), 2FF, Tumin, East Sikkim, Alt. 1475 m, 1.x. 1988, Coll. V.C.Agarwal, (ZSI Sikkim Survey, 1992), 1M Chungtham, North Sikkim, Alt 1500 m, 4.xi.1992, coll. M.S. Shishodia; (ZSI Sikkim Survey, 1998), 2MM,1F, Gangtok, Power Rest house, (at night, from wall), Stn. 5, Alt 1350 m, 25.iv.1998, Coll. A.K. Hazra; 1F Namchi, P.W.D. Rest House (at night), from Packing box, Alt 1400 m. Stn. 9, 27.iv.1998, coll. A.K.Hazra.

Geographical distribution : INDIA; Sikkim, West Bengal, Uttar pradesh, Bihar, Tripura, Manipur.

Remarks : The species is recorded for the first time from Sikkim. This species is widely distributed in the tropics and sub-tropics of old and new world. This species is very common in houses and libraries and a very serious pest in India.

ACKNOWLEDGEMENT

We express our sincere thanks to Dr. J.R.B. Alfred, Director, Zoological Survey of India for providing laboratory facilities.

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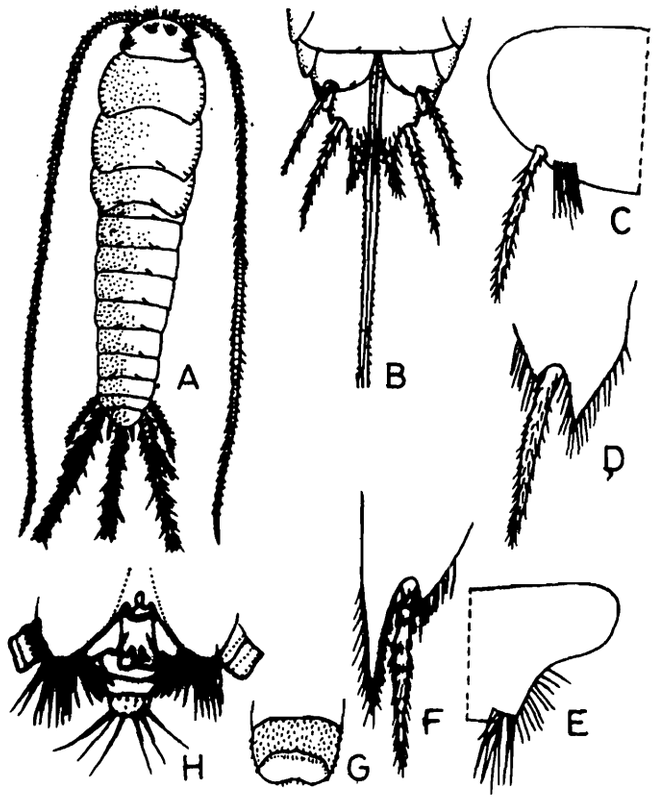

Fig.1

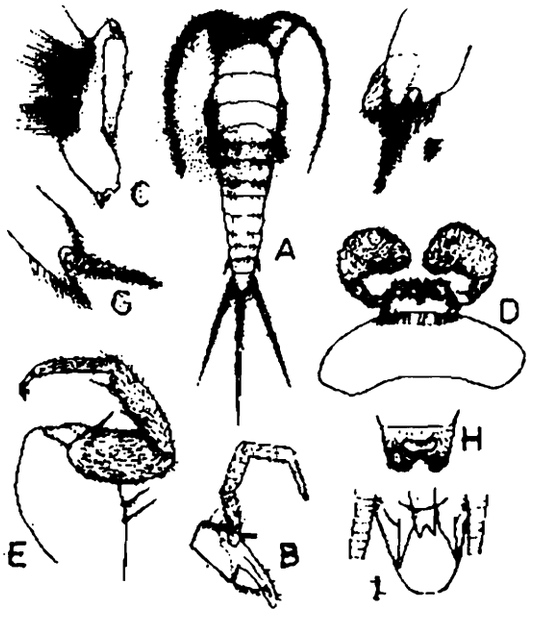

Fig.2

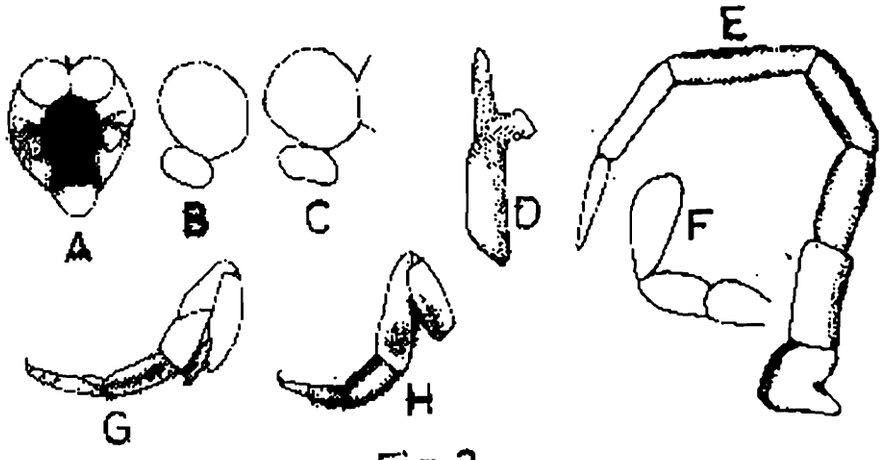

Fig.3

Fig. 1. *Ctenolepisma longicaudata* Escherich and their different parts of the body.
A. Entire body (Dorsal view) B. Female Ovipositor C. Sternum VIII left half and Stylet D. Sub coxae and Stylet of Sternum IX of male E. Half of 'X' tergum F. Sub coxae and Stylet of Sternum IX of female G. Penis of male H. Anal plates.

Fig. 2. *Lepisma saccharina* Linnaeus and its different parts of the body.
A. Entire dorsal view B. Maxillary Palp.; C. Mardible D. Labium and Labial Palp.; E. Hind leg F. Stylet IX G. Stylet VIII; H. Penis of male I. Anal plates.

Fig. 3. *Machilanus lapidicola* Wygodzinsky andits different parts of the body.
A. Head, Front view B. Eyeand ocellus, Front view C. Eye and Ocellus, lateral view D. Mandible E. Maxillary palp of female F. Labial Palp of female G. Hind Leg of female with Pigment pattern H. Fore leg of Female with Pigment pattern.

Zool. Surv. India
State Fauna Series 9 : Fauna of Sikkim (Part 2) :109-123, 2003

INSECTA : COLLEMBOLA

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INTRODUCTION

"Collembola", popularly known as spingtails, are small and primarily wingless insects. Sir John Lubbock (1870), an English entomologist, attributed this vernacular name to collembolans. These insects measure from 0.25 mm to 6 mm in length. They even occur in the vicinity of both South and North Poles (upto 83° South latitude in Antarctica). Few species are living permanently on glacier or snow fields. The diversity and the density of species remain linked with the soil rich in organic matter. Some species can live freely even on the surface of water (viz. *Podura aquatica, Sminthurides aquaticus etc.).*

Perusal of literature reveals that first study of Collembola from India is of Ritter (1911). Imms (1912) made significant contributions on Indian Collembola. The knowledge of Indian Collembola was further enriched through the contributions of several workers like Carpenter (1913, 1924), Handschin (1920), Mukherjee (1932), Denis (1936), Salmon (1957), Baijal (1955), Choudhuri (1963), Choudhuri and Roy (1965), Yosii (1965), Yosii (1966a,b); Mitra (1967–1993), Prabhoo (1971) and Hazra (1995).

The first collection of Collembola from Sikkim was probably made by Dr. T. Clay of the British Museum Natural History, London during 1952 and subsequently studied by J.T. Salmon of Newzealand (1956, 58, 69). R. Yosii of Japan also described few species from Sikkim in 1966. Mitra (1973) described a new sub-species of *Salina Viz; Salina tricolor sikkimensis* from the collection made by Dr. Clay.

It is noteworthy that this contribution is the first consolidated record of this group of Insects from the State of Sikkim involving 20 species under 13 genera.

Order COLLEMBOLA

Suborder ARTHROPLEONA

Key to the Superfamilies of ARTHROPLEONA

First thoracic segment dorsally distinct and with dorsal setae .....
.....PODUROIDEA, Womersley, 1933

First thoracic segment without dorsal setae and frequently more or less reduced or hidden dorsally by mesothoracic segment
ENTOMOBRYOIDEA, Womersley, 1933

Key to the Families of PODUROIDEA

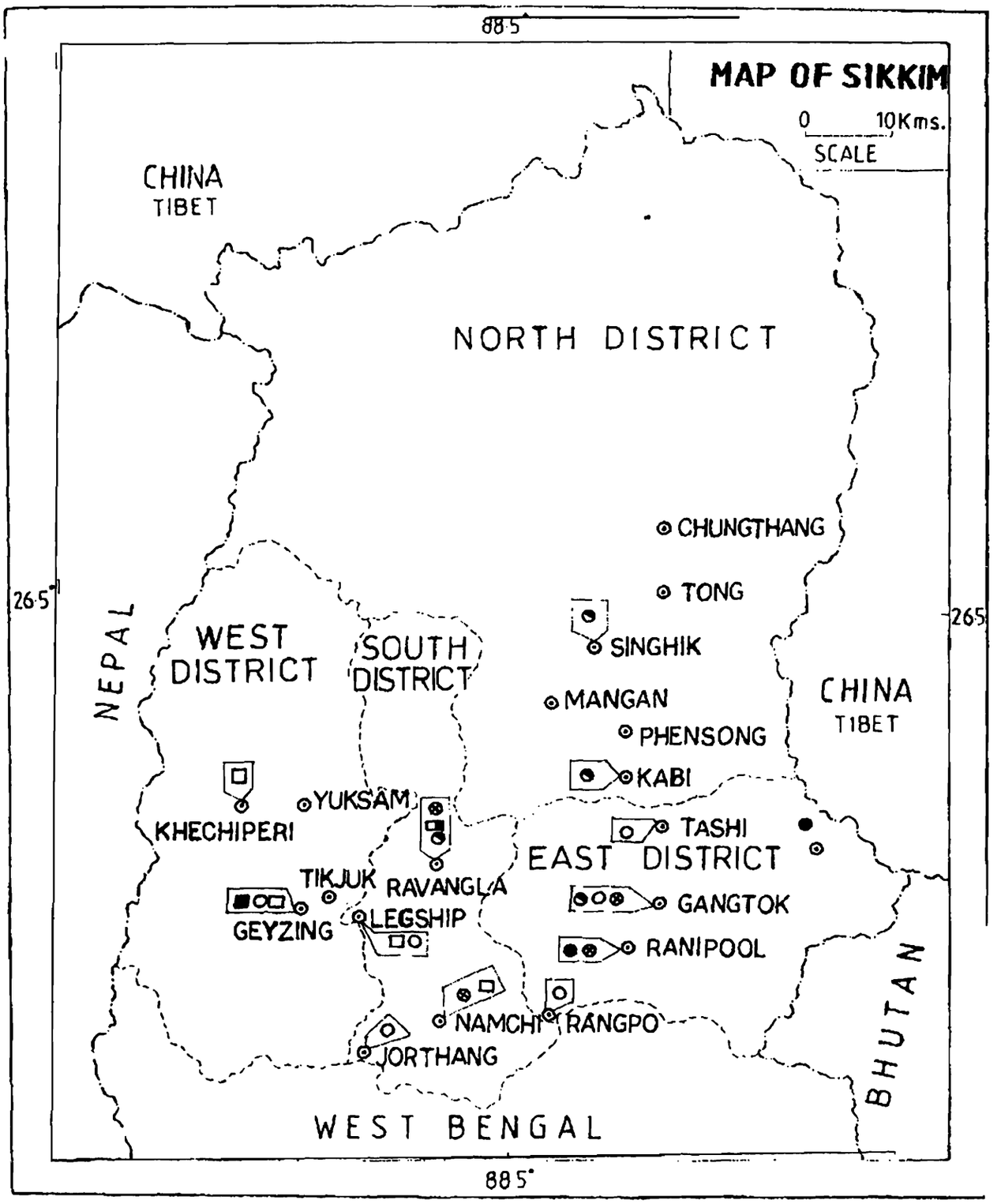
1. Pseudocelli present, at least on antennal base or dorsum of fifth abdominal segment.....
.....ONYCHIURIDAE, Gervais, 1841.

2. Pseudocelli absent.....
... HYPOGASTRURIDAE, Bourtet, 1839.

Key to the Families of ENTOMOBRYOIDEA

1. Hind coxae usually with tronchanteral organ. Abdomen IV appreciably longer than abdomen III. Scales present or absent, often ciliated. Furcula well developed .....
.. ENTOMOBRYIDAE Tomosvary, 1882.

2. Hind Coxae without trochanteral organ. Abdoman III and IV usually subequal; the abdomen IV never more than one and one-half times as long as the abdomen III, the other posterior abdominal segments often fused subsequently. Scales usually not present ..... ISOTOMIDAE Borner, 1913.



Map 1. Showing the distribution of Collembola in different district of Sikkim.

- ● *Mesaphorura choudhurii.*
- ■ *Hypogastrura indovaria*
- ◉ *Lepidocyrtus (Acrocyrtus) malayanus*
- ◎ *L.* (S. Str) *magnificua.*
- ◘ *Lepidocyrtus caudatus.*
- ○ *L* (S. Str) *medius.*
- □ *Sinella curviseta*

Key to the Subfamilies of ENTOMOBRYIDAE

1. Dentes dorsally crenulated and curving upward, basally in the line with manubrium ..... ENTOMOBRYINAE Schaeffer, 1896.

— Dentes not crenulated, straight and usually forming a basal angle with manubrium ... . 2.

2. Dental spine absent 3

— Dental spine present on the basal portion of the dentes only ..... TOMOCERINAE Schaeffer, 1896.

3. Eyes and Pigment absent; dentes with large dorsal scale without apical lobe .... PARONELLINAE Borner, 1913.

FAMILY ONYCHIURIDAE

This family is characterized by the presence of pseudocelli on the head and trunk and by the distinctive and usually complex sense organ of the third antennal segment.

This family represents only one genus & species from Sikkim.

I. Genus ***Mesaphorura*** Yosii, 1966.

1. *Mesaphorura choudhurii* Yosii, 1966.

1966. *Mesaphorura choudhurii* Yosii, 1966, *J. Coll. Arts and Sciences, Chiba Unvi.*, **4**(4) : 461-531.

Material examined : Tashi, Gangtok, 25.iv.98, Coll. A.K.Hazra, 25. exs. water falls, 17th miles towards Tssangu, 26.iv.98, Coll. A.K.Hazra, 6. exs. Ranipool Paddy field area, Gangtok, 30.x.92, Coll. A.K. Hazra, 57 exs.

Diagnostic characters : Body length 1.0 mm., white, antennae pedunculate, Ant. III & IV with border, Ant. IV distally with 'Seven' curving sensory setae. PAO narrowly elongated. Anal spine acute, slightly curving upwards, unguis, small, untoothed, unguiculus absent. Tenent hair absent. Furculum absent.

Distribution : India : Sikkim.

Family HYPOGASTRURIDAE

This family is best recognised by the absence of true pseudocelli and the simplicity of the sense organ of the third antennal segment.

This family represents single, genus & species from Sikkim.

II. Genus ***Hypogastrura,*** Bourlet, 1839.

2. ***Hypogastrura indovaria*** Salmon, 1970.

1970. Hypogastrura indovaria *Salmon,* Transactions Biol. Sci., **12** (13) : 149

Material examined : Side of the hill-slope near Geyzing Bazar, 8.V.98, Coll. A. K. Hazra, 45 exs. upper hill slope on Ranjeet River, Legship, 9.v.98, Coll. A.K. Hazra, 30 exs. Road side near Monastry campus, Pemayangtsi, Geyzing, 10.v.98, Coll. A.K. Hazra, 5 exs.

Diagnostic character : Body length upto 0.8 mm. Brownish black granular, Ocelli on black fields. Spare to heavy, of short and long curved simple setae. Antennae shorter than head. 8+8 eye. PAO very irregular, consisting of 4–12 indistinct disconnected lobes. With or without central boss. Abd. VI. with two long anal spines on papilae. Tenent hair never clavate, Claw and unguiculus finely granulate, Mucro finely granulate and spoon-shaped with two distinct lamellae.

Distribution : India : Sikkim.

Family ENTOMOBRYIDAE

Subfamily ENTOMOBRYINAE Schaeffer, 1896.

Dentes crenulated dorsally. Mucrone fulcate with basal spine, it is short and hook-like. Body with hairs or scales or both the chaetotaxy of head and trunk, and eye numbers are useful in identifying the members of this family.

III. Genus ***Lepidocyrtus*** Bourlet, 1839

The genus is represented by four species from Sikkim.

Key to the species of *Lepidocyrtu*

1. VIth abdominal segment with elongate cerciform tergum ..... *Lepidocyrtus caudatus* Carpenter, 1917

— VIth abdominal segment without elongate cerciform tergum 2

2. Dental lobe with accessory apparatus ..... *L. (Acrocyrtus) malayanus* Yosii, 1959.

— Dental lobe without accessory apparatus 3

3. Th II is very prominent and protruded over the head. Abd. II : IV = 1:7 .... *L. magnificus* Carpenter 1917.

— Th. II is protruded considerably over the head. Abd. III : IV = 1:3 ..... *L.medius* ..... Schaeffer, 1893.

3. ***Lepidocyrtus caudatus*** Carpenter, 1917 (Map 1)

1917. *Lepidocyrtus caudatus* Carpenter, *Rec. Ind. Mus. Calcutta;* **8** (ix) : 561–568.

Material examined : Way to Dethong Basti, Ravangla, 2.v.1998, Coll. A.K.Hazra, 20 exs. Inside Animal Husbandry Farm in the grass field way to Kewzing, Ravangla, 3.v.98, Coll. A.K. Hazra, 100 exs.

Diagnostic characters : Mesonotum slightly prominent, half as long as metanotum. Abd. IV Six times as long as Abd. III. Abd. VI prolonged into a slender cerciform process. colour pale yellow with violet patches on antennal segment, a violet spot on Th. II and Abd. III, IV and V.

Distribution : India : Sikkim, Elsewhere : Lower Burma.

4. ***Lepidocyrtus (Acrocyrtus) malayanus*** Yosii, 1959 (Map 1, Fig. 1)

1959. *Lepidocyrtus (Acrocyrtus) malayanus* Yosii, *Contr. Biol. Lab. Kyoto Univ.,* **10** : 28.

Material examined : Ranipool Paddy field area, Alt. 5,500 ft, 13 Km from Gangtok, East Distt. 30.x.1992, Coll. A.K. Hazra, 9 exs. Benjong, South Dist. 9.xi.92, Coll. A.K. Hazra, 5 exs. Namuna Basti, Namchi, 30.iv.98, Coll A.K.Hazra, 230 exs. Animal Husbandry Farm, way to Kewizing, Ravangla, 3.v.98, Coll. A. K. Hazra, 3 exs. Kewizing, near P.W.D. Bunglow, 3.v.98, Coll. A.K. Hazra, 30 exs.

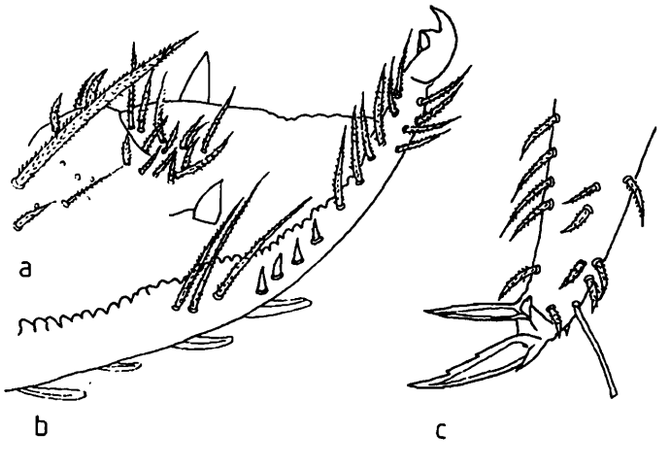


Fig. 1. *Lepidocyrtus (Acrocyrtus) malayanus* : a. dental end of manubrium, b. lateral view of dentes and nucro, c. Hind claw.

Diagnostic character : Ground colour brownish white, antennae distally bluish pigment from Ant. II. Eye 6+6. Scales are present darsally upon Ant. I and II, ratio of Ant. Segs. = 9 : 18 : 11 : 23. Th. II : III = 7 : 3. Abd. III : IV = 1 : 5. Manubrium : dentes = 9 : 8. Dorsal appexdix of dental lobe is prominent, acutely pointed in profile. Body length 2.5 mm.

Distribution : India : Sikkim, Tripura (West Dist.), Elsewhere : Singapore.

5. ***Lepidocyrtus (S.Str) magnificus*** Carpenter,1924 (Map 1, Fig. 2)

1924. *Lepidocyrtus (S. Str.) magnificus* Carpenter, *Rec. Ind. Mus. Cal.* **26** : 285-289.

Material examined : Ranikhola river bank, about 20 km. from Gangtok, 30.x.92, Coll. A.K. Hazra, 2 exs. Saramsa Orchid garden about 16 km. from Gangtok, 31.x.92. Coll. A. K. Hazra, 27 exs. 4 km. North West of Singhik, 5. xi. 92,, Coll. A. K. Hazra, 2 exs. Kabi, 28 km. from Gangtok, 7.xi.92, Coll. A.K. Hazra, 13 exs. Benjong, South distt. 9.xi.92, Coll. A. K. Hazra, 2 exs. Animal Husbandry Farm, way to Kewizing, Ravangla, 3.v.98, Coll. A.K. Hazra, 60 exs. Monstry campus, Pemayangtsi, 10.v.98, Coll. A. K. Hazra, 45 exs.

Diagnostic characters : Mesonotum four times as long as metanotum. Abd. IV Seven times as long as Abd. III. Antennae twice as long as head colour pale yellow- with Ant. III and IV, edges

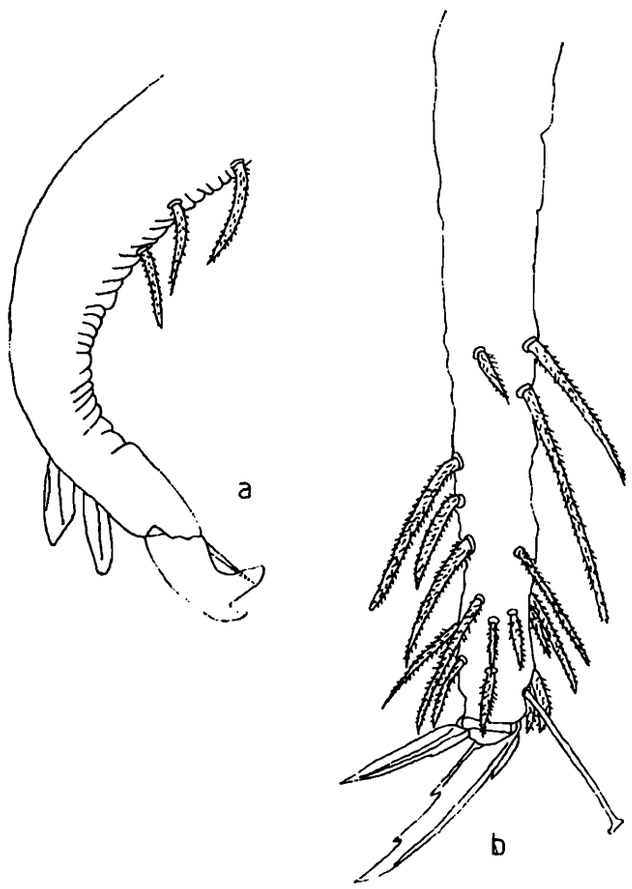


Fig. 2. *Lepidocyrtus* (S. Str) *magnificus* : a Mucro-dens, b. Hind claw.

of th. II & III and last abdominal segment dark violet. Relatively short III Antennal segment. Mucro stout with strong teeth, the dorsal spine short.

Distribution : India : Sikkim, Tripura (West Distt.) Assam.

6. ***Lepidocyrtus (S.str.) medius*** Schaeffer, 1898. (Map. 1, Fig. 3)

1898. *Lepidocyrtus* (S. Str.) *medius* Schaeffer, *Contr. Bios. Lab. Kyoto Unit.*, **10** : 26.

1913. *Lepidocyrtus* (S. Str.) *medius* Borner, *Tijdchr. v. Entom.*, **56** : 44-61.

1926. *Lepidocyrtus* (S.Str.) *medius* Uchida, Insecta *Mat. Sap.* **17** : 38-47.

Material examined : Ranikhola river bank, Gangtok, 30.x.92, Coll. A.K. Hazra, 10 exs. West of Tashi Hills, 01.xi.92, Coll. A.K. Hazra, 13 exs. Side of hill stream., Singhik, 4.xi.92, Coll. A.K.Hazra, 16 exs. Benjong, South distt. 9.xi.92, Coll. A.K. Hazra, 8 exs. Jorethang, 9.xi.92, coll. A.K. Hazra, 40 exs. Rongpo, PWD Rest House Campus, 12.xi.92, Coll. A.K.Hazra, 10 exs. Chirbir Forest, Jorethang, 12.v.98, Coll. A. K. Hazra, 37 exs. Dophang, Geyzing, 3.v.98, Coll. A.K. Hazra, 90 exs. upper Hill slope of Rangeet river, Legship, 9.v.98, Coll. A.K. Hazra. 170 exs.

Diagnostic characters : Colour brownish white. Antennae pigmented purple distally. A median spot between eyes. Ant. seg. as 12 : 28 : 30 : 42 : Th II : III = 15 : 7. Abd. III : IV : 1 : 3. Manubrium : dens as 1 : 1. Mucro with apical tooth elongated, anteapical tooth is little smaller.

Distribution : INDIA : Sikkim, Tripura (West Distt.), Singapore.

Fig. 3. *Lepidocyrtus* (S. Str.) *medius* : a. dorsal view of manubrium, b. Ventral view of manubrium, c. Mucro-dens, d. Ventral tube, e. Fore claw, g. Hind claw.

IV. Genus : ***Sinella*** Brook, 1882

The genus is represented by only one species from Sikkim.

7. *Sinella curviseta* Brook, 1882
(Map 1)

1966. *Sinella curviseta* Yosii. *J. Coll. Arts & Sci. Chiba Univ.*, **4** (4) : 461-531.

Material examined : Jorethang, 9.xi.92, Coll. A. K. Hazra, 80 exs. 4 km. North West of Singhik, 5.xi.92, Coll. A. K. Hazra, 60 exs. Namuna Basti, Namchi, 30.iv.1998, Coll. A. K. hazra, 270 exs. Kechiperi Lake, West Sikkim, Yuksum, 7.v.98, Coll. A. K. Hazra, 12 exs. side of the hill-slope near Geyzing Bazra, 8.v.98, Coll. A. K. Hazra, 55 exs. Chispani, Jorethang, 13.v.98, Coll. A. K. Hazra, 34 exs.

Diagnostic characters : White with pigment limited to eyes; Body with scattering of reddish pigment granules. Eyes with on separate patches, apical half of the third antennal segment with many extremely minute blunt setae. Clavate tenent hair. Unguis with minute apical tooth, unguiculus acuminate. Basal spine of mucro very long.

Distribution : INDIA : Sikkim, Punjab.

V. Genus ***Entomobrya*** Rondani, 1861

Subgenus ***Homidia*** Borner, 1906

This genus is represented by only one species from Sikkim.

8. ***E. (Homidia) Sp.*** Borner, 1906
(Map 2)

Material examined : *East Sikkim distt* : Ranipool paddy field, 30.x.92, coll. A. K. Hazra, 25 exs. Tackholm river bank, 30.x.92, Coll. A.K. Hazra, 17 exs. Saramsa orchid Garden, 31.x.92, Coll. A.K. Hazra, 43 exs. water falls, 17th Miles towards Tassangu, Alt. 3500 mts., 26.iv.98, Coll. A. K. Hazra, 2 exs. Tashi, 25.iv.98, coll. A. K. Hazra, 57 exs.

North Sikkim distt. :North West Singhik by the side of a hill stream, 4.xi.1992, Coll. A. K. Hazra, 1 ex.

Diagnostic characters : Back ground yellowish. Blue-black pigment forming transverse band on the IIIrd and IVth abdominal segments. Body not compressed. Dental spine 33 present. Apical mucronal tooth smaller than anteapical.

Distribution : INDIA : Sikkim.

Subfamily TOMOCERINAE, Schaeffer, 1896

The peculiar feature of fourth antennal segment shorter than the third easily separates this subfamily from all other entomobryids. There are two species under single genus from Sikkim.

VI. Genus ***Tomocerus*** Nicolet, 1842.

Key to the species of *Tomocerus*

The dens with petaloid spines .....
..... T. *petalospines* Salmon, 1969.

The dens without petaloid spines .....
..... *T. mitrai* prabhoo, 1980.

9. ***Tomocerus petalospinus*** Salmon, 1969
(Map. 2)

1969. *Tomocerus petalospinus* Salmon, *Zool. Pub; Victoria Univ.*, **51** : 39-49.

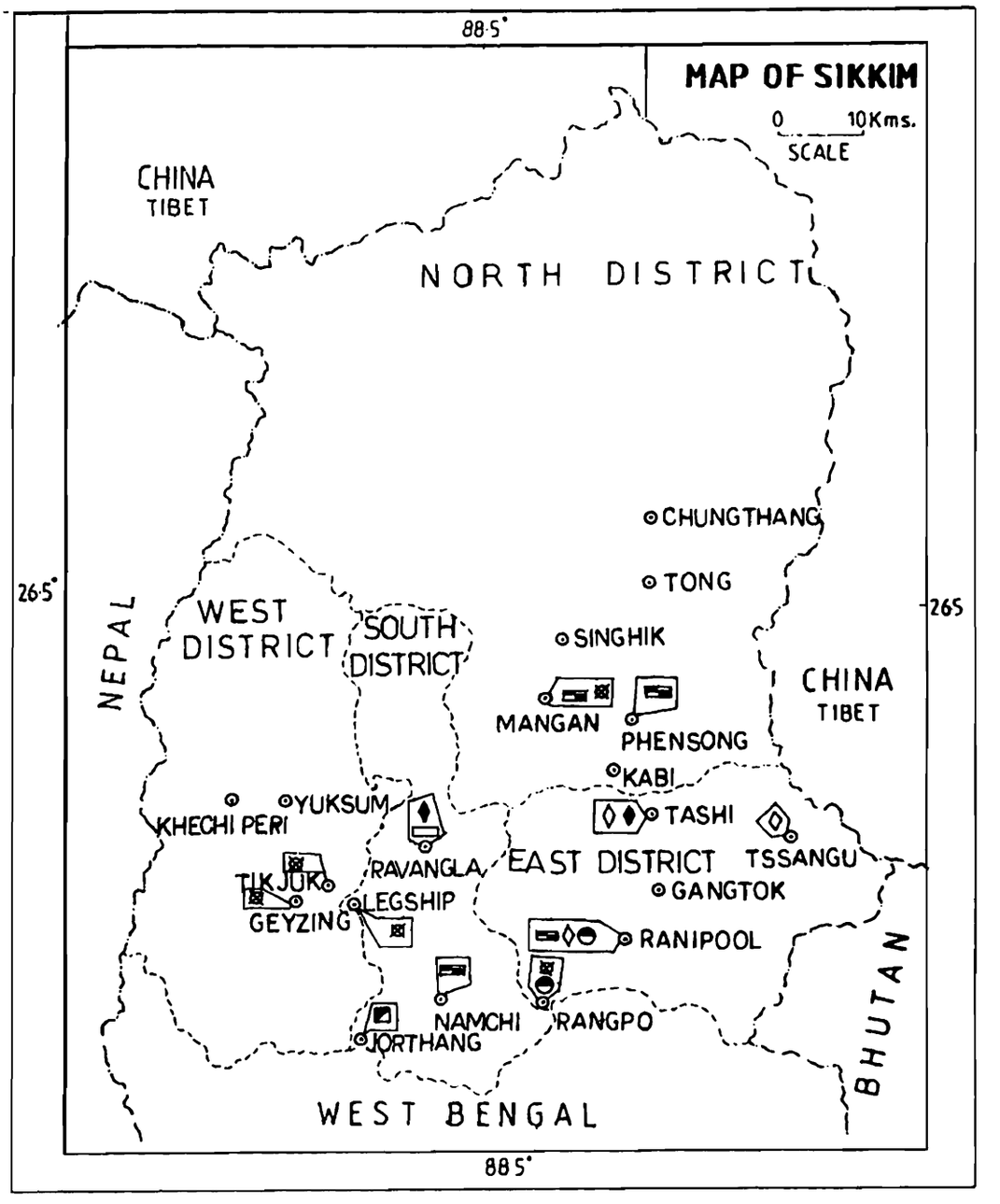
Material examined : Way to Dethong Basti, Ravangla, 2.v.98, Coll. A.K. Hazra, 70 exs. Animal Husbandry Farm. way to Kewzing, Ravangla, 3.v.98, Coll. A. K. Hazra, 30 exs.

Diagnostic characters : Deep brown to greyish brown. Long Plain Setae and many strongly fluted scales. Ant. III and IV. Strongly annulated and more or less fused. Claws with one pair of strong basal teeth and five (5) inner teeth. Mucro clothed with simple setae and having a small apical tooth, a large pre-apical tooth, seven large median teeth and ten fairly large lateral teeth. The dens bearing both large and small basally petaloid spines & forming a ring around the base of each spine, which is a distinct feature seperating the species from any other species of *Tomocerus*.

Distribution : INDIA : Sikkim.

10. ***Tomocerus*** (S. Str.) ***mitrai*** Prabhoo, 1980
(Map. 2)

1980. *Tomocerus* (S. Str.) *mitrai* Prabhoo and Murlidharan, *Entomon.*, **5** (3) : 207-210.



Map 2. Showing the distribution of Collembola in different districts of Sikkim

- *Alloscopus tetracantha*
- *Callyntrura boerneri*
- *Cyphoderus javanus*
- *E. (Homidia) sp.*
- *T. mitrai.*
- *Salina indica*
- *Tomocerus petalospinus.*

Material Examined : South-East of Tashi hills, 15 km From Gangtok, 01.xi.92, Coll. A. K. Hazra, 20 exs. Animal Husbandry Farm, way to Kewizing, Ravangla, 3.v.98, Coll. A. K. Hazra, 50 exs. Kewizing. Near P.W.D. Bunglo, 3.v.98, Coll. A.K. Hazra, 50 exs. Hill side slope on the way to Dethong Basti, Ravangla, 2.v.98, Coll. A. K. Hazra, 60 exs.

Diagnostic characters : Ground colour yellowish white with blue pigment towards lateral margin of thorax and Ant. II–III. Ocellar field deep blue. Body clothed with brownish blunt scales with prominent striations and finely ciliated setae. Dentes with scales on ventral side, towards the distal half-two rows of unilaterally plumose setae 8-10 in a rows. Ocelli 6 + 6. Unguis of usual type with 5-6 teeth. Dental spine brown in colour, finely striated longitudinally in a single row as 3, 1.5, 1. Mucro elongated with 4 intermittent teeth on outer lamella and two basal teeth. Outer basal tooth of mucro with a corner toothlet.

Distribution : India : Sikkim, Himachal Pradesh (Kulu).

Subfamily CYPHODERINAE Borner, 1913.

Members of this subfamily may be distinguished from other entomobryids by the combined absence of ocelli, dental crenulations, and dental spines. Only one genus has been found in Sikkim.

VII. Genus ***Cyphoderus*** Nicolet, 1842.

The genus is represented by only one species from Sikkim.

11. ***Cyphoderus javanus*** Borner, 1906 (Map. 2)

1906. *Cyphoderus javanus* Borner, *Mitt. Nat. Hist. Mus. Hamburg.*, **23** : 180.

1966. *Cyphoderus javanus* Yosii, *Kyoto. Univ.* Expedition to Karakoràm and Hindukush, **8** : 381.

1971. *Cyphoderus javanus* Prabhoo, *Oriental Insects. 5 (1)* : 38

Material Examined : Ranipool paddy field area, 13 km. from Gangtok, East distt. 30.x.1992, Coll. A. K. Hazra, 10 exs., Rongo, PWD Rest House Campus, 12.xi.92. Coll. A. K. Hazra, 2 ex.

Diagnostic characters : White, without trace of pigment. Eyes lacking, elongated mucro with a well developed lamellated anteapical tooth. Large fringed scales on dens, ungus and unguiculus both have enlarged wing like teeth.

Distribution : India : Sikkim, West Bengal (Calcutta), Kerala. Elsewhere : Java, Malaya, Thialand, Japan.

Subfamily PARONELLINAE Börner, 1913

The members of this subfamily can be distinguished from other entomobryids by the right & short dentes, presence of dental scale appendages on the terminal part of dentes. The mucrones in majority cases are plump, lobed into several teeth and is different in shape from the members of subfamily entomobryinae.

Key to the genera of subfamily PARONELLINAE from Sikkim

1. Body covered with scale 2
— Body not covered with scale 4
2. Eye 8 + 8 3
— Eye reduced in number .... ALLOSCOPUS Börner.
3. Basal seta of the outer maxillary ramus is blunt ..... CALLYNTRURA Börner
— Basal seta of the outer maxillary ramus is pointed .... DICRANOCENTROIDES Schött.
4. Mucro stout, usually tridented, dentes not annulated ..... SALINA MacGillivary.
— Muçro Vestigial, some times visible as hooklet fused with dentes, dentes annulated ..... YOSIIA Mitra

VIII. Genus ***Alloscopus*** Börner

The genus is represented by only one species from Sikkim.

12. *Alloscopus tetracantha* Börner, 1906 (Map. 2 Fig. 4)

1906. *Heteromurus (Alloscopus) tetracantha* Börner, *Mitt. Nat. Hist. Mus. Hamburg.* **23** : 177.

1959. *Alloscopus tetracantha* Yosii, *Contr. Biol. Lab. Kyoto Univ.*, **10** : 38.

1971. *Alloscopus tetracantha* Prabhoo, *Oriental Insect* **5** (1) : 33.

Material examined : Ranjeet river bed, Jorethang South, Sikkim, 12.v.1998, Coll. A.K. Hazra, 8 exs. under Banana clam inside Bull rearing Farm, Jorethang, 13.v.98, Coll. A.K. Hazra, 10 exs. District Industries Centre Campus, Jorethang, 14.v.98, Coll. A. K. Hazra, 20 exs. Govt. Secondary School Campus, Jorethang, 14.v.98, Coll. A. K. Hazra, 5 exs.

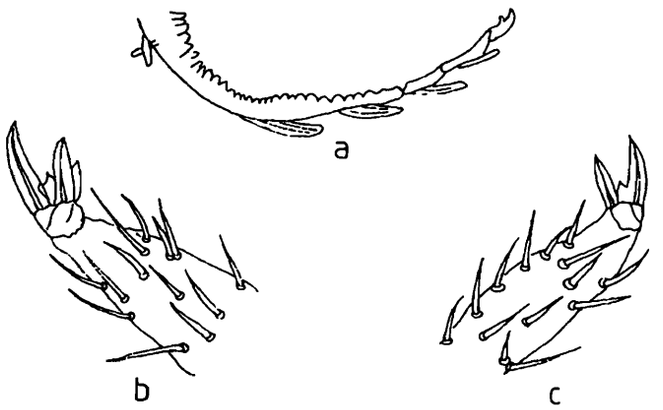


Fig. 4. *Alloscopus tetracantha:* a. Mucro-dens, b. Hind Claw, c. Fore Claw.

Diagnostic characters : White in colour. Ant. I is basally subdivided. Distal half of Ant. IV and whole length of Ant. V are distinctly annulated. Head without eyes. winged tooth of unguis and unguiculus. A row of 4–6 short spines on inner side of dentes. Distally, dentes are finely annulated gradually deminishing in smooth portion. Mucro bidentale without basal spine.

Distribution : India : Sikkim, West Bengal, Kerala, Elsewhere : Malaya, Singapore, Java, New Britain.

IX. Genus *Callyntrura* Borner, 1906.

The genus is represented by only one species from Sikkim.

13. *Callyntrura boerneri* (Imms., 1912) (Map. 2)

1912. *Paronella borneri* Imms. 1912.

1957. *Handschinphysa borneri* Salmon *Acta. Zool. Cracov.* **11**(14) : 313

1966. Callyntrura borneri Yosii, J. Coll. *Arts & Scien Chiba Univ.* 4(4) : 461-531.

Material Examined : Crossing P.W.D. Rest House & Mangan Chungthang Road, 3.xi.1992, Coll. A. K. Hazra, 10 exs. Kabi, 28 km from Gangtok, Alt. 5,400 ft. 7.xi.92, Coll. A. K. Hazra, 10 exs. River Rongpo & its tributory, 12.xi.92, Coll. A. K. Hazra, 40 exs. Tikjuk, Geyzing, 5.v.1998, Coll. A. K. Hazra 70 exs. pelling Girl's Hostel Road, pelling, 6.v.98. Coll. A. K. Hazra, 210 exs. Rethand Vill. Geyzing, 8.v.98, Coll. A. K. Hazra, 10 exs., Upper hill slope on Ranjeet River, Legship, 9.v.98, Coll. A. K. Hazra, 4 exs. Monstry campus, Pemayangtsi, 10.v.98, Coll. A. K. Hazra, 5 exs.

Diagnostic characters : Ground Colour brown, ornamented with purple patches to form a lateral stripes from antennal basis of head, posterior eye field & extending to body. Legs are beautifully banded. Besides body is covered with brownish scales. Unguis and unguiculus elongated, not different from other species, scale-like swelling of dentes normally large, mucro with seven teeth.

Distribution : India : Sikkim, W.B., Elsewhere : Nepal.

X. Genus *Salina* MacGillivary 1984 (Imms.) 1912

The genus is represented by only one Species.

14. *Salina indica* (Imms) 1912 (Map 2. Fig. 5)

1912. *Cremastocephalus indicus* Imms. *Proc. Zool. Soc. London* : 80-125.

1957. *Salina indica* Salmon. *Acta. Zool. Cracov.*, **11** (14) : 313-362 (in Part).

1973. *Salina indica* Mitra *Oriental Insects.*, 7(2) : 159-202.

Material examined : Ranipool Paddy field area, 30.x.92, Coll. A. K. Hazra, 2 exs. Takchom river

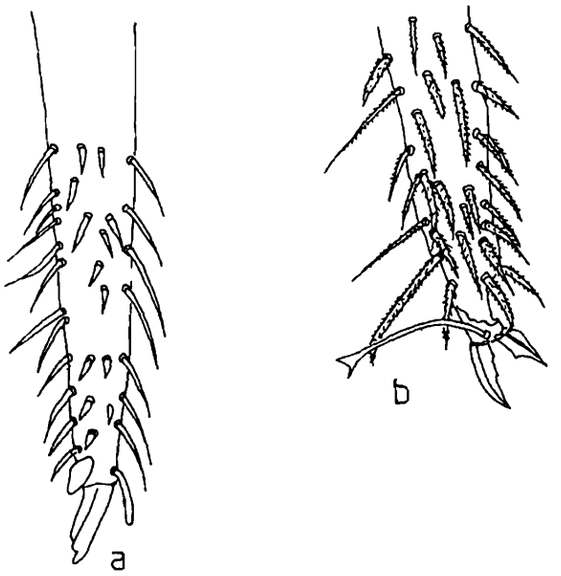


Fig. 5 : *Salina indica* : a. Mucro-dens, b. Hind claw.

bank, 31.x.92, coll. A.K. Hazra, 2 exs. Mangan Chungthang road, Singhik, 3.xi.92, Coll. A. K. Hazra, 19 exs. P.W.D. Rest House Campus, 4.xi.92, Coll. A. K. Hazra, 5 exs. 3 km. away from Singhik, 4.xi.92, Coll. A. K. Hazra, 2 exs. Near Phensong, 5.xi.92, Coll. A.K. Hazra, 12 exs. 2 km. South east of Dukbunglow, Namchi, 27.iv.1998, Coll. A. K. Hazra, 100 exs.

Diagnostic characters : Ground colour yellowish, overlaid irregularly by violet pigment which usually follows a lateral edges of the terga. Ocelli on black fields 8+8. General clothing of short to medium length ciliated setae with some long. stout, lightly flexed ciliated setae at the apex of mesotergum & along the dorsal surface of the thorax. Apex of dens with scale like appendage. Mucro bearing three plain teeth. More detailed description & picture given by Salmon in his original paper (1957).

Distribution : India : Sikkim, Manipur, Tripura (West and South distt.) U.P., West Bengal.

XI. Genus *Yosiia* Mitra, 1967.

The genus is represented by only one species from Sikkim.

15. *Yosiia dehradunia* Mitra, 1967 (Map. 3. Fig. 6)

1967. *Yosiia dehradunia* Mitra, *Proc. Zool. Soc. Calcutta.*, **20** : 43-47.

Material examined : Benjong, South district, 9.xi.1992, Coll. A. K. Hazra, 2 exs. Jorethang, 9.xi.92, Coll. A. K. Hazra, 2 exs. Mamring, Rongpo, 13.xi.92, Coll. A. K. Hazra, 20 exs.

Diagnostic characters : Ground colour pale yellow, dusted with blue pigment all over the body. Clothed with slender accuminate setae. Dens crenulated, mucro vestigial, some time preceptible in the form of a hooklet, not demarcated from dens. Dental scale appendage highly enlarged. Pear shaped head, 8+8 Ocelli. Ant. III and IV faintly annulated, relative length index of Ants I : II : III : IV = 32 : 46 : 48 : 70. Th. I reduced, the relative length index of Th II : III = 23 : 11. Each tibiotarsus with two large tibio-tarsal lobes. The relative length index of Abd. I : II : III : IV a : V : VI = 6 : 15 : 4 : 67 : 9 : 6. Ventral tube short. Body length 1.14 mm.

Distribution : India : Sikkim, Tripura (West dist.) West Bengal, U.P.

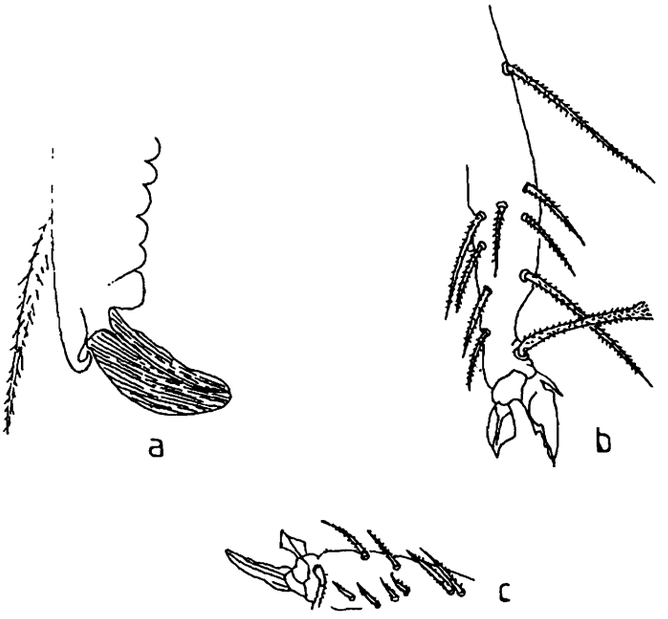


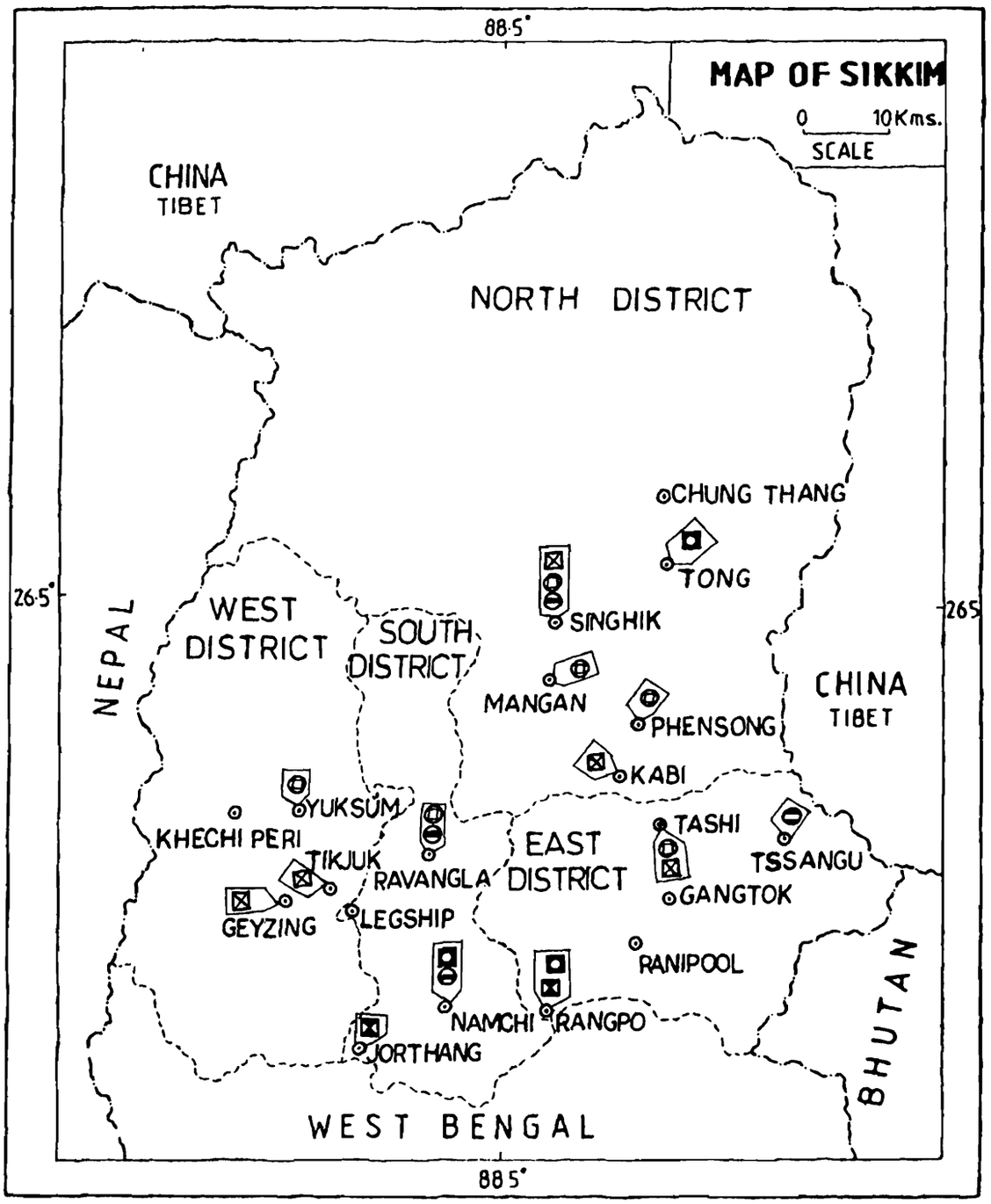
Fig. 6. *Yosiia dehradunia* : a. Mucro-dens, b. Hind claw, c. Fore claw.

XII. Genus *Dicranocentroides* (Imms) 1912.

The genus is represented by three species from Sikkim.

Key to the species of *Dicranocentroides*

1. Body devoid of dark pigmented patches ..... *Dicranocentroides flavescens* Yosii.



Map 3. Showing the distribution of Collembola in different districts of Sikkim

- ⊠ *Yosiia dehradunia*
- ⊖ *Dicranocentroides flavescens*
- ⊠ *Isotoma (Desoria) trispinata*
- ⊖ *D. fasciculatus*
- ◘ *D. Salmoni*
- ⊖ *I. (D) mazda*

— Body with distinct dark pigmented patches ..... 2.

2. Th. II totally pigmented, Abd. III with its lateral extensions and Abd. IV totally dark, no distinct transverse band on Abd. IV. In living Specimens shining metallic golden pigment occurs posteriorly on head, Th. II, Abd. I, II, posteromedially on Abd. IV. .. .. *fasciculatus* Salmon.

— Median patches on Th. II may be absent,but anterior margin always pigmented, Abd. III andits lateral extensions pigmented Abd. IV with medially and posteriorly pigmented transverse band. No shining metallic pigment occurs in living condition..... ..... *Salmoni* Mitra

16. ***Dicranocentroides flavescens*** Yosii 1966. (Map. 3. Fig. 7)

1966. *Dicranocentroides fasciculatus* f.n.*flavescens*, Yosii, *Res. Kyoto Univ. Sci. Exped. Karakoram and Hindukus.*, **8** : 333-405.

1975. *Dicranocentroides flavescens* Mitra, *Rec. Zool. Surv. India.*, **71** : 57-95.

Material examined : 4 km. North West of Singhik, 5.ix.92, Coll. A. K. Hazra, 6 exs. Upper phokrin, Namchi, 29.iv.98, Coll. A. K. Hazra, 500 exs. Namuna Basti, Namchi, 30.iv.1998, Coll. A. K. Hazra, 330 exs. way to Dethong Basti, Ravangla, 2.v.98, Coll. A. K. Hazra, 60 exs.

Diagnostic characters : A dark patch, characteristic of the species, present on vertex in between two ocellar fields. Dark patches absent on body. Ocelli 8+8. Relative length index of Ant. I : II : III : IV = 15 : 17 : 12 : 19. Relative length index of Thr. II : III = 14 : 8.5. Legs all similar, unguiculus lanceolate, acuminate with 2 external teeth. Relative length index of Abds. I : II : III : IV : V : VI = 5 : 6 : 4 : 39 : 5.5 : 2. Ventral tube long with a row of macrochaetal anteriorly. Relative length of manubrium : mucrodens = 28 : 38, dentes armed with two closely apposed rows of spines on inner margin; mucro large, parallel sided with 6 teeth. Body length 2–3.5 mm.

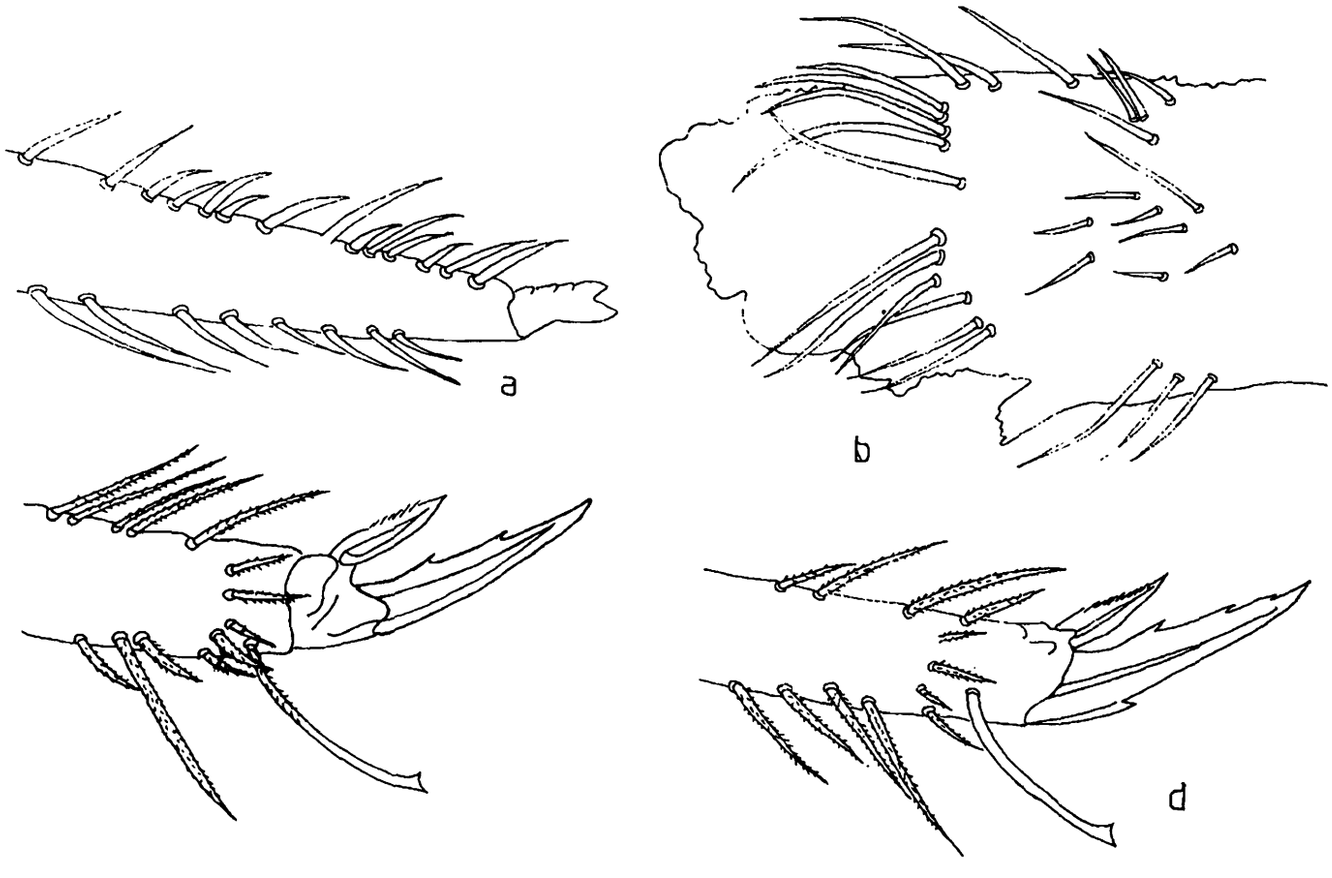


Fig. 7 : *Dicranocentroides flavescens* : a. Mucro-dens, b. Ventral tube, c. Fore claw. d. Hind claw.

Distribution : India : Sikkim, Tripura (West Distt.), West Bengal, Maharashtra, U.P.

17. ***Dicranocentroides fasciculatus*** Imms. 1912 (Map 3)

1912. *Dicranocentroides fasciculatus* Imms, *Proc. Zool. Soc.* London : 80-125.

1917. *Paronella crassicornis* Carpenter, *Rec. Indian. Mus. Calcutta*, **8** : 561-568, New Synonymy.

1925. *Dicranocentroides fasciculatus* Schott, Sarawak, *Mus. Jour.*, **3** : 107-127 (Lapsus for *fasciculatus*).

1957. *Dicranocentroides fasciculatus* Salmon, *Acta Zool Cracov.* **11**(14) : 313-362.

1975. *Dicranocentroides fasciculatus* Mitra, *Rec. Zool. Surv. Ind.* **71** : 57 95.

Material examined : Near Phensong, Singhik, 5.xi.92. Coll. A. K. Hazra, 30 exs. South East of Tashi Hills, 15 km. from Gangtok, 1.xi.92, Coll. A. K. Hazra, 35 exs. North East of Tashi Hills, 1.xi.92, Coll. A. K. Hazra, 45 exs. Crossing PWD Rest House & Mangan-chungthang Road, 3.xi.92. Coll. A. K. Hazra, 22 exs. Tong, 25 km. from Mangan, 3.xi.92 Coll. A. K. Hazra, 2 exs. 4 k. North West of Singhik, 5.xi.92, Coll. A. K. Hazra, 6 exs. Dambudara,, Namchi, 30.iv. 98, Coll. A. K. Hazra, 45 exs. way to Dethong Basti, Ravangla, 2.v.98, Coll. A. K. Hazra, 25 exs. Farming Falls, Yuksum, West Sikkim, 7.v.98. Coll. A. K. Hazra, 180 exs.

Diagnostic characters : Th. II always with reddish to brown pigment. Abd. II, IV, V. usually dark brown. Head usually dark pigmented. In some species, a deep violet transverse band across Abd. IV. which widens into a lateral blotch on each side as described by Salmon (1957).

More detailed description and figures are given by Mitra in his original paper (1975).

Distribution : India : Sikkim, Manipur, West Bengal (Calcutta), U.P.

18. ***Dicranocentroides salmoni*** Mitra, 1975 (Map 3)

1957. *Dicranocentroides fasciculatus* Salmon, *Acta. Zool. Gocov.*, **11** (14) : 313-362.

1957. *Handschinphysa crassicornis Sensu.* Salmon, ibid.

1975. *Dicranocentroides salmoni* Mitra, *Rec. Zool. Surv. Ind.* **71 : 57-95.**

Material examined : 4 km North West of Singhik, 5.xi.92, Coll. A. K. Hazra, 9 exs. Near Culvert No. C/72 on Mangan-Chungthangroad, 3.xi.92, Coll. A. K. Hazra, 23 exs. Benjong, South district, 9.xi.92, Coll. A. K. Hazra, 15 exs. Tong, 25 km from Mangan, 3.xi.92, Coll. A. K. Hazra, 15 exs. South East of Tashi Hills, 1.xi.92, Coll. A. K. Hazra, 47 exs. Kabi, 28 km. from Gangtok, 7.xi.92, Coll. A. K. Hazra, 5 exs. Rongo, P.W.D. Rest House Campus, 12.xi.92, Coll. A. K. Hazra, 1 ex. Kopche, Vill., Namchi, 28.iv.1998, Coll. A. K. Hazra, 3 exs.

Diagnostic characters : Extremely variable colour pattern. Th. III, Abd. I, II, III and its lateral extensions almost always pigmented, medially and posteriorly two transverse bands on Abd. IV. 1 + 1 dark ocellar field.

More detailed description & figures are given by Mitra in his original paper (1975).

Distribution : India : Sikkim, Assam, Meghalaya.

Family ISOTOMIDAE

Subfamily ISOTOMINAE, Schaeffer, 1896

Head prognathus, tracheae absent. Antennae inserted in front half of head. P.A.O. usually present; always simple. Mucrones short.

XIII Genus ***Isotoma*** Bourlet, 1839

Subgenus ***Desoria*** Nicolet, 1841

Key to the species of the genus *Isotoma (Desoria)*

The Genus is represented by two species from Sikkim.

1. Totally black pigmented ..... 1.*(Desoria)* ..... *mazda*

— Light yellowish pigmented ..... 1 *(Desoria)* ..... *trispinata*

19. ***I. (Desoria) trispinata*** (Macgillivary, 1896) (Map 3)

1966. *Desoria trispinata* Yosii, *J. Coll. Art. and Sci. Chiba Univ.*, **4** (4) : 461-531.

Material examined : Tackchan river bank; Gangtok, 30.x.92, Coll. A. K. Hazra, 1 exs. Kabi, 28 km. from Gangtok, 7.xi.92, Coll. A. K. Hazra, 14 exs. North West of Tashi-hills, 01.xi.92, Coll. A. K. Hazra, 10 exs. 4 km. West of Singhik, 5.xi.92, Coll. A. K. Hazra, 3 exs. Tikjuk, Geyzing, 5.v.1998, Coll. A. K. Hazra, 100 exs.

Diagnostic characters : Very characteristic feature is the rounded P.A.O. directly before eyes. Ant. IV with one subapical Cone; Tridentate mucro. Unguis always without tooth.

Distribution : India : Sikkim. Elsewhere : Japan, Taipai, Europe.

20. ***Isotoma (Desoria)* cf. *mazda*** Yosii (1971) (Map 3)

Material Examined : Tssangu lake glacier side. East distt. Alt. 3600 metres. 26.iv.1998. Coll. A. K. Hazra, 35 exs.

Diagnostic characters : The species is totally black in colour and was named as "Glacial fleas" of Himalayan by Yosii (1971) who described it from the Nare Glacier (Amai-Dublong Gletscher, 5,550 mts. altitude).

Distribution : India : Sikkim.

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INSECTA : ODONATA

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INTRODUCTION

The order odonata embraces dragonflies and damselflies, sometimes called only dragonflies. This is relatively a small order of insects and the extant forms are being represented by three suborders *viz.*, Zygoptera, Anisozygoptera and Anisoptera. These are cosmopoliton in distribution and are abundant in the tropics especially available in the vicinity of the aquatic bodies. In India about five hundred species and sub-species occur.

These beneficial insects are famous for their cute appearance, flightpower and sharp eye sight. These "flying machine" can fly backward, move vertically like helicopter or stop and turn in the midst of the most rapid progression as if they have been rammed into. This could be possibly due to the adjustment of the gravity between the bases of the wings and leaves a sharp contrast with all other living insects.

Dragonflies have the highest development of the compound eyes (Huxley 1953). Eyes occupy almost whole of the head. It has been estimated that an eye of an adult dragonfly contain 10,000 to 28,000 facets. Other parts of the head *viz.* labium, labrum, clypeus, frons, occiput etc. are very small. The head is movable and can be twisted sideways 180°, backward 70°, forward and downward 40°. With the aid of these attributes, the flies can select their habitat according to their choice (Corbet 1962).

These insects are primitive and possess some specialised features too. Their ancestors have been recorded from the carboniferous rocks; but no remarkable changes in the morphology had taken place after jurassic. The meso-and metathorax are fused to form the synthorax (thorax) and the legs have shifted forward to form a basket with the help of spines. Such features enable them to capture prey while on wing. The wings are membranous in nature and endowed with net of veins. The abdomen is relatively long and slender the genitalia is found to be at its tip. In case of male only, however, the second abdominal segment bears the compulatory organ. Mating behaviour is somewhat interesting and in doing so the male captures the neck of the female with the help of the anal appendages and in response the female amplexes its genitalia with the male copulatory organ and thus constitute the so called "wheel"

Female oviposit in water either being accompanied by the male or may remain alone. The male sometimes guard the ovipositing female. The larvae develop in water and feed on aquatic animals *viz.*, mosquito larvae, beetles, earthworms etc. with the aid of their labium. The adults live in air and feed on mosquitoes, flies, aphids, termites and other noxious insects with their powerful mandible.

THE MORPHOLOGY OF ADULT

Matured adults are only suitable form for classification. Larvae and immature forms are not very important; structures and their characters used in classification are as follows.

The matured adult is made up of a head, a prothorax, thorax and abdomen. The thorax carries a pair of fore wings and a pair of hind wings, three pairs of legs. The abdomen composed of ten segments, and anal appendages for seizing the female on the anal end of the 10th segment.

The Head

The major part of the head is occupied by two large compound eyes. They are either fused broadly along the middle line as in the family Libellulidae, Aeshnidae, or meet at a point as in Corduliidae; slightly separated as in Cordulegasteridae and widely separated as in Gomphidae of Anisoptera and in all Zygoptera. In Aniso-zygoptera the eyes are separated like Cordulegasteridae. In addition to this eyes, there are three tiny ocelli situated between and in front of the eyes, usually these are grouped round a small eminence known as the vesicle. Antennae are very short and inconspicuous. They are composed of four to seven segments. Mouthparts are fit for biting. The mandibles with strong incisor and molar teeth. The maxillae are with simple unjointed pulp and robustly toothed internal lobe. The labium is short and very broad. This is made up of a median and two lateral lobes. The median is cleft in the archaic forms and in zygoptera. The lateral lobes are smaller than median ones in archaic forms and in zygoptera; while larger in Anisoptera and in higher types it is made up of two segments, a basal and a large movable hook.

The Thorax

The thorax is divisible into two parts; the *Prothorax* which forms the neck; behind the prothorax lies the large mass technically known as the *Synthorax*, popularly called the *Thorax*. The thorax is formed due to fusion of meso-and meta thorax.

The prothorax is composed of an anterior lobe, collarlike and narrow, a tumid middle forms the greater part of the structure and hindmost is the posterior lobe, the structure, its hair, spines etc. help in classification, some times upto the species level, the posterior lobe help in movement of the head in different directions. The prothorax carries the first pair of legs, the thorax is oblique, the anterior surface has become the dorsum and bear wings; and thrusting the legs forward beneath the head. The dorsum of thorax possesses Mesothoracic triangle, the area of which sometimes help in species determination; behind the triangle lies the middorsal carinal ridge; on the lateral side, almost below the middorsal carinal suture and above the second pair of coxae (of leg) lies the antehumeral coloured stripe; lower part of the second pair of coxae lies in continuation of Humeral suture; below the humeral suture lies the Antero-lateral suture; below the antero-lateral suture lies the postero lateral suture, it is in continuation of the hinder part of the mesepimeron. Below the mesepimeron lies the metepimeron.

Legs are composed of short coxae and trochanter, long femora and tibiae; segmented tarsus and a claw. Femora, tibiae, tarsii are provided with long and short spines. Legs are rarely used for walking; they are mainly used for rest, and capture of prey.

Wings are two pairs : one pair fore wings and one pair hind wings. The wings are membranous; sometimes coloured sometimes clear. It has number of spines on the undersurface of the supporting ribs or nervures or veins. There is a net work of veins.

Following veins and spaces are named as follows :

1. Costa	Anterior border of the wings.
2. Subcosta	Below costa but upto the node.
3. Radius	From the base; lying between the subcosta and the media.
4. Arculus or Arc	A short, oblique, transverse vein near the base of the wings which forms the outer boundary of the basal or median space.
5. Riv+v	One of the branches of the radius in prolongation of the superior sector of the arc.
6. Sectors of Arc.	The origins of the nervures Riv+v and M.A.

7. Node	A thick part of the wing situated at an indenta-tion of the costal margin of the wing.
8. Subnode	An oblique vein descending from the node extending obliquely outward into the body of the wing and traversing the space lying between Ri and Rii.
9. Cubital nervure	A name commonly used for the anal crossing.
10. Cubital space	A space at the extreme base of the wings situated immediately posterior to the basal space and extending out as far as the base of the discoidal cell.
11. Discoidal cell	A well defined triangular or quadri-laterial space situated near the base of the wings, immediately distal to the cubital space.
12. Discoidal field	The space lying distal to the discoidal cell and bounded outwardly by the border of the wing. The nervures MA and Cu_2 constitute its anterior and posteror borders respectively.
13. Antenodal Nervures	Nervures or veins lying between the costa and subcosta on the proxial side of the node *i.e.* towards the base of the wing.
14. Postnodal Nervures	Veins or nervures lying between the costa and the radius on the distal side of the node *i.e.* towards the apex of the wing tip.
15. Median space or the basal space	The space lying between the base and the arc.
16. Cubital space or the submedian space	Space lying under the median space and between the wing base and the base of the discoidal cell.
17. Anal bridge	A short vein running parallel to the hinder border of the wing and passing below the discoidal cell.
18. Anal crossing	A short vein situated at the base of the wing and extending from Cu_2 + 1A to the Anal bridge or hinder border of the wing.
19. Anal loop	An area of cells situated at the base of the hind wing in many genera of Anisoptera. Its apex is made up of Anal vein.
20. Anal triangle	A triangular area at the extreme base of the hind-wing in the Anisoptera, made up of one or more cells, occuring in male only if it occurs at all.
21. The Abdomen	It lies behind the thorax. It consists of ten segments. The anal appendages are attached to the last.
22. The Anal appendages	Males in Zygoptera posses paired superior and inferior appendages; while males in Anisoptera posses a pair of superior and an inferior appendages.

COLLECTION OF DRAGONFLY

Benzene Technique

The imago is collected with the aid ofButterfly net. Then the specimen is killed with the Benzene vapour. To kill the specimens they are put in glass jar containing benzene soaked cotton covered with blotting paper. The specimens are taken out of jar and exposed to air for drying. The dried

specimens are put in paper envelope. Before putting in the envelope the abdomen of the dead specimens are made straight, wings are placed over the back. The envelope may contain blotting paper to soak the body fluid emitted by the dead specimen. The envelope must contain the collection data: locality (Village, District, State), date of collection, habitat, and name of the collector. *Benzene is volatile and quickly evaporates.*

Acetone Technique

The second technique is known as Acetone Technique. The specimens are collected with the aid of butterfly net. The specimen can be killed by drowning the specimens in the Acetone. The abdomen of the specimen is to be straightend and wings are to be kept over the thorax. Then the specimens are to be put in the paper envelope or triangle. Glassine envelope, Newspaper, Cellophane envelopes are not good for the purpose; regular "notebook" or typing paper is preferred. Collection data on the envelope to be written in pencil since acetone dissolves some kind of ink. Now the living specimen in the envelope to be drowned in the acetone filled jar and to be kept for twenty four hours.

Acetone kills the bacteria that cause decomposition, dries specimens by osmosis, and dissolves the surface wax layer which allow the specimen to dry quickly. Several examples is to be drowned in same jar. Acetoneis to be thrown out of the jar when acetone becomes pale straw colour like urine. The specimens to be dried by air.

Precaution

Benzene and Acetone are highly inflammable.

Preparation for study

The dead specimens can be studied as such; or they can be prepared for study. Wings are stretched making prependicular to the thorax; abdomen is to be made straight. Then an entomological pin is inserted through the thorax between the wings. A label containing collection data is prepared with cartidge paper. It is kept below the specimen piercing the pin through it. Finally the specimens are kept in the insect box. Which, too, contain preservatives and insect repallants.

MATERIAL AND METHODS

Adult specimens were collected by different parties, from the head quarter and regional stations, from Zoological Survey of India. A few examples have also been donated by Dr. Bhanu Nandi, lecturer in the department of Zoology, Darjeeling Govt. College. The specimens were prepared for study under binocular. Literature were consulted to get the previous records. Type localities and depositories have not been mentioned since Fraser has mentioned it in his Fauna of British India.

ABBREVIATION USED : M = Male; F = Female

Short History : Edmond De Selys (1891) first reported Odonata from this Himalayan State, Sikkim. He reported ***Calicnemia pulverulans, Aciagrion hisopa, Gynacantha bayadera, Orthetrem glaucum.*** Later on Ris (1909 & 1910) reported *Orthetrum tringulare* and *Palpopteura sexmaculata* from the state. Laidlaw (1917) recorded *Rhinocypha fenestrella;* Fraser (1919, 1922, 1923, 1926, 1928, 1929, 1931, 1934, 1935 and 1936) reported succesively *sympetrum hypomelas, Gynacanthaeschna sikkima, Megalogomphus smithi, Anisogomphus bivittatus, Bayadera longicauda, Anisopleura lestoides, Megalestis major, Megalestes irma, Anotogaster basalis palmpurensis, Protosticta himalaica, Bumargiolestes laidlawi (=melanothorax), Anisopleura comes, Rhinocypha quadrimaculata, Anax nigrofasciatus nigrolineatus, Periaeschna magdalena, Cephaleschna acutifrons, Petaliaeschna fletcherei, Anotogaster nipalensis, Chlorogomphus preciosus, Chlorogomphus mortoni, Neurothemis intermedia atalanta etc.* Lieftinck (1948) reported *Aciagrion pallidum* and *Neurothemis intermedia,* Prasad and Ghosh (1984) reported *Lyriothemis bivittata* and Mitra (1994) recorded *Orthetrum anceps, Aciagriom approximeus, Anisopleura subplatystyla.* Lahiri and Das (1991) reported *Anax nigrofascietus nigrolineatus.* Mitra (1999 and 2002) Prasad and Vershney (1995) reported several species from the state.

OBSERVATION

Classification

Taxa are arranged following Mitra (1994). The subfamilies of Fraser (1957) have been omitted since authorities differ in the opinion on evolution of different taxa. Family Macrodiplactidae has been merged with the family Libellulidae; and the name Chlorolestidae has been replaced by Synlestidae on the question of priority.

Order ODONATA
Suborder ZYGOPTERA
Superfamily CALOPTERYGOIDEA
Family EUPHAEIDAE
Genus ***Bayadera selys*** 1853

1. *Bayadera indica* (Selys)
2. *Bayadera longicauda* Fraser

Genus *Anisopleura* Selys 1853

3. *Anisopleura comes* Selys
4. *Anisopleura subplatystyla* Fraser
5. *Anisopleura lestoides* Selys

Family CHLOROCYPHIDAE
Genus *Rhinocypha* Rambur 1842

6. *Rhinocypha quadrimaculata* Selys
7. *Rhinocypha f fenestrella* Selys.

Superfamily LESTOIDEA
Family SYNLESTIDAE
Genus *Megalestes* Selys 1862

8. *Megalestes major* Selys
9. *Megalestes irma* Fraser

Superfamily COENAGRIONOIDEA
Family MEGAPODAGRIONIDAE
Genus *Burmargiolestes* Kennedy 1925

10. *Burmargiolestes laidlawi* Lieftinck

Family PLATYCNEMIDIDAE
Genus *Calicnemia* Strand 1926

11. *Calicnemia eximia* (Selys)
12. *Calicnemia miles* (Laidlaw)
13. *Calicnemia miniata* (Selys)
14. *Calicnemia mortoni* (Laidlaw)
15. *Calicnemia pulverulans* Selys

Family PLATYSTICTIDAE
Genus *Protosticta* Selys 1885

16. *Protosticta himalaica* Laidlaw

Family COENAGRIONIDAE
Genus *Ceriagrion* Selys 1876

17. *Ceriagrion fallax* RIS

Genus *Aciagrion* Selys 1891

18. *Aciagrion olympicum* Laidlaw
19. *Aciagrion hisopa* (Selys)
20. *Aciagrion approximans* Selys
21. *Aciagrion pallidum* Selys

Genus *Ischnura* Charpentier, 1840

22. *Ischnura senegalensis* (Rambur)
23. *Ischnura a. aurora* (Brauer)

Genus *Enallagma* Selys 1876

24. *Enallagma parvum* Selys

Genus *Agriocnemis* Selys, 1877

25. *Agriocnemis p. pygmaea* (Rambur)

Suborder ANISOPTERA
Superfamily AESHNOIDEA
Family GOMPHIDAE
Genus *Paragomphus* Cowley 1934

26. *Paragomphus lineatus* (Selys)

Genus *Anisogomphus* Selys 1857

27. *Anisogomphus bivittatus* (Selys)
28. *Anisogomphus orites* Laidlaw

Genus *Megalogomphus* Campion 1853

29. *Megalogomphus smithi* (Selys)

Genus *Onychogomphus* Selys 1854

30. *Onychogomphus bistrigatus* Selys

Family AESHNIDAE
Genus *Gynacantha* Rambur 1842

31. *Gynacantha bayadera* Selys

Genus *Anax* Leach 1815

32. *Anax nigrofasciatus nigrolineatus* Freser

Genus *Periaeschna* Martin 1909

33. *Periaeschna magdalena* Margin

Genus *Cephalaeschna* Selys 1883

34. *Cephalaeschna acutifrons* Martin

Genus *Petaliaeschna* Fraser 1927

35. *Petaliaeschna fletcheri* Fraser

Genus *Gynacanthaeschna* Fraser 1922

36. *Gynacanthaeschna sikkima* Karsch

Superfamily CORDULEGASTEROIDEA

Family CORDULEGASTERIDAE

Genus *Anotogaster* Selys 1854

37. *Anotogaster nipalensis* Selys
38. *Anotogaster basalis palampurensis* Fraser

Genus *Chlorogomphus* Selys 1854

39. *Chlorogomphus p. preciosus* (Fraser)
40. *Chlorogomphus mortoni* Fraser

Superfamily LIBELLULOIDEA

Family LIBELLULIDAE

Genus *Lyriothemis* Brauer 1864

41. *Lyriothemis bivittata* (Rambur)

Genus *Orthetrum* Newman 1833

42. *Orthetrum b. brunneum* (Fonscolombe)
43. *Orthetrum anceps* (Schneider)
44. *Orthetrum taeniolatum* (Schneider)
45. *Orthetrum c. cancellatum* (Linn.)
46. *Orthetrum t. triangulare* (Selys)
47. *Orthetrum glaucum* (Brauer)
48. *Orthetrum luzonicum* (Brauer)
49. *Orthetrum s. sabina* (Drury)
50. *Orthetrum pruinosum neglectum* (rambur)
51. *Orthetrum t. testaceum* (Brum.)
52. *Orthetrum japonicum internum* McLachlan

Genus *Palpopleura* Rambur 1842

53. *Palpopleura s. sexmaculata* (Fabr.)

Genus *Diplacodes* Kirby 1889

54. *Diplacodes nebulosa* (Fabr.)
55. *Diplacodes trivialis* (Rambur)

Genus *Crocothemis* Brauer 1868

56. *Neurothemis i. intermedia* (Rambur)
57. *Neurothemis i. atalanta* Ris
58. *Neurothemis fulvia* (Drury)

Genus *Sympetrum* newman 1833

59. *Sympetrum hypomelas* (Selys)
60. *Sympetrum decolaratum* Selys

Genus *Trithemis* Brauer 1868

61. *Trithemis aurora* (Burmeister)
62. *Thrithemis festiva* (Rambur)

Genus *Acisoma* Rambur 1842

63. *Acisoma p. panorpoides* (Rambur)

Genus *Bradinopyga* Kirby 1893

64. *Bradinopyga geminata* Rambur

Genus *Pantala* Hagen 1861

65. *Pantala flavescens* (Fabr.)

Order ODONATA

Key to suborders of ODONATA

The wings remain folded over the back of the thorax while at rest. Fore-and Hind Wings are almost identical in appearance. Wings are petiolated, or the bases of the wings usually not markedly broad, the discoidal cell four sided.... ..... Zygoptera

The wings remain stretched (almost perpendicular to the thorax) while at rest. Fore-and Hind wings are dissimilar in space. The discoidal cell is divided into superior or hyper-triangle and inferior or triangle ..... Anisoptera

Suborder ZYGOPTERA

Thin dragonflis (damselflies). Eyes always seperated from each other, head triangular. Labium, Labrum produced forward. Space between two eyes are occupied by ocelli, vesicle absent. Labium with middle and lateral lobes approximately equal; the middle lobe fissured. Prothorax variable in shape. Wings are identical in shape, discoidal cell four sided. Antenodals

reduced to two primary ones or more. Wings usually held close together while at rest. A pair of superior anal appendages at the end of 10th abdominal segment, and a pair of inferior anal appendages at the sides of the anal orifice female with a well developed ovipositor larvae variably shaped, possessing caudal gills, two to three in number, which show a great variety in shape and size, spine-like vesiculated or paddle shaped; breeds in stagnant or flowing water.

Key to Superfamilies of Suborder ZYGOPTERA

1. Wings with two antenodals 2

   Wings with more than two antenodals ..... CALOPTERYGOIDEA

2. Wings with veins IR_3 and R_{4+5} nearer to node than to the arc ..... CONAGRIONOIDEA

   Wings with veins IR_3 and R_{4+5} nearer to arc than to node ..... LESTOIDEA

Superfamily CALOPTERYGOIDEA

Abdomen usually 15-60 mm; wings usually petiolate (sometimes apetiolate); always more than two antenodals (generally more than 5); post nodals not in strict alignment with cross veins below; a number of intercalated sectors present, at least between branches of Rs & MA.

Distribution : Cosmopolitan

Key to families of Superfamily CALOPTERYGOIDEA

Wings petiolate ..... CHLOROCYPHIDAE

Wings apetiolate or slightly petiolate ..... EUPHAEIDAE

Family EUPHAEIDAE

Abdomen 30-40 mm; Ground colour non-metallic; first lateral suture of the thorax incomplete; wings generally coloured in case of males; Stalk of wings usually absent if present very small; antenodal veins always more than two; base of discoidal cell connected to radius by the angulated arc. Sectors of arc seperated or slightly united and arising from about the middle of the arc. The vein IA curved; discoidal cell short.

Distribution : India : Karnataka, Kerala, Meghalaya, Nagaland, Punjab, Sikkim, Tamil Nadu, West Bengal.

Outside India : Afghanistan, Bangladesh, Burgaria, Myanmar, China, Cyprus, Greece, Hongkong, Hungary, Indonesia, Iraq, Iran, Israel, Japan, Kampuchea, Laos, Malayasia, Nepal, Pakistan, Philippines, Russia, Syria, Taiwan, Thailand, Turkey, Yugoslavia, Vietnam.

Key to genera of Family EUPHAEIDAE

Vein R_{2+3} fused with R1 near its origin ..... *Bayadera* Selys

Vein R_{2+3} not fused with R1 near its origin ..... *Anisopleura* Selys

Genus ***Bayadera*** Selys

Epallage Group *Bayadera* Selys, 1853, *Bull. Acad. Belg.* 20 (Annexe) *Syn. Calopt p.* **49**.

Bayadera Selys, 1854 *Mon. Calopt.* p. 162; Fraser, 1934, *Fauna Brit. India, Odon.* **2** : 78; Davies, 1981, *Synop. Ext.* gen. Odon. p. 23.

Type species : *Epallage indica* Selys.

Distribution : India : Meghalaya, Sikkim, Uttar Pradesh (undivided), West Bengal.

Outside India : Bangladesh, China, Japan, Nepal, Taiwan, Thailand.

Abdomen 30-42 mm. Body black, marked with greenish yellow or blue, occasionally partly pruinosed; Wings hyaline, enfumed or tipped with black; node is in the middle of the wings; petiolation of the wing extend from about halfway from base to arc and to the level of first antenodal nervure; one cubital nervure in all wings pterostigma long and narrow. Abdomen longer than wings; Anal appendages considerably longer than segment 10; Superiors forcipate; inferiors conical tapering to a fine point.

Key to species of genus *Bayadera* Selys

Wings tipped with blackish brown; labium black lateral lobes greenish yellow; abdomen pulverulent white, foerwings with 23-24 antenodals, 21-22 postnodals; in hindwing 18-19 antenodals, 19-21 post nodals ..... *indica*(Selys)

Wings palely enfumed; labium entirely black; thorax black, marked with citron yellow; abdomen glossy black; forewings with 19-21 antenodals and 24-25 postnodals; in hindwing 15-16 antenodals, 20-25 postnodals .... *longicauda* Fraser

1. ***Bayadera indica*** (Selys)

Epallage indica Selys, 1853, *Bull. Acad. Belg.* **20** *(Annexe) Syn. Calopt.* p. 49.

Bayadera indica, Kirby, 1890, *Syn. Cat. Neur. Odon.* p. 108 Fraser, 1934, *Fauna Brit. India, Odon* **2** : 79-81.

Material examined : Mangan F 1, 12.iv.1981; Rangpo 2 M, 7.4.1981.

Remarks : The specimens were compared with 2 M, 1 F of Darjeeling, West Bengal. It appeared that specimens of two states do not actually differ.

Distribution : India : Sikkim : Mongan, Rangpo.

Outside Sikkim : India : Darjeeling, Almora, Dehra Dun, Kaligad, Nunnadi, Ranikhet, Chamoli, Garhwal, Kangra, Pauri, Tehri, Uttar Kashi.

Outside India : Bangladesh, China, Nepal (Tsuda 1991)

2. ***Bayadera longicauda*** Fraser.

Bayadera longicauda Fraser, 1928, *J. Bombay nat. Hist. Soc.* **33** : 353.

Distribution : India; Sikkim : Gangtok.

Outside India : Nepal, Thailand (Tsuda 1991).

No specimen could be available for study.

Genus ***Anisopleura*** Selys

Anisopleura Selys, 1853, *Syn. Calopt.* p. 48; Fraser 1934, *Fauna Brit. India, odon.* **2** : 84 : Davies, 1981, *Synop. Ext. Gen. Odon.* p. 23.

Abdomen 30-40 mm. ; wings of both sexes generally hyaline or, at most, with apices tipped with black in males; petiolation of wings extending a little distal to basal antenodal nervure especially in hindwings. Coastal border of wings of males with an abrupt angulation outwords at a point near the discoidal cell or about one-third the distance from base to node. Node is situated at about the middle of the wing; arc markedly angulated. Abdomen always longer than wings; thorax robust.

Type -.species : Anisopleura lestoides Selys.

Distribution : India : Assam, Meghalaya, Punjab, Sikkim, West Bengal.

Outside India : Bangladesh, China, Nepal, Thailand, Vietnam.

Key to species of genus *Anisopleura* Selys

Superior anal appendages with short spine in the middle. Abdomen 30-40 mm; post clypus greenish-yellow; anteclypeus black; vertex and occiput, with a large rounded spot of greenish - yellow on outer side of each lateral ocellus, Thorax black, marked with greenish yellow, wings hyaline, with dark brown in the extreme apex in male with bases pale saffron. 15-18 ante nodal in forewing, 13-16 in hind wings; 20-23 post nodal in forewings, 17-18 in the hindwings. Abdomen black marked with greenish yellow... ..... *lestoides* Selys

Superior anal appendages without spine. Abdomen 32-40 mm labrum citron yellow; anteclypeus black, post clypeus citron yellow; vertex black; small oval spot of greenish yellow on each side of lateral ocellus. A triangular spot of yellow on each side of the middle lope of the prothorax. Thorax black, wings hyaline, extreme apex of male forewings dark brown, Abdomen black. marked like ..... *lestoides comes* Selys

Superior anal appendages with short spine near base. Abdomen 34 mm.Labrum bright greenish yellow; postclypeus greenish - yellow. Prothorax black, with a large spot of greenish yellow on each side of the middle lobe. Thorax black marked with citron-yellow. Wings hyaline, male forewings

tipped with dark brown; ante-nodals 17 and 14, postnodals 22 and 20 in fore and hindwings respectively ..... *subplatyslyla* Fraser

3. ***Anisopleura comes*** selys

Anisopleura comes Selys, 1880, *C. R. Soc. Ent. Belg.* 23 : 43; Fraser, 1934. *Fauna Brit. India, Odon.* **2** : 87-89.

Material examined : Sikkim : Mongan 1 M 23.11.1991 (Present in the collection of G.P.R.S., Z.S.I., Patna).

Remarks : The specimen was compared with 1 M example from Darjeeling (W.B.) and observed that both agree with the description of the species present Fraser's Fauna of British India, Odonata.

Distribution : Sikkim : Mongan.

Outside Sikkim : Gopaldhara, Darjeeling, Assam, Dehra Dun, Mussorie, Chakrata, Kemptifalls, Punjab, Himalaya, Garhwal Hills.

Outside India : Nepal, Bangladesh, China.

4. ***Anisopleura subplatystyla*** Fraser

Anisopleura subplatystyla Fraser, 1927, *Rec. Indian Mus.* 29 : 81; Fraser, 1934, *Fauna Brit. India, Odon.* **2** : 89-91.

Material examined : Sikkim : Tumin 2 M, 23.9.1988.

Remarks : The specimens agreed with the description provided by Fraser (1934).

Distribution : Sikkim : Tumin.

Outside Sikkim : Shillong.

5. ***Anisopleura lestoides*** Selys

Anisopleura lestoides Selys, 1853, *Syn. Calopt.* p. 48; Fraser, 1934, *Fauna Brit. India, Odon.* **2** : 86-87.

Material examined : No specimen could be obtained for study.

Distribution : Sikkim

Outside Sikkim : Darjeeling, Gopaldhara, Assam, Dehra Dun, Garhwal Hills.

Outside India : Bangladesh, Nepal, Vietnam.

Family CHLOROCYPHIDAE

Abdomen 14-18 mm; stout, wings longer than abdomen, with petiole, clypeus distinct; primary antenodals present; 5 to 10 secondaries; but none is proxmial to the primaries. R_{2+3} usually strongly arched forward near origin, intercalary sectors present.

Distribution : India : throughout.

Outside India : Old World.

Genus ***Rhinocypha*** Rambur

Rhinocypha Rambur, 1842, *Ins. Nevrop.* p. 232; Fraser, 1934, *Fauna Brit. India, Odon.* **2** : 5.

Abdomen 16-18 mm; Hindwing 17-32 mm. Red or black marked with yellow, green or blue; epistome developed; the mesothoracic triangle developed on synthorax usually pink, blue or green in males, in case of females black, bordered with colours as in males. Wings narrow or moderately dilated, hyaline or partly opaque. The opaque area may be marked with metallic blue, violet, green or coppery. Antenodals 12-25 and postnodals 20-48; Discoidal cell more than half the length of the median space usually traversed by 2-7 veins, cubital space traversed by 3-8 veins. Sectors of arc arising from about middle of the arc and separated at origin. Male superior anal appendages are pincer like; about twice as long as abdominal segment 10; inferiors ungulate about half the length of the superiors.

Type species : *Rhinocyptha tincta* Rambur.

Distribution : India : Arunachal Pradesh, Assam, Karnataka, Kashmir, Maharashtra, Manipur, Nagaland, Orissa, Punjab, Sikkim, Uttar Pradesh (undivided), West Bengal.

Outside India : Australia, Bangladesh, myanmar, China, Hongkong, Japan, Laos, Nepal, Papua and New Guinea, Phillipines, Solomon Is., Taiwan, Thailand, Vietnam.

Key to species of *Rhinocypha* Rambur.

Vitreous spot in the hindwing at the level of pterostigma, small. Abdomen 17-19 mm. Hindwing 21-28 mm. Head black with an oval ochreous spot on each side of the posterior ocellus and another rounded spot on each side of the occiput. Prothorax black with a longitudinal mid

-dorsal stripe in male; stripe absent in female; abdomen glossy black with steely reflex; first segment with a small bright citron yellow spot on each side; females with black abdomen with ochreous spots. ..... *fenestrella* Rambur.

Vitreous spot in the hindwing at the level of the pterostigma, large. Abdomen 19-23 mm; Hindwing 21-25 mm. Head black with a small spot on each side of the ocellus; a smaller spot on each side of the occiput. Prothorax black unmarked in male but in female the posterior lobe with a longitudinal stripe. Abdomen black with a vestigeal lateral spot on sides of the first segment. In females abdomen black with yellow marking ..... *quadrimaculata* Selys.

6. ***Rhinocypha quadrimaculata*** Selys

Rhinocypha quadrimaculata Selys, 1853, *Syn. Calopt.* p. 60.

Material examined : No specimen could be obtained from Sikkim.

Remarks : Specimens from Arunachal Pradesh, Assam, Manipur, Orissa and West Bengal were studied.

Distribution : India : Sikkim, Arunachal Pradesh, Assam, Manipur, Orissa, Meghalaya, Uttar Pradesh (undivided) and West Bengal.

Outside India : Bangladesh, Myanmar, Nepal, Thailand.

7. ***Rhinocypha fenestrella*** Rambur.

Rhinocypha fenestrella Rambur, 1842, *Ins. Nevrop.* p. 236.

Material examined : No specimen could be obtained for study.

Remarks : Specimens from Arunachal Pradesh and Assam have been studied.

Distribution : India : Sikkim, Arunachal Pradesh, Assam, West Bengal.

Outside India : Burma (Myanmar), Malaysia, Malacca; scattered in Southern Asia, absent in Great Sunda Island.

Super family LESTOIDEA

Small or medium sized damselflies with narrow fore-and hindwings of nearly the same size and shape, with long slender petiole and generally long and narrow pterostigma. Postnodals in strict alignment with cross veins beneath. Usually IR_3 and R_{4+5} originate nearer to arc than node. Intercalated sectors present in apical part.

Distribution : Cosmopolitan.

Family SYNLESTIDAE

The family has sometimes been referred to as Chlorolestidae (Davies & Tobin 1984, Lahiri 1987; Prasad & Varshney 1995) a name based on that of the oldest genus included, *Chlorolestes*, described by Selys {1862 : *Bull. Acad. r. Belge*, (2) **14** : 33; Type species *Chlorolestes conspicua* Selys} *Synlestes* described by Selys (1869 : *Soc. ent. Belg.* 11 : Ixxxvi; Type species *Synlestes weyerii* Selys). Fraser (1957) proposed Chlorolestidae which contain subfamilies Chlorolestinae and Megalestinae. Chlorolestinae includes *Synlestes* Selys. But already Tillyard (1917 : *Biology of Dragonflies* p. 277, 283; Fraser 1933 : p. 19 defined subfamily Synlestinae in family Lestidae. The subfamily contains *Synlestes* and *Chlorolestes.* This is the first family rank treatment. So after separation from Lestidae and elevation to family the valid name is Synlestidae Tillyard. Similar opinion is hold by Dr. S. Tsuda (1991); *A distributional list of World Odonata, 1991).* The family includes genera *viz. Chlorolestes* Selys, *Ecchlorolestes* Barnard, *Episynlestes* Kennedy, *Megalestes* Selys, *Phylolestes.* Christiansen, *Sinolestes* Needham, *Synlestes* Selys.

Large insects (Abd. : 43-65 mm Indian forms). Wings hyaline sometimes coloured dark or blackish brown. Discoidal cell distinct, IR_3 and R_{4+5} arising from points nearer node than the arc; sometimes IR_3 arises from a point midway between the arc and the node white R_{4+5} arises from the point little proximal to the point original of IR_3; Cu_2 strongly arched towards the costa. Anal vein arises from the inner wing margin either at a point proximal to the arc and discoidal cell being at about the level of Ac or below the cell far distal to Ac; Pterostigma longer than broad.

Distribution : India : Arunachal Pradesh, Assam, Meghalaya, Punjab, Sikkim, Uttar Pradesh (undivided), West Bengal.

Outside India : Bangladesh, Bhutan, Botswana, Burma, China, Haiti, Lesotho, Malawi, Mozambique, Nepal, Switzerland, South Africa, Taiwan, Thailand, Zimbabwe.

Genus ***Megalestes*** Selys

Megalestes Selys, 1862, *Bull. Acad. Belg. Sci.* (2) 13 : 293; Fraser, 1933, *Fauna Brit. India, Odon.* **1** : 20.

Type species : *Megalestes major* Selys.

Abdomen 43-65.0 mm; Hindwing 30-38.0 mm long. Body usually metallic green with yellow marks. Wings long and narrow, transparent, colourless, sometimes with enfumation. Postnodals in fore wing 15-25 and in hind wing 12-18; arc at the level of the distal antenodal nervure. IR_3 arising from a point midway between the arc and the node; R_{4+5} arising from a point little proximal to IR_3. Pterostigma elongated, middle part is slightly swollen. Ab arising from the point proximal to the point where Ac meets it. Superior anal appendages of males equal to or a little longer than the segment 10; forcipate with a basal subquadrate projection, inner margin sometimes dilated and with a subapical expansion. Inferiors about one third as long as superiors, triangular or spherical and either with variously shaped basal spine or with divaricate spine at the apex.

Distribution : India : Arunachal Pradesh, Assam, Meghalaya, Uttar Pradesh (undivided), Punjab, Sikkim, West Bengal.

Outside India : Myanmar, Nepal, Indo-China, China.

Key to species of *Megalestes* Selys

Thorax black beneath, inferior anal appendages with two long spines ..... *irma* Fraser

Thorax pale yellow beneath/pruinosed white inferior anal appendages with single spine .... *major* Selys.

8. ***Megalestes major*** Selys

Megalestes major Selys, 1862, *Bull. Acad. Belg.* (2) 13 :293; Fraser, 1933, *Fauna Brit. India* Odon. **1** : 21-23.

Material examined : Sikkim : Tumin 1 M, 23.9.1988; 2 F, 1.10.1988.

Remarks : The female is robust build while the male is very thin. The male specimen was compared with a male from Mizoram (Champhai) and found that they agree with the description present in the Fauna of British India.

Distribution :

Present record : Sikkim (Tumin).

Past records : Outside Sikkim : Eastern India : Gopaldhara, Pashoke, Darjeeling, Assam, Mawphlong, Shillong, Mizoram.

Northern India : Kumaon, Bhim Tal, Dehra Dun, Mukteswar, North Punjab Hills, Garhwal Hills.

Outside India : Myanmar, Tonkin, Formosa, Nepal, Bhutan.

9. ***Megalestes irma*** Fraser

Megalestes irma Fraser, 1926, *J. Darjeeling nat. Hist. Soc.* p. **32**, 38.

Material examined : No specimen could be examined.

Distribution : India : Sikkim.

Super family COENAGRIONOIDEA

Zygoptera with narrow, petiolated wings; primary antenodal present and solitary save for a few aberrant genera in which a few additional antenodals may be present at the costal place only, distal to the primaries; arc usually in line with the distal antenodal nervure, in some genera distal to this level; postnodals for the greater part in line with the cross veins immediately. Pterostigma diamond shaped, sometimes the shape and size varying in between fore- and hind wings and between the sexes.

Key to the families of superfamily COENAGRIONOIDEA

1. Supplementary intercalated veins present in the distal parts of wings, pterostigma not braced, usually acuminate proximally; IR_3

and R_{4+5} usually terminating near the subnodus ..... MEGAPODAGRIONIDAE

Supplementary intercalated veins absent or at the most a few cells in length at apex of wings; IR_3 and R_{4+5} always terminating near the subnodus than arculus ..... 2.

2. Anal vein absent or reduced; Cu_2 varying from vein normal length to one of only one cell or so long ..... PLATYSTICTIDAE

Anal vein and Cu_2 of normal length 3

3. Discoidal cell elongate, anterior and posterior sides subequal, apex rather obtuse; anal vein separating from wing border proximal to Ac, which lies about midway between the two antenodals; veins MA and IR_3 running straight for the greater part of their length, only zigzagged apically or not at all ..... PLATYCNEMIDIDAE

Discoidal cell short, anterior side shorter than the posterior; anal vein separating from wing border at various levels, either proximal to at or distal to the vein Ac; veins MA and IR3 markedly zigzagged for greater part of their length ..... COENAGRIONIDAE

Family MEGAPODAGRIONIDAE

Medium sized dragonflies; body colour non-metallic, resting with wings widely or partly spread. Wings with a long petiole, narrow, hyaline, discoidal cell elongated, variable acutely angulated distally; sectors of arc arising from the lower half of the arc. R_3 and R_{4+5} varable; Cu_2 arched slightly costalwards at its origin. Pterostigma longer than broad; anal bridge vestigeal or complete. Abdomen long and slender or moderately long and robust, especially in females. Superior anal appendages of the male usually more or less forcipate; inferiors vestigeal.

Remarks : "This family was originally formed to include genera with a Lestine facies but differing from the latter by the more distal origin of the veins IR_3 and R_{4+5}. Which in them, arise at a point nearer to the nodus than arculus" (Fraser 1957).

Distribution : India, Myanmar, Laos, Thailand.

Genus ***Burmargiolestes*** Kennedy

Burmargiolestes Kennedy 1925, *Bull. Mus. Comp. Zool. Harvard.*, 67(7) : 296; Fraser, 1993, *Fauna Brit. India. Odon,* **1** : 89.

Head narrow, epistome prominent; prothorax with posterior lobe subsilobate, thorax robust, legs short, tibiae not dilated. Wings long and narrow; petiolated; petiolation extends far beyond the level of *ac* and near to the distal end of the discoidal cell. Node is near the discoidal cell far proximal to the level of pterostigma, *ac* situated almost at the level of first antenodal nervure; *ab* rudimentary, only a small vestige of its distal end is present. Discoidal cell acute at its distal end, costal side about two-thirds the length of the post costal. IR_2 arising about 3 cells distal to the origin of R_3. R_3 arising slightly nearer the node than the pterostigma. IR_3 arising one cell distal to the subnode; R_{4+5} arising at subnode. MA and IA are pectinate. Only a single row of cells between IA and the hind border of the wings. Pterostigma elongate. Abdomen long and slender; slightly dilated at base and anal ends. Superior anal appendages nearly twice the length of segment 10, forcipate; inferior appendages vestigeal. Genitalia : Hamules broad, subquadrate plates; penis broad at apex and slightly notched, curling up over the stem, its branches embracing the structure and spine like at ends; lobe of penis flash-shaped, tumid. Vulvar scale robust, extending slightly beyond of end of abdomen.

Type species : *Burmargiolestes melanothorax* (Selys.).

Distribution : India : Sikkim, Assam.

Outside India : Myanmar, Laos, Thailand.

10. ***Burmargoilestes laidlawi*** Lieftinck

Burmargiolestes laidlawi Lieftinck, 1960. *Men. Soc. ent. ital.* 38 fasc.(Men. Gridelli) : 236.

Abdomen 40 (M) 34(F); Hindwing 28(M) and 29(F) mm. The species, though closely related to *B. melanothorax* (Selys) the male of this North Indian species is easily distinguishable by the

pale blue colour of the face, the less extensive thoracic markings and pale abdominal rings and by its slightly broader and more closely veined wings. Figure cited by Fraser (1931 : *J. Bombay Nat. Hist. Soc.* 34 : 967-968) will serve to its recognition.

Remarks : No specimen could be obtained for study.

Distribution : India: Darjeeling, Sikkim, Assam (Fraser 1933c).

Family PLATYSTICTIDAE

In the post cubital space there is a cross-vein situated closer to the base of the wing than to the level of the proximal antenodal; a second postcubital cross vein, the true anal crossing (*ac*) is also present, lying between the levels of the two antenodals and forming a part of the subdiscoidal cell, when the cell is present, most of the cross veins situated distal to the nodus are arranged in transverse series, the only breaks being due to zigzagging of veins IR_2, IR_3 and MA, vein Cu_2 reduced or not. Anal vein either completely fused with posterior border of the wing or a short vein running from the border to *ac* and then or to meet the underside of the discoidal cell to enclose a small triangular subdiscoidal cell. Origins of IR_3 and R_{4+5} always close to or at the subnodus; veins IR_2 and IR_3 both comparatively long, arising at least nearer to subnodes. Nodus at about one-fourth of the wing length, or a little less. Pterostigma never elongate, trapezoidal or rhomboidal. Discoidal cell rectangular or subrectangular.

Genus ***Protostica*** Selys

Protosticta Selys, 1885, *C. R. Soc. Ent. Belg.* **29** : 145.

Abdomen 30-53 mm. Hindwing 18-30 mm. Coloured steely black, marked with white and turquiose blue; wings hyaline immaculate, long, narrow, falcate, cells mostly four sided; sectors of arc fused for a short distance from origin and thus arising from a common stalk; IR_3 straight, never zigzagged; R_{4+5} arising at or a little proximal or distal to the obliquenervure descending from the subnode; *ab* entirely absent. Abdominal segments 3-7 very slim and long; segments 8-10 varying in length in the species and sexes; 9 sometimes as long as 8, 10 very short. Anal appendages about twice the length 10, angulated downwards and inwards at their middle and chelate at apices.

Type species : *Protosticta simplicinervis* Selys.

Distribution : India. Western Ghats and N E India.

Outside India : Bangladesh, Myanmar.

11. ***Protosticta himalaica*** Laidlaw

Protosticta himalaica Laidlaw, 1917, *Rec. Indian Mus.* **17** : 342-343.

Male : Abdomen 40-43 mm; Hindwing 25-26 mm.

Female : Abdomen 37 mm. Hindwing 26mm.

Remarks : No specimen could be obtained for study.

Distribution : India : North Bengal, Assam, Sikkim at Altitudes 3000 to 6000 ft.

Outside India : Bangladesh.

Family PLATYCNEMIDIDAE

Nodus situated at about one-third of the wing length from the base, sometimes slightly more or less but never as close as one-fourth. Pterostigma small, more or less trapezoidal, usually more or less strongly braced. Tranverse arrangement of corss-veins distal to subnodus very complete, the only main veins which are zigzagged being IA, the distal part of MA and more rarely the distal partof IR_3. Discoidal cell elongate, its costal side little shorter than the posterior so that the distal angle is very rarely acute or sub-acute. Cu_2 and IA always present and well developed. Arculus at the level of the distal antenodal but occasionally slightly distal to that level.

Distribution : Cosmopolitan.

Genus ***Calicnemia*** Strand.

Abdomen 27-36 mm. Hindwing 21-29mm. Coloured red or bright chrome yellow marked

with black, or more rarely black partially obscured by pruinoescense. Wings hyaline, rounded at apices never falcate; discoidal cell elongate, costal side about three-fourth the length of the posterior distal side at least half as long as the basal, and very oblique; so that the cell is acutely pointed at its lower distal angle; sectors or arc arising from the lower end of the arc and divergent from origin. The vein *ac* situated slightly nearer to the lavel of the distal antenodal nervure; *ab* always present and complete, continued on as IA, which latter extends for about three-fourths the length of wings. R_{4+5} arising well proxmal to the level of the subnode, IR_3 a little distal.

Distribution : Cosmopolitan.

Key to species of *Calicnemia* Strand

Head and abdomen black, without markings. Thorax black ..... *pulverulans* Selys

Abdomen vermillion red without markings in male; in female abdomen yellow from segments 1 to 6, black from 7 to 10 ..... *eximia*(Selys)

Abdomen black, with segment 1, 2 and base of 3 brick red or bright ochreous; in females abdomen black, segments 1 to 5 bright ochreous oon dorsum ..... *mortoni* (Laidlaw)

Abdomen red with black markings on three end segments in male in female ferruginous as far as the middle third of segment 6; black thereafter as far as end; 1 to 3 with black rings..... ..... *miniata* (Selys)

. Abdomen black from segments 6 to end, basal segment red in male; in female abdomen bright yellow clouded with brown or reddish brown on dorsum, becoming black on segments 8 to 10, more broadly so at base of 8 and 9 .... *miles* (Laidlaw)

12. *Calicnemia eximia* (Selys)

Calicnemis eximia Selys 1863, *Bull. Acad. Belg.* (2) **16** : 160.

Material examined : Gangtak : 1 F, 27.x.1977.

Remarks : Labrum, bases of mandibles and vertex brick red instead of vermillion red as reported by Fruser (1933).

Distribution : India : Sikkim, West Bengal, Arunachal Pradesh, Meghalaya, Kumaon, Himachal Pradesh.

Outside India : Afghanistan, Bangladesh, China, Nepal (paratype in British Meseum).

13. *Calicnemia miles* (Laidlaw)

Calicnemis eximia race atkinsoni Selys *(C. eximia* M nec. *atkinsoni).* 1886, *Mem. Cour.* **38** : 131; 132.

Calicnemis miles Laidlaw, 1917, *Rec. Indian Mus.* 13 : 303; Fraser, 1933, *Fauna Brit. India. Odon.*, **1** : 178-181.

Remarks : No specimen could be obtained. Specimens from Manipur and Darjeeling of West Bengal could be studied.

Distribution : India : Sikkim, Chamoli, Dehra Dun, Garhwal, Kangra, Manipur and Darjeeling, Pauri, Tehri.

Outside India : Bhutan, Burma (Myanmar) , Thailand.

14. *Calicnemia miniata* (Selys)

Calicnemis miniata Selys, 1886, *Mem. Cuur.* **38** : 132.

Remarks : No specimen could be obtained for study; but specimen from Darjeeling had been examined.

Distribution : India : Darjeeling, Sikkim.

Outside India : Bangladesh, China, Szechuan, Nepal.

15. *Calicnemia mortoni* (Laidlaw)

Calicnemis mortoni Laidlaw, 1917, *Rec. Indian Mus.* **13** : 526-527.

Remarks : Holotype from Darjeeling could be examined.

Distribution : India : Darjeeling, Gangtok.

Outside India : Bhutan.

16. *Calicnemia pulverulans* Selys

Calicnemia pulverulans Selys, 1886, *Mem. Cour. Acad. Belg.* **38** : 133.

Remarks : No specimen could be obtained for study.

Distribution : India : Sikkim, Darjeeling, North Bengal; Uttarkashi, Tehri.

Outside India : Bangladesh, Myanmar, Nepal.

Family COENAGRIONIDAE

Species of the family present very much of the same type of venation but wider difference in their general appearance. Nodus at about one-third the wing length from base, never as little as one-fourth. Pterostigma always short, usually covering only one cell more rarely two, sometimes less than one cell's length, variable in shape but mostly rhomboidal or trapezoidal. Transverse series of cross veins distal to level of nodus almost always very complete, being only interrupted by the zigzagging of the distal portion of veins IA and MA, with sometimes additional zigzagging of the distal portions of IR_3 also. Post nodals comparatively few in number, from five to twenty, but usual less than twelve. Veins IR_3 and R_{4+5} arising close together at or near subnodus; in most of the genera, IR_3 arising at the subnodus and R_{4+5} slightly proximal to it. IR_2 and IR_3 arising distally, separated by from one to four cells. Discoidal cell with distal angle acute the anterior side little more than half as long as the posterior. Veins Cu_2 and IA always well developed. Subdiscoidal cell always complete, usually entirely free from the posterior margin of wing but sometimes partly sessile on it; in shape it is elongate, from one and half times to nearly twice as long as the discoidal cell. All species rest with their wings closely apposed over the dorsum of the thorax., anal appendages extremely variable, rarely forcipate or subforcipate, equal or subequal, more often quite inconspicuous due to their small size females often dimorphic or polymorphic.

Distribution : Cosmopolitan, both hemispheres.

Key to genera of the family COENAGRIONIDAE

1. Discoidal cell at the level of distal antenodal ..... 2.
— Discoidal cell distal to the level of distal anitenoidal ..... *Agriocnemis* Selys
2. A distinct ridge on frons .... *Ceriagrion* Selys
— No distinct ridge on frons 3
3. Borders of or body of pterostigma bicolorous ..... *Ischnura* Charp.
— Pterostigma unicolorous 4
4. Pterostigma different in length in four and hind wing ..... *Aciagrion* Selys
— Pterostigma equal length in fore and hind wings ..... *Enallagma* Charp.

Genus ***Ceriagrion*** Selys

Head narrow, with well defined frontal ridgs; post ocular coloured spots always absent; thorax long and narrow. Wings hayline, pterostigma lozenge shaped, narrow, oblique at both ends; post nodal nervures numbering from 10 to 12 in fore wings; sectors of arc arising from the lower end of the arc, divergent from their origins; *ab* always present and complete arising at the points where *ac* meets the hinder border of the wing in some cases *ab* may appear slightly proxmil to the level of *ac*. *ab* continued on as the nervure IA, but an angulation present at the junction of the two. R_{4+5} arising well before the oblique nervure descending from the node; IR_3 in continuation of that nervure. Abdomen slender, cylinderical; legs short; anal appendages variable in the species, but generally the superiors short and hooked, the inferiors longer, conical and tapering to a point.

Distribution : Cosmopolitan : Old World.

17. ***Ceriagrion fallax*** Ris

Ceriagrion fallax Ris, 1914, Ent. Mitteil 3(2) : 47-48.

Material examined : No specimen could be obtained for study. Specimens from Manipur, Mizoram and West Bengal have been studied.

Distribution : India : Sikkim, Assam, Himachal Pradesh, Manipur, Mizoram, Meghalaya, West Bengal.

Outside India : Burma (Myanmar), China, Indonesia, Malayasia, Nepal, Thailand, Taiwan.

Genus *Aciagrion* Selys

Aciagrion Selys, 1891, *Ann. Mus. Civ. Genova* (2)**10**(30) 509-511.

Head narrow, usually bearing triangular or elongate post - occular areas or spots; eyes globate, thorax slim, wings very narrow and subacute at appex, hyaline; pterostigma differing in fore and hindwings; post nodal nervures numbering 10 to 13 in fore wings; discoidal cell acutely pointed at the distal end; *ab* originates at the points where *ac* meets the hinder border of the wings and continued on as nervure IA but their junction strongly angulated; R_{4+5} arising well before or just before, the level of the nervure decending from the subnode; IR3 in continuation of that nervure. Abdomen variable of moderate or great length, legs short; anal appendages variable, short and insignificant; sometimes notched at apex or squarred, inferiors very minute.

Distribution : Old World.

Key to species of the genus *Aciagrion* Selys

1. Ground colour pale brown, with black markings on head and thorax. Abdomen 30-31 mm; Hindwing 18-20 mm. Vertex on head and occiput pale brown with large triangular pale blue post ocular spots. Prothorax brown on dorsum except anterior lobe which is pale blue. Abdomen very long and very slender, dilating somewhat at the anal end. Segment one very pale blue, almost white, with large dorsal black spot; segment 2 white, palest blue near the base and broadly black on dorsum except at the extreme base. Segments 3 to 7 similar to the segment 2 but white laterally; segment 8 to 10 pale azure blue, unmarked ..... *pallidum* Selys.

— Ground colour blue, with black markings on head, thorax and abdomen .....2.

2. Large species with abdomen 32-34 mm. in length. Vertex and occiput black, the latter with large transversely oval bluish green postocular spots connected by a narrow isthmus of blue across the middle line. Prothorax broadly black on dorsum, pale yellow or carneous laterally across the anterior lobe. Thorax black on dorsum, marked with rather broad pale blue antehumeral stripes. Abdomen pale blue at basal and anal segments; place yellow on the middle, marked with black as follows; segment 1 with large dorsal spot; segment 2 with small subapical dorsal triangle black line in a halo of ochreous; segments 3-7 with broad dorsal black stripes; segment 8-10 azure blue. Anal appendages carneous or palest blue tipped with black .... *olympicum* Laidlaw

— Smaller species with abdomen usually not more than 25 mm. in length 3

3. Abdomen 24-26 mm. Vertex andocciput black, the latter with broad blue post ocular area confluente across the mid occiput; its anterior border forming a straight line from eye to eye. Prothorax broadly black on dorsum, the anterior lobe and sides broadly azure blue; Thorax broadly black on dorsum to about halfway between humeral and antero-lateral suture, marked with narrow lilacious violet antehumeral stripe; laterally lilaceous violet fading to pinkish beneath. Abdomen pale blue at the sides marked broadly with black on dorsum. Segments 8-10 azure blue. Anal appendages black ..... *hisopa hisopa* (Selys)

— Abdomen 22-24 mm. Vertex and occiput black, the latter with small postocular blue spot on each side; narrowly connected across the middle line by a stripe of the same colour. Prothorax black on dorsum, blue obscured with pruinescence at the sides. Thorax blackon dorsum to nearly as far lateral as antero-lateral sutures; laterally pale blue. abdomen segment 1 black on dorsum, segment 2 black on dorsum, pale blue or bluish green laterally; segment 3-7 black on dorsum, 8-10 azure blue, segment 10 black at its apical border .... *approximans* Selys

18. *Aciagrion olympicum* Laidlaw

Aciagrion olympicum Laidlaw, 1919, *Rec. Indian mus.* **16** :171, 184-186.

Material examined : Sikkim : Rabangla (1800 m) 1 M, 6.10.1988. Tummi (1400 m.) 1 F, 25.9.1988; 6 F, 29.9.1988 coll. T. R. Mitra.

Remarks : The male specimen varies from Fraser's (1933 c) description having clypeus; bases of mandibles, frons right upto antehumeral stripe blue. Female and male agree with species of West Bengal and Arunachal Pradesh.

Distribution : Eastern Himalayas : Darjeeling (W.Bengal) and Sikkim, Arunachal Pradesh.

19. *Aciagrion hisopa hisopa* (Selys)

Pseudagrion hisopa Selys, 1876, *Bull. Acad. Belg.* (2) **42** : 509.

Aciagrion hisopa Selys, 1891, *Ann. Mus. Civ. Geneva* (2) **10** (30) : 511-512.

Material examined : 1 M, Rangdom, 19.10.1977; 3 M, Chulung, 20.10.1977, *coll.* B. Nandi.

Distribution : India : Sikkim, Darjeeling, Western Ghats.

Outside India : Burma (Myanmar), China, Malaysia, Signapore, Japan, Bangladesh, Sri Lanka, Nepal, Pakistan, Thailand, Vietnam.

20. *Aciagrion approximans* Selys

Pseudagrion microcephalum race *approximans* Selys, 1876, *Bull. Acad. Belg.* (2) **42** : 507-508.

Aciagrion approximans Selys, 1891, *Ann. Mus. Civ. Genova* (2) **10** (30) : 512.

Material Examined : Chulung 1 M, 20.10.1977. *coll.* B. Nandi.

Remarks : The specimen agree with the specimens (2M) from Manipur.

Distribution : India : Sikkim, West Bengal, Manipur, Nagaland, Meghalaya.

21. *Acigrion pallidum* Selys

Aciagrion pallidum Selys, 1891, Ann. Mus. Civ. Genova (2) **10** (3) : 512–513.

Material examined : No specimen could be obtained for study. Materials from Assam, Bihar, Orissa, Tripura and West Bengal have been examined.

Distribution : India : Sikkim, Assam, W. Bengal, Arunachal Pradesh, Bihar (undivided), Meghalaya, Western Ghats, Central India, Northern India.

Outside India : Burma (Myanmar), Nepal, Kampuchea, Thailand, Vietnam.

Genus *Ischura* Charpentier

Ischnura Charpentier, 1840, Lib. Europ. p. 20.

Head narrow, without frontal ridge, postocular spots presents, thorax robust and short; posterior lobe of prothorax usually simple, but sometimes prolonged at its centre; anterior border of thorax usually with a pair of small horseshoe shaped, hooks. Wings hyaline; pterostigma of males shaped and coloured differently in fore and hindwings, that of forewings very variable in the species. Sectors of arc arising from the lower end of the arc, divergent from the origins; *ab* always present and complete, arising well proximal to the level of *ac*, which lies between the two antenodals; *ab* continued as but with an angulation at the junction. R_{4+5} arising well proximal to the oblique nervure descending from the node; IR_3 in continuation of that nervure. Abdomen moderately short and robust, tumid at base in many species; segment 10 with two prominent tubercles. On dorso-apical border. Anal appendages very variable in species. Females provided with a ventral apical spine in the segment 8.

Distribution : Cosmopolitan.

Key to the species of Genus *Ischnura* Charp

Abdominal segments 3 to 6 citron yellow; pterostigma in forewings slightly broader than long; shaped; rose red for its proximal half, hyaline for its distal, inner and posterior borders thick black, anterior border white, out border yellow; in the hindwing much smaller, about half the size, uniform pale grey, almost colourless, all bordering nervures excepting the costal thick and

black, costal border white. Abdomen citron yellow except segments 8 to 10 which are azure blue..
.....*a. aurora* Brauer

Abdominal segments 3 to 6 black on dorsum; pterostigma of forewings very oblique, diamond shaped, black but the outer angle and costal border narrowly white tinted with blue on the upper surface of the wing; pterostigma of hind wing smaller than that of fore, uniform pale brown or carneous, framed in black nervures. Abdomen black, marked with blue and yellow as follows :- segment 1 broadly azure blue at the sides and along apical border., the dorsum broadly metallic blue black; segment 2 metallic blue black on dorsum laterally azure blue fading to pale green laterally. Segments 3 to 7 black on dorsum, citron-yellow at the sides, segment 8 azure blue; segment 9 broadly black on dorsum azure blue laterally, segment 10 black on dorsum broadly yellow on the sides..... *senegalensis* (Rambur)

22. ***Ischnura senegalensis*** (Rambur)

Agrion senegalensis Rambur, 1842, *Ins. Nevrop.* p. 276.

Ischnura senegalensis Selys, 1876, *Bull. Acad. Benig.* (2) **41** : 273.

Material examined : Sikkim : Chulung 1 M, 2.10.1977, *coll.* B. Namdi.

Remarks : The specimen does not differ from the description provided by Fraser.

Remark : *New record.*

Distribution : India : Sikkim and throughout India.

Outside India : Cosmopolitan.

23. ***Ischnura aurora aurora*** Brauer

Agrion delicatum Hegan, 1858, *Verh. Zool. -bot. Ges. Wien* **8** : 479.

Ischnura aurora Ris, 1915, *Nova Caledomia Zool.* ii, **4**, p. 67.

Ischnura delicata, Fraser, 1933, *Fauna Brit. India Odon.* vol. **1** : 360-362.

Ischnura aurora aurora, Tsuda, 1991, *A distributional list of World Odonata,* 1991 p. 34.

Material examined : Rangeet Valey 1 M, 1 F, 6.10.1977, *coll.* B. Nandy.

Remarks : The specimens agree with the description present in Fauna of British India.

Distribution : India : Sikkim and throughout India.

Remarks : New record.

Outside India : Old World.

Genus ***Enallagma*** Charpentier

Enallagma Charpentier, 1840, *Lib. Europ.* p. 21.

Head narrow, without any frontal ridge; post-ocular coloured spots always present, but often elongate and confluent across the occiput; thorax robust; posterior lobe of prothorax simple rounded; anterior border of thorax without hooks. Wings hyaline; pterostigma shaped and coloured the same in fore and hindwings; arc situated at the level of the distal antenodal nervures *ab* always present and complete arising well proximal to the level of ac which usually lies between the two antenodal nervures, *ab* continued as IA with an angulation at the junction of the two R_{4+5} arising well proximal to the nervure descending from the node, IR_3 is in continuation of that nervure. Abdomen moderately short and slender. Segment 8 in the female with a ventral apical spine.

Type species : Enallagma cyathigerum Charpentier.

Distribution : Cosmopolitan.

24. ***Enallagma parvum*** Selys

Enallagma parvum Selys, 1876, *Bull. Acad. Belg.* (2), **41** : 537.

Material examined : No specimen could be examined. Materials from Assam, Bihar, Manipur, Orissa and West Bengal have been examined.

Remarks : This is a very small species, with abdomen not more than 17 mm. in length; post nodal nervures in forewings 6 to 7 in number.

Distribution : India : Sikkim, West Bengal, Meghalaya, Manipur, Uttar Pradesh (undivided), Western Ghats, Assam, Bihar, Orissa.

Outside India : South East Asia.

Genus ***Agriocnemis*** Selys

Agriocnemis Selys, 1869, *Pollen & Van Dam Fauna Mad Ins.*, P. 24.

Head narrow, without any frontal ridge, postocular coloured spots always present; thorax short and robust; posterior lobe of prothorax simple, but slightly variable in the species; no hooks on anterior border of thorax. Wings hyaline; pterostigma similar or dissimiliar in fore and hind wings, very small, diamond shaped, *arc* situated distal to the level of the distal antenodal nervure; *ab* always present and complete arising will proximal to the level of *ac : ab* continued as IA with an angulation at the junction of the two; R_{4+5} arising well before the oblique nervure descending from the subnode; IR_3 in continuation of that nervure, Abdomen slim and cylinderical dilating somewhat towards the anal segments. Segment 8 in the female without any ventral spine.

Type-species : Agriocnemis rufipes Kirby

Distribution : Cosmopolitan.

25. ***Agriocnemis pygmaea*** (Rambur)

Agrion pygmaeum Rambur, 1842, *Ins. Ne'vrop* p. 278.

Agriocnemis pygmaea Selys, 1877, *Syn. Agr. 5^me Legion : Agrion* (Suite et fin) p. 52.

Material examined : Rabangala 1 F, 2.10.1988; 1 F, 3.10.1988, 1 M 1 F 7.10.1988, Ranipool 1 M, 12.10.1988 *coll.* T.R.Mitra.

Remarks : The specimens were compared with specimen from Arunachal Pradesh, Assam, Bihar (undivided) , Manipur, Mizoram, Orissa, West Bengal, Maharashtra, Madhya Pradesh (undivided) and Nicobar. It was found that males agree with each other.

Distribution : India : Throughout India.

Outside India : Old World.

Suborder ANISOPTERA

Fore and hindwings are dissimilar in shape. At rest wings remain stretched, discoidal cell divided into two triangles – a superior known as the hypertriangle, and the inferior the discoidal cell. Pterostigma always present. Tenth abdominal segment provided with a pair of superior anal appendages and an inferior anal appendage. This may be simply triangular or bifurcated into two branches. Head globular and eyes confluent to a variable extent, but in case of Gomphidae and Cordulegasteridae eyes are separated.

Key to families of ANISOPTERA

1. Eyes separated or meeting shortly 2
— Eyes united 3
2. Eyes very slightly separated or united only at a point; discoidal cell in fore and hindwings if identical then median space is not travered; if dissimilar then median space is traversed .....CORDULEGASTERIDAE
— Eyes widely separated; discoidal cells dissimilar in fore and hindwings, the median space entire .....GOMPHIDAE
3. Discoidal cells are almost identical in fore- and hindwings; middle lobe of labium large and fissured .....AESHNIDAE
— Discoidal cells are dissimilar in fore and hindwings; middle lobe labium small and intact .....LIBELLULIDAE

Family GOMPHIDAE

Eyes widely separated, wings broad hyaline never coloured; hindwing of male strongly angulated at the tornus, antenodal nervures numerous, those of costal and subcostal not coinciding, the two primary robust antenodals always present; discoidal cells traversed or entire that of forewing subequilateral, that of hindwing; median space entire, anal loop absent or rudimentary. Anal appendages highly specialised, the inferiors strongly bifid.

Distribution : Cosmopolitan.

Key to genera of *Gomphidae*

1. Anal loop absent; first post anal cell not extending proximal to base of subtrigone in hindwing, anal triangle three celled..... 3

— Anal loop present, although often rudimentary, first post anal cell extending more or less proximal to base of subtrigone in hindwing, anal triangle four celled 2

2. Branches of inferior anal appendage ending in two fine branches .... *Megalogomphus* Campion

— Branches of inferior anal appendage ending in acute or obtuse point .... *Onychogomphus* Selys

3. Superior anal appendages as long as branches of inferior appendage and furnished beneath with a black robust spine .....*Anisogomphus* Selys

Superior anal appendages longer than inferior appendage and without spine or process ..... *Paragomphus* Cowley

Genus ***Paragomphus*** Cowley

Most part of the body sandy yellow marked with shades of brown and black, rarely black marked with yellow. Head moderately large, triangular, frons angulated, occiput simple, slightly and shallowly concave. Wings : reticulation close, tornus angulated and base of hindwing excavated; anal triangle 4-celled; only two transverse nervures between the sectors of the arc, from arc to bifurcation of Rs. in the fore wings; one in the hindwings; two rows of post anal cells in fore wings and five in hindwings; anal loop absent nodal index high; primary antenodal nervures in first and the fifth; discoidal cells entire; pterostigma rather long expanded at its middle; IA in fore-wings pectinate, with a maximum of four cells between it and the margin of the wing Cu_2 and IA parallel to margin of hind-wing; only a single cubital nervures in all wings. Abdomen of male tumid at base, narrow and cylinderical from segment 3 to base of segment 7, from which point the abdomen is again dilated especially at segments 8 and 9 which bear broad lateral wing like projections. Abdomen in female more or less cylindrical throughout segment 8 and 9 without lateral dilations. Anal appendages; superiors longer than segment 10, tapering to apex, the terminal half curled regularly downwards and very closely apposed.

Type Species : Gomphus cognatus Rambur.

Distribution : Asia, Africa, Madagacar.

26. ***Paragomphus lineatus*** (Selys)

Gomphus lineatus Selys, 1850, *Rev. Odon.* p.386. *Mesogomphus lineatus* Fraser, 1934, *Fauna Brit. India Odon.* **2** : 230-234.

Material examined : Sikkim : Khanikhola : 1 M, 1 F, 6.7.1979 coll. G.K.Srivastava & party.

Remarks : The specimens do not differ from specimens from Tripura and Darjeeling as well as from Fraser's (1934) description.

Distribution : India : Sikkim, Orissa, Bihar (undivided), Tripura, West Bengal, Meghalaya, Uttar Pradesh (undivided), Maharashtra, Karnataka, Kerala and Tamil Nadu.

Outside India : Burma (Myanmar) Nepal, Sri Lanka, Turkey.

Genus ***Anisogomphus*** Selys

Anisogomphus Selys, 1857, *Mon. Gomph.* p. 102.

Abdomen : 31-52 mm. Hindwing : 30-33 mm. Colour black, marked with bright greenish yellow.

Head with frons slightly rounded. Flattened above, occiput flat, posterior border straight or slightly convex. Wings hyaline, reticulation close; tornus rounded or with the slightest angulation; base of hindwing very oblique, anal triangle three celled, three or four transverse nervures between the sectors of arc from arc to bifurcation of Rs. in forewing, only one or rarely two in the hindwing. Two rows of post anal cells in fore wing and four rows in hindwing. Anal loop absent, first postanal cell of hindwing not extending proximal to middle of base of subtrigone. Basal incomplete antenodal nervure present (in *A. bivittatus; A. orites),* may or may not be present (in *A. occipitalis).* Nodal index high; IA in fore-wing markedly pectinate, Cu_2 and IA in hindwing, slightly divergent at wing margin in hindwings; one or two cubital nervures in forewing one in hindwing. Pterostigma short and swollen. Abdomen tumid at base, then slim and cylindrical as far as the segmant seven, from which point

dilates again especially at segment 8 and 9 as far as the end. Anal appendages : superiors white, with a vantral black spine like protubearance, these appendages directed straight backwards or but slightly divericate; the inferior deeply and very broadly bifid, the two branches splayed out to such an extend as to be nearly in a straight line.

Type species : Anisogomphus bivittatus (Selys)

Distribution : India, Bangladesh, Nepal, China, Taiwan, Sri Lanka, Pakistan, Korea, Soviet Russia.

Key to species of *Anisogomphus* Selys

Abdomen 36-38 prothorax black, marked with a moderately large subdorsal spot on each side of the posterior lobe, a geminate spot in the middle. A sinuous humeral stripe present, not confluent above with the antehumeral stripe; post clypeus at its lower part of and the occiput yellow .... *bivittatus* (Selys)

Abdomen 31-34 mm.; prothorax black marked with citron - yellow. Antehumeral and stripes connected above by an oblique transverse spot; posclypeus and occiput black..... *orites* Laidlaw

27. ***Anisogomphus bivittatus*** (Selys)

Gomphus bivittatus Selys, 1854 Bull. Acad. Belg. **21** (2) : 46.

Anisogomphus bivittatus, Fraser, 1934, *Fauna Brit. India. Odon.* **2** : 192-194.

Material examined : No material could be obtained for study.

Distribution : India : Sikkim, West Bengal and Western Himalayas.

Outside India : Nepal.

28. ***Anisogomphus orites*** Landlaw

Anisogomphus orites Landlaw, 1922, *Rec. Indian Mus.* 24 : 371, 393; Fraser, 1934, *Fauna Brit. India. Odon,* **2** : 194-196.

Material examined : Rangpo, Sikkim, 1 F, 3 Nov. 1994.

Remarks : The specimen agrees with the description provided by Fraser (1934).

Distribution : India : Northern Bengal, Assam, Sikkim.

Outside India : Bangladesh, Nepal.

Genus ***Onychogomphus*** Selys

Onychogomphus Selys, 1854, *Bull. Acad. Belg.* 21 : 30; Fraser, *Fauna Brit. India. Odon.* **2** : 239-241.

Abdomen 33-45 mm. Hindwing 28-38 mm. colour yellow, marked with black, or black marked with yellow, anal appendages long, strongly curled and forcipate, the branches of the inferior closely apposed, wings : reticulation close, tornus angulated, base of hindwing oblique and deeply excavate. IA in forewing pectinated, 3 rows of the cells between IA and the wing border, Cu_2 and IA parallel to each other. Abdomen tumid at base, thin and cylindrical from segment 3 to 7 from which point it becomes somewhat dilated again, segment 8 and 9 often having pseudo-lateral delations.

Type species : Libellula forcipata Linn.

Distribution : Old World.

29. ***Onychogomphus bistrigatus*** Selys

Onychogomphus bistrigatus Selys, 1854, *Mon. Gomph.* p. 22. Tusda 1991, *A distributional list of World Odonata,* 1991, p. 220.

Onychogomphus M. flavum Selys, 1894, *Ann. Soc. Ent. Belg.* 38 : 169. Fraser, 1834, *Fauna Brit. India. Odon.* **2** : 250-254.

Material examined : 2 M Rabong, Sikkim, 16, Oct., 1995.

Remarks : The specimen does not vary from the discription provided by Fraser (1934).

Distribution : India : Darjeeling and Sikkim.

Remarks : A new record from Sikkim.

Genus ***Megalogomphus*** Campion

Megalogomphus Campion, 1923, *Ann. Mag. nat. Hist.* (9) 12 : 668; Fraser, 1934, *Fauna Brit. India. Odon.* **2** : 291.

Abdomen 47-60 mm. Hindwing 40-51 mm.

Dragnflies with glossy or mat black marked

with bright citron yellow. Head triangular, frons angulated, occiput low and simple in the male, sometimes spined in the female. Wing : reticulation very close; tornus markedly angulated; base of hindwing rather deeply excavated; membrane narrow : anal triangle four celled very rarely three celled. Two to three nervures between the sectors of arc from the arc to the bifurcation of Rs in forewings and one in hindwing; nodal index very high; discoidal cells in fore and hindwings identical. IA in fore wing markedly pectinate; Cu_2 and IA in hindwing parallel almost as far as the termen. Only one cubital nervures in all wings. R_{4+5} and MA undulated. Abdomen tumid at base, narrow and cylindrical from segment 3 to the base of 7, thereafter expanded markedly so on segments 8 and 9 which have narrow lateral wing like projections Anal appendages superiors twice the length of segment 10, projecting straight backwards tapering finely to the end; inferior deeply bifid into two long narrow branches, which are themselves deeply bifid at the apex and slightly divaricate.

Type-species : Heterogoomphus smithi Selys.

Distribution : India : Sikkim.

Outside India : Bangladesh, Sri Lanka, Vietnam, Indonesia, Thailand, Malaysia and China.

30. ***Megalogomphus smithi*** (Selys)

Heterogomphus smithi Selys, 1854, *Bull. Acad. Belg.* **21** : 29.

Megalogomphus smithi Laidlaw, 1930, *Trans. Ent. Soc. Lond.* 78 : 196 Fraser, 1934, *Fauna Brit. India. Odon.* **2** : 294-296.

Material examined : No specimen could be obtained for study.

Distribution : India : Sikkim, Assam.

Outside India : Bangladesh, China.

Family AESHNIDAE

Eyes very broadly contiguous; labium with middle and lateral lobes approximately equal, middle lobe with a slight incision or longitudinal groove; Wings long, moderately broad, discoidal cell approximately equal elongated in the length of wings and made up of 2 to 7 or more rarely numerous cells; a well formed compact anal loop lying just posterior to subtriangle and discoidal cell. Supplementary nervures Rspl. and Mspl. present and situated at a variable distance from IR_3 and MA respectively.

Distribution : Cosmopolitan.

Key to the genera of the family AESHNIDAE

1. Base of the hindwing without a notch; tornus of hindwing rounded in both sexes; anal triangle absent ..... *Anax* Leach

— Base of hindwing with a deep notch, tornus of hindwing angulated anal triangle always present 2

2. Median space traversed by one or more nervures; an incomplete basal antenodal nervure nearly always present 3

— Median space entire; incomplete basal antenodal nervure absent .... *Gynacantha* Ramb

3. Pterostigma long; face narrow; arc situated distal to the distal primary antenodal nervure; supplementary nervure arising from the distal side of the discoidal cell running straight to the border of wing..... ..... *Petaliaeschna* Fras.

— Pterostigma short, face broad, arc situated proximal to the distal primary antenodal nervure; the supplementary nervure arising from the distal side of the discoidal cell zigzagged from origin or absent.....4

4. Segment 10 of female prolonged into a dentigerous plate which ends in 2 long divaricate spines; discoidal cells long and narrow; frons not markedly raised .... *Periaeschna* Martin

— Segment 10 of female rounded, dentigerous plate absent; discoidal cell short and broad; frons markedly raised .... *Cephalaeschna* Selys

— Dentigerous plate ending in 2 robust

apposed spines; discoidal cells short and broad; frons raised ..... *Gynacanthaeschna* ..... Selys

Genus ***Gynacantha*** Rambur

Gynacantha Rambur, 1842, *Ins. Nevrop* p. 209.

Abdomen 41-58 mm. Hindwing 34-52 mm.

Homogenous dull brown or green colour. Head large and globular, eyes very broadly contiguous. Thorax comparatively small. Wings long and broad very closely reticulated, base of hindwing of male short, narrowed obtusely notched, tornus angulated but not produced, rounded in the female; membrane short; pterostigma moderately long, very narrow braced; discoidal cell 5 7 celled similar in size and shape in fore and hindwings, anal triangle three celled; anal loop oval, made up of numerous cells.

IR_3 forked a little proximal side of pterostigma and with three rows of cells between branches of fork; 4 to 7 rows of cells between IR_3 and Rspl; 1 row of cells between the origins of Cu_2 and IA in hindwing; 6 to 10 cubital nervure in all wings; basal space entire; hypertrigones traversed by many nervures. Abdomen of variable shape in male; usually a little tumid at base, more or less constricted at the segment 3. Oreillets usually large; anal appendages very long, very narrow and coated with long hairs on the innerside of the apical half; inferior appendages narrowly, not emarginate. Female with very long lanceolate anal appendages. Ovipositor long. Segment 10 prolonged laterally and ventrally into two proged plate, the curved prongs or spines strongly divaricate.

Type-species : *Gynacantha subinterrupta* Rambur.

Distribution : Cosmopolitan.

31. ***Gynacantha bayadera*** Selys

Genacantha bayadera Selys, 1891, *Ann. Mus. Civ. Genova* 30 : 47 Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 103.

Material examined : No specimen could be obtained for examination. Specimens from calcutta and Birbhum Examined.

Distribution : India : Sikkim, Darjeeling, Calcutta, Birbhum. (W.Bengal)

Outside India : Burma, China, Formosa, Taiwan, Celebes, Australia and New Guinea.

Genus ***Anax*** Leach

Anax Leach, 1815, *Edinb. Encycl.* 9 : 137; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 134.

Abdomen 46-62 mm. ..... Hindwing 46-60 mm.

Head very large globular, eyes broadly contiguous; frons sharply angled fore-border or crest, but not elevated. Thorax robust; legs long and robust. Wings hyaline but often partly tinted with yellow or pale brown. Wings long and broad; apices pointed, base straight, tornus rounded; pterostigma elongate very narrow, anal triangle absent anal loop quadrate made up of 10 to 12 cells in rows of three or more. Abdomen tumid at base, often slightly constricted at segment 3 then cylinderical or slightly depressed at end segments, which may be slightly dilated; oreillets absent. *Anal appendages* : Superiors very homogenous in the genus, broadly lanceoleted, bluntly rounded at apices with small spine an outer side of the apex and very strong ridge on upper surface, inner upper surface towards apex coated with long hairs. Inferior appendages quadrate, much shorter than superior very broad or more or less deeply notched at apical border and armed at each outer corner with two or more robust imbricated spine. Female with shorter anal appendages or more rarely of the same length, lanceolate knife shaped; dentigerous plate rounded, coated with fine, short spines.

Type specimen : *Anax imperator* Leach

Distribution : Cosmopolitan.

32. ***Anax nigrofasciatus nigrolineatus*** Fraser

Anax nigrolineatus Fraser, 1935, *J. Darjeeling Nat. Hist. Soc.* **10** : 23-25.

Anax nigrofasciatus nigrolineatus Asahina, 1962, *Jap. J. Zool.* **13** : 249-250.

Material examined : 1F, Lachen 4.6.1959, *Coll.* A. G. K. Menon. The specimen agrees with the description provided by Fraser.

Distribution : Sikkim, Darjeeling.

Genus ***Periaeschna*** Martin

Periaeschna Martin, 1909, *Cat. Coll. Selys* (Aeschnimes) fasc. 20 : 7, 157; Fraser. 1936, *Fauna Brit. India. Odon* **3** : 81.

Abdomen 48-57 Hindwing 40-51 mm.

Head large, globular, eyes broadly contiguous; occiput almost obsolete; face narrow; frons elevated and usually rising cone like medially. Thorax robust, hind femora with two rows of minute closely - set spines, with a few longer ones at the distal end. Wings broad, rounded at apices or rather pointed; base of hindwing in male nearly straight, tornus right angled; membrane present short limited to petiole of wing pterostigma very short, always braced; arc proximal to distal primary antenodal nervure, IR_3 forked at the point midway between the node and pterostigma; 2 or occassionally 3 rows of cells between the branches of the fork; only a single row of cells between IR_3 and Rspl. One or more usually two rows of cells between the origins of Cu_2 and IA in hindwing. Median, and cubital spaces traversed several times; and incomplete basal antenodal nervure present in all wings; discoidal cells long and narrow; the shorter and broader than the fore, made up of 5 or 6 cells; supplementary nervure arising from the distal side of the discoidal cells irregular and poorly developed, always zigzagged from the origin. IA markedly pectinate in all wings. Abdomen slightly tumid at base constricted at segment 3, cylindrical in female and the end segments small and composed. Anal appendages simple: superiors lanceolate, inferior triangle, with acute apex. Female with the sides of segment 10 prolonged downwards and ending in two long divaricate spines; Ovipositor massive but not extending beyond end of abdomen.

Type species : *Periaeschna magdalena* Margin

Distribution : India, Nepal, Bangladesh, China, Vietnam, Taiwan, Malayasia.

33. ***Periaeschna magdalena*** Martin

Periaeschna magdalena Martin, 1909, *Cat. Coll. Selys.* (Aeschnines) fasc. 20 : 157; Fraser, 1936, *Fauna. Brit. India. Odon.* **3** : 82-84.

Remarks : The species could not be obtained for study.

Distribution : India : Sikkim (Gangtok), Meghalaya, Bengal.

Outside India : Burma (Myanmar), Taiwan, Bangladesh, China, Vietnam.

Genus ***Petaliaeschna*** Fraser

Petaliaeschna Fraser, 1927, *Rec. Indian. Mus.* 29 : 72 Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 79.

The genus resembles *Cephalaeschna* but differs from it by the following characters :- Face narrow; frons raised in a cone at middle of crest; wings broader and longer, with closer reticulation; pterostigma longer and never braced; membrane always obsolate; level of the arc markedly distal to the outer primary antenodal nervure; discoidal cells narrow and relatively longer, made up of at least 6 cells; accessory nervure arising from distal side of the discoidal cells not zigzagged, but a strong well developed nervure through out its course; genital plate of female rounded and furnished with minute short hair like spines.

Type-species : *Petaliaeschna fletcheri* Fraser.

Distribution : India, China.

34. ***Petaliaeschna fletcheri*** Fraser

Petaliaeschna fletcheri Fraser, 1927, *Rec. Indian. Mus.* 29 : 73-74; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 79-81.

Remarks : The species could not be obtained for study.

Distribution : Sikkim, Meghalaya.

Genus ***Gynacanthaeschna*** Fraser

Gynacanthaeschna Fraser, 1922, *J. Bombay, mat. Hist. Soc.* 28 : 110; Fraser, 1936, *Fauna of British India. Odon.* **3** : 76.

The genus resembles *Cephalaeschna* but differs only in structures of the genitalia of the female. Face very broad and orbicular as in *Cephalaeschna orbifrons*; pterostigma very short with brace usually situated distal to the proximal end; discoidal cells with 3 to 5 cells, but usually only

3; arc nearly always situated at the level of distal primary antenodal nervure or distal of that level; anal triangle always three celled; forming of IR_3 nearer pterostigms than node; reticulation rather more open than in *Cephalaeschna*. Female with tenth segment of abdomen produced ventrally to form a plate furnished with two spine like prongs; ovipositor moderately long, extending up to the tips of the prongs.

Type-species : *Cephalaeschna sikkima* Karsch.

Distribution : India, Bangladesh, Nepal.

35. ***Gynacanthaeschna sikkima*** (karsch)

Cephalaeschna sikkima Karsch, 1891, *Ent. Nachr.* **17** : 6-7.

Gynacanthaeschna sikkima, Fraser, 1927, *J. Bombay. nat. Hist. Soc.* 28 : 110, 618-620; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 77-79.

Remarks : The specimen could not be obtained for study.

Distribution : India : Sikkim, Cherrapunji, Gopaldhara, Assam, Uttar Pradesh (Undivided).

Outside India : Bangladesh, Nepal.

Family CORDULEGASTERIDAE

Large dragonflies with ground - colour of black or dark brown marked with citron yellow. Head transversely elongate. Labium either longer than broad or as long as broad, tapering anteriorly; the apex bifid for about the apical third, lateral lobes very large, outer border rounded, inner straight or denticulate and with a long curved hook at apex; Labrum broader than long, nearly quadrangular, but the angles slightly rounded. Antennae with basal joint robust short, annular, second joint twice as long and a little less robust, rounded at its end, the end segment articulated or not and variable; face projecting, quadrate or broader than long and with the frons raised or not, sometimes higher than occiput; eyes large, meeting at a point or more or less separated; vesicle small or absent; occiput small, variable shaped, with tumid posterior border or raised as a horn variable in the sexes. Prothorax very small entirely hidden by the head. Thorax robust or moderately so. Legs robust, short or long, femora cylinderical, flattened below and furnished with two rows of small teeth variably shaped in the genera, tibiae with four well marked longitudinal ridges and two rows of variable spines, long or short or with membranous keel. Tarsal hooks robust, situated about the middle of the claws. Wings variable shaped, the hind wing usually broader than the fore wing, their base angulate or rounded, hyaline, coloured or not, node situated nearly at the centre of the wing; arc angulated or not; medium space traversed or not; an incomplete basal antenodal nervure present or not; basal space usually entire sometimes traversed; discoidal cell variably shaped and occasionally differently shaped in fore and hindwings; anal loop present in hind wings, varibly shaped; anal triangle present or not; antenodal nervures numerous; the first or second and from the eighth to the tenth are the primaries; pterostigma variable, short or long; membrane small or moderately large. Abdomen cylinderical in or both sexes or compressed in the female usually tumid at base but variable at apex or anal end as long as wings or much longer, more rarely shorter than the wings in the female. Anal appendages very variable in the genera, but very similar in the species of individual genera, usually equal in length to segment 10 of abdomen; the superior triquetral or compressed and straight or slightly curved, pointed at apex and furnished below with one or two teeth; inferior appendages variably shaped usually shorter than superior quadrate, notched or not at apex.

Distribution : Cosmopolitan.

Genus ***Anotogaster*** Selys

Abdomen 52-64 mm Hindwing 42-63 mm

Head big, eyes meeting only at a point, occiput small, slightly elevated along the hind border, frons broad, high but not higher than occiput, broadly and shallowly excavate above, coated evenly with fine hairs; antennae seven jointed, the basal joint short rounded, the second long and very robust, the third as long as second but slim, the fourth to sixth each less than half the length

of the third, the last one very short and filamentous. Prothorax short; posterior lobes rounded, tumid. Thorax thick, usually coated with fine hairs. Legs robust, hind femora extending to about the middle of the second abdominal segment, armed with a row of widely placed, very short obtuse spines on the outer side and a double row of more closely set sharper spines on the inner, two longer spines at the extreme distal end; tibiae with a row of moderately long, evenly sized spines on the inner side and a row of evenly sized blunt teeth on the outer; anterior tibiae with a short distal keel, which is absent in the female. Claw hooks robust, situated about the middle of claws. Wings hyaline, females usually with a patch of bright amber tint at bases of all wings. Hindwings broad, reticulation very close; base of hindwings straight, tornus rightly rounded; membrane broad and long pterostigma long and narrow; discoidal cell of similar shape in fore and hindwings; subtrigone scarcely differentiated from the cubital space; numerous ante-and postnodal nervures; discoidal field beginning with a row 4 or 4 cells and continued as 2 rows for variable distance; IA pectinate in all wings; Cu_2 in fore-wings nearly straight, so that the discoidal field is scarcely dilated at the termen; a small but well defined anal loop in the hindwing. Abdomen long and cylinderical; Anal appendages, slightly divaricate, with ventral spine beneath the superior. Ovipositor long.

Type-specimen : *Anotogester nipalensis* Selys.

Distribution : India, Bangladesh, Nepal, China, Japan, Thailand, Korea, Taiwan, Russia.

Key to species of *Anotogester* Selys

The costa and first antenodal nervure, arc, costal and distal sides of discoidal cell, and basal portions of IA and MA bright yellow; pterostigma black, covering nearly $2^1/_2$ cells, discoidal cells 2 celled in all wings, hypertrigones traversed once in all wings, subtrigone entire, two cubital nervures in forewings, one or two in the hind wings; discoidal field with rows of cell to about the level of the bridge; anal loop five celled .... *nipalensis* Selys

The costal and all other nervures of wings black, hypertriangles entire, two to three cubital nervures usually open or five cells, pterostigma black bordered with bright citron yellow along with the costa..... *basalis palampurensis* Fraser

36. ***Anotogaster nipalensis*** Selys

Anotogaster nipalensis Selys, 1850, *Bull. Acad. Belg.* (2) 21 : 102; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 50-51.

Remarks : A female specimen from Darjeeling could be examined. No specimen from Sikkim could be obtained for study.

Distribution : India : Sikkim, Darjeeling, Assam.

Outside India : Bangladesh, Nepal.

37. ***Anotogaster basalis palampurensis*** Fraser

Anotogaster basalis palampurensis Fraser, 1929, *Mem. Indian Mus.* 9(3) : 88-89; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 49-50.

Remarks : No specimen could be obtained for study.

Distribution : India : Sikkim.

Outside India : Nepal.

Genus ***Chlorogomphus*** Selys

Chlorogomphus Selys, 1854, *Bull. Acad. Belg.* 21(2) : 99. Fraser, 1936, *Fauna Brit. India. Odon* **3** : 5-6.

Abdomen 45-60 mm Hindwing 42-60 mm

Head broad but not deep; eyes separated or slightly united; postclypeus broader than frons. Occiput small tumid in male and low and excavate in female. Thorax small and cubical; legs short but robust. Wings long and broad, especially the hindwing of females, hyaline in male; hyaline/ coloured for the greater part or partly opaque in the females; reticulation close, node situated much nearer pterostigma than base in forewing; pterostigma relatively short and narrow, rather longer in female. Base of hindwing shallowly excavate near the insertion of wing in male; the excavation filled in by the membrane so that the base is broadly rounded; always rounded in female. Abdomen variable longer or slightly

shorter than hindwing, cylinderical in male, laterally compressed in the female. Anal appendages homogenous with minor specific differences, slightly longer than segment 10; superior widely separated, slightly curved and converging slightly at the apices, often furnished with ventral spines. Inferiors deeply cleft into slightly divaricate branches which are as long as superiors.

Type-species : *Chlorogomphus magnificus* Selys.

Distribution : Oriental and Palaearctic region.

Key to species of *Chlorogomphus* Selys

Eyes moderately or widely seperated, especially in the female; hind-wings of female very broad at a base, and all wings broadly tinted with golden yellow; discoidal cell of hindwings with costal and basal sides of equal length or basalside the longer; the posterior angle acute; abdomen equal in length to hindwings or but slightly longer in the males. Anal appendages in male black; superiors as long as segment 10, widely seperated broad at base, tapering somewhat to apex, which is slightly curled in and obtuse. Inferior appendages broadly triangular and with its apex deeply bifid, the two branches robust, rather obtusely pointed and strongly divergent. In female anal appendages shortly conical widely separated by a conical protubearances .... *mortoni* Fraser

— Eyes just meeting or but slightly seperated in both sexes; hindwing of female not markedly broadend and rarely coloured and then but partially so; discoidal cell of hindwing with costal side slightly longer than basal and the posterior angle subacute; abdomen markedly longer than the hindwings in both sexes. Anal appendages black; superior as long as segment 1, curved towards each other in their apical halves, broad at base, bifid at apex, a robust ventral spine situated near the apex and not visible from above, a tuft of coarse hairs springing from the outer aspect of the blunt apex; the inferiors equal in length or slightly longer than superiors, broadly and deeply bifid, the two sides of the cleft curled strongly upwards and ending in a short bifid spine .... *preciosus preciosus* (Fraser)

38. ***Chlorogomphus preciosus preciosus*** (Fraser)

Orogomphus preciosus Fraser, 1924, *Mem. Dept. Agric. India (Ent.)* **8** : 75-76.

Chlorogomphus preciosus Fraser, 1936, *Fauna Brit. India. Odon.* 1991, p. 19-22.

Chlorogomphus p. preciosus, Tsuda, 1991 *A list of World Odonata*, 1991, p. 130.

Remarks : A female specimen from Darjeeling could be examined; no specimen from Sikkim could be obtained for study.

Distribution : India : Sikkim, Darjeeling.

Outside India : Burma (Myanmar), Nepal.

39. ***Chlorogomphus mortoni*** Fraser

Chlorogomphus mortoni Fraser, 1936, *Proc. R. ent. Soc. Lond.* (B) **5** : 224.

Remarks : No specimen could be obtained for study.

Distribution : Sikkim.

Family LIBELLULIDAE

Dragonflies of small, medium or large size and robust build, frequently brightly coloured, but rarely metallic, the sexes usually differing strongly in colour and margins. Eyes united, vesicle distinct. Wings usually short to medium sized, occasionally differing in shape in the sexes, the hindwing always rounded at the base in both sexes; discoidal cell in forewing often markedly narrowed and elongate in the breadth of the wing, usually traversed and occasionally reticulated; anal loop, stocking shaped. Legs variable, usually short and robust, anterior femora without a pencil of hairs at the distal end and tibiae without keels. Abdomen extremely variable in shape, usually shorter than the wings. Anal appendages nearly always simple, rarely specialized.

Distribution : Cosmopolitan.

Key to Genera of LIBELLULIDAE

1. Pterostigma bicolourous ..... *Bradinopyga* Kirby
— Pterostigma unicolorous 2
2. Wings totally or partly hyaline 3
— Wings with patches of black ..... *Palpopleura* Rambur
3. Posterior lobe of prothorax large and with hairs 4
— Posterior lobe of prothorax small and naked 7
4. Distal antenodal nervure complete 5
— Distal antenodal nervure incomplete 6
5. 6 to 7 antenodals in forewing ..... *Acisoma* Rambur
— 12 or more antenodals in forewing ..... *Orthetrum* Newman
6. Borders of discoidal field converging strongly at wing margin ..... *Sympetrum* Newman
— Borders of discoidal cell field in fore-wing diverging at the wing margin ..... *Diplacodes* Kirby
7. Discoidal field with borders converging 8
— Discoidal field with borders diverging 10
8. Distal antenodal complete ..... *Lyriothemis* Brauer
— Distal antenodal incomplete 9
9. Dscoidal cell in fore-wing very narrow, its costal side only about one-fourth to one-third the length of basal; a conspicuous supplementary nervures (IR_2) present between R_2 and R_3 ..... *Pantala* Hagen
— Discoidal cell in fore-wing broader, its costal side about one-half the length of basal; no supplementary nervure, IR_2 present between R_2 and R_3 ..... *Trithemis* Brauer
10. More than one cubital nervures in all wings ..... *Neurothemis* Brauer
— One cubital nervures in all wings ..... *Crocothemis* Brauer

Genus ***Lyriothemis*** Brauer

Lyriothemis Brauer, 1868, *Verh. zool. bot. Ges. Wien.* 18 : 180, 365, 728; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 263-265.

Abdomen 19-37 mm Hindwing 24-43 mm

Dragonflies with diverse shape of abdomen and wing venation, but agreeing closely on the shape of genitallia and important features of wing venation. Head usually large, eyes broadly contiguous, frons variable with or without accentuated crest; vesicle bifid. Prothorax with small posterior lobe; thorax very stout, legs slim; hind femora in both sexes with a row of short similarly sized spines. Abdomen generally variable, but broad at base and then tapering towards the anal end. Genitallia : Lamina hoodshaped, projecting; hamules of great size and very prominent, foliate and with very short inner spine; lobe small ungulate, constricted at base. Female with borders of segment 8 only slightly dilated or not at all, vulvar scales very small. Wings hyaline, occasionally tinted at extreme base or with dark streaks in the subcostal and cubital spaces; long and narrow or decidedly broad, especially in female; reticulation close; discoidal cells as well as the arc are almost at the same level in fore- and hind-wings. Discoidal cell in forewing may be traversed but in hind-wing it is always traversed; subtrigone in fore-wing with a number of cells; anal loop variable, usually long, with the dilated distal end and with strongly angulated distal side; number of cubital nervures variable, antenodal nervures are large in number; R_3 IR_3 R_{4+5} curve gently or sharply toward the margin of the wing.

Type-species : *Lyriothemis cleis* Brauer

Distribution : India, Bangladesh, Burma (Myanmar), China, Indonesia, Malayasia, Thailand, Laos, Nepal, Vietnam, Hongkong, Japan, Taiwan, Phillipenes, Singapore, Papua New Guinea.

40. ***Lyriothemis bivittata*** (Rambur)

Libellula bivittata Rambur, 1842, *Ins. Nevrop.* p. 75.

Lyriothemis bivittata Ris, 1909, *Cat. Coll. Selys.* fasc 9 p. 103, 112-115; fraser, 1936, *Fauna Brit. India. Odon* **3** : 269-270.

Material examined : Sikkim, Khanikhola 1 F, 6.7.1979.

Remarks : The specimen differs from the Fraser's (1936) description since the brown stripe of the hindwing extends upto the seventh antenodal nervure.

Distribution : India : Sikkim; Darjeeling, Sibsagar, Nowgang.

Outside India : Bangladesh, Burma (Myanmar), Laos, Malaysia, Nepal, Thailand and Vietnam.

Genus ***Orthetrum*** Newman

Orthetrum Newman, 1833, *Ent. Mag* 1 : 511; Fraser, 1936, *Fauna Brit. India. Odon* **3** : 291-292.

Abdomen 22-36 mm Hindwing 25-41 mm

A large genus, varying colour and shape of abdomen. Head moderately large, frons with well defined crest in both sexes. Posterior lobe of prothorax large, erect and fringed with long hairs. Thorax robust, with variable colour and margins. Wings long; reticulation close; node lying nearer pterostigma than base of wing; sectors of arc shortly fused in fore-wing, longer fusion in hindwing; trigone in the forewing three celled, discoidal field with 3 rows of cells at the begining and widely dilated at the wing border; anal field of hindwing broad, anal loop greatly overlapping the discoidal cell, its distal end dilated and distal side right angled; one to three rows of cells between IR_3 and Rspl. Cu_2 variably arising from the distal side of the discoidal cell or separated therefrom, distal antenodal complete and the number of antenodals is not less than 12 in forewing.

Type-species : *Libellula coerulescens* Fabricius.

Distribution : Old World.

Key to species of *Orthetrum* Newman

1. Males coloured red, females brownish or ochreous. 2
— Males brown or black, often pruinosed, yellow markings, females vary in colour and markings 3
2. In males face ochreous to pale reddish brown, frons anteriorly and above dark brown, vesicle and occiput dark reddish brown, prothorax and thorax reddish brown to dull purple due to pruinescence; wings hyaline enfumed pale especially towards apices in old adults, and with a reddish brown basal markings extending distal wards in hind wings to first antenodal nervure and nearly as far as tornal angle; only a vestige of this in fore-wing. Abdomen bright vermillion red in subadult; but in adult it is purplish red due to pruinescence. Females are like subadults. ..... *O. pruinosum. neglectum* (Rambur)
— Males' face, frons yellowish or pale brown; frons in front scarlet red, prothorax thorax ferruginous; in females the red coloured is replaced by ochreous; Wings hyaline, in males a golden amber coloured marking at the base of hindwings; in female a vestige of this occurs. Abdomen bright red, broad at base tapered gradually to anal end .... *O. t. testaceum* (Burm.)
3. Abdomen enormously swollen at base and then abruptly slimmed and compressed laterally to the end; greenish yellow marked with black; not pruinosed; Cu_2 rather widely separated from the posterior angle of the discoidal cell, arising from its distal side; anal area, adjoining membrane of the hindwing tinted with amber yellow; female similar to male ..... *O. sabina* (Drury)
— Abdomen not enormously swollen at base and variable 3
4. Abdomen never enormously swollen at base, never very slim, mostly with pruinosed abdomen and thorax. Thorax velvety blackish brown; Wings in male with a triangular black mark, in female it is absent; abdomen not pruinosed; borders of segment 8 dilated, vulvar scale obsolaete .... *O.t.triangulare* Selys.

— Base of hindwing of male without a triangular mark 5

5. Cu_2 in hindwings arising from the distal side of the discoidal cell away from the posterior angle. Protharax blackish brown, thorax pale olivaceous green; abdomen dorso-ventrally dilated at base, then narrow and tapered, pruinosed pale azure blue except at sides of the segments 1, 2 and base of 3 which are bright yellow. In female thorax palest green with fine black sutures; abdomen greenish yellow; sides of segment 8 broadly dilated, ninth ventral plate a little fumed ..... *O.luzonicum* (Braucer)

— Cu_2 in hindwing arising from the posterior angle of the discoidal cell 6

6. The thorax and abdomen pruinosed blue in adult males; single row of cells between IR_3 and Rspl. abdomen laterally and dorsoventrally broad at base and tapered gradually to as far as anal end, triquetral in cross section. Wings hyaline, tinted with browinsh in old adults; membrane pure white; costal borders of many antenodal nervures pale yellow..... ..... *O. anceps* (Schneider)

— Two or more rows of cells between IR_3 and Rspl. 7

7. Costal border of wings and all antenodal nervures bright yellow. Prothorax black, anterior border of anterior lobe, a fine bow shaped stripe across middle lobe and whole posterior lobe bright yellow; thorax dark olivaceous, coated with fine grey hairs. Wings hyaline; abdomen broad at base, tapered from there to anal end; segments 1-2 olivaceous; 3-7 in the adult pulverulent blue, 8-10 black. In female abdomen bright ochreous marked with black. Wings with a pale yellow tint at extreme base. Anal appendages black, shortly conical. .... *O.c. cancellatum* (Linn.)

— Costal borders and antenodals black. 8

8. Wings hyaline, with extreme base tinted with dark amber-yellow to as far as the cubital nervures and well into the anal triangle in hindwing. In fully adult specimens the whole wing enfumed palely and evenly with brown; in female the wings are similar to male; in male the abdomen pruinosed pale dirty blue from segment 1 to 8, the rest is black. In female the abdomen reddish brown with a broad greenish yellow stripe on middorsum extending from segments 1 to 7; segments 8 to 10 black on middorsum ..... *O. glaucum* (Brauer)

— Wings hyaline, even in old adults. Membrane narrow and cinereous; costal nervure finely yellow especially distal to node; prothorax and thorax uniformly pulverulant blue in full adult males; in case of females prothorax dark brown, posterior lobe pale divaceous green, thorax palest brown on middorsum bordered outwardly with a vertical pale olivaceous stripe..... ..... *O. taeniolatum* (Schneider)

— Wings hyaline but tinted with brownish in old adults especially towards the apices and along posterior part of wings. Membrane pure white; pterostigma ochreous between black nervures. Costal border of many antenodals pale yellow. Thorax pruninosed in male; in female olivaceous brown on dorsum, marked with a narrow blackish humeral stripe which becomes obsolete above, laterally olivaceous with all sutures black..... ..... *O. b. brunneum* (Fonscolmbe)

— Abdomen short and broad, almost white with pruinescence, thorax with two broad greenish or bluish stripes, more or less obscured with pruinescene. Face and frons olivaceous green; prothorax black, thorax olivaceous green; in female thorax and abdomen without pruinescence and bright yellow; wings hyaline and amber yellow tinting at extreme base of hind wing .... *O. japoniaum internum* McLachlam

41. ***Orthetrum brunneum brunneum*** (Fonscolombe)

Libellula brunnea Fonscolombe, 1837, *Ann. Ent. Soc. France,* **6** : 141.

Orthetrum brunneum brunneum, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 294-295.

Material examined : 1M, Mongan, 1.xi.1992.

Remark : The specimen differs from the description provided by Fraser (1936) in having labium, labrum and face rust red. In this respect it agrees with specimens from Arunachal Pradesh, Manipur and Tripura of eastern India.

Distribution : India : Sikkim (Mongan); Arunachal Pradesh, Assam, Bihar (undivided), Kashmir, Manipur, Tripura, Uttar Pradesh (undivided).

Outside India : Asia and Europe.

Remark : A new record.

42. ***Orthetrum anceps*** (Schneider)

Libellula anceps Schneider, 1845, *Stett. Ent. Zeit.* **6** *: 111.*

Orthetrum anceps, Fraser, 1936, *Fauna Brit. India Odon,* **3** : 295-296.

Material examined : 1F Chulung 20. x. 1977.

Remark : The specimen vary from Fraser's (1936) description in having labium and labrum ochreous, post clypeus and frons grey, postnodals in both fore-and hind-wings are 8-9. The specimen agrees with specimens deposited in the collection of Zoological Survey of India.

Distribution : India : Sikkim : Chulung; Arunachal Pradesh, Mizoram, West Bengal.

Outside India : West Asia, Africa and Europe.

Remark : A new record.

43. ***Orthetrum taeniolatum*** (Schneider)

Libellula taeniolatum Schneider, 1845, *Stett. Ent. Zeit.* **6** : 111.

Orthetrum taeniolatum Kirby, 1890, *Syn. Cat. Neur. Odon.* p. 37; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 296-298.

Material examined : Sikkim : Lachung 1 M 20 viii. 1979; Nayabazar 1F, 29. x. 1977; Rabangla 1 F, 6. x. 1988; Tumin 1 M, 29. ix. 1988; 1 m, 10. x. 1988.

Distribution : India : Sikkim (Lachung, Nayabazar, Rabangla, Tumin) Bihar (undivided), West Bengal, Uttar Pradesh (undivided), Himachal Pradesh, Kashmir, Rajasthan, Madhya Pradesh (undivided) and Maharashtra.

Outside India : Burma (Myanmar), Pakistan, Sri Lanka, Iran, Nepal, Turkey, Somali.

Remark : The specimens agree with Fraser's (1936) description. A new record.

44. ***Orthetrum luzonicum*** (Brauer)

Libellula luzonica Brauer, 1868, *Verh. Zool. bot. Ges. Wien.* **18** : 169, 732.

Orthetrum chrysostigma luzonicum Ris, 1909, *Cat. Coll. Selys fasc.* 9 : 203 : 210-212 : 1936, *Fauna Brit. India. Odon.* **3** : 298-300

Material examined : 1M Gangtak 10. x. 1988; 1M Rangpo; 26. x. 1977; 1F Tadong 22. x. 1995.

Distribution : India : Sikkim, Assam, West Bengal, Nagaland, Meghalaya, Uttar Pradesh (undivided), Himachal Pradesh, Karnataka, Tamil Nadu, Kerala and Gujarat.

Outside India : Afganistan, Bangladesh, Burma (Myanmar), Sri Lanka, China, Hongkong, Indonesia, Japan, Malaysia, Nepal, Philippines, Taiwan and Vietnam.

Remarks : The specimens do not differ from Fraser's (1936) description.

A new record.

45. ***Orthetrum sabina sabina*** (Druny)

Libellula sabina Druny, 1770, *Ill. Exot. Ins.* **1** : 114.

Orthetrum sabina Kirby, 1889, *Trans. Zool. Soc. Lond.* 12 : 302; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 300-302.

Orthetrum sabina sabina, Lieftinck, 1954, *Treubia* **22** (Suppl.) : 137.

Material examined : Sikkim : Nayabazar 2 M

3.9.1992; Ranipool 2 M 1F 4.6.1994; Namthang 3 M 12.8.1990.

Distribution : India : Sikkim.

Elsewhere : Arunachal Pradesh, Assam, Bihar (undivided), Manipur, Meghalaya, Orissa, Tripura, Uttar Pradesh (undivided), Himachal Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu, West Bengal, Andaman Island and Nagaland.

Outside India : Old World.

Remarks : The specimens agree with the description present in Fraser (1936). A new record.

46. ***Orthetrum cancellatum cancellatum*** (Linn.)

Libellula cancellata Linnaeus, 1758, *Syst. Nat. ed.* 10 : vol. **1** : 554.

Orthetrum cancellatum Neyer dur, 1874, *Mitt. Schwiez. Ent. Ges.* **4** : 330.

Orthetrum cancellatum cancellatum, Ris, 1909, *Cat. Coll. Selys* fasc. 9 : 180; 229-231; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 302-307.

Material examined : Sikkim, Lachung : 1M, 2.7.1977.

Distribution : India : Sikkim (Lachung).

Elsewhere : Kashmir, Himachal Pradesh and Madhya Pradesh (undivided).

Outside India : Old World.

Remarks : The specimen agrees with description present in the Fauna of British India. Odonata. vol. 3 Fraser (1936).

47. ***Orthetrum japonicum internum*** McLachlan

Orthetrum japonicum internum Machlachlan, 1894, *Ann. Mag. Nat. Hist.* (6) 13:431; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 304-305.

Material examined : Sikkim : Phadong 1F 10.10.1993.

Distribution : India : Sikkim : Himachal Pradesh, Meghalaya, Uttar Pradesh (undivided), Nagaland, West Bengal, Kashmir and Assam.

Outside India : Bangladesh, Burma (Myanmar), China, Nepal, Tibet, Japan, Pakistan, Thailand, Taiwan, Vietnam and Korea.

Remarks : The specimen does not vary from Fraser's description in Fauna of British India, Odonata, Vol. 3 (1936). A new record.

48. ***Orthetrum triangulare triangulare*** (Selys)

Labellula triangularis Selys, 1878. *Mitt. Mus. Dresden* p. 314.

Orthetrum triangulare, Kirby, 1886, *Proc. Zool. Soc. Lond.* p. 327.

Orthetrum triangulare triangulare, Ris. 1909, *Cat. Coll. Selys.* fasc. 9 : 181, 243-244; Fraser, 1936; *Fauna Brit. India. Odon.* **3** : 305-307.

Material examined : Sikkim : Geyzing 1M, 6.10.1977, Nayabazar 2M, 30.10.1977; Phensom 1M, 19.10.1977, Rangdom 5M, 19.10.1977.

Distribution : India : Sikkim (Geyzing, Nayabazar, Phensom and Rangdom).

Elsewhere : Arunachal Pradesh, Assam, West Bengal, Meghalaya, Kashmir, Bihar (undivided), Uttar Pradesh (undivided), Tamil Nadu, Karnataka and Kerala.

Outside India : Afganistan, Burma (Myanmar), China, Nepal, Laos, Sri Lanka, Thailand and Vietnam.

Remarks : The specimens do not vary from Fraser's (1936) description.

49. ***Orthetrum glaucum*** (Brauer)

Libellula galuca Brauer, 1865, *Verh. Zool. bot. Ges. Wien.* **15** : 1012.

Orthetrum glaucum, Kirby, 1890, *Syn. Cal. Neur. Odon.* p. 39; Fraser, 1936, *Fauna Brit. India, Odon.* p. 307-309.

Material examined : Sikkim : Geyzing 1M, 1F, 6.11.1977; Gangtok 1M, 21 10.1977; Jorethang 1 M, 1F, 29.10.1977; Mongan 1M, 1F, 29.10.1977; Nayabazar 2F, 29.10.1977; 6M, 2F, 19.10.1977; Rangpoo 1F, 26.10.1977; Rangdom 5M, 19.10.1977; 1M, 21.10.1977; Ranipool 1F, 9.10.1988.

Distribution : India : Sikkim (Gangtok, Geyzing, Jorethang, Mongan, Nayabazar, Rangpo, Rangdom and Ranipool).

Elsewhere : Arunachal Pradesh, Assam, Manipur, Mizoram, Tripura, West Bengal, Uttar Pradesh (undivided), Himachal Pradesh, Karnataka, Kerala, Maharashtra, Madhya Pradesh (undivided) and Tamil Nadu.

Outside India : Burma (Myanmar), China, Malaysia, Nepal, Indonesia, Philippines, Thailand, Taiwan, Hongkong, Japan and Vietnam.

Remarks : The specimens do not vary from Fraser's (1936) description.

50. ***Orthetrum testaceum testaceum*** (Burmeister)

Libellula testacea Burmeister, 1839, *Handh. Ent.* **2** : 859.

Orthetrum testaceum, Kirby, 1890, *Syn. Cal. Neur. Odon.* p. 39.

Orthetrum testaceum testaceum, Ris, 1910, *Cat. Coll. Selys Lib.* fasc. 10 : 181; Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 309-310.

Material examined : Sikkim : Rangpo 1M, 12.11.1992.

Distribution : India : Sikkim.

Elsewhere : Orissa.

Outside India : Bangladesh, Burma (Myanmar), China, Philippines, Singapore, Indonesia, Malaysia, Thailand, Vietnam and Taiwan.

Remarks : The specimen agrees with the description present in Fauna of British India, Odonata.

51. ***Orthetrum pruinosum neglectum*** (Rambur)

Libellula neglecta Rambur, 1841, *Ins. Nevrop.* p. 86.

Orthetrum pruinosum neglectum, Ris, 1909, *Cat. Coll. Selys.* fasc. 9 : 181; Fraser, 1936, *Fauna Brit. India. Odon.* 3 : 311-313.

Material examined : Sikkim : Bygoria 1M, 30.10.1977; Phensong, 1M, 19.10.1977; Rangdom 1M, 19.10.1977; Ranipool 12M, 2F, 9.10.1988; 6M, 6F, 12.10.1988; Tumin 6M, 30.10.1988; 6M, 1F, 1.10.1988.

Distribution : India : Sikkim (Bygoria, Phesong, Rangdom, Ranipool and Tumin); Arunachal Pradesh, Assam, Bihar (undivided), Manipur, Mizoram, Nagaland, Orissa, Tripura, West Bengal, Meghalaya, Uttar Pradesh (undivided), Himachal Pradesh, Rajasthan, Madhya Pradesh (undivided), Karnataka, Kerala, Tamil Nadu and Andaman Is.

Outside India : Afganistan, Bangladesh, Burma (Myanmar), China, Indonesia, Japan, Laos, Malaysia, Singapore, Thailand, Taiwan, Vietnam, Nepal, Philippines and Sri Lanka.

Remarks : The specimens agree with description given by Fraser (1936).

Genus ***Palpopleura*** Rambur

*Palpopleura*Rambur, 1842, *Ins. Nevrop.* p. 129. Fraser, 1936, *Fauna Brit. India. Odon.* **3** : 316.

Abdomen 12-16 mm Hindwing 14-21 mm

Libelluline dragonflies of small size but robust build. Head large, frons markedly angulated at crest and with shallow sulcus; prothorax with large posterior lobe, fringed with long hairs; thorax robust; abdomen short dorsoventrally depressed, fusiform. Wings short, coloured in both sexes; discoidal cells traversed often several times; wings yellow marked with black spots/stripes; $10^1/_2$ to $12^1/_2$ antenodals in fore-wings; anal loop very long, outer border angulated. Genitalia of male small, lobe prolonged; vulvar scales projecting, short and rounded; borders of segment 8 not dilated.

Type-species : *Palpoleura vestita* Rambur.

Distribution : India, Bangladesh, Nepal, China, Burma (Myanmar), Vietnam, Africa and Madagascar.

52. ***Palpopleura sexmaculata sexmaculata*** (Fabricius)

Libellula sexmaculata Fabricius, 1787, *Mant. Ins.* **1** : 338.

Palpopleura sexmaculata Brauer, 1868, *Verh. Zool. bot. Ges. Wien.* **18** : 716.

Palpopleura sexmaculata sexmaculata Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 318-320.

Material examined : Sikkim : Dentam 1M, 1F, 2.11 1977; Mongan 1F, 24.10.1977; 1F, 29.10.1977; Nayabazar 1M, 30.10.1977; Rangdom 1M, 2F, 19.10.1977; Ranipool 2F, 9.10.1988; 3M, 2F, 12.10.1988; Tumin 1M, 30.9.1988; 1M, 1.10.1988.

Distribution : India : Sikkim (Dentam, Mongon, Nayabazar, Rangdom, Ranipool and Tumin) : Arunachal Pradesh, Assam, Bihar (undivided), Manipur, Mizoram, Nagaland, Orissa, Tripura, West Bengal, Uttar Pradesh (undivided), Himachal Pradesh, Rajasthan, Madhya Pradesh (undivided), Karnataka, Kerala, Tamil Nadu and Andaman Is.

Outside India : Afganistan, Burma (Myanmar), Bangladesh, China, Laos, Hongkong, Malaysia, Nepal, Thailand and Vietnam.

Remarks : The specimens agree with the description provided by Fraser (1936) and specimens present in Zoological Survey of India.

Genus ***Diplacodes*** Kirby

Diplacodes Kirby 1889, *Trans. Zool. Soc. Lond.* 12 : 263, 307 Fraser, 1936, *Fauna Brit. India, Odon,* **3** : 331.

Abdomen 14-25 mm. Hindwing 17-24 mm

Small odonates with greenish yellow colour marked with black, or black with or without pruinescens. Head moderately large, frons with deep sulcus, and without any ridge. Prothorax with large posterior lobe fringed with long hairs. Thorax narrow, legs slim. Wings short and broad; reticulation moderately close; sectors of arc shortly fused in forewing; and with a long fusion in the hindwing; $6^1/_2$ to $9^1/_2$ antenodals in forewings; Cu_2 in hindwing separated from the posterior angle of the discoidal cell; borders of the discoidal field divergent at the wing border. Abdomen slightly dilated at the thoracic end and then slim. Genitallia : Lamina strongly and evenly arched or projecting markedly hood like; hamules with narrow oval base and short, strongly curled hooks; lobe variable, clubbed or tongue shaped. Female with borders of segment 8 not dilated; vulvar scales prolonged, prominent in profile, very broad.

Type-species : *Libellula lefebvrei* (Rambur)

Distribution : India : Throughout.

Outside India : Old World; in tropical zones, extending to Oceania.

Key to species of *Diplacodes* Kirby

Apices of wings tipped with black in male, but hyaline in female; labium, labrum and face brown with yellow marking frons and vesicle violet; with metallic lustre; prothorax, thorax, abdomen and legs entirely black, thinly pruinosed in adults in tenerals subadults and female the thorax is marked with yellow ..... *nebulosa* (Fabricius)

Wings in both sexes hyaline, save a small yellow point in the cubital space of hind wing; labium, labrum and bases of mandibles creamy yellow; face, frons and vesicle pale azure blue; prothorax pale brown to black; a middorsal stripe extending the full length of the dorsum; thorax greenish yellow or olivaceous with sutures finely black; the area between the middorsal carina and humeral sutures violaceous brown, in old adult specimens the thorax becomes pruinosed; Abdomen with segments 1 to 3 greenish yellow, with sutures finely black ..... *trivialis* (Rambur)

53. ***Diplacodes trivialis*** (Rambur)

Libellula trivialis Rambur, 1842, *Ins. Nevrop.* p. 115.

Diplacodes trivialis, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 336 338.

Material examined : 1 F, Gangtok, 27.10.1977; 1M, Mongan, 24.10.1977.

Distribution : India : Sikkim, (Gangtak, Mongan) Throughout India.

Outside India : Old World.

Remark : A new record.

54. ***Diplacodes nebulosa*** (Fabr.)

Libellula nebulosa Fabricius, 1793, *Ent. Syst.* **2** : 379.

Diplacodes nebulosa, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 335-336.

Material examined : 1M, Gangtok, 27.10.1977. 1M, Jorethang 1.6.1994.

Distribution : India : Sikkim (Gangtak, Jorethang), Throughout India.

Outside India : Australia, Southeast Asia.

Genus ***Crocothemis*** Brauer

Crocothemis Brauer, 1868, *Verh. Zool. bot. Ges. Wien.* 18 : 367; Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 343-345.

Abdomen 24-35 mm. Hindwing 27-38 mm.

Head moderate size, eyes shortly contiguous, prothorax with small posterior lobe, thorax robust, colour varies from straw to red, wings hyaline. Antenodals vary from $7^1/_2$ to $14^1/_2$ in fore wing, the distal one incomplete. Cu_2 usually arising from the posterior angle of the discoidal cell; discoidal cell widely divergent at the wing border 1 or 2 rows of cells between IR_3 and Rspl. Abdomen depressed, moderately broad at base and tapered gradually to the end in male, cylindrical in female.

Type-species : *Libellula servilia* Drury.

Distribution : Old World, extended to New World.

55. ***Crocothemis servilia servilia*** (Drury)

Libellula servilia Drury, 1770, *Ill exot. Ins.* **4** : 112.

Crocothemis servilia servilia Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 345-347.

Material examined : 2 M, Chulung, 20.10.1977; 1F, Geyzing, 6.11.1977; Gangtok 1F, 27.10.1977; 1M, 2.11.1977; 5M, Nayabazar 30.10.1977; 1M, Kabi 19.10.1977.

Distribution : India : Sikkim (Chulung, Geyzing, Gangtak, Nayabazar, Kabi) Throughout India.

Outside India : Old World, extended to New World.

Remark : A new record.

Genus ***Bradinopyga*** Kirby

Bradinopyga Kirby, 1893, *J. Linn. Soc. Zool.* 24 : 588; Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 348.

Abdomen 26-30 mm. Hindwong 33-36 mm.

Cryptic colour in black greys, and white. Head moderately large, eyes broadly contiguous, prothorax with small rounded posterior lobe, thorax robust. Wings hyaline, long and moderately narrow; regiculation very close; $10^1/_2$ to $12^1/_2$ antenodal nervures in the forewing; discoidal field widely divergent at the wing border, 2 or 3 rows of cells between IR_3 and Rspl.

Type-species : *Libellula geminata* Rambur.

Distribution : Old World.

56. ***Bradinopyga geminata*** (Rambur)

Libellula geminata Rambur, 1842, *Ins. Nevrop.* p. 90.

Bradinopyga geminata, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 349-350.

Material examined : 5M, 7F, Jorethang 10.11.1994.

Distribution : India : Sikkim (Jorethang), Bihar (undivided), Orissa, Tripura, West Bengal, Uttar Pradesh (undivided), Rajasthan, Madhya Pradesh (undivided), Maharashtra, Karnataka and Tamil Nadu.

Outside India : Thailand and Sri Lanka.

Remark : A new record.

Genus ***Neurothemis*** Brauer

Neurothemis Brauer, 1867, *Verh. Zool. bot. Ges. Wien.* 17 : 6, 289; Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 350-352.

Abdomen 16-26 mm Hindwing 20-32 mm

Wings partly or wholly coloured, often very close reticulation. Head moderately large, eyes rather shortly contiguous; frons rounded. Prothorax with small posterior lobe, arched and slightly emarginate. Thorax robust. Wings broad, reticulation close, secondary reticulation often present in the coloured area. Antenodals $11^1/_2$ or more; more than one cubital nervures in forewing and in hindwing 1 or more. 1 or 2 rows of cells between IR_3 and Rspl. Abdomens short, slightly dilated dorso ventrally at base and then slim and tapered very gradually to the anal end; rather compressed and subcylindrical in female.

Type-species : *Libellula fulvia* Drury.

Distribution : Tropical Asia, Sundaic, Archipelago, Malayasia, Phillippines, New Geuinea, Australia.

Key to species of *Neurothemis* Brauer

1. Antenodal in forewing more than 30; wings opaque raddish brown, except for an irregular triangular area at apices of wings which is clear and uncoloured; labium creamy yellow, labrum bright ochreous; face forms, vesicle reddish brown. Prothorax, thorax, abdomen uniform reddish brown. Many forms of females are found, varying from complete isochrome to heterocheome are available. In female wings clear amber yellow with a dark ray in the subcostal space which extends on costal space near the node ....*fulvia* (Drury)

– Antenodals in forewing less than 30.....2

2. Yellow area at base of wings not very sharply defined and rather pale in colour, costal border of wings pale yellow to as far as pterostigma; a pale brown humeral stripe on thorax..... *intermedia intermedia* (Rambur)

– Yellow area at base of wings very well defined and deep amber yellow, often enfumed with brown, costal border of wings not tinted with yellow as a rule, humeral stripe absent on thorax ....*intermedia atalanta* Ris

57. ***Neurothemis fulvia*** (Drury)

Libellula fulvia Drury, 1773, *Ill. Exot. Ins.* 2 : 84 *Neurothemis fulvia*, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 353-354.

Material examined : 1 M Namthang 10.11.1995.

Distribution : India : Sikkim (Nomthang) Throughout India.

Outside India : South-east Asia.

58. ***Neurothemis intermedia intermedia*** (Rambur)

Libellula intermedia Rambur, 1842, *Ins. Nevrav.* p. 91. *Neurothemis intermedia intermedia*, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 357-358.

Material examined : 1 M, Tumin 29.10.1988.

Distribution : India : Sikkim (Tumin) Throughout India.

Outside India : Southeast Asia, China.

59. ***Neurothemis intermedia atalanta*** Ris

Neurothemis intermedia atalanta Ris, 1916, *Cat. Coll. Selys.* fasc. **16** : 1168.

Material examined : 1M, Jorethang 7.9.1992.

Distribution : India : Eastern and Southwestern India.

Outside India : Southeast Asia.

Remark : A new record.

Genus ***Sympetrum*** Newman

Sympetrum Newman, 1833, *Ent. Mag.* 1 : 511. Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 370.

Abdomen 21-27mm Hindwing 29-35mm

Usually coloured yellow or reddish with restricted black markings and with hyaline wings or marked with yellow at base. Head small or medium sized; frons prominent, but without a well defined crest. Prothorax with very large posterior lobe fringed with long hairs. Thorax moderately robust; legs long and rather slim. Abdomen slim or narrowly fusiform towards the anal end, cylindrical or triquetral in section. Wings relatively short and broad, reticulation rather open, discoidal cell in fore-wing narrow, its apex sloping towards base of wing costal side not more than half the length of the basal, traversed. Antenodals in forewing $7^1/_2$ to $9^1/_2$; Cu_2 arising from the posterior angle of the discoidal cell in hindwing. One or two rows of cells between IR3 and Rspl.

Type-species : *Libellula vulgata* Linn.

Distribution : Cosmopolitan.

Key to species of genus *Sympetrum* Newman

Labium creamy white; face, frons and vesicle pale bluish white or olivaceous and sometimes with a pale flush of red at summit of frons, which

has a small black point at its centre in front of vesicle. Prothorax pale sandy yellow, with a broad black band between the anterior and the middle lobes and the middorsal line on the posterior lobe. Thorax pale sandy yellow or greenish yellow. Wings hyaline, veins mostly yellow. Abdomen sandy yellow ..... *decoloratum* (Selys)

Labium palest brown or dirty yellow, middle lobe and the lateral lobes coloured black. Labrum, face, frons and the vesicle are suffused with bright red, olivaceous at sides of the face and anteclypeus. Occiput and upper surface of eyes reddish brown. Prothorax black; the anterior lobe and the middle of the middle lobe bright yellow; posterior lobe dull yellow. Thorax golden brown on dorsum with a broad black humeral stripe. Abdomen bright reddish ochceous above, black beneath. Wings hyaline .....*hypomelas* (Selys)

60. ***Sympetrum hypomelas*** (Selys)

Diplax hypomelas Selys, 1884, *Ann. Soc. Ent. Belg.* **28** : 37.

Sympetrum hypomelas, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 373-374.

Material examined : Chunthang 1M, 11.7.1979; Tumin 4M, 2F, 29.9.1988.

Distribution : India : Sikkim (Chunthang, Tumin) Arunachal Pradesh, Assam, Bihar (undivided), Manipur, Mizoram, Meghalaya, West Bengal.

Outside India : Bangladesh, Bhutan, Burma (Myanmar), China, Nepal and Tibet.

61. ***Sympetrum decoloratum*** (Selys)

Deplax vulgata race decolorata Selys, 1884, *Ann. Soc. Ent. Belg.* **28** : 35.

Sympetrum decoloratum, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 380-381.

Material examined : Jorethang 1F, 7.12.1992; Geyzing 1F, 9.11.1994.

Distribution : India : Rajasthan and Sikkim (Jorthong).

Outside India : Pakistan, Central Asia and Africa.

Genus ***Acisoma*** Rambur

Acisoma Rambur, 1842, *Ins. Nevrop.* p. 26, 28. Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 329-331.

Libellulid dragonflies of small size, usually bluish marked with black. Head relatively small and eyes meeting at a point. Prothorax with large posterior lobe which is fringed with long hairs. Thorax small. Abdominal segments 1-5 laterally and dorsoventrally dilated and then abruptly slimmed and cylinderical from segments 6-10. Wings short, moderately broad, reticulation nearly open. 7-9 antenodals; the distal complete or incomplete. Cu_2 in the hindwing widely separated from the posterior angle of the discoidal cell.

Type-species : *Acisoma panorpoides* Rambur.

Distribution : India, Nepal, China, Sri Lanka, Burma (Myanmar), Thailand, Malayasia, Indonesia, Japan, Taiwan, Philippines, Africa and Madagascar.

62. ***Acisoma panorpoides panorpoides*** Rambur

Acisoma panorpoides Rambur, 1842, *Ins. Nevrop.* p. 28.

Acisoma panorpoides panorpoides, Fraser, 1936, *Fauna Brit. India, Odon.* 3 : 330-331.

Material examined : Ranipool 1F, 2.10.1993.

Distribution : India: Sikkim (Ranipool) Arunachal Pradesh, Assam, Meghalaya, Mizoram, Manipur, Orissa, Tripura, West Bengal, Rajasthan, Uttar Pradesh (undivided), Maharashtra, Tamil Nadu, Karnataka, Kerala and Madhya Pradesh (undivided).

Outside India : Southeast Asia, Celebes.

Genus ***Trithemis*** Brauer

Trithemis Brauer, 1868, *Verh. Zool. bot. Ges. Wien.* 18 : 176. Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 381-382.

Abdomen 19-32mm Hindwing 24-36mm

Libellulid dragonflies of medium size with diversified colour, head of moderate size, frons variable with or without distinct crest. Prothorax with small, posterior lobe, without any hair. Thorax narrow, wings long and relatively broad,

reticulation close; $8^1/_2$ to $15^1/_2$ antenodal nervure in forewing; Cu_2 arising from the posterior angle of the discoidal cell. Abdomen variable.

Type-species : *Libellula aurora* Burmeister.

Distribution : Ethiopean and oriental region.

Key to the species

Labium blackish brown, labrum dark olivaceous brown. Thorax and abdomen violaceous black; base of hindwing with a small dark brown spot; neuration black. Prothorax blue; thorax coated with purplish pruinescence, abdominal segments 1 to 3 with a thin bluish pruinescence. Anal appendages black ..... *festiva* (Rambur)

Labium dark ochreous, with lobes blackish; labrum dark brown. Thorax and abdomen violaceous crimson, base of hindwing with small reddish brown spot; neuration crimson. Prothorax reddish rown, anterior lobe pale brown, anterior half of middle lobe and base of posterior lobe black. Abdominal segment 10 at base marked with black ..... *aurora*(Burm)

63. ***Trithemis aurora*** (Burmeister)

Libellula aurora Burneister, 1839, *Handb. Ent.* **2** : 859.

Trithemis aurora, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 383-385.

Material examined : Jorethang 1F, 29.10.1977; Nayabazar 1F, 29.10.1977; 1M, 30.10.1977.

Distribution : India : Sikkim (Jorethang, Nayabazar) Throughout India.

Outside India : Southeast Asia.

64. ***Trithemis festiva*** (Rambur)

Libellula festiva Rambur, 1842, *Ins. Nevrop.* p. 92.

Trithemis festiva, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 387-389.

Material examined : Malbazar 6M, 14.10.1995.

Distribution : India : Sikkim (Malbazar) Throughout India.

Outside India : Middle east, South east Asia and New Guinea.

Genus ***Pantala*** Hagen

Pantala Hagen, 1861, *Syn. Neur. Amer.* p. 142. Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 413.

Libellulid dragonflies of large size and robust build, coloured yellowish ocher or reddish. Head large, eyes broadly contiguous. Prothorax with very small posterior lobe; thorax robust. Abdomen robust, dilated at the proximal end. Wings long broad at base, narrow and pointed at the apices. $13^1/_2$ antenodals in forewings. Discoidal field strongly converging at the wing border. Pterostigma of forewing is bigger than that of hindwing.

Type-species : *Libellula flavescaus* Fabricius.

Distribution : Cosmopolitan.

65. ***Pantala flavescens*** (Fabricius)

Libellula flavescens Fabricius, 1798, *Ent. Syst. Suppl.* p. 285.

Pantala flavesceus, Fraser, 1936, *Fauna Brit. India, Odon.* **3** : 414-416.

Material examined : Tumin 1M, 30.9.1988; 2M, 1.10.1988.

Distribution : India : Sikkim (Tumin) Throughout India.

Outside India : Cosmopolitan.

SUMMARY

Insects of the Order Odanata are dragonflies. In India they are available in all environmental conditions *viz.*, the Himalayan mountain chains, the deserts, the sea coasts etc.

These insects are famous for their habit of controlling the populations of noxious insects *viz.* mosquitoes, flies, aphids, termites etc. both as larvae and adult. Fraser (1933) rightly recorded them "Economically they are of great importants in destroying noxious flies and mosquitoes as well as the smaller moths which are regarded as pests. Life in the tropics would seen become unbearable were it not for the beneficient work of vast numbers of dragonflies acting as scavengers of the atmosphere. Some species which take to

the wing only after dark or at dusk live entirely on mosquitoes."

The present study is a part of a study of the State fauna being undertaken by Zoological Survey of India. Moreover, the developmental programmes undertaken by different Government and non-Government Organisations are destroying the habitat of dragonflies and reducing the biodiversity in the state. Hence the study has become essential.

During the preparation of the report the investigator has to negotiate a devious path through kind suggestions, opinions and recommendations from expert since multifacet opinions are advocated on many issues *viz.* taxanomic, linguistic etc. Synonyms covering names are followed upon as per availability in recent literature.

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INSECTA : ORTHOPTERA : ACRIDOIDEA AND EUMASTACOIDEA

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INTRODUCTION

The superfamilies Acridoidea and Eumastacoidea have 21 families under them in the World. In India, there are record of 5 families only. The members of these families are commonly known as short-horned grass-hoppers, locusts, bushhoopers, surface grasshoppers, monkey hoppers or eumastacids. There are about 1482 genera, and more than 8550 species known from the world (Kevan, 1982), of which 164 genera, and 300 species are known from India. The average size of the body vary from 8 mm to 50 mm. The economic importance of the group is very much as some of the members damage crops and vegetable plants or forest plantation. Well known locust species, *Schistocerca gregaria* (Forskål) and *Locusta migratoria* (Linn.) commonly known as 'Desert Locust' and 'Migratory Locust' respectively belong to these families.

The members of the group are found throughout the World, wherever Orthoptera are found. Though many of them have restricted distribution and majority of species are tropical, the group is well represented in temperate climates too.

Earlier notable workers in the World on taxonomy of the group are Linnaeus (1758), De Geer (1773), Fabricius (1758, 1793), Thunberg (1815), Serville (1831, 1839), De Haan (1842), Walker (1859, 1870, 1871), Saussure (1884, 1888), Brunner (1893, 1898) and Bolivar (1895, 1902, 1909). The most notable work on Indian grasshoppers was made by Kirby (1914). He wrote "Fauna of British India, including Ceylon and Burma, Orthoprtera (Acridiidae). Later on Bolivar (1914, 1917-18), Uvarov (1921, 1923, 1925, 1929, 1940, 1941, 1943) have also studied the Orthoptera of Indian subcontinent. Willemse (1955) has studied the Orthoptera of Indo-Malayan region. Later on Dirsh (1954, 1958), Dirsh & Uvarov (1953) Banerjee & Kevan (1960), Singh & Kevan (1965), Hollis (1965, 1968, 1971 and 1975), Mason (1973) and Ritchie (1981, 1982) have taxonomically revised several genera. Tandon (1975, 1978) and Tandon & Shishodia (1969, 1976, 1989) have studied Indian grasshoppers from different States. Shishodia & Hazra (1985, 1986) have studied the Acridoidea fauna of Silent Valley, and Namdhapa, Arunachal Pradesh. Bhowmik (1986) gave an account of West Bengal fauna, specially of North Bengal. Subsequently Hazra *et.al.* (1993) and Hazra *et. al.* (1995) have studied Acridoidea fauna of all districts of West Bengal and Meghalaya respectively.

As regards to the Acridoid fauna of Sikkim, there are only stray records of some species which were made by Kirby (1914), Uvarov (1921, 1927, 1942), Ramme (1941), Willemse (1932, 1955) etc. *Hygracris palustris* is recorded here after 66 years or so from India. *Phonogaster cariniventris* was described from South India, its occurrence in north eastern India is interesting. The desert locust, *Schistocerca gregaria* (Forskål) is generally recorded from North and North-Western India. However, there are stray records of its occurrence from Bihar and West Bengal. Its occurrence in Sikkim is doubtful, though on the label placed in jar where two examples of the species are kept, it is clearly written, "Sikkim, 1915-1916, Capt. Dracot (Lord Carmichael's collection)."

Present paper deals with 46 species, distributed under 39 genera and 3 families. Twenty four species are recorded for the first time from Sikkim, and are marked with an asterisk (*). This study is based on the material brought by different Survey parties of the department, as well as the old collections present in the National Zoological Collection. Some of the species have been traced out from the literature. We believe that there shall be more species in State, which could not be collected and reported so far.

In some published records, 'Sikkim' is given, and exact locality of collection is not mentioned. In all such cases, we have also reported the distribution in "Sikkim" Such species have not been included in maps.

LIST OF TAXA

Superfamily ACRIDOIDEA

Family ACRIDIDAE

Subfamily HEMIACRIDINAE

1. *Hieroglyphus banian* (Fabricius)
2. **Spathosternum prasiniferum prasiniferum* (Walker).

Subfamily OXYINAE

3. **Caryanda paravicina* (Willemse)
4. **Hygracris palustris* Uvarov
5. **Oxya hyla hyla* Serville

Subfamily COPTACRIDINAE

6. *Coptacra foedata* (Serville)
7. **Eucoptacra saturata* Walker
8. **Apalacris varicornis* Walker

Subfamily TROPIDOPOLINAE

9. *Oxyrrhepes obtusa* (De Haan)

Subfamily CALLIPTAMINAE

10. *Peripolus pedarius* (Stål)

Subfamily EYPREPOCNEMIDINAE

11. **Choroedocus* (?) *robustus* (Serville)
12. **Eyprepocnemis* sp.

Subfamily CATANTOPINAE

13. *Alectorolophus bimaculatus* Kirby
14. *Catantops pinguis innotabilis* (Walker)
15. **Catantops pulchellus* (Walker)
16. *Stenocatantops splendens* (Thunberg)
17. **Xenocatantops humilis* (Serville)
18. *Xenocatantops brachycerus* (Willemse)

Subfamily CYRTACANTHACRIDINAE

19. *Chondracris rosea* (De Geer)
20. *Patanga japonica* (Bolivar)
21. **Schistocerca gregaria* (Forskål)

Subfamily ACRIDINAE

22. **Acrida exaltata* (Walker)
23. **Ceracris nigricornis nigricornis* (Walker)
24. *Ceracris nigricornis laeta* (Bolivar)
25. *Gonista sagitta* (Uvarov)
26. *Holopercna darjeelingensis* (Bolivar)
27. **Phlaeoba antennata* Brunner
28. *Phlaeoba sikkimensis* Ramme
29. **Phalaeoba assama* Ramme

Subfamily GOMPHOCERINAE

30. *Aulacobothrus luteipes* (Walker)
31. **Mesopsis cylindricus* (Kirby)
32. **Phonogastar cariniventris* Henry

Subfamily OEDIPODINAE

33. **Aiolopus thalassinus tamulus* (Fabricius)
34. *Gastrimargus africanus africanus* (Saussure)
35. *Gastrimargus marmoratus* (Thunberg)
36. *Heteropternis respondens* (Walker)
37. **Pternoscirta cinctifemur* (Walker)
38. **Oedaleus abruptus* (Thunberg)
39. *Pusana laevis* (Uvarov)
40. **Sphingonotus longipennis* (Saussure)
41. *Trilophidia annulata* (Thunberg)

Family PYRGOMORPHIDAE

42. **Atractomorpha burri* Bolivar
43. **Atractomorpha crenulata crenulata* (Fabricius)

44. *Aularches miliaris* Linnaeus
45. **Tagasta indica* Bolivar

Superfamily EUMASTACOIDEA

Family CHOROTYPIDAE

46. *Butania lugubris* var. *major* Bolivar

SYSTEMATIC ACCOUNT

Order ORTHOPTERA

Key to Superfamilies

1. Antennae longer than front femora ..... ACRIDOIDEA

– Antennae shorter than front femora..... EUMASTACOIDEA

Superfamily ACRIDOIDEA

Key to families

1. Foveolae latereal or inferior, never forming the tip of the fastigium; stridulatory mechanism present ..... ACRIDIDAE

- Foveolae of the vertex contiguous, superior and forming the extremity of the fastigium; stridulatory mechanism absent ..... PYRGOMORPHIDAE

Family ACRIDIDAE

Key to subfamilies

1. Prosternal tubercle or process usually present 2

   Prosternal process or tubercle absent 8

2. Radial area of tegmen with a series of regular parallel, stridulatory veinlets ..... HEMIACRIDINAE

- Stridulatory veinlets of radial area of tegmen absent 3

3. Lower external lobe of hind knee with spine-like apex ..... OXYINAE

- Lower external lobe of hind knee with apex rounded, angular or subacute but not spine-like 4

4. Last abdominal tergite in male (in most of genera) with attenuate or trilobate apex ..... COPTACRIDINAE

   Last abdominal tergite without well developed furcula; supra-anal plate variable 5

5. Mesosternal interspace closed ..... TROPIDOPOLINAE

   Mesosternal interspace mostly open 6

6. Mesosternal lobes rounded or obtuse-angular or acute-angular, but not rectangular..... 7

   Mesosternal lobes rectangular ..... CYRTACANTHACRIDINAE

7. Dorsum of pronotum flat or weakly tectiform, with median and lateral carinae linear (linear carinae sometimes obliterated); male cercus with strongly compressed, lobiform or subacute, downcurved apex ..... EYPREPOCNEMIDINAE

   Dorsum of pronotum of variable shape; lateral carinae, if present, not linear; male cercus variable, but not as mentioned above..... CATANTOPINAE

8. Stridulatory file present in posterior femora. ..... GOMPHOCERINAE

   Stridulatory file absent in posterior femora 9

9. Head with more acute in profile, and with a more acute angle of frons; tegmina without intercalary vein (if present, weak, irregular and not serrated even in male) ..... ACRIDINAE

   Head with rounded in profile, face almost vertical, rarely oblique and generally broadly rounded; tegmina always with an interaclary vein in median area (mostly well developed) OEDIPODINAE

Subfamily HEMIACRIDINAE

Key to genera

1. Size small; prosternal tubercle spathulate; mesosternal interspace open; tegmina with a

patch of densely placed transverse nervules between the two radial nervures; apex of male cercus spine-like..... ***Spathosternum*** Krauss

— Size medium to large; prosternal tubercle conical; mesosternal interspace closed; tegmina thickly reticulated towards the base and with the costa only slightly expanded; apex of male cercus simple or bifurcate with pointed or obtuse apex..... ***Hieroglyphus*** Krauss

Genus ***Hieroglyphus*** Krauss, 1877

1. ***Hieroglyphus banian*** (Fabricius)

1798. Gryllus banian Fabricius, *Suppl. Entom. Syst.*, (4) : 194.

1973. Hieroglyphus banian, Mason, *Bull Br. Mus. nat. Hist.* (Ent.), **28**(7): 541.

Diagnosis : Size a little large, body generally green to yellow-green; male cercus with apex bifurcate, relatively slender, with upper branch of fork recurved anteriorly towards head and lower branch elongate and acute; lower valves of ovipositor long and slender with external lateral projection well defined and acute.

Distribution : India : Andhra Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Sikkim, Tamilnadu, Uttar Pradesh and West Bengal; Afghanistan; Bangladesh; Bhutan; China; Myanmar; Nepal; Thailand; Vietnam.

Remarks : *Hieroglyphus banian* is a major pest of paddy. It is also injurious to maize, millets, sugar cane and grasses.

Genus ***Spathosternum*** Krauss, 1877

2. * ***Spathosternum prasiniferum prasiniferum*** (Walker)

(Map 1)

1871. Heteracris (?) prasinifera Walker, *Cat. Derm. Salt. Brit. Mus.*, **5**. Suppl. : 65.

1936. Spathosternum prasiniferum prasiniferum, *Tinkham, Lingnan. Sci. J.*, **15** : 51.

Material examined : 2 MM, 1F, Melli, South Sikkim, 21. ix. 1983, G.K.Srivastava; 1 M, 1 F, Singtam, 22. ix. 1983, G. K. Srivastava; 6 MM, 2 FF, Namchi, South Sikkim, 28, 29. ix. 1983, G. K. Srivastava; 1 M, 1 F, Mangan, North Sikkim, 13. x. 1984, T. K. Mukherjee; 3 MM, 2 FF, Ranipool, East Sikkim, 27.x. 1992, M. S. Shishodia; 8 MM, 15 FF, Tadong, 28.x.1992, M.S. Shishodia; 11 MM, 13 FF, Phodong, North Sikkim, 31.x.1992, M. S. Shishodia; 5 MM, 10 FF, Horticulture garden, Mangan, 1. xi. 1992. M.S.Shishodia; 2 MM, 3 FF, Geyzing, West Sikkim, 7.xi.1992, M.S.Shishodia; 7 MM, 6 FF, Melli, South Sikkim, 9.xi.1992, M.S.Shishodia; 4 MM, 1 F, Namchi, South Sikkim, 10.xi.1992, M.S.Shishodia;

Diagnosis : Small in size, body colour generally green; broad blackish or dark brown stripe run behind the lower part of eyes and below the lateral carinae of pronotum on either side; central area of tegmina with a longitudinal black streak, generally almost obsolete in the male but well marked in the female, but very variable, sometimes being entire; tegmina reaching distal end of hind femur or slightly beyond it; wing well developed.

Distribution : This species is distributed throughout in India. It is also found in Myanmar, S.E.China, Thailand and Vietnam.

Remarks : It is, generally, found on either side of road, crop fields and pastures, and is a pest of paddy, berseem, lucerna, maize, sugarcane, wheat etc.

Subfamily OXYINAE

Key to genera

1. Robust species; both upper and lower genicular lobes of hind femur spined ..... ***Hygracris*** Uvarov.

— Medium sized species; only lower genicular lobe of hind femur spined..... 2

2. External apical spine of hind tibiae present; male epiphallus with ancorae; tegmina and wings reduced ..... ***Caryanda*** Stål

— External apical spine of hind tibiae absent; tegmina and wings well developed; epiphallus without ancorae..... ***Oxya*** Serville

Genus ***Caryanda*** Stål, 1878

3. ****Caryanda paravicina*** (Willemse)
(Map 1)

1925. Oxya paravicina willemse, *Tidjschr. Ent.*, **68** : 55.

1975. Caryanda paravicina, Hollis, *Bull. Br. Mus. nat. Hist.* (Ent.). **31**(6) : 218.

Material examined : 2 MM, 2 FF, Namchi, South Sikkim, 25, 26. ix. 1983, G. K. Srivastava; 2 MM, 5 FF, Gangtok, East Sikkim, 30.ix. and 1,2.x.1983, G. K. Srivastava; 4 MM, 4 FF, Tadong, East Sikkim, 28.x.1992, M.S.Shishodia; 2 FF, Geyzing, West Sikkim, 7.x.1992, M.S.Shishodia; 4 MM, 11 FF, Namchi, South Sikkim, 10.xi. 1992, M.S.Shishodia.

Diagnosis : Size medium; fastigium of vertex with median longitudinal carinulae, although weak, and difficult to see; prosternal tubercle conical and sub-acute; dorsum of pronotum almost cylindrical, posterior margin of metazona rounded; tegmina reduced, extending to posterior margin of 3rd abdominal tergite; hind wings strap-like, shorter than tagmina; posterior margin of 10th abdominal tergite with a rhomboidal projection on either side of the mid line; supra-anal plate trapezoid with rounded triangular posterior projection; cercus conical; ventral surface of subgenital plate convex or flat, with two very widely spaced spines on posterior margin; lower genicular lobes of hind femur spined.

Distribution : India : North-Eastern India.

Genus ***Oxya*** Serville, 1831

4. ****Oxya hyla hyla*** Serville
(Map 1)

1831. Oxya hyla Serville, *Annls Sci. nat.*, **22** : 287.

1971. Oxya hyla hyla, Hollis, *Bull. Br. Mus. nat. Hist.* (Ent.), **26** (7) : 278, 280 and 282.

Material examined : 1 M, 1 F, Rangpo, 3.x.1984, T.K. Mukherjee; 2 MM, Tikjack village, 4 kms. West of Geyzing, West Sikkim, 4.iii.1989, Y.Chaturvedi & K.C. Kansal; 2 MM, 1 F, Ranipool, East Sikkim, 27.x.1992, M.S.Shishodia; 5 MM, 6 FF, Phodong, North Sikkim, 31.x.1992, M.S.Shishodia; 6 MM, 6 FF, Chungtham, North Sikkim, 4.xi. 1992, M.S.Shishodia.

Diagnosis : Medium in size; antennae longer than head and pronotum together; supra-anal plate trapezoidal with triangular apical projection; small tubercle present on both sides of supra-anal plate; cercus subacute or very little notched at apex, lower part a little large; subgenital plate, in female, with two longitudinal ridges extending forward from posterior margin, posterior margin in middle notched.

Distribution : This species is widely distributed in India; Bangladesh; Pakistan; Nepal; Sri Lanka; Afghanistan; Africa and Persia. However, it is recorded in India from Andhra Pradesh, Arunachal Pradesh, Assam, Goa, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Orissa, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.

Remarks : Mainly inhabits rice fields and low lying grasslands and is found near streams on grasses of many genera, and therefore entirely graminivorous, but there are records of feeding on broad-leaved crops.

Genus ***Hygracris*** Uvarov, 1921

5. ****Hygracris palustris*** Uvarov
(Map 1)

1921. Hygracris palustris Uvarov, *Ann. Mag. nat. Hist.* London, (9) **7** : 506.

Material examined : 3 FF, Rangpo, 7.x.1984, T.K.Mukherjee.

Diagnosis : Body colour brownish olivaceous; a little larger than *Oxya* Serville; face smooth, frontal ridge subparallel sided, sulcate; occiput smooth; with two irregular lateral impressions; pronotum narrow anteriorly, impresso-punctate, more densely so on metazona; median carina visible only in metazona, cut by all the sulci; lateral carinae not distinct, cut by all the sulci; prosternal tubercle broad and flattened at base, narrow at apex, inclined backwards, with numerous hairs; tegmina and wings well developed; cerci, in male, notched at apex.

Distribution : India : Assam, Bihar.

Remarks : This species is recorded here after 66 years or so. It is also available in Assam (Mangaldai Dist., 8-9.x.1910, S.W.Kemp). Uvarov (1921) stated that due to the expanded hind part of hind tibiae, it can and does swim.

Subfamily COPTACRIDINAE

Key to Genera

1. Antennae nearly three times as long as the head and pronotum together; eyes prominent ***Apalacris*** Walker

— Antennae less than three times the length of the head and pronotum together; eyes normal 2

2. Frontal costa parallel-sided, not wider between antennae ..... ***Coptacra*** Stål

— Frontal costa distinctly widened between antennae and wider than the vertex between eyes ..... ***Eucoptacra*** Bolivar.

Genus ***Coptacra*** Stål

6. ***Coptacra foedata*** (Serville)

1839. Acridium foedatum Serville, *Ins. Orth.*, : 662.

1873. Coptacra foedata, Stål, *Recens. Orth.*, **1** : 58.

1976. Coptacra foedata, Tandon, *Rec. zool. Surv. India. Misc. Publ. Occ.* paper No. **3** : 9.

Material examined : 1 F, Rangpo, 20.ix.1983, G.K.Srivastava.

Diagnosis : Medium in size; antennae yellowish brown, dark at apex; pronotum with small rugosities of brown or dark brown colour; hind wings hyalinous, slightly infumated at apex; hind femora brown, area supera with two indistinct brown spots in the middle; area infero-externa black, inner area red; hind tibiae red.

Distribution : India : Arunachal Pradesh, Meghalya, Sikkim; Ambon; China; Cochin-China; Indo-China; Japan; java; Myanmar; Philippines and Taiwan.

Genus ***Eucoptacra*** Bolivar, 1902

7. **Eucoptacra saturata*** (Walker)
(Map 1)

1870. Acridium saturatum Walker, Cat. Derm. Salt. Brit. Mus., **4** : 628.

1921. Eucoptacra saturata, Uvarov, *Ann. Mag. nat. Hist.* London (9) **7** : 503.

Material examined : 1 F, Rangpo, 20.ix.1983, G.K.Srivastava; 2 MM, Ranipool, East Sikkim, 27.x.1992, M.S.Shishodia; 11 MM, 12 FF, Tadong, East Sikkim, 28.x.1992, M.S.Shishodia; 6 MM, 1 F, Horticulture garden, Mangan, 1.xi.1992, M.S.Shishodia; 6 MM, 4 FF, Melli, South Sikkim, 9.xi.1992, M.S.Shishodia; 1 M, 1 F, Namchi, South Sikkim, 10.xi.1992, M.S.Shishodia.

Diagnosis : Medium in size; body rusty red brown in colour; head short, smooth, tip of vertex flat; prosternal tubercle stout, slightly acute; hind femora black beneath; hind tibiae red, as long as the hind famora; tegmina a little shorter than the body with numerous small marks; wings hyaline.

Distribution : India : Assam, Madhya Pradesh, Orissa, Tripura, Uttar Pradesh.

Genus ***Apalacris*** Walker, 1870

8. **Apalacris varicornis*** Walker
(Map 1)

1870. Apalacris varicornis Walker, *Cat. Derm. Salt. Brit. Mus.*, **4** : 642.

1914. Apalacris varicornis, Kirby, *Fauna Brit. India, Orthopt.* : 238.

Material examined : 1 M, 2 FF, Rangpo, 20.ix.1983, G.K.Srivastava; 1 M, Ranipool, 27.x.1992, M.S.Shishodia; 3 MM, Chungtham, North Sikkim, 4.xi.1992, M.S.Shishodia.

Diagnosis : Medium in size; general colouration brownish or olivaceous green; antennae reddish brown at base, light coloured at apex; prosternal tubercle pointed; lateral lobe of pronotum with broad yellow spot along the posterior margin, reaching the humeral angle; pronotum with a median carina and three sulci;

wings light bluish, apex infumate; hind femur with two oblique transverse black bands, these bands are sometimes incomplete; hind tibiae red.

Distribution : India : Arunachal Pradesh, Assam, West Bengal; Bangladesh; China; Borneo; Japan; Java; Malaya; Myanmar; Perak; Sumatra; Tonkin; Vietnam; Yunan.

Remarks : This species inhabits in dense vegetation.

Subfamily TROPIDOPOLINAE

Genus ***Oxyrrhepes*** Stål, 1873

9. ***Oxyrrhepes obtusa*** (De Haan)

1842. Acridium (Oxya) obtusum De Haan, *Verh. Ned. Overz. Bezitt.* Orth., 155, 156.

1859. Acridium extensum Walker, *Ann. Nat. Hist.* (3)4 : 222.

1914. Oxyrrhepes extensa, Kirby, fauna *Brit. India. Orthopt.*, : 209.

1955. Oxyrrhepes obtusa, Willemse, *Publties naturrh. Gennot Limburg*, Reeks **8** : 32.

Material examined : 1 F, Sikkim, E. T. Atkinson.

Diagnosis : Size medium or rather long, body slender or moderately stout; general colouration brown; antennae filiform, joints slightly flattened; head reclinate; vertex convex, with a fine median keel; pronotum with some irregular dark spots on the disc, deeply and densely punctured; median carina cut by all the sulci, lateral carinae indistinct; prosternal tubercle prominent, compressed, curved and inclined backwards; tegmina and wings well developed; subgenital plate somewith trilobate; ovipositor with curved valves.

Distribution : India : Arunachal Pradesh, Karnataka, Madhya Pradesh, Rajasthan, Sikkim, Tamil Nadu and West Bengal; Ceram; Celebes; China; Gilolo Island; Java; Lombok; Myanmar; Sri Lanka, Sumatra; Taiwan etc.

Remarks : ***Oxyrrhepes extensa*** (Walker) is synonymised with ***O. obtusa*** (De Haan). Two examples of ***O. extensa*** are present in National Zoological Collection, Calcutta, which are collected from Sikkim and Arunachal pradesh.

Subfamily CALLIPTAMINAE

Genus ***Peripolus*** Martinez, 1902

10. ***Peripolus pedarius*** (Stål)
(Map 1)

1878. Calliptamus pedarius Stål, *Kong. Svent. Freg.* Resa Omkring Jorden, **3** : 75.

1902. Peripolus pedarius, Martinez, *Ann. Soc. esp. Hist. nat.*, Madrid, **30** : 303.

1942. Peripolus pedarius Uvarov, *Ann. Mag. nat. Hist.*, London (11) **9** : 56.

Material examined : 1 F, Rangpo, 20.ix.1983, G.K.Srivastava; 1F, Melli, South Sikkim, 21.ix.1983, G.K.Srivastava; 1 F, Singtam, 22.ix.1983, G.K.Srivastava; 3 MM, 5 FF, Namchi, South Sikkim, 25, 28.ix.1983, G.K.Srivastava; 1 M, 1 F, Namchi, South Sikkim, 16.x.1984, T.K. Mukherjee; 4 MM, 3 FF, Namchi, South Sikkim, 16.x.1984, T.K. Mukherjee; 4 MM, 3 FF, Namchi, South Sikkim, 10.xi.1992, M.S.Shishodia.

Diagnosis : Size large, body very stout, female much large; fastigium of vertex grooved, forming an obtuse angle with the frontal ridge; antennae filiform; pronotum obtusely angulated both at anterior and posteior margins; prosternal tubercle cylindrical and conical; tegmina short, laterally placed, extend beyond Ist abdominal segment; cerci, in female, broad at base, tappering towards apices, whereas in male, it is large, laterally compressed, curved inside, bilobed at apex.

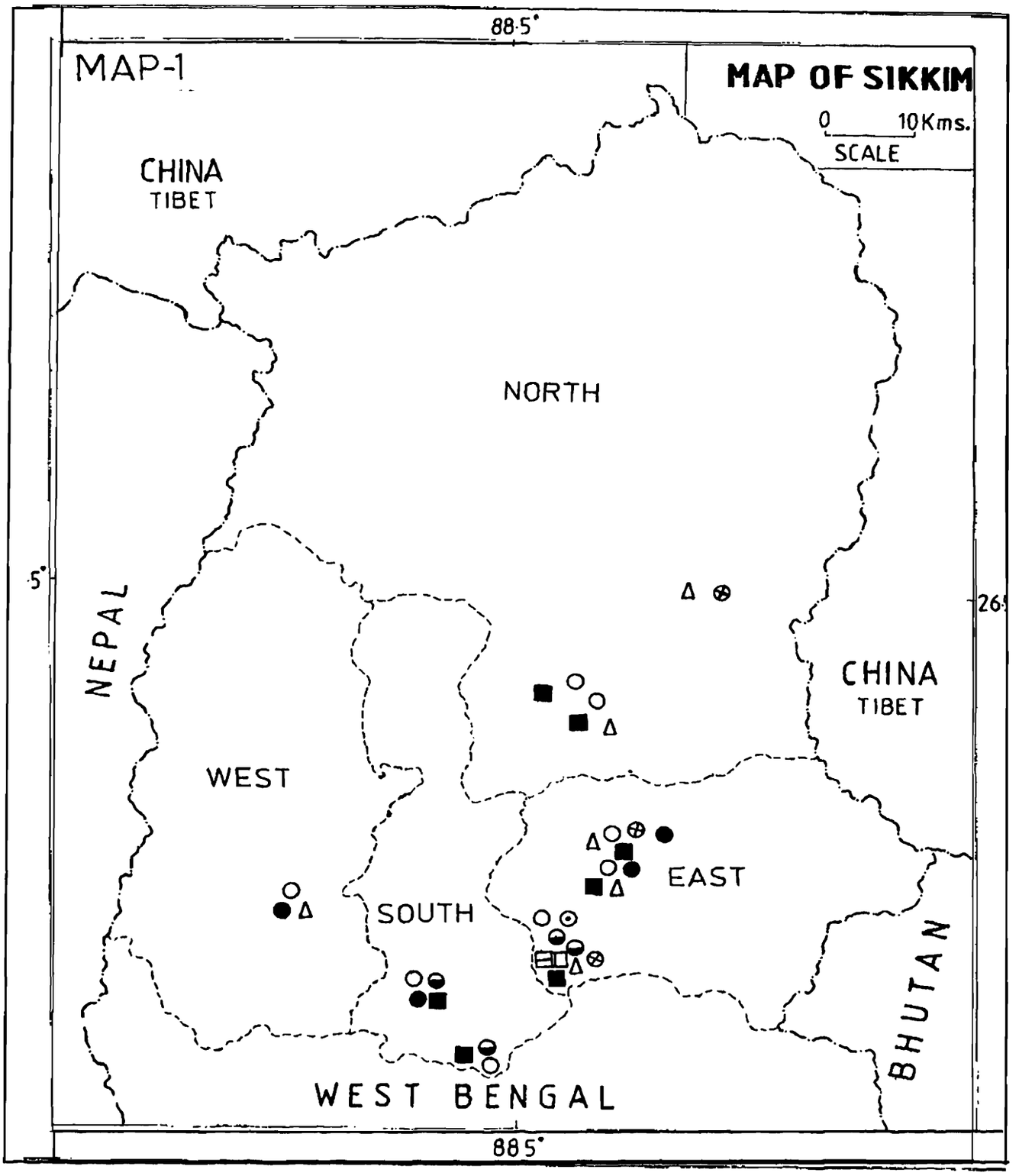
Distribution : India : Assam, Sikkim, Uttar Pradesh and West Bengal; Nepal.

Subfamily EYPREPOCNEMIDINAE

Key to genera

1. Male cercus wide, compressed on apical half, with appex rounded; prosternal tubercle acuminate, bent backwards at an angle about the middle ..... *Choroedocus* Bolivar.

— Male cercus narrow, may be slightly



- ○ *Spathosternum prasiniferum prasiniferum* (Walker)
- ● *Caryanda paravicina* (Willemse)
- △ *Oxya h. hyla* Serville
- □ *Hygracris palustris Uvarov*
- ⊟ *Coptacra foedata* (Serville)
- ■ *Eucoptacra saturata* (Walker)
- ⊗ *Apalacris varicornis* (Walker)
- ◓ *Peripolus pedarius* (Stal)
- ⊙ *Choroedocus (?) robustus* (Serville)

compressed at base, but always acute or subacute apex; prosternal tubercle straight, obtuse at apex ..... *Eyprepocnemis* Fieber.

Genus ***Choroedocus*** Bolivar, 1914

11. ***Choroedocus** (?) **robustus*** (Serville) (Map 1)

1839. Acridium robustum Serville, *Hist. Nat. Ins. Orth.*, 647.

1921. Choroedocus (?) robustus, Uvarov, Trans. *ent. Soc. Lond.*, : 109.

Material examined : 1 F, Singtam, 29.x.1992, M.S.Shishodia.

Diagnosis : Moderately large in size; antennae filiform, median segments almost twice as long as wide; median carina of pronotum cut by all the three transverse sulci; prosternal tubercle gradually tapering apically, weakly incurved and pubescent; tegmina extending well beyond posterior knee; supra-anal plate tongue shaped, apex broadly rounded; subgenital plate gradually tapering, apex truncate; cercus wide, thick, strongly compressed, incurved and downcurved.

Distribution : India : Arunachal Pradesh, Assam, West Bengal; Bangladesh.

Remarks : It is an endemic species, and is generally found in Eastern India where it is reported to have caused severe defoliation of young teak plantation.

Genus ***Eyprepocnemis*** Fieber, 1853

12. * ***Eyprepocnemis*** sp.

Material examined : 1 F, Sikkim, ? v.1912.

Diagnosis : Of medium size; pronotum above flat, with a characteristic dark spot, lateral carinae weak, median carina linear; prosternal tubercle cylindrical, a little curved backwards, with rounded or inflated apex; male cercus narrowing towards apex, often-oblique at upper apical edge; female subgenital plate tribolate; male subgenital plate subconical and short.

Distribution : India; Africa; Malaya Archipelago; Mediterranean coast of Europe; South Asia.

Remarks : During the present study authors could not get any other specimen except an old specimen, which is partly damaged and difficult to identify upto specific level.

Subfamily CATANTOPINAE

Key to genera

1. Thorax with a crest; tegmina short, reaching beyond the 2nd or 3rd tergite only, wings rudimentary ..... *Alectorolophus Brunner*

— Thorax without crest; tegmina and wings well developed 2

2. Pronotum subcylindrical, slightly narrowing forwards; prosternal tubercle thick, cylindrical or slightly antero-posteriorly compressed, with rounded apex ..... *Catantops* Schaum

— Pronotum not subcylindrical; prosternal tubercle not cylindrical, and never with rounded apex 3

3. Pronotum constricted; prosternal tubercle conical ..... *Xenocatantops* Dirsh & Uvarov

— Pronotum flattened (not constricted); prosternal tubercle laterally compressed (very slender body-form).. *Stenocatantops* Dirsh & Uvarov

Genus ***Alectorolophus*** Brunner V. W., 1898

13. ***Alectorolophus bimaculatus*** Kirby

1914. Alectorolophus bimaculatus Kirby, Fauna Brit. India, Orthopt. : 237

1976. Alectorolophus bimaculatus, Tandon, Rec. zool. Surv. India, Misc. Publ., Occ. Paper, **3** : 15

Diagnosis : Body stout and very rugose; pronotum narrowed in front, with a high, quadrilobate serrulate crest, deeply cut between the lobes by the sulci; rudimentary tegmina fused in the middle; hind femora denticulated on the carina; median carina of hind femur with a strong spear-like projection above the knees; hind tibiae as long as hind femur

Distribution : India : Sikkim

Remarks : This species could not be examined by the authors.

Genus ***Catantops*** Schaum, 1853

14. ***Catantops pinquis innotabilis*** (Walker) (Map 2)

1870. *Acridium innotabile* Walker, *Cat. Derm. Salt. Brit. Mus.*, **4** : 629

1925 *Catantops innotabilis*, Uvarov, *Mission Babault Inde*, Acrididae : 30

1953. *Catantops pinquis innotabilis*, Dirsh & Uvarov, *Tijdschr. Ent.*, **96**(3) : 233

Material examined : 1M, 1F, Geyzing, West Sikkim, 15.x.1984, T. K. Mukherjee

Diagnosis : Size medium; antennae filiform, shorter than head and pronotum together; prosternal tubercle short, subcylindrical, rounded at apex; lateral lobe of pronotum without pattern; hind femur broad and thick, external disc without black median spot below upper carinula, internal disc with four small black, irregular spots; hind tibiae light red; tegmina and hind wings extend beyond the hind knees; male cercus upcurved, with broadened apex, and projecting upper apical angle

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Goa, Kerala, Laccadive Islands, Madhya Pradesh, Orissa, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal; Afghanistan; Java; Korea; Indo-China; Malaya; Myanmar; New Guinea; Philippines; Sri Lanka; Sumatra; Tibet; Thailand and Yunnan.

15. * ***Catantops pulchellus*** (Walker)

1870. *Cyrtacanthacris pulchella* Walker, *Cat. Derm. Salt. Brit. Mus.*, **3** : 574

1943. *Catantops pulchellus*, Uvarov, *Ann. Mag. nat. Hist.*, (11) **10** : 127

Material examined : 1F, Sikkim, L.M.

Diagnosis : Size medium; antennae shorter than head and pronotum together; lateral lobe of pronotum in upper half with a narrow lingitudinal stripe; prosternal tubercle inclined backwards with rounded apex; hind femur on external disc with two long black stripes below the upper carinula, and a black spot at base of knee; cercus simple, broad at base, narrowing apically, upcurbed and incurved with rounded apex

Distribution : India : Andaman Islands, Karnataka; Bangladesh and Pakistan

Remarks : Itis a minor pest of cotton, rice and wheat.

Genus ***Stenocatantops*** Dirsh & Uvarov, 1953

16. ***Stenocatantops splendens*** (Thunberg) (Map 2)

1815. Gryllus splendens Thunberg, *Mem. Acad. Sci. St-Petersb.*, *5* : 236

1953. Stenocatantops splendens, Dirsh & Uvarov, *Tijdschr, Ent.*, **96** (3) : 237

Material examined : 1 F, Namchi, South Sikkim, 28.ix.1983, G K Srivastava; 2 MM, Mangan, North Sikkim, 10.iii.1984, T.K. Mukherjee; 1 F, 6 kms. South of Geyzing, 5.iii.1989, Y.Chaturbedi and K.C.Kansal; 8 MM, 5 FF, Ranipool, East Sikkim, 27.x.1992, M.S. Shishodia; 3 FF, Singtam, 29.x.1992, M.S.Shishodia; 3 MM, 2 FF, Phodong, North Sikkim, 31.x.1992, M.S.Shishodia; 4 MM, 3 FF, Horticulture garden, Mangan, North Sikkim, 1.xi.1992, M.S. Shishodia; 3 MM, 1 F, Geyzing, West Sikkim, 7.xi.1992, M.S.Shishodia; 9 MM, 6 FF, Melli, South Sikkim, 9.xi.1992, M.S. Shishodia, 2 MM, 2 FF, Namchi, South Sikkim, 10.xi.1992, M.S.Shishodia

Diagnosis : Medium to large in size and slender; antennae thin, weakly compressed dorsoventrally, longer than head and pronotum together; pronotum moderately compressed laterally; tegmina projecting beyond hind knees by length of head and pronotum together or less; hind femur moderately slender; subgenital plate weakly acute-conical; cercus slightly broadened at base, narrowing and incurved towards apex

Distribution : Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Delhi, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Sikkim, Tamil Nadu, Tripura and West Bengal; Borneo;

Celebes; S. E. China; Hainan; Java; Key Island; Korea, Malaya, Moluccas; Myanmar; Nepal. Philippine Island; Sri Lanka, Greater and Lesser Sunda Island; Sumatra; Taiwan; Thailand; Vietnam

Remarks : It is found in open country on the outskirts of jungle, in grassland derived from previous cultivation, on road side vegetation, and in gardens. It is reported to damage cocoa, coconut, maize, mulberry, oil palm, rice, sugar cane, teak and leguminous cover crops in rubber plantation.

Genus ***Xenocatantops*** Dirsh & Uvarov, 1953

Key to species

1. General appearance large and more slender; lateral lobe of pronotum with indistinct dark markings; prosternal tubercle acutely conical; antennae much longer than head and pronotum together, with middle segments nearly two to three times as long as wide .... *humilis*(Serville)

— General appearance smaller and less slender; lateral lobe of pronotum clearly demarcated with dark markings; prosternal tubercle obtusely conical or almost cylindrical; antennae equal in length to or longer or shorter than head and pronotum together, middle segments squarish to nearly as long as wide..... *brachycerus*(willemse)

17. ***Xenocatantops humilis*** (Serville) (Map 2)

1839. *Acridium humile* Serville, *Ins. Orth.* : 662.

982. *Xenocatantops humilis*, Jago, *Trans. Amer. ent. Soc.*, **108** : 450, 454.

Material examined : 1 M, Rangpo, 7.x.1984, " K. Mukherjee.

Diagnosis : General appearance slender, and medium in size; pronotum slightly constricted, metazona divergent posteriorly; tegmina surpassing hind knee for more than half pronotal length; subgenital plate short, subconical.

Distribution : India : Andaman Island, Arunachal Pradesh, Assam, Karnataka, Kerala, Madhya Pradesh, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal, Bangladesh; Borneo; Java; Kei Island; Lombok, Malaya; Myanmar; philippine Island; Sri Lanka, Thailand; S. Tibet; Vietnam.

Remarks : This species is found on shrubs as well as in agricultural fields, like rice, maize, etc.

18. ***Xenocatantops brachycerus*** (Willemse) (Map 2)

1932. *Catantops brachycerus* Willemse, *Annls. Soc. ent. fr.*, **101** : 106.

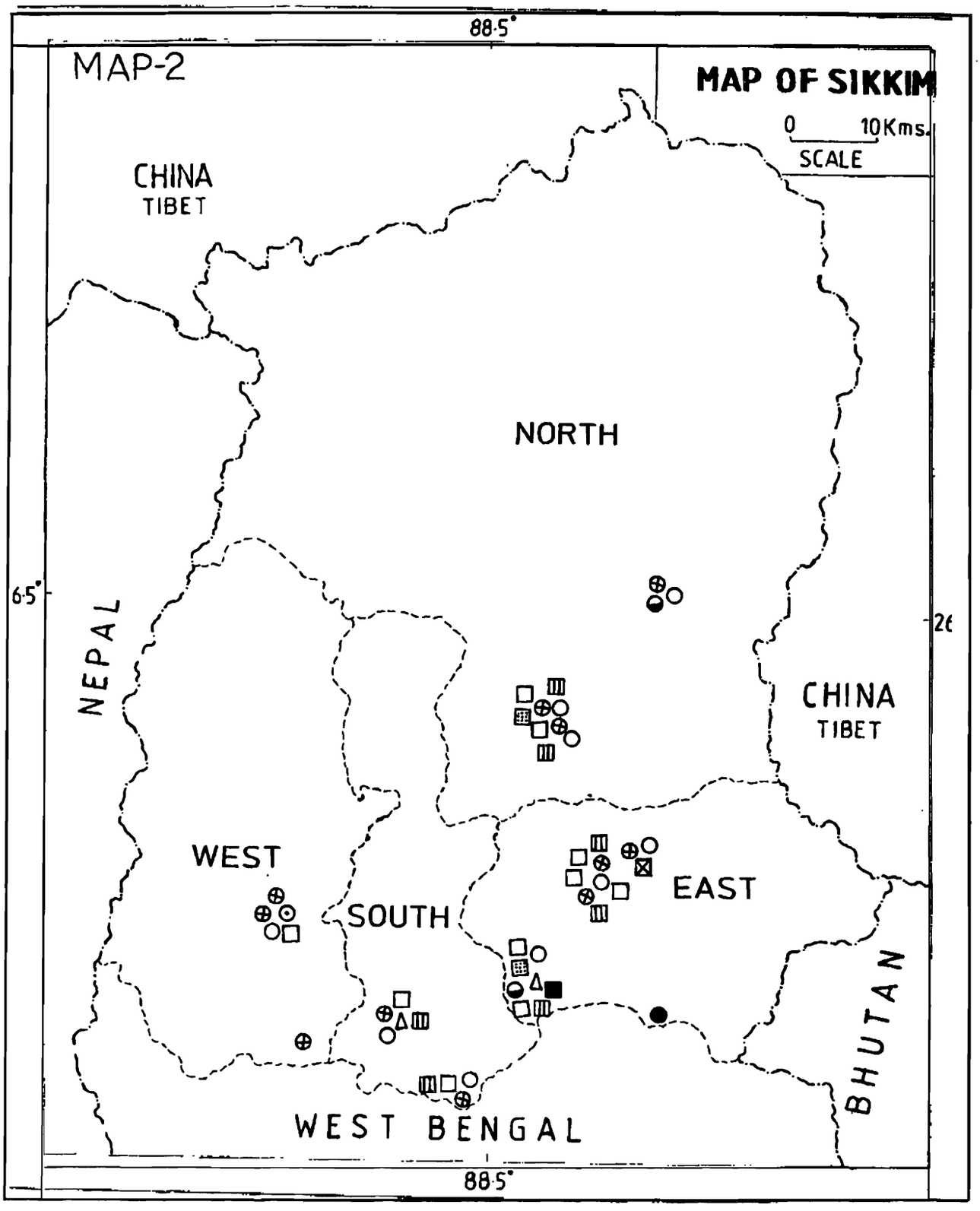
1982. *Xenocatantops brachycerus*, Jago, *Trans. Amer. ent. Soc.*, **108** : 449, 453.

Material examined : 3 FF, Gangtok, East Sikkim, 28, 30.ix.1983, G.K.Srivastava; 2 FF, 4 FF, Mangan, North Sikkim, 17, 19.x.1984, T.K. Mukherjee; 3 FF, Longchom, 7 kms west of Geyzing, 4.iii.1989, Y Chaturvedi & K.C. Kansal; 2 FF, 5 kms. north-west of Nayabazar, 9.iii.1989, K.C. Kansal; 2 FF, 9 FF, Ranipool, East Sikkim, 27.x.1992, M.S.Shishodia; 5 FF, 6 FF, Tadong, East Sikkim, 28.x.1992, M.S.Shishodia; 9 FF, 15 FF, Phodong, North Sikkim, 31.x.1992, M.S.Shishodia; 4 FF, 6 FF, Horticulture garden, Mangan, North Sikkim, 1.xi.1992, M.S.Shishodia; 5 FF, 6 FF, Chungtham, North Sikkim, 4.xi.1992, M.S.Shishodia. 8 FF, 9 FF, Geyzing, West Sikkim, 7. xi. 1992, M.S.Shishodia, 7 FF, 11 FF, Melli, South Sikkim, 9.xi.1992, M.S.Shishodia; 3 FF, 4 FF, Namchi, South Sikkim, 10.xi.1992, M.S.Shishodia.

Diagnosis : General appearance similar to the preceding species, but size smaller and slightly more compactly built; head, in profile, with inflated compound eyes; tegmina surpassing hind knee for about half pronotal length.

Distribution : India : North India, specially Sikkim; Bhutan; China; Nepal; Taiwan.

Remarks : The most reliable features to distinguish between these two species are the length of antennae and the length/width ratio of its longest segments; This ratio in *X. brachycerus* did not exceed 1.8, whereas in *X.humilis* it varies from 2.0 to 3.0 (F.Willemse, 1968 : 66).



- *Catantops pinguis innotabilis* (Walker)
- *Stenocatantops splendens* (Thunberg)
- *Xenocatantops humilis* (Serville)
- *Xenocatantops brachycerus* (Willemse)
- *Chondracris rosea* (De Geer)
- *Patanga japonica* (Bolivar)
- *Acrida exaltata* (Walkar)
- *Ceracris n. nigricornis* Walker
- *Holopercna darjeeligensis* (Bolivar)
- *Phleeoba antennata* Brunner
- *Phleeoba sikkimensis* Ramme
- *Phlaeoba assama* Ramme

Subfamily CYRTACANTHACRIDINAE

Key to genera

1. Prosternal tubercle strongly curved backwards at an angle, touching or almost touching mesosternum, inflated in middle with acutely or subacutely conical apex ..... *Chondracris* Uvarov

— Prosternal tubercle straight, vertical or slightly incurved backwards in direction of mesothorax, far from reaching the latter, conical, cylindrical or compressed 2

2. Frontal ridge in both sexes slightly expanded, above median ocellus distinctly wider than intermediately below it; subgenital plate in male with one or two deep incisions at apex *Schistocerca* Stål

— Frontal ridge in both sexes not expanded above median ocellus, its margins almost parallel to each other; subgenital plate in male conical, pointed without apical incisions..... *Patanga* Uvarov.

Genus ***Chondracris*** Uvarov, 1923

19. ***Chondracris rosea*** (De Geer)
(Map 2)

1773. *Acrydium roseum* De Geer, *Mem. Ins.*, **3** : 488.

1923. *Chondracris rosea*, Uvarov, *Bull. ent. Res.*, **14** : 39.

1975. *Chondracris rosea*, Tandon, *In Dr.B.S.Chauhan Comm. Volume* : 396.

Material examined : 1 **F**, Rhenok, Sikkim, 23.ix.1959, B.K.Tikadar.

Diagnosis : Large in size; body robust, coaresly punctured, uniformly green; fastigium of vertex strongly sloping; median carina of pronotum moderately raised in prozona, straight in metazona; metazona feebly tectiform, disc forming distinct angles with the lateral lobes; tegmina exceeding the hind knees by one fourth of their total length; wings hyaline, with the base rose; hind tibiae and tarsi red.

Distribution : India : Arunachal Pradesh, Assam, Madhya Pradesh, Manipur, Orissa, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal; Bangladesh; Bhutan, China; Hainan Island; Indonesia; Japan; Java; Korea; Manchuria; Philippines; Taiwan; Thailand and Vietnam.

Remarks : This species is found in and around dense vegetation near the stream and hill slopes (Tandon, 1975). It is reported to damage cotton, citrus, hemp, banana, coconut, groundnut, guava, maize, rice, sugarcane, tea, teak etc.

Genus ***Patanga*** Uvarov, 1923

20. ***Patanga japonica*** (Bolivar)
(Map 2)

1895. *Acridium japonicum* Bolivar, *Ann. Mus. Genova*, **39** : 98.

1914. *Orthacanthacris japonicum*, Kirby, *Fauna Brit. India, Orthopt.* : 229.

1923. *Patanga japonica*, Uvarov, *Ann. Mag. nat. Hist.*, (9) **12** : 364.

Material examined : 1 **F**, Rangpo, 20.ix. 1983, G.K.Srivastava; 2 **FF**, Chungtham, 4.xi. 1992, M.S.Shishodia.

Diagnosis : Large in size; body cylindrical; antennae filiform, as long as head and pronotum together; pronotum distinctly compressed laterally, punctate, crossed by all the three sulci; prosternal tubercle cylindrical, a little inclined, with rounded apex; tegmina with coarse and irregular reticulation, spotted with brown longitudinally along the middle; wings tinged with red at the base; cercus short, conical, spine like; supra-anal plate tongue shaped; subgenital plate with almost truncate margin.

Measurements (in mm.) :	*Male*	*Female*
Body length	34	55
Tegmina Length	35	46

Distribution : India : Sikkim, West Bengal; China; Japan; Pakistan.

Remarks : It is a rare species, recorded from Sikkim.

Genus ***Schistocerca*** Stål, 1873

21. * ***Schistocerca gregaria*** (Forskål)

1775. *Gryllus gregarius* Forskål, *Descriptiones animaleum, avium amphibiorum etc. quae in itinere orientali observavie Petrus Forskål,* : 81.

1907. *Schistocerca gregaria,* Krauss, *Denkschr. Akad, Wiss. Wien,* **71** (2) : 12.

1976. *Schistocerca gregaria,* Tandon, *Rec. zool. Surv. India, Misc. Publ., Occ. Paper No.* **3** : 23.

Material examined : 1 M, 1 F, Sikkim, 1915–1916, Capt. Dracot (Lord Carmichael's Collection)

Diagnosis : Size large; antennae filiform, shorter than head and pronotum together; pronotum constricted, with median carina cut by the usual transverse sulci, hind sulcus placed about the middle, hind margin rounded; tegmina and wings very long; tegmina with sparse reticulation; prosternal tubercle cylindrical, slightly widened in middle, inclined backwards, apex obtuse; hind femer short; cerci wide, compressed, with almost truncate; subgenital plate triangularly emarginate; cerci, in female, short and pointed.

Eyes with parallel vertical dark stripes, which are separated by either light coloured interstripes or dark pigments.

Distribution : The whole of the African countries; Europe, the western and south western coastal zones of Iberian Peninsula; in Asia, the whole Arabian Peninsula, eastern half of Turkey upto 40° of the North latitude, the whole of Iran, Pakistan and small countries of Middle East; in India, south of Himalayan Range, but upto Nepal; the lowland of Russian Central Asia upto 45° North latitude, upto Lake Aral; in east the area is reaching Myanmar.

Remarks : This species is commonly known as Desert Locust, and very destructive when in swarm condition. It is most sensitive to changes in population density which results the migration by swarms. Phase transformation from solitarious to gregarious phase and vice-versa rapidly and frequently.

Swarms of the Desert Locust have plagued agriculture from the earliest recorded times, *i.e.* 1,300 B.C. Since 1860 there have been Seven major plague, in 1860-67, 1869-81, 1889-1910, 1912-19, 1926-34, 1940-48 and 1949-63, with minor ones in 1968 and 1978 (in the above said areas).

Locust hoppers eat about their own weight of fresh vegetation every day. It is a mixed feeder and feed on a very wide range of wild and cultivated plants. They also inflict considerable damage by cuting through stems and leaves which are not actually eaten, and breaking branches with their weight when settled.

The occurence of the species in Sikkim which is not a known zone of infestation is very interesting from Zoogeographical point. This record extents the range of distribution of solitaria phase of this species.

Subfamily ACRIDINAE

Key to genera

1. Head conically ascending; hind femora with a spine on the dorso-external and dorso-internal genicular lobes ..... *Acrida* Linn`e

— Head not ascending; hind femora with rounded dorso-external and dorso-internal genicular lobes 2

2. Antennae filiform ..... *Ceracris* Walker

— Antennae ensiform or sword-shaped 3

3. Apex of tegmina and wings usually sharpend, rarely rounded ..... *Gonista* Bolivar

— Apex of tegmina and wings usually rounded of 4

4. Lateral carinae of pronotum linear, continuous; fastigium of vertex often with a strong median dividing carinula; posterior femora thickened at base ..... *Phlaeoba* Stål

— Lateral carinae of pronotum diverging in metazonal area; fastigium of vertex with or without indistinct median carinula; posterior femora rather slender at base .... *Holopercna* Karsch

Genus ***Acrida*** Linn'e, 1758

22. * ***Acrida exaltata*** (Walker)
(Map 2)

1859. *Truxalis exaltata* Walker, *Ann. Mag. nat. hist.*, **4** : 222.

1954. *Acrida exaltata*, Dirsh, *Bull. Soc. Fouad Entom*, **38** : 149.

Material examined : 2 FF, Rangpo, 20. ix. 1983, G. K. Srivastava; 1 F, Namchi, South Sikkim, 26.ix.1983, G.K.Srivastava; 1 M(Nymph), Rangpo, 7.x.1984, T. K. Mukherjee.

Diagnosis : Head conically ascending, basal part narrow; fastigium of vertex broad, laminate and truncate at extremity; transverse sulcus of pronotum placed near the middle of disc; male subgenital plate, in profile, comparatively long, with more elongate part; tegmina without pointed apex, a little produced beyond the hind knees; wings slightly shorter than tegmina.

Distribution : India : Arunachal Pradesh, Bihar, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Madhya Pradesh, Meghalaya, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal; Afghanistan; Bangladesh; Iran; Pakistan; Soudi Arabia; S.E. Tibet; Yemen; and West Aden.

Remarks : The species is one of the commonest grasshoppers of India, and is a pest of paddy, ragi, cotton, maize, pea gram, sugar cane, ladies finger, chili, brinjal etc.

Genus ***Ceracris*** Walker, 1870

Key to subspecies

1. Size a little smaller (18-30mm) .... *n. nigricornis* Walker

— Size larger and robust (22-37 mm) ....*nigricornis laeta* (Bolivar)

23. * ***Ceracris nigricornis nigricornis*** Walker
(Map 2)

1870. *Ceracris nigricornis* Walker, *Cat. Derm. Salt. Brit Mus.*, **4** : 791.

1925. *Ceracris nigricornis nigricornis*, Uvarov, *Ent. Mitt. Berl.*, **14** : 13-14.

Material examined : 1 M, Teng, N. Sikkim, 30.viii.1959, A.G.K. Menon; 2 FF, Gangtok, 30. ix. 1983, G.K.Srivastava; 2 MM, 1 F, Yokswn, 2, 7.x.1983, S.Chattopadhya; 2 MM, 2 FF, Mangan, North Sikkim, 12.x.1983, G.K. Srivastava; 8 MM, 4 FF, Tadong, East Sikkim, 28.x.1992, M.S.Shishodia; 3 MM, Singtam, 29.x. 1992, M.S.Shishodia; 9 MM, 4 FF, Phodong, North Sikkim, 31.x.1992, M.S.Shishodia; 18 MM, 4 FF, Horticulture garden, Mangan, 1.xi.1992, M.S.Shishodia; 8 MM, 7 FF, Chungtham, North Sikkim, 4.xi.1992, M.S.Shishodia; 20 MM, 9 FF, Geyzing, West Sikkim, 7.xi.1992, M.S.Shishodia; 13 MM, 8 FF, Namchi, South Sikkim, 9.xi.1992, M.S.Shishodia.

Diagnosis : Size medium; colouration brownish-green or olive green; black lateral fascia on head, and along the upper margin of pronotal disc, this fascia not extending on the disc of matazona; antennae much longer than head and pronotum together; face coarsely punctured; pronotum thick, very coarsely punctured in prozona, less coarsely, but more densely in metazona; lateral carinae very low, divergent behind, cut by all the sulci, the last sulcus placed a little behind the middle of pronotum; median carina not much distinct, cut by the third sulcus only; tegmina brown or bluish-green, with the anal field apple green or olive-green; hind femora externally with a narrow, but always distinct, blackish fascia just before the pre-apical pale ring; hind tibiae dirty bluish, with the base black, a pale post basal ring, followed by a blackish ring.

Distribution : India : Arunachal Pradesh, Bihar, Himachal Pradesh, Manipur, Meghalaya, Uttar Pradesh, West Bengal; Myanmar; South China.

Remarks : Uvarov (1925) has stated that the small (typical) subspecies, thus occurs in N.E.India, in the middle regions of Himalays, which suggests that the species belongs really to South Chinese fauna and only relatively recently penetrated westwards into India.

24. ***Ceracris nigricornis laeta*** (Bolivar)

1870. *Ceracris nigricornis* Walker, *Cat. Derm.Salt. Brit. Mus.*, **4** : 791.

1914. *Kuthya laeta* Bolivar, *Trab. Mus. nac. Cienc.nat., Madr.* (Ser. Zool), no **20** : 79.

1925. *Ceracris nigricornis laeta,* Uvarov, *Ent. Mitt. Berl.,* **14** : 14, 15.

Diagnosis : This subspecies is more larger and robust than the preceding subspecies. The rest of the characters are similar to *C. nigricornis nigricornis* Walker.

Distribution : India : Sikkim; Tonkin; Taiwan; West and South China.

Remarks : Though Bhowmik (1986) has recorded this subspecies from Sikkim, but we could not studied this subspecies.

Genus *Gonista* Bolivar, 1898

25. ***Gonista sagitta*** (Uvarov)

1912. *Gelastorrhinus sagitta* Uvarov, *Horae. Soc. Ent. Ross.,* **49**(3) : 10.

1933. *Gonista sagitta,* Uvarov, *Travs. Inst. zool. Acad. Sci.* USSR, **1** : 189.

Diagnosis : Commonly known as arrow grasshopper; body long and slender; head small, much shorter than the pronotum; vertex strongly projecting forward, strongly depressed, distinctly narrowed forward; antennae sword-shaped; apex of tegmina and wings shorter than tegmina; dorsal genicular lobes of hind femur rounded; mesosternum, in female, with distinctly separated lobes in the middle.

Distribution : India : Karnataka (Mysore plateau), Tamil Nadu (Madurai, Kodaikanal), Sikkim; Afghanistan; Myanmar and Sri Lanka.

Remarks : *Gelastorrhinus selache* (1902) and *Carcharacris chloroticus* Bolivar (1914) are more or less similar species to *Gonista sagitta* (Uvarov), and is previously recorded from Sikkim.

Genus ***Holopercna*** Karsch, 1891

26. ***Holopercna darjeelingensis*** (Bolivar)
(Map 2)

1914. *Sjoestedtia darjeelingensis* Bolivar, *Trab. Mus. Cienc. nat. Madr.,* **20** : 77.

1985. *Holopercna darjeelingensis,* Bhowmik, *Rec. zool. Surv. India, Misc. Publ., Occ. Paper No.* **78** : 11.

Material examined : 1M, Sikkim, E. T. Atkinson; 1M, 1F, Rangpo, 12.xi.1992, A. K. Hazra.

Diagnosis : Size larger than Phlaeoba Stål; fastigium of vertex with indistinct median carinula; lateral carinae of pronotum diverging in metazona; wings blue in the middle, followed by a black band, varying in width, but generally with broad band, curving from the middle of costa to above the anal angle, without dark spot at the apex; hind femora rather slender at base, blue in colour; hind tibiae alternately banded with blue and black.

Distribution : India : Assam, Himachal Pradesh, Meghalaya, Sikkim, Uttar Pradesh and West Bengal.

Genus ***Phlaeoba*** Stål, 1860

Key to species

1. Subgenital plate of male obtuse at apex .... *antennata* Brunner

— Subgenital plate of male tapering at apex 2

2. Fastigium as long as broad; prozona without dark rectangular tubercles; tegmina reaching upto 1/3rd of the posterior femur .... *sikkimensis* Ramme

— Fastigium longer than broad; prozona with 4 dark rectangular tubercles; tegmina reaching upto the posterior knees ..... *assama* Ramme

27. * ***Phlaeoba antennata*** Brunner
(Map 2)

1893. Phlaeoba antennata Brunner, Annali Mus. civ. Stor. nat. Giacome Doria, **33** : 124.

1914. *Phlaeoba antennata,* Kirby, *Fauna Brit. India.* Orthopt. : 102.

Material examined : 1 M, Melli, 21.ix.1983, G.K.Srivastava; 1 M, Rangpo, 7.x.1984, T.K. Mukherjee; 2 MM, Ranipool, 27.x. 1992, M.S.Shishodia; 12 MM, 7 FF, Tadong, 28.x.1992, M.S.Shishodia; 10 MM, 4 FF, Phodong, North Sikkim, 31.x.1992, M.S.Shishodia; 2 MM, Horticulture garden, Mangan, North Sikkim,

1.xi.1992, M.S.Shishodia; 2 MM, Namchi, South Sikkim, 10.xi. 1992, M.S.Shishodia.

Diagnosis : Olive brown with a broad yellow band running from the vertgex to the end of the tegmina at least in male; antennae ensiform, black, tipped with yellow; pronotum smooth, with all the three carinae well marked; tegmina narrow; wings bluish hyaline at base, infuscated towards the tip; subgenital plate rounded at apex; posterior tibiae dirty blue.

Distribution : India : Arunachal Pradesh, Assam, Kerala, Meghalaya, Rajasthan, West Bengal; Annam; Bangladesh; Borneo; China; Hainan; Isle of Penang; Malaya peninsula; Myanmar; Perak; Tonking; Sumatra.

28. ***Phlaeoba sikkimensis*** Ramme (Map 2)

1914. *Phlaeoba sikkimensis* Ramme, Mitt; zool. Mus. Berl., **25***(1) : 13.*

Material examined : 1 M, Mangan, North Sikkim, 9.ix.1983, G K Srivastava; 1 F, Singtam, 22.ix.1983, G K Srivastava; 1 F, Yoksam, 7.x. 1983, S. Chattopadhya; 1 M, 4 FF, Manul, North Sikkim, 22.ix.1992, S. Ahmed.

Diagnosis : A little large in size, male somewhat large than female; fastigium as long as broad, with longitudinal ridges in the middle; antennae broad at base, narrowed apically; pronotum with sharp middle and lateral carinae; lateral carinae parallel; posterior margin of pronotum obtuse; tegmina reaching 1/3rd of the posterior femur; anal plate, in male, deeply grooved at basal half; subgenital plate tapering.

Distribution : India : Sikkim; Eastern Nepal.

29. * ***Phlaeoba assama*** Ramme (Map 2)

1941. *Phlaeoba assama* Ramme, *Mitt. zool. Mus. Berl.,* **25**(1) : 9.

Material examined : 2 FF, Gangtok, 2.x. 1983, G. K. Srivastava.

Diagnosis : Fastigium longer than broad, trapeziform, a strong median furrow between the anterior margin of eyes, median ridge runs from the anterior margin of fastigium to the middle of occiput; antennae about 1/4th longer than head and pronotum together, basal half segmenta of antennae broad, apical part very narrow; pronotum rectangular, prozona with 4 dark rectangular tubercles, anterior margin transverse and posterior margin obtuse; tegmina reaching upto the posterior knees.

Distribution : India : Assam, Arunachal Pradesh.

Subfamily GOMPHOCERINAE

Key to genera

1. Antennae filiform; fastigium of vertex not long, normal; tegmina and wings not long, narrow and pointed .... *Aulacobothrus* Bolivar

— Antennae ensiform; fastigium of vertex very long, extending as far beyond the eye as forward from pronotum, tegmina and wings long,narrow and pointed 2

2. Dorsum of head behind middle of eye with 7 carinae including the strong median one; disc of pronotum with two supplementary carinae between median and lateral carinae; prosternum without a tubercle; abdomen with tergites 3-5, with a pair of sharp longitudinal ridges .... *Phonogaster* Henry

— Dorsum of head and pronotum without extra carinae, except median and lateral carinae; prosternal tubercle present even if reduced; abdomen without any distinct longitudinal ridges ..... *Mesopsis* Bolivar

Genus ***Aulacobothrus*** Bolivar, 1902

30. ***Aulacobothrus luteipes*** (Walker) (Map 3)

1871. *Stenobothrus luteipes* Walker, *Cat. Derm. Salt. Brit. Mus.,* **5** Suppl. : 82.

1921. *Aulacobothrus luteipes,* Uvarov, *Ann. Mag. nat. Hist.,* (9)7 : 482.

Material examined : 1 M, 1 F, Rangpo, 9. x. 1984, T.K.Mukherjee

Diagnosis : Size small; antennae filiform, longer than head and pronotum together; fastigium of vertex almost trapezoidal, with truncate apex, concave, with transverse basal furrow; fastigial foveolae not visible from above; pronotum with nearly parallel lateral carinae which are weakly concave in the middle part, posterior margin obtusely angulate, median carina distinct; hind femur with three black bands on the dorsal surface and with a black one at distal end; hind tibiae reddish in the apical part.

Distribution : India : Assam, Bihar, Delhi, Himachal Pradesh, Jammu & Kashmir, Karnataka, Maharashtra, Orissa, Sikkim, Tamil Nadu, West Bengal; N. America; Baltistan; China; Europe; Japan, Myanmar, Pakistan and Sri Lanka.

Genus ***Mesopsis*** Bolivar, 1906

31. * ***Mesopsis cylindricus*** (Kirby) (Map 3)

1914. *Aswatthamanus cylindricus* Kirby, *Fauna Brit. India,* Orthopt : 101.

1921. *Mesopsis cylindricus,* Uvarov, *Ann. Mag. nat. Hist.* (9)7 : 482.

Material examined : 2 MM, Rangpo, 9.x. 1984, T.K.Mukherjee.

Diagnosis : Body long and cylindrical; head and pronotum smooth; head not raised; fastigium of vertex very long, extending as far beyond the eyes as the length of pronotum, narrowed and obtusely rounded at apex; frontal ridge narrow and sulcated; antennae much widened and flattened towards the base, and tapering towards apical part; tegmina and wings very long, narrow and pointed; front and middle legs very short, hind legs very long and slender.

Distribution : India : Andhra Pradesh, Bihar, Madhya Pradesh.

Genus ***Phonogaster*** Henry, 1940

32. * ***Phonogaster cariniventris*** Henry (Map 3)

1940. *Phonogaster cariniventris* henry, *Trans. R. ent. Soc. Lond.,* **90** : 510.

Material examined : 1 F, Rangpo, 9.x.1984, T.K.Mukherjee.

Diagnosis : Long and slender species; basal 9 segments of antennae strongly tricarinate, remaining segments cylindrical; dorsum of head behind middle of eye with seven carinae including the strong median one; dorsum of pronotum with two other carinae beside the median and lateral carinae; tegmina extending beyond the fully extended hind leg; wings less than half tegminal length, acutely pointed; abdomen with tergites 3-6 hollow and tympanate; tergites 3-5 each with a pair of sharp, longitudinal ridges on each side in the lower part; hind femur with inner face provided with a row of stridulatory pegs; supra-anal plate triangular, transversely sulcate across middle; cerci short, conical; ovipositor short.

Distribution : India : S. India (Tamil Nadu), Tripura.

Remarks : The species is available among coarse grasses with a thin shade of small trees (Henry, 1940). We have also collected these specimens from long grasses with sharp edges.

Submily OEDIPODINAE

Key to genera

1. Median carina of pronotum complete or cut by one sulcus 2

— Median carina of pronotum cut by two or three sulci 6

2. Thorax rather short; pronotum without strong crest or not strongly tectiform 3

— Thorax long; pronotum strongly tectiform .... *Gastrimargus* Saussure

3. Wings without well marked fascia 4

— Wings with well marked fascia (pronotum with pale marks arranged so as to form x-shaped) ..... *Oedaleus* Fieber

4. Transverse veins in apical part of tegmina oblique, arranged zig zag .... *Pternoscirta* Saussure

5. Internal calcaria of posterior tibiae normal; intercalary vein of tegmina approaching M or equidistant between M and CUA; the field before the intercalary vein with sparse not slopping cross veins ..... *Aiolopus* Fieber

— Internal calacria of posterior tibiae unequal the lower one longer than the other and hooked at apex; intercalary vein of tegmina strongly approaching CUA; the field infront of intercalary vein with dense strongly slopping cross veins ..... *Heteropternis* Stål

6. Median carina of Pronotum intersected by two transverse grooves ..... *Trilophidia* Stål

— Median carina of pronotum intersected by three transverse grooves 7

7. Head much elongate, front strongly reclinate *Pusana* Uvarov

— Head not much elongate, front not strongly reclinate ..... *Sphingonotus* Fieber

Genus ***Aiolopus*** Fieber, 1853

33. ****Aiolopus thalassinus tamulus*** (Fabricius) (Map 3)

1758. *Gryllus tamulus* Fabricius, *Ent. Syst. Suppl.* : 195

1968. *Aiolopus thalassinus tamulus*, Hollis, *Bull. Br. Mus. nat. Hist.* (Ent.), **22**(7) : 347.

Material examined : 1 M, Singtam, 22.ix. 1983, G. K. Srivastava.

Diagnosis : Size medium; fastigium with front angle more acute; foveolae narrowly trapezoid, about twice as long as wide; frontal ridge gradually narrowing and almost angular towards fastigial end, sparsely punctured; hind femur unicolours, without any oblique fascia; posterior tibiae usually with red colour in apical fourth and broadly separated from black band by a wide bluish grey band.

Distribution : India : Andaman & Nicobar Islands, Bihar, Delhi, Himachal Pradesh, Madhya Pradesh, Karnataka, Orissa, Rajasthan, Tamil Nadu, West Bengal; Australia; Bangladesh; Borneo; China; Hainan; Japan; Java; Myanmar; New-Guinea; Singapore; Sri Lanka; Sumatra and Taiwan.

Remarks : It is a species of grassy places, both extensive grasslands and smaller patches. It is also found in irrigated land in crops and fallow fields. This species is only graminivorous but also ambivorous to some extent. Few records of damage are reported especially of cabbage, cereals, cotton, fodder, maize, millet, onion, rice, sugar cane, tea, tobacco, wheat, pea and beat.

Genus ***Gastrimargus*** Saussure, 1884

Key to species

1. Internal ventral surface of hind femur blue-grey to blue-black .... *africanus africanus* (Saussure)

— Internal ventral surface of hind femur straw-coloured ..... *marmoratus* (Thunberg)

34. ***Gastrimargus africanus africanus*** (Saussure)

1888. *Oedaleus (Gastrimargus) marmoratus* var. *africana* Saussure, *Mem. Soc. Phys. Hist. nat.* Geneve, **30**(1) : 39.

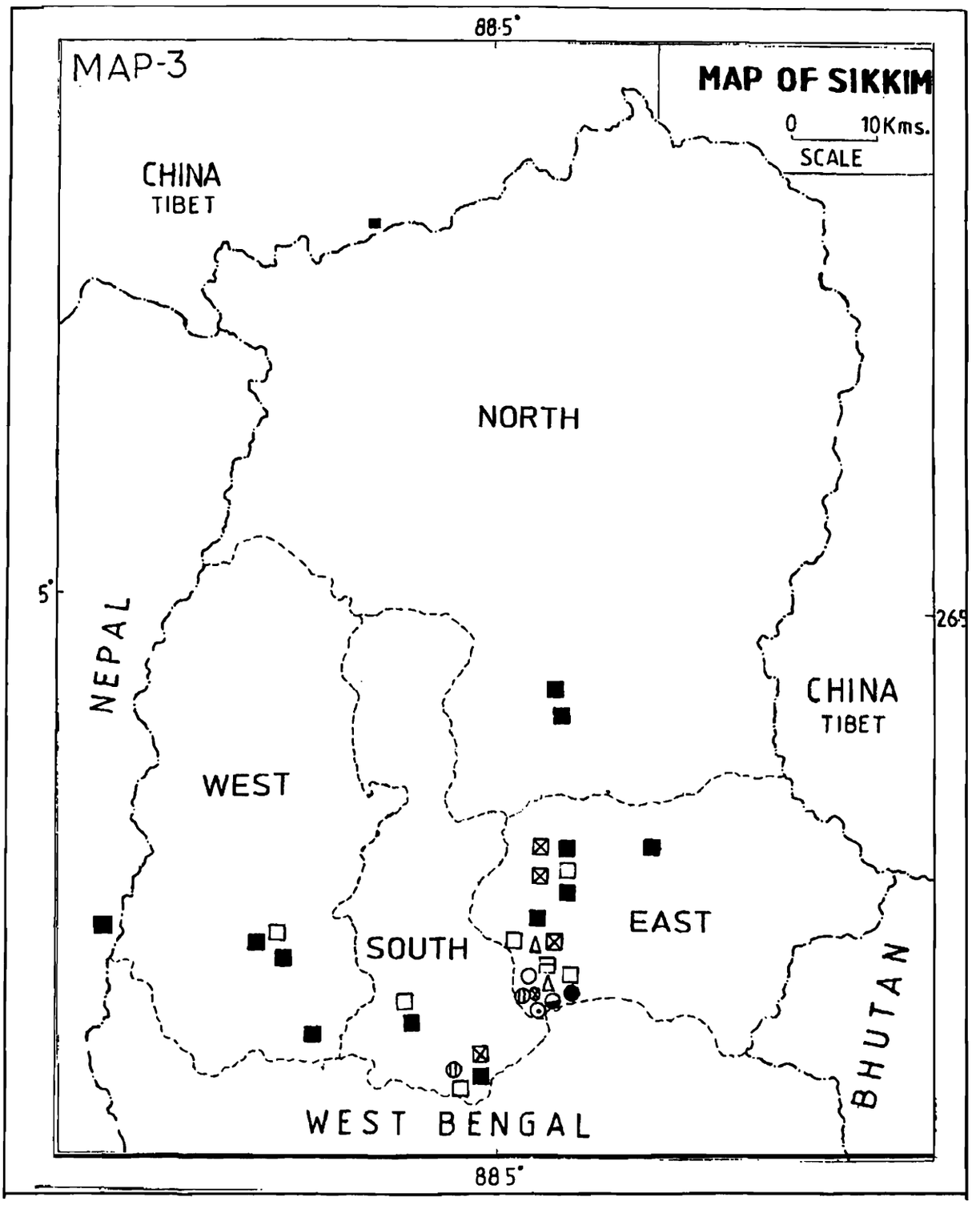
1910. *Gastrimargus africanus*, Kirby, *Syn. Cat. Orth.*, **3** : 227.

1982. *Gastrimargus africanus africanus*, Ritchie, *Bull. Br. Mus. nat. Hist.* (Ent.) **44** (4) : 248.

Material examined : 1 F, Sikkim, E.T Atkinson.

Diagnosis : Size medium to large; fastigium of vertex concave; pronotum with median carina moderately arcuate, shallowly intersected by hind sulcus, hind margin sharply or bluntly acutangular, dorsum smooth with pale X-marking usually effaced and without pale striae; tegmina surpassing hind knees by more than 25 mm., basal transverse band sometimes reduced or absent; hind wings with complete fascia; internal ventral surface of hind femur blue-grey to blue-black.

Distribution : India : Arunachal Pradesh, Bihar, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Orissa, Sikkim, Uttar Pradesh, West Bengal; Africa; Arabia; Myanmar; Nepal; Pakistan; Sri Lanka; Tibet; Thailand; Ritchie (1982) recorded it from Kurseong, which he included it in Sikkim.



Map-3

- *Aulacobothrus luteipes* (Walker)
- *Mesopsis cylindricus* (Kirby)
- *Phonogastar cariniventris* Henry
- *Aiologus thalassinus tamulus* (Fabricius)
- *Heteropternis respondens* (Walker)
- *Pternoscirta cinctifemur* (Walker)
- *Oedaleus abruptus* (Thunberg)
- *Pusana laevis* (Uvarov)
- *Trilophidia annulata* (Thunberg)
- *Atractomorpha burri* Bolivar
- *Atractomorpha c. crenulata* (Fabricius)
- *Tagasta indica* Bolivar

Remarks : It frequents bare patches in tall grass-land, open woodland and forest clearings (Jago, 1968; Joyce, 1952; Phipps, 1970). There are reports of damage by this species to maize and millet (Descamps, 1954), sorghum (Joyce, 1952), tobacco (Zacher, 1921) etc.

35. ***Gastrimargus marmoratus*** (Thunberg)

1815. *Grylus marmoratus* Thunberg, *Mem. Acad. Sci. St. petersb.*, **5** : 232.

1982. *Gastrimargus marmoratus,* Ritchie, *Bull. Br. Mus. nat. Hist.* (Ent.), **44** : 262.

Diagnosis : Size medium to large; median carina of pronotum sometimes intersected by posterior sulcus, pronotal X-marking with posterior arms usually indistinct or absent; tegmina surpassing folded hind knees by one-quarter to two-fifths of hind femur length, transverse bands sometimes reduced; hind wing fascia complete, basal area pale yellow, apex with dark pigments; internal surface of hind femur straw-coloured, with small brown patch in basal half of medial area.

Distribution : India : Andhra Pradesh, Assam, Bihar, Karnataka, Maharashtra, Meghalaya, Sikkim, Uttar Pradesh, Tamil Nadu, West Bengal; Bangladesh; Borneo; China; Flores; Hong Kong; Japan; Java; Korea; Lombok; Malaya; Myanmar; New Guinea; the Philippines; Sulawesi; Sumatra; Taiwan; Thailand; Vietnam.

Remarks : This species visits tall grassland, old cultivation and greyzing land often with Lalang (Miller-1932, 1934; Tinkham-1935, Roffey-1979). There are records of damage to maize, paddy, sorghum, citrus, sugar cane, Cocoa and oil palm (Roffey, 1979).

Genus ***Heteropternis*** Stål, 1873

36. ***Heteropternis respondens*** (Walker)
(Map 3)

1859. *Acrydium respondens* Walker, *Ann. Mag. nat. Hist.*, (3)**4** : 223.

1914. *Heteropternis respondens,* Kirby, *Fauna Brit. India.* Orthopt : 141.

Material examined : 1 M, Rangpo, 20.ix. 1983, G.K.Srivastava; 3 MM, Rangpo, 9.x.1984, T.K.Mukherjee; 1 F, Melli 9.xi.1992, M.S. Shishodia.

Diagnosis : Size medium; head smooth; antennae filiform; pronotum with a continuous median carina, cut by the principal sulcus before the middle; hind margin of pronotum rectangular, rounded at apex; tegmina opaque at basal half, transverse veins in apical part erect, the cells square or oblong; wings without well marked fascia; hind tibiae red, internal calcaria greatly unequal, the lower one much longer than the other.

Distribution : India : Arunachal Pradesh, Bihar, Karnataka, Orissa, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal; Bangladesh; China; Indonesia; Japan; Java; Malaysia; Malacca; Myanmar; Nepal; Philippines; Sri Lanka; Sumara; Taiwan.

Remarks : A species of open short grassland, fallow and crops. There are few records of minor damage to maize, paddy, pepper and sugar cane.

Genus ***Pternoscirta*** Saussure, 1884

37. * ***Pternoscirta cinctifemur*** (Walker)
(Map 3)

1859. *Acridium cinctifemur* Walker, *Ann. Mag. nat. His.* (3) **4** : 223.

1914. *Pternoscirta cinctifemur,* Kirby, *Fauna Brit. India,* Orthopt. : 134.

Material examined : 1F, Rangpo, 20.ix. 1983, G. K. Srivastava.

Diagnosis : Size medium; head and pronotum rugulose; thorax short, median carina of pronotum cut by one groove only; tegmina with transverse veins of apical part oblique and arranged zig-zag way; wings rose colour at the basal half, then clouded hyaline; hind femur buff with black sports, banded with black above and black on the inner side; hind tibiae black, banded blue beyond.

Distribution : India : Assam, Goa, Meghalaya, Orissa, Tamil Nadu, West Bengal; Eastern Nepal; Sri Lanka.

Genus ***Oedaleus*** Fieber, 1853

38. * ***Oedaleus abruptus*** (Thunberg)
(Map 3)

1815. *Gryllus abruptus* Thunberg, *Mem. Acad. Sci. St. Petersb.*, **5** : 23.

1981. *Oedaleus abruptus*, Ritchie, *Bull. Br. Mus. nat. Hist.* (Eng.), **42**(3) : 104.

Material examined : 1M, Rangpo, 9.x.1984, T.K.Mukherjee.

Diagnosis : Size small; fastigium of head almost flat; pronotum short with incomplete wide cruciform marks, strongly carinated and entire, the median sulcus visible on the sides of pronotum before the middle, pointed at hind margin; hind wings hyaline or pale yellow at the base, with a black transverse band, curving inwards to the anal angle; hind tibiae straw-coloured with dark basal ring and thicker subbasal pale ring.

Distribution : India : Andhra Pradesh, Bihar, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal; Bangladesh; China; Mynamar; Indo-China; East Nepal; Pakistan; Sri Lanka; and Thailand.

Remarks : *Oedaleus abruptus* has a wide range in the tropical grasslands of southern Asia in low-land areas, South of the Himalayas. There are a number of reports of crop damage, such as maiza, rice, wheat, bajra, jowar, tomato etc.

Genus ***Pusana*** Uvarov, 1940

39. ***Pusana laevis*** (Uvarov)
(Map 3)

1921. *Pusa laevis* Uvarov. *Ann. Mag. nat. Hist.* (9)**7** : 491.

1940. *Pusana laevis*, Uvarov, Ann. Mag. nat. Hist. **6**(3) : 117.

Material examined : 1F, Rangpo, 2.vii.1979, P. Halder; 1M, Chanutor, Rangpo, 3.vii.1979, P. Halder.

Diagnosis : Size medium; face and body covered with sparse hairs; antennae longer than head and pronotum together; face smooth, frontal ridge sulcate and parallel between fastigium and ocellum; pronotum feebly constricted anteriorly, metazona almost flat, scarcely raised above the prozona; tegmina extending beyond hind knees; wings hyaline, veins bluish, except the apical part where they are brown; hind tibiae bluish.

Distribution : India : Bihar, Himachal Pradesh, Sikkim; Bangladesh.

Genus ***Sphingonotus*** Fieber 1852

40. * ***Sphingonotus longipennis*** Saussure

1884. *Sphingonotus longipennis* Saussure, *Mem. Soc. Phys. Hist. nat. Geneve*, **28**(9) : 197, 203.

1964. *Sphingonotus longipennis*, Bei-Bienko & Mishchenko, *Locusts and grasshoppers of the U.S.S.R. and adjacent countries*, part II : 629.

Material examined : 2MM, Sikkim (Old collection of National Zoological Collection, without other date).

Diagnosis : Larger than other species of the genus; dark bank of hind wings long, in the form of a quarter circle, nearly reaching the inner margin, base of wing sky-blue-greenish, sometimes nearly colourless; hind tibiae with 2 dark bands; hind femur short, stout, only 3.3 times longer than wide; subgenital plate, in female, with a notch on the middle of posterior margin.

Distribution : India : Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh, West Bengal; Afghanistan; Bangladesh; E. Nepal; S.E. Tibet.

Remarks : This species is inhabitant of the surface of ground without dense vegetation (geophiles). It is also found on stony banks of rivers, hill streams and sandy areas.

Genus ***Trilophidia*** Stål, 1873

41. ***Trilophidia annualata*** (Thunberg)
(Map 3)

1815. *Gryllus annulatus* Thunberg, *Mem. Acad. Sci. St.-Petersb.*, **5** : 234.

1965. *Trilophidia annulata*, Hollis, *Trans. R. end. Soc. Lond.*, **117**(8) : 251.

Material examined : 2MM, 3FF, Singtam, 22.ix.1983, G.K. Srivastava; 2 MM, 2 FF, Namchi, South Sikkim, 26.ix.1983, G.K. Srivastava; 1 M, 1 F, Rangpo, 9.x.1984, T.K. Mukherjee; 2MM, 1F, Ranipool, 27.x.1992, M.S.Shishodia; 2MM, 1F, Geyzing, West Sikkim, 7.xi.1992, M.S.Shishodia; 3MM, 2FF, Melli, South Sikkim, 9.xi.1992, M.S.Shishodia.

Diagnosis : Size medium; body brown or grey with black markings, pubiscent beneath; pronotum rugose with a high median carina, forming two teeth in front, and with lateral carinae; wing yellow at base and brown or black beyond; hind tibiae brown with a pale band towards the base and with a little pale band beyond the middle.

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Bihar, Goa, Kerala, Himachal Pradesh, Madhya Pradesh, Orissa, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal; Afghanistan; Bangladesh; Borneo; S. China; Japan; Java; Korea; Malaysia; Mongolia; Myanmar; Nepal; Pakistan; Philippines; Sarawak; Singapore; Sri Lanka; Sumatra, Taiwan; Thailand; Vietnam.

Family PYRGOMORPHIDAE

Key to genera

1. Antennae remote from the eyes, placed infront of the ocelli **2**

— Antennae near the eyes and inserted below the ocelli (posterior lobe of pronotum convex, raised above the level of the anterior lobes, with strong rugae; abdomen with dorsal callosity ..... ***Aularches*** Stål

2. Tegmina long and narrow; body moderately slender ..... ***Atractomorpha*** Sausseur

— Tegmina rather short and broader; body very robust ..... ***Tagasta*** Bolivar

Genus *Atractomorpha* Saussure

Key to species

1. Body-form broad, stout and rather short; lateral pronotal lobe without a membranous area (outer face of hind femur convex and strongly keeled ..... ***burri*** Bolivar

— Body-form more slender and elongate; lateral pronotal lobe often with a membranous area near posterior margin (fastigium of vertex not very long, male abdomen with apex obtuse) *crenulata* (Fabricius)

42. * ***Atractomorpha burri*** Bolivar (Map 3)

1905. *Atractomorpha burri* Bolivar, *Bol. Soc. esp. Hist. nat.* **5** : 197, 203.

1960. *Atractomorpha burri*, Banerjee & Kevan, *Treubia*, **25** : 177.

Material examined : 1F, 6 kms from Gangtok, 10.x.1984, T.K.Mukherjee; 1F, Lingchom, 7 kms. west of Geyzing, 4.iii.1989, Y.Chaturvedi & K C Kansal; 2 FF, Rothak, 6 kms north of Nayabazaron Legship road, 10.iii. 1989, Y Chaturvedi; 4MM, 1F, Ranipool, East Sikkim, 27.x.1992, M.S.Shishodia; 5MM, 4FF, Tadong, East Sikkim, 28.x.1992, M.S.Shishodia; 1M, Singtam, East Sikkim, 29.x.1992, M.S.Shishodia; 3FF, Phodong, North Sikkim, 31.x.1992, M.S.Shishodia; 4 MM, Horticulture garden, Mangan, North Sikkim, 1.xi.1992, M.S.Shishodia; 2 MM, Geyzing, West Sikkim, 7.xi.1992, M.S.Shishodia; 7 MM, 2 FF, Melli, South Sikkim, 9.xi.1992, M.S.Shishodia, 1 M,, Namchi, South Sikkim, 10.xi.1992, M.S.Shishodia.

Diagnosis : Medium is size, body-form comparatively broad, rather short; postocular tubercle strongly raised and regularly arranged; lateral pronotal lobe without a membranous area; posterior margin of pronotal disc distinctly angular; tegmina not pointed at apex; hind wings hyaline or rosy at base; outer face of femur convex and strongly keeled; dorsal ovipositor valves stout.

Distribution : India : Arunachal Pradesh, Assam, Meghalaya, Orissa, West Bengal; Bangladesh; Bhutan; Upper Burma; South West China; Indo-China; Malaya; Nepal; Mergui-Archipelago and Thailand.

Remarks : Specimens collected from Namchi

and Singtam are brown in folour. This species is reported to damage leguminous crop plants.

43. * ***Atractomorpha crenulata crenulata*** (Fabricius) (Map 3)

1793. *Truxalis crenulatus* Fabricius, *Eng. Syst.*, **2** : 28.

1969. *Atractomorpha cremulata cremulata,* Keven & Chen., *Zool. J. Linn. Soc.*, **48** : 187.

Material examined : 1 M, 1 F, Rangpo, 20.ix.1983, G.K. Srivastava.

Diagnosis : There are two subspecies, and the above said subspecies is found in India. General body-form slightly more slender; fastigium of vertex rather short; pronotal carinae often ill defined; tegmina generally longer; hind wings fully developed, rosy when mature; outer face of hind femur not convex and keeled; male abdomen with apex more obtuse.

Distribution : India : Andaman Islands, Andhra Pradesh, Bihar, Goa, Jammu & Kashmir, Kerala, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Maldive and Laccadive Islands; Bangladesh; Malaya; Myanmar; Pakistan; Sri Lanka; N.W.Sumatra; Thailand; South Vietnam.

Remarks : Commonly known as surface grasshopper, and is found in both green & brown forms. It remains active throughout the year though its activities are much reduced in winter season. It is reported to damage Jute, gram, sunflower, tobacco, chilli, maize, wheat, pea, colocasoa, etc.

Genus ***Aularches*** Stål, 1873

44. ***Aularches miliaris*** Linnaeus

1758. *Gryllus (Locusta) miliaris* Linnaeus, *Syst. Nat.* (ed.x) **1** : 432.

1914. *Aularches miliaris,* Kirby, *Fauna Brit. India,* Orthopt., : 168.

1963. *Aularches miliaris,* Keven, *Ark. Zool.*, **16** : 75.

Diagnosis : Body a little large, stout; head yellowish, or more or less mottled with brown above; pronotum yellow on the sides; the space between the sulci with several strong pointed conical tubercles on each side, the hinder lobe very rugose, deeply pitted, and rounded behind; tegmina light brown, thickly reticulated with yellow nervures, and with a variable number of large and small callous yellow spots; wings purplish brown, darkest towards the base.

Distribution : India : Jammu & Kashmir, Meghalaya, Orissa, Sikkim, Tamil Nadu, Uttar Pradesh and West Bengal; Bangladesh; Indonesia; Java; Kampuchea; W. Malaysia; Myanmar; Nepal; Pakistan; Sri Lanka; Thailand; Tibet; S. Vietnam.

Remarks : This species is markedly phytophilous. It usually occurs in shrub and herb thickets of forest margins, and in area with cultivated or wild trees, many of which it attacks. It is reported to damage jack fruit, coconut, dadap, pinus, *Shorea robusta* seedlings, seedlings of teak trees, coppica shoots, banana, beans, betelnut, cacao, cardamom, cashew, chilli, cinchona, cotton, millet, guava, jute, maize, mango, rice, rubber, sugar cane, tobacco, etc.

Genus ***Tagasta*** Bolivar, 1905

45. * ***Tagasta indica*** Bolivar (Map 3)

1905. *Tagasta Indica* Bolivar, *Bol. Soc. Espan. Hist. Nat.*, **5** : 112, 113.

1914. *Tagasta indica,* Kirby, *Fauan Brit. India,* Orthopt., 180.

Material examined : 2MM, 4FF, Singtam, 22.ix.1983, G.K. Srivastava; 1M, Ranipool, 27.x. 1992, M.S. Shishodia; 1F, Melli, South Sikkim, 9.xi.1992, M.S. Shishodia.

Diagnosis : Size medium; body subfusiform; fastigium of vertex equilaterally triangular; antennae inserted near the eyes; cheeks with a row of large yellow granules behind each eye; pronotum rounded in front and obtusely angulated behind, median carina almost, and lateral carinae wholly obsolete; tegmina nearly as long as the hind femora, with tip narrowly obtuse, olive, with a dark brown spot at the base; wings shorter than the tegmina; deep rose-colour.

Distribution : India : Arunachal Pradesh, Meghalaya, West Bengal; Bhutan; Myanmar.

Super-family : EUMASTACOIDEA

Family CHOROTYPIDAE

Sub-family ERIANTHINAE

Genus ***Butania*** Bolivar, 1903

46. ***Butania lugubris*** var. ***major*** Bolivar

1898. *Erianthus lugubris* Brunner, *Abh. Senckenb. Ges.*, **24** : 225.

1930. *Butania lugubris* var. *major* Bolivar, *Trab. Mus. Cienc. nat. Madrid,* **46** : 143.

Diagnosis : Antennae shorter than the front femora; frontal costa between the antennae smooth, more or less dilated; fastigium of vertex short, obtuse; pronotum rounded at the tip, and sharply carinated above; hind femora normal; tegmina narrow; wings blackish with white spots and markings towards the tip.

Distribution : India : Sikkim.

Remarks : Brunner (1898), Kirby (1914) and Bolivar (1930) have reported this species/variety from Sikkim. Since then it has never been reported.

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INSECTA : ORTHOPTERA : TETTIGONIIDAE

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INTRODUCTION

The Tettigoniid Orthopterans are long horned grass-hoppers Suborder – Ensifera. They are characterised by mandibulate mouthparts, antennae thread-like which are longer than body, front tibiae are usually with basal auditory organs and tarsi four segmented, wings are usually fully developed, ovipositor is normally sickle, sword or dagger shapped. The general colouration is most often predominantly green. Some of the members of this group are crop pest. Hence, the Tettigoniids have some economic importance. So far more than 5000 species of these Tettigoniids have been recorded globally, which indicates that the group has been extensively studied over the years in different countries.

In India, the author has made considerable contribution on the group for well over two decades from 1972 to 1994.

Recently, Zoological Survey of India undertook a number of faunistic surveys in Sikkim and the Tettigoniid material collected by different scientists of this department from time to time have been studied.

The material contains altogether 18 species under 15 genera belonging to 6 subfamilies and 6 species, have been newly recorded.

Consolidated list of the species of Tettiqoniidae recorded from Sikkim

1. *Letana linearis* Walker
2. *Elimaea securigera* Brunner
3. *Holochlora indica* Kirby
4. *Euhexacentrus annulicornis* Stål
5. *Mecapoda elongata* (Linn.)
6. *Euconocephalus incertus* (Walker)
7. *Conocephalus (xiphidion) maculatus* (Le Guillou)
8. *Sathrophyllia rugosa* (Linnaeus)
9. *Sathrophyllia femorata* (Fabricius)
10. *Sanaa regalis* (Brunner)
11. *Sanaa imperialis* (White)
12. *Parasanaa donovani* (Donovan)
13. *Tegra viridivitta* (Walker)
14. *Tegra novaehollandiae viridinotata* (Stål)
15. *Climacoptera venosa* (Walker)
16. *Pseudophyllus ligatus* (Brunner)
17. *Chloracris brunneri* (Beier)
18. *Phyllozellus siccus* (Walker)

SYSTEMATIC ACCOUNT

Family : TETTIGONIIDAE

Key to subfamilies of **TETTIGONIIDAE**

1. Male subgenital plate with a pair of styles... 2
– Male subgenital plate without styles .... PHANEROPTERINAE
2. Fore tibia with long movable spine..... ..... LISTROSCELINAE
– Fore tibia without apical spine 3
3. Pronotum bears 2 distinct suture ....PSEUDOPHYLLINAE
– Pronotum without distinct suture 4
4. Fore and middle femora spined beneath .... COPIPHORINAE

- Fore and middle femora unspined beneath 5

5. Male subgenital plate divided almost from base ..... CONOCEPHALINAE

- Male subgenital plate bifurcated at about the middle ..... MECOPODINAE

Subfamily PHANEROPTERINAE

Key to genera of PHANEROPTERINAE

1. Antennae slender, double the length of the body; elytron very narrow and thick reticulated ..... ***Letana*** Walker (1 species only)

- Antennae not so long 2

2. Hind margin of pronotum circular, epiproct triangular .... ***Holochlora*** Kirby (1 species only)

- Hind margin of pronotum truncate, epiproct sub-conical..... ***Elimaea*** Stål (1 species only)

Genus 1 ***Letana*** Walker, 1869

1869. *Letana Walker, Cat. Derm. Salt. Br. Mus.,* **2** *: 227*

1. ***Letana linearis*** Walker

1869. *Letana linearis* : Walker, *Cat. Derm. Salt. Br. Mus.,* **2** : 278

1990. *Letana linearis* : *Ingrisch, Ent. Scand.,* **21**(3) : 267

Material examined : North Sikkim Dist., 1 M, Mangan, i.xi. 1992. Coll. M.S.Shishodia

Diagnosis : Medium sized to large, strikingly coloured; tegmina only surpassing hind knees. Supra-anal plate with long, curved, apically darkened lateral appendanges; phallus sclerite saw-blade-shaped

Distribution : India : Himalayas; Sikkim, Meria Basti; and also from Nepal

Genus 2. ***Elimaea*** Stål

1874. *Elimaea* Stål, *Recens. Orth.,* **11** : 2–7

2. ***Elimaea securigera*** Brunner

1891. *Elimaea securigera* Brunner, *Verh. Zool. Bot. Ges. Wien., Viena,* **40** : 47

Material examined : North Sikkim Dist. 4 F, 1M, Phodong, 31.x.1992, Coll. M.S.Shishodia; *South Sikkim Dist.* 1F, Namchi, 10.xi.92, Coll. A.K.Hazra; *East Sikkim Dist.* 1F, Gangtok, 28.xi.1992, Coll. M.S.Shishodia

Diagnosis : Medium sized species; fastigium cone-shaped, poorly developed; posterior margin of pronotum semicircular; both edge of elytron straight, male subgenital plate hook-shaped with profuse tiny spines arranged innerside; ovipositor hook-shaped, epiproct with acute apex

Distribution : India : Sikkim, Assam, Meghalaya and West Bengal. Also known from Sri Lanka

Remarks : The species was recorded by the author from Meghalaya, Tripura and West Bengal. It is being recorded here for the first time from Sikkim

Genus 3. ***Holochlora*** Stål

1873. *Holochlora* Stål, *Ofv. vet. Akad, Fo'rh.,* **30**(4) : 42

3. Holochlora indica Kirby 1906

1906. *Holochlora indica* Kirby, *Syn. Cat. Orthopt.,* **2** : 430

Material examined : East Sikkim Dist. 1M, 2F, Ranipool, 14.11.1993, Coll. S.K.Saha; East Sikkim Dist. 2F, Rongpo, 15.11.93, Coll. S.K.Saha; 1F, Ranipool, 13.11.1993, Coll. S.K.Saha; *West Sikkim Dist.* 1F, Nayabazar, 20.ix. 1993, Coll. S.K.Saha; *North Sikkim Dist.* 2M, Mangan, 1.xi.1992, Coll. M.S.Shishodia

Diagnosis : Fastigium conically produced with round apex; anterior margin of pronotum concave and posterior margin convex; radius sector 2 arises from middle of wing and bifurcated at its basal third; hind femur with spines on apical half and anterior two paris bare of spines; male subgenital plate at the region of bifurcation forms a circle, style foot shaped, circus gradually narrowed and curved at apex; ovipositor curved and serrate at apical region

Distribution : India : Sikkim, Meghalaya, Orissa, Tripura, Tamil Nadu and West Bengal

Remarks : The species was recorded by the author from Meghalaya, Tripura and West Bengal and it is being recorded first time from Sikkim

II. Subfamily LISTROSCELINAE

Genus 4. ***Euhexacentrus***

1877. Hebard, *Proc. Acad. nat. Sci.* Philad., **74** : *270.*

4. ***Euhexacentrus annulicornis*** (Stål)

1877. *H. (Exacentrus) annulicornis* Stål, *Ofv. K. Ventensk, Acad. Forh.* **34** (10) : 46

1922. *Fuhexacentrus annulicornis;* Hebard, *proc. Acad. Nat. Sci. Philade.* **74** : 271

Material examined : East Sikkim Dist. 1F, Gangtok, 1.xi.1992, Coll. M.S.Shishodia

Diagnosis : Medium sized species; yellowish buff coloured; vertex dark brown dorsally; elytron pale green or green yellow; both edges nearly straight; hind femoral spines blackish brown except paler apical ones; male subgenital plate slightly longer than broad; basal third of ovipositor swollen, its length nearly half the length of the body

Distribution : India : Sikkim, Assam, Maharashtra, Meghalaya, Tripura and West Bengal. It is also known from Phillipine

Remarks : The species was recorded from Meghalaya, Tripura and West Bengal by the author and it is being recorded for the first time from Sikkim

III. Subfamily MECOPODINAE

Genus 5. ***Mecopoda*** Serville

1831. *Mecopoda* Serville, *Ann. Sci. nat.*, **22** : 154

5. ***Mecopoda elongata*** (Linn.)

1758. *Gryllus elongatus* Linnaeus,*Syst. Nat. ed.* **10**, 1 : 429

1922. *Mecopoda elongata* Hebard, *Proc. Acad. Nat. Sci. Phila,* **74** : 182

Material examined : North Sikkim District, 2F, Phodong, 31.x.1992, Coll. M.S.Shishodia; *South Sikkim District,* 1M, 1F, Namchi, 1.xi.1992, Coll. M.S.Shishodia; 1 Nayabazar, 20.ix.1993, Coll. S.K. Saha; 2M, Mangan, 1.xi.1992, Coll. M.S. Shishodia

Diagnosis : Brownish species,fastigium wide, posterior marginof pronotum almost double the width than anterior region; subcosta sharply sinuate just beyond middle; male subgenital plate developed conically from region of bifurcation; ovipositor straight being slightly narrowed at apex

Distribution : India : Sikkim, Andaman Islands, Assam, Karnatake, Maharashtra, Meghalaya, Orissa, Tripura, Uttar Pradesh and W.Bengal.

Remarks : The species was recorded from Meghalaya, Tripura and West Bengal by the author. The species is being recorded here for the first time from Sikkim.

IV. Subfamily Copiphorinae

Genus 6. ***Euconocephalys*** Karny

1907. *Euconocephalus* Karny, *Abh. zool. -bot. Ges. Wien,* **4** (3) : 39

6. ***Euconocephalus incertus*** (Walker)

1869. *Conocephalus incertus* Walker, *Cat. Derm. Salt. Brit. Mus.,* **2** : 320

1912. *Euconocephalus incertus* : Karny, *Gen. Insectorum,* **2** (139) : 35

Material examined : North Sikkim District, 1F, Mangan, 1. xi. 1992, coll. M.S. Shishodia

Diagnosis : Greenish species; vertex conically produced; pronotum broadly rounded at posterior margin; radius sector 2 arises much before middle of wing; male subgenital plate bears two styles at apex; style bifurcated at apex; ovipositor subequal to the length of body

Distribution : India : Sikkim, Meghalaya, Orissa, Tripura and West Bengal

Remarks : The species was recorded by the author from Meghalaya, Tripura (in press) and West Bengal. It is being recorded here for the first time from Sikkim

V. Subfamily CONOCEPHALINAE

Genus 7. *Conocephalus* Thunburg

1815. *Conocephalus* Thunburg *Mem. Acad. St. Petersberg,* **5** : 214

7. *Conocephalus (Xiphidion) maculatus* (Le Gouillon)

1841. *Xiphidion maculatus* Le Gouillon, *Rev. Zool.,* : 294

1922. *Conocephalus (Xiphidion) maculatus* Hebard, *Proc. Acad. Nat. Sci. Philad.,* **74** : 243

Material examined : *East Sikkim Dist.* 1**M**, 2**F**, Tadong, 28.x.1992, Coll. M.S.Shishodia; *North Sikkim Dist.* 5**M**, 1**F**, Phodong, 31.x.1992, Coll. M.S.Shishodia; 1**M**, 1**F**, Mangan, 1.xi.1992, Coll. M.S.Shishodia

Diagnosis : Presence of suffused and interrupted brown band between medium and ulner veins of the tegmina

Distribution : India : Sikkim, Tripura

Remarks : The species was recorded by the author from Tripura and it is being recorded here first time from Sikkim

VI. Subfamily PSEUDOPHYLLINAE

Key to tribes

1. Green or Yellow leaf like form; elytra not rugose; wings hyaline, often opaque green at apex; only hind femora compressed, mostly ventrally thorned, but not lobed 2

   Brownish; mostly bark like form; elytra rugose; wings more or less red brown; cross veins mostly with dark or transparent areola; all femora compressed at exteroventral margin, more or less laminately expanded ..... *Cymatomerini* Walker (Not discussed here).

2. Mesosternum strongly oblique or transverse; costal margin of tegmina curved, therefore the tegmina more or less oval 3

   Mesosternum nearly square or only very little transverse; costal margin of tegmina more or less straight, therefore the tegmina more or less straight, therefore the tegmina almost parallel sided ..... *Tegra* Walker.

3. Ventral outer margin of front femora lamellarly expanded, more or less lobbed 4

- Ventral outer margin of front femora simple, neither lamellar expanded nor lobbed 6

4. Anal field of wing well developed 5

   Anal field of wing entirely reduced .... *Platenia* Dohrn (Not discussed here)

5. Costal margin of tegmina entirely margined *Sathrophyllia* Stål

   Costal margin of tegmina lobbed or wavy... *Olcinia* Stål (Not discussed here)

6. R of tegmina follow a parallel, course with SC and only its distal part divergent; male subgenital plate not steeped 7

   R of tegmina behind the middle twice of SC bent down and if again draw nearer, male subgenital plate steeped .... *Sathrophyllopsis* De Jong (Not discussed here)

7. Wing black; transverse veins narrowly cleared edged; transverse furrow of pronotum normally deepen ..... *Sanaa* Walker

   Wing in fumated, the transverse veins obscurely edged; hind transverse furrow of pronotum unusually deeply curved .... *Parasanaa* Beier

Genus 8. *Sathrophyllia* Stål

1874. *Sathrophyllia* Stål, *Rec. Orthopt.,* **2** : 54

Key to species of Sathrophyllia Stål

1. Dark spots in cells of elytron more or less round or oval shaped, presence of swollen median crest on basal part of pronotum .... *rugosa* (Linnaeus)

   Dark spots in the cells of elytron more or less semilunar shaped, pronotum without median crest ..... *femorata* (Febricius)

8. *Sathrophyllia rugosa* (Linnaeus)

1758. *Gryllus (Terrigonia) rugosa* Linnaeus. *Syst. Nat.* (10 ed.), **1** : 430

1962. *Sathrophyllia rugosa* : Beier, *Das Tierreich,* **73** : 199-200

Material examined : Sikkim, 1 larva, coll. N. Annandale. VI. 1910 (other particular are not available)

Diagnosis : Median crest large, often swollen on the basal part of pronotum, appearance rugose, colour ash brown, tegmina convex, femur with semirounded grooves ventrally, all tibiae spotted, ovipositor blade like

Distribution : India: Sikkim, Karnataka, Meghalaya, Tamil Nadu and West Bengal. Also known from Sri Lanka, Sumatra, Java (?)

Remarks : The species was recorded from Meghalaya and West Bengal by the author

9. ***Sathrophyllia femorata*** (Fabricius)

1963. *Sathrophyllia femorata* : Beier, *Orthopterorum Catalogus,* part **5** : 64

Material examined : 1M, Sikkim, coll. E.T. Atkinson. No further details

Diagnosis : Large brownish species; vertex excavated at apex, apex with two horny projections, pronotum crested over; elytron undulating with round apex; all femora waved below; male subgenital plate broad, stylus conical, epiproct rounded, cerci curved with black apex, ovipositor sword like with black apex

Distribution : India : Sikkim, West Bengal. Also known from Myanmar, Borneo, Java, Nias and Sumatra

Remarks : The specimen, present in National Zoological Collection, is partially damaged. This specimen was identified as *Acanthodis femorata* Stål, but it appears to me that it is *Sathrophyllia femorate* Stål, as *Ananthodis* is available only in America

Genus 9. ***Sanaa*** Walker

1870. *Sanaa* Walker, *Cat. Derm. Salt, Brit. Mus,* **3** : 483

Key to species of *Sanaa* Walker

1. Male subgenital plate yellowish brown .... *imperialis* (White)

- Male subgenital plate black .... *regalis* (Brunner)

10. ***Sanaa regalis*** (Brunner)

1895. *Termera regalis* Brunner, *Monogr. Pseud.* : 94, Taf. 4, fig. 39

1962. *Sanaa regalis* : Beier, *Das Tierreich,* **73** : 214

Material examined : Sikkim. No other particulars

Diagnosis : Pronotum yellow, elytron brown with spots, hind wings spotted anteriorly; meso and metasternum brown, pleura black; legs largely brownish, all femora medially and ventrally black; male subgenital plate large, broad black style straight but somewhat curved at apex; ovipositor black at the base

Distribution : India : Sikkim, Assam, Nagaland and West Bengal

11. ***Sanaa imperialis*** (White)

1846. *Locusta (Acanthodis) imperialis* White, *Ann. Mag. nat. Hist.* London, **18** : 23, pl.1

1870. *Sanaa imperialis* Walker, *Cat. Derm. Salt. Brit. Mus.* **3** : 438

1962. *Sanaa imperialis* : Beier, Das. Tierreich. **73** : 213

Material examined : Sikkim; Reported from literature

Diagnosis : head yellow infront, rest brown. Body deep brownish black, lighter brown below. Elytron somewhat bulging at the base, and brown, 3 to 6 small yellowish, green subtraingular spots on the outer edge; some transverse marks near the tibia of hindleg, tarsi of forelegs blackish brown, ovipositor yellow

Distribution : India : Sikkim, Assam, Maghalaya. Also known from Nepal

Remarks : The species could not be studies in the present collection. However, the description has been noted down from the literature

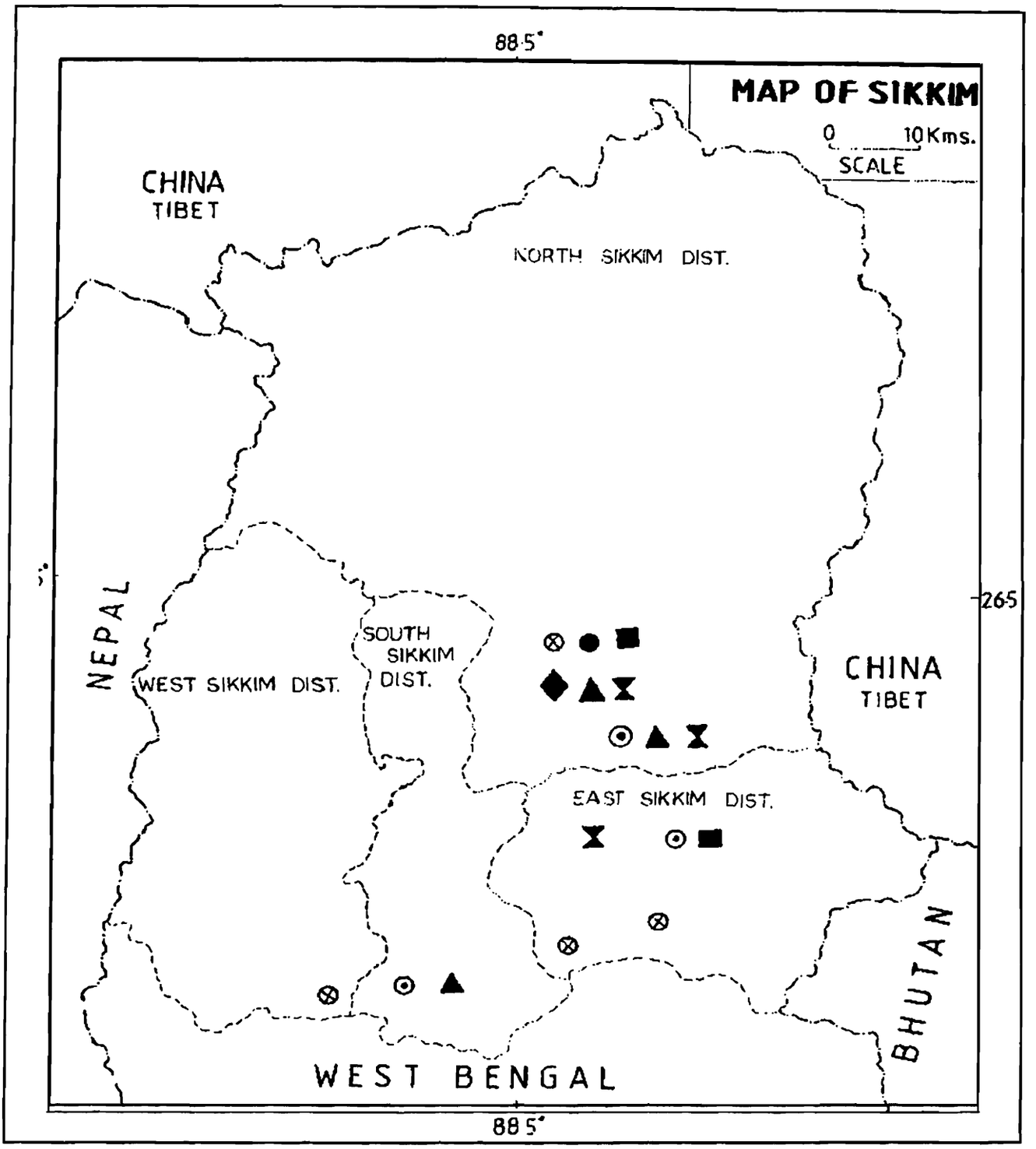
Genus 10. ***Parasanaa*** Beier

1944 *Parasanaa* Beier. *Stettin. entom. Z.* **105** : 89

12. ***Parasanaa donovani*** (Donovan)

1834. *Gryllus donovani* Donovan, *Nat. Repos.,* **2** Taf. 69

1848. *Acanthodis donovani* : Westwood, *Cab. Orient. entom* : **51** : Taf. 25. fig.2



- *Letana linearis*
- *Elimaea securigera*
- *Holochlora indica*
- *Euhexacentrus annulicornis*
- *Mecopoda elongata*
- *Euconocephalus incertus*
- *Conocephalus (xiphidion) maculatus*

1944. *Parasanaa donovani* : Beier, *Stettin. entom. Z.*, **105** : 89

1962. *Parasanaa donovani* : Beier, *Das, Tierriech.* **73** : 215

Material examined : Sikkim. No other details

Diagnosis : Head and body dark brown. Only the pronotum and one transverse band on the fifth abdominal tergite bright yellow. Antennae brownish. Pronotum with 2 dark brown spots at hind margin. The tegmina dark reddish brown with 3 big irregular bright yellow spots between R and Cu. Male sulegenital plate big, broad, outcuved terminally. The style short; ovipositor reddish brown

Distribution : India : Sikkim

Genus 11. *Tegra* Walker

1870. *Tegra* Walker, *Cat. Derm. Salt. Brit. Mus.*, **3** : 439

Key to the species of *Tegra*

1. Tegmina 3.3 to 3.7 times longer than broad, apex broadly rounded; costal field mostly broader than space R RS; right circus of male without teeth. (Head, body, leg and tegmina mostly brown) .... *novaehollandiae viridinotata* (Stål)

   Tegmina 4.5 to 5.6 times longer than broad, apex narrowly rounded, costal field mostly narrow than space R-RS; right circus of male with teeth ..... *viridivitta* (Walker)

13. *Tegra viridivitta* (Walk)

1870. *Cymatomera viridivitta* Walker, *Cat. Derm. Salt. Brit. Mus.*, **3** : 456

1962. *Tegra viridivitta* : Beier, *Das Terreich.* **73** : 220-221

Material examined : Reported form literature

Diagnosis : pronotum rounded and bears faint medium carina; head is dark brown. Antennae black. All the femora are brown and smooth dorsally, rest of legs are dark brown. Tegmina rather broad; Ovipositor nearly black and distinctly curved upwards

Distribution : India : Sikkim, Assam, Meghalaya. Also known from Nepal

14. *Tegra novaehollandiae viridinotata* (Stål)

1874. *Tarphe viridinotata* Stål, *Rec. orth.*, **2** : 72

1962. *Tegra novaehollandiae viridinotata* : Beier, *Das Tierreich* **73** : 219

Material examined : Reported from literature

Diagnosis : Pronotum often clearly spotted, front part of fastigium whitish. Male subgenital place large, ovipositor reddish brown and curved

Distribution : India : Sikkim, Assam and also from Burma, Tonkin, Thailand and China

Tribe 2 **Pseudophyllini** De Jong

Key to genera

1. Hind margin of pronotum wrinkled; anal field of male tegmina widely spread (broadend)... 2

– Hind margin of pronotum smoth, anal field in male tegmina not broadened (Transverse vein of tegmina not pass) .... ***Chloracris*** Pict. & Sauss.

2. Tegmina narrow, Sc and R straight..... .....***Climacoptera*** Brunner.

– Tegmina broad, Sc and R curved..... .....***Pseudophyllus*** Serville

Genus 12. *Climacoptera* Brunner

1895. *Climacoptera* Brunner, *Monogr. Pseu* : 41.

15. *Climacoptera venosa* (Walker)

1869. *Pseudophyllus venosus* Walker, *Cat. Derm. Salt. Brit. Mus.*, *2* : 403

1895. *Climacoptera procera* Brunner, *Monogr. Pseud.* : **42** ; Taf. 1, fig. 10

1962. *Climacoptera venosa* : Beier, Das *Tirreich*; **73** : 35

Material examined : It is reported from literature

Diagnosis : Bright green. Antennae brighly setaceous (hairly); pronotum sparsely and plainly granulated. Tegmina 3.6 times longer than the broad. Costal field in front of Sc with one line/ raw yellow calocity spot. The hind femora at

ventral outer margin with 13 spines. Hind tibiae at the dorsal inner margin with 8 to 10 very big spines, at the outher margin with 2 to 4 small spines. Ovipositor more than double as long as the pronotum. Body length 30 mm

Distribution : India : Sikkim, Assam and West Bengal

Remarks : The species could not be studied in the present collection. However the description is noted down from the literature

Genus 13. ***Pseudophyllus*** Serville

1831. *Pseudophyllus* Serville. *Ann. Sci. Nat.* Paris, **22** : 143

16. ***Pseudophyllus ligatus*** (Brunner)

1895. *Cleandrus ligatus Brunner, Mon. Pseud.* : 40

1962. *Pseudophyllus ligatus* : Beier, *Das Tierrich,* **73** : 37

Diagnosis : Relatively short species, vertex with one whitish transverse band between the eyes. Fastigium of the verlex long and narrow, twice so long as the margin of the antennal socket. Pronotum evenly granulated, the hind margin smooth. Tegmina proportionately narrow without dividing the veins, also male with narrow anal field (basal 3 mm. broad). Transverse veins with R, RS and M runs throughout. Hind femora ventrally at the outer margin with 8 to 10 spines. Hind leg very strong with broad spines. Hind tibiae with 8 to 10 spines. Hind leg very strong with broad spines. Hind tibiae with 8 to 10 spines. Male subgenital plate distally vdiverted into two lobes, style long. Body length 0 to mm

Distribution : The species could not be studied in the present collection. However, the description is noted down from the literature

Genus 14 ***Chloracris*** Pictet & Saussure

1892. *Chloracris* Pictet and saussure, *Icon. Saut. Vertres* : 10

17. ***Chloracris brunneri*** Beier

1954. *Chloracris brunneri* Beier, *Revis. Pseud.,* **1** : 64

1962. *Chloracris brunneri* Beier, *Das Tierreich,* **73** : 48-49

Material examined : Sikkim. Reported from literature

Diagnosis : Green. Antennae marely dark circled distally. The margin of antennal socket wide surpassing of the vertex. Pronotum smooth and softly granulated with very fine and low transverse furrow, the margin almost smooth, tegmina more or less 3 times longer than the broad. Transverse veins only very little obliquely placed and not angled; veins of the costa of shoulder lobes are in irregular network form. Supra anal plate distally, weakly rounded, terminally broadly truncated. Female subgenital plate terminally more or less curved. Ovipositor little longer than the hind femora, at apex blackened

Distribution : India : Sikkim, and also from Bangladesh, Tonkin

Remarks : The species could not be studied in the present collection. However, the description is noted down from the literature

Tribe 3 **Phyllomimini**

Genus 15. ***Phyllozellus*** Pictet & Saussure

Diagnosis : Robust species with narrow tegmina, meso and meta sternum strongly transverse, all of them as long as wide; tymphanal cover almost always lies adjacent, rearly arched externally (extrad). Pronotum not roof-shaped, carinated; apex gradually tapering, with 2 long spines; and CU of Tegminapedunculate basally; hind femora without spines dorsally, exteroventrally considerably long spines

18. ***Phyllozellus siccus*** (Walker)

1869. *Pseudophyllus siccus* Walker, *Cat. Derm. Salt. Brit. Mus.;* **2** : 403

1962. *Phyllozellus siccus* : Beier, *Das Tierreich,* **73** : 102

Material examined : Sikkim; Reported from literature

Diagnosis : This species is easily known by the curious rugose erosion path in the anal area of the tegmina and by the peculiar venal pattern. The subcostal and radial veins diverge about the same place, where the branch of the radial vein finds its origin namely a little before the middle

of the tegmina, the hind femora ventrally bear thorns which are of equal length

Distribution : This species could not be studied in the present collection. However, the description is noted down from the literature

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INSECTA : DERMAPTERA

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INTRODUCTION

The present study deals with 50 species belonging to 30 genera, is based upon the specimens present in the Zoological Survey of India and information available through literature. Besides five other species recorded from the area based either upon females/nymphs or doubtful identifications are not included in the main text and listed at the end.

Following synonymies are proposed i.e., *Chaetospania assamensis* Sakai, 1997, *Opisthocosmia rimosae* Zhang, Ma & Chen, 1992 and *Forficula stenotica* Zhang and Yang, 1992 under *Irdex nitidipennis* (Bormans, 1894), *Pterygida temora* (Burr, 1904) and *Forficula genitalia* Kapoor, 1968, respectively.

Fauna of the State is an interesting admixture of different faunal elements. In the foot hills and forested slopes tropical forms are more common which are the derivatives of Indo-Malayan and Chinese elements. There is preponderance of Palaearctic forms at higher altitudes between 2500 m and above 4000 m.

High altitude melanism besides black colour is manifested by bright reddish orange on head or whole body in the individuals of certain species above 3500 m.

Occurrence of a large number of specimens at one or different localities for the same or other species confirms the phenomenon of congregation in high altitude insect fauna.

Key to various taxa

1(10). Neck blattoid type i.e., (fig. 2) anterior and posterior cervical sclerites anterior to prosternum separated from each other but hind margin of posterior sclerite may be separate or fused with apical margin of prosternum ..... PYGIDICRANOIDEA (PYGIDICRANIDAE)

2(3). Antennal segments 4-5 transverse, 25 segmented or more ..... PYGIDICRANINAE

(Parameres neither knobed nor hooked externally or internally, occasionally external apical angle with a convexity, may be inflated internally; narrow, of uniform width or dilated at base and tapering apaically, tip hooked or befid (fig. 4). ..... *Acrania* Burr

(Penultimate sternite broadly rounded posteriorly with a faint emargination in middle and margin normal (not thickened); ultimate tergite not strongly rugose; forceps stout, externally at base with a strong emargination, internal margin arcuate enclosing a rhomboidal space) (Fig. 3) .... *A. constricta* (Hincks)

3(2). Antennal segments 4-6 longer than broad, 20 segmented or less

4(9). Femora cosmpressed with sharp longitudinal ridges; male genitalia with parameres armed internally in various ways ..... DIPLATYINAE

(Parameres usually simple, internally without any prominent teeth, occasionally margin undulate, feebly emarginate or provided with fine serrations.) .... *Haplodiplatys* Hincks

5(8). Penultimate sternite trisinuate posteriorly

6(7). Posterior median lobe short, distinctly emarginate, postero-lateral angles sharp, projecting; parameres straight gradually narrowing from base to apex with tip pointed, arms of virga without membranous flange (figs. 5-6) .... *H. trisinuatus* Srivastava

7(6). Posterior median lobe broad, shallowly emarginate, postero-lateral angles rounded; parameres apically hooked, tip obtuse, arms of virga provided with flange (figs. 7-8)..... ..... *H. malaisei* (Hincks)

8(5). Penultimate sternite not trisinuate posteriorly, instead with a deep emargination in middle, parameres with tip pointed, external margin undulated, internal margin shallowly emarginate, virga shorter than distal lobes (figs 9 10) .... *H. rileyi* (Hincks)

9(4). Femora not compressed, usually smooth; male genitalia with parameres unarmed (Pygidium vertical, forceps trigonal in basal one third afterwards depressed (figs. 11 12) .....PROLABISCINAE Bey-Bienko ..... *Parapsalis* Borelli ..... *P. infernalis* (Burr)

10(1). Nect forficuloid type, i.e., (fig. 1) anterior and posterior cervical sclerites fused and the hind margin of latter joined with anterior margin of prosternum

11(37). Male genitalia with two functional distal lobes, often one of them reduced or atrophied (figs. 4, 6, 8, 10, 12, 14, 17, 18)

12(36). Pygidium in both sexes vertical with its hind margin not free; forceps partially trigonal near base and afterwards moderately depressed or cylindrical .... ANISOLABOIDEA

13(25).Male genitalia, if virga present, usually not wider at base and without a sinuous inner tube; otherwise denticulate pads present ANISOLABIDIDAE ..... ANISOLABIDINE

14(20).Parameres narrow, three times longer than broad,at base armed with a large or small tooth ..... *Aborolabis* Srivastava

15(19).Sides of certain abdominal segments carinate

16(17).Apterous; sides of abdominal segments 6-9 acute angled posteriorly, striate and carinate (ultimate tergite transverse; forceps stout or weak, strongly incurved in apical half; paramere narrow, basal tooth about as long as parameres (figs. 13–14) .... *A. pervicina* (Burr)

17(16).Elytra and wings well developed or former abbreviated and latter absent; sides of abdominal segments 6-9 obtuse angled, rugosely punctate and with a linear convexity (ultimate tergite transverse; forceps with branches at base sub-contiguous, left branch straight, incurved gently in apical one third; and right branch incurved in middle; paramere narrow, basal tooth comparatively broader; about as long as paramere (figs. 15–17) .... *A. sikkimensis* Srivastava

19(15).Sides of abdominala ecarnite 6-9 acute angled posteriorly, tergites above finely punctulated; peultimate sternite posteriorly rounded; ultimate tergite quadrate; forceps with branches contiguous, almost straight, apices gently incurved; parameres narrow, basal tooth about the same size and shape as paramere (fig. 18) .... *A. kalaktangensis* Srivastava

20(14).Parameres unarmed at base, about as long as broad, square and flat, external margin convex ..... *Euborellia* Burr

21(22).Usually apterous (legs yellow, often femora with a broad brownish or blackish ring; parameres with external apical angles

rounded (figs. 19–20) .... *E. annulipes* (Lucas)

22(21).Elytra present as narrow ovate flaps on sides of mesonotum; wings absent

23(24).Size larger (10 13 mm); head yellowish brown; sides of abdominal segments recurved; parameres with external apical angle a little projecting (21–22) .... *E. annandalei* (Burr)

24(23).Size smaller (8 11 mm); head black; sides of abdominal segments not recurved, external apical angle of paramere not projecting and with a distinct inner apical concavity (fig. 23) .... *E. annulata* (Fabricius)

25(13).Male genetalia with distinct virga, dilated at base with a distinct inner sinuous tube ..... LABIDURIDAE

26(27).Elytra with a sharp ridge along the costal margin; legs relatively short, posterior femora not longer than pronotum .... NALINAE ..... Nala Zacher

(Elytra and wings smooth, pubescent; forceps in basal half dilated internally, afterward thin and cylindrical; parameres narrowed apically with tip pointed (figs. 24–25) ..... *N. nepalensis* (Burr)

27(26). Elytra without any sharp ridge along the costal margin; legs longer, posterior femora longer than pronotum .... LABIDURINAE

28(29).Sides of abdominal segments without spines or crests; forceps stout and arcuate; parameres apically without a distinct epimerite (figs. 26–27) .... *Labidura* Leach ..... *Labidura riparia* (Pallas)

29(28). Sides of certain abdominal segments, in normal males, with spines or crests; forceps long and slender, generally arcute in basal half, afterwards almost straight; parameres apically with an epimerite .... *Forcipula* Bolivar

30(35).Sides of certain abdominal segments with a sharp spine

31(34).Forceps in the middle of basal remote part with a sharp spine

32(33). Body covered with short and long dense pubescence; elytra and wings well developed; pronotum about as long as broad; sides of abdominal segments 3-5 with a sharp spine (directed externally); forceps with a sharp internal spine in middle of remote basal part, directed internally (figs. 28–29) .... *F. trispinosa* (Dohrn)

33(32).Body covered with fine and sparse pubescence; elytra well developed but wings concealed; sides of abdominal segments 3-5 with a hooked spine and on 6th a small tubercle present; forceps with a sharp spine directed posteriorly, followed by a small tubercle internally in the middle of basal remote part (figs. 30–31) .... *F. borellii* Chopard

34(31).Forceps internally crenulated (not with spine) in basal remote part

(Body covered with fine and less dense pubescence except on wings; forceps crenulate internally in the remote basal part in normal forms, in minor forms forceps almost straight or gently undulate in middle) (figs. 32–33) .... *F. indica* Brindle

35(31).Sides of certain abdominal segments with a pair of spines, often of unequal size or poorly developed(figs. 33–34) .... *F. abbreviata* Srivastava

36(12).Pygidium in both sexes forming a flat process with hind margin free; forceps with branches broad and flat (figs. 36–37) .... APACHYOIDEA ..... *Apachyus* Serville ..... *A. feae* Bormans

37(11).Male genitalia with a median basal portion (Proparamere) and distal lobe .... FORFICULOIDEA

38(49).Second tarsal segment simple .... SPONGIPHORIDAE

39(48).Second tarsal segment broader than long or about as broad as long

40(41). Hind tarsi comparatively long & slender, 1st segment over five times longer than broad (elytra smooth, occasionally costal margin with a row of small rubercles, each with a thick setae) ..... IRDEXINAE
..... *Irdex* Burr
..... *I. nitidipennis* (Bormans)

(=*Chaetospania assamensis* Sakai 1997 **Syn. n.**)
(figs. 38 – 39)

41(40).Hind tarsi comparatively short and thick, 1st segment three to four times longer than broad (body weakly depressed or convex, head convex, pronotum gently narrowed)
..... LABIINAE

42(43).Male genitalia with parameres deeply excised, with an external and internal lobes (penultimate sternite, in middle, produced posteriorly into a long spine) .....
..... *Labia* Leach
..... *L. minor* (L)
(figs. 40 – 41)

43(42).Male genitalia with parameres entire (not excised)

44(45).Eyes large or very large, as long or longer than the length of head behind eyes.....
..... *Apovostox* Hebard
..... *A. agrawali* Srivastava
(fig. 42)

45(44).Eyes small, normally shorter than length of head behind eyes

46(47).Branches of forceps of both sexes not strongly setulose; those of male without a ventral inner flange and of female narrowed from base to apex with inner margin never strongly dentate or crenulate .....
..... *Circolabia* Steinmann

(Forceps dilated in basal half only, strongly incurved in apical half, pygidium scarcely visible from above) .....
..... *C. curvicauda* (Motschulsky)
(fig. 43)

47(46). Branches of forceps both sexes strongly setulose, bearing numerous long stiff hairs; those of male with or without a vental flange, and of female not narrowed from base to apex but almost parallel-sided for most of the length, and inner margin with at least a ventral inner flange, the margins of which strongly dentate or crenulate....
..... *Chaetospania* Karsch

Head transverse, depressed, both head and pronotum usually punctured and pubescent at least partially; branches of forceps in both sexes usually with a ventral inner flange, or this weakly indicated; abdomen strongly depressed (figs. 44 45) .....
..... *C. feae* (Bormans)

48(39).Second tarsal segment longer than broad (hind tarsal segment, in profile, almost of uniform width, only scarcely narrowed basally and slightly shorter than third, first segment slightly longer than the combined length of last two segment) .....
..... HOMOTAGINAE
..... *Homotages* Burr
..... *H. feae* (Bormans)
(fig.46)

49(38).Second tarsal segment dilated or produced in the form of a narrow lobe below the third segment

50(57).Antennae 17-22 segmented; second tarsal segment spiniform, extending below, upto the middle of third, visible from sides only
..... CHELISLOCHIDAE

51.(52).Elytra along the costal margin with a sharp ridge, often not complete .....
..... CHELISOCHELLINAE
..... *Chelisochella* Burr

(Build stout, elytra with purple metallic sheen; tibae hardly sulcate above at extreme apex; forceps stout, broadly incurved, internally at base with a bifid tooth, afterwards margin serrate near apex one sharp tlooth present (figs. 47 48).....
..... *C. suparba* (Dohrn)

52(51).Elytra along the costal margin without any ridge..... CHELISOCHINAE

53(56). Elytra and wings smooth and glaberous; genitalia with parameres four to five times longer than broad, occasionally feebly dilated in middle or feebly emarginate apically a little before apex

54(55).Tibiae sulcate above in distal half

(Head strongly depressed; pronotum quadrate; legs with tarsi short; genitalia with parameres feebly emarginate apically, a little before apex (figs. 49 – 50) .... *Laprophorella* Mjöberg ..... *L. kervillei* (Burr)

55(54).Tibiae smooth above, only at extreme apex sulcate; wings with metallic lustre..... .....*Adiathetus* Burr

(Build stout; elytra and wings with brillient purple lusture, finely granulose; forceps with branches flattened in basal half with its inner margin strongly serrated, afterward gently incurved (fig. 51) .... *A. shelfordi* (Burr)

56(53).Elytra and wings punctured and pubescent; genitalia with parameres twice as broad as long, greatly dilated in middle .....

.....*Hamaxas* Burr ..... *H. feae* (Bormans) (fig.52 – 53)

57(50).Antennae 12-16 segmented; second tarsal segment lobed, visible from above on either side of third segment (fig. 60) .... FORFICULIDAE

58(72).Antennal joints long and slender, 4th longer than the 3rd or almost equal, both of similar build, i.e., slender (fig. 63)

59(62).Elytra with a sharp ridge along the costal margin.....COSMIELLINAE .....*Liparura* Burr

60(61).Abdomen faintly punctate, sides of segments 4-7 not recurved, an oblique ridge present on segment 5 & 6 only; forceps cylindrical, internal margin smooth, except for a small tooth in middle (figs. 54 – 55) ..... *L. kamengensis* Srivastava

61(60).Abdomen deeply punctate, sides of segments 4-7 recurved, with an oblique serrated ridge; forceps depressed, inner margin crenate and with a strong tooth in middle (fig. 56) ..... *L. serrata* Srivastava

62(58).Elytra without any ridge along the costal margin..... OPISTHOCOSMIINAE

63(68).Hind tarsi with 1st segment distinctly longer than the remaining two together

64(65).Build slender; pronotum slightly longer than broad, anteriorly narrowed than the head .....*Paracordax* Srivastava .....*P. politus* (Burr) (fig. 57)

65(64).Build comparatively stouter; pronotum about as long as broad, anteriorly as broad as head .....*Eparchus* Burr

66(67).Sides of abdominal segments 5 or 5-8 with a conical tubercle; forceps horizontal at base with a strong rounded tubercle above, often weakly developed (fig. 58) ....*E. insignis* (Haan)

67(66).Sides of abdominal segments 7-9 convex or obtuse angled with an oblique serrated ridge, sometimes ridge absent; forceps undulated with a faint ridge or strong tooth above close to inner margin at basal two thirds (fig. 59) .....*E. simplex* (Bormans)

68(63).Hind tarsi with 1st segment almost equal to 3rd and 2nd broadly lobed

69(72).Parameres narrow, aciculata ....*Timomenus* Burr

70(71).Stout build; general colour shining black with lusture, forceps with branches elongated, at basal one fourth with a triangular and incurved tooth, another small tooth on upper border, a little beyond middle internally (figs 60 – 61) .... *T. lugens* (Bormans)

71(70).Slender build; general colour brown to black with greenish sheen; forceps with branches more selender and elongated, armed at basal one third with a vertical, triangular tooth, hardly incurved and a more compressed, another internal tooth present on upper border in apical one third (fig. 62) ..... *T. nevilli*(Burr)

72(69).Parameres broad and flat..... .....*Paratimomenus* Steinmann

(General colour blackish brown; head, sides of pronotum and legs yellow; forceps

remote, almost straight, incurved at apices, internally at about middle with a sharp flattened tooth directed posteriorly (figs. 63 – 64) ..... *P. brahma* (Burr)

73(58).Antennal joints shorter and wider, occasionally apical ones long and slender, 4th shorter or almost equal to 3rd but former always wider (fig. 79)

74(77).Mesosternum broader than long

75(76).Elytra with a sharp ridge along the costal margin..... ALLODAHLINAE ..... *Allodahlia* Verhoeff

(Wings basally with a yellow spot; elytra and abdomen finely punctulated and pygidium aciculate (figs 65 – 66) .... *A. ahrimanes* (Burr)

76(75).Elytra without a ridge along the costal margin..... ANECHURINAE .....*Anechura* Scudder

(Pygidium short transveres; forceps at base internally with a triangular tooth, afterwards blanches cylindrical, long, gently incurved or short, strongly incurved (fig. 67 68) ..... *A. stoliczkae* (Burr)

77(74).Mesosternum about as broad as long

78(83). Forceps generally curved or elongated, cylindrical, not deplanate at base..... .....EUDOHRNIINAE

79(80).Body with meallic sheen; deeply and densely punctate; antennal segments stout ..... *Paradohrnia* Shiraki

(Forceps slightly longer than the body; pygidium short, bilobed, deeply emarginate in middle (figs 69 71)..... ..... *P. uniformes* (Brindle) ..... (=*P. longiforceps* Srivastava)

80(79).Body without metallic sheen; elytra smooth; antennal segment slender..... ..... *Pterygida* Verhoeff

81(82).Forceps internally with two pairs of teeth (figs 72 – 73) .....*P. temora* (Burr) (= *Opisthocosmia ramosae* Zhang, Ma & Chen, 1992 **Syn. n.**)

82(81).Forceps internally with a pair of teeth (fig. 74) ..... *P. vishnu* (Burr)

83(78).Forceps in most of the species deplanate in basal half or less, afterwards cylindricala or depressed ..... *FORFICULINAE*

84(85).Elytra abbreviated, obliquely truncate posteriorly; ultimate tergite narrowed posteriorly ..... *Guanchia* Burr

(Body smooth; pronotum transverse; sides of abdominal segments 6-8 obtuse angled, ultimate tergite lacking inverted V-shaped carina and forceps with inner basal lamellation directed upwards (figs 75 76) .....*G. chirurga* Burr

85(84).Elytra ample, rarely abbreviated, with hind margin truncate, not oblique and ultimate tergite not narrowed posteriorly .... *Forficula* Linnaeus

86(87).Pronotum semicircular, sides convex, with rounded hind margin forming a sort of arc (General colour smoky brown to reddish brown; pronotum on sides, elytra and wing yellow; forceps dilated internally in basal one third, afterwards branches cylindrical, strongly incurved with apices crossing (figs 77 81) ..... *F. genitalia* Kapooar, 1968 (=*Forficula stenotica* Zhang & Yang, 1992 **Syn. n.**).

87(86).Pronotum quadrate, often hind margin rounded or obtuse in middle, sides straight

88(91).Pygidium distinct, longer than broad

89(90).Size larger (11.9-17.9 mm, including forceps); pronotum weakly transverse; pygidium at base partially hidden by inner lamellation of forceps, hind margin convex; forceps deplanate in basal half or a little less with its inner margin crenulate, afterwards abruptly attenuated, almost straight or gently incurved near apices (fig. 82) .....*F. beelzebub* (Burr)

90(89).Size smaller (9.3-10.0 mm, including forceps); pronotum strongly transvers; pygidium fully exposed, narrowed in middle, hind margin straight, posterolateral

angles with minute point and a median dorsal spine present close to hind margin; forceps near base with a faint tubercle above, not lamellate internally (fig. 83) .... *F. beebei* Burr

91(88).Pygidium small, broader than long, generally obtuse or pointed apically

92(97).Pronotum weakly transverse (fig. 84)

93(96).Size larger (13.9-17.4 mm, including forceps); forceps dilated in basal half or a little beyond

94(95).Elytra and wings well developed; legs with femora black or dark brown; abdominal tergite punctulate; forceps dilated internally in basal half (figs. 84 – 86) .... *F. tawangensis* Srivastava

95(94).Elytra abbareviated; wings concealed; legs with femora dirty yellow; abdominmal tergites punctate; forceps dilated internally in a little beyond basal half only (figs 87 88) .... *F. jayarami* Srivastava

96(93).Size smaller (7.0-10.7 mm, including forceps); legs uniformly coloured; abdominal atergites punctate; forceps dilated internally in basal one fourth only (figs. 89 – 90) ..... *F. planicollis* (Kirby)

97(92).Pronotum strongly transverse (figs. 91, 93)

98(99).Elytra and wings short; pronotum narrowed posteriorly; forceps with basal dilation crenulate along the inner margin, afterwards branches depressed, in cross-section quadrangular (figs 91 – 92) .... *F. bhutanensis* Brindle

99(98). Elytra and wings longer; if elytra short, wings concealed or wanting; forceps at base with a large blunt tooth, afterwards branches cylindrical, in cross section rounded (figs 93 – 95) .... *F. schlagintweiti* (Burr)

DISTRICTWISE DISTRIBUTION OF SPECIES WITH ALTITUDINAL RANGE

Name of the taxa	Name of the Districts				Altidudinal range (in m)
	North	South	East	West	
PYGIDICRANIDAE					
PYGIDICRANINAE					
Acraina constricta (Hincks)	+				Not given
DIPLATYINAE					
Haplodiplatys trisinuatus Srivastava	+				1029
Haplodiplatys malaisei (Hincks)			+		1709
Haplodiplatys rileyi (Hincks)	+		+		1442-1823
PROLABISCINAE					
Prolabisca infernalis (Burr)	+				1176
ANISOLABOIDEA					
ANISOLABIDIDAE					
ANISOLABIDINAE					
Aboarolabis pervicina (Burr)				+	400
Abrolabis sikkimensis Srivastava			+		400
Aborolabis kalaktangensis Srivastava			+		400

Name of the taxa	Name of the Districts				Altidudinal range (in m)
	North	South	East	West	
Euborellia annulipes (Lucas)			+		400
Euborellia annandalei (Burr)			+		400
Euborellia annulata (Fabricius)			+	-	400
LABIDURIDAE					
NALINAE					
Nala nepalensis (Burr, 1907)			+	+	400-950
LABIDURINAE					
Labidura riparia (Pallas)				+	400
Forcipula trispinosa (Dohrn)		+	+	+	356-1211
Forcipula borellii Chopard	+				1944
Forcipula indica Brindle			+	+	400-830
Forcipula abbreviata Srivastava				+	1386-1849
APACHYOIDEA					
APACHYIDAE					
Apachyus feae Bormans			+		400
FORFICULOIDEA					
SPONGIPHORIDAE					
IRDEXINAE					
Irdex nitidipennis (Bormans)		+	+	+	1650-2297
LABIINAE					
Labia minor (L)			+		1550
Apovostox agrwali Srivastava		-	+	-	1800
Circolabia curvicauda (Motschulsky)	+		-	+	1130-1176
Chaetospania feae (Bormans)	+		+		1147-1650
HOMOTAGINAE					
Homotages feae (Bormans)	+		+	+	1176-1823
CHELISOCHIDAE					
CHELISOCHELLINAE					
Chelisochella superba (Burr)					Not given
CHELISOCHINAE					
Laprophorella kervillei (Burr)			+		830-1515
Adiathetus shelfordi (Burr)		-		-	Not given
Hamaxas feae (Bormans)			-	+	400
FORFICULIDAE					
COSMIELLINAE					
Liparura kamengensis Srivastava	+				2310-4851
Liparura serrata Srivastava	+				4581
OPISTHOCOSMIINAE					
Paracordax politus (Burr)	+			-	1927
Eparchus insignis (Haan)			+		400-1176

Name of the taxa	Name of the Districts				Altidudinal range (in m)
	North	South	East	West	
Eparchus simplex (Bormans)				+	2297
Timomenus lugens (Bormans)		+	+		1200-1176
Timomenus nevilli (Burr)	+			+	400-1550
Paratimomenus brahma (Burr)	+		+		1442-1640
ALLODAHLINAE					
Allodahlia ahrimanes (Burr)					Not given
ANECHURINAE					
Anechura stoliczkae Burr	+				2165-2620
EUDOHRNIINAE					
Paradohrnia uniformes (Brindle)	+				3845
Pterygida temora (Burr)	+				1200-1367
Pterygida vishnu (Burr)			+		1759
FORFICULINAE					
Guanchia chirurga Burr	+			+	3500-4917
Forficula genitalia Kapoor				+	1176-1323
Forficula beelzebub (Burr)	+				3277
Forficula bebeei Burr	+				2620-3750
Forficula tawangensis Srivastava			+		1550
Forficula jayarami Srivastava	+				2165
Forficula planicollis (Kirby)		+			1230
Forficula bhutanensis Brindle	+				2871-4686
Forficula schlagintweiti (Burr)	+				2620-3500

DOUBTFUL SPECIES AND REJECTED RECORDS

Haplodiplatys rufescens (Kirby)

Forcipula quadrispinosa (Dohrn)

Anechura zubovskii Semenov

Haplodiplatys urbanii Brindle

Allodahlia guptae Kapoor

SYSTEMATIC ACCOUNTS

PYGIDICRANOIDEA
PYGIDICRANIDAE
PYGIDICRANINAE

1. ***Acrania constricta*** (Hincks, 1955)
(figs. 3–4)

Remarks : Record of this species from Sikkim (North) rests on 'Paratype 1 Male; Sikkim, Gopal Dhara, Rongbong Valley' by Hincks (1959, p. 101).

Distribution : India : Sikkim (as above); West Bengal (Darjeeling dist.).

Also reported from Bhutan.

DIPLATYINAE

2. ***Haplodiplatys trisinuatus*** Srivastava, 1988
(figs. 5–6)

Material examined : India : Sikkim (North), Chungthang, *ca* 1029 m, Holotype Male, 11.8.1979 (*S.M. Ali* coll.).

Remarks : It is known by its Holotype Male only.

Distribution : As above.

3. ***Haplodiplatys malaisei*** (Hincks, 1947)
(figs. 7–8)

Material examined : India : Sikkim : (East), Gangtok, 1 Male (genitalia mounted between two coverslips and pinned with the specimen), 1 Female, 4 nymphs, *ca* 1709 m, 3.6.1979 (*M. S. Shishodia* coll.), determined by G. K. Srivastava, 1979.

Distribution : India : Sikkim (as above).

Originally described from Myanmar (N.E., Kambaiti, 7000 ft).

4. ***Haplodiplatys rileyi*** Hincks, 1955
(figs. 9–10)

Remarks : From Sikkim this species is recorded on Male, Female from Gangtok and Singhik (Hincks, 1955, p. 74).

Distribution : India : Sikkim (North & South) Gangtok & Singhik) and West Bengal (Darjeeling dist.).

PROLABISCINAE

5. ***Prolabisca infernalis*** (Burr, 1913)
(figs. 11–12)

Material examined : India : Sikkim (North), Mangan, 7 Females, 9 nymphs, *ca* 1176 m, ex rotten wood, 10.9.1983 (*G. K. Srivastava* coll.).

Distribution : India : Sikkim (as above), West Bengal (Darjeeling & Jalpaiguri dists); Arunachal Pradesh and Meghalaya.

Also recorded from Bhutan, China (Yunnan), Taiwan and Borneo.

ANISOLABOIDEA
ANISOLABIDIDAE
ANISOLABIDINAE

6. ***Aborolabis pervicina*** (Burr, 1913)
(figs. 13–14)

Material examined : India : Sikkim (West), Nayabazar, Likship Road, 9 Male, 11 Females, 9 nymphs, *ca* 400 m, 4.1.1976 (*G. K. Srivastava* coll.).

Distribution : India : Sikkim (as above); West Bengal (Darjeeling dist.), Arunachal Pradesh, Meghalaya and Himachal Pradesh.

7. ***Aborolabis sikkimensis*** Srivastava, 1993
(figs. 15–17)

Material examined : India : Sikkim (East), Rangpo, 1 Male (genitalia mounted between two coverships and pinned with the specimen), 2 Females, ex debris, *ca* 400 m, 19.9.1983, (*G. K. Srivastava* coll.).

Distribution : India : Sikkim (East) (as above); West Bengal (Darjeeling dist.) and Arunachal Pradesh.

8. ***Aborolabis kalaktangensis*** Srivastava, 1972 (fig. 18)

Material examined : India : Sikkim (East), Rangpo, 1 Male, *ca* 400 m, 19.9.1983, ex debris (*G.K. Srivastava* coll.).

Distribution : India : Sikkim (as above) and Arunachal Pradesh.

9. ***Euborellia annulipes*** (Lucas, 1847) (figs. 19–20)

Material examined : India : Sikkim : (East), Sikkim, Rangpo, 2 Males (genitalia amounted between two coverslips and attached to the pin of the specimens), 1 Female, 5 nymphs, *ca* 400 m, 19.9.1983, ex debris (*G. K. Srivastava* coll.).

Distribution : India : Sikkim (as above); practically all over India.

It has world wide distribution but more common in tropical and subtropical regions.

10. ***Euborellia annandalei*** (Burr) (figs. 21–22)

Material examined : India : Sikkim (East) : Rangpo, 1 Male (genitalia mounted between two coverslips and attached to the pin of the specimen), *ca* 400 m, ex under bark of standing tree, 25.12.1975 (*G. K. Srivastava* coll.).

Distribution : India : Sikkim (as above), West Bengal (Darjeeling dist.); Bihar and Assam.

11. ***Euborellia annulata*** (Fabricius, 1793) (fig. 23)

Material examined : India : Sikkim (East), Rangpo, 1 Male (genitalia mounted between two coverslips and pinned with the specimen), 2 Females, *ca* 400 m, 19.9.1983, ex debris (*G.K. Srivastava* coll.).

Distribution : India : Sikkim (as above); West Bengal, Madhya Pradesh, Tamil Nadu, Karnataka and Rajasthan.

Also distributed widely in the Oriental and Eithopian Regions.

LABIDURIDAE
NALINAE

12. ***Nala nepalensis*** (Burr, 1907) (figs 24–25)

Material examsined : India : Sikkim (East) : Rangli, 2 Males, 8 Females and 3 nymphs, *ca* 950 m, 23.12.1975 (*G.K. Srivastava* coll.) : (West) Nayabazar, Likship Road, 1 Male, *ca* 400m, 4.1.1976 (*G.K. Srivastava* coll.).

Distribution : India : Sikkim (as above); West Bengal (Darjeeling dist.); Meghalaya, Mizoram, Arunachal Pradesh, Jammu and Kashmir, Uttar Pradesh (Himalaya) and Himachal Pradesh.

Also known from Pakistan, Nepal, Bhutan, Malaya and Indo-China.

LABIDURINAE

13. ***Labidura riparia*** (Pallas, 1773) (figs 26–27)

Material examined : India : Sikkim (West), Sispu, 11 km West of Nayabazar, *ca* 400 m, 3 Males, 1 nymph, 9.3.1989 (*D.K. Mandal* coll.); Jorathang, Ranjit River bank, 1 Male, 12.3.1984 (*Y. Chaturvedi* and *K.C. Kansal* coll.).

Distribution : India : Sikkim (as above), practically all over the country.

World wide in distribution.

14. ***Forcipula trispinosa*** (Dohrn, 1863) (figs. 28–29)

Material examined : India : Sikkim : (East), Rangpo, 1 Male, *ca* 400 m, ex under bark, 25.12.1975 (*G.K. Srivastava* coll.).

Distribution : India : Sikkim (above and after Sakai, 1997, p. 48 from (South) Samdong, *ca* 1211 m, Nampung, *ca* 1103 m and (West) Nayabazar, *ca* 356 m); West Bengal (Darjeeling dist.), Meghalaya, Assam, Mizoram, Arunachal Pradesh, Uttar Pradesh (Himalaya).

Also recorded from Bhutan, Nepal and Afghanistan.

15. ***Forcipula borellii*** Chopard, 1924
(figs. 30–31)

Remarks : Sakai (1997, p. 48) has reported this species from 'Sikkim (North), F. Schmid legit; Ramtang, *ca* 1413-1849 m, 3.iv.1959, 1 Male'

Distribution : India : Sikkim (as above); Meghalaya, Mizoram and Arunachal Pradesh.

16. ***Forcipula indica*** Brindle, 1966
(figs. 32–33)

Material examined : India : Sikkim (East) : Rangli, 4 Females, 3 nymphs, 18.12.1975, 1 male, 1 nymph, 23. 12. 1975 (*G. K. Srivastava* coll.); (West) : Jorathang, bank of Ranjit River, 1 Male, 1 Female and 5 nymphs, 12.3. 1984 (*Y. Chaturvedi* and *K. C. Kansal* coll.); Chonpung, 1 Male, 27.10.1959; Tingling, 1 Female, 28.10.1959 (*B. K. Tikader* coll.).

Distribution : India : Sikkim (as above); Meghalaya, West Bengal (Darjeeling dist.).

Also recorded from Nepal, Bhutan.

17. ***Forcipula abbreviata*** Srivastava, 1986
(figs. 34–35)

Material examined : India : Sikkim (East) : Gangtok, 1 Male, *ca* 1760 m, 2.10.1983 (*G. K. Srivastava* coll.); Singtam, 1 Male, *ca* 1515 m, 5.4.1959 (*A. G. K. Menon* coll.).

Remarks : Sakai (1997) has reported *Forcipula decolyi* Bormans from Assam, Manipur, Mizoram and Sikkim (West: Hi, *ca* 1386-1815 m, 1 Female and 4 nymphs, *ca* 1413-1849 m, 1 Males, 2 Females; Samdong, *ca* 1413 m, 3 Males; and Singbeng, *ca* 1654 m, 1 Male). Srivastava (1986) has pointed out that specimens referred to this species from India and adjacent countries actually belong to *F. abbreviata* Srivastava.

Distributiuon : India : Sikkim (as above); West Bengal (Darjeeling dist.) and Arunachal Pradesh.

Also recorded from Bhutan and Nepal.

APACHYOIDEA
APACHYIDAE

18. ***Apachyus feae*** Bormans, 1894
(figs. 36–37)

Material examined : India : Sikkim, 6 nymphs (no further data), det. by M. Burr as *Apachyus feae* Bormans; (East) : Rangpo, 400 m, 1 Female, 2.8.1970 (*P. Halder* coll.).

Remarks : Since this is the only known species from Indian subcontinent the above identification may be considered as correct. The measurements of above female specimen are : body 26.0 mm and forceps 5.0 mm.

FORFICULOIDEA
SPONGIPHORIDAE
IRDEXINAE

19. ***Irdex nitidipennis*** (Bormans, 1894)
(figs. 38–39)

Chaetospania assamensis Sakai, 1997, *Bull. Biogeogr. Soc. Japan*, **52**(2) : 45, figs. 1-4 (Male, Female; India : Assam, Manipur and U.P. (Pauri Garhwal) and Sikkim – Holotype Male, Allotype Female & Paratypes Males & Females deposited in Agriculture Canada, Biosystematics Research Institute, Ottawa, Ontario, Canada and Paratype Male deposited in Institute of Life Sciences, Daito Bunka University, Saitama, Japan.) - **Syn n.**

Material examined : India : Sikkim (South) : Namchi, 1 Male,1 example (Brachypterous), *ca* 1650 m, 16.9.1983 (*G.K. Srivastava* coll.); Ravangla, 1 Male (Brachypterous), *ca* 1850 m, 3.5.1998 (*A. K. Hazra* coll.); (East): Gangtok, 3 Males, 7 Females (Brachypterous) & 5 nymphs, *ca* 1550 m, ex bamboo sheath, 6.3.1979 (*S. K. Saha* coll.).

Remarks : The coloured photographs of *Chaetospania assamensis* sent by Prof. Sakai show that this species is nothing else but *Irdex nitidipennis* (Bormans, 1894). For this reason *Chaetospania assamensis* Sakai, 1997 is considered as synonym of *Irdex nitidipennis* (Bormans, 1894).

Srivastava (1985) has elaborately clarified the status of *I. nitidipennis* while discussing intraspecific variations.

Distribution : India : Sikkim (as above and (West) Benlagla, *ca* 2066 m, Bakkim, *ca* 2297 m); West Bengal (Darjeeling dist.), Assam, Meghalaya, Mizoram and Arunachal Pradesh.

Also recorded from Bhutan, Myanmar, Vietnam, Java and Hainan Is.

LABIINAE

20. ***Labia minor*** (Linnaeus, 1758) (figs. 40–41)

Material examined : India : Sikkim (East) : Gangtok, 1 Male, 1 Female, *ca* 1550 m, ex soil litter, 7.9.1978 (*A.C. Mishra* coll.).

Distribution : India : Sikkim (as above); West Bengal, and Tamil Nadu. Also widely distributed in Oriental, Ethiopian, Palaearctic and Neotropical regions.

21. ***Apovostox agrawali*** Srivastava, 1999 (fig. 42)

Material examined : India : Sikkim (East): Tumin, Holotype Male, *ca* 1800 m, 26.9.1988 (*V. C. Agrawala* coll.); Assam, Chingsao, *ca* 1254-1782 m, 13.6.1960 (*F. Schmid* coll.) det. by S. Sakai as *Chaetospania* c.f *foliata* (Burr).

Distribution : India : Sikkim and Assam (as above).

22. ***Circolabia curvicauda*** (Motschulsky, 1863) (fig. 43)

Material examined : India : Sikkim (North) : Mangan, 1 Male, *ca* 1176 m, 15.9.1983 (*G. K. Srivastava* coll.); (East) Rhenok, 5 Males, 12 Females & 4 nymphs, *ca* 1130 m, 10.3.1974, ex bamboo sheath (*S. K. Saha* coll.).

Distribution : India : Sikkim (as above) and almost throughout India.

Widely distributed in the tropics of Old and New World and partly Palaearctic.

23. ***Chaetospania feae*** Bormans, 1894 (figs. 44–45)

Material examined : India : Sikkim (East) : Gangtok, Chandmari Basti, Nathula Road, 17 Males, 23 Female, 17.12.1975, *ca* 1550 m, ex banana stem sheath (*G.K. Srivastava* coll.); (North) : Mangan, *ca* 1147 m, 1 Male, 7.3.1979, ex banana sheath (*S.K. Saha* coll.).

Distribution : India : Sikkim (as above), West Bengal (Darjeeling dist.) and Arunachal Pradesh.

HOMOTAGINAE

24. ***Homotages feae*** (Bormans, 1888) (fig. 46)

Material examined : India : Sikkim (North) : Singhik, 27 Males, 12 Females, *ca* 1823 m, 3.11.1992 (*A. K. Hazra* coll.); Mangan, 1 Male, 1 Female, *ca* 1176 m, 26.4.1976, ex under stones (*C. B. Srivastava* coll.); (East) : Tumin, 1 Male, *ca* 1800 m, 28.9.1988 (*V. C. Agrawal* coll.); (West) : Rimbi Falls, 1 Male, *ca* 1200 m, 7.8.1998; (North) near Phensong, 1 Female, *ca* 1323 m, 5.11.1992 (*A.K. Hazra* coll.).

Distribution : India : Sikkim (as above and Singbong, *ca* 1640 m); West Bengal (Darjeeling dist.); Uttar Pradesh (Himalaya), Meghalaya and Arunachal Pradesh.

Also recorded from Nepal and Myanmar.

CHELISOCHIDAE
CHELLISOCHELLINAE

25. ***Chelisochella superba*** (Dohrn, 1865) (figs. 47–48)

Remarks : Burr (1910, p. 131, figs. 89, a & b) records this species from Sikkim. Perhaps this specimen may be preserved in British Museum (Natural History), London where most of the Burr's collection is housed.

In the collections of Zoological Survey of India, Calcutta, 1 Male from Johor, Malaya (without further data) det. by Burr is present.

Distribution : India : Sikkim, Malaya, Sumatra (Mentawei Isl.) and Borneo.

CHELISOCHINAE

26. ***Laprophorella kervillei*** (Burr, 1905) (figs. 49–50)

Material examined : India : Sikkim (East) : Singtam, 1 Female, *ca* 1515m, ex bamboo sheath; Rangli, 6 Males, 1 Female, ex bamboo sheath, *ca* 830 m, 12.3.1979 (*S. K. Saha* coll.).

Distribution : India : Sikkim (as above); West Bengal, Tripura, and Arunachal Pradesh.

27. ***Adiathetus shelfordi*** (Burr, 1900) (fig. 51)

Remarks : Record of this species from India : Sikkim is after Burr (1910, p. 142).

Distribution : India (Sikkim), Malaysia and Indonesia (Borneo and Sumatra).

28. ***Hamaxas feae*** (Bormans, 1894) (figs. 52–53)

Material examined : India : Sikkim (West) : Nayabazar, Likship Road, 1 Male, *ca* 400 m, ex banana stem sheath, 4.1.1976 (*G. K. Srivastava* coll.).

Distribution : India : Sikkim (as above), West Bengal (Darjeeling dist.) and Arunachal Pradesh.

Also widely distributed in the Oriental Region.

FORFICULIDAE
COSMIELLINAE

29. ***Liparura kamengensis*** Srivastava, 1977 (figs. 54–55)

Cosmiella (Skendyle) aptera (*nec* Verhoeff, 1902); Sakai, 1997, *Bull Biogeogr. Soc. Japan,* **52**(2) : 51 (Male, Female; India : Assam and Male, Female; Sikkim).

Material examined : India : Sikkim : (North) : Dolma Sampa, *ca* 4851 m, 1 Male, 5.vi.1960 (*F. Schmid* coll.); Assam, Talung Dzong, *ca* 2310-2574 m, 1 Female, 13.ix.1961 (*F. Schmid* coll.) both specimens det. As *Cosmiella (Skendyle) aptera* (Verhoeff, 1902) by Sakai.

Distribution : India : Sikkim (as above), Manipur and Arunachal Pradesh.

30. ***Liparura serrata*** Srivastava, 1977 (fig. 56)

Remarks : Record of this species from the area rests on "1 Male, 1 Female, Sikkim, Dolma Sampa, 4851 m, 5.6.1960 (*F. Schmid* legit)" by Sakai (1997, p. 51).

Distribution : India : Sikkim (West as above), Assam, Manipur and Arunachal Pradesh.

OPISTHOCOSMIINAE

31. ***Paracordax politus*** (Burr, 1911) (fig. 57)

Remarks : Sakai (1997, p. 50) records this species from the area as "....Sikkim (North), Ramtang, *ca* 1927 m, 18.x.1959, 1 Male, 1 Female, (*F. Schmid* legit).

Distribution : India : Sikkim (North as above), West Bengal (Darjeeling dist.), Manipur and Assam.

32. ***Eparchus insignis*** (Haan, 1842) (fig. 58)

Material examined : India : Sikkim : (East), Tadung, 1 Female, *ca* 1176 m, 21.4.1976 (*C. B. Srivastava* coll.); Rangpo, 2 Males, *ca* 400 m, 26.12.1975; Rangli, 1 Male, 21.12.1975, *ca* 830 m (*G. K. Srivastava* coll.).

Distribution : India : Sikkim (as above), Assam, Meghalaya, West Bengal and Arunachal Pradesh.

Also known from Sri Lanka, Nepal, Myanmar, Thailand, Java, Celebes and Hainam Isls.

33. ***Eparchus simplex*** (Bormans, 1894) (fig. 59)

Remarks : The record of this species from the area is after Sakai (1997, p. 50) mentioned as

"Sikkim : Bakkim, *ca* 2297 m, 2.x.1960, 1 Male (*F. Schmid* leight).

Distribution : India : Sikkim (West – as above); Meghalaya, West Bengal (Darjeeling dist.) and Arunachal Pradesh.

Also recorded from Myanmar, China, (Yunnan), Malaysia, Sumatra and Philippine Isls.

34. ***Timomenus lugens*** (Bormans, 1894) (figs. 60–61)

Material examined : India : Sikkim (South) : Upper Camaran, Namchi, 1 Male, *ca* 1200m, 30.4.1998 (*A. K. Hazra* coll.); (East) : Tadong, *ca* 1176 m, 5 Male, 24.11.1994 (*G. C. Sen* coll.).

Distribution : India : Sikkim (as above and (North) Lathong, *ca* 2187 m); West Bengal (Darjeeling dist.), Assam, Meghalaya, Manipur and Arunachal Pradesh.

Also recorded from Myanmar, China (Yunnan) and Malaysia.

35. ***Timomenus nevilli*** (Burr, 1904) (fig. 62)

Material examined : India : Sikkim : (East), Rangpo, 4 Males, 3 Females, *ca* 400 m, 23.3.1979; Gangtok, 11 Males, 2 Females, ex banana sheath, 18.3.1979, 8 Males, 13 Females, ex bamboo sheath, *ca* 1550 m, 4.3.1979 (*S. K. Saha* coll.); (North) Mangan, *ca* 1176 m, 1 Female, 11.2.1992 (*J. K. Prasad* coll.).

Distribution : India : Sikkim (as above and Dothang, *ca* 1333 m), Assam, Manipur and Arunachal Pradesh.

Also known from Bhutan, Nepal, Myanmar, and China (South).

36. ***Paratimomenus brahma*** (Burr, 1904) (figs 63–64)

Material examined : India : Sikkim (East), Gangtok, Deorali, 1 Male, 1 Female, *ca* 1442 m, ex Orchid leaves, 14.4.1981 (*R. K. Varshney* coll.); Arunachal Pradesh, West Siang dist., Kambang, 1 Male (genitalia mounted between two coverslips and attached to pin of specimen), 7.11.1985, ex bamboo stem sheath, (*G. K. Srivastava* coll.).

Distribution : India : Sikkim (as above and North Manu, *ca* 1640 m & Teng, *ca* 1533 m), Assam, Meghalaya and Arunachal Pradesh.

Also known from Bhutan.

ALLODAHLINAE

37. ***Allodahlia ahrimanes*** (Burr, 1900) (figs 65–66)

Remarks : Type locality of this species is Sikkim (Burr 1900).

Distribution : India : Sikkim, West Bengal (Darjeeling dist.) and Arunachal Pradesh.

Also recorded from Myanmar and Vietnam.

ANECHURINAE

38. ***Anechura stoliczkae*** Burr, 1911 (figs 67–68)

Material examined : India : Sikkim : (North), Zema; 2 Males (macrolabic), 2 Females, *ca* 2620 m, 3.8.1989 (*S. Chattopadhyay* coll.).

Remarks : The colour of head and abdominal tergites is red. Measurements : Male : Body – 8.0-9.5 mm, forceps – 5.5-5.9 mm; Female : body – 7.0-8.0 m, forceps – 1.5-2.0 mm.

Distribution : India : Sikkim (North as above and Lothang, *ca* 2165 m); Uttar Pradesh (Himalaya) and Himachal Pradesh.

Also known from Bhutan and Nepal.

EUDOHRNIINAE

39. ***Paradohrnia uniformes*** (Brindle, 1975) (figs 69–71)

Remarks : This species is recorded from Sikkim by Sakai (1997) as per following details "....Sikkim : Yagthang, *ca* 3845 m, 17.6.1959, 1 Male (*F. Schmid* legit)"

Distributiion : India : Sikkim (North – as above), Manipur and Arunachal Pradesh.

Also known from Bhutan.

40. ***Pterygida temora*** (Burr, 1904)
(figs. 72–73)

Opisthocosmia temora Burr, 1904, *Trans. Ent. Soc. Lond.*, **1904** : 312 (Type Male : Museum National d'Histoire naturelle, Paris; Type locality : India, West Bengal, Darjeeling).

Opisthsocosmia ramosae Zhang, Ma & Chen, 1992, *Insects of Wuling Mountains area, South Western China* : 115, fig. 1 (Holotype Male, and Paratype 1 Male; China Hunan Sangzhi, Mt. Tianping, 1630 m – deposited in Beijing Institute of Zoology, Academia Sinica) **syn. n.**

Opisthocosmia ramosae; Sakai, 1994, *Dermapterorum Cat*, **26** : 5975; Coloured photograph of Paratype Male, SS-1331, 23, 24.

Pterygida temora; Sakai, 1995, *Dermapterorum Cat.*, **27** : 6988, fig. of Holotype Male.

Pterygida temora; Sakai & Zhang, 1995, *Special Bull. Daito Bunka Univ.*, **53** : 9287; Pl. 1, fig. 4 (Male; India : U.P., Kumaon Hills, Naukuchiatal, 4100 ft.)

Opisthaocosmia ramosae; Sakai, 1997, *Bull. Biogeogr. Soc. Japan*, **52**(2) : 49 (U.P., Naukuchiatal, 1367 m and Sikkim : (North) Ramtang, 1927 m, 1 and Samdong, 1200 m, 1 male, 1 female).

Remarks : After careful comparison of diagrams of both the species, *Opisthocosmia ramosae* Zhang, Ma & Chen, 1992 and *Pterygida temora* (Burr, 1904) it is evident that former is synonym of the latter.

Occurrence of this species from Sikkim is based on the record of Sakai (1997).

Distribution : India : Sikkim (North : Ramtang, *ca* 1367 and Samdong, *ca* 1200 m); U.P. (Kumaon Hills) and West Bengal (Darjeeling dist.).

Also recorded from China (Hunan).

41. ***Pterygida vishnu*** (Burr, 1904)
(fig. 74)

Material examined : India : Sikkim : (East), Gangtok, 2 Males, *ca* 1759 m, 29.5.1979 (*M.S. Shishodia* coll.); 1 Male, *ca* 1759 m, 9.11.1989 (*S.K. Gupta & M. Prasad* coll.).

Remarks : Measurements : Male, body – 11.0-13.0 mm, forceps –9.0-9.5 mm; Female, body – 4.5-6.5 mm, forceps – 1.9-2.0 mm.

Distribution : India : Sikkim (as above); West Bengal (Darjeeling dist.).

FORFICULIDAE

42. ***Guanchia chirurga*** Burr, 1911
(figs. 75–76)

Material examined : India : Sikkim (North), 5 km NW of Lachen, *ca* 3500 m, 1 Male, 2 Female, 30.7.1989; Thangoo, *ca* 3775 m, 3 Males, 1 Female, 15.7.1989 (*S. Chattopadhyay* coll.).

Remarks : There is a trace of red on head and abdominal tergites. Measurements : Male, body – 8.0-9.5 mm, forceps – 5.0-5.5 mm; Female, body – 7.0-8.0 mm, forceps – 1.5-2.0 mm.

Distribution : India : Sikkim (as above and Tunglu (W), *ca* 3823 – 4110 m, Rongaha, *ca* 4752 m, Theulacha(S), *ca* 4917 m, Thomphyak, 4224 m, Kalep (S), *ca* 3993 m, Taling, *ca* 4058 m, Yedang (S), *ca* 3194 m and Tombu, *ca* 479 m – all in North Sikkim).

43. ***Forficula genitalia*** Kapoor, 1968
(figs. 77–78)

Forficula genitalia Kapoor, 1968, *Entomologist*, **101** : 7, pl. 4, figs. 1-4 (Holotype Male; India : West Bengal, Darjeeling dist., Darjeeling – deposited in the Entomology Division, Indian Agricultural Research Institute, New Delhi).

Forficula stenotica Zhang & Yang, 1992, *Sinozoologica*, **9** : 164, figs. 2, A-F (Holotype Male; China, Yunnan, 1320 m.

deposited in Beijing Agricultural University, Beijing)) – **Syn. n.**

Forficula genitalia; Srivastava, 1993, *State Fauna Series,* **3** : *Fauna of West Bengal* (Zool. Surv. India) : 434, figs. 215-217.

Forficula stenotica; Sakai and Zhang, 1995, *Special Bulll. Daito Bunka Univ.,* **53** : 9295 (Assam, Sikkim (West) : Dentham, *ca* 1324 m, Dethang, *ca* 1176 m).

Remarks : *Forficula stenotica* Zhang & Yang, 1992 is treated as synonym of *Forficula genitalia* Kapoor, 1968 after careful comparison of descriptions and figures of both the species.

Distribution : India : Sikkim (West : Dethang, *ca* 1176 m and Dentham, *ca* 1324 m) and West Bengal (Darjeeling dist.) and Assam.

Also recorded from China (Yunnan).

44. ***Forficula beelzebub*** (Burr, 1900) (fig. 82)

Remarks : Record of this species from the area is after Sakai (1997, p. 53 – Sikkim : Chachu, 3277 m).

Distribution : India : Sikkim (North – as above), West Bengal (Darjeeling dist.), Meghalaya, Arunachal Pradesh and Uttar Pradesh (Himalaya).

Also reported from Nepal, Bhutan, and Africa.

45. ***Forficula beebei*** (Burr, 1911) (fig. 83)

Material examined : India : Sikkim : (North), 54 km NW of Lachen, *ca* 3500 m, 11 Females, 01.3.1989, 2 Males, 1 Female, 2.8.1989, 9 Males, 13 Females, 3.8.1989; Thangoo, *ca* 3750 m, 1 Male, 15.7.1989, Zema, *ca* 2620 m, 1 Male, 2 Females, 3.8.1989 (*S. Chattopadhyay* coll.).

Remarks : Most of the specimens are macropterous. In some specimens head is clear reddish orange and abdominal tergites are also of the same colour.

Distribution : India : Sikkim (as above and Chachu, *ca* 3277 m); West Bengal (Darjeeling dist.) and Arunachal Pradesh.

Also known from Nepal and Bhutan.

46. ***Forficula tawangensis*** Srivastava, 1983 (figs. 84–86)

Material examined : India : Sikkim : (East), Deorali, 8 km from Gangtok, 1 Male, 29.2.1989 (collector's name not given), Gangtok, *ca* 1550 m, 1 Male, 1 Female and 1 nymph, 21.4.1980 (*B. Nandi* coll.).

Remarks : General colour dark yellowish brown, head orange; antennae, elytra, wings and forceps yellowish brown; abdominal tergites dark brown with shades of yellow.

Measurements : Male, body – 13.0 mm; forceps – 4.5 mm and length of basal dilation of forceps – 1.0 mm.

Distribution : India : Sikkim (as above), West Bengal (Darjeeling dist.), Assam and Arunachal Pradesh.

47. ***Forficula jayarami*** Srivastava, 1972 (figs. 87–88)

Remarks : Sakai (1997, p. 54) records it from "Sikkim (North), Lathong, *ca* 2165 m, 26.vii.1959 (*F. Schmid* leigt.).

Distribution : India : Sikkim (as above), Assam and Arunachal Pradesh.

48. ***Forficula planicollis*** (Kirby, 1891) (figs. 89–90)

Material examined : India : Sikkim : (South), Namchi, *ca* 1230 m, 1 Male, 30.4.1998 (*A. K. Hazra* coll.).

Distribution : India : Sikkim (as above and Sandakphu), Meghalaya, West Bengal (Darjeeling dist.), Uttar Pradesh (Himalaya) and Arunachal Pradesh.

Also known to occur in Nepal, Bhutan, Myanmar and China (Yunnan).

49. ***Forficula bhutanensis*** Brindle, 1995 (figs. 91–92)

Material examined : India : Sikkim : (North), 5 km NW of Lachen, *ca* 3500 m, 2 Males, 3 Females, 3.8.1989, 1 Male, 1 Female, 29.7.1989, 1 Male, 1 Female, 1.8.1989 (*S. Chattopadhyay* coll.); Yumthang, *ca* 3200 m, 12 km W, 1 Male, 1 Female, 19.4.1992, Lachen, *ca* 3600 m 6 Males, 3 Females, 5 nymphs, 24 26.4.1992 (*A. R. Lahiri* coll.).

Distribution : India : Sikkim (as above and (North) Yatang, *ca* 3846-4686 m, Chetang, *ca* 2871 m, Yedang, *ca* 3194 m) and West Bengal (Darjeelsing dist.).

Also known from Bhutan.

50. ***Forficula schalgintweiti*** (Burr, 1904) (figs. 93–95)

Material examined : India : Sikkim : (North), 5 km NW of Lachen, *ca* 3500 m, 1 Male, 2 Females, 1.7.1989, 4 Females, 2.7.1989, 8 Males, 5 Females, 3.8.1989; Zema, *ca* 2620 m, 3.8.1989 (*S. Chattopadhyay* coll.).

Remarks : Head and abdominal tergites are dark reddish brown.

Distribution : India : Sikkim (as above and Chetang, *ca* 2871 m), West Bengal (Darjeeling dist.), Arunachal Pradesh, Jammu & Kashmir, Uttar Pradesh (Himalaya) and Himachal Pradesh.

Also known from Nepal, Bhutan, Tibet, Myanmar and China (Szechwan).

DOUBTFUL SPECIES AND REJECTED RECORDS

1. ***Haplodiplatys rufescens*** (Kirby, 1989) – Hincks (1955) records this species as being distributed in Himalayas from Shimla to Sikkim. No definite record from Sikkim is known.

2. ***Haplodiplatys urbanii*** Brindle, 1975 – Srivastava's (1988, p. 200) record of this species from 'India (Sikkim) should be read as 'W.B., Darjeeling dist.). Besides 2 Females refered to this species from 'Sikkim, village 9th mile nr Ranipul' by Srivastava is a doubtful record.

3. ***Forcipula quadrispinosa*** (Dohrn, 1863) – Record of this species from Sikkim by Burr (1910, p. 94) is based on 2 Females present in the collection of Zoological Survey of India, Calcutta and are labelled as 'Sikkim' without any further data. Elytra and wings are smooth & pubescent and do not belong this species. Therefore this record is rejected.

4. ***Allodahlia guptae*** Kapoor, 1968 – This species is described on Holotype Male from Sikkim. Its status is doubtful. Besides the Holotype Male is missing according to the author of the species (figs 96–98).

5. ***Anechura zubovskii*** Semenov, 1901 – Record of the species from 'Sikkim :Dalapchand, 850 m, 15.iv.1977, Bhakta B. (2 Females)' by Srivastava (1983) is doubtful and is rejected.

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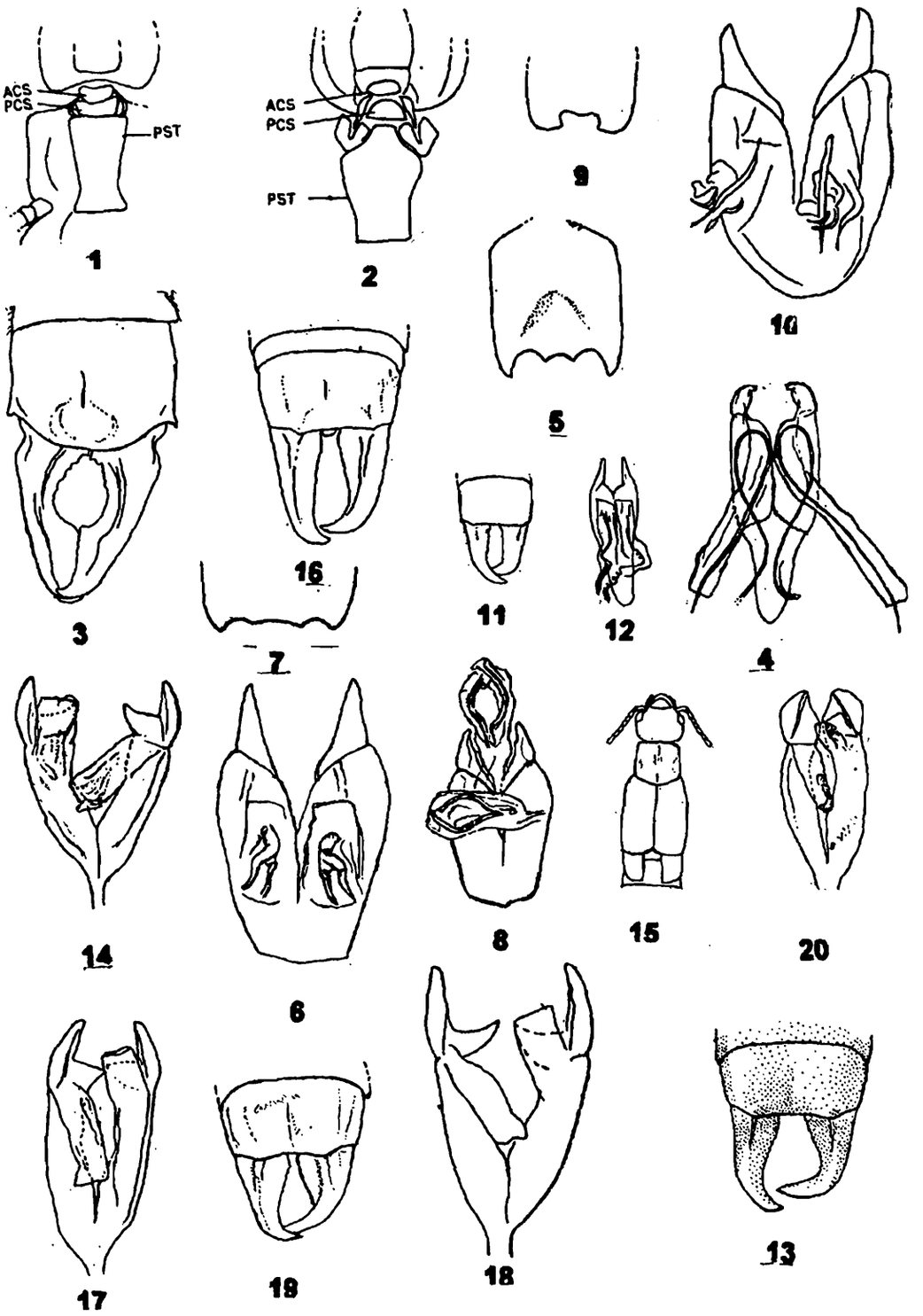
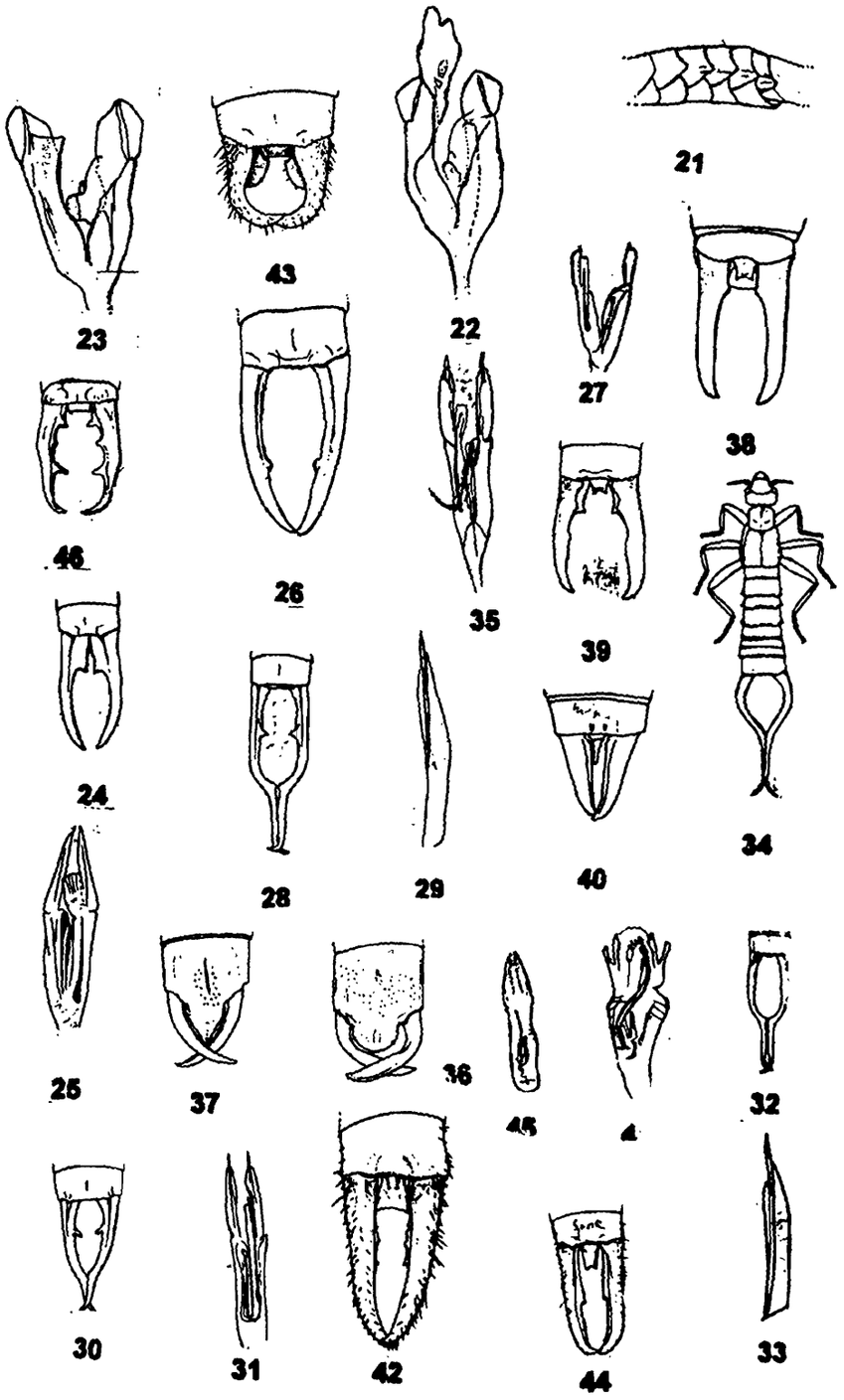
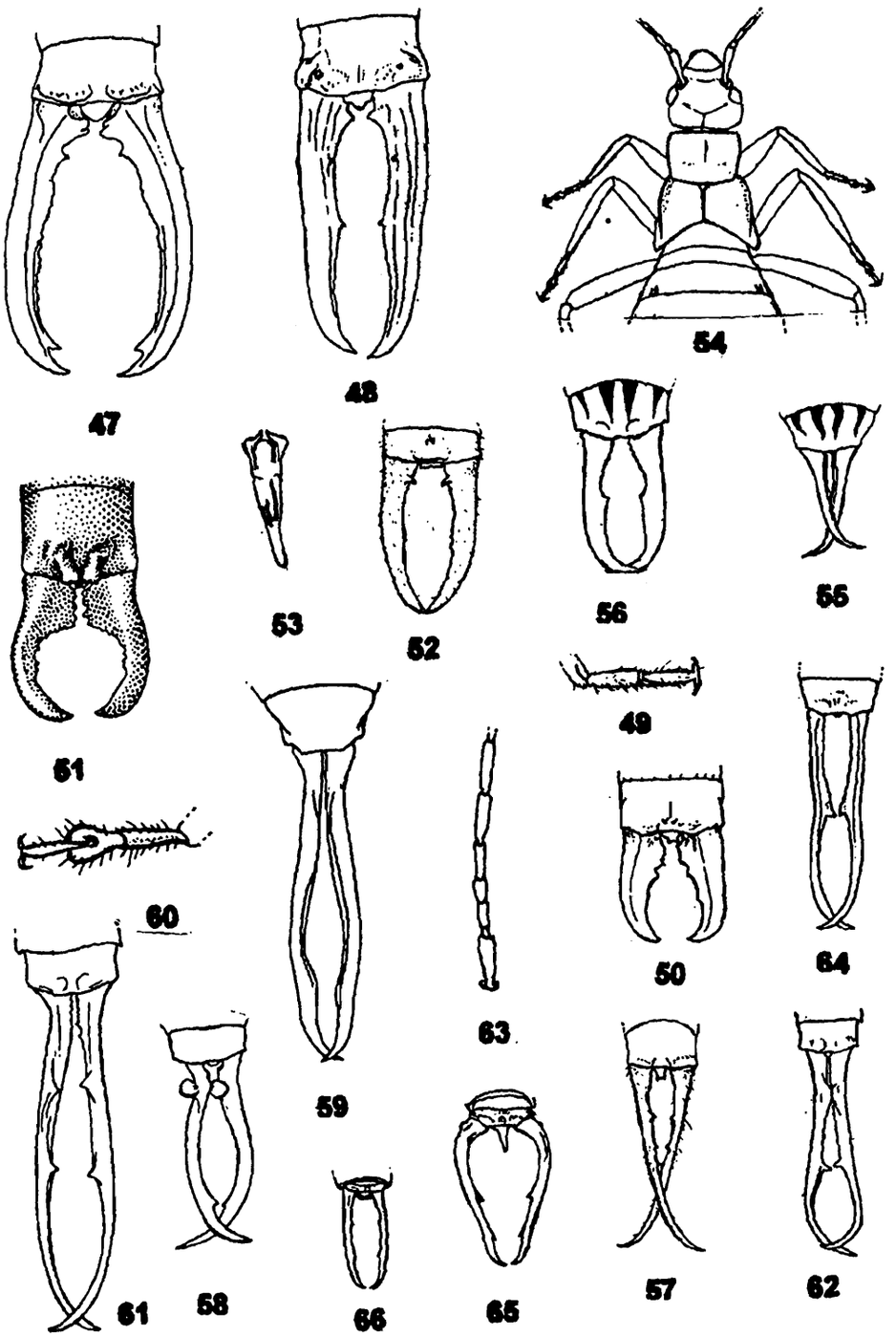


Figs. 1-20 : 1. Forficuloid neck, 2. Blattoid neck; *Acrania constricta* (Hincks), Male, 3. Ultimate tergite and forceps, 4. Genitalia; *Haplodiplatys trisinuatus* Srivastava, Male, 5. Penultimate steranite, 6. Genitalia; *Haplodiplatys malaisei* (Hincks), Male, 7. Posterior half of penultimate sternite, 8. Genitalia; *Haplodiplatys rileyi* (Hincks), Male, 9. Posterior half of penultimate sternite, 10. Genitalia; *Parapsalis infernalis* (Burr), Male, 11. Ultimate tergite and forceps, 12. Genitalia; *Aborolabis pervicina* (Burr), Male, 13. Ultimate tergite and forceps, 14. Genitalia; *Aborolabis sikkimensis* Srivastava, Male, 16. Anterior portion of body, 17. Genitalia; *Aborolabis kalaktangensis* Srivastava, Male, 18. Genitalia; *Euborellia annulipes* (Lucas), Male, 19. Ultimate tergite and forceps, 20. Genitalia

(Abbreviations used : ACS – Anterior cervical sclerite, PCS – Posterior cervical sclerite and PST – Prosternum).

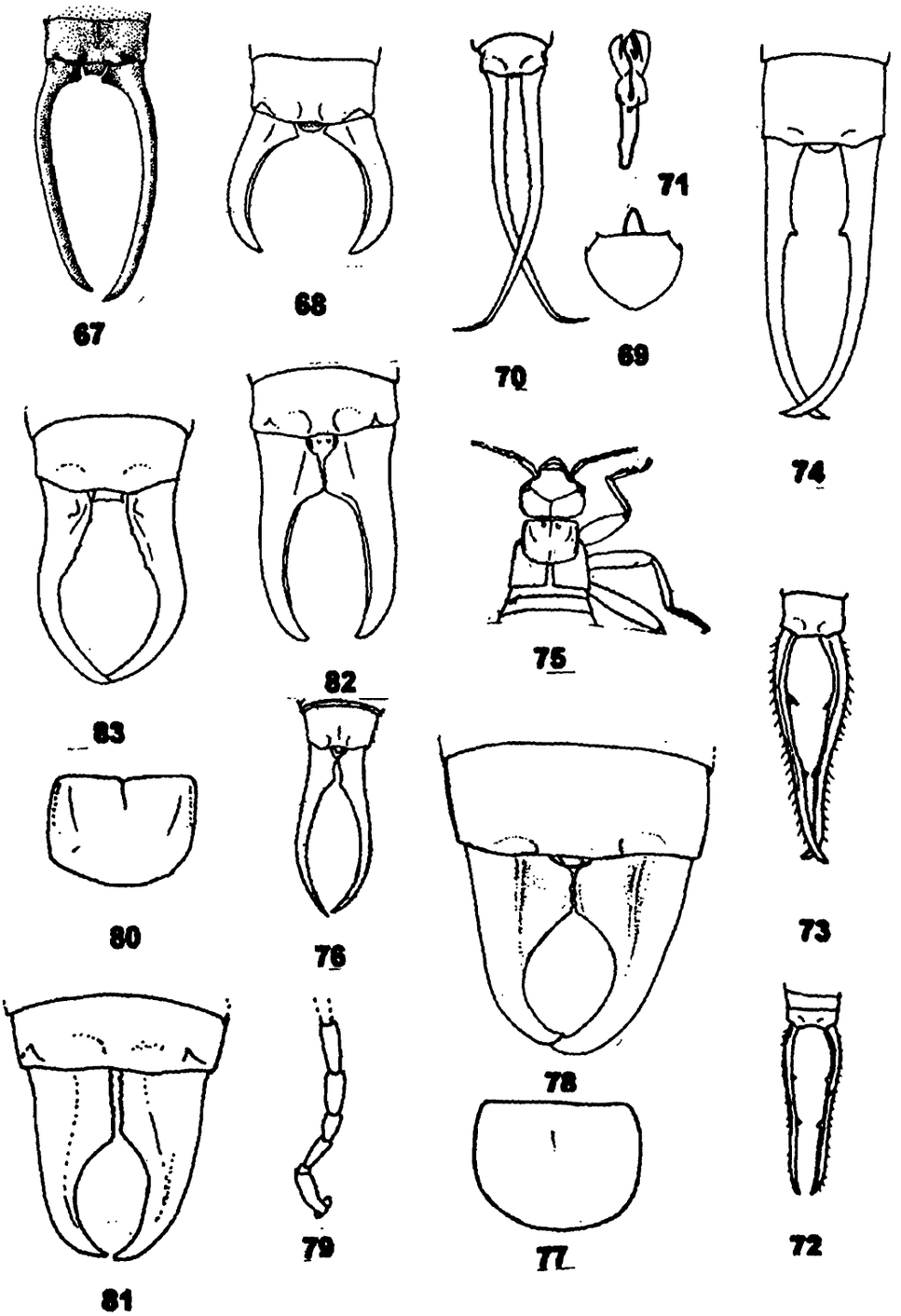


Figs. 21-46 : *Euborellia annandalei* (Burr), Male, 21. Sides of abdominal segments, 22. Genitalia; *Euborellia annulata* (Fabricius), Male, 23. Genitalia; *Nala nepalensis* (Burr), Male, 24. Ultimate tergite and forceps, 25. Genitalia; *Labidura riparia* (Pallas), Male, 26. Ultimate tergite and forceps, 27. Genitalia; *Forcipula trispinosa* (Dohrn), Male, 28. Ultimate tergite and forceps, 29. Paramere; *Forcipula borellii* Chopard, Male, 30. Ultimate tergite and forceps, 31. Genitalia; *Forcipula indica* Brindle, Male, 32. Ultimate tergite and forceps, 33. Paramere; *Forcipula abbreviata* Srivastava, Male, 34. Dorsal view, 35. Genitalia; *Apachyus feae* Bormans, Male, 36. Ultimate tergite and forceps, Female, 37. Ultimate tergite and forceps; *Irdex nitidipennis* (Bormans), Male, 38-39. Ultimate tergite and forceps; *Labia minor* (Linnaeus), Male, 40. Ultimate tergite and forceps, 41. Genitalia; *Apovostox agrawali* Srivastava, Male, 42. Ultimate tergite and forceps; *Circolabia curvicauda* (Motschulsky), Male, 43. Ultimate tergite and forceps; *Chaetospania feae* (Bormans), Male, 44. Ultimate tergite and forceps, 45. Genitalia; *Homotages feae* (Bormans), Male, 46. Ultimate tergite and forceps.



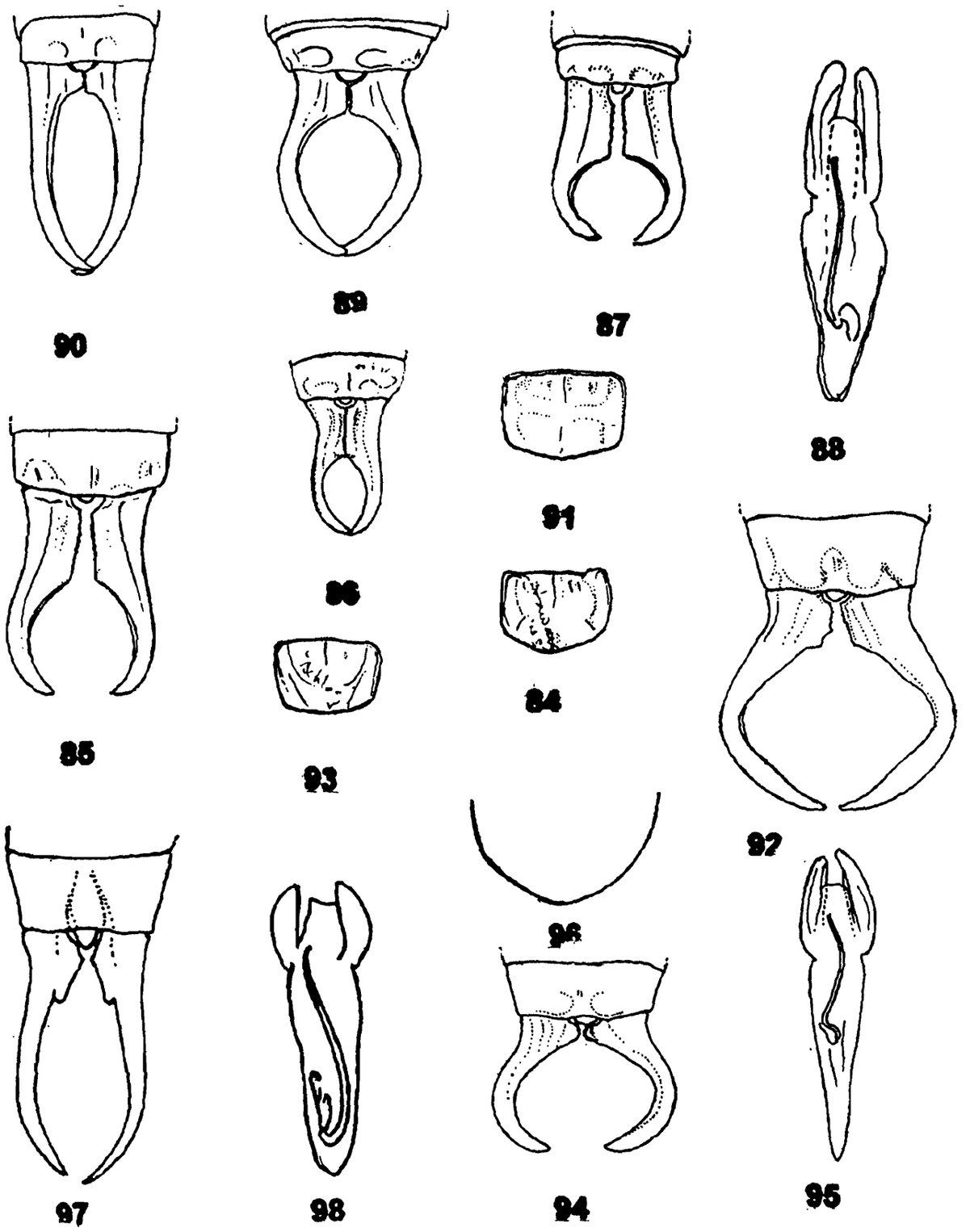
Figs. 47-66 : *Chelisochella superba* (Dohrn), Male, 47. Ultimate tergite and forceps; Female, 48. Ultimate tergite and forceps; *Laprophorella kervillei* (Burr), Male, 49. Ultimate tergite and forceps, 50. Hind tarsi, *Adiathetus shelfordi* (Burr), Male, 51. Ultimate tergite and forceps; *Hamaxas feae* (Bormans), Male, 52. Ultimate tergite and forceps, 53. Genitalia; *Liparura kamengensis* Srivastava, Male, 54. Anterior portion of body, 55. Ultimate tergite and forceps; *Liparura serrata* Srivastava, Male, 56. Ultimate tergite and forceps; *Paracordax politus* (Burr), Male, 57. Ultimate tergite and forceps; *Eparchus insignis* (Haan), Male, 58. Ultimate tergite and forceps; *Eparchus simplex* (Bormans), Male, 59. Ultimate tergite and forceps; *Timomenus lugens* (Bormans), Male, 60. Hind tarsi, 61. Ultimate tergite and forceps; *Timomenus nevilli* (Burr), Male, 62. Ultimate tergite and forceps; *Paratimomenus brahma* (Burr), Male, 63. A few basal antennal segments, 64. Ultimate tergite and forceps; *Allodahlia ahrimanes* (Burr), Male, 65-66. Ultimate tergite and forceps.

(figs. 47, 48, 51, 65 & 66 are not based on material from India : Sikkim)



Figs. 67-83 : *Anechura stoliczkae* Burr, Male, 67-68. Ultimate tergite and forceps; *Paradohrnia uniformes* (Brindle), Male, 69. Penultimate sternite, 70. Ultimate tergite and forceps, 71. Genitalia; *Pterygida temora* (Burr), 72-73. Ultimate tergite and forceps; *Pterygida vishnu* (Burr), 74. Ultimate tergite and forceps; *Guanchia chirurga* Burr, Male, 75. Anterior portion of body, 76. Ultimate tergite and forceps; *Forficula genitalia* Kapoor, Male, 77. Pronotum, 78. Ultimate tergite and forceps, 79. A few basal antennal segments, 80. Pronotum, 81. Ultimate tergite and forceps; *Forficula beelzebub* (Burr), Male, 82. Ultimate tergite and forceps; *Forficula beebei* Burr, Male, 83. Ultimate tergite and forceps.

(Figs. 72, from the Holotype Male of *Opisthocosmia temora* redrawn after Burr, 1910; fig. 73 of *Opisthocosmia rimosae* Zhang, Ma & Chen, 1992, redrawn after Sakai, 1994; figs. 79-81 of *Forficula stenotica* Zhang & Yang, 1992 – redrawn from the photograpah sent by Sakai, of a Male, recorded in Sakai & Zhang, 1995 from Sikkim).



Figs. 84-98 : *Forficula tawangensis* Srivastava, Male, 84. Pronotum, 85-86. Ultimate tergite and forceps; *Forficula jayarami* Srivastava, Male, 87. Ultimate tergite and forceps, 88. Genitalia; *Forficula planaicollis* (Kirby), Male, 89-90. Ultimate tergite and forceps; *Forficula bhutanensis* Brindle, Male, 91. Pronotum; 92. Ultimate tergite and forceps; *Forficula schlagintweiti* (Burr), Male, 93. Pronotum, 94. Ultimate tergite and forceps, 95. Genitalia; *Allodahlia guptae* Kapoor, Male, 96. Posterior half of penultimate sternite, 97. Ultimate tergite & forceps, 98. Genitalia

(figs. 96-97 after Kapoor, 1968).

Zool. Surv. India
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INSECTA : BLATTARIAE

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INTRODUCTION

Blattariae includes cockroaches. There are about 3,500 species recorded from World (Imms, 1963), of which about 186 are recorded from India. These insects are predominantly found in tropical countries, but a few species are found in temperate areas. *Blatta orientalis, Periplaneta americana* and *Blattella germanica* are few species which are very common in India. Cockroaches are found in or on the ground, among low vegetation and debris, but some inhabit caves, some species live near water, where as a few species live in desert. These insects, generally are omnivorous. Cockroaches are medically important, as some species mechanically transmit by food/ garbage, or water borne diseases.

Perusal of literature reveals that not much work on Blattariae of Sikkim has been done. Earlier workers like Kirby (1904), Shelford (1906, 1910), Hanitsch (1915, 1929) did work on taxonomy of blattids. Later on Princis (1964, 1966, 1967) and Roth (1978, 1985, 1988, 1995) have also done notable work on the group. But no body has studied the cockroaches of Sikkim, except with some stray records. The present study will deal exclusively the Blattariae fauna of Sikkim. This study is based on the published records and the available material present in the Zoological Survey of India, Calcutta, along with the recent material which is collected by the Survey parties from the different districts of Sikkim.

The present paper deals with 17 species, which are distributed under 13 genera, 6 subfamilies and 5 families. Three species are recorded here for the first time from Sikkim.

SYSTEMATIC ACCOUNT

Order BLATTARIAE

Key to the suborders of BLATTARIAE

1. Antero-ventral margin of mid and hind femora with spines; transverse suture absent or another border between the frons and the flat, single clypeus 2

— Antero-ventral margin of the mid and hind femora without spines, short and sometimes thickly covered with bristles (occasionally bristles are transformed in minute spinules), at most with apical spines on the outside; transverse suture distinctly present between the frons and the projecting bipartite clypeus. ..... 3.

2. Anal area of hind wing, in normal position flat, may not fan-like; with thick post clypeus. ..... POLYPHAGOIDEA

— Anal area of the hind wing, in normal position, folded into fan-like at rest; devoid of thick post clypeus. ..... BLABEROIDEA

3. Subgenital plate of male symmetrical with 2 styles, female ovipositor valves divided longitudinally. ..... BLATTOIDEA

— Subgenital plate of male more specialized; female without valves ..... EPILAMPROIDE

Suborder POLYPHAGOIDEA

Family HOMOEOGAMIIDAE

Key to genera

1. Both sexes fully winged; hind tibiae with 6 spines at apical margin; inter-ocular distance narrow ..... ***Ergaula*** Walker

— Female apterous; hind tibiae with 7 spines at apical margin, inter-ocular distance wide..... ..... ***Eucorydia*** Hebard

Genus ***Ergaula*** Walker, 1868

1. ***Ergaula nepalensis*** (Saussure)

1893. *Dyscologamia nepalensis* Saussure, *Rev. Suisse Zool.*, **1** : 300

1963. *Ergaula nepalensis* : Princis, *Orthopt. Catalog.*, Pt. **4** : 80

Material examined : 1 ex. (damaged), Sikkim (no specific Locality and date)

Diagnostic characters : As the specimen is damaged, the specific characters are taken from literature. Head not covered by pronotum; pronotum elliptical, trapezoid, densely punctate, lateral margin oblique, apical margin round to subtruncate; tegmina unequally flat; colour dark reddish with spots on both tegmina

Distribution : India (Sikkim), Nepal and Myanmer

Remarks : National Zoological Collection, Calcutta, has one identified example, which bears no specific locality, date of collection and name of collector. This has only the pronotal part.

Genus ***Eucorydia*** Hebard, 1929

2. ***Eucorydia westwoodi*** Hebard

1929. *Eucorydia westwoodi* Hebard, *proc. Acad. nat. Sci. philad.*, **81** : 96

Material examined : 2M, Sikkim (no specific locality, date of collection and the name of collector available), Z. S. I. Regd. No. 5654/14; 2F, Sikkim, 25. vii. 1887, coll. E. T. Atkinson, Z. S. I. Regd. No. 9004

Diagnostic characters : Male : Size small; head not exposed; interocular space conspicuously wider than the distance between the antennal sockets; pronotum suboval, wider behind the middle, posterior margin a little rounded; tegmina and wings fully developed, extending beyond the apex of adbomen, former with longitudinal discoidal sector; hind wings with subcosta straight and reach the costal margin, media and radius with stalked at base; supraanal plate symmetrical, incision at the anterior margin, posterior margin rounded with a glow groove in the middle; subgenital plate small, asymmetrical with a shallow groove near the hind margin; antero-ventral margin of hind femur without spine; tarsal claws simple

Pronotum dark-beown, pubescent, punctured, laterally with big brownish yellow spot in a shape of eye ball; tegmina yellowish brown with several dark spots of different shapes

Measurements (in mm.)(Male; Female) : Body length 9 - 15.0; 10-15; tegmen length 9-14.0, 10-13.0; pronotum 4.0, 4.0; pronotum width 5.6-6.2, 5-6.3

Distribution : India (Sikkim), Malaysia.

Family DEROCALYMMIDAE

Key to species of *Paranauphoeta*

1. Tegmina with two golden yellow spots .... *circumdata* (De Haan)

— Tegmina without golden yellow spots, but with golden yellow line or band..... ..... *Indica* Saussuri & Zehntner

3. ***Paranauphoeta circumdata*** (De Haan)

1842. *Blatta Nauphoeta circumdata* De Haan, in *Temminck, Verhand. nat. Ges. nederl. overz. Bezitt.*, **16** Zool., 52

1964. *Paranauphoeta circumdata* : Princis, *Orthopt. Catalog.*, Pt. **6** : 250

Material examined : 2 M, 1 F, Sujjun (no specific locality, date of collection), Coll. Mus. Collection (Z. S. I Regd. No.2539/5, 2542/5 and 2543/5)

Diagnostic characters : Male : Size medium; head with vertex prominantly exposed; pronotum, a little depressed medially, anterior margin rounded, posterior margin truncate; tegmina with scutellum triangular in shape, anterior margin weakly sigmoid, posterior margin rounded; wings sub-truncate apically, plical notch absent; supra-

anal palte with anterior margin transverse, posterior margin shallowly convex

Pronotum Black and laterally with golden border on both side; antennae brown, testaceous at base and sulphur colour at apex; tegmen with two golden yellow spots

Measurements (in mm.)(Male; Female) : Body length 21.2, 24.0; pronotum 7.0, 7.5; tegmen 17.0, 18.0

Distribution : India (Sikkim, Assam and West Bengal), Borneo, Jawa, Malaysia, Sumatera

Remarks : This species is recorded for the first time form Sikkim. The most striking feature of the species is its golden yellow spots on tegmina.

4. ***Paranauphoeta indica*** Saussura & Zehntner & Zehntner

1985. *Paranauphoeta indica* Saussure *Revue suisse Zool.*, **3** : 16.

1964. *Paranauphoeta indica* : Princis, *Orthopt. Catalogus, Pt.* **6** : 249.

Material examined : 4 M, Sikkim (no specific locality, date and name of collector), Regd. Nos. 5718/14, 5726/14, 8178/3 and 8198/3

Diagnostic characters : Size medium head with vertex a little exposed; interocular space more or less equal to the distance between antennal sockets; pronotum subelliptical, wider behind the middle, truncate at posterior margin; tegmina and wings fully developed; supra-anal plate large but not extending beyond the apex of genital plate; subgenital plate asymmetrical; antero-ventral margin of front femur without spine; subgenital plate of female reach about the hind margin of supra-anal plate, symmetrical, posterior margin rounded

Behind the vertex reddish-yellow semicircular band present; pronotum with a narrow reddish-yellow band on both side laterally; tegmen except the basal region; supra-anal plate with golden yellow colour at the border region

Measurements (in mm.)(Male; Female) : Body length 25-26, 25-27; pronotum 7-7.3, 7-8.0; pronotum width 8.5-9.3, 8.5-9.4; tegmen 22-23, 23-24

Distribution : India (Arunachal Pradesh, Assam and Sikkim)

Family PYCNOSCELIDAE

Genus ***Pycnoscelus*** Linnaeus, 1758

5. ***Pycnoscelus surinamensis*** **(linnaeus)**

1758. *Blatta surinamenis* Linnaeus, Syst. naturae (10th ed.) **1** : 424

1964. *Pycnoscelus surinamensis* : Princis, *Orthopt. Catalogus,* Pt **6** : 264

Material Examined : 1 M, sikkim (no specific locality, date and collector); 1 M, Rangpo 28. xii. 1975, coll. G.K.Srivastava: 2 M Tadong, 27 V. 1975, Coll. M.S. Shishodia: 1M Naya bazar, W Sikkim, 4. i. 1976; and 1 M Mangan, N. Sikkim, 2. vii. 1979, coll. P. Halder

Diagnostic characters : Size medium; vertex with head exposed: ocelli large, approximate to eye; pronotum rounded laterally, posterior margin convex; tegmina and wings scarcely extending upto the appex of abdomen; subgenital plate with unequally rounded at apex

Shiny blackkish-brown with buff lateral margine of the translucent tegmina; anterior and lateral edged of pronotum also buff colour

Measurements (in mm.) : Female Body length 16-20.0; pronotum 4.5-5.4; pronotum width 6.5-7.0; tegmen 18-20.0

Distribution : Cosmopolitan

Remarks : This species normally exists in female sex. Occasionally parthenogenetic males occur in culture of *surinamensis*, but they are non-functional when mated to parthenogenetic females (Roth 1967). Eighth sternite of male rounded posteriorly, the ninth completely hidden and bearing one style

Family BLATTIDAE

Key to genera

1. Tegmina and wings fully developed; pronotum with a pair of large spot, usually of light yellowish background 2

— Tegmina and wings usually reduced, yellow spots absent 3

2. Pronotum broad behind the middle, sides deflexed ..... ***Periplaneta*** Burm.

— Pronotum broad before the middle, sides not deflexed ..... ***Homalosilpha*** Stål.

3. Arolia subobsolete; tegmina and wings reduced, covering two/third of the abdominal terga. *Blatta* Linn-Arolia moderately developed; tegmina and wings squamiform or quadrate, and sometimes fully developed .... ***Hebardina*** Bey-bienko

Genus ***Periplaneta*** Burmeister, 1893

6. ***Periplaneta americana*** (Linnaeus)

1758. *Blatta americana* Linnaeus, *Sys. naturae* (10th ed.) **1** : 424.

1966. *Periplaneta americana* : Princis, *Orthopt. Catalogus,* Pt. **8** : 405.

Material examined : 3 exs. (abdomen damaged) (no specific locality, date and name of collector); 1M, Nayabazar, Sikkim, 15. iii. 1959, coll. A.G.K.Menon

Diagnostic characters : Size large; head with vertex exposed; antennae long, surpassing by about 1.5 times of the body length; ocelli small but not projecting; pronotum smooth flattened, sides deflexed, wider behind the middle; tegmina extending beyond the apex of abdomen by 4 7 mm.; wings with anal fan supra-anal plate deeply excised; subgenital plate with weakly rounded at hind margin; femora and tibiae strongly spined; posterior metatarsus longer than the remaining joints

General colour reddish-brown; pronotum with a yellow narrow band at lateral margin and another broad at lateral margin; tegmina uniformly reddish-brown

Measurements (in mm.)(Male; Female) Body length 28 33, 27 32.0; pronotum 7.4 9.0, 8 9.0; pronotum width 9 10.8, 10 11.5; tegmen 27.2 29.5, 27.5 30.7

Distribution : Cosmopolitan

Remarks : It is recorded for the first time from Sikkim.

Genus ***Homalosilpha*** Stol, 1874

7. ***Homalosilpha ustulata*** (Burmeister)

1839. *Periplaneta ustulata* Burmeister, *Handb. Ent., Berlin, No.* **32** : 503

1966. *Homalosilpha ustulata* : Princis, *Orthopt, Catalogus,* pt. **8** : 458

Material examined : 1 ex. (abdomen damaged), Sikkim (no specific locality), 25. vii 1887, coll. E. T. Atkinson (Z. S. I. Regd. No. 9010/7)

Diagnostic characters : Size medium; head with vertex exposed; ocelli small; pronotum wider before the middle, all the angles broadly rounded; abdomen with postero-lateral corners of all the segments with toothlike projections; supra-anal plate small, deep excised at apex; antero-ventral margin of front femur with a row of stout spines, of which the largest near the middle; female supra-anal plate with notch at posterior margin; female subgenital plate convex at posterior margin

General colouration reddish-dark; pronotum yellow on all sides, disc with two black, curved, longitudinal stripes medially; tegmina uniformly brown

Measurements (in mm.)(Male; Female) : Body length 24 28.0, 25 - 28.5; pronotum 6.0 - 7.8, 6.7 7.8; pronotum width 7.5 8.6, 8 - 9.0; tegmen 23 30.0, 27 31.0

Distribution : India (Andaman Islands, Arunachal Pradesh, Assam, Orissa, Sikkim and West Bengal), Borneo, Celebes, Java Malaysia and Sumatra

Genus ***Hebardina*** Bey-Bienko

8. ***Hebardina concinna*** (De Haan)

1842. *Blatta (Periplaneta) concinna* De Haan, in *Temminck Verhand.* Orth : 50

1990. *Hebardina concinna* : Roth, *Mem. Mus, Victoria,* **50** (20) : 363

Material examined : 2 M, Sikkim (no specific locality, date and name of the collector), Z.S.I. Regd. No. 7295/1

Diagnostic characters : Size small, head with vertex a little exposed; ocular space greater than the space between antennal sockets; pronotum trapezoidal, lateral margin rounded; tegmina and wings squamiform or rounded, at least three segments exposed; supra-anal plate small and transverse; subgenital plate small, anterior margin entire with two styles; antero-ventral margin of front femur with feebly curved spines, which abruptly decrease in size towards the apex; female tegmina reach upto 2nd segment

Colour uniformly dark-brown or black on head, pronotum and tegmen

Measurements (in mm.)(Male; Female) : Body length 12.5 14.0; 13.5 15.8; pronotum length 3.5 3.8; 3.6 4.2; pronotum width 4.5 5.0, 4.6 - 5.7; tegmen 8.5 14.0, 7 10.0

Distribution : India (Arunachal Pradesh, Assam, Gujrat, Meghalaya, Sikkim, Tamil Nadu and West Bengal), Australia, Borneo, Celebes, Japan, Java, Malacca, Malaysia, Myanmar, Philippines, Sumatra and Vietnam

Remarks : Tegmina in both sexes of this species are, usually, reduced, but the degree of reduction varies considerably in size, the females tend to be larger than males but their measurements overlap

Suborder EPPILAMPROIDEA

Key to families

1. Pronotum and tegmina always with distinct dark punctation; subcosta provided with rami anteriorly ..... EPILAMPRIDAE

— Pronotum and tegmina may not with dark punctation; subcosta with rami anteriorly 2

2. Hind wings in most of the part lacking apical triangle between CUI and 3A; subgenital plate with more distinct shape but never ectoboidem type ..... BLATTELLIDAE

— Hind wings continuously with single apical triangle between CUI and 3A; subgenital plate always ectoboidem type ..... ECTOBIIDAE

Family ECTOBIIDAE

Genus ***Hemithyrosocera*** Saussure, 1893

9. ***Hemithyrosocera palliata*** (Fabricius)

1798. *Blatta palliata* Fabricius

1791. *Hemithyrosocera palliata* : Princis, Orthopt. Catalogus, pt. **14** : 1124

Material examined : 1M, Sikkim (no specific locality and date), coll. E.T. Atkinson; 1M, Gangtok, E. Sikkim, 31. v. 1979, Coll, M. S. Shishodia; 1F, Tadong, 10 vi 1979, Coll. M. S. Shishodia

Diagnostic characters : Size small; body moderately slender; head not very broad, vertex slighly exposed; ocellar spots forming an angle with the intervenning area, face with lateral margin decidedly converging ventrally; tegmina with costal area shorter than the anal area, subcostal vein a little curved, branching in middle, media and cubitus fused; supra-anal plate transverse; male subgenital plate with anterior margin transverse, partly covered by seventh abdominal segment, apex rounded; antero-ventral margin of front femur with a row of spines which generally, decrease in size distally; female subgenital plate rounded

General colouration blackish; cerci with apex whitish

Measurements (in mm.) (Male; Female) : Body length 10 11.5, 9.5 12.0; pronotum 2.2, 2.2 2.4; tegmen 9 10.0, 8.7 9.5

Distribution : India (Arunachal Pradesh, Assam, Himachal Pradesh, Kerala, Sikkim and uttar Pradesh), Borneo, China, Jawa, Malacca, Myanmar and Thailand

Remarks : Recorded for the first time from Sikkim

Family EPILAMPRIDAE

Genus ***Rhabdoblatta*** Kirby, 1903

10. ***Rhabdoblatta ridleyi*** (Kirby)

1903. *Hediata horologica* Kirby, *Ann. Nat. Hist.*, (7) **12** : 280

1965. *Rhabdoblatta ridleyi* : Princis, *Orthopt, Catalogus*, Pt. **11** ; 672

Material examined : 1F, Panchwa hill, E. Sikkim, 22. ii. 1962, coll. S. Ail

Diagnostic characters : Size large; head with vertex exposed; ocelli large, close to eye; pronotum broader than long, anterior margin transverse, posterior margin obtusely rounded; tegmen densely reticulated; supra-anal plate broad with two flattened styles; antero-ventral margin of front femur with 3 spines near the proximal end another 2 near the distal end

Head light reddish-brown in the middle, yellowish grey behind and below the eyes; pronotum light grey; tegmina light with numerous black spots

Measurements (in mm.) (Male; Female) : Body length 35.0, 45.0; pronotum 6.1, 8.3; pronotum width 7.8, 10.1; tegmen 31.7, 40.5

Distribution : India (Meghalaya, Sikkim), Jawa, Singapore

Remarks : It is recorded here for the first time from Sikkim

Family BLATTELLIDAE

Genus ***Blattella*** Caudell, 1903

11. ***Blattella germanica*** (Linnaeus)

1767. *Blatta germanica* Linnaeus, *Syst. naturae*, **1**(2)(12th ed.) : 688

1969. *Blattella germanica* : Princis, *Orthopt. Catalogus*, Pt. **13** : 807

Material examined : 1M, Nayabazar, W. Sikkim, 15. iii. 1959 coll. A.G.K. Menon; 1 F, Geyzing, 4. iv. 1959, coll. A.G.K. Menon; 3M, Nayabazar, W. Sikkim, 4. i. 1979, coll. G. K. Srivastava; 1M, Gangtok, E. Sikkim, 30. v. 1979, coll. M.S.Shishodia; 1F, Rangpo, E. Sikkim, 7 v. 1981, coll. R.K.Varshney; 1M, Gangtok, E. Sikkim, 2. x. 1983, coll. G.K.Srivastava; 1F, Namchi, S.Sikkim, 25. ix. 1983, coll. G.K.Srivastava

Diagnostic characters : Size small; head with vertex exposed; eyes a little shorter than the twice the width between eyes; pronotum transverse; tegmen elongated, subcosta shorter than anal field, discoidal vein forked before the middle; supra-anal plate semicircular or subtriangular; subgenital plate of male with a large broad rounded lobe at the posterior margin; styles symmetrical; antero-ventral margin of front femur armed with long spines on basal half, followed by short spines apically, except three long unequal at apex; female supra-anal plate moderately triangular, apex obtuse emarginate; subgenital plate of female large. Colour testaceous

Measurements (in mm.) (Male; Female) : Body length 10.5 11.5, 10 12.5; pronotum 0.3, 0.3; tegmen 10.6 10.8, 11.4 12.5

Distribution : Cosmopolitan

Family PANESTHIDAE

Key to genera

1. Seventh abdominal segment laterally straight, weakly uneven or slightly or deeply concave on apical half 2

— Seventh abdominal segment laterally thickened in the form of elevated ridge variable in length ..... ***Salganea*** Stol

2. Sixth abdominal segment with the posterolateral angle produced into a sharp point .....***Miopanesthia*** Saussure

— Sixth abdominal segment with the posterolaterial angle not produced or only triangular .....***Panesthia*** Serville.

Genus ***Panesthia*** Serville, 1831

Key to species

1. Tegmina essentially unicoloured without distinct bands or markings and about the same colour as the pronotum. If differently coloured from the pronotum, the tegmina are without maculae or bands and are not yellowish..... 2

— Tegmina yellowish or orangish, usually in the form of spots or bands (tegmina with a narrow

transverse black basal line, except at base of the marginal field, followed by a broad yellowish, or reddish-brown band extending slighly less than 1/3rd from the base, remainder black; ..... *regalis* Walker

2. Punctations on the surfaces of the supra-anal plate of 7th abdominal tergite and sternite, dense stellate-like ..... *Stellate* Sauss

— Punctations on the surfaces of the supra-anal plate, and 7th abdominal tergite and sternite, not stellate like .... *angustipennis cognata* Bey-Bienko

12. ***Panesthia angustipennis cognata*** Bey-Bienko

1970. *Panesthia cognata Bey-Bienko, Entomol. Rev.*, **84** : 529

1979. *Panesthia angustipennis cognata* : Roth, *Aust. J. Zool.*, Suppl. Ser., No. **74** : 42

Material examined : 1M, (nymph), 1F, Sikkim (no specific locality, date and name of collector)

Diagnostic characters : Size large; head with densely punctate, vertex exposed; pronotum transverse, tegmina and wings extending to about the apex of abdomen; lateral margin of 7th abdominal tergite concave; supra-anal plate with hind margin serrulate, usually with 6 10 small teeth; subgenital plate broadly exposed, antero-ventral margin of front femur usually with 3, sometimes 2 or 4 spines and a minute distal spine, posterior margin with a large spine

Head black in colour; pronotum black or sometimes reddish-brown laterally; tegmina black or dark-brown

Measurements (in mm.) (Male; Female) : Body length 30-42.0, 28-42.0; pronotum 6-8.5, 5.8-9.0; pronotum width 10-14, 9.5-13.5; tegmen 26-32, 28-40

Distribution : India (Assam, Meghalaya, Nagaland, Sikkim), Bhutan, China, Laos, Myanmar, Tibet, Thailand, N. & S. Vietnam wish colour on meso and metanotum

13. ***Panesthia stellata*** Saussure

1895. *Panesthia stellata* Saussure, *Revue Suisse Zool.*, **3** : 313

1979. *Panesthia stellata* : Roth, *Aust. J. Zool., Suppl. Ser. No.* **74** : 63

Material examined : 3 exs. Sikkim (no specific locality and date), coll. E. T. Atkinson, Z.S.I. Regd. Nos. 1791/6, 6722/8 and 3218/8

Diagnostic characters : Size large; head finely punctate, vertex not fovelate, exposed; pronotum wide in the middle, anterior margin a little concave, closely situated, tubercles on the disc absent; 1 to 5 tergites gently punctate, from 7th tergites laterally densely punctate, space between the punctations stellate-shape; antero-ventral corners of all abdominal tergites without holes, postero-lateral margin of 7th tergite indented; supra-anal plate with 7-9 distinct teeth at hind margin; female supra-anal plate with 6-10 teeth; subgenital plate broadly exposed; antero-ventral margin of front femur with 2 to 3 spines, and a small spine at distally

Measurements (in mm.) (Male; Female) : Body length 26-31.0, 26-34.0; pronotum 5.2-7.0, 5-7.3; pronotum width 9-11.5, 9-11.5; tegmen 27-30.0, 27-31.0

Distribution : India (Assam, Meghalaya, Nagaland, Sikkim, Arunachal Pradesh, West Bengal), Bangladesh, Bhutan and Myanmar

Remarks : Roth (1979) stated that brachypterous and macropterous forms of this species are similar, except their reduced tegmina

14. ***Panesthia regalis*** Walker

1868. *Panesthia regalis* Walker, *Cat. Blatt. Brit. Mus. Nat. Hist., No.* **7** : 21

1979. *Panesthia regalis* : Roth, *Aust. J. Zool.*, Supply, Ser. No. **74** . 117

Material examined : 1 ex. Sikkim (no specific locality, date and name of collector). 1M, Kalijhora, Tadong, 12. iv. 1978, coll. A. R. Bhowmik

Diagnostic characters : Head finely punctat, ocellus spots small and irregular in shape, vertex hardly exposed; pronotum with anterior margin distinctly excavated; tegmina and wings extended upto or beyond the abdomen; lateral margin of

7th tergite a little concave, caudal angle with a spine directed posteriorly; supra-anal plate of male with distinct teeth, lateral angle subcute; subgenital plate of male exposed and curved; anterior margin of female pronotum more shallowly excavated, and both tegmina and wings mutilated

Antennae with 4 to 8 segments pale from the base; tegmina with a narrow black basal region, followed by a large yellowish patch; legs black

Measurements (in mm.)(Male; Female) : Body length 30-36, 32-33; pronotum 6.5-8.0, 7.3-7.6; pronotum width 11.3-12.2, 11.8-12.8; tegmen 26-30

Distribution : India (Assam, Meghalaya, Nagaland, Sikkim and West Bengal), Bangladesh, Bhutan and Mayanmar

Remarks : *Panesthia regalis* Walker, generally, occurs in forest of hill region. This species can be identified with the help of basal segments of antennae which are pale at base (4 to 8)

Genus ***Miopanesthia*** Saussure, 1895

15. ***Miopanesthia bigibbosa*** Saussure

1895. *Miopanesthia bigibbosa* Saussure, *Revue suisse Zool.*, **3** : 324

1979. *Miopanesthia bigibbosa* : Roth, *Aust. J. Zool.* Suppl. Ser; No. **74** ; 137

Material examined : 3 exs., Sikkim (no specific locality, date), coll. E.T. Atkinshon, Z.S.I. Regd. Nos. 3223/8, 6702/8 and 5768/14

Diagonostic characters : Size medium; head punctate, ocelli large and rounded; vertex not foveolate; pronotum transverse, anterior margin entire, laterally curved; tegmina and wings extending beyond the abdomen; 7th tergite feebly convex laterally, terminating into posterior directed spine; supra-anal plate with hind margin entire; subgenital plate rounded at apex; reddish-brown in colour, ocelli yellow, legs and abdomen casteneous

Measurements (in mm.) (Male; Female): Body length 22-24, 20-23; pronotum 5-5.8, 5-5.5; pronotum width 7.7-9.0, 8.1-8.3, tegmen 24.0

Distribution : India (Meghalaya, Sikkim and West Bengal).

Genus ***Salganea*** Stål, 1877

Key to species

1. Tegmina and wings fully developed; anteroventral margin of front femur with 1 to 3 spines ..... *raggei* Roth

— Tegmina and wings reduced to lateral pads, not reaching the hind margin of metanotum; antero-ventral margin of front femur without spines ..... *biglumis* (Saussure)

16. ***Salganea raggei*** Roth

1979. *Salganea raggei* Roth, *Aust. J. Zool.* Suppl. Ser. No. **69** : 30

Material examined : 1F, (nymph), Sikkim (no specific locality and name of collector), - v. 1912

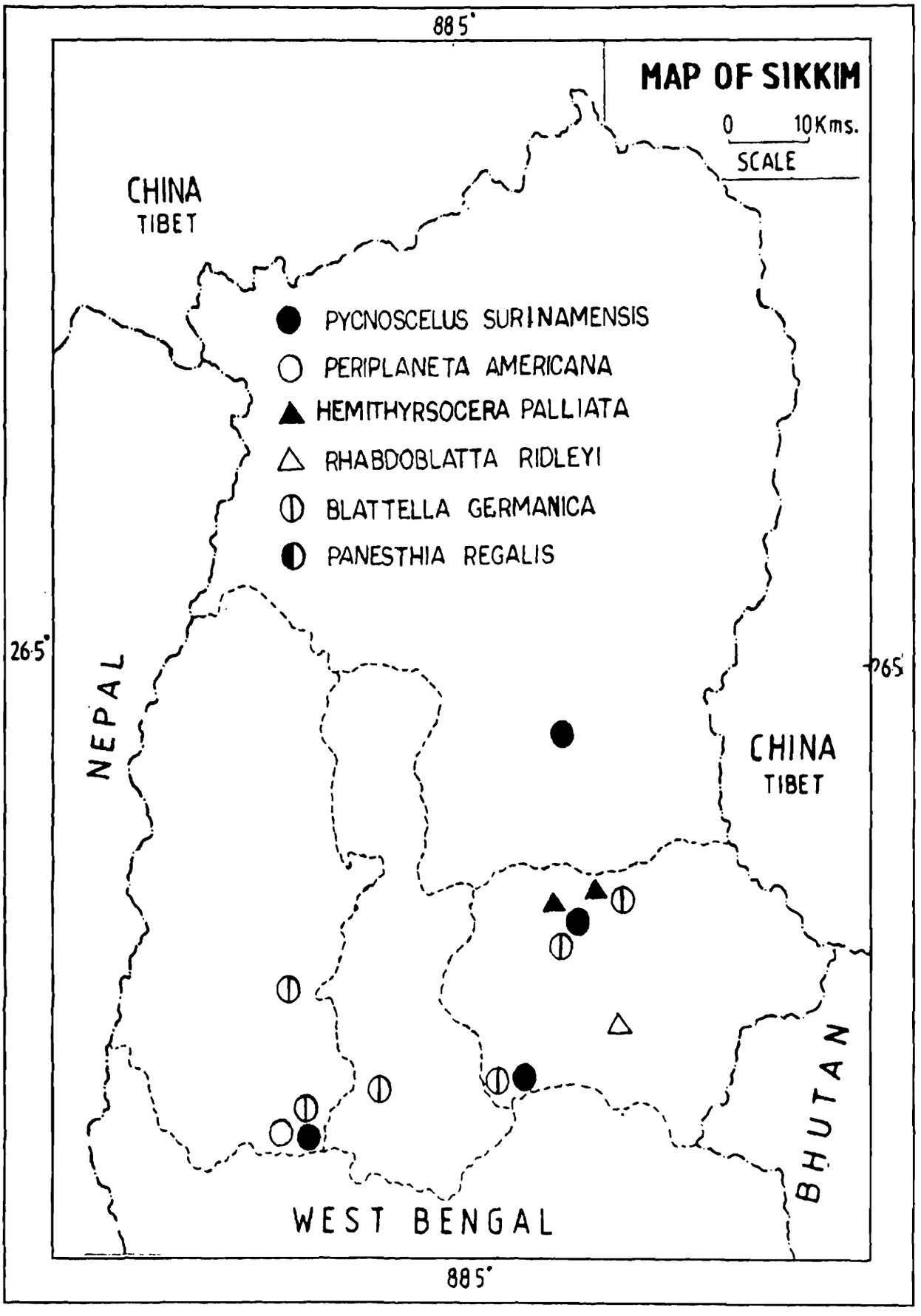
Diagnostic characters : Size large; head punctate, ocelli large, vertex not foveolate; male pronotum with anterior margin V-shaped emergination, a small tubercle present behind the margin on either side of line; abdominal tergites 1-5 punctate, latero-caudal angle with short, bluntly rounded oblique spines; supra-anal plate transverse, hind margin with 8-16 subequal teeth (Sometimes may be fused together); cercus conical; antero ventral margin of front femur without spine; female pronotum with anterior margin less excised, disc tubercle less prominent; female supra-anal plate with 11-14 subequal teeth

Head, pronotum, tegmina and abdominal tergites black; legs and abdominal sternites reddish-brown; last sternite black

Measurements (in mm.) (Male; Female) : Body length 29-48, 30.5-49.0, pronotum 6.3-7.0, 8-11.5; pronotum width 9-14, 10-14.5

Distribution : India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim and Uttar Pradesh), Bangladesh, Bhutan, China, Indo-China Peninsula, Hainan, Laos, Nepal, Taiwan, Thailand, N. & S. Vietnam

Remarks : It has a little variation with *S. biglumis*. This species is a main land species (Roth 1979)


88.5°
MAP OF SIKKIM
0 10Kms.
SCALE
CHINA
TIBET
PYCNOSCELUS SURINAMENSIS
PERIPLANETA AMERICANA
HEMITHYRSOCERA PALLIATA
RHABDOBLATTA RIDLEYI
BLATTELLA GERMANICA
PANESTHIA REGALIS
26.5°
NEPAL
CHINA
TIBET
BHUTAN
WEST BENGAL
88.5°

17. *Salganea biglumis* (Saussure)

1895. *Panesthia biglumis* Saussure, *Revue suisse Zool.*, **3** : 319

1979. *Salganea biglumis* : Roth, *Aust, J. Zool.*, Suppl. Ser. No. **69** : 75

Material examined : 1F, Sikkim (no specific locality, date coll. ; de Niceville, Z.S.I. Regd. No. 8268/13

Diagnostic characters : Size large; head punctate, vertex slightly exposed; ocelli small, elliptical; pronotum with anterior margin shallowly incurved, few punctation present on posterior half, a pair of small tubercles present on disc; tegmina and wings mutulated or fully developed; meso and metanotum sparsely punctate; 7th abdominal tergite with lateral margin crenulated, caudal angle with small, oblique teeth, supra-anal plate with posterior margin 9-12 triangular teeth; subgenital plate with hind margin rounded; antero-ventral margin of hind femur without spines, posterior margin with a small spine

Head, thorax and abdominal tergites black; abdominal sternites reddish-brown, shaded black laterally; legs reddish-brown

Measurements (in mm.)(Male; Female) : Body length 28-30; pronotum 5-6; pronotum width 9-9.5; tegmen 4-4.5

Distribution : India (Assam, Meghalaya, Nagaland, Sikkim and West Bengal), Philippines

SUMMARY

This paper deals with 17 species, distributed over 13 genera and 5 families. Three species are recorded for the first time from Sikkim, Key for the identification of suborders, families, genera and species of Blattariae have been provided; The distributional maps are also given for each species known from various districts of Sikkim.

ACKNOWLEDGEMENTS

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LIST OF THE SPECIES RECORDED FROM SIKKIM

Order BLATTARIAE

Suborder POLYPHAGOIDEA

Family HOMOEOGAMIIDAE

1. *Ergaula nepalensis* (Saussure)
2. *Eucorydia westwoodi* Hebard

Suborder Blaberiodea

Family DEROCALYMMIDAE

3. *Paranauphoeta circumdata* (De Haan)
4. *Paranauphoeta indica* Saussure & Zehntner

Family PYCNOSCELIDAE

5. *Pycnoscelus surinamensis* (Linnaeus)

Suborder BLATTOIDEA

Family BLATTIDAE

6. *Periplaneta americana* (Linnaeus)
7. *Homalosipha ustulata* (Burmeister)
8. *Hebardina concina* (De Haan)

Family ECTOBIIDAE

9. *Hemithyrsocera palliata* (Fabricius)

Suborder EPILAMPROIDEA

Family EPILAMPRIDAE

10. *Rhabdoblatta ridleyi* (Kirby)

Family BLATTELLIDAE

11. *Blattella germanica* (Linnaeus)

Family PANESTHIDAE

12. *Panesthia anguistipennis cognata* Bey-Bienko
13. *Panesthia stellata* Saussure
14. *Panesthia regalis* Walker
15. *Miopanesthia bigibosa* Saussure
16. *Salganea raggei* Roth
17. *Salganea biglumis* (Saussure)

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ROTH, L.M. 1988. Some cavernicolous and epigean cockroches with six new species, and a discussion of the Nocticolidae (Dictyoptera : Blattaria). *Revue suisse Zool.* **95** : 297-321.

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SHELFORD, R. 1906. XIV. Studies of the Blattidae. *Trans ent. Soc.* London, **1906** (pt. II) : 231-79.

SHELFORD, R. 1910. Orthoptera. Fam. Blattidae, Subfamily Blattinae (=Periplanetinae). *Gen. Ins.,* **109** : 1-27.

Zool. Surv. India
State Fauna Series 9, Fauna of Sikkim (Part 2), 239-249, 2003

INSECTA : ISOPTERA

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INTRODUCTION

In the Western part of the Eastern Himalaya, the State of Sikkim is situated between the Singhalila and Donkhya ranges. In its north, the Central basin is separated from Tibet by broad convex area of the Great Himalayan peaks, built up of Crystalline rocks, in which the river Tista gets its origin. To the south, it is blocked by the Darjiling ridges through which the Tista flows down the narrow gorge situated west of Kalimpong. In the east, the Chumbi valley separates the state from Bhutan.

The rugged hilly region consists of high mountains and deep valleys, accommodating hardly any plain land in the State. Due to rapid change in topography and altitude, the climate changes within a short distance. There is always contrast in temperature and rainfall between the valleys, foot hills and mountain top.

The state has dense original forest along with valuable plantation of Sal, Simul and Bamboo. The most dense temperate forest lies in Lachen and Lachung area in the north.

The termite fauna of Sikkim is extremely poorly known. The single species, *Reticulitermes assamensis* (Gardner) has been reported by Chhotani and Das (1983). Very recently, one more species, *Odontotermes sikkimensis* has been described by Thakur and Rathore (1986).

However, a fairly good collection has been accumulated in the Isoptera Section made mostly by different survey parties during the period 1979 to 1989. This collection was further augmented by some good collection made by Sri P. H. Roy (1994-1997).

The present study reveals the occurrence of 16 species from the area, of which 14 species are recorded for the first time. It appears that the termite fauna is very rich in the hot and humid valleys, while the hilly tracts are impoverished in faunal strength.

SYSTEMATIC ACCOUNTS

a) *General Morphology* : Termites have three major castes, namely, imago, soldier and worker. The general morphology has been deal recently by Roonwal and Chhotani (1989) in "Fauna of India" including the characters of taxonomic importance. Identification of termite species is mostly based on these characteristic features of soldier caste. In addition, the measurements of the characters of the soldiers used for the preparation of keys are as follows : Length and width of head, length of mandibles (except in nasute forms) and distance of tooth (if present) from the tip of the mandible, length and width of pronotum and postmentum, number of antennal segments, etc.

Best method of collection of soil termites is done with the help of a shovel pushing it into the soil and put the material on a tray and ultimately picking them up with the help of a forceps. Wood-eating forms are collected by the forceps after cutting the wood with the help of a hand axe. All the collections of queen from the soil nest needs caution to trace the royal chamber wherein the queen lives.

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b) *List of abbreviations used* : E., East; W., West; W, Worker; S., South; S, soldier; N., North; Im, Imago; Max., Maximum; ex., extracted form.

c) *List of Taxa* : List of species so far recorded from Sikkim (Author's name and year against each species in parenthesis indicates its first record from the state) including the present report.

d) *List of species already known from the State :*

Family RHINOTERMITIDAE

Genus ***Reticulitermes*** Holmgren

1. *Reticulitermes assamensis* Gardner (Chhotani and Das, 1983)

Family TERMITIDAE

Genus ***Odontotermes*** Holmgren

2. *Odontotermes sikkimensis* Thakur and Rathor (Thakur and Rathor, 1986)

e) *List of species recorded for the first time*

Family RHINOTERMITIDAE

(i) Genus ***Coptotermes*** Wasmann

1. *Coptotermes travians* (Haviland)

Family TERMITIDAE

Subfamily TERMITINAE

(ii) Genus ***Microcerotermes*** Silvastri

2. *Microcerotermes beesoni* Snyder
3. *Microcerotermes cameroni* Snyder

(iii) Genus *Pericapritermes* Silvestri

4. *Pericapritermes assamensis* Mathur and Thapa
5. *Pericapritermes tetraphilus* (Silvestri)

(iv) Genus *Odontotermes* Holmgren

6. *Odontotermes boveni* Thakur
7. *Odontotermes giriensis* Roonwal and Chhotani
8. *Odontotermes horai* (Wasmann)
9. *Odontotermes horni* (Wasmann)
10. *Odontotermes parvidens* Holmgren and Holmgren

(v) Genus *Hypotermes* Holmgren

11. *Hypotermes obscuriceps* (Wasmann)

(vi) Genus *Microtermes* Wasmann

12. *Microtermes obesi* Holmgren

(vii) Genus *Nasutitermes* Bank

13. *Nasutitermes jalpaiguriensis* Prasad and Sen Sarma
14. *Nasutitermes emersoni* Snyder

Key to the families of ISOPTERA (Soldier)

1(2) Pronotum flat; mandibles without serration on onner margin or almost with a few at base ..... Family : Rhinotermitidae

2(1) Pronotum saddle-shaped; mandibles either with serration or with a few distinct teeth .....Family : Termitidae

Key to the genera of *Rhinotermitidae* (Soldier)

1. Head oval, gradually narrowing infront; fontanelle large, placed far infront ....*Coptotermes* Wasmann

– Head subrectangular, parallel sided; fontanelle small, circular and lying a little infront of middle of head dorsum ....*Reticulitermes* Wasmann

Key to genera of *Termitidae* (Soldier)

1. Head projected in front into a long nasus; mandibles degenerated and non-functional ..... *Nasutitermes* Bank

– Head not projected in front into a nasus; mandibles well developed and functional 2

2. Mandibles asymmetrical, long and slender; left mandible strongly twisted; anterior margin of labrum straight with very weak antero-lateral projections ....*Pericapritermes* Silvestri

– Mandibles symmetrical and moderately long; left mandible not exactly straight but without any lateral projection 3

3. Head subrectangular; postmentum narrow, not strongly arched at the middle; mandibles

with inner margins serrated, without any definite dentition .... *Microcerotermes* Silvestri

– Head broadly to rectangularly oval, narrowed anteriorly; postmentum broad, strongly arched at the middle; mandibles with inner margins either with a minute teeth or with 3–5 crenulations or definite dentition on left mandible 4

4. Mandibles short, thin and delicate, each with a minute denticle at the middle; smaller species, soldiers smaller than workers *Microtermes* Wasmann

– Mandibles large and strong, with 3–5 crenulations or with a definite teeth on left mandible; comparatively larger species, generally soldiers larger than workers 5

5. Left mandible without any tooth but with 3–5 crenulations at basal half .... *Hypotermes* Holmgren

– Left mandible with a tooth placed at different positions on its inner margin, but without any crenulation .... *Odontotermes* Holmgren

1. ***Reticulitermes assamensis*** Gardner

1944. *Reticulitermes assamensis* Gardner, *Indian J. Ent.*, **6** : 105–106, *S.* Type-locality : Sadiya, Assam, India.

1989. *Reticulitermes assamensis*, Roonwal and Chhotani, *Fauna of India, Isoptera (Termites)*, **1** : 498-501, Figs. 258, 259.

Material examined : (A) Sev. S and W collected by *D. N. Tiwari*, 1992-1994 as follows : (i) 1 S and 6 W from Rangoli, E. Sikkim, 24.iv.1992; (ii) 1 S and 4 W from Rumtek, Gangtok, E. Sikkim, 22.iv.1994; (iii) 1 S and 5 W from Geyzing, W. Sikkim, 7.v.1992; (iv) 1 S and 3 W from Chungthang, N. Sikkim, 27.iv.1992; (v) 1 S and 7 W from Kabi, N. Sikkim, 30.iv.1992; (vi) 1 S and 6 W from Tarku, Sikkim, 2.v.1992. (B) Sev. S and W collected by *P. H. Roy and party*, 1994-1997 as follows : (i) 5 S, 10 W and 10 Im from Tumin Wild Life Sanctuary, E. Sikkim, 8.vi.1997, ex. "Pine log"; (vi) 1 S and 3 W from Tumin Wild Life Sanctuary, E. Sikkim, 8.vi.1997; (vii) 1 S and 2 W from Tumin Wild Life Sanctuary, E. Sikkim, 6.vi.1997, ex. "gallery on Soil"; (x) 12 Im and 4 S from Sonmary forest, W. Sikkim, 8.vi.1995, ex. "Stump"; (xi) 3 S and 6 W from Sonmary forest, Geyzing, W. Sikkim, 8.v.1995, ex. "Stump"; (xii) 2 S and 4 W from Sonmary forest, Geyzing, W. Sikkim, 8.v.1995, ex. "wooden fence post"; (xiii) 2 S and 8 W from Sonmary forest, Geyzing, W. Sikkim, 8.v.1995, ex. "wooden fence post"; (xiv) 4 S and 4 W from Sonmary forest, Geyzing, W. Sikkim, 8.v.1995, ex. "Stump"; (xv) 2 Im, 3 S and 8 W from Sonmary forest, Geyzing, W. Sikkim, 8.v.1995, ex. "stump"; (xvi) 4 S and 8 W from Phensong, N. Sikkim, 3.iv.1994, ex. "stump"

Measurements (in mm) : Head length to base of mandible 2.03–2.11; Max. head width 1.15 – 1.34; Max. mandible length 1.03; Pronotum length 0.45–0.52; Pronotum width 0.75–0.80; No. of antennal segment, 15–16.

Distribution : INDIA : Sikkim : Chungthong, Gangtok (Rumtek), Geyzing (Sonmary forest), Phensong, Rangoli and Tumin Wild Life Sanctuary; Assam, Arunachal Pradesh, Meghalaya, West Bengal. *Elsewhere* : Bhutan and China.

Remarks : Abundance of *Reticulitermes assamensis* in the State is not unusual, since it is a temparate species infesting the dead and decaying felled logs in the forest. It is not so far reported to cause any pronounced damage to the wood works. It is mostly associated with pinelogs and tree trunk of Pine in addition to other minor logs.

2. ***Coptotermes travians*** Haviland

1896. *Termes (Coptotermes) travians* Haviland, *J. Linn. Soc. (Zool.)*, **26** : 169, Im, S, W. *Type-locality* : Singapore and Sarawak (Malaysia).

1962. *Coptotermes travians*, Roonwal and Chhotani, *Indian Species of the Termite Genus Coptotermes*. New Delhi (*Eng. Monogr. Indian Coun. agric. Res.* No. 2), pp. 61-69.

1989. *Coptotermes travians*, Roonwal and Chhotani, *Fauna of India (Isoptera)*, **1** : 461-467, figs. 244-247.

Material studied : (A) Sev. S and W collected by *P.H. Roy and party*, 1994-1995 as follows : (i) 7 S and 12 W from Rangpo, E. Sikkim, F.C. No. R/3, 14.iv.1994, ex. "fence of *Sal* post"; (ii) 15 S and 10 W from Rangpo College area, E. Sikkim, F.C. No. R/9, 14.iv.1994, ex. "under log"; (iii) 6S and 10 W from Rangpo around ITI College, E. Sikkim, F.C. No. R/7, 14.iv.1994, ex. "under fence Post"; (iv) 20 S and 10 W from Rangpo around Sikkim distillary, E. Sikkim, F.C. No. R/1, 14.iv.1994, ex. "fence wooden post"; (v) 6 S and 6 W from Rangpo forest area, E. Sikkim, F.C. No. R/12, 14.iv.1994, exp. "under wooden post"; (vi) 10 S and 20 W from Rangpo around Sikkim distillary, E. Sikkim, F.C. No. r/5, 14.iv.1994, ex. "Wooden fence post"; (vii) 12 S and 6 W from Rangpo, CRP Campus, E. Sikkim, Ex. "Wooden fence post"; (viii) 3 S and 8 W from Rumtek, E. Sikkim, 6.iv.1994, exp. "soil under bamboo"; (iv) 5 S and 10 W from Mamming, S. Sikkim, 20.v.1995, ex. 'under log"; (x) 6 S and 25 W from Melli, S. Sikkim, F.C. No. R/27, 13.iv.1994, ex. "under wooden log"; (xi) 8S and 10 W from Melli around forest area, S. Sikkim, F.C. No. R/26, 13.iv.1994, ex. "Gallery under Soil"; (xii) 5 S and 20 W from Melli, S. Sikkim, F.C. No. R/28, 13.iv.1994, ex. "fence post"; (xiii) 5 S and 8 W from Phensong, N. Sikkim, 3.iv.1994, ex. "Stump" (B) 10 S and 40 W, Rangpo, E. Sikkim coll. *B. N. Nandi and party*, 12.iv.1980, ex. "Decaying stump"

Measurements (in mm) : Length of head to lateral base of mandible, 1.30-1.38; Max. head width 1.07-1.14: Mandible length, 0.80–0.84; Pronotum length 0.40–0.43; Pronotum width Postmentum length 0.80–0.84; Postmentum width 0.38–0.42; Antennal segments, 14–15.

Distribution : INDIA : Sikkim : Phensong, Mammring and Rangpo; Assam, Andaman and Nicobar Islands, Meghalaya, Orissa, Tripura and West Bengal. ELSEWHERE : Bangladesh, Myanmar, Malayasia, Singapore and Indonesia.

Remarks : This species occurs predominantly in the area unlike to its allied species *C. heimi* which is a very common one in the plains. It hardly can be treated a economically important species.

Key to the species under the genus *Microcerotermes*

1. Head pale-brown; pronotum with an indistinct median notch; mandible weakly hooked at apex; mandibles rather straight at outer margin ..... *beesoni* Snyder

– Head dark-brown; pronotum with a distinct median notch; mandible comparatively strongly hooked at apex; mandible strongly incurved at outer margin .... *cameroni* Snyder

3. *Microcerotermes beesoni* Snyder

1933. *Microcerotermes beesoni* Snyder, *Proc. U. S. natn. Mus.*, **82** (16) : 12–14, Im. *Type-locality* : Chakata Range, Haldwani, Uttar Pradesh, India.

1980. *Microcerotermes beesoni*, Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (3) : 257, 258, 260.

1997. *Microcerotermes beesoni*, Chhotani, *Fauna of India Isoptera (Termitues)*, **2** : 155-159. figs. 68, 69.

Material studied : (i) 15 S and 55 W from Rangpo, 3 kms. N.E. of SPWD Bunglow, E. Sikkim, coll. *B. Nandi and party*, 14.iv.1980, ex. "Gallery inside fallen branch"

Measurements (in mm) : Head length to base of mandibles, 1.54; Max. head width, 0.92; Max. mandible length 0.96; Length of pronotum 0.38; Width of pronotum 0.61; No. of antennal segments, 13.

Distribution : INDIA : Sikkim : Rangpo, 3 kms. N.E.of SPWD Bunglow, Uttar Pradesh, Delhi, Haryana, Punjab, Madhya Pradesh, Orissa, West Bengal and Assam. *Elsewhere* : Bhutan, Pakistan and Bangladesh.

Remarks : The species is well distributed in India, mostly associated with the soil-habitats and sometimes constructs carton nest being adpest to tree trunk, fence posts, stump, etc.

4. *Microcerotermes cameroni* Snyder

1934. *Microcerotermes cameroni* Snyder, *Indian For. Rec.*, **20** (11) : 21–22, Im and S. *Type-locality* : North Vellore Dist., Tamil Nadu.

1980. *Microcerotermes cameroni* Roonwal and Verma, *Proc. Indian natn. Sci. Acad.*, (B) **46** (3): 257, 258.

1997. *Microcerotermes cameroni* Chhotani, *Fauna of India Isoptera* (Termites), **2** : 162–165, figs. 72, 73.

Material studied : Sev S and W collected by *P.H. Roy and party,* 1994 as follows : (i) 10 S and 20 W,from Jorethang S. Sikkim, F.C. No. R/3, 10.iv.1994, ex. "stump"; (ii) 10 S No. R/17, 11.iv.1994, ex. "Stump"; (iii) 3 S and 10 W from Jorethang Garden Complex, S. Sikkim, F.C. No. R/4, ex. "long"; (iv) 1 S and 10 W from Jorethang, S.Sikkim, F.C. No. R/9, 10.iv.1994, ex. "stump"; 6 S and 10 W from Jorethang forest area, F. C. No. R/15, 11.iv.1994, ex. "stump"; (vi) 1 S and 12 W from Jorethag Garden Complex, F.C.No. R/2, 10.iv.1994, ex. "log"; (vii) 1 S and 10 W from Jorethag Garden Complex, F.C. No. R/3, 10.iv.1994, exp. "stump"; (viii) 5 S and 15 W from Jorethang, S. Sikkim, F.C. No. R/5, 10.iv.1994, ex. "gallery in the Sal log"; (ix) 5 S and 20 W from Jorethang, S. Sikkim, F.C. No. R/7, 10.iv.1994, ex. "stump"; (x) 1 S and 8 W from Topakhani, E. Sikkim, 2.v.1995, ex. "log"

Measurements (in mm) : Head length to base of mandible 1.57; Max. head width 0.96; Max. mandible length, 0.76; Length of pronotum 0.34; Width of pronotum 0.61; No. of antennal segments, 13.

Distribution : INDIA : Sikkim : Jorthang forest area and Garden Complex; Tamil Nadu, Kerala, Andhra Pradesh, West Bengal.

Remarks : The species is quite closely allied to *M. beesoni* and it is more common than the related one. It is always associated with soil under felled logs and wood, indicating preference to moist soil.

Key to the species of *Pericapritermes* (Soldier)

1. Smaller species; head length without mandible 2.00–2.11; head width 1.06–1.25 mm; and mandible length, 1.24 mm. ....*P. assamensis* Mathur and Thapa

– Larger species; head length without mandible 2.50–2.75 mm; head width 1.48–1.70 mm and mandible length 1.60–1.84 mm.....*P. tetraphilus* (Silvestri)

5. *Pericapritermes assamensis* (Mathur and Thapa)

1965. *Capritermes assamensis* Mathur and Thapa *Bull. Ent.*, No. **6** : 10–12.

1968. *Pericapritermes assamensis* Krishna, *Bul. Am. Mus. nat. Hist.*, **138**(5) : 293.

1997. *Pericapritermes assamensis* Chhotani, *Fauna of India* Isoptera (Termites), **2** : 322–324, fig. 158.

Material studied : (i) 3 S and Sev. W, B.M. Bazar Basti, near Namchi, S. Sikkim, coll. *P.H. Roy and party,* 15.v.1995, ex. 'under leaves and soil'; (ii) 1 S and sev. W. Onlakh, *Ca.* 6 kms. E. of Geyzing beyond Sakyong, W. Sikkim, coll. *D.Y. Chaturvedi and K.C. Kansal,* 3. viii.1989, ex. "trunk of Orange tree"

Measurements (in mm.) : Head length to lateral base of mandible 2.00–2.11; Max. head width 1.19–1.23; Length of pronotum 0.34; Width of pronotum, 0.76–0.80. No. of antennal segments, 14.

Distribution : INDIA : Sikkim : Namchi, Onlakh; Assam, West Bengal. *Elsewhere* : None.

Remarks : This is a soil inhabiting species reported from the Eastern India, including the foot hills of the Himalaya. The material from Onlakh, mentioned above with comparatively long narrow head seems to be intercolonial difference.

6. *Pericapritermes tetraphilus* (Silvestri)

1922. *Capritermes tetraphilus* Silvestri, *Rec. Indian Mus.*, *24*(4) : 543–545, S. and W.

1965. *Pericapritermes tetraphilus,* Krishna, *Am. Mus. Novit.*, No. 2210; 15–16.

1997. *Pricapritermes tetraphilus* Chhotani, *Fauna of India Isoptera (Termites), 2* : 338–341, figs. 165, 166.

Material studied : (i) 2S and 8 W from Dumthang Basti, near Namchi, S. Sikkim, coll. *P. H. Roy and party,* 15.v.1995, ex. "under a small log"; (ii) 3 S and 6 W from Dumthang Basti near Namchi, S. Sikkim, coll. *P. H. Roy and party,* 15.v.1995, ex. "under log"; (iii) 2 S and 6 W from 4 kms E. of SPWD Bunglow, E. Sikkim, coll. *B.Nandi and party,* 18.iv.1980, ex. "decaying stump"

Measurements (in mm) : Length of head to lateral base of mandible 2.46–2.50; Max. head width, 1.46–1.50; Mandible length, 0.76–0.88; Pronotum length, 0.42–0.46; Pronotum width, 0.88; No. of antennal segments, 13.

Distribution : INDIA : Sikkim : Dumthang Basti (near Namchi) and Rangpo, 4 kms. east of SPWD Bunglow: Assam, West Bengal, Madhya Pradesh. *Elsewhere* : Bangladesh, Myanmar and China.

Remarks : This soil inhabiting species is frequently found in felled logs in contact with soil.

Key to the species of the genus *Odontotermes* (Soldier)

1. Tooth on left mandible placed in the distal half, tooth index 0.22–0.37; comparatively smaller species, head length to base of mandible 1.30–1.40 mm. 2
– Tooth on left mandible placed in the basal half, tooth index more than 0.50; comparatively larger species head length to base of mandibles 2.70-4.00 mm. 4
2. Tooth index 0.22–0.27; postmentum much longer than broad, lateral sides almost parallel sided .... *giriensis* Roonwal and Chhotani
– Tooth index 0.27–0.32; postmentum slightly longer than broad, lateral sides distinctly outcurved 3
3. Head somewhat oval, tooth placed comparatively less towards apex, mandibular tooth index, 0.31–0.37 .... *bovini* Thakur
– Head somewhat round; tooth placed more towards apex; mandibular tooth index 0.27–0.32 ..... *sikkimensis* Thakur and Rathore
4. Tooth of left mandible prominent, placed just below the middle, index 0.55–0.60 ... . *horni* (Wasmann)
– Tooth of left mandible minute and placed on the basal third 5
5. Head capsule distinctly narrowed anteriorly; antennae 17–segmented; comparatively larger species, mandibular tooth index 0.58–0.65 .... *parvidens* Holmgren and Holmgren
– Head capsule with sides almost parallel, indistinctly narrowed anteriorly; antennae 16–segmented; mandibular tooth index 0.60–0.65 ... *horai* Roonwal and Chhotani

7. *Odontotermes boveni* Thakur

1976. *Odontotermes boveni* Thakur, *Indian Forester*, **102** (8) : 500, 502 (*nom. nud.*).

1981. *Odontotermes boveni* Thakur, *Indian For. Rec. (N.S.) Ent., 14*(2) : 4, 12, 30–33, S. and W. *Type-locality* : Gwaldam, Garhwal, Uttar Pradesh, India.

1997. *Odontotermes boveni*, Chhotani, *Fauna of India, Isoptera (Termites)*, 2 : 460–462, fig. 218.

Material studied : (A) Sev. S. and W collected by *P. H. Roy and party* 1994–1996 as follows : (i) 2 S and 6 W from Rangpo, E. Sikkim, 15.iv.1994, ex. "gallery on a log"; (ii) 3 S and 10 W from Geyzing, W. Sikkim, 9.v.1995, ex. "under fallen leaves"; (iii) 2 S and 20 W from Geyzing, W. Sikkim, 9.vi.1996, ex. "Under fallen leaves"; (iv) 5 S and 8 W from Geyzing, W. Sikkim, 7.v.1995, ex. "under fallen leaves"; (v) 5 S and 10 W from Geyzing, Legship, W. Sikkim, 9.v.1995, ex. "under fallen bamboo leaves; (vi) 1 S and 8 W from Phensang, Mangon, N. Sikkim, 3.iv.1994, ex. 'stump'; (vii) 8 S and 16 W from Mangon, N. Sikkim, 3.iv.1994, ex. 'stump'; (viii) 2 S and 6 W from Namthang, Namchi, S. Sikkim, 14.v.1995; (xi) 2 S and 20 W from Jorathang, S. Sikkim, 10.vi.1996; (x) 4 S and 14 W from Namchi forest area, S. Sikkim, 14.v.1995; (xi) 3 S and 4 W from Namchi, S. Sikkim, 15.v.1995, ex. 'under log'. (B) Sev. S and W collected by *B. Nandi and party* 1980 as follows : (i) 8 S and 16 W from Rangpo, E. Sikkim, 15.iv.1980, ex. "fence post"; (ii) 3 S and 16 W from Rangpo, Jungle around SPWD Bunglow, E. Sikkim, 11.iv.1980, ex. "earthen gallery on fence post", (C) S and W collected by *M. Prasad and party* as follow : (i) 1 S and 3 W from Tadong, S. Sikkim, 10.vii.1979.

Measurements (in mm) : Length of head to lateral base of mandible, 1.38–1.40; Head width, 1.26–1.30; Mandible length, 0.73–0.76; Tooth distance from tip, 0.24–0.26; Pronotum length 0.50–0.51; Pronotum width 0.80–0.83; No. of antennal segments, 15.

Distribution : INDIA : Sikkim : Geyzing, Rangpo, Mangon, Namchi, Namthang, Jorethang, andTadong; Madhya Pradesh and Uttar Pradesh. *Elsewhere* : Nepal.

Remarks : The species is quite common in this region covering all the districts of Sikkim.

8. ***Odontotermes giriensis*** Roonwal and Chhotani

1962. *Odontotermes giriensis* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India,* (B) **28**(4): 289, 296, 341–345, pls. 28, 29 S.W. *Type-locality*: Rangrengiri, Garo Hills, Meghalaya.

1997. *Odontotermes giriensis,* Chhotani, *Fauna of India Isoptera (Termites),* **2** : 478-482. figs. 229, 230.

Material examined : 1 S and 4 W. from Sonmarry forest, Geyzing,, W. Sikkim, coll. *P. H. Roy and party,* 15.v.1995, ex. 'wooden fence pole'.

Measurements (in mm) : Head length to base of mandibles 1.34; Max. head width 1.23; Max. mandible length 0.76; Tooth distance from tip 0.19; Pronotum length 0.57; Pronotum width 0.88; No.of antennal segments, 15.

Distribution : INDIA : Sikkim : Geyzing (Sonmary forest), Assam, Meghalaya, Arunachal Pradesh, Tripura, Manipur, Orissa and Uttar Pradesh. *Elsewhere* : Bangladesh.

Remarks : It is one of the most common soil inhabiting termites of the North-east India, including its adjacent countries like Bangladesh. In a single occasion in Sikkim, it has been collected for the first time from a fence pole.

9. ***Orontotermes horai*** Roonwal and Chhotani

1962. *Odontotermes horai* Roonwal and Chhotani, *Proc. natn. Inst. Sci. India,* (B) 28(4) : 289, 296, 346–349, pls. 30, 31, S. W. *Type-locality* : Bank of Nongpriang stream, Khasi Hills, Meghalaya, India.

1997. *Odontotermes horai* Chhotani, *Fauna of India, Isoptera (Termites), 2* : 495–498, fig. 239, 240.

Material studied : (A) 1 S and 5 W from Pakyong, 14 kms. South of Rangpo, E. Sikkim, F.C. No. R/6, coll. *P. H. Roy and party,* 7.iv.1997. (B) Sev. S and W from Geyzing, Legship, W. Sikkim collected by *P.H.Roy and party* as follows : (ii) 5 S and 12 W, 8.v.1995, ex. "stump"; (iii) 2 S and 8 W, 8.v.1995, ex. "fence post"; (iv) 10 S and 15 W, 8.v.1995, ex. "stump"; (v) 2 S and 6 W, 8.v.1995, ex. "Fence post"; (vi) 6 S and 12 W, 8.v.1995, ex. "stump"

Measurements (in mm) : Head length to base of mandible, 1.57–1.96; Max. width of head, 1.54–1.76; Max. mandible length 1.11–1.18; Tooth distance from tip 0.62–0.64; Pronotum length, 0.69–0.73; Pronotum width, 1.19–1.22; No.of antennal segments, 15.

Distribution : INDIA : Sikkim, Geyzing and Pakyong; Meghalaya, Madhya Pradesh, Nagaland, Uttar Pradesh and West Bengal. *Elsewhere* : Nepal and Pakistan.

Remarks : The species is one of the subterrenean termites occuring in northern India. Itis very close to *O. parvidens* Holm. and Holm. in shape, size and position of teeth on the left mandible.

10. ***Odontotermes honni*** (Wasmann)

1902. *Termes horni* Wasmann, *Zool. Jb. Syst.,* **17**(1) : 111 Sand W. *Type-locality;* Nalanda, Sri Lanka.

1913. *Ocontotermes (Odontotermes) horni,* Bugnion, *Rev. Suiss Zool.,* **21**(10) : 299–310.

1962. *Odontotermes horni,* Roonwal and Chhotani, *Proc. nat. Inst. Sci. India,* (B) **28**(4) : 296, 349–352.

1997. *Odontotermes horni,* Chhotani, *Fauna of India Isoptera (Termites),* **2** : 498–502, figs. 241, 242.

Material examined : (i) 5 S and 25 W from Pakyong, 14 kms. South of Rangpo, E. Sikkim, coll. *P. H. Roy and party,* F.C. No. R/6, 7.iv.1997, ex. "gallery in fence post"; (ii) 2 S and 6 W from Namchi, S. Sikkim, coll. *P.H.Roy and Party,* 12.v.1995.

Measurements (in mm) : Head length to lateral base of mandible, 2.60–2.65; Max. head width

2.05–2.10; Mandible length 1.50–1.52; Tooth distance from the tip 0.85–0.88; Pronotum length 0.90–0.94; Pronotum width, 1.60–1.64; No. of antennal segments, 17.

Distribution : INDIA : Sikkim : Namchi and Pakyong north east of Rangpo; Manipur, Meghalaya, Tripura, South India, *Elsewhere* : Sri Lanka.

Remarks : *O. horni,* a closely allied species, to *O. feae,* is a very variable species occuring commonly in the South east Asia. But it occurs sparsely in the hilly tracts in the study area.

11. ***Odontotermes parvidens*** Holmgren and Holmgren

1917. *Odontotermes (Odontotermes) parvidens* Holmgren and Holmgren, *Mem. Dept. agric. Sci.*, **5** (3) : 154. S. and W. *Type-locality* : Mysore to Mercara Road.

1997. *Odontolermes parvidens* Chhotani, *Fauna of India Isoptera (Termites),* **2** : 526–530, figs. 258, 259.

Material studied : Sev. S and W from in and around Rangpo, E. Sikkim collected by *P. H. Roy and party* 1994 as follows : (i) 4 S and 10 W, near Central School, 15.iv.1994, ex. "fence post"; (ii) 3 S and 15 W, ITI College, 14.iv.1994, ex. "Soil under wooden log"; (iii) 4 S and 2 W, around Sikkim distilary, 14.iv.1994, ex. "under log"; (iv) 2 S and 2 W, 17.v.1995, ex. "gallery on tree"; (v) 8 S and 12 W, around forest area, 14.iv.1994, ex. "soil under log"; (vi) 3 S and 12 W, 12.iv.1994, ex. "fence wooden post"; (vii) 14 S and 1 W, from forest area round Rongpo, 18.v.1995, ex. "fence post"; (viii) 3 S and 8 W from 13 kms. South of Gangtok, Ranipool, 5.iv.1994, ex. "stump"; (ix) 4 S and 12 W, from Ranipool, 5.iv.1994, ex. "stump"; (x) 9 S and 12 W from Samsries Garden, 3 kms. South of Ranipool, 5.iv.1994, ex. "stump" (B) Sev. S and W collected by *P. H. Roy and party* 1994–1995 as follows : (xi) 4 S and 4 W from Geyzing, W. Sikkim, 9.v.1995, ex. "fence post" (xii) 10 S and 20 W from Naya Bazar forest area, W. Sikkim, 9.iv.1994, ex. "under a Sal log"; (xiii) 8 W and 12 W from Naya Bazar, W. Sikkim, 9.iv.1994, ex. "barbed wooden fence post"; (xiv) 1 S and 4 W from Naya Bazar forest area, W. Sikkim, 9.iv.1994, ex. "under log"; (xv) 3 S and 8 W Legship, Geyzing,, W. Sikkim, 9.v.1995, ex. "under log" (C) Sev. S and W collected by *P. H. Roy and party* 1994–1997 as follows : (xvi) 12 S and 2 W from Melli, around Power pillar, S. Sikkim, 13.iv.1994, ex. "under log"; (xvii) 4 S and 8 W from Mellibazar, Melli forest area, S. Sikkim, 10.iv.1997, ex. "stump"; (xviii) 2 S and 2 W from Mellibazar, S. Sikkim, 10.viii.1997, ex. "stump"; (xix) 8 S and 12 W from Namchi, S. Sikkim, 11.v.1995, ex. "stump"; (xx) 6 S and 15 W from Namchi, S. Sikkim, 12.v.1995, ex. "stump"; (xxi) 1 S and 4 W from Jorethang, forest area, S. Sikkim, 11.iv.1994, ex. "stump"; (xxii) 6 S and 5 W from Jorethang forest area, S. Sikkim, 11.iv.1994, ex. "log"; (xxiii) 2 S and 2 W from Jorethan forest area, S. Sikkim, 11.iv.1994, ex. "log"

Distribution : INDIA : Sikkim : Rangpo, Ranipool, Naya Bazar, Legship, Mellibazar, Namchi, Jorethang; Northern, eastern and north-eastern India. *Elsewhere* : Bangladesh, Bhutan and Pakistan.

Remarks : The species is highly variable one and very common in the hilly tracts including Sikkim. The shape and size of head and teeth of the species varies appriciably in different population. The biology of the species is quite similar to other fungus growing soil termites of India.

12. ***Odontotermes sikkimensis*** Thakur and Rathore

1986. *Odontotermes sikkimensis* Thakur and Rathore, *J. Ind. Acad.* Wood Sci., **17**(1) : 53–56, S and W, *Type locality* : Namchi, Sikkim, India, Fig. 1 and 2.

Measurements (in mm) : Head length to base of mandible 1.30–1.40; Max. width of head 1.10–1.25; Mandible length, 0.65–0.73; Length of pronotum 0.40–0.50; Max. width of pronotum 0.75–0.80; No.of antennal segments, 15–16.

Distribution : INDIA : Sikkim : Namchi (South Sikkim). *Elsewhere* : None.

Remarks : The species has recently been described by Thakur and Rathore. No material is available for the present study.

13. ***Hypotermes obscuriceps*** (Wasmann)

1902. *Termes obscuriceps* Wasmann, *Zool. Jb. Syst.*, **17** : 113–114, S. and W. *Type-locality* : Trincomalee, Sri Lanka.

1956. *Hypotermes obscuriceps* Roonwal and Sen Sarma, *Indian J. agric. Sci.*, **26**(1) : 25.

1997. *Hypotermes obscuriceps*, Chhotani, *Fauna of India, Isoptera (Termites)* **2** : 557–561, fig. 273–274.

Material studied : (A) Sev. S and W collected by *P.H.Roy and party* 1995 as follows: (i) 2 S and 2 W from Namchi, S. Sikkim, 13.v.1995, ex. "gallery on a tree trunk"; (ii) 2 S and 6 W from Namthang, 10 kms. North east from Namchi, S. Sikkim, 14.v.1995, ex. "under leaves"; (iii) 10 S and 6 W from Dumthang near Namchi, S. Sikkim, 15.v.1995, ex. "stump"; (iv) 1 S and 15 W from Namchi, S. Sikkim, 13.v.1995; (v) 4 S and 20 W from Namchi, forest area, S. Sikkim, 13.v.1995, ex. "wooden Pole"; (vi) 8 S and 10 W from Dumthang, near Namchi, S. Sikkim, 15.v.1995, ex. "stump"; (vii) 4 S and 8 W from Namchi, S. Sikkim, 13.v.1995, ex. "stump"; (viii) 4 S and 8 W from Namchi, S. Sikkim, 13.v.1995, ex. "gallery on felled log"; (ix) 4 S and 10 W from Namchi, S. Sikkim, 15.v.1995; (x) 10 S and 8 W from Namthang, S. Sikkim, 14.v.1995, ex. "under stone"; (xi) 5 S and 12 W from Namchi, S. Sikkim, 13.v.1995, ex. "stump"; (xii) 3 S and 10 W from Legships, Geyzing, W. Sikkim, 9.v.1995, ex. "stump"; (xiii) 5 S and 15 W from Legships, Geyzing, W. Sikkim, 9.v.1995, ex. "stump"; (xiv) 4 S and 20 W from Legships, Geyzing, W. Sikkim, 9.v.1995, ex. "beneath leaves" (B) (xv) 10 S and 85 W from F.R.H. *ca,* half a kilometer south of Samsing, Sikkim, coll. *B. Nandi and party* 3.iv.80, ex. "earthen gallery on decaying stump"

Measurements (in mm) : Head length to base to mandible, 1.34–1.38; Max. head width, 1.11–1.23; Mandible length, 0.65–0.69, Pronotum length, 0.50–0.54; Pronotum width, 0.80, No. of antennal segments, 14–15.

Distribution : INDIA : Sikkim, Namchi, Geyzing, Samsing; Meghalaya, Tamil Nadu, Tripura and West Bengal. *Elsewhere* : Sri Lanka and Vietnam.

Remarks : This is quite a common species in the hilly tracts of Sikkim. It occurs always in soil contact attacking stump, decaying logs, fence posts, etc. in close association with different species of *Odontotermes.*

14. ***Microtermes obesi*** Holmgren

1911. *Microtermes obesi* Holmgren, *J. Bombay nat. Hist. Soc.*, **21**(1) : 787–788, Im. *Type-locality* : Khandala, Maharashtra, India.

1997. *Microtermes obesi* Chhotani, *Fauna of India Isoptera (Termites),* **2** : 583–587, fig. 286, 287.

Material studied : (A) Sev. S and W collected by *P. H. Roy and party* 1994–1995 as follows : (i) 5 S and 20 W from, E. Sikkim, 26.v.1995, ex. "under fencing pole"; (ii) 3 S and 6 W, from Mangmyurl, 3 kms. from Rangpo, E. Sikkim, 26.v.1995, ex. "under log"; (iii) 3 S and 15 W from Check post area of Rangpo forest, E. Sikkim, 15.v.1994, ex. "wooden fence pole"; (iv) 1 S and 3 W from Topakhani, E. Sikkim, 21.v.1995, ex. "under soil"; (v) 2 S and 2 W from Rangpo forest area, E. Sikkim, 18.v.1995, ex. "gallery on treee"; (vi) 1 S and 5 W from Rangpo forest area, E. Sikkim, 18.v.1995, ex. "gallery on tree" (B) Sev. S and W collected by *B. Nandi and party,* 1980, as follows : (vii) 5 S and 25 W and 10 Nymp., from Rangpo, ca., 11 kms. North of SPWD Banglow, E. Sikkim, 12.v.1980, ex. "Decayed stump"; (viii) 8 S and 40 W from Rangpo, *ca.*, 11 kms. North of SPWD Bunglow, E. Sikkim, 12.iv.1980, ex. "Decaying stump"

Measurements (in mm) : Head length to lateral base of mandible, 1.03–1.05; Max. head width 0.80–0.82; Mandible length 0.55; Pronotum length 0.50–0.54; Pronotum width, 0.80–0.84; Max. width of postmentum, 0.41–0.46; No. of antennal segments, 14–15.

Distribution : INDIA : Sikkim : Rangpo, Mangmyurl; Assam, Bihar, Meghalaya, Karnataka, Orissa, Tripura and Maharashtra. *Elsewhere* : Sri Lanka, Bangladesh and Pakistan.

Remarks : This fungus inhabiting species is as common as in Sikkim, as in India, Pakistan and Bangladesh. It extends its thin and narrow galleries

to fence post, tree trunks, stumps, under decaying logs and wood in the study area. Although the species is a well-known pests of agricultural and vegetable crops, nothing particular is known from Sikkim.

Key to the species under the genus *Nasutitermes* (Soldier)

1. Posterior margin of head substraight, in profile dorsal margin of head with rostrum weakly incurved at the base of rostrum, no distinct outcurved point above antennal base ..... *emersoni* Snyder

– Posterior margin of head round, in profile dorsal margin of head with rostrum substraight althrough; distinct but minute outcurved point above antennal base ....*jalpaiguriensis* Prasad and Sen-Sarma.

15. *Nasutitermes emersoni* Snyder

1934. *Nasutitermes (Nasutitermes) emersoni* Snyder, *Indian For. Rec.*, **20**(11) : 11–12, S. *Type-locality* : Sunderbans, Bangladesh.

1997. *Nasutitermes emersoni*, Chhotani, *Fauna of India Isoptera (Termites)*, **2** : 633–635, figs. 307 and 308.

Material studied : (i) 5 S and 19 W, Ranipool, LLHP, 13 km. south of Gangtok, S. Sikkim, coll. *P.H.Roy and party*, 5.iv.1994, ex. 'soil'; (ii) 40 S and 20 W, Jalipool, ICAR compound, 13 km south of Gangtok, S. Sikkim, coll. *P. H. Roy and party*, 6.iv.1994, ex. under bamboo leaves; (iii) 55 S and 6 W, Mongon, W. Sikkim, coll. *P. H. Roy and party*, 2.iv.1994, ex. 'stump'; (iv) 51 S and 15 W, Jalipool, ICAR compound, coll. *P. H. Roy and party*, 6.iv.1994, under bamboo leaves.

Measurements (in mm) : Head length with rostrum, 1.54–1.69; Length of rostrum, 0.54–0.60; Max. head width, 0.86–1.05; Pronotum length, 0.16–0.21; Pronotum width, 0.43–0.50; No. of antennal segments, 11–12.

Remarks : The species *Nasutitermes emersoni* is so far known only from Bangladesh and reported here for the first time from India. It mostly occurs under leaves in soil or on stump in Sikkim.

16. *Nasutitermes jalpaiguriensis* Prasad and Sen Sarma

1959. *Nasutitermes jalpaiguriensis Prashad* and Sen Sarma, *Indian Counc. Agric. Res.* (Ent. Monogr.) Code No. 10–23, pp. 39–43, S and W. *Type-locality* : India : West Bengal : Jalpaiguri, Teesta Division, Prasad and Sen Sarma (1959) described this species from the material from Jalpaiguri which was referred to as *N. fletcheri* (Holmgren and Holmgren) by Roonwal and Pant (1953).

1997. *Nasutitermes jalpaiguriensis* Chhotani, *Fauna of India, Isoptera (Termites)*, **2** : 650–652, fig. 318.

Material studied : (A) Sev. S and W from Rangpo, E. Sikkim collected by *P. H. Roy and party* 1994–1995 as follows : (i) 2 S, 6 W and 10 Im from Rangpo forest area, E. Sikkim, 18.v.1995, ex. "stump; (ii) 12 S and 25 W from Rangpo, Singtam, E. Sikkim, 18.v.1995, ex. "stump"; (iii) 15 S and 22 W from Rangpo, Singtam, 14 kms. from Rangpo, E. Sikkim, 18.v.1995, ex. "stump"; (iv) 5 S and 15 W from Rangpo, E. Sikkim, F.C. No. R/13, Stn. No. 4, 14.iv.1994, ex. "wooden post"; (v) 1 S and 2 W from Rangpo, E. Sikkim, 18.v.1995, ex. "stump"; (vi) 10 S and 20 W from Rumtek, E. Sikkim, F.C. No. R/1, Stn. No. 2, 6.iv.1994, ex. "Soil under leaves"; (vii) 20 S and 30 W from Rumtek, E. Sikkim, F.C. No. R/2, Stn. No. 2, 6.iv.1994, ex. "soil under bamboo leaves", (viii) 10 S and 10 W from Namchi forest area on the way to Rangpo, E. Sikkim, 14.v.1995, ex. "soil under leaves"; (ix) 5 S and 12 W from Sombare forest, W. Sikkim, 8.v.1995, ex. "stump"; (x) 2 S and 2 W from Dumthang Basti, Near Namchi, S. Sikkim, 5.v.1995, ex. "stump"; (xi) 6 S and 10 W from Namchi, Near Pagoda Buddha mandir, forest area, S. Sikkim, 15.v.1995, ex. "fence post"; (xii) 6 S and 10 W from Jorethag, Industrial Development Complex, S. Sikkim, 11.iv.1994, ex. "stump"; (B) Sev. S. and W from Rangpo, jungle around S.P.W.D. Bunglow, E. Sikkim, collected by *B. Nandi and party*, 1980 as follows : (xiii) 15 S and 20 W, 13.iv.1980, ex. "decaying stump"; (xiv) 5 S and 15 W, 15.iv.1980; (xv) 20 S and 50 W, 14.iv.1980, ex. "gallery inside fallen branch"; (xvi) 5 S and 12 W, 15.iv.1980, ex. "gallery inside fallen branch"; (xvi) 5 S and 12 W, 15.iv.1980, ex. "fence pole";

(xvii) 10 S and 20 W, 15.iv.1980, ex. "fence pole"; (xviii) 2 S and 10 W, 15.iv.1980, ex. "fence post" (C) Sev. S and W collected by *D.N. Tiwari and party,* 1992 as follows : (xix) 2 S and 6 W from Pakyang, E. Sikkim, 23.iv.1992; (xx) 1 S and 6 W from Rishi, Sikkim, 3.v.1992. (D)10 S and 20 W from Singtam, E. Sikkim (alt. 600 m) coll. *M. Prasad and party,* 7.vii.1979.

Measurements (in mm) : Head length with rostrum, 1.46–1.65; Length of rostrum, 0.54–0.63; Max. head width, 0.88–1.00; Pronotum length, 0.15–0.18; Pronotum width, 0.42–0.46; No. of antennal segments, 12.

Distribution : INDIA: Sikkim : Rangpo, Namchi, Singtam, Pakyang Rishi, Sombare forest, Jorethang; West Bengal, Tripura, Arunachal Pradesh. Elsewhere : Bangladesh.

Remarks : The species is quite common in the State including different areas of the eastern Himalaya. In the study area, it infests the bark of live trees and wood in its varied forms especially dried and decaying portions.

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INSECTA : HEMIPTERA : HOMOPTERA : APHIDIDAE

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INTRODUCTION

The aphids are tiny insects, sucking sap from the various parts of plants. They are remarkable for polymorphism, polyphytophagism, host alternating heteroecious behaviour, reproductive habits and for the ability of transmitting plant viral diseases. They have importance as crop pests. Out of 620 plant viruses, about 200 are arthropod-borne and among these, 164 are transmitted by aphids alone (Behura, 1986). The association of aphids with variety of crop plants coupled with their damage potential make them important subjects of study. They enjoy more or less a cosmopolitan distribution and are found in more abundance in plains of temperate climates. Of 4,702 aphid species recorded world over, 1020 thrive well in oriental region, out of which India accounts for nearly 650 species belonging to 200 genera (over 250 aphid species are economically important pests of agricultural and horticultural crops). Thus, the Indian aphids constitute 14% of the global fauna. Compilation of data also reveals that at least 1200 plant species belonging to nearly 700 genera and 175 Natural Orders are infested by these aphids in India. As a result of thorough study on the group, a series of publications are made on Indian aphids but for limitation of space only some important references are cited below.

Major contributions on Indian aphids are by Barlow (1890), Buckton (1893-1898), Cotes (1893), Fletcher (1914), van der Goot (1916-1917), Das (1918), George (1924-28), Krishnamurthy (1928, 1930), Deshpande (1930, 1937), Ayyar (1937), Ullah (1940), A. N. Basu (1961-1969), Behura (1963, 1965), Verma (1965-1974), David and his associates (1956-1975), Chakrabarti and his associates (1970 till date), D. N. Raychaudhuri and his collaborators (1956-till date), R. C. Basu and D. N. Raychaudhuri (1980), A. K. Ghosh (1974-till date), Stary and A. K. Ghosh (1983), L. K. Ghosh (1986-till date), A. K. Ghosh and Quednau (1990).

Although D. N. Raychaudhuri (*ed.* 1980) made a significant contribution on aphids of North east India and Bhutan, no such consolidated work on aphids of Sikkim is published so far.

Two species of aphids were recorded for the first time from Sikkim by Cotes (1893). Later, A. K. Ghosh and D. N. Raychaudhuri (1968) recorded 30 more species of aphids from a preliminary survey made during 1962. In 1968 under a PL-480 project on aphids on Northeast India, Entomology Laboratory, Zoology Department, University of Calcutta carried out extensive survey in the area.

A perusal of literature reveals that altogether 185 species belonging to 91 genera under 8 subfamilies are so far known from Sikkim through the works of M. R. Ghosh, R. C. Basu and D. N. Raychaudhuri 1970; M. R. Ghosh, A. K. Ghosh and D. N. Raychaudhuri 1971a, 1971b; A. K. Ghosh, H. Banerjee and D. N. Raychaudhuri 1971; M. R. Ghosh, P. K. Pal and D. N. Raychaudhuri 1974; D. N. Raychaudhuri and M. Chatterjee 1974; S. Chakrabarti and D. N. Raychaudhuri 1975; P. K. Mondal and D. N. Raychaudhuri 1977; B. K. Agarwala and D. N. Raychaudhuri 1977; M. R. Ghosh, R. C. Basu and D. N. Raychaudhuri 1977; P. K. Mondal 1977; P. K. Mondal, B. K. Agarwala and D. N. Raychaudhuri 1978a, 1978b; B. K. Agarwala and

D. N. Raychaudhuri 1980; M. R. Ghosh and D. N. Raychaudhuri 1981; B. K. Agarwala and D. N. Raychaudhuri 1981a, 1981b, 1981c; B. K. Agarwala and D. N. Raychaudhuri 1982; B. K. Agarwala, P. K. Mondal and D. N. Raychaudhuri 1982; B. K. Agarwala and D. N. Raychaudhuri 1986.

The present contribution is an attempt to provide a comprehensive account of 185 species and subspecies of aphid belonging to 91 genera under 8 subfamilies so far known from the state of Sikkim. A subfamilywise break up of the Aphididae of Sikkim is shown (Table-1) here to have an overview of aphids occurring in the area. A topography in brief has been provided to understand the flora and fauna. The work deals with a brief note on earlier investigations, running keys to the Subfamilies, Tribes, Subtribes, Genera, Species/Subspecies, literature reference, geographical distribution of each species both within Sikkim, India and elsewhere. Also, provided morphometric measurements of available morphs of all the species/subspecies examined unless otherwise mentioned. Besides, biological notes concerning aphid species, wherever possible, are provided together with taxonomic affinities with the related species. A table (No. 2) has also been given to indicate as to the infestation of aphids (of various subfamilies) on economically important plants in the area. Summary and discussion throwing light on the endemism have also been incorporated at the end followed by relevant references. Lastly, charts showing districtwise distribution and distribution maps have also been given to accommodate all the 185 species and subspecies so far known from Sikkim. The taxonomic keys, however, presented here are essentially for identification of Aphididae of Sikkim and it may not work for aphids not represented in the region. Taxonomic nomenclature of the listed genera and species have mostly been adopted after G. Remaudiere and M. Remaudiere (1997).

The entire work has been reviewed and suitably illustrated. Some of the diagrams are taken from Agarwala and Raychaudhuri 1977, 1982, Mondal 1977, D. N. Raychaudhuri (*ed.*) 1980, Chakrabarti 1988, Mondal 1977, A. K. Ghosh 1982, 1984, 1988, Ghosh and Quednau, 1990.

All the material, unless otherwise mentioned in the text were examined from the collections represented in Z.S.I. and Entomology Laboratory, Department of Zoology, C.U. but for limitation of space detailed collection data under each species/subspecies are not provided.

MORPHOLOGY AND TERMINOLOGY

The body of an aphid has normally three distinct regions, (Fig. 1, 2) head, thorax and abdomen but head and prothorax may be fused or there may be various types of fusion of abdomenal segments.

The head bears a flat or convex frons, with or without lateral frontal tubercles, (fig. 3) which when present may be smooth, rugose, spinulose, and parallel, converging or diverging. Eyes are normally large, compound type, but in apterae of Pemphiginae eyes may be represented by triommatidia, Paired lateral or dorsal tubercles may be present on the head, thoracic and abdominal segments, and three ommatidia protruding from the posterolateral margin in the eyes of alatae form "occular tubercles" Antennae usually consist of two short basal segments and a flagellum of 1–4 segments which may be variably smooth, imbricated or even reticulated; the penultimate antennal segment bears a primary rhinarium at the distal end and in the last antennal segment, the primary rhinarium placed basally demarkates, the 'base' from the slender apical part, termed 'processus terminalis' which is measured from the distal apex of the primary rhinarium to the tip; secondary rhinaria may vary in shape, size and number and may be variably present on antennal segment III, IV and V and sometimes on base of VI in alatae and on antennal segment III of apterae of some Aphididae. Rostrum consists of 5 segments, last segment being usually small and fused with the 4th segment, the combined structure is known as 'ultimate rostral segment', which may be of various

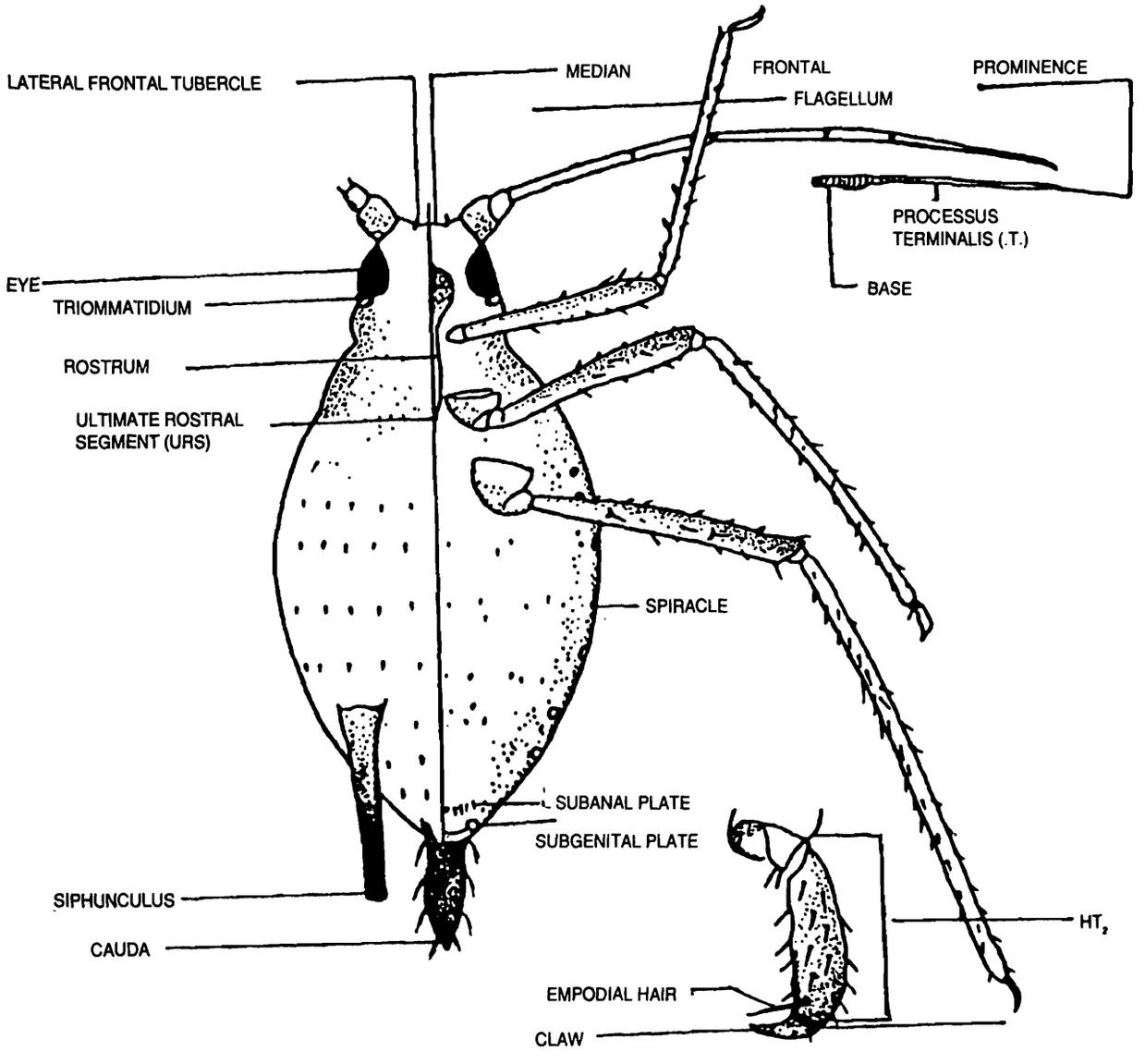


Fig. 1. Typical apterous viviparous female of an aphid.

types and sometimes these can be associated with particular feeding site, e.g. aphids feeding on Graminae with short ultimate rostral segment and those on Coniferae with long and distinct 5th segment of rostrum; ultimate rostral segment usually bears a variable number of accessory hairs besides a tuft of 6 primary hairs at the apex.

Thorax consists of three segments,Pro-meso-, and metathorax, the first may fuse with the head, the others may variably fuse among themselves or with the abdomen. Mesothorax in apterae usually show mid thoracic furca, the arms of which be seperated or connected by a sessile or stalked base. Legs consist usually of 5 segments, sometimes coxae and trochanters may be fused; femora and tibiae may be smooth or variably imbricated, the latter may bear peg-like hairs or stridulatory ridges or pseudorhinaria-like structures, sometimes tibiae may be distinctly spinulose apicad or may be swollen. Tarsi are usually 2 segmented and the small first tarsal segments bear 2–7 ventral hairs, in some groups like Drepanosiphinae dorsal hairs may also be present; second tarsal segment usually imbricated, sometimes spinulose and bear dorso and lateroapical hairs and a pair of terminal claws; empodial hairs present between the claws, may be hair-like, flattended or expanded at apices. Fore wings (Fig. 2) possess a variably pigmented stigma which may not extend upto the tip of the

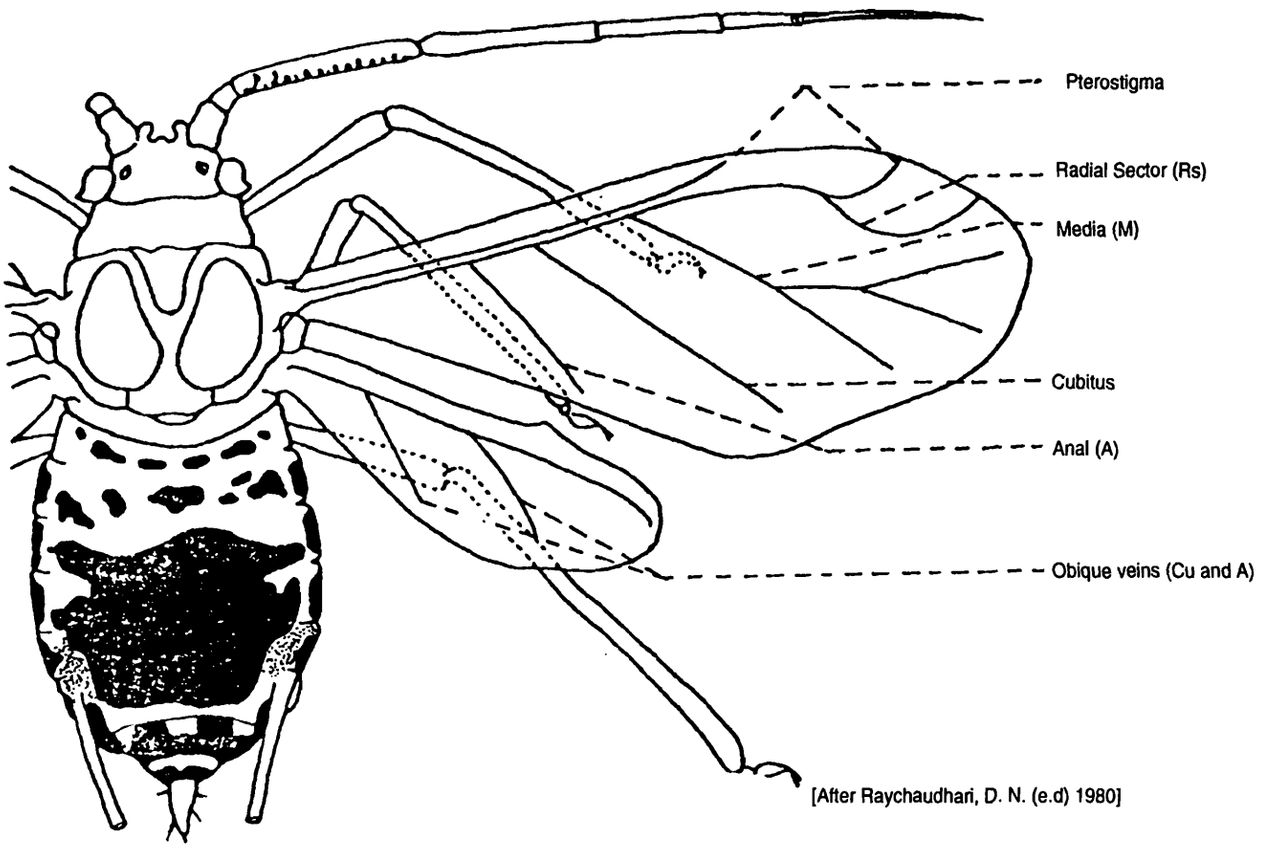


Fig. 2. Typical alate viviparous female of an aphid : C, Cauda; m, intersegmental muscle; S, spiracle; Siph., Siphunculus; t, tubercle.

wings, a straight or curved radial sector, simple or once or twice forked media, besides anal and cubitus veins; hindwing (Fig. 2) are always much smaller than fore wings, bear 2 oblique veins which may be reduced to 1 or may even be absent; wing veins may be variably infuscated or pale or partly united.

Abdomen consists of 9 segments, the terminal segment becoming modified as Cauda. Abdominal dorsum may be variably pigmented and sculptured; dorsal hairs may be fine, acuminate or with furcated apices and may be numerous or very sparse, extremely long or hardly discernible. Each of the abdominal segments 1-7 usually bears a pair of spiracle, which may be round, reniform and may be surrounded by a conspicuous spiracular plate. Lateral abdominal tubercles usually present on 1st and 7th tergite, those on 2nd-6th may be variably present; other tubercles may sometimes occur variably. Abdominal segment 5 or 6 usually bears a pair of Siphunculi, which may be elongate, truncate, cylindrical, clavate, tapering or pore-like and may be smooth, imbricated or reticulated and with or without hairs; siphunculi are absent in some Aphididae. Subanal plate situated ventral to the Cauda, may be entire, indented or bilobed; subgenital plate bears many hairs. Cauda may be elongate, oval, semioval, knobbed etc. and bears 2 or many hairs. Wax plates or pores may be variably present on head, thorax and abdomen and some species may remain completely covered with waxy secretion as in many Pemphiginae.

The oviparous females are usually apterous and possess numerous pseudosensoria on swollen hind tibiae; males usually alate but smaller in size than alatae viviparae, exhibit distinct sclerotic claspers.

Measurements for taxonomic study : Measurements of different morphological structures and hairs are essential in following descriptions and keys for identification. Measurements are taken with ocular micrometer under low magnification for body size etc., and

under high magnification for minute structures. Measurements of the following structures are essential for any aphidological study; words in parenthesis show the abbreviations used in the text.

1. Body length : Distance from frons to distal end of cauda
2. Body width : Maximum width at middle of abdomen.
3. Antenna : Length from base of segment I to tip of processus terminalis.
4. Base of last anternnal segment : Length from basal articulation to the outer margin of primary rhinarium
5. Processus terminalis (p.t.) : Length from distal end of primary rhinarium of last segment to the tip of the segment.
6. Basal diameter of antennal segment III (b.d. III) : Diameter at the very base of the segment.
7. Ultimate rostral segment (u.r.s.) : Length from base of segment 4 to the tip of segment 5 of rostrum.
8. Second segment of hind tarsus (h.t.2) : Length from basal articulation to the apex excluding claws.
9. Siphunculus (Siph.) : Length from basal articulation to the tip of the siphunculus.
10. Cauda : Length of cauda from middle of its base to apex.
11. Hairs : Length of hair from socket to the tip.

ABBREVIATIONS USED

The following abbreviations have been used in the text :—

Aptera/e	:	Apterous viviparous female/s
Alata/e	:	Alate viviparous female/s
a.s.	:	Antennal segment
b.d. III	:	Basal diameter of antennal segment III
Coll.	:	Collector
C.U.	:	Calcutta University (Department of Zoology), Calcutta
cu	:	Cubitus vein of fore wing
F.T.C.	:	First tarsal chaetotaxy
h.t. 2	:	Second joint of hind tarsus
indet	:	Unidentified
mm	:	Millimetre
M	:	Medial vein of fore wing
p.t.	:	Processus terminalis
Sc	:	Subcostal vein in fore wing
Times	:	As long as
U.r.s./,urs	:	Ultimate rostral segment
Z.S.I.	:	Zoological Survey of India, Calcutta
I, II, III..VI	:	Antennal segment I, II, III ...VI
1,2, 3, ...8	:	Abdominal segments 1,2,3, ...8

COLLECTION AND PRESERVATION

Aphids infest under surface of leaves, young terminal shoots, flower buds and flowers, roots, stem and branches of plants and vary in colour from dirty green to dark, or pink, red, yellow etc. The best method of collection is to collect aphids alive on plant part, in polythene bags but care should be taken to avoid excessive moisture within the container; from the colony thus collected, some adults may be seperated for preservation and the rest may be kept in wide mouth glass jar covered with mulmul cloth along with the host-plant material so as to allow the immature forms to develop further or to collect winged forms from alate nymphs. This method is also useful for rearing aphid parasites, which usually emerge within 2–3 weeks. Collection of these soft-bodied homopteran from plants is to be done by hand, with a soft camel hair brush dipped in ethyl alcohol, and they may be preserved in the fluid, concentration of which varies between 70%–90% according to the methods preferred by various aphidologists. Some workers prefer a mixture of ethyl alcohol and 75% acetic acid (50:50) for purpose of storage.

The insects preserved in alcohol, are to be cleared for mounting and permanent storage, on slides. For this purpose, insects are washed in alcohol and boiled in a water bath for 5–7 minutes; after carefully decanting off the alcohol, 10% KOH is added to the tube and the specimens are boiled again for 2–3 minutes for the purpose of cleaning. After decanting off the KOH, the specimens should be boiled in a solution of chloral phenol (saturated solution of chloral hydrate in distilled liquid phenol) for 10–15 minutes (depending on size and sclerotisation of the material). After clearing, the specimen may be mounted directly on clean glass slide in various mountant media; the one most commonly followed, is a media composed of Chloral hydrate (20 gm), powdered gum acacia (12 gm), glycerine (12 cc) and distilled water (40 cc). The media, as prepared above, is normally filtered through glass wool for removing impurities. Slides with the specimens are normally kept in flat trays for natural drying or may be dried in an oven till the peripheral mountant dries up; a suitable ringing material may be used. Two labels, one incorporating data for host plant, locality, date, name of the collector and the other with scientific name and name of scientist identifying the same, are pasted over the slides, Eastop and van Emden (1972) have dealt in details about various collection, preservation and mounting techniques.

It may be noted that besides collecting aphids from plant parts, several traps may be used for aerial population–study, the most common one being the Mocricks yellow pan trap (12x12x3 inches yellow painted pan). The pan filled about two third with water may be put adjacent to cultivated field or any vegetation and aphids being attracted by yellow colour and trapped in water may be removed at regular intervals.

BIOLOGY

Polymorphism and Reproduction

Ancestors of aphids have been considered as amphigonic oviparous insects from which the situation of extreme polymorphism evolved in present day aphids, in which each species has at least one parthenogenetic viviparous morph and in most an apterous female morph. Most of the aphids leading a holocyclic life cycle have five or six morphs *viz.* males, and as females, fundatrices, apterous and alate virginoparae or parthenogenetic forms, apterous and alate gynoparae that produce only oviparae. In the region under study, however, anholocyclic life cycle is the predominent pattern for most of the species, as they seem to be incapable of reproducing sexually or producing viable eggs and as a result apterous and alate parthenogenetic viviparous morphs become the most common morphs; most of the species moult 4 times before reaching maturity; males and oviparous females of a few species are met mostly in Northeast Himalaya and adjacent region, at high altitudes (c 2000m – c 2500m), at low temperature 6° – 16°C, RH. 51%–90% and at an average day length of 8–10 hours, but their capability to produce viable eggs (0.40 mm – 0.90 mm) remained mostly unknown. Parthenogenetic reproduction in aphids is achieved by thelytoky or diploid parthenogenesis and this leads to rapid population increase. Polymorphism in aphids has been reviewed by Hille Ris Lambers (1966).

Association with ants

Association of ants with aphids may be casual to intimate and exhibits different forms of mutualism. It has been stated that in obligate host-association of aphids, continuous association with ants is prevented due to heteroecious cycle, and only monoecious condition permits intimate association. Ants have been observed to drive away the natural enemies, e.g. *Lasius* spp. driving away predatory larvae of Syrphidae and Coccinellidae; *Formica* spp. have been observed not only to repel the enemies but also to attack and capture adult and older larvae of Syrphidae; but ant's hostility and alertness is stated to decrease with increasing food supply i.e. honey dew from aphids. Aphid species in some cases, multiply more rapidly when attended by ants and consequently, due to increased uninterrupted uptake of phloem-sap and increased excretion

rate of honey, ants benefit from more supply of food from aphid source.

The honey dew excreted by aphids, is a complex mixture of variable quality of many free amino acids, amides, minerals and vitamins, and provides nutrition to the ants and their solicitation probably increases the amino acid content and total amount of excreted honey dew. An excellent review on mutualism between ants and Homoptera has been given by Way (1963).

SYSTEMATIC ACCOUNT

CLASSIFIED LIST OF APHIDS OF SIKKIM

Family APHIDIDAE

Subfamily ANOECIINAE

Tribe **Aiceonini**

Genus 1. ***Aiceona*** Takahashi

1. *Aiceona titabarensis* (Raychaudhuri and Ghosh)

Tribe **Anoeciini**

Genus 2. ***Anoecia*** Koch

2. *Anoecia vagans* (Koch)

Subfam ily APHIDINAE

Tribe **Aphidini**

Subtribe **Aphidina**

Genus 3 ***Aphis*** Linnaeus

3. *Aphis craccivora* Koch
4. *Aphis fabae solanella* Theobald
5. *Aphis gossypii* Glover
6. *Aphis kurosawai* Takahashi
7. *Aphis longisetosa* Basu
8. *Aphis nasturtii* Kaltenbach
9. *Aphis nerii* Boyer de Fonscolombe
10. *Aphis spiraecola* Patch

Genus 4. ***Toxoptera*** Koch

11. *Toxoptera aurantii* (Boyer de Fonscolombe)
12. *Toxoptera citricidus* (Kirkaldy)
13. *Toxoptera odinae* (van der Goot)

Tribe **Rhopalosiphina**

Genus 5 *Hysteroneura* Davis

14. *Hysteroneura setariae* (Thomas)

Genus 6. ***Melanaphis*** van der Goot

15. *Melanaphis bambusae* (Fullaway)
16. *Melanaphis pahanensis* (Takahashi)
17. *Melanaphis sacchari indosacchari* (David)

Genus 7. ***Rhopalosiphum*** Koch

18. *Rhopalosiphum maidis* (Fitch)
19. *Rhopalosiphum nymphaeae* (Linnaeus)
20. *Rhopalosiphum padi* (Linnaeus)
21. *Rhopalosiphum rufiabdominalis* (Sasaki)
22. *Rhopalosiphum yoksumi* Ghosh, Banerjee and Raychaudhuri

Genus 8. ***Schizaphis*** Borner

23. *Schizaphis graminum* (Rondani)
24. *Schizaphis rotundiventris* (Signoret)

Tribe **Macrosiphini**

Genus 9. ***Acutosiphon*** Basu, Ghosh and Raychaudhuri

25. *Acutosiphon obliquoris* Basu, Ghosh and Raychaudhuri

Genus 10. ***Acyrthosiphon*** Mordvilko

26. *Acyrthosiphon rubi* Narzikulov

Genus 11. ***Akkaia*** Takahashi

27. *Akkaia bengalensis* Basu
28. *Akkaia neopolygoni* Ghosh, Ghosh and Raychaudhuri
29. *Akkaia sikkimensis* Agarwala and Raychaudhuri

Genus 12. ***Amphorophora*** Buckton

30. *Amphorophora ampullata bengalensis* Hille Ris Lambers and Basu

Genus 13. ***Arthromyzus*** Borner

31. *Arthromyzus smilacifoliae* Ghosh and Raychaudhuri

Genus 14. ***Aulocorthum*** Mordvilko

32. *Aulocorthum (Aulocorthum) dasi* Ghosh, Basu and Raychaudhuri
33. *Aulocorthum (Aulocorthum) linderae* (Shinji)
34. *Aulocorthum (Aulocorthum) magnoliae* (Essig and Kuwana)

35. *Aulocorthum (Aulocorthum) nipponicum* (Essig and Kuwana)
36. *Aulocorthum (Aulocorthum) rhamni* Ghosh, Basu and Raychaudhuri
37. *Aulocorthum (Aulocorthum) solani* (Kaltenbach)
38. *Aulocorthum (Neomyzus) circumflexum* (Buckton)
39. *Aulocorthum (Neomyzus) primulum* (Ghosh, Banerjee and Raychaudhuri)

Genus 15. ***Brachycaudus*** van der Goot

40. *Brachycaudus helichrysi* (Kaltenbach)

Genus 16. ***Brachymyzus*** Basu

41. *Brachymyzus jasmini* Basu

Genus 17. ***Brevicoryne*** van der Goot

42. *Brevicoryne brassicae* (Linnaeus)

Genus 18. *Capitophorus* van der Goot

43. *Capitophorus eleagni* del Guercio
44. *Capitophorus formosatemisiae* (Takahashi)
45. *Capitophorus hippophaes javanicus* Hille Ris Lambers
46. *Capitophorus hippophaes mitegoni* Eastop
47. *Capitophorus indicus* Ghosh and Raychaudhuri

Genus 19. ***Cavariella*** del Guercio

48. *Cavariella araliae* Takahashi
49. *Cavariella nigra* Basu

Genus 20. ***Cryptosiphum*** Buckton

50. *Cryptosiphum artemisiae* Buckton

Genus 21. ***Elatobium*** Mordvilko

51. *Elatobium sclerotica* Agarwala, Pramanick and Raychaudhuri

Genus 22. ***Ericolophium*** Tao

52. *Ericolophium sikkimensis* Agarwala and Mahapatra

Genus 23. ***Eumyzus*** Shinji

53. *Eumyzus himalayas* Agarwala, Pramanick and Raychaudhuri

Genus 24. ***Hyadaphis*** Kirkaldy

54. *Hyadaphis coriandri* (Das)

Genus 25. ***Hyalomyzus*** Richards

55. *Hyalomyzus raoi* Hille Ris Lambers

Genus 26. ***Hyperomyzus*** Borner

56. *Hyperomyzus carduellinus* (Theobald)

Genus 27. ***Impatientinum*** Mordvilko

57. *Impatientinum impatiens* (Shinji)
58. *Impatientinum (Neoimpatientinum) smilaceti* Agarwala, Mondal and Raychaudhuri

Genus 28. ***Indiaphis*** Basu

59. *Indiaphis rostrata* Ghosh and Raychaudhuri

Genus 29. ***Jacksonia*** Theobald

60. *Jacksonia sikkimensis* Ghosh, Basu and Raychaudhuri

Genus 30. ***Liosomaphis*** Walker

61. *Liosomaphis berberidis* (Kaltenbach)
62. *Liosomaphis himalayensis* Basu

Genus 31. ***Lipaphis*** Mordvilko

63. *Lipaphis erysimi* (Kaltenbach)

Genus 32. ***Macromyzus*** Takahashi

64. *Macromyzus (Macromyzus) woodwardiae* (Takahashi)
65. *Macromyzus (Anthracosiphoniella) maculatus* (Basu)

Genus 33. *Macrosiphoniella* del Guercio

66. *Macrosiphoniella (Macrosiphoniella) kikungshana* Takahashi
67. *Macrosiphoniella (Macrosiphoniella) pseudoartimisiae* Shinji
68. *Macrosiphoniella (Macrosiphoniella) sanborni* (Gillette)
69. *Macrosiphoniella (Macrosiphniella) sikkimartemisiae* Agarwala and Raychaudhuri
70. *Macrosiphoniella (Macrosiphoniella) yomogifoliae* (Shinji)
71. *Macrosiphoniella (Macrosiphoniella) spinipes* Basu

Genus 34. ***Macrosiphum*** Passerini

72. *Macrosiphum (Macrosiphum) pachysiphon* Hille Ris Lambers

73. *Macrosiphum (Macrosiphum) rosae* (Linnaeus)

Genus 35. ***Matsumuraja*** Schumachar

74. *Matsumuraja capitophoroides* Hille Ris Lambers

Genus 36. ***Metopolophium*** Mordvilko

75. *Metopolophium (Metopolophium rubifoliae* (Raychaudhuri, Ghosh and Basu)

Genus 37. ***Micromyzus*** van der Goot

76. *Micromyzus kalimpongensis* Basu

77. *Micromyzus niger* van der Goot

Genus 38. ***Myzakkaia*** Basu

78. *Myzakkaia kuwanis* (Ghosh, Basu and Raychaudhuri)

79. *Myzakkaia verbasci* (Chowdhuri, Basu, Chakrabarti and Raychaudhuri)

Genus 39. ***Myzus*** Passerini

80. *Myzus cerasi* (Fabricius)

81. *Myzus dycei* Carver

82. *Myzus formosanus* Takahashi

83. *Myzus ornatus* Laing

84. *Myzus persicae* (Sulzer)

85. *Myzus siegesbeckicola* Strand

Genus 40. ***Neoacyrthosiphon*** Tao

86. *Neoacyrthosiphon holsti* (Takahashi)

Genus 41. ***Neomasonaphis*** Ghosh and Raychaudhuri

87. *Neomasonaphis anaphilidis* (Basu)

88. *Neomasonaphis inulae* (Ghosh and Raychaudhuri)

Genus 42. ***Oedisiphum*** van der Goot

89. *Oedisiphum soureni* Basu

Genus 43. ***Pentalonia*** Coquerel

90. *Pentalonia nigronervosa* Coquerel

Genus 44. ***Phorodon*** Passerini

91. *Phorodon (Paraphorodon) cannabis* Passerini

Genus 45. ***Rhopalosiphoninus*** Baker

92. *Rhopalosiphoninus (Myzosiphon) smilacifoliae* (Ghosh and Raychaudhuri)

Genus 46. ***Semiaphis*** van der Goot

93. *Semiaphis heraclei* (Takahashi)

Genus 47. ***Shinjia*** Takahashi

94. *Shinjia orientalis* (Mordvilko)

Genus 48. ***Sinomegoura*** Takahashi

95. *Sinomegoura citricola* (van der Goot)

96. *Sinomegoura photiniae* (Takahashi)

Genus 49. ***Sitobion*** Mordvilko

97. *Sitobion akebiae* Shinji

98. *Sitobion aulocorthoides* David, Narayanan and Rajasingh

99. *Sitobion gravelii* (van der Goot)

100. *Sitobion indicum* Basu

101. *Sitobion miscanthi* (Takahashi)

102. *Sitobion pseudoluteum* Ghosh

103. *Sitobion rosaeformis* (Das)

104. *Sitobion sikkimense* (Ghosh and Raychaudhuri)

105. *Sitobion takahashii* (Eastop)

Genus 50. ***Subovatomyzus*** Basu

106. *Subovatomyzus leucosceptri* Basu

Genus 51. ***Tricaudatus*** Narzikulov

107. *Tricaudatus polygoni* Narzikulov

Genus 52. ***Trichosiphonaphis*** Takahashi

108. *Trichosiphonaphis gerbarae* Ghosh and Raychaudhuri

Genus 53. ***Tuberocephalus*** Shinji

109. *Tuberocephalus sasaki* (Matsumura)

Genus 54. ***Uroleucon*** Mordvilko

110. *Uroleucon formosanus crepidis* Ghosh, Ghosh and Raychaudhuri

111. *Uroleucon pseudotanaceti* (Verma)

112. *Uroleucon sonchi* (Linnaeus)

Genus 55. ***Vesiculaphis*** Hille Ris Lambers

113. *Vesiculphis pieridis* Basu

114. *Vesiculaphis sikkimensis* Mondal, Agarwala and Raychaudhuri

Genus 56. ***Xenomyzus*** Aizenberg

115. *Xenomyzus scabripes* Basu, Ghosh and Raychaudhuri

Tribe **Pterocommatini**

Genus 57. ***Pterocomma*** Buckton

116. *Pterocomma* sp.

Subfamily III DREPANOSIPHINAE

Genus 58. ***Betacallis*** Matsumura

117. *Betacallis querciphaga* Basu, Ghosh and Raychaudhuri

118. *Betacallis sikkimensis* Basu, Ghosh and Raychaudhuri

Genus 59. ***Clethrobius*** Mordvilko

119. *Clethrobius dryobius* Chakrabarti and Raychaudhuri

Genus 60. ***Neobetulaphis*** Basu

120. *Neobetulaphis chaetosiphon* Quednau and Chakrabarti

121. *Neobetulaphis pusilla* Basu

Genus 61. ***Shivaphis*** Das

122. *Shivaphis celti* Das

Genus 62. ***Taiwanaphis*** Takahashi

123. *Taiwanaphis dineni* Mondal, Agarwala and Raychaudhuri

Genus 63. ***Takecallis*** Matsumura

124. *Takecallis aurandinariae* (Essig)

Genus 64. ***Taoia*** Quednau

125. *Taoia indica* (Ghosh and Raychaudhuri)

Genus 65. ***Tinocallis*** Matsumura

126. *Tinocallis himalayensis* Ghosh, Ghosh and Raychaudhuri

Genus 66. ***Tinocalloides*** Basu

127. *Tinocalloides montanus* Basu

Subfamily IV GREENIDEINAE

Tribe **Cervaphidini**

Genus 67. *Anomalosiphum* Takahashi

128. *Anomalosiphum indigoferae* Ghosh, Ghosh and Raychaudhuri

Genus 68. ***Schoutedenia*** Rubsaamen

129. *Schoutedenia ralumensis* Rubsaamen

Genus 69. ***Sumatraphis*** Takahashi

130. *Sumatraphis celti* Takahashi

Tribe **Greenideini**

Genus 70. ***Eutrichosiphum*** Essig and Kuwana

131. *Eutrichosiphum alnicola* (Basu)

132. *Eutrichosiphum arunachali* Basu, Ghosh and Raychaudhuri

133. *Eutrichosiphum betulae* Mondal, Chatterjee and Raychaudhuri

134. *Eutrichosiphum davidi* Raychaudhuri

135. *Eutrichosiphum pseudopasaniae* Szelegiewicz

136. *Eutrichosiphum quercifoliae* Raychaudhuri, Ghosh, Banerjee and Ghosh

137. *Eutrichosiphum sikkimense* Raychaudhuri, Ghosh, Banerjee and Ghosh

138. *Eutrichosiphum tapatii* Mondal, Chatterjee and Raychaudhuri

Genus 71. ***Greenidea*** Schouteden

139. *Greenidea (Greenidea) decaspermi* Takahashi

140. *Greenidea (Greenidea) ficicola* Takahashi

141. *Greenidea (Greenidea) longicornis* (Ghosh, Ghosh and Raychaudhuri)

142. *Greenidea (Greenidea) longirostris* Basu

143. *Greenidea (Paragreenidea) symplocosis* Ghosh, Basu and Raychaudhuri

144. *Greenidea (Trichosiphum) brachyunguis* Chatterjee, Mondal and Raychaudhuri

145. *Greenidea (Trichosiphum) bucktonis* Ghosh, Basu and Raychaudhuri

146. *Greeidea (Trichosiphum) formosana heeri* Raychaudhuri, Ghosh, Banerjee and Ghosh

147. *Greenidea (Trichosiphum) prunicola* Ghosh, Banerjee and Raychaudhuri

148. *Greenidea (Trichosiphum) sikkimensis* Raychaudhuri, Ghosh, Banerjee and Ghosh

Genus 72. ***Greenideoida*** van der Goot

149. *Greenideoida (Paratrichosiphum) luteum* (Basu)

Genus 73. ***Mollitrichosiphum*** Suenaga

150. *Mollitrichosiphum (Mollitrichosiphum) nigriabdominalis* Agarwala, Mondal and Raychaudhuri

151. *Mollitrichosiphum (Mollitrichosiphum) tenuicorpus* (Okajima)
152. *Mollitrichosiphum (Mollitrichosiphum) trilocum* Agarwala and Ghosh
153. *Mollitrichosiphum (Metatrichosiphum) buddleiae* Ghosh, Banerjee and Raychaudhuri
154. *Mollitrichosiphum (Metatrichosiphum) montanum* van der Goot
155. *Mollitrichosiphum (Metatrichosiphum) nandii* Basu

Subfamily V HORMAPHIDINAE

Tribe **Ceraphidini**

Genus 74. ***Aleurodaphis*** van der Goot

156. *Aleuradaphis blumeae* van der Goot

Genus 75. ***Astegopteryx*** Karsch

157. *Astegopteryx minuta* (van der Goot)

Genus 76. ***Ceratoglyphina*** van der Goot

158. *Ceratoglyphina bambusae bengalensis* Ghosh

Genus 77. ***Ceratovacuna*** Zehntner

159. *Ceratovacuna indica* Ghosh, Pal and Raychaudhuri
160. *Ceratovacuna lanigera* Zehntner
161. *Ceratovacuna perglandulosa* Basu, Ghosh and Raychaudhuri
162. *Ceratovacuna silvestrii* (Takahashi)

Genus 78. ***Glyphinaphis*** van der Goot

163. *Glyphinaphis bambusae* van der Goot

Genus 79. ***Pseudoregma*** Doncaster

164. *Pseudoregma alexanderi* (Takahashi)
165. *Pseudoregma bucktoni* Ghosh, Pal and Raychaudhuri
166. *Pseudoregma panicola* (Takahashi)

Genus 80. ***Pseudoastegopteryx*** Ghosh, Pal and Raychaudhuri

167. *Pseudoastegopteryx himalayensis* Ghosh, Pal and Raychaudhuri

Tribe **Nipponaphidini**

Genus 81. *Nipponaphis* Pergande

168. *Nipponaphis (Pseudonipponaphis) querciphaga* Ghosh and Raychaudhuri

Subfamily VI LACHNINAE

Tribe **Cinarini**

Genus 82. ***Cinara*** Curtis

169. *Cinara (Cinara) atrotibialis* David and Rajasingh
170. *Cinara (Cinara) tistaensis* Agarwala and Raychaudhuri
171. *Cinara (Cinara) tujafilina* del Guercio
172. *Cinara (Cupressabium) cupressi* (Buckton)

Tribe **Lachnini**

Genus 83. ***Lachnus*** Burmeister

173. *Lachnus tropicalis* (van der Goot)

Genus 84. ***Nippolachnus*** Matsumura

174. *Nippolachnus piri* Matsumura

Subfamily VII PEMPHIGINAE

Tribe **Fordini**

Genus 85. ***Chaetogoica*** Remaudiere and Tao

175. *Chaetogeoica graminiphaga* Raychaudhuri, Pal and Ghosh

Genus 86. ***Geoica*** Hartig

176. *Geoica lucifuga* (Zehntner)
177. *Geoica sikkimensis* Raychaudhuri, Pal and Ghosh

Tribe **Pemphigini**

Genus 87. ***Epipemphigus*** Hille Ris Lambers

178. *Epipemphigus imaicus* (Cholodkovsky)

Genus 88. ***Pemphigus*** Hartig

179. *Pemphigus eastopi* Mondal
180. *Pemphigus vulgaris* Raychaudhuri, Pal and Ghosh

Tribe **Eriosomatini**

Genus 89. ***Eriosoma*** Leach

181. *Eriosoma lanigerum* (Hausmann)

Genus 90. ***Tetraneura*** Hartig

182. *Tetraneura (Tetraneura) sikkimensis* Raychaudhuri, Pal and Ghosh
183. *Tetraneura (Indotetraneura) basui* Hille Ris Lambers
184. *Tetraneura (Tetraneurella) nigriabdoinalis* (Sasaki)

Subfamily VIII THELAXINAE

Genus 91. ***Kurisakia*** Takahashi

185. *Kurisakia indica* Basu

TOPOGRAPHY

Sikkim lies in the shortest route between Tibetan plateau and Indian plains. It has an estimated areas of about 4392 sq.km. It is bounded by Tibet on the North and East, West Bengal on the South and Nepal on the West. The average annual rainfall is 400cm to 500cm. The temperature at places inhabited by human beings ranges between 4°C and 30°C. The variations of altitude have resulted diversity in climatic conditions in Sikkim. It has three types of Zones *viz.*, Tropical (up to *ca* 200m), Temperate (*ca.* 200m- *ca* 350m) and Alpine (*ca* 3500- 5540m).

Consequential to varied climatic conditions, Sikkim offers a wide variety of vegetation types. These are Tropical vegetation, Temperate vegetation, and Alpine vegetation. The flora of the eastern Himalayas is well represented in Sikkim alone and it is one of the botanically richest areas in the whole of Asia. More than 4000 plant species (including 50 species of economic importance) belonging to 160 families are known to occur here. Lower altitudes have lush vegetation. The vegetational pattern changes with altitudinal differences.

Key to the Subfamilies of APHIDIDAE

1(2) First tarsal segments with 9 or more ventral hairs; body and appendages usually with many long and fine hairs; head with a median suture ..... LACHNINAE

2(1) First tarsal segments at most with 7 ventral hairs; hairs on body and appendages variable in length and shape; head usually without median. suture 3

3(4) Siphunculi usually elongate and hairy or short and truncate without any hair but in latter with a pair of dorsal processi arising from 7th tergite and eyes of apterae of 3 facets..... GREENIDEINAE

4(3) Siphunculi of various shapes, if elongate then usually without hairs 5

5(6) Subanal plate never indented or bilobed; head and prothorax usually separate; empodial hairs always fine 7

6(5) Subanal plate usually bilobed; head and prothorax may be free or variably fused; empodial hairs may be flattened or fine 9

7(8) Siphunculi usually elongate and without hairs; p.t. usually longer than base VI; First tarsal segments with 2-5 ventral hairs .... Aphidinae

8(7) Siphunculi cone-shaped with many hairs; cauda broader than long; p.t. always shorter than base of last antennal segment; First tarsal segment with 5-7 hairs..... ..... Anoeciinae

9(10) Eyes in all morphs large; siphunculi variably imbricated or reticulated; wax plates usually absent.....11

10(9) Eyes of apterae of 3 facets; siphunculi never with reticulation; wax plates usually present.; head and pronotum in apterae seperate; frontal processi absent; apterae never aleyrodiform..... PEMPHIGINAE

11(12)Body and appendages usually with conspicuous dorsal hairs; cauda semicircular, never knobbed; Gonapophysis 3 ..... PTEROCOMMATINAE

12(11)Body and appendages without such conspicuous hairs; cauda knobbed or semicircular; empodial hairs usually flattened ..... DREPANOSIPHINAE

Subfamily ANOECIINAE

Genus 1. ***Aiceona*** Takahashi

1921, *Aiceona* Takahashi, R. *Aphididae of Formosa, Agri, Exp. Sta. Govt. Formosa Rep.* pt. I : 85

Type species : *Aiceona actinodaphis* Takahashi, 1921

Table 1 : A subfamilywise break up of family Aphididae of Sikkim

Subfamilies		No. of species	No. of genera	No. of Endemic species	No. of Endemic genera
ANOECIINAE	–	2	2	1	–
APHIDINAE					
Tribes					
i) **Aphidini**	–	22	6	3	–
ii) **Macrosiphini**	–	91	48	40	5
iii) **Pterocommatini**	–	1	1	–	–
DREPANOSIPHINAE	–	11	9	9	2
GREENIDEINAE					
Tribes					
i) **Cervaphidini**	–	3	3	1	–
ii) **Greenideini**	–	25	4	19	–
HORMAPHIDINAE					
Tribes					
i) **Cerataphidini**	–	12	7	4	–
ii) **Nipponaphidini**	–	1	1	1	–
LACHNINAE					
Tribes					
i) **Cinarini**	–	4	1	2	–
ii) **Lachnini**	–	2	2	–	–
PEMPHIGINAE					
Tribes					
i) **Fordini**	–	6	4	3	–
ii) **Eriosomatini**	–	4	2	2	–
THELAXINAE	–	1	1	1	–
Total		185	91	86	7

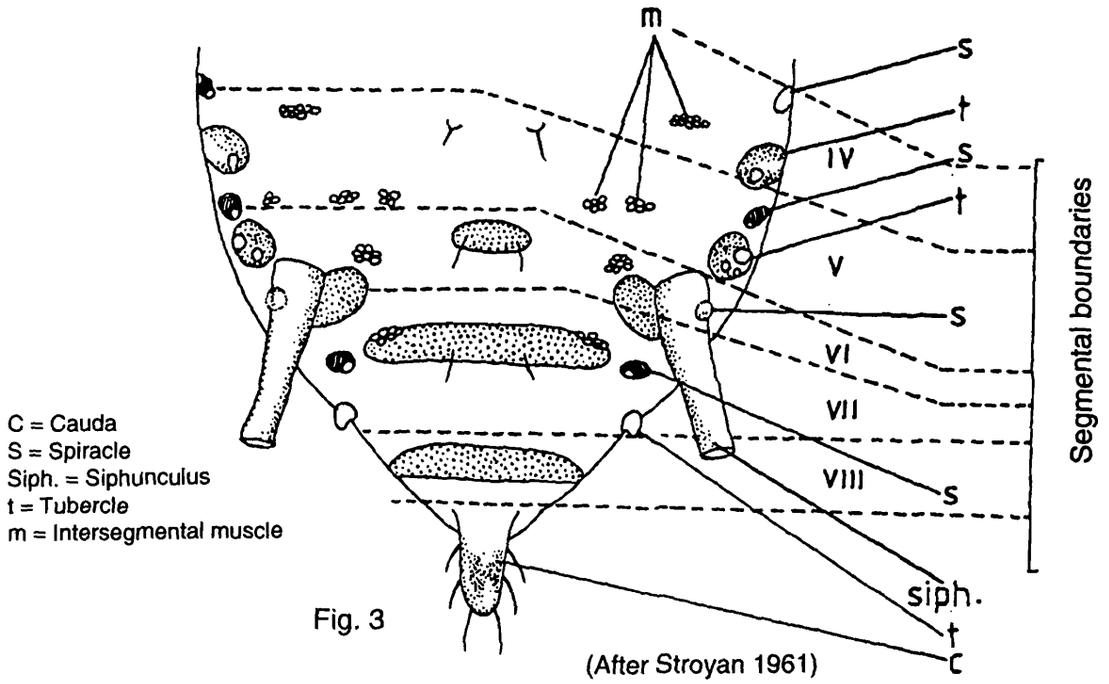


Fig. 3

(After Stroyan 1961)

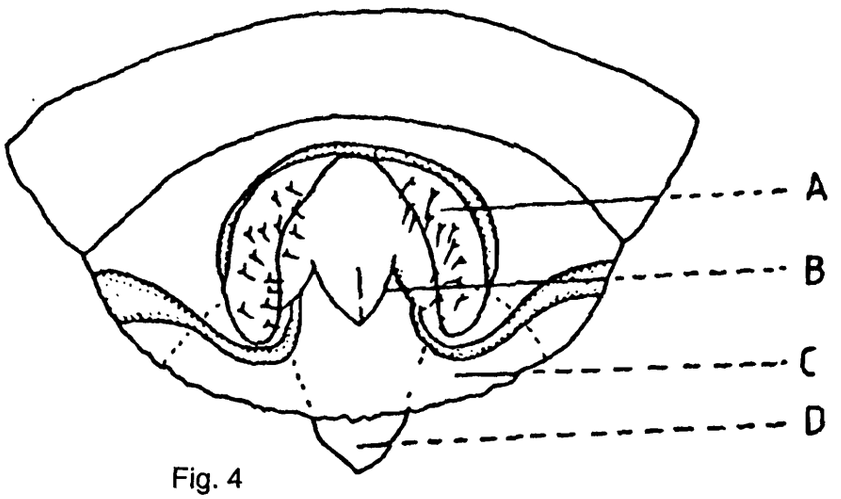


Fig. 4

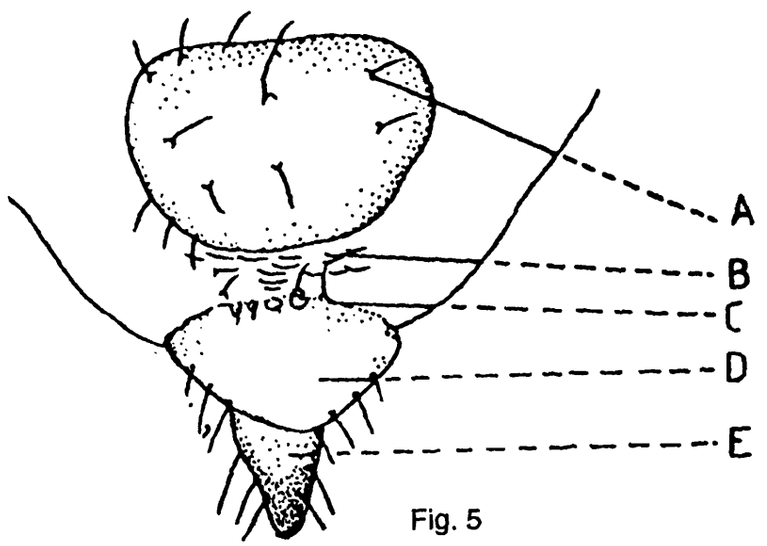


Fig. 5

Fig. 3-5 : 3. Posterior abdominal dorsum (Aptera); 4.Typical male appendages of *Aphis* Linn.: A, Opercula; B, Penis; C, Anal Plate; D, Cauda; 5. Typical female genitalia of an ovipara of *Aphis* Linn. A, Genital or Subgenital Plate: B, Genital pore or Vulva; C. Rudimentary gonapophysis; D, Anal plate; E, Cauda

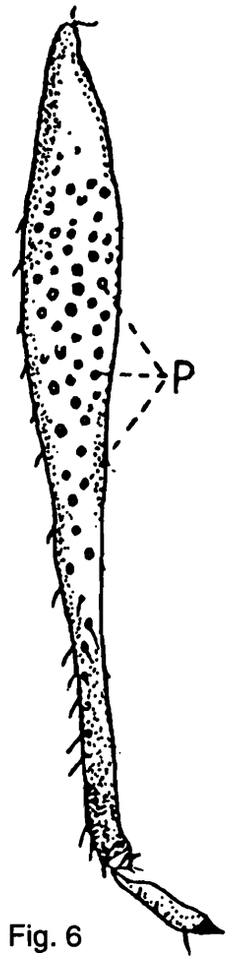


Fig. 6

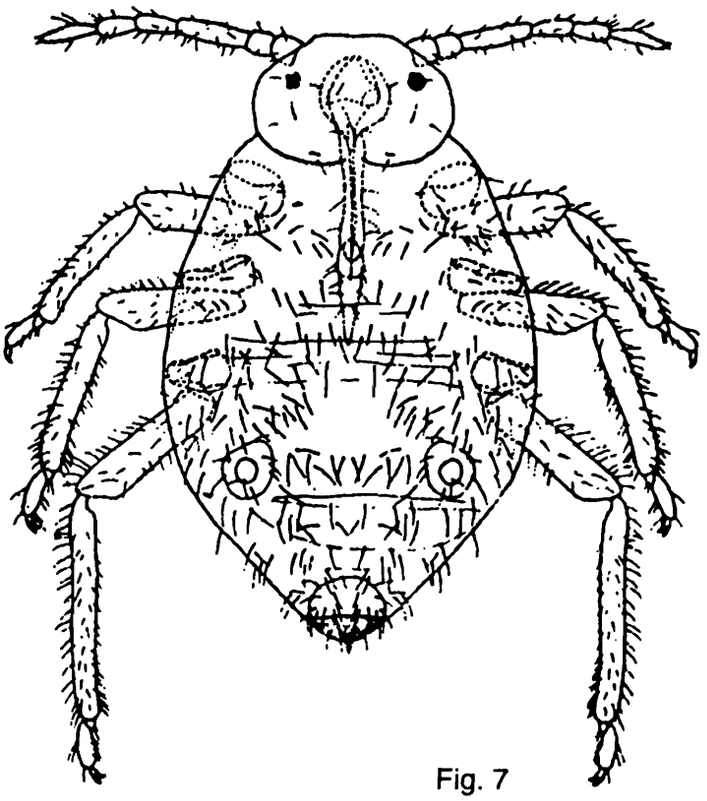


Fig. 7

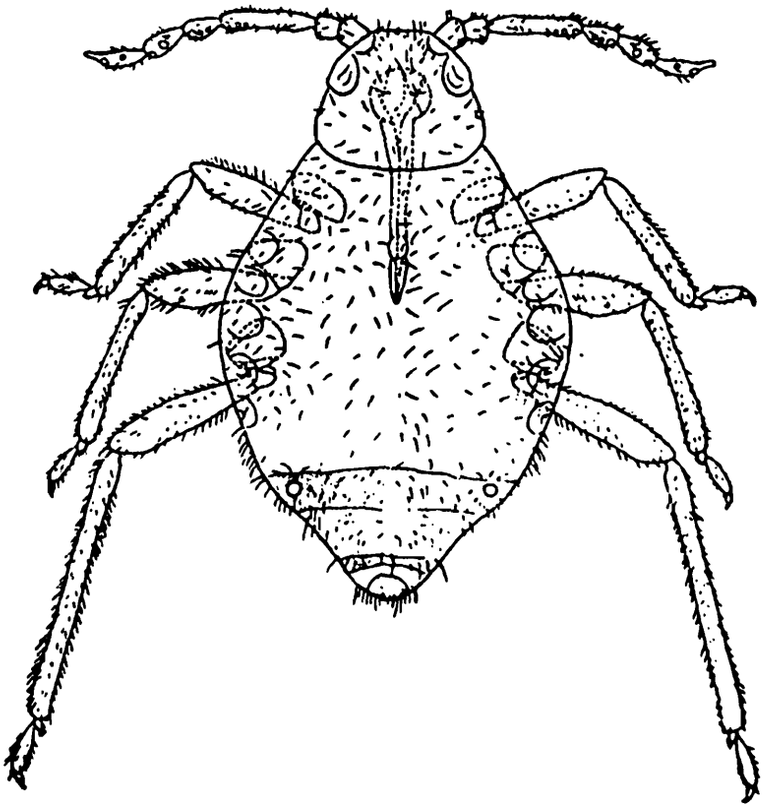


Fig. 8

Fig. 6-8 : 6. Hind tibia showing pseudosensoria in apterous ovipara of *Aphis* Linn. : P, Pseudosensoria; 7. *Aiceona titabarensis* (Ghosh and Raychaudhuri) : Aptera; 8.*Anoecia vagans* Koch : Aptera

1. ***Aiceona titabarensis*** (Raychaudhuri and Ghosh)

1964. *Aiceona titabarensis* Raychaudhuri, D. N. and Ghosh, A. K., *Zool. Meded*, **39** : 257

1973. *Aiceona litseae* Basu, A. N. and Hille Ris Lambers, D. : Ghosh, M. R. and Raychaudhuri, D. N. *Oriental Ins.*, **7**(4) : 549

1988. *Aiceona titabarensis* (Raychaudhuri and Ghosh); Ghosh, A. K., *Fauna of India, Aphididae,* pt. 4: 64

Material : Apterae and alatae, on *Litsea polyantha*, Pakyong, 29. IX. 1971, coll. M. R. Ghosh

Measurements (Aptera) : Length of body 2. 6; width of body 1.5; antenna 1.30; a.s. III 0.42. IV 0.24, VI (0.19+0.05); u.r.s. 0.20; ht2 0.20

Measurements (alata) : Length of body 2.07, width 0.92; antenna 1.2; a.s. III 0.40, IV 0.23, V 0.20, VI (0.13+0.05); u.r.s. 0.24, ht2 0.15

Distribution : India : Sikkim (East Sikkim), Assam, West Bengal

Remark : The species enjoys holocyclic life cycle. The viviparous morphs Darjeeling–Sikkim region appears to be all through the year. Sexual females are found during December–March.

Ghosh, M.R. and Raychaudhuri, D. N. (1973) described oviparae from Darjeeling (West Bengal) and also reported its occurreance in Sikkim.

Genus 2. ***Anoecia*** Koch

1857. *Anoecia* Koch, *Die Pflanzenlause Aphiden,* **3** : 275

Type species : *Aphis corni* Fabricius 1775

2. ***Anoecia vagans*** (Koch)

1856. *Achizoneura vagans* Koch, *Die Pflanzen. Aphiden,* Nurnberg, **8** : 268

1957. *Anoecia vagans,* Ghosh, A. K., *The Fauna of India : Aphidoidea* pt. **4** : 108

Material : Apterae and nymphs from unidentified grass, Rimbik, 20. IV. 1972

Measurements (Aptera) : Length of body 2.10, width of body 1.25; antenna 0.98, a.s. III 0.36, IV 0.15, V 0.15, VI (0.15 + 0.06); u.r.s. 0.12; h.t.2 0.11

Distribution : India : Sikkim (North Sikkim), Uttar Pradesh. *Elsewhere* : Europe, North Africa

Remarks : In Indian region, only apterae viviparae from grass roots in Sikkim and *Triticum vulgare* (poaceae) in Uttar Pradesh have been recorded during the months of April–June. Pal (1975) collected from Grass roots at depth of 1 cm – 2 cm in dry sandy soil at an elevation of *C* 2500 m.

Subfamily APHIDINAE

Key to the tribes

1(2) Spiracles of abdominal segments 1 and 2 placed closely; lateral abdominal tubercles mostly absent on segments 1 and 7; antennal segments III in apterae with or without secondary rhinaria ..... **Macrosiphini**

2(1) Spiracles of abdominal segments 1 and 2 placed for apart 3

3(4) Body and antennae densely hairy and pilose; Cauda small and rounded .... **Pterocommatini**

4(3) Body and antennae never with dense hair; cauda never rounded ..... **Aphidini**

Tribe **Aphidini**

1(2) Lateral abdominal tubercles on abdominal segments 1 and 7 placed posteroventrally to the spiracles; frons without any projection ..... **Aphidina**

2(1) Lateral abdominal tubercles on abdominal segments 1 and 7 placed posterodorsally to the spiracles; frons with rhopalosiphine projection ..... **Rhopalosiphina**

Subtribe **Aphidina**

Key to the genera of the Subtribe Aphidina

1(2) Hind tibiae with rows of peg-like structures; lateroventral areas of abdominal segments 6 & 7 with rows of spinules forming interconnecting striae ..... ***Toxoptera***

2(1) Hind tibiae without such structures and rows of spinules absent ..... ***Aphis***

Subfamily APHIDINAE

Tribe **Aphidini**

Subtribe **Aphidina**

Genus 3 ***Aphis*** Linnaeus

1758. *Aphis* Linnaeus, *Syst. Nat.* (10th Ed.), **1** : 451

Type species : *Aphis sonchi* Linnaeus, 1758

Key to the species of *Aphis* Linnaeus

Apterae :

1(2) U.r.s. stiletto-shaped ..... *kurosawai*

2(1) U.r.s. may be of various shapes but never stiletto-shaped.....3

3(4) First segment of hind tarsus usually with 3 hairs; cauda with 8–10 hairs ..... *nerii*

4(3) First segment of hind tarsus always with 2 hairs 5

5(6) 8th abdominal tergite with 3–8 hairs .... *fabae solanella*

6(5) 8th abdominal tergite with only 2 hairs. 7

7(8) Abdominal dorsum usually completely sclerotic ..... *craccivora*

8(7) Abdominal dorsum pale and smooth....9

9(10) Hairs on posterior abdominal tergites longer, never less than 3xb.d.III .... *longisetosa*

10(9) Hairs on posterior abdominal tergites shorter, about 0.5–1.8 x b.d. III 11

11(12) Longest hair on hind femora as long as or longer than its maximum width..... ..... *spiraecola*

12(11) Longest hair on hind femora appreciably shorter than its maximum width.....13

13(14) Second tarsal segment with only primary hairs ..... *nasturtii*

14(13) Second tarsal segment with primary and secondary hairs; hairs on 8th tergite shorter, hardly as long as b.d. III..... ..... gossypii

3. ***Aphis craccivora*** Koch
(Figs. 9–10)

1854. *Aphis craccivora* Koch, *Die Pflanzenlause Aphiden*, **1** : 24.

1968. *Aphis craccivora* Koch; Basu, Chakrabarti and Raychaudhuri, *Oriental Ins.*, **2** (3 & 4) : 349.

1986. *Aphis craccivora* Koch ; Ghosh, *Mem. zool. Surv. India*, **17**(3) : 29.

Material : Apterae and Alatae on *Tephrosia candida*, Singtam, 24.xii.1970; apterae and alatae, on *Dolichos lablab*, Hee Gyathang, 10.xi.1974; apterae and nymphs, on *Phaseolus roxburghii*, Phodang, 18.x.1975, C.U.Colls.; 2 apterae, 2 nymphs and 5 alatae, on *Brassica* sp., Lingey, January, 1994 Coll. L. K. Ghosh

Measurements (Aptera) : Length of body 2.20; width of body 1.35; antenna 1.30; a.s. III 0.35, IV 0.21, V 0.20, VI (0.12 + 0.27); u.r.s. 0.10; h.t.2 0.12; siphunculus 0.35; cauda 0.22

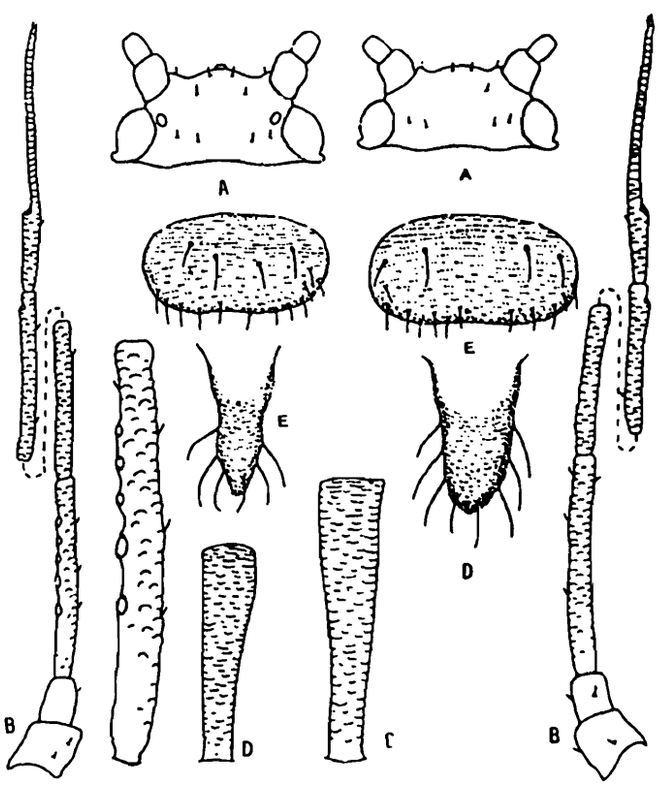


Fig. 10 Fig. 9

Fig. 9-10. 9. *Aphis craccivora* Koch : Aptera: A, Head; B, Antenna; C, Siphunculus; D, Cauda; E, Genital plate; 10. *Aphis craccivora* Koch : Alata : A, Head; B, Antenna; C, a.s. III; D, Siphunculus; E, Cauda; F, Genital Plate

Measurements (Alata) : Length of body 2.25; width of body 1.04; antenna 1.50; a.s. III 0.35, IV 0.30, V 0.30, VI (0.13+0.32); u.r.s. 0.10; h.t. 2 0.13; siphunculus 0.35; cauda 0.20

Distribution : India: Sikkim (East Sikkim, North Sikkim), all over. *Elsewhere* : Cosmopolitan

Remarks : Brown to blackish brown aphids usually infest the apical parts of the host plants. Sometimes it becomes menace to pulse crops. The species was first reported from Sikkim by Ghosh, Ghosh and Raychaudhuri (1971). It is recorded as a vector of 14 plant virus diseases. In India, the species enjoys holocyclic mode of reproduction. Sexuales of the species have so far been reported on Leguminous plants in Germany (Falk, 1957/58). In India, Basu *et al.* (1968) recorded sexuales on *Tinospora cordifolia* in Calcutta and Verma and Khurana (1974) on *Phaseolus aurens* at Haryana. While surveying aphids in the fields of Sikkim, senior author collected apterae and nymphs of the species on *Brassica* sp., an unusual host plant for this aphid. But proper surveys in the mustard field may yield interesting result.

4. ***Aphis fabae solanella*** Theobald
(Fig. 11)

1758. *Aphis fabae* Scopoli, *Entomologie carnioiica* : 139

1958. *Aphis fabae* Scopoli; David *Indian J. Ent.*, **19** : 171–180

1986. *Aphis fabae* Scopoli; Ghosh, *Mem. zool. Surv. India,* **17**(3) : 29

Material : Apterae and alatae, on *Rumex* sp. Gangtok, 26.v.1970; apterae and alatae on *Solanum nigrum,* Singtam, 27.v.1970; apterae and alatae, on *Solanum nigrum,* Gangtok, 10.iii.1971, C.U.Colls.

Measurements (Aptera) : Length of body 2.30; width of body 1.40; antenna 1.50; a.s. III 0.35, IV 0.27, V 0.27. VI (0.11+0.40); u.r.s. 0.13; h.t. 2 0.11; siphunculus 0.40; cauda 0.21

Measurements (Aptera) : Length of body 2.20; width of body 2.92; antenna 1.58; a.s. III 0.35, IV 0.27, V 0.26, VI (0.13+0.40); u.r.s. 0.13; h.t.2 0.12; siphunculus 0.33; cauda 0.20

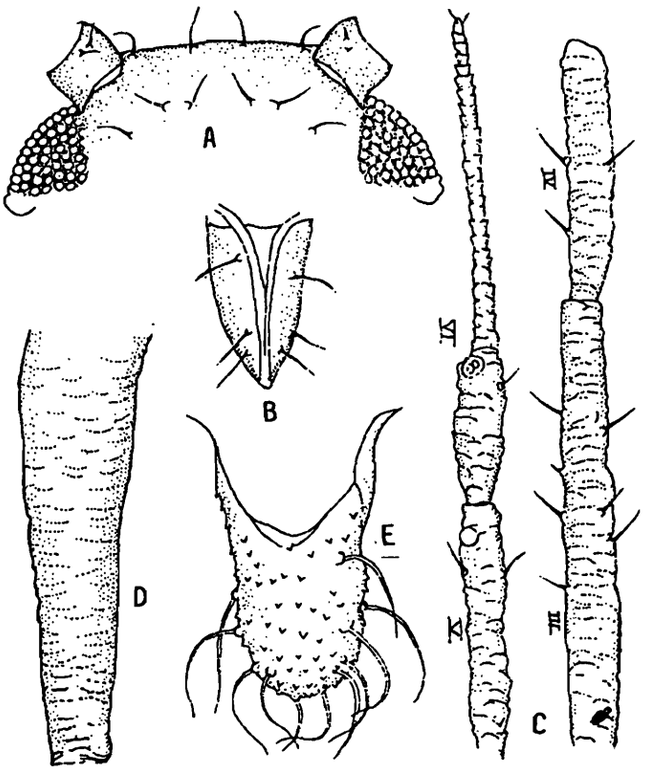


Fig. 11. *Aphis fabae solanella* Theobald : Alata: A, Head; B, U.r.s.; C, a.s. III-VI; D, Siphunculus; E, Cauda

Distribution : India : Sikkim (East Sikkim); widely distributed. *Elsewhere* : Cosmopolitan

Remarks : The blackish brown aphids cause severe damage i.e. curling of the leaves of the host plants and are always associated with ants. The species has a wide range of host plants (Solanaceae, Polygonaceae, Asteraceae and Brassicaceae). Raychaudhuri *et al.* (1980) described oviparous female and alate males from Northwest India.

5. ***Aphis gossypii*** Glover
(Figs. 12-13)

1877. *Aphis gossypii* Glover, *Rep. Comm. Agric.* U.S.A. for 1816:36

1986. *Aphis gossypii* Glover; Ghosh, *Mem. zool. Surv. India,* **17**(3) : 35

Material : Apterae, alatae and nymphs on *Maesa chisea,* Gangtok, 22.xii.1970; Alatae and nymphs on *Eupatorium odoratum,* Jorethang, 23.iv.1970; alatae and nymphs on *Capsicum annum,* Gangtok, 23.x.1962, Coll. A. K. Ghosh; 2. apterae, 2 nymphs and 5 alatae, on *Bidens pilosa,* Lingey, January, 1994, Coll. L. K. Ghosh

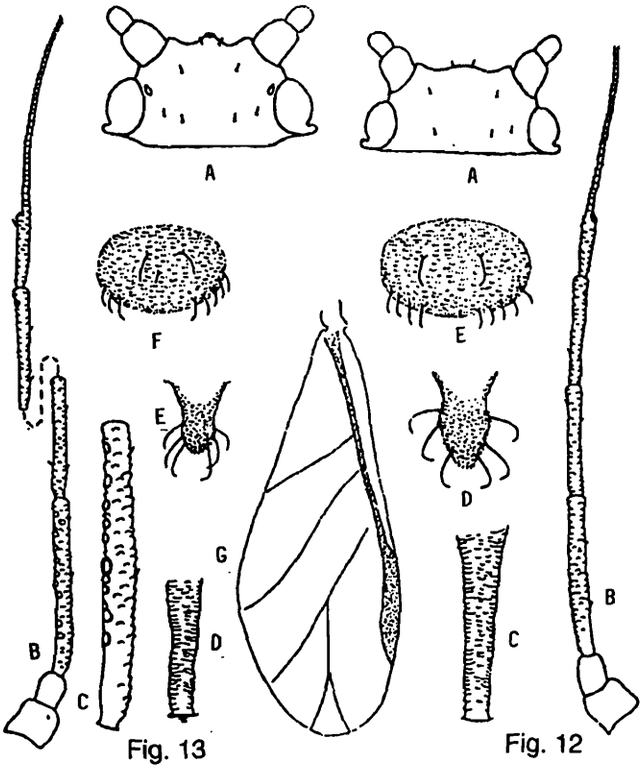


Fig. 12-13 : 12. *Aphis gossypii* Glover : Aptera: A, Head : B, Antenna; C, Siphunculus; D, Cauda; E, Genital Plate; 13. *Aphis gossypii* Glover : Alata : A, Head; B, Antenna; C, a.s. III; D, Siphunculus; E, Cauda; F, Genital Plate; G, Fore wing

Measurements (Aptera) : Length of body 1.52; width of body 0.77; antenna 1.06; a.s. III 0.26, IV 0.18, V 0.17, VI (0.11+0.26); u.r.s. 0.12; h.t.2 0.08; siphunculus 0.25; cauda 0.16

Measurements (Alata) : Length of body 1.50; width of body 1.00; antenna 0.88; a.s. III 0.15, IV 0.15, V 0.14, VI (0.10+0.26); u.r.s. 0.08; h.t. 2 0.08; siphunculus 0.25; cauda 0.16

Distribution : India : Sikkim (East Sikkim, South Sikkim), widely distributed. *Elsewhere* : Cosmopolitan.

Remarks : This is extremely polyphagous species infesting almost all the aerial parts of the host plants. It is subject to colour variations. Variable kinds of damage to the host plants are noticed. The species exhibits great range of morphological variation even on the same host. It is found to transmit about 44 viruses of plants (Eastop, 1958). Ghosh and Raychaudhuri (1968) first time reported this species from Sikkim.

6. *Aphis kurosawai* Takahashi

1921. *Aphis kurosawai* Takahashi, *Aphididae of Formosa, Agr. Exp. Sta. Govt. Formosa. Rept.* pt. 1 : 53

1975. *Aphis kurosawai* Takahashi; Chakrabarti and Raychaudhuri, *Oriental Ins.*, **9** (2) : 198

1986. *Aphis kurosawai* Takahashi; Ghosh, *Mem. zool. Surv. India*, **17**(3) : 41

Material : Apterae and nymphs, on *Artemisia* sp., Deorali, 27.xi.1971; Apterae and nymphs, on *Artemisia* sp., Gangtok, 23.xi.1971; apterae, alatae and nymphs, on *Artemisia vulgaris*, Mangan, 17.v.1975, C.U.Colls.

Measurements (Aptera) : Length of body 2.00; width of body 1.10; antenna 0.78; a.s. III 0.14, IV 0.13, V 0.11, VI (0.09+0.16); u.r.s. 0.12; h.t. 2 0.08; siphunculus 0.17; cauda 1.08

Measurements (Alata) : Length of body 2.10; width of body 1.08; antenna 1.08; h.t.2 0.09; siphunculus 0.19; cauda 0.16

Distribution : India : Sikkim (East Sikkim, North Sikkim); Assam, Himachal Pradesh, Jammu & Kashmir, Manipur, Nagaland, Uttar Pradesh, West Bengal. *Elsewhere* : Bhutan; China; Japan; Nepal; Taiwan and Thailand

Remarks : Ghosh, Banerjee and Raychaudhuri (1971) reported the species for the first time from Sikkim. The characteristic feature of this aphid is the stiletto-shaped ultimate rostral segment. Most favoured host is *Artemisia* spp. (N.O. Asteraceae). It leads anholocyclic life cycle throughout the year in India.

7. *Aphis longisetosa* Basu
(Fig. 14)

1969. *Aphis ruborum longisetosa* Basu, *Oriental Ins.*, **3**(4) : 356

1976. *Aphis longisetosa* Basu; Eastop and Hille Ris Lambers, Catalogue of the World's Aphididae : 66

1986. *Aphis longisetosa* Basu; Ghosh, *Mem. zool. Surv. India*, **17**(3) : 43

Material : Apterae, alatae and nymphs, on *Rubus ellipticus*, Gangtok, 28.x.1971; apterae, alatae and nymphs, on *Rubus ellipticus*, Lachung, 6.vi.1975; apterae, on *Rubus elipticus*, Namchi, 24.v.1970, C.U.Colls.

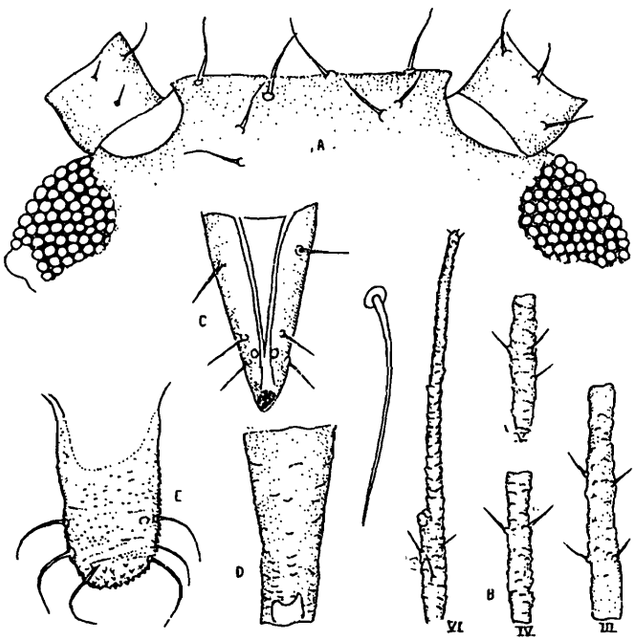


Fig. 14. *Aphis longisetosa* Basu : Aptera : A, Head; B, a.s. III-VI; C, U.r.s. D, Siphunculus; E, Cauda; F, Dorsal hair

Measurements (Aptera) : Length of body 1.70; width of body 1.05; antenna 0.94; a.s. III 0.18, IV 0.11, V 0.11, VI (0.10+0.23); u.r.s. 0.12; h.t.2 0.09; siphunculus 0.16; cauda 0.16

Measurements (Alata) : Length of body 1.60; width of body 0.80; antenna 0.98; a.s. III 0.22, IV 0.16, V 0.12, VI (0.09+0.25); u.r.s. 0.11; h.t.2 0.10; siphunculus 0.13; cauda 0.12

Distribution : India : Sikkim (East Sikkim, North Sikkim, South Sikkim), Arunachal Pradesh, Himachal Pradesh, Nagaland, Uttar Pradesh, West Bengal

Remarks : Ghosh, Ghosh and Raychaudhuri (1971) reported the species for the first time from Sikkim. These aphids are very much host specific, infesting *Rubus* spp. (N.O. Rosaceae). Syrphid larvae are known to be important predators of this aphid. The species can be recognised by larger dorsal body hairs (more than twice as long as b.d. III).

8. *Aphis nasturtii* Kaltenbach
(Fig. 15)

1843. *Aphis nasturtii* Kaltenbach, *Mongr. Fam. Pflanz.*: 76

1986. *Aphis nasturtii* Kaltenbach; Ghosh, *Mem. zool. Surv. India*, **17**(3) : 45

Material : Apterae, alata and nymphs, on *Osbechia chinensis,* Phodang; aptera and nymphs, on *Polygonum runcinatum,* Mongan, 17.v.1973, C.U.Coll.

Measurement(Aptera) : Length of body 1.50; width of body 0.85; antenna 0.84; a.s. III 0.15, IV 0.13, V 0.12, VI (0.09+0.23); u.r.s. 0.09; h.t.2 0.06; siphunculus 0.20; cauda 0.15

Measurements (Alata) : Length of body 1.35; width of body 0.60; antenna 0.86; a.s. III 0.30, IV 0.16, V 0.13, VI (0.09+0.20); u.r.s. 0.10; h.t.2 0.07; siphunculus 0.17; cauda 0.12

Distribution : India : Sikkim (North Sikkim), Arunachal Pradesh, Haryana, Himachal Pradesh, Manipur, Meghalaya, Nagaland, Uttar Pradesh, West Bengal. *Elsewhere* : America; Europe; Great Britain; Middle East; Nepal; Pakistan; Taiwan; U.S.A

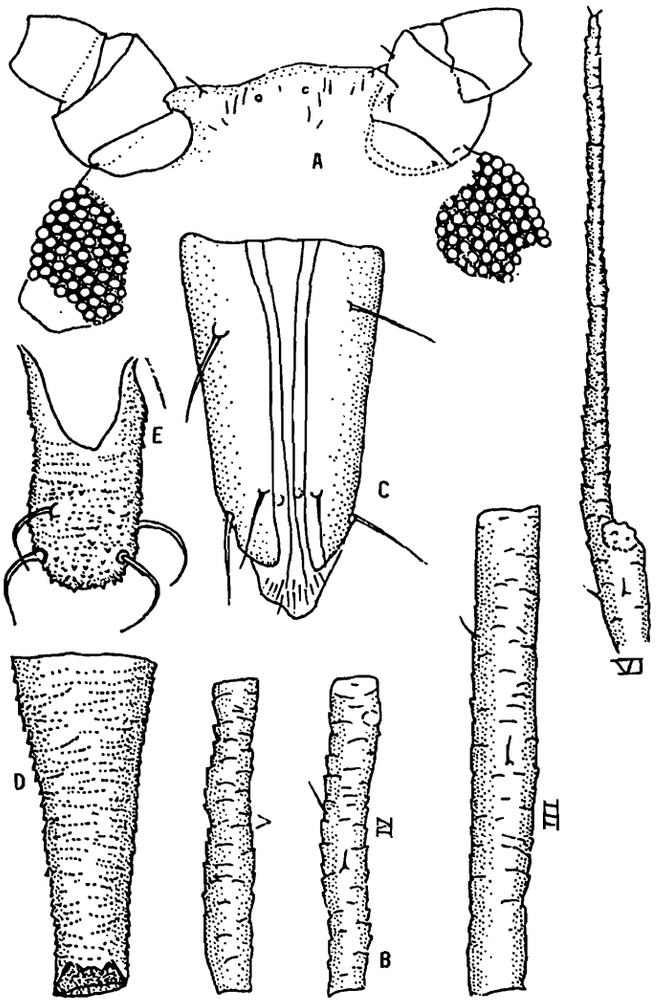


Fig. 15. *Aphis nasturtii* (Kltb.) Aptera: A, Head; B, A.S. III-VI; C, U.r.s.; D, Siphunculus; E, Cauda

Remarks : In India, this species infests 74 plant species belonging to 64 genera under 37 families. These are pale brown to brown insects in life. The species leads holocyclic life at least in North East India (Basu *et al.* 1970). It was first reported from Sikkim by Ghosh, Banerjee and Raychaudhuri (1971).

9. ***Aphis nerii*** Boyer de Fonscolombe

1841. *Aphis nerii* Boyer de Fonscolombe, *Annals. Soc. Ent. Fr.*, **10** : 179

1918. *Aphis nerii* Boyer de Fonscolombe; Das, *Mem. Indian Mus.*, **6**(4) : 220-222

1986. *Aphis nerii* Boyer de Fonscolombe: Ghosh, *Mem. zool. Surv. India*, **17**(3) : 48

Material : Aptera, on *Asclepias* sp., Gangtok, 26.x.1962, Coll. A. K. Ghosh; apterae and alatae, on *Calotropis* sp., Jorethang, 28.xii.1971, C.U.Coll.; apterae, host not known, 26.x.1962, Coll. A.K.Ghosh

Measurements(aptera) : Length of body 2.60; width of body 1.56; antenna 1.60; a.s. III 0.40, IV 0.25, V 0.26, VI (0.09+0.39); u.r.s. 0.13; h.t.2 0.11; siphunculus 0.43; cauda 0.25

Measurements (Alata) : Length of body 2.27; width of body 1.16; antenna 1.80; a.s. III 0.45, IV 0.35, V 0.28, VI (0.11+0.48); u.r.s. 0.15; h.t.2 0.11; siphunculus 0.43; cauda 0.25

Distribution : India : Sikkim : (East Sikkim, South Sikkim), all over. *Elsewhere* : Virtually cosmopolitan

Remarks : Life colour yellowish. Ghosh and Raychaudhuri (1968) reported the species for the first time from Sikkim. The species is normally found in Asclepiadaceae and Apocynaceae. In India, it infests 15 species belonging to 11 genera under 6 plant families. The species is so far known by parthenogenetic form in India including Sikkim.

10. ***Aphis spiraecola*** Patch

1914. *Aphis spiraecola* Patch, *Bull. Me. agric. Exp. stn.*, (283) : 270

1980. *Aphis spiraecola* Patch; Raychaudhuri, D.N. *(ed.)*, Aphids of Northeast India and Bhutan : 58

Material : Apterae, alatae and nymphs, on *Bidens pilosa*, Tadong, 25.x.1962, Coll. A.K.Ghosh; alatae and nymphs, on *Bidens pilosa*, Gangtok, 26.v.1970, Coll. M.R.Ghosh, apterae, alatae and nymphs, on *Artemisia caruifolia*, Sanklang, 3.xi.1974., Coll. P.K.Mondal

Measurements (Aptera) : Length of body 1.88; width of body 1.0; antenna 0.95; a.s. III 0.22, IV 0.15, V 0.14, VI (0.11+0.25); u.r.s. 0.12; h.t.2 0.11, siphunculus 0.35; cauda 0.22

Measurements (Alata) : Length of body 2.0, width of body 0.83; antenna 1.0; a.s. III 0.23, IV 0.20, V 0.16, VI (0.12+0.25); u.r.s. 0.11; h.t.2 0.11; siphunculus 0.24; cauda 0.18

Distribution : India : Sikkim (East Sikkim) and almost all states in India. *Elsewhere* : Australia, Bhutan, Bermuda; China, Nepal; New Zealand; North America; Iran, Pakistan; Sri Lanka; Taiwan; Thailand; Vietnum

Remarks : Ghosh and Raychaudhuri (1968) reported the species for the first time from Sikkim.

Genus 4 ***Toxoptera*** Koch

1856. *Toxoptera* Koch *Die Pflanzen Aphiden*, **3** : 253

Type species : *Toxoptera aurantiae* Koch, 1856 = *Aphis aurantiae* B.d.F., 1841

Key to the species of *Toxoptera* Koch

Apterous viviparous female

1(2) Siphunculi much shorter, maximally about half as long as cauda; F.T.C. 3,3,2 .... *odinae*

2(1) Siphunculi as long as or longer than cauda; F.T.C. 3,3,3 3

3(4) Longest hair on a.s. III as long as to 1.5 times as long as b.d. III; siphunculi heavily imbricated; cauda with 25–36 hairs .... *citricidus*

4(3) Longest hair on a.s. III shorter than b.d. III; siphunculi sparsely imbricated; cauda with 9–17 hairs ..... *aurantii*

Alate viviparous female

1(2) Siphunculi 1.0–1.60 times as long as its width; F.T.C. 3,3,2; cauda always shorter than siphunculi ..... *odinae*

2(1) Siphunculi about 2.0–3.6 times as long as its width; F.T.C. 3,3,3; cauda always longer than siphunculi 3

3(4) Cauda with 24–36 hairs; a.s. III with more than 16 secondary rhinaria; longest hair on a.s. III as long as to longer than b.d. III *citricidus*

4(3) Cauda maximally upto 18 hairs; a.s. III with atmost 14 secondary rhinaria; longest hair on a.s. III shorter than to as long as b.d. III ..... *aurantii*

11. ***Toxoptera aurantii*** (Boyer de Fonscolombe)

1841. *Aphis aurantii* Boyer de Fonscolombe, *Ann.Soc.Entomol France*, **10** : 178

1976. *Toxoptera aurantii* (B.d.F.); Mondal, Basu and Raychaudhuri, *Oriental Ins.*, **10**(4) : 535

1994. *Toxoptera aurantii* (B.d.F.); Ghosh and Basu, *State Fauna Series 3, Fauna of West Bengal*, Pt. **5** : 161

Material : Apterae and alatae on *Lagerstromia flosroeginae*, Gangtok, 26.v.1970 Coll. M.R.Ghosh; apterae and alatae on *Eugenia* sp, Dzongenlik, 6.xi.1974, Coll. P.K.Mondal

Measurements (Aptera) : Length of body 1.65; width of body 1.0; antenna 1.40; a.s. III 0.31, IV 0.26, V 0.25, VI (.08+0.37); u.r.s. 0.10; h.t.2 0.07; siphunculus 0.20; cauda 0.17

Measurements (Alata) : Length of body 2.00; width of body 0.90; antenna 1.65; a.s. III 0.35, IV 0.30, V 0.29, VI (0.11+0.44); u.r.s. 0.10; h.t.2 0.07; siphunculus 0.27; cauda 0.16

Distribution : India : Sikkim (East Sikkim), widely distributed; virtually cosmopolitan.

Remarks : Mondal *et al.* (1976) have given an account of the genus *Toxoptera* Koch. This black to shiny aphid is highly polyphagous. Among the host plants quite a few are of economic importance. It always infests growing tender shoots. Ants attend the aphids.

12. ***Toxoptera citricidus*** (Kirkaldy)

1907. *Myzus citricidus* Kirkaldy, *Proc. Hawai ent. Soc.*, **1** : 100

1994. *Toxoptera citricidus* (Kirkaldy); Ghosh and Basu, State Fauna Series 3, *Fauna of West Bengal*, pt. **5** : 161

Material : Apterae, alatae and nymphs, on *Citrus* sp., Singhik, 4.xi.1974, Coll. P.K. Mondal (C.U.Coll.)

Measurements (aptera) : Length of body 2.38; width of body 1.60; antenna 1.35; a.s. III 0.35, IV 0.20, V 0.20, VI (0.09-0.40); u.r.s. 0.13; h.t.2 0.12; siphunculus 0.40; cauda 0.26

Measurements (alata) : Length of body 2.38; width of body 1.0; antenna 1.72; a.s. III 0.32, IV 0.30, V 0.29, VI (0.10+0.50); u.r.s. 0.14; h.t.2 0.12; siphunculus 0.37; cauda 0.20

Distribution : India : Sikkim (North Sikkim), widely distributed; virtually cosmopolitan

Remarks : The species is a pest of orange and other citrus fruits (Rutaceae). It damages mainly the apical stem and is attended by black ants. The dark brown large aphid is polyphagous and occurs throughout the year. It sometimes occurs along with *Toxoptera aurantii.*

13. ***Toxoptera odinae*** (van der Goot)

1917. *Longiunguis odinae* van der Goot, *Contr. Faune Indes neerl.*, **1**(3) : 113

1976. *Toxoptera odinae* (v.d.G.); Mondal, Basu and Raychaudhuri, *Oriental Ins.*, **10**(4) : 537

1994. *Toxoptera odinae* (v.d.G.); Ghosh and Basu, *State Fauna Series 3, Fauna of West Bengal*, pt. **5** : 162

Material : Apterae, alatae and nymphs, on *Rhus* sp., Gangtok, 28.x.1971, Coll. M.R.Ghosh (C.U.Coll.)

Measurements (Aptera) : Length of body 1.84; width of body 0.95; antenna 1.20; a.s. III 0.32, IV 0.20, V 0.19, VI (0.10+0.28); u.r.s. 0.13; h.t.2 0.09; siphunculus 0.10; cauda 0.18

Measurements (Alata) : Length of body 2.00, width of body 0.84; antenna 1.40; a.s. III 0.35, IV 0.36, V 0.25, VI (0.11+0.30); u.r.s. 0.14; h.t.2 0.09; siphunculus 0.10; cauda 0.09

Distribution : India : Sikkim (East Sikkim), all over. *Elsewhere* : China; Japan; Java; Korea; Malaya : Nepal ; Philippines; Sri Lanka; Sumatra; South America; Taiwan and Thailand

Remarks : The species is attended by red ants. This brown plumy aphid is polyphagous and gregarious.

Subtribe RHOPALOSIPHINA

Genus 5. ***Hysteroneura*** Davis

1919. *Hysteroneura* Davis, *Can. Ent.*, **51** : 263

Type species : *Siphonophora setariae* Thomas, 1878

14. ***Hysteroneura setariae*** (Thomas)

1878. *Siphonophora setariae* Thomas, *Bull. Ill. St. Lab. nat. Hist.*, **1**(2) : 5

1986. *Hysteroneura setariae* (Thomas); Ghosh, *Tech. Monogr.* 16, Zoological Survey of India : 33

Material : 5 apterae, 1 alata and 3 nymphs on undet. Poaceae, Singtam, 24.xii.1970. Coll. M.R.Ghosh (C.U.Coll.)

Measurements (Aptera) : Length of body 1.80, width of body 1.06; antenna 1.35; a.s. III 0.30, IV 0.19, V 0.18, VI (0.08+0.48); u.r.s. 0.09; h.t.2 0.10; siphunculus 0.30; cauda 0.20.

Measurements (Alata) : Length of body 1.70; width of body 0.87; antenna 1.80; a.s. III 0.38, IV 0.27, V 0.25, VI (0.11+0.65); u.r.s. 0.09; h.t.2 0.10; siphunculus 0.30; cauda 0.18.

Distribution : India : Sikkim (East Sikkim), all over. *Elsewhere* : virtually cosmopolitan.

Remarks : This rusty plum aphid was first noticed in philippines in 1958 (Babtzar, 1965). David, Rajasingh and Narayanan (1967) recorded it for the first time from Peninsular India while Ghosh, M.R. Ghosh, A.K. and Raychaudhuri, D.N. (1971) reported the species for the first time from Sikkim.

Genus 6. ***Melanaphis*** van der Goot

1917. *Melanaphis* van der Goot, *Contr. Fauna Indes neerl.*, **1**(3) : 60

Type species : *Aphis bambusae* Fullaway, 1910

Key to the species and subspecies of *Melanaphis* van der Goot

Apterous viviparous female

1(2) Longest hair on anterior abdominal tergites shorter than or almost as long as b.d. III; cauda usually with 9–17 hairs; F.T.C. 3,3,2 *sacchari forma indosacchari*

2(1) Longest hair on anterior abdominal tergites always longer than b.d. III; cauda with 4–5 hairs; F.T.C. 3,3,3, ... *bambusae*

15. ***Melanaphis bambusae*** (Fullaway)

1910. *Aphis bambusae* Fullaway, *Ann. Rep. Hawaii Agr. Exp. Sta.*, 1909 : 35

1974. *Melanaphis bambusae* (Fullaway); Raychaudhuri and Banerjee, *Oriental Ins.*, **8**(3) : 372

Material : 2 apterae and 5 nymphs on *Bambusa* sp. Singtam, 24.xii.1970, Coll. M.R. Ghosh (C.U.Coll.)

Measurements : (Aptera) : Length of body 1.20; width of body 0.70; antenna 1.15; a.s. III 0.30, IV 0.20, V (0.11+0.44); u.r.s. 0.06; h.t.2 0.06; siphunculus 0.11; cauda 0.09

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Manipur, West Bengal. *Elsewhere* : Australia; China; Egypt; Hawaii; Japan; Java; Malaya and Taiwan.

Remarks : Basu (1961) reported the species for the first time from India. From Sikkim it was reported for the first time by Ghosh *et al.* (1971). The aphid is grey to dark brown in colour with powdery waxy secretion.

16. ***Melanaphis pahanensis*** (Takahashi)

1951. *Aphis pahanensis* Takahashi, *Ann. Ent. Soc. Amer.*, **43** : 596

1974. *Melanaphis pahanensis* (Takahashi); Raychaudhuri and Banerjee, *Oriental Ins.*, **8**(3) : 378

Distribution : India : Sikkim (East Sikkim), Uttar Pradesh

Remarks : According to Raychaudhuri and Banerjee (1974), a vagrant specimen collected at

Sikkim was sent to Dr. V.F.Eastop, British Museum, London for comments. He informed "*Melanaphis* sp. just possibly *pahanensis* Takahashi" Earlier, David *et al.* (1969) and Ghosh and Raychaudhuri (1970) dealt with the species. The material could not be studied.

17. ***Melanaphis sacchari forma indosacchari*** (David)

1897. *Aphis sacchari* Zehntner, *Arch. Sikerind Ned-Ind.*, **5** : 551

1974. *Melanaphis sacchari* (Zehntner); Raychaudhuri and Banerjee, *Oriental Ins.*, **8**(3) : 379

1976. *Melanaphis sacchari forma indosacchari* (David); Eastop and Hille Ris Lambers, *Survey of The World's Aphids*, The Hague : 275

Material : Apterae and nymphs, on Napier grass, DZongu-Lik 6.xi.1975, Coll. P.K.Mondal

Measurements (Aptera) : Length of body 1.76; width of body 1.05; antenna 0.97; a.s. III 0.18, IV 0.16, V 0.13, VI (0.08+0.11); u.r.s. 0.07; ht2 0.09; siphunculus 0.11; cauda 0.15

Distribution : India : Sikkim (North Sikkim), all over. *Elsewhere* : Cosmopolitan.

Remarks : Mondal (1977) reported the species as *Melanaphis sacchari* (Zehntner) for the first time from Sikkim. Different opinion exists as to the identity of this aphid. The taxon is considered here in the sense of Eastop and Hille Ris Lambers (1976). David (1957) made the first report of this aphid from India. Subsequently, a number of workers recorded the aphid from different parts of India. The insect is subject to colour variation *viz.*, cream, brown, dark brown, grey, light green etc. and is attended by ants.

Genus 7. ***Rhopalosiphum*** Koch

1854. *Rhopalosiphum* Koch, *Die Pflanzenlause Aphiden*, **1** : 23

Type species : *Aphis nymphaeae* Linnaeus, 1761

Key to the species of *Rhopalosiphum* Koch

Apterous viviparous female

1(2) P.t. 4.06–5.33 times as long as base VI; u.r.s. 0.4–0.75 times as long as h.t.2; dorsal and abdominal hairs with blunt apices; cauda usually with 4 hairs ..... *padi*

2(1) P.t. 1.90–3.50 times as long as base VI; u.r.s. 0.75–1.00 times as long as h.t. 2. 3

3(4) Siphunculi 0.15–0.18 times as long as body; longest hair on abdominal tergite 7 0.60–0.90 times as long as b.d. III ..... *yoksumi*

4(3) Siphunculi 0.07–0.09 times as long as body; longest hair on tergite 7 about 1.50–2.50 times as long as b.d. III ..... *maidis*

Alate viviparous female

1(2) Antennae usually 5–segmented; abdominal tergite 8 with 4–6 hairs ... *rufiabdominalis*

2(1) Antennae 6–segmented; abdominal tergite 8 with 2 hairs 3

3(4) Secondary rhinaria (15–19) restricted only on a.s. III; siphunculi 0.15–0.17 times as long as body ..... *yoksumi*

4(3) Secondary rhinaria present on a.s. III (7–26), IV (1–10) and V (1–5) ..... *maidis*

18. ***Rhopalosiphum maidis*** (Fitch)

1856. *Aphis maidis* Fitch, *Trans. N.Y.State Agr. Soc.*, **15** : 550

1971. *Rhopalisiphum maidis* (Fitch); Ghosh, Ghosh and Raychaudhuri, *Proc. zool. Soc., Calcutta* **24** : 165

Material : Apterae, alatae and nymphs, on *Zea mays*, Singtam, 27.v.1970, Coll. M. R. Ghosh, (C.U. Coll.)

Measurements (Aptera) : Length of body 1.80; width of body 1.00; antenna 0.66; a.s. III 0.14, IV 0.08, V 0.08, VI (0.08+0.16); u.r.s. 0.07; h.t.2 0.09; siphunculus 0.15; cauda 0.10

Measurements (Alata) : Length of body 1–30; width of body 0.40; antenna 0.70; a.s. III 0.15, IV 0.10, V 0.09, VI (0.16+0.15); u.r.s. 0.06; h.t. 2 0.07; siphunculus 0.09; cauda 0.08.

Distribution : India : Sikkim (East Sikkim), widely distributed. *Elsewhere* : virtually cosmopolitan.

Remarks : This corn aphid is a well known pest of large number of graminaceous crops in India. Eastop (1954) recorded the alate males of this species in Kenya (Africa) during June–July. Das, B. (1918) recorded alate males from Lahore (Now in West Pakistan). Menon and Ghai (1969) for the first time recorded oviparae on wheat at Delhi, India

It is the commonest aphid species in Maize and causes appreciable injury by attacking inflorescence.

19. ***Rhopalosiphum nymphaeae*** (Linnaeus)

1761. *Aphis nymphaeae* Linnacus, *Fauna Suecica,* **2** : 260

1980. *Rhopalosiphum nymphaeae* (Linnaeus) : Raychaudhuri, D.N. (*ed.*), Aphids of Northeast India and Bhutan : 69

Material : Apterae, alatae and nymphs, host indet., Jorethang, 3.x.1972. C.U.Coll

Measurements (Aptera) : Length of body 2.85; width of body 1.40; antenna 1.32; a.s. III 0.30, IV 0.24, V 0.17, VI (0.13+0.54); u.r.s. 0.16; h.t.2 0.16; siphunculus 0.35; cauda 0.15

Measurements (Alata) : Length of body 2.30; width of body 1.00; antenna 1.70; a.s. III 0.48, IV 0.30, V 0.25, VI (0.16+0.63); u.r.s. 0.19; h.t.2 0.17; siphunculus 0.35; cauda 0.14

Distribution : India : Sikkim (South Sikkim), widely distributed. *Elsewhere* : Virtually cosmopolitan.

Remarks : David (1958) and Basu, Ghosh and Raychaudhuri (1970) recorded alate males from South India and both alate male and oviparae from Shillong in North east India respectively. Therefore, it suggests that the species enjoys holocyclic life cycle in India. The species is characterised in having distinct clavate siphunculi. In India, it is found to infest plants belonging to Apocyanaceae, Caesalpinae, Hydrocharitaceae, Menispermaceae, Rosaceae and Urticaceae

20. ***Rhopalosiphum padi*** (Linnaeus)

1758. *Aphis padi* Linnaeus, *Systema Naturae* (10th Ed.) : 451

1986. *Rhopalosiphum padi* (Linnaeus) : Ghosh, *Tech. Monogr.* No. **16**, *Zoological Survey of India* : 38

Material : Apterae, on *Eleusine coracana,* Namchi, 22.x.1975, Coll. P.K.Mondal

Measurements : (Aptera) : Length of body 1.35; width of body 1.25; antenna 1.10; a.s. III 0.30, IV 0.18, V 0.15, VI (0.08+0.40); u.r.s. 0.09 h.t.2 0.09; siphunculus 0.24; cauda 0.13

Distribution : India : Sikkim (South Sikkim) Arunachal Pradesh, Assam, Himachal Pradesh, Meghalaya, West Bengal. *Elsewhere* : Cosmopolitan.

Remarks : The aphids are brownish green in colour. These insects usually infest ventral surfaces of leaves, infested parts of the plant turn yellow. The aphids are attended by ants.

21. ***Rhopalosiphum rufiabdominalis*** (Sasaki)

1899. *Toxoptera rufiabdominalis* Sasaki, *Rep. Hokkaido agric. Exp. Sta.,* **17** : 202

1956. *Rhopalosiphum rufiabdominalis* (Sasaki); Doncaster, *Bull. Ent. Res.,* **47** : 742

1980. *Rhopalosiphum rufiabdominalis* (Sasaki); Raychaudhuri (*ed.*) *Aphids of North East India and Bhutan* : 70

Material : Alatae and nymphs, on *Lycopersicum esculentum,* Gangtok, 16.x.1975, Coll. P.K. Mondal (C.U.Coll.)

Measurements : (Alata) : Length of body 1.72; width of body 0.82; antenna 1.45; a.s. III 0.50, IV 0.18, V (0.09+0.56); u.r.s. 0.14; h.t.2 0.11; siphunculus 0.11; cauda 0.10

Distribution : India : Sikkim (East Sikkim), all over. *Elsewhere* : Cosmopolitan

Remarks : Mondal (1977) reported the species for the first time from Sikkim. Ghosh (1986) expressed the possibility of holocycly of the aphid in India. Young *et al.* (1971) reported for the first time the species occurring in the roots and under ground stems in barley at Delhi. This is the first record of the aphid from the roots of barley in India.

22. *Rhopalisiphum yoksumi* Ghosh *et al.*

1971. *Rhopalosiphum yoksumi* Ghosh, Banerjee and Raychaudhuri, *Proc. zool. Soc., Calcutta*, **24** : 102

1980. *Rhopalosiphum yoksumi* Ghosh *et al* ; Raychaudhuri D.N. (*ed.*), *Aphids of North east India and Bhutan*: 71

Material : Apterae and alatae, on *Poa* sp., Yoksum, 13.iv.1970, Coll. H. Banerjee (C.U. Coll.)

Measurements (Aptera) : Length of body 2.30; width of body 1.50; antenna 1.30; a.s. III 0.30, IV0.25, V 0.20, VI (0.11+0.35); u.r.s. 0.13; h.t.2 0.12; siphunculus 0.33; cauda 0.20

Measurements (Alata) : Length of body 1.90, width of body 0.87; antenna 1.42; a.s. III 0.39, IV 0.22, V 0.18, VI (0.12+0.40); u.r.s. 0.15; h.t.2 0.14; siphunculus 0.32; cauda 0.15.

Distribution : India : Sikkim (West Sikkim) and Meghalaya.

Remarks : The species is characterised by its having long rostrum reaching hind coxae, short dorsal hairs (15 µm, long siphunculi (0.34-0.41 mm in apterae and 0.30 mm in alatae); 8th tergite with 2 hairs and cauda with 9 hairs.

Genus 8. ***Schizaphis*** Borner

1931. *Schizaphis* Borner, *Anz. Schadlingsk.*, **7** :10

Type Species : *Aphis graminum* Rondani, 1847

Key to the species of *Schizaphis* Borner

1(2) Cauda dark, constricted near at the middle and with a bulbous apex; siphunculi longer, never less than twice as long as cauda, anterior tergal hairs on abdomen minute and blunt but hairs on 7th and 8th tergites much longer and conspicuous .... *.rotundiventris*

2(1) Cauda somewhat pale; siphunculi never more than twice as long as cauda; anterior tergal hairs on abdomen short as these gradually become longer caudad. .... *.graminum*

23. *Schizaphis graminum* (Rondani)

1852. *Aphis graminum* Rondani, *Nuova Ann. Sci. Nat. Bolonga* (Ser.3), **6**:10

1980 *Schizaphis graminum* (Rondani) : Raychaudhuri, D.N. (ed.), *Aphids of Northeast India and Bhutan* : 72

Material : Alata and nymphs, on undet. Grass, Singtam, 24.XII.1970, Coll. M.R. Ghosh

Measurements (Alata) : Length of body 1.65; width of body 0.77; antenna 1.52; a.s. III 0.34, IV 0.21, V 0.22, VI (0.09+0.50); u.r.s. 0.06; h.t.2. 0.09; siphunculus 0.26; cauda 0.09

Distribution : India : Sikkim (East Sikkim), widely distributed. *Elsewhere* : Cosmopolitan.

24. *Schizaphis rotundiventris* (Signoret)

1966. *Schizaphis rotundriventris* (Signoret 1860); Eastop, *Austral J. Zoology*, **14**:498

1980. *Schizaphis rotundriventris* (Signoret); Raychaudhuri, D.N. (ed.), *Aphids of Northeast India and Bhutan*: 74

Material : Apterae and nymphs, on *Cyperus exhaltans*, Singtam, 27.V.1970, Coll. M.R.Ghosh

Measurements (Aptera) : Length of body 1.56; width of body 0.90; antenna 1.50; a.s. III 0.33, IV 0.23, V 0.19, VI (0.09+0.51); u.r.s. 0.09; h.t.2 0.07; siphunculus 0.33; cauda 0.11

Distribution : India : Sikkim (East Sikkim), Meghalaya, South India, Uttar Pradesh, West Bengal. *Elsewhere* : Africa; Australia; Middle East; Philippines; Sabah, Sierra Loone; South Rhodesia; Sri Lanka and Sudan

Key to the genera of the tribe Macrosiphini

1(2) Tarsi atrophied and without claws; F.T.C. 1.0.0 ..... ***Shinjia***

2(1) Tarsi normal 3

3(4) Supracaudal process present on post siphuncular abdominal segments at least in apterae 5

4(3) Supracaudal process absent 7

5(6) Only abdominal tergite 8 with a hair bearing process which in apterae reduced to a small tubercle; siphunculi weekly or strongly clavate ..... ***Cavariella***

6(5) Each tergite 7 and 8 in apterae with distinct process which in alatae much reduced, such processi bear a pair of hairs ..... ***Tricaudatus***

7(8) Cauda hardly or not longer than width at base 9

8(7) Cauda distinctly longer than width at base 13

9(10) Siphunculi very short; cauda broadly oval; apterae without secondary rhinaria, alatae with such rhinaria usually on a.s. III ..... ***Cryptosiphum***

10(9) Siphunculi subcylindrical, longer than width 11

11(12) Dorsal abdominal hairs in apterae at most up to twice as long as b.d. III; siphunculi in apterae stout, somewhat conical, so that basal width is never less than twice its width at apex ..... ***Brachycaudus***

12(11) Dorsal abdominal hairs in apterae never less than twice and may be upto 4 times as long as b.d. III; siphunculi in apterae slender, nearly cylindrical ... ***Oedisiphum***

13(14) Transversely arranged spinules present on 2nd tarsal segment 15

14(13) Tarsi without such spinules 21

15(16) F.T.C. 5,5,5 17

16(15) F.T.C. 3,3,3 19

17(18) U.r.s. about 1.20-1.60 times as long as h.t.2 with 9-12 secondary hairs, the longest being longer than primary hairs ..... ***Neomasonaphis***

18(17) U.r.s. about twice as long as h.t.2 with 16-18 fine hairs which are never longer than primary ones. ..... ***Indumasonaphis***

19(20) Siphunculi swollen on distal half and with distinct basal stem; apterae with secondary rhinaria on a.s.III; midthoracic furca stalked ..... ***Amphorophora***

20(19) Siphunculi cylindrical; apterae without secondary rhinaria on a.s. III; midthoracic furca sessile..... ***Neoacyrthosiphon***

21(22) Some of the secondary hairs on u.r.s. as long as or longer than primary hairs, Secondary rhinaria tuberculate, siphunculi calf-shaped ..... ***Macrosiphoniella***

22(21) Secondary hairs on u.r.s. usually much shorter than primary hairs 23

23(24) Siphunculi reticulated 25

24(23) Siphunculi not reticulated but sometime a few interconnecting striae present near the apical flange 31

25(26) Siphunculi weekly to distinctly swollen ..... ***Arthromyzus***

26(25) Siphunculi cylindrical 27

27(28) Apterae usually without secondary rhinaria; abdominal dorsum with hair bearing tubercles on spinupleural area, cauda in apterae digitiform ..... ***Macromyzus***

28(27) Apterae with secondary rhinaria 29

29(30) Secondary rhinaria protuberant, abdominal dorsum normally with hair bearing sclerites; F.T.C. usally 5,5,5 ..... ***Uroleucon***

30(29) Secondary rhinaria nonprotuberant; abdominal dorsum usually devoid of hair bearing sclerites; F.T.C 3,3,3 but may be 4,4,4 ..... ***Marcosiphum***

31(32) Siphunculi warty 33

32(31) Siphunculi not warty 37

33(34) Siphunculi in apterae tapering to a point at apex and with the oblique pore situated much basad of the apex, in alatae the oblique pore placed at apex ..... ***Acutosiphon***

34(33) Siphunculi not as above 35

35(36) Primary rhinaria in apterae star-shaped, in alatae with finger-like process ..... ***Akkaia***

36(35) Primary rhinaria not as above; all the abdominal spiracles similar ..... ***Vesiculaphis***

37(38) Abdominal dorsum in apterae with reticulated pattern 39

38(37) Abdominal dorsum in apterae without such pattern 43

39(40) Head smooth dorsally at least in apterae; siphunculi with a preapical circumcission; apterae with secondary rhinaria on a.s. III ..... ***Sinomegoura***

40(39) Head in apterae with spinules both on dorsum and venter; siphunculi without preapical circumcission; apterae usually without secondary rhinaria 41

41(42) Siphunculi with strong spinular imbrications; dorsal abdominal hairs with widely expanded apices ..... ***Pentalonia***

42(41) Siphunculi not with spinular imbrications; dorsal abdominal hairs in apterae short and blunt ..... ***Micromyzus***

43(44) Head at least in apterae with processi 45

44(43) Head without processi 47

45(46) Head in apterae rugose; abdominal dorsum areolated with sparse spinules; primary rhinaria nonciliated ..... ***Tuberocephalus***

46(45) Head in apterae densely warty dorsally and ventrally; primary rhinaria strongly ciliated ..... ***Phorodon***

47(48) Antennal segment I usually with a finger-like projection from the inner apex, sometime such projection less developed; apterae without secondary rhinaria; primary rhinaria ciliated .... ***Matsumuraja***

48(47) Antennal segment I never with such projection 49

49(50) Apterae mostly with secondary rhinaria 51

50(49) Apterae without secondary rhinaria 59

51(52) Dorsum of head in apterae covered with warts or spinules 53

52(51) Dorsum of head in apterae usually not as above but may be slightly wrinkled, sometimes only a few spinules may occur below middle of frons 55

53(54) Apterae with low but distinct median frontal prominence and usually without secondary rhinaria ..... ***Aulocorthum***

54(53) Apterae without median frontal prominence and abdomen usually with horse shoe-shaped patch ..... ***Neomyzus***

55(56) Apterae without any median frontal prominence

–a) Secondary rhinaria in apterae distributed over basal 0.7 portion of a.s. III or over its entire length; siphunculi somewhat calf-shaped, area in front of siphunculi pale ..... ***Impatientinum***

–b) Secondary rhinaria in apterae restricted only near base of a.s. III; siphunculi rather cylindrical, never calf-shaped, area in front of siphunculi of uniform colour .... ***Acyrthosiphon***

56(55) Apterae with median frontal prominence 57

57(58) Siphunculi gently clavate at distal half; ante-and post siphuncular sclerites absent; siphunculi with an annular incision near apex ..... ***Hyperomyzus***

58(57) Suphunculi subcyclindrical but never clavate; all caudal hairs more or less of similar length ..... ***Metopolophium***

59(60) Dorsum of head in apterae usually smooth or may be slightly wrinkled 61

60(59) Dorsum of head in apterae spinulose or warty 77

61(62) Dorsal abdominal hairs at least in apterae, with distinct capitate apices; siphunculi usually cylindrical but may be slightly clavate on distal half ..... ***Capitophorus***

62(61) Dorsal abdominal hairs in apterae not as above 63

63(64) Siphunculi shorter than cauda 65

64(63) Siphunculi longer than cauda.....69

65(66) Siphunculi barrel-shaped; abdominal dorsum in apterae with pigmented transverse segmental bands; cauda triangular .....***Brevicoryne***

66(65) Siphunculi not as above; if however, sometimes barrel-shaped, then cauda not triangular 67

67(68) Siphunculi with a preapical circumcission and an apical flange; wing veins normal .....***Hydaphis***

68(67) Siphunculi without preapical circumcission and apical flange; wing vein thick and bordered brown ..... ***Semiaphis***

69(70) Dorsal abdominal hairs long with acute apices; siphunculi without a flange at apex; eyes without occular tubercles ....***Indiaphis***

70(69) Dorsal abdominal hairs short and not with acute apices 71

71(72) Siphunculi with a distinct preapical circumcission; 8th tergite with fine hairs being much longer than those with blunt apices on anterior abdominal tergites..... ..... ***Subovatomyzus***

72(71) Siphunculi without pre-apical circumcission.....73

73(74) Midthoracic furca in apterae sessile; alatae with secondary rhinaria on segments III, IV and sometimes also on segment V ... . ***Lipaphis***

74(73) Mid thoracic furca in apterae with separate arms 75

75(76) Siphunculi distinctly swollen in middle and with a constriction near base; cauda somewhat narrowly conical..... ..... ***Liosomaphis***

76(75) Siphunculi not swollen rather cylindrical; cauda elongate, constricted at middle .... ***Elatobium***

77(78) Siphunculi with pore obliquely placed and often with hairs.....79

78(77) Siphunculi with pore not obliquely placed and never with hairs 83

79(80) Siphunculi without apical flange 81

80(79) Siphunculi with an apical flange; only oblique vein present on hind wing..... ..... ***Trichosiphonaphis***

81(82) Apterae with dorsum of head spinular and with median frontal prominence; primary rhinaria on a.s. III in apterae placed somewhat away from apex of the segment .....***Xenomyzus***

82(81) Apterae with dorsum of head warty and without median frontal prominence; primary rhinaria on a.s. V in apterae placed close to apex of the segment ....***Jacksonia***

83(84) Apterae with median frontal prominence 85

84(83) Apterae without median frontal prominence 87

85(86) Alatae with secondary rhinaria only on a.s. III; primary rhinaria non-ciliated ....***Aulacorthum***

86(85) Alatae with secondary rhinaria on a.s. III-IV; primary rhinaria ciliated ....***Neohyalomyzus***

87(88) Dorsal abdominal hairs in apterae on low but distinct tuberculate bases; siphunculi in apterae densely imbricated .... ***Eumyzus***

88(87) Dorsal abdominal hairs never on tuberculate bases 89

89(90) Apterae with stout, subcylindrical, short siphunculi or somewhat subpentagonal cauda; alatae with strongly protuberant secondary rhinaria on a.s. III-IV .... ***Brachymyzus***

90(89) Apterae never with such combination of siphunculi and cauda; abdominal dorsum in apterae either completely dark or pale; alatae usually with secondary rhinaria on a.s. III and IV; secondary rhinaria somewhat protuberant but not so as in above .....***Myzus***

Genus 9. ***Acutosiphon*** Basu, Ghosh and Raychaudhuri

1970. *Acutosiphon* Basu *et al., Proc. zool. Soc., Calcutta,* **23** : 84

Type species : *Acutosiphon obliquoris* Basu, Ghosh and Raychaudhuri

25. ***Acutosiphon obliquoris*** Basu *et al.* (Fig. 21)

1970. *Acutosiphon oblioquoris* Basu, Ghosh and Raychaudhuri, *Proc. zool. Soc., Calcutta,* **23** : 84

1976. *Acutosiphon obliquoris* Basu, Ghosh and Raychaudhuri, *Oriental Ins.,* **10**(2) : 268

Material : Apterae and alatae, on undet plant of N.O. Cyperaceae, Gangtok, 16.x.1975, Coll. P.K. Mondal

Measurements (Aptera) : Length of body 1.70; width of body 1.0; antenna 0.78; a.s. III 0.20, IV 0.11, V 0.10, VI (0.10+0.08); u.r.s. 0.10; h.t.2 0.11; siphunculus 0.33; cauda 0.15

Measurements (Alata) : Length of body 2.40; width of body 1.04; antenna 1.40; a.s. III 0.45, IV 0.24, V 0.22, VI (0.19+0.17) u.r.s. 0.10; h.t.2 0.10; siphunculus 0.26; cauda 0.12

Distribution : India : Sikkim (East Sikkim), Himachal Pradesh, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Japan

Remarks : Ghosh, M. R., Ghosh, A.K. and Raychaudhuri, D.N. (1971) described alata vivipara and alate male collected from plant of N.O. Cyperaceae at Gangtok, Sikkim.

Genus 10. ***Acyrthosiphon*** Mordvilko

1914. *Acyrthosiphon* Mordvilko, *Fauna Russie,* **1** : 75

Type species : *Aphis pisi* Kaltenbach, 1843 (= *Aphis pisum* Harris, 1776)

26. ***Acyrthosiphon rubi*** Narzikulov

1957. *Acyrthosiphon rubi* Narzikulov, *Ent. obzr.,* **36** : 673

1975. *Acyrthosiphon rubi* Narzikulov, David and Hameed, *Oriental Ins.,* **9**(3) : 214

Material : Apterae, on *Rubus ellipticus,* Gangtok, 22.xii.1970, Coll. M. R. Ghosh

Measurements (Aptera) : Length of body 2.10; width of body 1.14; antenna 3.00; a.s. III 0.62, IV 0.54, V 0.46, VI (0.20+0.95); u.r.s. 0.14; h.t.2 0.16; siphunculus 0.64; cauda 0.18

Distribution : India : Sikkim (East Sikkim), West Bengal. *Elsewhere* : Bhutan, U.S.S.R

Remarks : The species is closely related to *Acyrthosiphon rubi elliptici* Stroyan and Nagaich but differs in having antennae longer than body, u.r.s. as long as h.t.2 and less number of secondary rhinaria on a.s. III. Papillated tergum in apterae is important feature of the species. D.N. Raychaudhuri, L.K.Ghosh and S.K.Das (1980) described apterous oviparous female and alate male collected on *Rubus ellipticus* at Kalpa, Himachal Pradesh.

Genus 11. ***Akkaia*** Takahashi

1919. *Akkaia* Takahashi, *Insect World,* **23**(12):439

Type species : *Akkaia polygoni* Takahashi, 1919

Key to the species of *Akkaia* Takahashi

1(2) F.T.C. 4,4,2; caudal hairs 9–11; lateral frontal tubercles as long as a.s.I .... *sikkimensis*

2(1) F.T.C. 3,3,3 or 3,3,2; cauda with at most 8 hairs 3

3(4) Finger-like projection on lateral frontal tubercles short, at most up to 0.5 x segment I; p.t. at least 1.5 times as long as base of terminal segment ..... *bengalensis*

4(3) Finger-like projection on lateral frontal tubercles long, about 1.5 times as long as segment I; p.t. as long as to little longer than base of terminal segment .... *neopolygoni*

27. ***Akkaia bengalensis*** Basu

1967. *Akkaia bengalensis* Basu, *Bull. Ent.,* **8**(2) : 143

1980. *Akkaia bengalensis* Basu; Raychaudhuri D.N. *(ed.), Aphids of Northeast India and Bhutan,* : 93

Material : Apterae and alatae, on *Polygonum berbatum,* Gangtok, 22.xii.1970, Coll. M. R. Ghosh

Measurements (Aptera) : Length of body 1.90; width of body 1.10; antenna 1.15; a.s. III 0.45, IV 0.14, V (0.10+0.22); u.r.s. 0.09; h.t.2 0.10; siphunculus 0.45; cauda 0.14.

Measurements (Alata) : Length of body 2.50; width of body 1.05; antenna 1.82; antennal segment III 0.66, IV 0.24, V (0.15+0.60); u.r.s. 0.10; h.t.2 0.09; siphunculus 0.41; cauda 0.15.

Distribution : India : Sikkim (East Sikkim), Meghalaya, West Bengal.

Remarks : The aphids are common on N.O. Polygonaceae growing on damp areas. They are milky white to cream in colour and with dark brown siphunculi, usually attended by ants.

28. ***Akkaia neopolygoni*** Ghosh, Ghosh and Raychaudhuri

1970. *Akkaia neopolygoni* Ghosh, Ghosh and Raychaudhuri, *Oriental Ins.*, 4(4); 377

1980. *Akkaia neopolygoni* Ghosh *et al.*; Raychaudhuri, D.N. (ed.), *Aphids of Northeast India and Bhutan* : 94

Material : Aptera and nymphs, on *Polygonum molle,* North Sikkim Highway, 23.xii.1970, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 2.60; width of body 1.25; antenna 0.90; a.s. III 0.30, IV 0.18, V 0.12, VI (0.08+0.09); u.r.s. 0.11; h.t.2 0.12; siphunculus 0.55; cauda 0.25.

Distribution : India : Sikkim (North Sikkim), Arunachal Pradesh, West Bengal.

29. ***Akkaia sikkimensis*** Agarwala and Raychaudhuri (Fig. 16)

1977. *Akkaia sikkimensis* Agarwala and Raychaudhuri, *Entomon, 2*(1) : 77.

Material : 3 apterae and nymphs, on *Raphanas sativus,* Mangan, 8.xii.1975, Coll. S.Datta

Measurements : Length of body 2.55; width of body 1.25; antenna 1.08; a.s. III 0.35, IV 0.17, V 0.12, VI (90.08+0.12); u.r.s. 0.11; h.t.2 0.10; siphunculus 0.58; cauda 0.25.

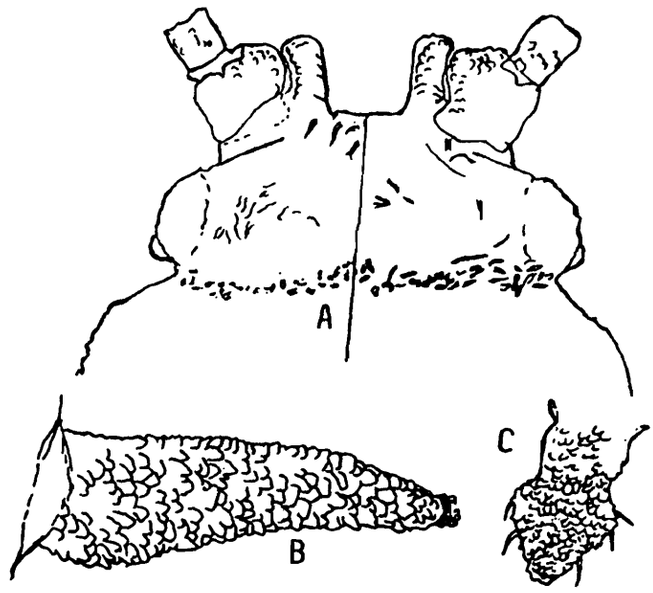


Fig. 16. *Akkaia sikkimensis* Agarwala and Raychaudhuri : Aptera : A, Head; B, Siphunculus; C, Cauda

Distribution : India : Sikkim (East Sikkim).

12. Genus ***Amphorophora*** Buckton

1876. *Amphorophora* Buckton, *Monograph of British Aphides, R. Society,* London, **1** : 187

Type species : *Amphorophora ampullata* Buckton, 1876.

30. ***Amphorophora ampullata bengalensis*** Hille Ris Lambers and Basu

1966. *Amphorophora ampullata bengalensis* Hille Ris Lambers and Basu, *Entomol. Ber.*, **26** : 14

1971. *Amphorophora ampullata bengalensis* Hille Ris Lambers and Basu; Ghosh, *Tech. Mon.* No. **16**, Zoological Survey of India : 54

Material : Apterae, alatae and nymphs, on an undet Fern, Gangtok, 23.xii.1970. Coll. M.R. Ghosh.

Measurements (Aptera) : Length of body 3.50; width of body 1.80; antenna 5.15; a.s. III 1.25, IV 1.0, V 0.82, VI (0.25+1.28); u.r.s. 0.18; h.t.2 0.13; siphunculus 0.78; cauda 0.30.

Measurements (Alata) : Length of body 3.85; width of body 1.70; Antenna 5.09; a.s. III 1.18, IV 1.02, V 0.90, VI (0.25+1.28); u.r.s. 0.18; h.t.2 0.15; siphunculus 0.68; cauda 0.29.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Himachal Pradesh, Manipur, Meghalaya, Nagaland and West Bengal; Elsewhere: Nepal.

Genus 13. ***Anthromyzus*** Borner

1950. *Anthromyzus* Borner, *Neue europaische Blattalausarten* : 12

Type species : *Rhopalosiphum staphyleae* Koch, 1856

31. ***Anthromyzus smilacifoliae*** (Ghosh and Raychaudhuri)

1968. *Neorhopalosiphoninus smilacifoliae* Ghosh and Raychaudhuri *Proc. zool. Soc., Calcutta,* **21** : 188

1980. *Arthromyzus smilacifoliae* (Ghosh and Raychaudhuri); Raychaudhuri, Ghosh and Basu, *In* : Aphids of Northeast India and Bhutan) : 99

Material : Alata, on *Smilax* sp., Gangtok, 28.x.1962, Coll. A. K. Ghosh.

Measurements (Alata) : Length of body 3.30; width of body 1.30; antenna 3.74; a.s. III 0.83, IV 0.73, V 0.57, VI (0.20+1.11); u.r.s. 0.14; h.t.2 0.09; siphunculus 0.60; cauda 0.18.

Distribution : India : Sikkim (East Sikkim)

Remarks : The species is originally described from Sikkim. Eastop (1958, 1966) recognises *Arthromyzus* as a subgenus of *Rhopalosiphoninus.*

Genus 14. ***Aulocorthum*** Mordvilko

1914. *Aulocorthum* Mordvilko, *Fauna de la Russie,* **1** : 68

Type species : *Aphis solani* Kaltenbach, 1843

Key to the species of *Aulocorthum (Aulacorthum)*

1(2) Dorsum of head smooth; siphunculi pale with 1 or 2 apical interconnecting striae ..... *rhamni*

2(1) Dorsum of head spinulose 3

3(4) Antennal segment III shorter than p.t. 5

4(3) Antennal segment III longer than p.t. 7

5(6) Processus terminalis about 5 times as long as base of a.s. III .....*nipponicum*

6(5) Processus terminalis 4.5 times as long as base of a.s. VI ..... *solani*

7(8) Cauda with 4–5 hairs; antennae longer than body; u.r.s. at most 1.25 times as long as hind tarsus 2 .....*magnoliae*

8(7) Cauda with more than 7 hairs; antennae shorter than body; u.r.s. never less than 1.45 times as long as hind tarsus 2 ..*dasi*

32. ***Aulocorthum (Aulacorthum) dasi*** Ghosh, Basu and Raychaudhuri

1970. *Aulocorthum dasi* Ghosh, Basu and Raychaudhuri, *Oriental Ins.,* **4**(1) : 66

1980. *Aulocorthum dasi* Ghosh *et al.;* Raychaudhuri D.N. *(ed.), Aphids of Northeast India and Bhutan* : 103

Material : Apterae, on *Solanum torvum,* Pelling, 20.III.1970, Coll. H. Banerjee

Measurements (Aptera) : Length of body 2.70; width of body 1.30; antenna 2.56; a.s. III 0.61, IV 0.44, V 0.38, VI (0.14+0.65); u.r.s. 0.16; h.t.2 0.11; siphunculus 0.60; cauda 0.26.

Distribution : India : Sikkim (West Sikkim), Meghalaya.

33. ***Aulocorthum (Aulocorthum) lindere*** (Shinji)

1982. *Aulocorthum (Aulocorthum) lindere* (Shinji); Agarwala, Pramanick and Raychaudhuri, *Akitu,* N.S. **47** : 5

Material : Not examined.

Measurements (Alata) (After B. K. Agarawala *et al.,* 1982 a) : Length of body 2.62; width of body 1.44; antenna 3.06; a.s. III 0.79, IV 0.54, V 0.54, VI (0.16+0.84); u.r.s. 0.12; h.t.2 0.12; siphunculus 0.55; cauda 0.18

Distribution : India : Sikkim.

Remarks : The species is whitish yellow in life. In India, it is known only from Sikkim. The alate viviparous female is described for the first time by Agarwala *et al.* (1982). This morph is collected from the State of Sikkim.

34. *Aulocorthum (Aulocorthum) magnoliae* (Essig and Kuwana)

1918. *Rhopalosiphum magnoliae* Essig and Kuwana, *Proc. Calif. Acad. Sci.*, **8** : 59

1971. *Aulocorthum magnoliae* (Essig and Kuwana); Ghosh, Ghosh and Raychaudhuri, *Proc. zool. Soc. Calcutta,* **24** : 164

1980. *Aulocorthum magnoliae* (Essig and Kuwana), Raychaudhuri *(ed.),* Aphids Northeast India and Bhutan : 104

Material : Apterae, on indet plant, Deorali, 22.xii.1970, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 2.80; width of body 1.40; antenna 3.2; a.s. III 0.74, IV 0.52, V 0.50, VI (0.23+0.95); u.r.s. 0.16; h.t.2 0.11; siphunculus 0.68; cauda 0.32.

Distribution : India : Sikkim (East Sikkim), Himachal Pradesh, Meghalaya, West Bengal; Elsewhere : Japan; Korea and Taiwan.

35. *Aulocorthum (Aulocorthum) nipponicum* (Essig and Kuwana)

1918. *Macrosiphum nipponicum* Essig and Kuwana, *Proc. Calif. Acad. Sci.*, **8** : 48

1980. *Aulocorthum nipponicum* (Essig and Kuwana); Raychaudhuri *(ed.)* Aphids of Northeast India and Bhutan : 104

Material : Apterae, on indet plant, Melli, 19.vii.1969, C.U.Coll.

Measurements (Aptera) : Length of body 2.85; width of body 1.48; Antenna 3.00; a.s. III 0.75, IV 0.50, V 0.52, VI (0.19+0.95); u.r.s. 0.14; h.t.2 0.10; siphunculus 0.60; cauda 0.25.

Distribution : India : Sikkim (South Sikkim), Arunachal Pradesh, Himachal Pradesh, Meghalaya, Nagaland, West Bengal; Elsewhere: China; Japan; Korea and Taiwan.

36. *Aulocorthum (Aulocorthum) rhamni* Ghosh, Ghosh and Raychaudhuri

1971. *Aulocorthum rhamni* Ghosh, Ghosh and Raychaudhuri, *Oriental. Ins.* 4(4) : 379

1980. *Aulocorthum rhamni* Ghosh *et al.;* Raychaudhuri *(ed.),* Aphids of Northeast India and Bhutan : 105

Material : Apterae, on *Sarumia* sp., Yaksum, 14.ii.1970, C.U. Coll.

Measurements (Aptera) : Length of body 2.00; width of body 1.10; antenna 2.08; a.s. III 0.42, IV 0.35, V 0.30, VI (0.13+0.48); u.r.s. 0.10; h.t.2 0.08; siphunculus 0.35; cauda 0.20.

Distribution : India: Sikkim (West Sikkim), Himachal Pradesh, Meghalaya, West Bengal.

37. *Aulocorthum (Aulocorthum) solani* (Kaltenbach)

1843. *Aphis solani* Kaltenbach, *Monographie der Familian der Pflanzenlause,* 15

1969. *Aulocorthum solani* (Kaltenbach); Chowdhuri, Basu and Raychaudhuri; *Sci. Cult.*, **35** : 336

Material : Aptera, on undet plant, Pelling, 14.iii.1970, C.U. Coll.

Measurements (Aptera) : Length of body 2.46; width of body 1.24; antenna 2.60; a.s. III 0.60, IV 0.47, V 0.38, VI (0.15+0.74); u.r.s. 0.12; h.t.2 0.10; siphunculus 0.46; cauda 0.21.

Distribution : India : Sikkim (West Sikkim), Himachal Pradesh. *Elsewhere* : Cosmopolitan (Kumar and Burkhardt, 1971).

Subgenus *Neomyzus* van der Goot

1915. *Neomyzus* van der Goot, *Beitr. Z. kem. der Halland Blattalause,* **7**

Key to the species of *Neomyzus*

1(2) Antennal segment III distinctly imbricated and entirely dark, siphunculi 0.15–0.19 times as long as body ..... *circumflexum*

2(1) Antennal segment III smooth and dark with at least basal portion; siphunculi 0.23–0.25 times as long as body ..... *primulum*

38. *Aulocorthum (Neomyzus) circumflexum* (Buckton)

1876. *Siphonophora circumflexus* Buckton, *Monograph of the British Aphides,* Ray Society, London, **1** : 130

1972. *Neomyzus circumflexus* (Buckton); Basu, Ghosh and Raychaudhuri, *Sci. Cult.*, **38** : 495

1997. *Aulocorthum (Neomyzus) circumflexum* (Buckton); Remaudiere and Remaudiere, Catalogue of the World's Aphididae, Homoptera : Aphidoidea : 76

Material : Apterae and nymphs, on *Tropaeolum majus,* Natu La, 24.x.1962, Coll A.K. Ghosh; Alata and nymphs, on *Datura* sp., 23.xii.1970; apterae and nymphs, on *Ipomoea lobata,* Gangtok, 16.xi.1976. C.U. Coll.

Measurements (Aptera) : Length of body 2.15; width of body 1.05; antenna 1.90; a.s. III 0.46, IV 0.32, V 0.26, VI (0.15+0.52); u.r.s. 0.10; h.t.2 0.08; siphunculus 0.35; cauda 0.14.

Measurements (Alata) : Length of body 1.75; width of body 0.70; antenna 2.35; a.s. III 0.50, IV 0.40, V 0.38, VI (0.17+0.66); u.r.s. 0.11; h.t.2 0.09; siphunculus 0.32; cauda 0.15.

Distribution : India : Sikkim (East Sikkim), widely distributed; Elsewhere : Cosmopolitan.

Remarks : Ghosh and Raychaudhuri (1968) recorded this greenish brown species from Sikkim for the first time.

39. ***Aulocorthum (Neomyzus) primulum*** Ghosh, Banerjee and Raychaudhuri

1971. *Aulocorthum (Neomyzus) primulum* Ghosh, Banerjee and Raychaudhuri, *Proc. zool. Soc. Calcutta,* **24** : 100

1980. *Neomyzus (Neomyzus) primulum* Ghosh, Banerjee and Raychaudhuri, Raychaudhuri *(ed),* Aphids of Northeast India and Bhutan : 230

1997. *Aulocorthum (Neomyzus) primulum* Ghosh *et al.*; Remaudiere and Remaudiere, Catalogue of the World's Aphididae, Homoptera; Aphidoidea : 77

Material : Apterae and nymphs, on *Primula* sp., Chumrigaon, 31.iii.1970, C.U. Coll.

Measurements (Aptera) : Length of body 1.83; width of body 0.97; antenna 1.78; a.s. III 0.48, IV 0.29, V 0.22, VI (0.11+0.52); u.r.s. 0.11; h.t.2 0.10; siphunculus 0.41; cauda 0.14.

Distribution : India : Sikkim (South Sikkim), Meghalaya.

Remarks : The greenish aphids usually infest *Primula* sp. (N.O. Primulaceae) and *Symplocos* sp. (N.O. Styraceae). This is an endemic species to Northeast India.

Genus 15. ***Brachycaudus*** van der Goot

1913. *Brachycaudus* van der Goot, *Tijdschr. Ent.,* **56** : 97

Type species : *Aphis myosotidis* Koch, 1854

40. ***Brachycaudus helichrysi*** (Kaltenbach)

1843. *Aphis helichrysi* Kaltenbach, *Mon. der Fam. Pflanzen,*: 102

1913. *Brachycaudus helichrysi* (Kaltenbach); van der Goot, *Tidschr. Ent.* **56** : 97 (in Cottier, 1953)

1986. *Brachycaudus helichrysi* (Kaltenbach); Ghosh, *Tech. Mon.* No. **16** : Zoological Survey of India : 62

Material : 5 apterae, on *Gnaphalium* sp., Namchi, 24.v.1970, Coll. M. R. Ghosh; 2 alatae and 1 nymph, on indet plant of N.O. Aroideae, Chawang, 24.x.1962, Coll. A.K.Ghosh; Many apterae, alatae and nymphs, on *Ageratum* sp., Mamring, January, 1994, Coll. L. K. Ghosh.

Measurements (Aptera) : Length of body 1.35; width of body 0.80; antenna 0.54; a.s. III 0.12, IV 0.09, V 0.07, VI (0.07+0.15); u.r.s. 0.14; h.t.2 0.08; siphunculus 0.10; cauda 0.07.

Measurements (Alata) : Length of body 1.47; width of body 0.70; antenna 1.30; a.s. III 0.33, IV 0.16, V 0.11, VI (0.06+0.36); u.r.s. 0.10; h.t.2 0.09; siphunculus 0.13; cauda 0.09.

Distribution : India : Sikkim (West Sikkim), all over; Elsewhere : Cosmopolitan.

Remarks : The species is very common in the state and causes much damage to plants. It is attended by ants. The species enjoys holocyclic life cycle in India.

Genus 16. ***Brachymyzus*** Basu

1964. *Brachymyzus* Basu, *J. Linn. Soc. London, Zool.* **45** (305) : 223

Type species : *Brachymyzus jasmini* Basu, 1964

41. ***Brachymyzus jasmini*** Basu (Figs. 18–19)

1964. *Brachymyzus jasmini* Basu, *J.Linn. Soc. London.Zool.,* **45** (305) : 223

1980. *Brachymyzus jasmini* Basu; Raychaudhuri *(ed.),* Aphids of Northeast India and Bhutan : 109

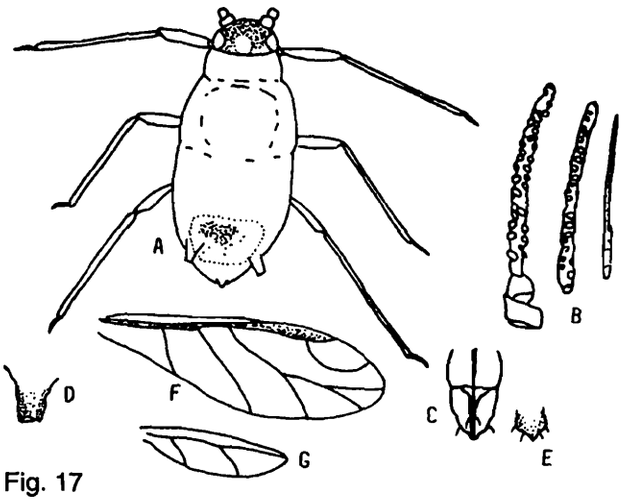


Fig. 17

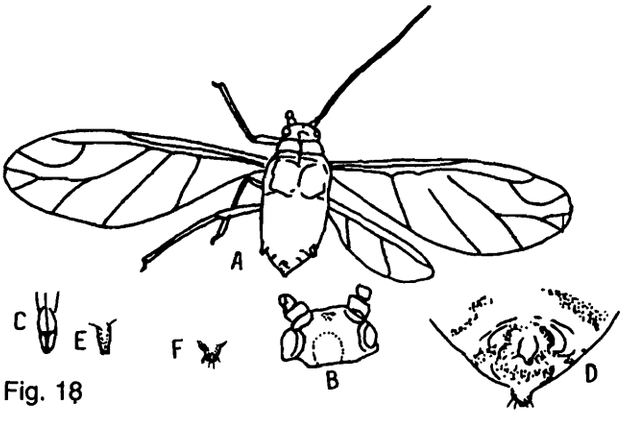


Fig. 18

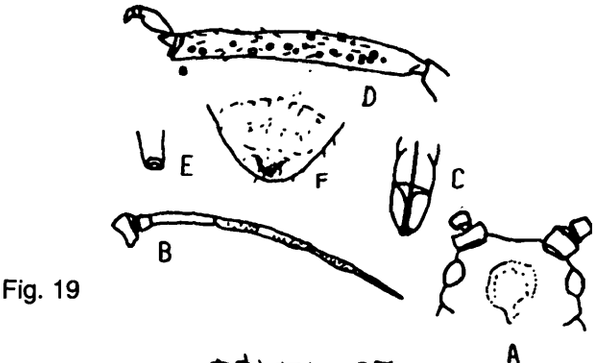


Fig. 19

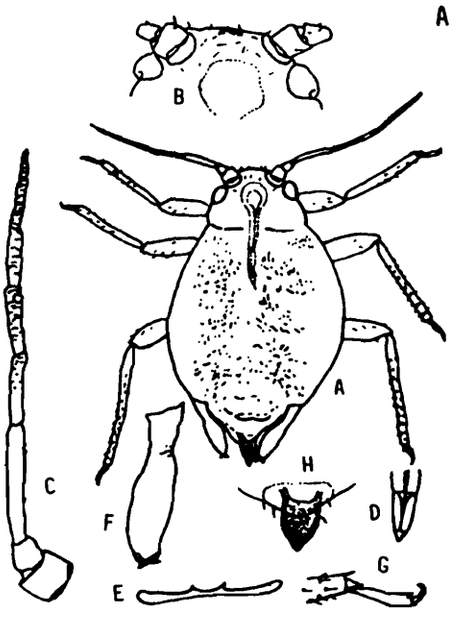


Fig. 20

Fig. 17-20 : 17. *Brachymyzus jasmini* Basu : Alata : A, Body; B, Antennal segments, C, U.r.s.; D, Posterior abdominal dorsum; E, Siphunculus; F, Fore wing; G, Hind wing; 18. *Brachymyzus jasmini* Basu : Alata male: A, Body; B, Dorsum of head; C, U.r.s.; D, Posterior abdominal dorsum; E, Siphunculus; F, Cauda; 19. *Brachymyzus jasmini* Basu : Oviparous female : A, Dorsum of head; B, Antenna; C, U.r.s.; D, Hind tibia; E, Siphunculus; F, Cauda; 20. *Liosomaphis berberidis* (Kalt.): Aptera: A, Entire body; B, Dorsum of head; C, Antenna; D, U.r.s.; E, Mid thoracic furca; F, Siphunculus; G, Hind tarsi; H, Cauda

Material : Apterae and nymphs, on *Nellia* sp., Manul, 19.xi.1974, C.U. Coll.

Measurements (Aptera) : Length of body 1.60; width of body 0.95; antenna 1.15; a.s. III 0.27, IV 0.17, V 0.18, VI (0.10+0.25); u.r.s. 0.08; h.t.2 0.09; siphunculus 0.13; cauda 0.09.

Distribution : India : Sikkim (North Sikkim), West Bengal.

Remarks : Both alate male and apterous oviparous female are reported for the first time from Sikkim (Mondal 1977: Ph.D.Thesis, Calcutta University).

Genus 17. ***Brevicoryne*** van der Goot

1915. *Brevicoryne* van der Goot, *Bietr. Z. Kennt. der Holland. Blattalause* : 245

Type species : *Aphis brassicae* Linnaeus, 1758

42. ***Brevicoryne brassicae*** (Linnaeus)

1758. *Aphis brassicae* Linnaeus, *Systema Naturae*, **1** (10th ed.): 452

1918. *Brevicoryne brassicae* (Linnaeus); Das *Mem. Indian Mus.*, **6**(4) : 187

1980. *Brevicoryne brassicae* (Linnaeus); Ghosh *et al.*, *Bull. zool. Surv. India*, *3* (1&2) : 67

Material : Apterae, alatae and nymphs, on *Brassica campestris*, Tadong, May, 1994, Coll. P.K.Ghosh.

Measurements (Aptera) : Length of body 2.30; width of body 1.50; antenna 1.25; a.s. III 0.40, IV 0.17, V 0.16, VI (0.09+0.32); u.r.s. 0.10; h.t.2 0.15; siphunculus 0.14; cauda 0.17.

Measurements (Alata) : Length of body 1.60; width of body 0.65; antenna 1.35; a.s. III 0.40, IV 0.15, V 0.15, VI (0.09+0.38); u.r.s. 0.10; h.t.2 0.14; siphunculus 0.11; cauda 0.13.

Distribution : India : Sikkim (East Sikkim), Himachal Pradesh, Uttar Pradesh, Punjab, South India, West Bengal and widely distributed. *Elsewhere* : Virtually cosmopolitan.

Remarks : Light green to brownish insects infest mainly the aerial parts of the host plants belonging to N.O. Brassicaceae. The species reproduces holocyclically at higher elevations. L. K. Ghosh *et al.* (1980) described the species in details.

Genus 18. ***Capitophorus*** van der Goot

1913. *Capitophorus* van der Goot, *Tijdschr. Ent.*, **56** : 84.

Type-species : Aphis carduina Walker, 1850

Key to the species and subspecies of the Genus *Capitophorus*

Apterous viviparous female

1(2) Dorsum of abdomen with duplicated spinal and pleural hairs .....*formosartemisiae*

2(1) Dorsum of abdomen with spinal and pleural hairs not duplicated 3

3(4) Spinal hairs on all abdominal segments long and more or less of equal length .... *indicus*

4(3) Spinal hairs on abdomen generally longer caudad but these may not be present on anterior abdominal segments.....5

5(6) Siphunculi cylindrical; ultimate rostral segment 4, about 4–5 times as long as segment 5 .....*elaeagni*

6(5) Siphunculi distinctly clavate 7

7(8) Longest hair on anterior abdominal dorsum much shorter, about 0.15–0.20 times as long as b.d. III and that on a.s. III about 0.12–0.23 times as long as b.d. III; u.r.s. shorter, about 0.8 times as long as h.t.2.. ..... *hippophaes javanicus*

8(7) Longest hair on anterior abdominal dorsum rather long, about 0.75–1.08 times as long as b.d. III and that on a.s. III about 0.30 times as long as b.d. III; u.r.s. about as long as or little longer than h.t.2..... ..... *hippophaes mitegoni*

43. ***Capitophorus eleagni*** (del Guercio)

1894. *Myzus elaeagni* del Guercio, *Natural sicil (Palermo)*, **13**(10) : 189

1953. *Capitophorus elaeagni* (del Guercio); Basu and Raychaudhuri, *Oriental Ins.*, **10**(s) : 571

Material : Apterae and nymphs, on *Cnicus* sp., Pelling, 14.iii.1970, Coll. H. Banerjee.

Measurements (aptera) : Length of body 1.70; width of body 0.85; antenna 1.86; a.s. III 0.36, IV 0.32, V 0.26, VI (0.08+0.60); u.r.s. 0.13; h.t.2 0.08; siphunculus 0.50; cauda 0.21.

Distribution : India : Sikkim (West Sikkim). Meghalaya : Elsewhere : Cosmopolitan.

44. ***Capitophorus formosartemisiae*** (Takahashi)

1921. *Myzus formosartemisiae* Takahashi, *Aphididae of Formosa*, **1** : 25

1961. *Capitophorus formosartemisiae* (Takahashi); Basu and Raychaudhuri, *Oriental Ins.*, **10**(4) : 571

Material : Apterae and nymphs on *Artemesia* sp., Jorethang, 19.1.1971, Coll. M.R.Ghosh, Alate and nymphs on *Artemesia* sp. Mongan, 17.v.1975, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 1.80; width of body 0.85; antenna 1.80; a.s. III 0.40, IV 0.23, V 0.24, VI (0.09+0.68); u.r.s. 0.15; h.t.2 0.08; siphunculus 0.64; cauda 0.12.

Measurements (Alata) : Length of body 1.75; width of body 0.70; antenna 0.14; h.t.2 0.08, siphunculus 0.39; cauda 0.09.

Distribution : India : Sikkim (South Sikkim) Arunachal Pradesh, Meghalaya, Uttar Pradesh, West Bengal; Elsewhere : Bhutan; Taiwan and East Asian Countries.

Remarks : Ghosh, Ghosh and Raychaudhuri (1971) reported the species for the first time from

Sikkim. Apterous oviparous female is recorded from Bhutan by Ghosh, Basu and Raychaudhuri (1971).

45. ***Capitophorus hippophaes javanicus*** Hille Ris Lambers

1953. *Capitophorus hippophaes javanicus* Hille Ris Lambers, *Temminckia,* **9** : 156

1976. *Capitophorus hippophaes javanicus* Hille Ris Lambers; Basu and Raychaudhuri, *Oriental Ins.* **10**(4) : 574

Material : Apterae and nymphs, on *Polygonum moli,* Gangtok, 10.iii.1971, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.48; width of body 0.75; antenna 1.50; a.s. III 0.30, IV 0.20, V 0.20, VI (0.09+0.60); u.r.s. 0.08; h.t. 2 0.07; siphunculus 0.40; cauda 0.18.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Himachal Pradesh, Manipur, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Australia; China; Europe; Indonesia; Japan; Korea; New Zealand; Pakistan and Taiwan.

46. ***Capitophorus hippophaes mitegoni*** Eastop

1956. *Capitophorus hippophaes mitegoni* Eastop, *Entomologist,* **89** : 9

1986. *Capitophorus hippophaes mitegoni* Eastop; Ghosh, *Tech. Mon.* **16**, Zoological Survey of India : 66

Material : Aptera and nymphs, on *Polygonum* sp. Pelling, 14.iii.1970, Coll. H. Banerjee.

Measurements (Aptera) : Length of body 2.25; width of body 1.16; antenna 2.20; a.s. III 0.45, IV 0.35, V 0.31, VI (0.11+0.80); u.r.s. 0.10; h.t. 2 0.11; siphunculus 0.70; cauda 0.26.

Distribution : India : Sikkim (West Sikkim) Himachal Pradesh, Meghalaya, West Bengal, *Elsewhere* : Africa and Australia.

47. ***Capitophorus indicus*** Ghosh and Raychaudhuri

1968. *Capitophorus indicus* Ghosh and Raychaudhuri, *Ann. Entomol. Soc. Amer.,* **63**(3): 752

1976. *Capitophorus indicus* Ghosh and Raychaudhuri; Basu and Raychaudhuri; *Oriental Ins.,* **10**(4) : 572

Material : Many apterae, alatae and nymphs, on *Polygonum* sp., Gangtok, 26.xii.1969, Coll. A. K. Ghosh.

Measurements (Aptera) : Length of body 2.00; width of body 0.95; antenna 2.37; a.s. III 0.44, IV 0.35, V 0.34, VI (0.10+0.88); u.r.s. 0.10; h.t. 2. 0.10; siphunculus 0.60; cauda 0.22.

Measurements (Alata) : Length of body 2.10; width 0.90; antenna 2.60; a.s. III 0.48, IV 0.38, V 0.37, VI (0.10+0.78); u.r.s. 0.09; h.t. 2 0.08; siphunculus 0.40; cauda 0.17.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Meghalaya, Uttar Pradesh, West Bengal.

Genus 19. ***Cavariella*** del Guercio

1911. *Cavariella* del Guercio, *Redia,* **7** : 323

Type species : *Aphis pastinaceae* Linnaeus, 1758

Key to the species of the genus *Cavariella*

Apterous viviparous female

1(2) Tergum blackish; supracaudal process short and broad; antennae 6-segmented .... *nigra*

2(1) Tergum pale; supracaudal process long and slender; antennae 5-segmented ..... *araliae*

48. ***Cavariella araliae*** Takahashi

1921. *Cavariella araliae* Takahashi, *Aphididae of Formosa Agr. Exp. Sta. Govt. Formosa Rep.* pt. 1, **20** : 37

1980. *Cavariella araliae* Takahashi; Raychaudhuri, D.N. *(ed.), Aphids of Northeast India and Bhutan* : 121

Material : Apterae and nymphs, on *Salix* sp., Gangtok, 25.xi.1969, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 2.00; width of body 1.18; antenna 0.85; a.s. III 0.35, IV 0.10, V (0.10+0.19); u.r.s. 0.12; h.t. 2 0.10; siphunculus 0.35; cauda 0.15.

Distribution : India : Sikkim (East Sikkim), Meghalaya; *Elsewhere* : China; Japan; Korea and Taiwan.

49. *Cavariella nigra* Basu

1964. *Cavariella nigra* Basu, *J.Linn. Soc.(Zool),* **45** (305): 240

1986. *Cavariella nigra* Basu; Ghosh, *Tech. Mon.,* **16,** Zoological Survey of India : 70

Material : Apterae and alatae, on undet host, Lachung, 6.vi.1975, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 1.94; width of body 0.96; antenna 0.78; a.s. III 0.25, IV 0.11, V 0.10, VI (0.09+0.12); u.r.s. 0.13; h.t.2 0.11; siphunculus 0.30; cauda 0.15.

Measurements (Alata) : Length of body 1.85; width of body 0.80; antenna 1.12; a.s. III 0.44, IV 0.17, V 0.11, VI (0.10+0.15); u.r.s. 0.12; h.t. 2 0.11; siphunculus 0.20; cauda 0.11.

Distribution : India : Sikkim (North Sikkim) Himachal Pradesh, West Bengal.

Remarks : The species was originally described from both apterae and alatae collected on *Salix elegans* at Darjeeling in Eastern Himalaya. Ghosh (1986) described sexual female from Himachal Pradesh for the first time. This hints at the possibility of the holocyclic life cycle of the species in India.

Genus 20. *Cryptosiphum* Buckton

1879. *Cryptosiphum* Buckton, *Mongr. Br. Aphides,* **2** : 144

Type species : *Cryptosiphum artemisiae* Buckton, 1879

50. *Cryptosiphum artemisiae* Buckton (Fig. 22)

1879. *Cryptosiphum artemisiae* Buckton, *Monogr. Br. Aphides,* **2** : 145

1980. *Cryptosiphum artemisiae* Buckton; Raychaudhuri, D.N. *(ed.), Aphids of Northeast India and Bhutan*:128

Material : Apterae, alata and nymphs, on *Artemisia vulgaris,* Gangtok 24. XII. 1970, Coll. M.R. Ghosh.

Measurements (Aptera) : Length of body 1.45; width of body 0.96; antenna 0.47; a.s. III 0.10, IV 0.04, V 0.04, VI (0.06 + 0.05) u.r.s. 0.13; h.t. 2 0.09.

Measurements (Alata) : Length of body 1.19; width of body 0.06; antenna 0.70; a.s. III 0.25, IV 0.06, V 0.08, VI (0.07 + 0.12); u.r.s. 0.12; h.t. 2 0.09.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Meghalaya; West Bengal. *Elsewhere* : China; Europe; Japan, Korea and Taiwan.

Genus 21. *Elatobium* Mordvilko

1914. *Elatobium* Mordvilko, *Faune Russie, Ins. Hem.* **1** (1): 72

Type species : *Aphis abietina* Walker, 1849

51. *Elatobium sclerotica* Agarwala, Pramanick and Raychaudhuri (Fig. 25)

1982. *Elatobium sclerotica* Agarwala, Pramnick and Raychaudhuri, *Akitu* N.S., **47**: 1

Material : Apterae, on indet host plant, Lachung, 28.xi.1976, C.U. Coll.

Measurements (Aptera) : Length of body 3.00; width of body 1.40; antenna 2.13; a.s. III 0.65, IV 0.35, V 0.32, VI (0.19+0.45); u.r.s. 0.10; h.t. 2 0.15; siphunculus 0.72; cauda 0.32.

Distribution : India : Sikkim (North Sikkim).

Remarks : The species is known so far by apterous viviparous females collected from indet plant at an altitude *ca* 3000m in Northern Sikkim. It is yellowish green in life. The aphid is characterised by the presence of a dark patch on the abdomen.

Genus 22. Genus *Ericolophium* Tao

1963. *Ericolophium* Tao, *Pl. Prot. Bull., Taiwan,* **5** : 187.

Type species : *Macrosiphum itoe* Takahashi, 1925

52. *Ericolophium sikkimensis* Agarwala and Mahapatra

1986. *Ericolophium sikkimensis* Agarwala and Mahapatra, *Entomon,* **11** (4):299.

Material : Apterae, on unidentified plant of Ericaceae, Lachung, 24.xi.1983, Coll. S. K. Mahapatra.

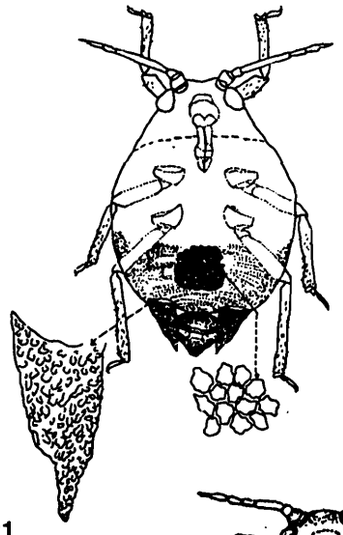


Fig. 21

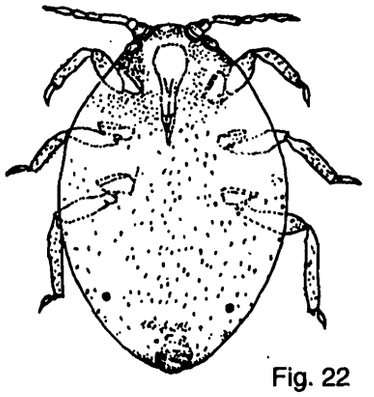


Fig. 22

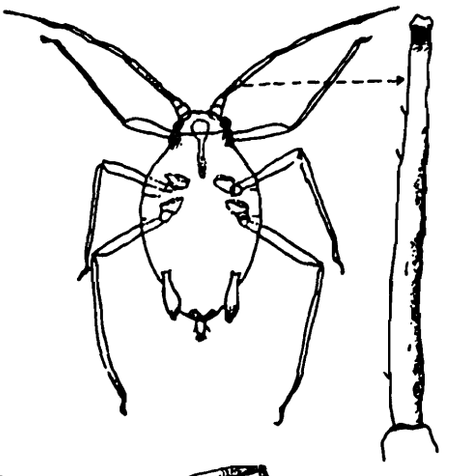


Fig. 23

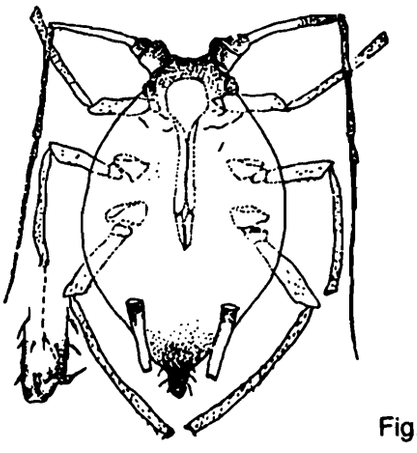


Fig. 24

Figs. 21-24 : 21. *Acutosiphon obliquoris* Basu *et al.* : Aptera; 22. *Cryptosiphum artemisiae* Buckton : Aptera; 23. *Hyperomyzus carduellinus* (Theobald): Aptera; 24. *Shinjia orientalis* (Mordvilko): Aptera

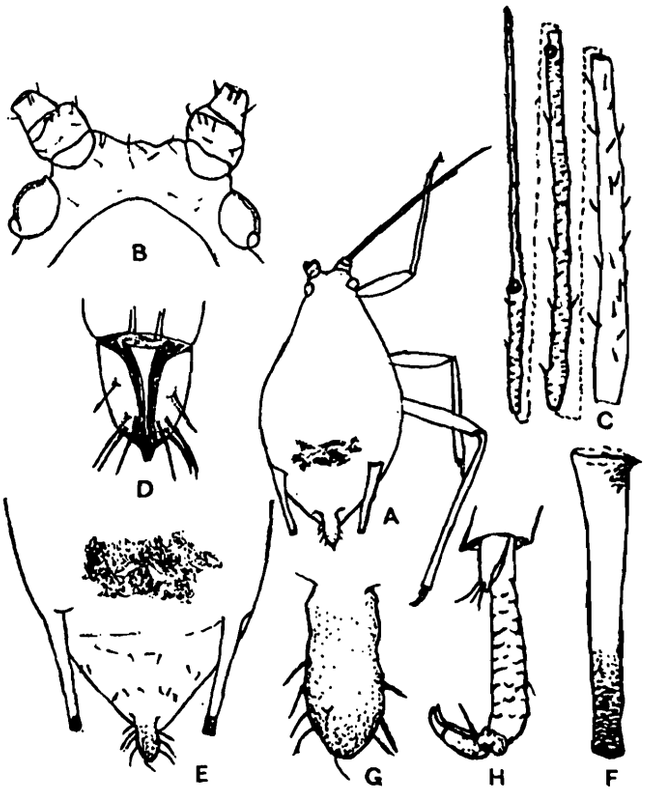


Fig. 25. *Elatobium sclerotica* Agarwala *et al.*: Aptera: A, Body; B, Head (enlarged); C, A.s. III-VI; D, U.r.s.; E, Posterior abdominal dorsum; F, Siphunclus; G, Cauda; H, Hind tarsi

Measurements (Aptera) : Length of body 2.65; width of body 1.17; antenna 2.05; a.s. III 0.57, IV 0.35, V 0.28, VI (0.18+0.50); u.r.s. 0.14, h.t. 2 0.13; siphunculus 0.35; cauda 0.18.

Distribution : India : Sikkim (North Sikkim).

Remarks : The species is characterised by a distinct patch on abdominal dorsum. It is an endemic species described from Sikkim with illustrations and is so far known by apterous viviparous female only. Agarwala and Mahapatra (1986) discussed the taxonomic affinity with the only other known species i.,e., *Ericolophium itoe* (Takahashi).

Genus 23. ***Eumyzus*** Shinji

1929. *Eumyzus* Shinji, *Lansania,* **1** : 111.

Type species : *Aphis impatiensae* Shinji, 1924

53. ***Eumyzus himalaya*** Agarwala, Pramanick and Raychaudhuri (Fig. 26)

1982. *Eumyzus himalaya* Agarwala, Pramanick and Raychaudhuri, *Akitu* NS, **47** : 3

Material : Apterae, on indet Cucurbitaceae, Gangtok,16.xi.1974, C.U.Coll.

Measurements (Aptera) : Length of body 1.80; width of body 1.00; antenna 1.04; a.s. III 0.25, IV 0.15, V 0.12, VI (0.09+0.28); u.r.s. 0.10; h.t.2 0.09; siphunculus 0.26; cauda 0.15.

Distribution : India : Sikkim (East Sikkim).

Remarks : The species is endemic to Northeast India. It is known by apterous viviparous females collected on indet Cucurbitaceae at an altitude *ca* 1675m in Eastern Sikkim. The species is related to *Eumyzus darjeelingensis* Basu and Raychaudhuri 1974 but can be separated by dark terga and number of secondary hairs (4) on u.r.s. in *Eumyzus himalaya.*

Genus 24. ***Hyadaphis*** Kirkaldy

1904. *Hyadaphis* Kirkaldy, *Entomologist,* **37** : 279

Type species : *Aphis xylostei* Schrank, 1801 nec. De Geer 1773 = *Siphocoryne foeniculi* Passerini, 1860

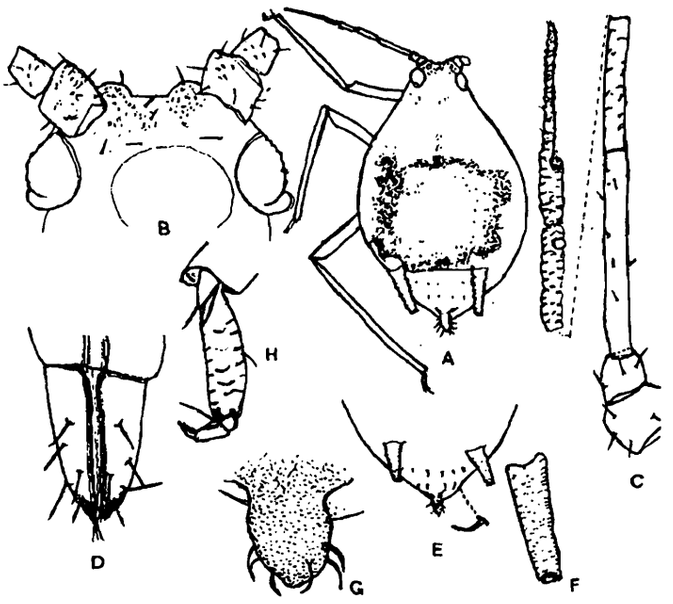


Fig. 26. *Eumyzus himalaya* Agarwala and Raychaudhuri: Aptera : A, Body; B, Head (enlarged); C, Antenna; D, U.r.s.; E, Posterior abdominal dorsum showing hairs (one enlarged) on 7th and 8th tergite; F, Siphunculus; G, Cauda; H, Hind tarsi

54. ***Hyadaphis coriandri*** (Das)

1918. *Brevicoryne coriandri* Das, *Mem. Indian Mus.*, **6** (4): 180

1980. *Hyadaphis coriandri* (Das); Raychaudhuri, D. N. *(Ed.), Aphids of North East India and Bhutan* : 143

Material : Apterae and nymph, on *Rubus fructicorus,* Gangtok, 15.XI.1974, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 2.10; width of body 1.20; antenna 0.95; a.s. III 0.27, IV 0.13, V 0.12, VI (0.09+0.18); u.r.s. 1.10; h.t.2 0.13; siphunculus 0.20; cauda 0.25.

Distribution : India : Sikkim (East Sikkim), Bihar, Himachal Pradesh, Manipur, Meghalaya, South India, Uttar Pradesh, West Bengal. *Elsewhere* : Egypt; Nigeria; Pakistan and South Africa

Remarks : The most preferred host of this aphid is the plants belonging to N.O. Umbelliferae.

Genus 25. ***Hyalomyzus*** Richards

1958. *Hyalomyzus* Richards, *Fla Ent.* **41**(4) : 169

Type species : *Myzus eriobotryae* Tissot 1935

55. ***Hyalomyzus raoi*** Hille Ris Lambers

1973. *Hyalomyzus raoi* Hille Ris Lambers, *Oriental Ins.*, 7(2) : 242

1980. *Neohyalomyzus raoi* (Hille Ris Lambers); Raychaudhuri (*ed.*). *In* : Aphids of Northeast India and Bhutan : 222

1997. *Hyalomyzus raoi* Hille Ris Lambers: Remaudiere and Remaudiere, Catalogue of the World's Aphididae, Homoptera : Aphidoidea : 100

Material : Apterae, on *Rubus ellipticus*, Yaksum, 13.iii.1970, C. U. Coll.

Measurements (Aptera) : Length of body 2.20; width of body 0.89; antenna 2.20; a.s. III 0.62, IV 0.43, V 0.30, VI (0.14+0.47); u.r.s. 0.15; h.t.2 0.13; siphunculus 0.46; cauda 0.20.

Distribution : India : Sikkim (West Sikkim), Meghalaya, Uttar Pradesh, West Bengal.

Remarks : This is also an endemic species. The recorded host plants of the species in India are *Artemisia* spp., *Chenopodium* spp., *Helicteres* spp., *Oplismenas compositus*, *Rosa* spp., *Rubus* spp. (Raychaudhuri, D.N. (*ed.*), 1983).

Genus 26. ***Hyperomyzus*** Borner

1933. *Hyperomyzus* Borner, *Kleine Mitteilungen uber Blattlause* privately published : 2

Type species : *Aphis lactucae* Linnaeus, 1758

56. ***Hyperomyzus carduellinus*** (Theobald) (Fig-23)

1915. *Rhopalosiphum carduellinus* Theobald, *Bull. entomol. Res.*, **6** : 113

1980. *Hyperomyzus carduellinus* (Theobald); Raychaudhuri, D. N. (*ed.*) *In : Aphids of North East India and Bhutan* : 147

Material : Aptera, on *Sonchus arvensis*, Gangtok, 16.XI.1974; apterae on *S. arvensis*, Phodang, 18.X.1975, Coll. P. K. Mondal.

Measurements : (Aptera) : Length of body 2.50; width of body 1.18; antenna 2.10; a.s. III 0.51; IV 0.34, V 0.33, VI (0.12+0.55); u.r.s. 1.10; h.t.2 0.11; siphunculus 0.45; cauda 0.26.

Distribution : India; Sikkim (East Sikkim), Arunachal Pradesh, Assam, Himachal Pradesh, Nagaland, South India, Uttar Pradesh, West Bengal. *Elsewhere* : Virtually cosmopolitan

Remarks : The aphids are green in life and are often found predated by coccinellid beetles.

Genus 27. ***Impatientinum*** Mordvilko

1914. *Impatientinum* Mordvilko, *Faune Russie, Ins. Hem.* **1** : 72

Type species : *Impatientinum fuscum* Mordvilko, 1928 = *Aphis balsamines* Kaltenbach, 1862

Key to the subgenera of *Impatientinum*

1(2) F. T. C. 3,3,3; abdominal dorsum with a consoilidated dorsal patch .... ***Impatientinum*** s.s.

2(1) F. T. C. 4,4,4; abdominal dorsum only marginally dark .....***Neoimpatientinum***

57. ***Impatientinum impatiens*** (Shinji)

1922. *Tuberosiphum impatiens* Shinji, *Dob Zasshi (Zool. Mus.)*, **3**(406) : 789

1965. *Impatientinum impatiens* : Takahashi, *Ins. Matsumurana*, **28** : 23

1980. *Impatientinum impatiens* (Shinji); Raychaudhuri, D. N. (*ed.*) In : *Aphids of North East India and Bhutan* : 149

Material : Aptera, on *Impatiens* sp. Gangtok, 25.X.1962, Coll. A. K. Ghosh.

Measurements (Aptera) : Length of body 2.20; width of body 1.12; antenna 2.42; a.s. III 0.65; IV 0.45, V 0.35, VI (0.12+0.67); u.r.s. 0.11; h.t.2 0.12; siphunculus 0.65; cauda 0.33.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Himachal Pradesh, West Bengal. *Elsewhere* : Japan, Korea and Taiwan.

58. ***Impatientinum (Neoimpatientinum) smilaceti*** Agarwala, Mondal & Raychaudhuri (Fig 27)

1982. *Impatientinum (Neoimpatientinum) smilaceti* Agarwala, Mondal and Raychaudhuri, *Entomon*, **7**(1) : 37-45

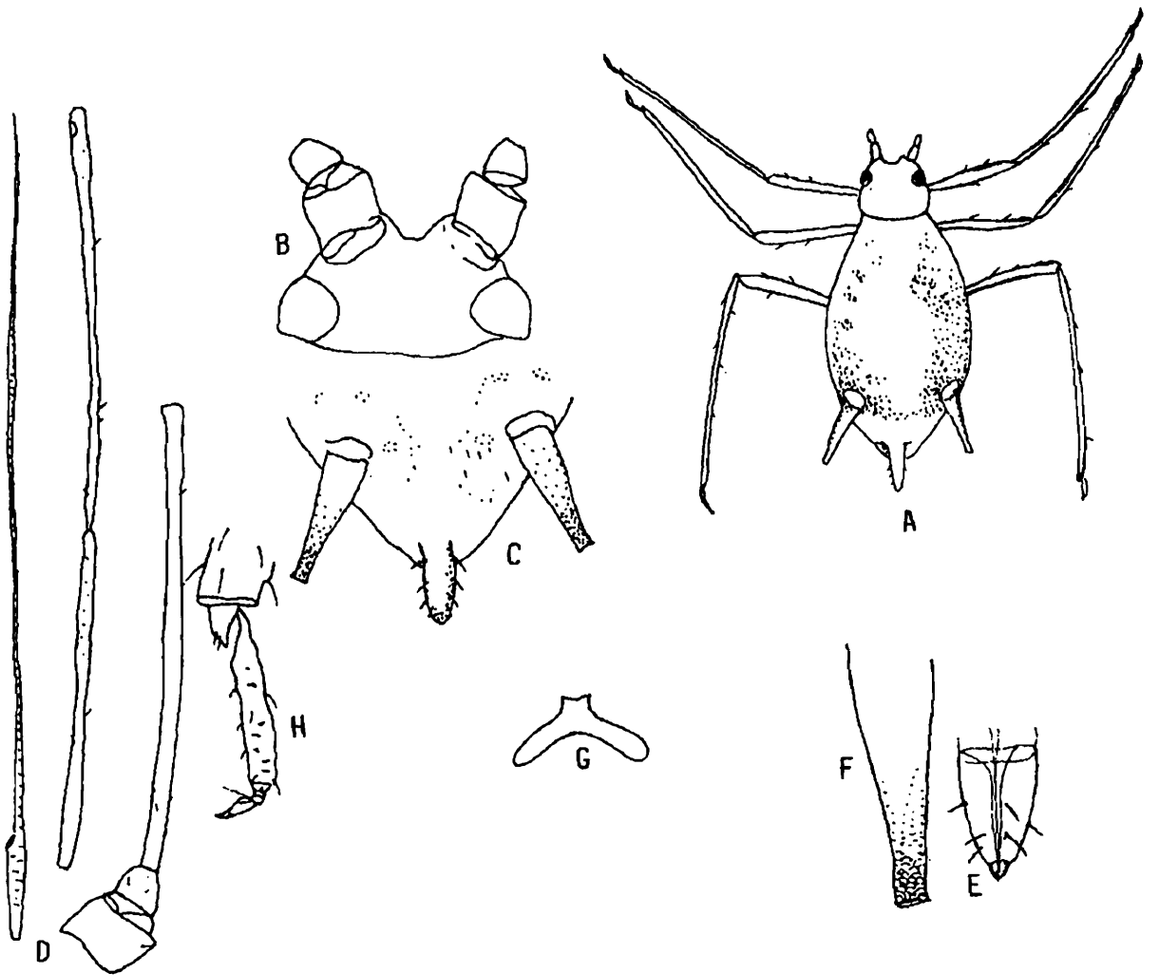


Fig. 27. *Impatientinum (Neoimpatientinum) smilaceti* Agarwala *et al.* : Aptera : A, Body; B, Dorsum of head; C, Posterior abdominal dorsum; D, Antenna; E, U.r.s.; F, Siphunculus; G, Mid thoracic furca; H, Hind tarsi.

1997. *Impatientinum (Neoimpatientinum) smilaceti* Agarwala *et al*; Remaudiere and Remaudiere, *Catalogue of the World's Aphididae* : 104

Material : Apterae, on *Smilax macrophylla*, Lachung, 6.VI.1975, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 2.90; width of body 1.32; antenna 3.20; a.s. III 0.08, IV 0.54, V 0.52, VI (0.17+0.80); u.r.s. 0.11; h.t.2 0.16; siphunculus 0.52; cauda 0.33.

Distribution : India : Sikkim (North Sikkim).

Remarks : The life colour of this aphid is orange with a dark marginal patch on abdomen. The species is so far known by apterous viviparous female only from Sikkim.

Genus 28. ***Indiaphis*** Basu

1969. *Indiaphis* Basu, *Oriental Ins.*, 3(2) : 175

Type species : Indiaphis crassicornis Basu, 1969

59. ***Indiaphis rostrata*** Ghosh and Raychaudhuri 1972

1972. *Indiaphis rostrata* Ghosh and Raychaudhuri, *Proc. zool. Soc.*, Calcutta **25** : 95

1980. *Indiaphis rostrata* Ghosh and Raychaudhuri : Raychaudhuri, D. N. (*ed.*) In : *Taxonomy of Aphids of North East India and Bhutan* : 151

Material : Apterae, on *Rhododendron* sp., Chumrigaon, 31.III. 1970, Coll. H. Banerjee.

Measurements : (Aptera) Length of body 1.95; width of body 1.05; antenna 0.80; a.s. III 0.26; IV 0.12, V(0.10+0.12); u.r.s. 0.15; h.t.2 0.11; siphunculus 0.22; cauda 0.12.

Distribution : India : Sikkim (South Sikkim).

Genus 29. ***Jacksonia*** Thoebald

1923. *Jacksonia* Theobald, *Scott. Nat.*, : 19

Type species : Jacksonia papillata Theobald, 1923

60. ***Jacksonia sikkimensis*** Ghosh, Basu and Raychaudhuri

1977. *Jacksonia sikkimensis* Ghosh, Basu and Raychaudhuri, *Oriental Ins.* **11**(4) : 581

1997. *Jacksonia sikkimensis* Ghosh *et al.*, Remaudiere and Remaudiere, In : *Catalogue of the World's Aphididae* : 105.

Material : Alata, on undet Poaceae, Sheratong, 1.XI, 1962, Coll. A. K. Ghosh.

Measurements : (in mm) of the Alata: Length of body 1.20; width of body 0.65; antenna 1.15; a.s. III 0.35. IV 0.18, V 0.16, VI (0.11+0.23); u.r.s. 0.07; h.t. 2 0.06; siphunculus 0.12; cauda 0.08.

Distribution : India : Sikkim (North Sikkim).

Remark : A. K. Ghosh and D. N. Raychaudhuri (1968) reported the material as *Jacksonia conandri* (Takahashi).

Genus 30. ***Liosomaphis*** Walker

1868. *Liosomaphis* Walker, *Zoologists*, (2) **3** : 1119

Type species : *Aphis berberidis* Kaltenbach, 1843

Key to the species of *Liosomaphis*

1(2) Processus terminalis 1.05-1.10 times as long as base VI; u.r.s. about 1.1 times as long as h.t. 2 ..... *berberidis*

2(1) Processus terminalis 1.80-2.0 times as long as base VI; u.r.s. hardly up to 0.80 times as long as h.t. 2 ..... *himalayensis*

61. ***Liosomaphis berberidis*** (Kaltenbach) (Fig-20)

1843. *Aphis berberidis* Kaltenbach, *Monographie der Pflanzenlause* : 95

1956. *Liosomaphis berberidis* (Kaltenbach); David, *J. Bombay nat Hist. Soc.*, **55** (1) : 111

Material : Apteae and nymphs, on *Azelia* sp. Locality not known, 6. VI. 1975, Coll. P. K. Mondal.

Measurements (in mm) of an Aptera: Length of body 1.55; width of body 0.80; antenna 0.70; a.s. III 0.18. IV 0.10, V 0.09, VI (0.09+0.10); u.r.s. 0.10; h.t.2 0.09; siphunculus 0.35; cauda 0.14.

Distribution : India : Sikkim, Himachal Pradesh.

62. ***Liosomaphis himalayensis*** Basu

1964. *Liosomaphis himalayensis* Basu, *J. Linn. Soc. London, Zool.*, **45**(305) : 231

1986. *Liosomaphis himalayensis* Basu; L. K. Ghosh, *Tech. Monogr.* **16**, Zoological Survey of India : 95

Material : Apterae on *Crataegus spinosa*, Lachung, 6. VI. 1975, Coll. P. K. Mondal.

Measurements (in mm) of an Aptera : Length of body 2.10; width of body 1.0; antenna 1.20; a.s. III 0.35, IV 0.18, V 0.18, VI (0.11+0.25); u.r.s. 0.09; h.t. 2 0.10; siphunculus 0.46; cauda 0.24.

Biological notes : Light green aphids usually infest the apical shoots of the host plants without any noticeable injury.

Distribution : India : Sikkim (North Sikkim), Himachal Pradesh, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Nepal.

Remarks : Verma (1974) and Ghosh and Pramanik (1976) recorded alate male from Himachal Pradesh.

Genus 31. ***Lipaphis*** Mordvilko

1928. *Lipaphis* Mordvilko, *Keys to the insects of the European part of U.S.S.R.* (In Russian) : 200

Type species : *Aphis erysimi* Kaltenbach 1843

63. ***Lipaphis erysimi*** (Kaltenbach) (Fig. 28)

1843. *Aphis erysimi* Kaltenbach, *Mon. fam. pfl.*: 99

1928. *Lipaphis erysimi* (Kaltenbach); Mordvilko, *Keys to the Insects of the European part of USSR* (In Russian) : 200

1980. *Lipaphis erysimi* (Kaltenbach); Raychaudhuri D.N. (*ed.*) In : *Aphids of North East India and Bhutan* : 161

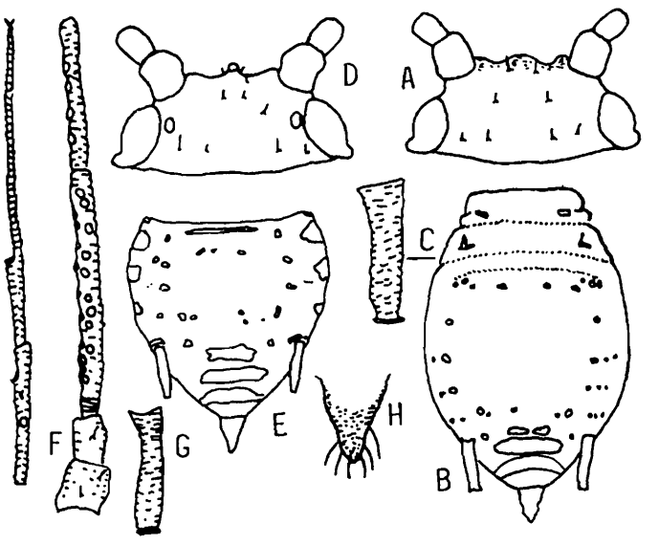


Fig. 28. *Lipaphis erysimi* (Kalt.) Aptera: A, Head; B, Thorax with post abdominal dorsum; F, Antenna; G, Siphunculus; H, Cauda

Material : Apterae and alatae, on *Raphanus sativus*, Mangan, 17.v.1975, Coll. P.K. Mondal.

Measurements (in mm) of an Aptera : Length of body 1.40; width of body 0.95; antenna 0.90; a.s. III 0.25; IV 0.09, V 0.09, VI (0.10+0.20); u.r.s. 0.08; h.t. 2 0.11; siphunculus 0.16; cauda 0.14.

Measurements (in mm) of Alata : Length of body 1.50; width of body 0.95; antenna 0.94; a.s. III 0.26, IV 0.10, V 0.11; VI (0.10+0.21); u.r.s. 0.08; h.t.2 0.11; siphunculus 0.17; cauda 0.14.

Biological notes : Greyish green to pale brown aphids feed gregariously on the host plants.

Distribution : India : Sikkim (North Sikkim), widely distributed. *Elsewhere* : Cosmopolitan.

Remarks : The species is one of the major pests of cruciferous crops in India and is particularly menace to mustard.

Genus 32. ***Macromyzus*** Takahashi

1960. *Macromyzus* Takahashi, *Kontyu*, **28**(4) : 225.

Type species : *Myzus woodwardiae* Takahashi, 1921

Key to the subgenera of *Macromyzus*

1(2) Apterae with secondary rhinaria on a.s. III and sometimes also on IV .... ***Anthracosiphoniella***

2(1) Apterae without secondary rhinaria on a.s. III ..... ***Macromyzus***

64. ***Macromyzus (Macromyzus)*** *woodwardiae* (Takahashi)

1921. *Myzus woodwardiae* Takahashi, *Aphididae of Formosa, Agr.Exp.Sta.Govt. Formosa Rep.* Pt. I : 20

1960. *Macromyzus woodwardiae* (Takahashi); Takahashi, *Kontyu*, **28**(4) : 225

1980. *Macromyzus (Macromyzus) woodwardiae* (Takahashi); Raychaudhuri, D.N. *(ed.)* In : *Aphids of North East India and Bhutan* : 165

Material : Apterae on fern, Singtam, 27.xii.1969, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 4.20; width of body 2.10; antenna 2.78; a.s. III 0.85, IV 0.55, V 0.40, VI (0.12+0.44); u.r.s. 0.15; h.t.2 0.11; siphunculus 0.97; cauda 0.15.

Biological notes : This aphid is characterised by its having blackish transverse patches on dorsum of abdomen and usually occurs on rachis of fern leaves.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Meghalaya, West Bengal; Elsewhere : Japan; Nepal; Taiwan.

65. ***Macromyzus (Anthracosiphoniella) maculatus*** (Basu)

1969. *Anthracosiphoniella maculatum* Basu, *Oriental Ins.*, **3** : 169

1997. *Macromyzus (Anthracosiphoniella) maculatus* (Basu); Remaudiere and Remaudiere, *Catalogue of the World's Aphididae* : 108

Material : Apterae, on fern, Mangan, 23.v.1975, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 2.90; width of body 1.60; antenna 2.00; a.s. III 0.35, IV 0.66, V 0.50, VI (0.16+0.80); u.r.s. 0.15; h.t.2 0.11; siphunculus 1.05; cauda 0.15.

Biological notes : Brownish aphids infest undersurfaces of leaves and rachis of the host plant.

Distribution : India : Sikkim (West Sikkim), Meghalaya, West Bengal.

Genus 33. ***Macrosiphoniella*** del Guercio

1911. *Macrosiphoniella* del Guercio, *Redia*, **7** : 331

Type species : *Siphonophora atra* Ferrari, 1872

Key to the species of *Macrosiphoniella*

Apterous viviparous female

1(2) Inner margin of hind tibiae with a row of spines ..... *spinipes*

2(1) Inner margin of hind tibiae without spines besides normal hairs 3

3(4) Longest hair on a.s. III 2.70–3.0 times as long as b.d. III ..... *kikungshana*

4(3) Longest hair on a.s. III at most twice as long as b.d. III 5

5(6) Siphunculi at most twice its maximum width 7

6(5) Siphunculi 2.6–4.2 times as long as its maximum width 9

7(8) A.s. III with at most 5 secondary rhinaria on its basal half ..... *sikkimartemisiae*

8(7) A.s. III with never less than 10 secondary rhinaria distributed throughout the length *sanborni*

9(10) A.s. III pale; tibiae pale at middle, rest brown; cauda with 9–14 hairs .... *pseudoartemisiae*

10(9) A.s. III black; tibiae also black entirely; cauda with 14–18 hairs .....*yomogifoliae*

66. ***Macrosiphoniella kikunshana*** Takahashi

1937. *Macrosiphoniella kikunshana* Takahashi, *Lingan Sc. J.* **16**(1) : 54

1976. *Macrosiphoniella kikunshana* Takahashi; Basu and Raychaudhuri, *Oriental Ins.*, **10**(2) : 301

Material : Apterae, on *Asclepias curassavica*, Tadong, 25.x.1962, Coll. A.K.Ghosh; apterae on *Artemisia vulgaris*, Singtam, 27.xii.1969, Coll. M. R. Ghosh

Measurements (Aptera) : Length of body 3.00; width of body 1.30; antenna 3.10; a.s. III 0.67, IV 0.54, V 0.43, VI (0.14+0.84); u.r.s. 0.15; h.t.2 0.14; siphunculus 0.32; cauda 0.30.

Biological notes : Brown aphids usually colonise on apical shoots and ventral surface of young leaves of the host plant.

Distribution : India : Sikkim (East Sikkim), Himachal Pradesh, West Bengal. *Elsewhere* : China.

67. ***Macrosiphoniella pseudoartemisiae*** Shinji

1933. *Macrosiphoniella pseudoartemisiae* Shinji, *Kontyu*, **7**(5,6) : 216

1976. *Macrosiphoniella pseudoartemisiae* Shinji; Basu and Raychaudhuri, *Oriental Ins.*, **10**(2) : 302

Material : Apterae and alatae, on *Artemisia vulgaris*, Gangtok, 13.xi.1962 Coll. A.K.Ghosh.

Measurements (Aptera) : Length of body 2.80; width of body 1.37; antenna 2.78; a.s. III 0.56; IV 0.52, V 0.42, VI (0.20+0.55); u.r.s. 0.14; h.t.2 0.15; siphunculus 0.30; cauda 0.36.

Measurements (Alata) : Length of body 2.25; width of body 0.95; antenna 2.40; a.s. III 0.46, IV 0.44, V 0.39, VI (0.18+0.55); u.r.s. 0.15; h.t.2 0.15; siphunculus 0.27; cauda 0.30.

Distribution : India : Sikkim (East Sikkim), Meghalaya, South India, Uttar Pradesh, West Bengal. *Elsewhere* : Bhutan; China; Japan; Korea.

Remarks : The usual host plants of this aphid are *Artemisia* spp. (N.O. Asteraceae).

68. ***Macrosiphoniella sanborni*** (Gillette)

1908. *Macrosiphum sanborni* Gillette, *Can Ent.*, **40** : 65

1938. *Macrosiphoniella sanborni (Gillette)*; Hille Ris Lambers, *Temminckia*, **3** : 30

1976. *Macrosiphoniella sanborni* (Gillette); Basu and Raychaudhuri, *Oriental Ins.*, **10**(2) : 305

Material : Apterae on *Chrysanthemum* sp., Gangtok, 23.x.1962, Coll. A. K. Ghosh.

Measurements (Aptera) : Length of body 2.0; width of body 1.0; antenna 2.28; a.s. III 0.58, IV 0.38, V 0.34, VI (0.13+0.60); u.r.s. 0.13; h.t.2 0.13; siphunculus 0.27; cauda 0.36.

Biological notes : Dark brown shiny aphids infest the inflorescence, apical shoot and ventral surface of leaves of host plant.

Distribution : India : Sikkim (East Sikkim), widely distributed. *Elsewhere* : Virtually cosmopolitan.

69. ***Macrosiphoniella sikkimartemisiae*** Agarwala and Raychaudhuri

1977. *Macrosiphoniella sikkimartemisiae* Agarwala and Raychaudhuri, *Entomon,* **2**(1) : 79

1997. *Macrosiphoniella sikkimartemisiae* Agarwala and Raychaudhuri,; Remaudiere and Remaudiere, *Catalogue of the World's Aphididae* : 110

Material : Aptera, on *Artemisia* sp., Rangrang, 6.xii.1975, Coll. S. Dutta.

Measurements (Aptera-damaged) : Length of body ? width of body ? antenna ? a.s. III 0.55; IV 0.27; V 0.30, VI (?+?); u.r.s. 0.13, h.t. 2 0.12; siphunculus 0.27; cauda 0.24.

Distribution : India:Sikkim (North Sikkim).

70. ***Macrosiphoniella yomogifoliae*** (Shinji)

1922. *Macrosiphum yomogifoliae* Shinji, *Dob. Zasshi* (Zool. Mag.) **34**(407) : 788

1971. *Macrosiphoniella yomogifoliae* (Shinji), Miyazaki, *Ins. Mats.* **34**(1) : 21

1976. *Macrosiphoniella yomogifoliae* (Shinji); Basu and Raychaudhuri, *Oriental Ins.,* **10**(2) : 305

Material : Apterae, on *Artemisia* sp., Singtam, 24.xii.1970, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 3.20; width of body 1.50; antenna 3.25; a.s. III 0.75, IV 0.70, V 0.56, VI (0.24+0.76); u.r.s. 0.18; h.t.2 0.17; siphunculus 0.40; cauda 0.50.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Himachal Pradesh, Meghalaya, South India, Uttar Pradesh, West Bengal. *Elsewhere* : China; Japan; Korea; Malaysia and Taiwan.

71. ***Macrosiphoniella (Chosoniella) spinipes*** Basu

1967. *Macrosiphoniella spinipes* Basu, *Bull. Ent.,* **8**(2) : 151

1976. *Macrosiphoniella spinipes* Basu; Basu and Raychaudhuri, *Oriental Ins.,* **10**(2) : 304

1997. *Macrosiphoniella (Chosoniella) spinipes* Basu; Remaudiere and Remaudiere, *Catalogue of the World's Aphididae* : 112

Material : Apterae, on *Artemisia* sp., Singtam, 20.x.1975, Coll. P.K.Mondal; alata, on *Artemisia cornifolia,* Mangan, 2.xi.1974, Coll. P.K.Mondal.

Measurements (Aptera) : Length of body 3.45; width of body 1.40; antenna 4.00; a.s. III 0.92, IV 0.75, V 0.70, VI (0.25+1.06); u.r.s. 0.20; h.t.2 0.12; siphunculus 0.82; cauda 0.52.

Measurements (Alata) : Length of body 3.10; width of body 3.15; antenna 3.92; a.s. III 0.90, IV 0.70, V 0.73, VI (0.25+1.05); u.r.s. 0.20; h.t.2 0.13; siphunculus 0.70; cauda 0.40.

Distribution : India : Sikkim (East Sikkim), Meghalaya, West Bengal.

Genus 34. ***Macrosiphum*** Passerini

1860. *Macrosiphum* Passerini, *Gli. Aphidi, Parma* : 27

Type species : *Aphis rosae* Linnaeus, 1758

Key to the species of *Macrosiphum* Passerini

1(2) U.r.s. equal to longer than h.t.2 (1.0–1.20 times); secondary rhinaria (15–25) distributed over the entire length of a.s. III ..... *rosae*

2(1) U.r.s. shorter than h.t.2 (0.60–0.90 times); secondary rhinaria fewer on a.s. III and never distributed over entire length..... ..... *pachysiphon*

72. ***Macrosiphum (Macrosiphum) pachysiphon*** Hille Ris Lambers

1966. *Macrosiphum pachysiphon* Hille Ris Lambers; *Tidschr. Ent.,* **109** : 213

1971. *Macrosiphum pachysiphon* HRL; Ghosh, Ghosh and Raychaudhuri, *Proc. zool. Soc. Calcutta,* **24** : 165

Material : Apterae, on undet Rosaceae, N.S.H., 22.xii.1970, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 3.00; width of body 1.50; antenna 2.48; a.s. III 0.70, IV

0.40, V 0.35, VI (0.14+0.60); u.r.s. 0.12, h.t.2 0.20; siphunculus 0.60; cauda 0.35.

Distribution : India : Sikkim (N.S.H.), Arunachal Pradesh, Himachal Pradesh, Manipur, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Pakistan.

73. ***Macrosiphum (Macrosiphum) rosae*** (Linnaeus)

1758. *Aphis rosae* Linnaeus, *Syst. Nat.*, (10th ed.) **1** : 452

1971. *Macrosiphum rosae* (Linnaeus); Ghosh, Ghosh and Raychaudhuri, *Proc.zool.Soc., Calcutta*, **24** : 165

Material : Apterae and alatae, on *Rosa cania*, Tsungthang, 14.xi.1974, Coll. P. K. Mondal

Measurements (Aptera) : Length of body 2.68; width of body 1.00; antenna 3.00; a.s. III 0.80, IV 0.66, V 0.50, VI (0.14+0.78); u.r.s. 0.14, h.t.2 0.13; siphunculus 0.90; cauda 0.45

Measurements (Alata) : Length of body 2.80; width of body 1.00; antenna 3.00; a.s. III 0.85, IV 0.66, V 0.60, VI (0.15+0.74); u.r.s. 0.14; h.t. 2 0.13; siphunculus 0.90; cauda 0.40

Distribution : India : Sikkim (North Sikkim), all over. *Elsewhere* : virtually cosmopolitan.

Genus 35. ***Matsumuraja*** Schumachar

1921. *Matsumuraja* Schumachar, *Zool.Anz.*, **53** : 186

Type species : Acanthaphis rubi Matsumura 1918

74. ***Matsumuraja capitophoroides*** Hille Ris Lambers

1966. *Matsumuraja capitophoroides* Hille Ris Lambers, *Tidschr Ent.*, **109**(8) : 215

1970. *Matsumuraja capitophoroides* Hille Ris Lambers; Chakrabarti & Ghosh, *India J. Hort.*, **27**(3) : 228

Material : 1 aptera and 1 alata, on undet. host, Gangtok, Date nil, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.72; width of body 0.35; antenna 1.34; a.s. III 0.25, IV 0.19, V 0.21, VI (0.13+0.33); u.r.s. 0.10; h.t.2 0.09; siphunculus 0.39; cauda 0.11.

Measurements (Alata) : Length of body 1.70; width of body 0.65; antenna 1.50; a.s. III 0.35, IV 0.21, V 0.22, VI (0.14+0.40); u.r.s. 0.09; h.t.2 0.09; siphunculus 0.32; cauda 0.09.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Himachal Pradesh, Manipur, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Pakistan.

Genus 36. ***Metopolophium*** Mordvilko

1914. *Metopolophium* Mordvilko, *Faune Russie*, **1** : 82

Type species : *Aphis dihorda* Walker, 1848

75. ***Metopolophium (Metopolophium) rubifoliae*** (Raychaudhuri, Ghosh & Basu)

(1975) 1978. *Metopolophium (Microlophium) rubifoliae* Raychaudhuri, Ghosh and Basu, *Proc. zool. Soc., Calcutta*, **28** : 115–131.

1997. *Metopolophium (Metopolophium) rubifoliae* (Raychaudhuri *et al.*); Remaudiere and Remaudiere, *Catalogue of the World's Aphididae* : 120

Material : Apterae and alata, on *Rubus ellipticus*, Gangtok, 22.xii.1970 Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 3.25; width of body 1.60; antenna 4.30; a.s. III 0.92, IV 0.65, V 0.58, VI (0.14+1.20); u.r.s. 0.14; h.t.2 0.15; siphunculus 0.70; cauda 0.32.

Measurements (Alata) : Length of body 3.85; width of body 1.40; antenna 5.20; a.s. III 1.16, IV 1.04, V 0.95, VI (0.20+1.35); u.r.s. 0.18; h.t.2 0.19; siphunculus 0.80; cauda 0.40.

Distribution : India : Sikkim (East Sikkim), Nagaland.

Genus 37. ***Micromyzus*** van der Goot

1917. *Micromyzus* van der Goot, *Contr. Faune Indes neerl.* **1**(3) : 52.

Type species : *Micromyzus nigrum* van der Goot, 1917

Key to the species of *Micromyzus*

1(2) Antennae always much shorter (0.68–0.90 times) than body; F.T.C. 3,3,2; p.t. at most 4 times as long as base VI .... *kalimpongensis*

2(1) Antennae always longer (1.20–1.35 times) than body; F.T.C. 3,3,3; p.t. more than 4 times as long as base VI..... *niger*

76. ***Micromyzus kalimpongensis*** Basu (Figs. 29–30)

1967. *Micromyzus kalimpongensis* Basu, *Bull. Ent.*, **8**(2): 152

1980. *Micromyzus kalimpongensis* Basu; Raychaudhuri, D.N. *(ed.), Aphidsof North East India and Bhutan*: 205

Material : Apterae and nymphs, on *Elettaria cardamomum*, Gangtok, 19.v.1975, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.50; width of body 1.08; antenna 1.30; a.s. III 0.32, IV 0.20, V 0.18, VI (0.10+0.38); u.r.s. 0.10; h.t.2 0.08; siphunculus 0.28; cauda 0.10.

Distribution : India : Sikkim (East Sikkim), Meghalaya, West Bengal.

Remarks : The species appears to enjoy holocyclic life cycle in Sikkim because both oviparous females and alate males were collected from the area (Mondal Ph.D. thesis, 1977).

77. ***Micromyzus niger*** van der Goot

1917. *Micromyzus nigrum* van der Goot, *Contr. faune Indes neerl.*, **1**(3) : 53

1980. *Micromyzus nigrum* van der Goot; Raychaudhuri D.N. *(ed.)* In : *Aphids of North East India and Bhutan*: 205

1997. *Micromyzus niger* van der Goot; Ramaudiere G and Remaurdiere M, *Catalogue of the World's Aphididae*: 122

Material : Apterae, on Fern (undet), Majhitar, 21.1.1971, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.40; width of body 0.72; antenna 1.80; a.s. III 0.46, IV 0.28, V 0.26, VI (0.09+0.54); u.r.s. 0.09; h.t.2 0.08; siphunculus 0.30; cauda 0.13.

Distribution : India : Sikkim (South Sikkim), West Bengal. *Elsewhere* : Java.

Genus 38. ***Myzakkaia*** Basu

1969. *Myzakkaia* Basu; *Oriental Ins.*, **3** : 177

Type species : *Myzakkaia himalayensis* Basu, 1969

Key to the species of *Myzakkaia*

1(2) Dorsal body hairs minute and 'myzine' type; F.T.C. 3,3,3 ..... *verbasci*

2(1) Dorsal body hairs moderately long with acuminate apices, and about 0.3–0.7 times as long as b.d. III; F.T.C. 3,3,2..... ..... *kuwanis*

78. ***Myzakkaia kuwanis*** (Ghosh, Basu and Raychaudhuri)

1970. *Vesiculaphis kuwanis* Ghosh, Basu and Raychaudhuri; *Oriental Ins.*, **4**(1) : 73

1971. *Vesiculaphis kuwanis* Ghosh *et al.* : Ghosh and Raychaudhuri; *Proc. zool. Soc., Calcutta*, **24** : 166

1997 *Myzakkaia kuwanis* (Ghosh, Basu and Raychaudhuri); Remaudiere G and Remaudiere M, *Catalogue of the World's Aphididae* : 123

Material : Apterae and nymphs, on undet host, Gangtok, 22.xii.1970, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 2.20, width of body 1.30; antenna 1.90; a.s. III 0.29, IV 0.15, V 0.13, VI (0.11+0.25); u.r.s. 0.11; h.t.2 0.12; siphunculus 0.34; cauda 0.18.

Distribution : India : Sikkim (East Sikkim), Meghalaya, West Bengal.

79. ***Myzakkaia verbasci*** Chowdhuri, Basu, Chakrabarti and Raychaudhuri

1969. *Vesiculaphis verbasci* Chowdhuri, Basu, Chakrabarti and Raychaudhuri; *Oriental Ins.*, **3**(1) : 90

1976. *Vesiculaphis verbasci* Chowdhuri *et al;* Ghosh, Basu and Raychaudhuri, *Oriental Ins.*, **10**(1) : 276

1997. *Myzakkaia verbasci* Chowdhuri *et al*; Remaudiere, G and Remaudiere, M. *Catalogue of the World's Aphididae* : 123

Material : Aptera, on *Polygonum alatum*, 3.iii.1970, Gangtok, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.40; width of body 0.80; antenna 0.95; a.s. III 0.24, IV 0.14, V 0.10, VI (0.08+0.22); u.r.s. 0.08; h.t.2 0.08; siphunculus 0.26; cauda 0.09.

Distribution : India : Sikkim (East Sikkim) widely distributed.

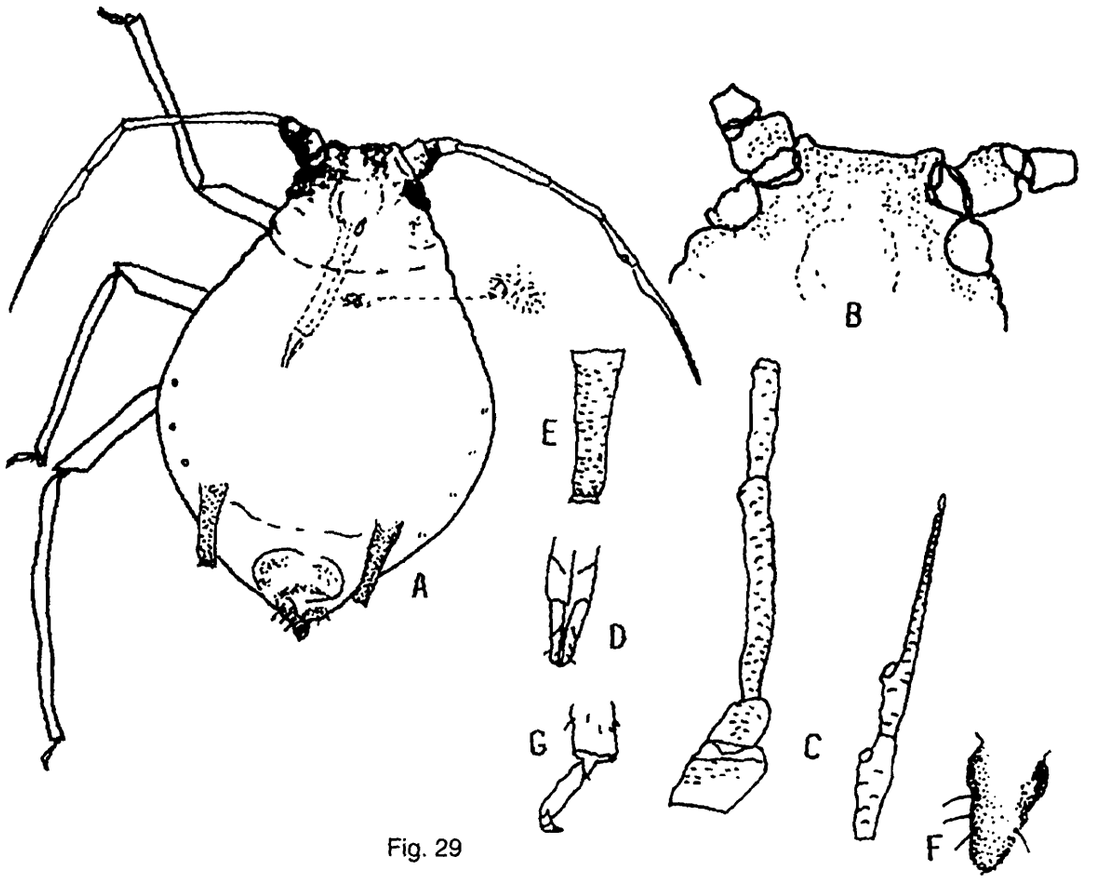


Fig. 29

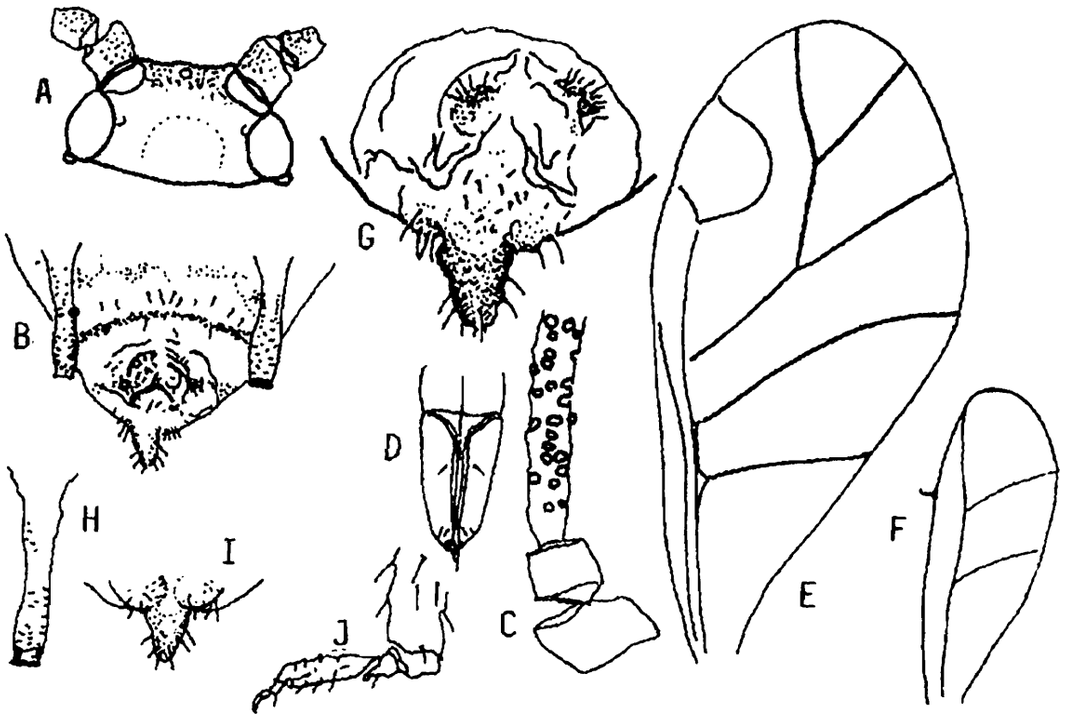


Fig. 30

Figs. 29-30 : 29. *Micromyzus kalimpongensis* Basu: Aptera: A, Entire body; B, Dorsum of head; C, Antenna; D, Ultimate rostral segment; E, Siphunculus; F, Cauda; G, Tarsi with portion of tibia; 30. *Micromyzus kalimpongensis* Basu: Alate male: A, Dorsum of head; B, Posterior.

Genus 39. *Myzus* Passerini

1860. *Myzus* Passerini, *Gli Afidi, Parma* : 27

Type species : Aphis ceraci Fabricius, 1785

Key to the species of *Myzus*

Apterous viviparous female

1(2) Abdominal tergite 7 produced caudad .... *siegesbeckicola*

2(1) Abdominal tergite 7 normal 3

3(4) F.T.C. 3:3:2; siphunculi very short (0.05–0.08 times) as long as body ....*formosanus*

4(3) F.T.C. 3:3:3; siphunculi rather long (0.2–0.30 times as long as body) 5

5(6) U.r.s. 0.80–0.90 times as long as h.t.2; siphunculi about twice as long as cauda.. ..... *persicae*

6(5) U.r.s. as long as or little longer (1.08–1.20 times) than h.t.2 7

7(8) Siphunculi bent towards apex, as long as to longer than the width of head across the outer margins of eyes; roughly imbricated; antennae also roughly imbricated .... *dycei*

8(7) Siphunculi distinctly shorter than the width of head across the outer margin of the eyes 9

9(10) Dorsum of head warty only laterally; abdominal dorsum pale and usually with segmentally arranged dark patches .... *ornatus*

10(9) Dorsum of head uniformly warty; p.t. shorter than antennal segment III; siphunculi strongly imbricated ..... *cerasi*

80. *Myzus cerasi* (Fabricius)

1775. *Myzus cerasi* Fabricius, *Syst. Entomologiae*: 734

1971. *Myzus ceraci* (Fabricius) (Partim); Miyazaki, *Insecta Matsum.*, **34**(1) : 119

1980. *Myzus cerasi* (Fabricius); Raychaudhuri, D.N. *(ed.)* In : *Aphids of North East India and Bhutan* : 212

Material : Apterae, on undet. plant, Gangtok, 26.xii.1969, Coll. M.R.Ghosh.

Measurements (Aptera) : Length of body: 1.70; width of body 0.85; antenna 0.85; a.s. III 0.19, IV 0.14, V 0.11, VI (0.06+0.19); u.r.s. 0.09; h.t.2 0.08; siphunculus 0.29; cauda 0.13.

Distribution : India : Sikkim (East Sikkim), Himachal Pradesh, Meghalaya, Uttar Pradesh, West Bengal; Elsewhere : Virtually cosmopolitan.

81. *Myzus dycei* Carver

1961. *Myzus dycei* Carver, *Proc. R. ent. Soc. London,* **30**: 69

1980. *Myzus dycei* Carver; Raychaudhuri, D.N. *(ed.),* In : *Aphids of North East India and Bhutan* : 213

Material : Apterae and nymphs, on *Urtica parviflora,* Gangtok, 10.ii.1971, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.70; width of body 0.95; antenna 1.25; a.s. III 0.32, IV 0.20, V 0.19, VI (0.09+0.30); u.r.s. 0.10; h.t.2 0.10; siphunculus 0.42; cauda 0.14

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Himachal Pradesh, Meghalaya, West Bengal. *Elsewhere* : Australia; China; Japan and Nepal.

82. *Myzus formosanus* (Basu)

1969. *Myzus brevisiphon* Basu, *Oriental Ins.* **3**(2) : 100

1997. *Myzus formosanus* (Basu); Remaudiere, G and Remaudiere, M., *Catalogue of the World's Aphididae*: 125

Material : Apterae, on *Polygonum alatum,* Tsungthang, 14.XI.1974, Coll. P. K. Mondal.

Measurements(Aptera) : Length of body 1.44; width of body 0.30; antenna 0.75; a.s. III 0.15, IV 0.08, V 0.08, VI (0.08+0.26); u.r.s. 0.07; h.t.2 0.07; siphunculus 0.08; cauda 0.08.

Distribution : India : Sikkim (North Sikkim), Meghalaya, Uttar Pradesh, West Bengal.

83. *Myzus ornatus* Laing

1932. *Myzus ornatus* Laing, *Entomol Mon. Mag.*, **68** : 52

1976. *Myzus ornatus* Laing; Basu and Raychaudhuri, *Oriental Ins.*, **10**(1) : 107

Material : Apterae from undet Compositae, Gangtok, 30.X.1962, Coll. A. K. Ghosh.

Measurements(aptera) : Length of body 1.40; width of body 0.70; antenna 0.82; a.s. III 0.21, IV 0.12, V 0.11, VI (0.08+0.19); u.r.s. 0.08; h.t.2 0.08; siphunculus 0.26; cauda 0.11.

Distribution : India : Sikkim(East Sikkim), all over; Elsewhere : Cosmopolitan.

84. ***Myzus persicae*** (Sulzer)

1776. *Aphis persicae* Sulzer, *Abgekurzte Gesch. Insekten*: 105

1953. *Myzus persicae* (Sulzer); Cottier, *Bull. Newzealand Dep.Sci.Indust.Res.* **106** : 281

1976. *Myzus persicae* (Sulzer); Basu and Raychaudhuri, *Oriental Ins.*, **10**(1) : 107

Material : 1 aptera and alata, on *Nicotiana tabacum*, Gangtok 25.X.1962, Coll, A. K. Ghosh; 8 apterae and nymphs on *Brassica* sp. Gangtok, 15.XI.1974, Coll. P. K. Mondal; apterae, on *Ageratum* sp., Lingey, 22.ii.1994, Coll.

Measurements(Aptera) : Length of body 2.0; width of body 1.20; antenna 1.80; a.s. III 0.43, IV 0.35, V 0.25, VI ().12+0.45); u.r.s. 0.11; h.t.2 0.11; siphunculus 0.50; cauda 0.20.

Measurements(Alata) : Length of body 2.10; width of body 0.95; antenna 2.50; a.s. III 0.56, IV 0.45, V 0.35, VI (0.13+0.55); u.r.s. 0.12; h.t.2 0.11; siphunculus 0.50; cauda 0.20.

Distribution : India : Sikkim(East Sikkim), widely distributed. *Elsewhere* : Cosmopolitan.

85. ***Myzus siegesbeckicola*** Strand

1929. *Myzus siegesbeckicola* Strand, *Acta Univ.Latv.*, **20** : 22

1976. *Myzus siegesbeckicola* Strand; Basu and Raychaudhuri; *Oriental Ins.* **10**(1) : 99

Material : 2 apterae, on *Sigesbeckia orientalis*, Mongan, 3.XI.1974, Coll. P. K. Mondal.

Measurements(Aptera) : Length of body 1.11; width of body 0.70; antenna 1.06; a.s. III 0.27, IV 0.15, V 0.11, VI (0.08+0.36); u.r.s. 0.11; h.t.2 0.06; siphunculus 0.36; cauda 0.13.

Distribution : India : Sikkim (North Sikkim), Meghalaya, West Bengal. *Elsewhere* : Japan; Korea; Sumatra; Taiwan.

Remarks : Basu and Raychaudhuri (1976) recorded the species for the first time from India and described alate viviparous female which was hitherto unknown.

Genus 40. ***Neoacyrthosiphon*** Tao

1963. *Neoacyrthosiphon* Tao, *Plant Protect.Bull.,Taiwan*, **5**(3) : 189

Type species : *Acyrthosiphon taiheisanum* Takahashi, 1935

86. ***Neoacyrthosiphon holsti*** (Takahashi)

1935. *Macrosiphum holsti* Takahashi, *Kanowia*, **14** : 318

1980. *Pseudoacyrthosiphon (Pseudoacyrthosiphon) holsti* (Takahashi); Raychaudhuri, D. N. (*ed.*), In : *Aphids of North East India and Bhutan* : 242

1997. *Neoacyrthosiphon holsti*(Takahashi); Remaudiere, G. and Remaudiere, M, *Catalogue of the World's Aphididae* : 131.

Material : Apterae and nymphs, on *Rhododendron* sp. Jamlingaon,23.III.1970, Coll. H. Banerjee.

Measurements(Aptera) : Length of body 3.16; width of body 1.30; antenna 2.20; a.s. III 0.88, IV 0.35, V 0.36, VI (0.18+0.34); u.r.s. 0.20; h.t.2 0.11; siphunculus 0.90; cauda 0.40.

Distribution : India : Sikkim(South Sikkim), Meghalaya, West Bengal. *Elsewhere* : Japan; Taiwan.

Genus 41. ***Neomasonaphis*** Ghosh and Raychaudhuri

1972. *Neomasonaphis* Ghosh and Raychaudhuri, *Oriental Ins.*, **6**(3) : 377

Type species : *Masonaphis anaphilidis*, 1964

Key to the species of *Neomasonaphis*

1(2) Dorsal cephalic hairs with slightly spatulate to incrassate apices; u.r.s. subequal to h.t.2; antennae about 1.4 times as long as body; p.t. at least 5 times as long as base of a.s. V ..... *anaphilidis*

2(1) Dorsal cephalic hairs with distinct swollen apices; u.r.s. 1.6-2.0 times as long as h.t.2; antenna about 1.7 times as long as body; p.t. about 4.5 times as long as base VI ... . *inulae*

87. *Neomasonaphis anaphilidis* (Basu)

1964. *Masonaphis anaphilidis* Basu, *J.Linn.Soc.Lond. Zool.* **45**(305) : 229

1972. *Masonaphis (Neomasonaphis) anaphilidis* Basu; Basu, Ghosh and Raychaudhuri, *Oriental Ins.*, **6**(3) : 377

1997. *Neomasonaphis anaphilidis* (Basu); Remaudiere, G and Remaudiere, M., *Catalogue of the World's Aphididae* : 132

Material : Apterae, on *Anaphilis* sp., Deorali,9.III.1971, Coll. M. R. Ghosh.

Measurements(Aptera) : Length of body 4.60; width of body 1.90; antenna 6.5; a.s. III 1.40, IV 1.39, V 1.00, VI (0.30+1.75); u.r.s. 0.20; h.t.2 0.15; siphunculus 1.09; cauda 0.48.

Distribution : India : Sikkim(East Sikkim), Arunachal Pradesh, Himachal Pradesh, Uttar Pradesh, West Bengal. *Elsewhere* : Bhutan.

88. *Neomasonaphis inulae* (Ghosh and Raychaudhuri)

1972. *Masonaphis(Neomasonaphis) inulae* Ghosh and Raychaudhuri, *Oriental Ins.*, **6**(3) : 377

1997. *Neomasonaphis inulae* (Ghosh and Raychaudhuri); Remaudiere, G. and Remaudiere, M, *Catalogue of the World's Aphididae* : 133

Material : Apterae, on undet Ericaceae, Phodong, 15.XI.1974, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 2.75; width of body 1.10; antenna 4.12; a.s. III 1.0, IV 0.39, V 0.70, VI (0.26+1.24); u.r.s. 0.25; h.t.2 0.13; siphunculus 0.80; cauda 0.42.

Distribution : India : Sikkim(North Sikkim), Himachal Pradesh, Meghalaya, Uttar Pradesh.

Remarks : According to Chakrabarti *et al.* (1983), the species perhaps alternates between *Rhododendron* sp. and *Inula* spp.(Asteraceae).

Genus 42. *Oedisiphum* van der Goot

1971. *Oedisiphum* van der Goot, *Contr. Faune Indes neerl.*, **1** : 112

Type species : *Oedisiphum composiatum* van der Goot 1971

89. *Oedisiphum soureni* Basu

1964. *Oedisiphum soureni* Basu, *J. Linn. Soc.(Zool)*, **45**: 238

1980. *Oedisiphum soureni* Basu; Raychaudhuri, D. N. (*ed.*), In : *Aphids of North East India and Bhutan* : 231

1997. *Oedisiphum soureni* Basu; Remaudiere, G. and Remaudiere, M., *Catalogue of the World's Aphididae*: 194

Material : Apterae and nymphs, on *Anaphilis contorta,* Lachung, 6.VI.1975, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 1.80; width of body 0.90; antenna 0.90; a.s. III 0.26, IV 0.09, V 0.10, VI (0.08+0.22); u.r.s. 0.21; h.t.2 0.11; siphunculus 0.16; cauda 0.12.

Distribution : India : Sikkim(North Sikkim), Uttar Pradesh, West Bengal. *Elsewhere* : Nepal.

Genus 43. *Pentalonia* Coquerel

1859. *Pentalonia* Coquerel, *Ann.Soc.ent.Fr.*, **3** : 259

Type species : *Pentalonia nigronervosa* Coquerel, 1859

90. *Pentalonia nigronervosa* Coquerel

1859. *Pentalonia nigronervosa* Coquerel, *Ann.Soc.ent.Fr.*, **3** : 260

1994. *Pentalonia nigronervosa* Coquerel; Ghosh and Basu, *State Fauna Series* **3** : *Fauna of West Bengal,* Zoological Survey of India : 221

Material : 1 aptera and 1 nymph, on *Musa* sp., Singtam, 29.V.1970, Coll. H. Banerjee; 1 alata and 1 nymph on *Musa* sp. Singtam, 24.XII.1970., Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.60; width of body 0.98; antenna 1.50; a.s. III 0.30, IV 0.22, V 0.20, VI (0.09+0.56); u.r.s. 0.15; h.t.2 0.07; siphunculus 0.30; cauda 0.07.

Measurements (Alata) : Length of body 1.70; width of body 0.80; antenna 1.00; a.s. III 0.32, IV 0.28, V 0.24, VI (0.09+0.68); u.r.s. 0.12; h.t.2 0.07; siphunculus 0.30; cauda 0.10.

Distribution : India : Sikkim(East Sikkim), all over. *Elsewhere* : Cosmopolitan.

Genus 44. ***Phorodon*** Passerini

1860. *Phorodon* Passerini, *Gli Afidi, Parma* : 27

Type species : *Aphis humuli* Schrank, 1801

91. ***Phorodon(Paraphorodon) cannabis*** Passerini

1860. *Phorodon cannabis* Passerini, *Gli.Afidi,Parma* : **36**

1963. *Phorodon(Diphorodon) cannabis* Passerini; Takahashi, *Insecta Matsum.*, **28**(1) : 40

1997. *Phorodon (Paraphorodon) cannabis* Passerini; Remaudiere, G. and Remaudiere, M., *Catalogue of the World's Aphididae* : 137

Material : Apterae, on *cannabis sativa,* Hee Gyathang, 10.XI.1974, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 1.60; width of body 0.78; antenna 1.10; a.s. III 0.26, IV 0.15, V 0.14, VI (0.08+0.35); u.r.s. 0.09; h.t.2 0.06; siphunculus 0.52; cauda 0.17.

Distribution : India ; Sikkim(North Sikkim), Himachal Pradesh, Jammu and Kashmir State, Manipur, Meghalaya, South India, West Bengal; Elsewhere : Europe; Japan; Middle East; Pakistan.

Remarks : The species is invariably found on *Cannabis sativa* (Moraceae). Ants attend these pale green aphids which infest mainly on the under surface of young leaves and stems. As a result of infestation the leaves become curled.

Genus 45. ***Rhopalosiphoninus*** Baker

1920. *Rhopalosiphoninus* Baker, *Bull.U.S.Dep.Agri.*, (826): 58

Type species : *Amphorophra latysiphon* Davidson 1912

92. ***Rhopalosiphoninus (Myzosiphon) smilacifoliae*** (Ghosh and Raychaudhuri)

1968. *Neorhopalosiphoninus smilacifoliae* Ghosh and Raychaudhuri, *Proc. zool. Soc, Calcutta,* **21**(2) : 188

1997. *Rhopalosiphoninus (Myzosiphon) smilacifoliae* (Ghosh and Raychaudhuri) Remaudiere, G and Remaudiere, M., *Catalogue of the World's* Aphididae: 141

Material : An alata, on *Smilax* sp., Gangtok, 28.X.1962, Coll. A. K. Ghosh.

Measurements (Alata) : Length of body 3.30; width of body 1.30; antenna 3.60; a.s. III 0.80, IV 0.73, V 0.57, VI (0.20+1.11); u.r.s. 0.12; h.t.2 0.13; siphunculus 0.60; cauda 0.18.

Distribution : India : Sikkim (East Sikkim)

Remarks : The species is originally described from Sikkim by Ghosh and Raychaudhuri (1968) who based their description only on alate viviparous female collected on *Smilax* sp. at an altitude of 1450 metre. The other morphs are unknown. They erected the new genus *Neorhopalosiphoninus* to accommodate *smilacifoliae* having spinulosity on the swollen reticulated siphunculi.

Genus 46. ***Semiaphis*** van der Goot

1913. *Semiaphis* van der Goot, *Tijdschr.Ent.*, **56** : 105

Type species : *Aphis carotae* Koch, 1854 (*Aphis dauci* Fabricius, 1775)

93. ***Semiaphis heraclei*** (Takahashi)

1921. *Brachycolus heraclei* Takahashi, *Aphididae of Formosa,* **1** : 60

1965. *Semiaphis heraclei* (Takahashi); Takahashi, *Insecta Matsum.*, **28**(1) : 53

1980. *Semiaphis heraclei* (Takahashi); Raychaudhuri, D. N. (*ed.*), In : *Aphids of North East India and Bhutan* : 248

Material : Apterae, on *Schizium* sp. Paksyak, 4. VI. 1975, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 1.75; width of body 1.00; antenna 0.90; a.s. III 0.30, IV 0.10, V 0.08, VI (0.07+0.20); u.r.s. 0.08; h.t.2 0.12; siphunculus 0.09; cauda 0.19.

Distribution : India : Sikkim(North Sikkim), Meghalaya, West Bengal. *Elsewhere* : China : Hawai.

Genus 47. ***Shinjia*** Takahashi

1938. *Shinjia* Takahashi, *Tenthrodo,* **2** : 6.

Type species : *Microtarsus pteridifoliae* Shinji, 1929

94. ***Shinjia orientalis*** (Mordvilko)

1929. *Microtarsus pteridifoliae* Shinji, *Lansania,* Tokyo, **1** : 44

1970. *Shinjia peridifoliae* (Shinji); Ghosh and Raychaudhuri, *Sci.Cult.*, **36** : 48

1997. *Shinjia orientalis* (Mordvilko); Remaudiere, G. and Remaudiere, M., *The Catalogue of the World's Aphididae* : 143

Material : Apterae, alata and nymphs., on *Dryopteris* sp., Gangtok, 22.X.1962, Coll. A. K. Ghosh; apterae and nymphs, *Pteria* sp., Deorali, 28.X.1971, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.40; width of body 0.75; antenna 1.76; a.s. III 0.35, IV 0.24, V 0.24, VI (0.10+0.69); u.r.s. 0.12; siphunculus 0.36; cauda 0.12.

Measurements (Alata) : Length of body 1.52; width of body 0.75; antenna 1.90; a.s. III 0.40, IV 0.26, V 0.26, VI (0.11+0.78); u.r.s. 0.11; siphunculus 0.25, cauda 0.12.

Distribution : India : Sikkim(East Sikkim), Arunachal Pradesh, Manipur, Meghalaya, Uttar Pradesh, West Bengal; Elsewhere : Australia; China; Japan; Korea; Nepal.

Genus 48. ***Sinomegoura*** Takahashi

1960. *Sinomegoura* Takahashi, *Kontyu*, **28**(4) : 228

Type species : *Acyrthosiphon photinae* Takahashi, 1936

Key to the species of *Sinomegoura*

1(2) Antennae and cauda pale; longest hair on anterior abdominal dorsum at most 0.40 times as long as b.d.III ..... *photinae*

2(1) Antennae and cauda dark; longest hair on anterior abdominal dorsum 0.50-0.60 times as long as b.d.III ..... *citricola*

95. ***Sinomegoura citricola*** (van der Goot)

1917. *Macrosiphoniella citricola* van der Goot, *Contr.Faune Indes neerl.*, **1**(3) : 34

1963. *Sinomegoura citricola* (van der Goot); Tao, *Plant Prot. Bull. Taiwan*, **5**(3) : 183

1968. *Sinomegoura citricola* (van der Goot); Ghosh and Raychaudhuri, *Proc. zool. Soc. Calcutta*, **21** : 189

Material : 1 Alata, on *Bambusa* sp., Gangtok, 21.X.1962. Coll. A. K. Ghosh.

Measurements (Alata) : Length of body 2.80; width of body 1.30; antenna 2.95; a.s. III 0.70, IV 0.52, V 0.53, VI (0.21+0.76); u.r.s. 0.14; h.t.2 0.09; siphunculus 0.38; cauda 0.30.

Distribution : India : Sikkim(East Sikkim), Arunachal Pradesh, Bihar, Himachal Pradesh, Manipur, Meghalaya, Nagaland, West Bengal. *Elsewhere* : Australia; China; Japan; Java; Nepal; New Guinea; Philippines; Singapore; Sumatra and Taiwan;

Remarks : Ghosh and Raychaudhuri(1968) expressed doubt of the host plant *Bambusa* sp., unusual for this species.

96. ***Sinomegoura photinae*** (Takahashi)

1936. *Acyrthosiphon photinae* Takahashi, *Lingnan Sci.J.*, **15** : 600.

1971. *Sinomegoura photinae* (Takahashi); Ghosh, Ghosh and Raychaudhuri, *Proc.zool.Soc.Calcutta*, **24** : 166.

1980. *Sinomegoura photinae* (Takahashi); Raychaudhuri, D. N. (*ed.*), In : *Aphids of North East India and Bhutan*: 253

Material : Apterae, on *Photinia* sp., Gangtok, 27.XII.1970, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.80; width of body 1.0; antenna 2.50; a.s. III 0.50, IV 0.48, V 0.44, VI (0.18+0.72); u.r.s. 0.13; h.t.2 0.11; siphunculus 0.40; cauda 0.35.

Distribution : India : Sikkim(East Sikkim), Meghalaya, West Bengal. *Elsewhere* : China; Japan.

Genus 49. ***Sitobion*** Mordvilko

1914. *Sitobion* Mordvilko, *Faune Russie, Ins. Hem.*, **1**(1): 337

Type species : *Aphis granaria* Kirby, 1798 = *Aphis avenae* Fabricius, 1775

Key to the species of *Sitobion*

Apterous viviparous female

1(2) F.T.C. 4:4:4; longest hair on a.s. III 0.7-0.8 times as long as b.d. III .... *pseudoluteum*

2(1) F.T.C. 3:3:3 3

3(4) Hind tibiae with a row of short spine-like hairs besides normal hairs; a.s. III with 12-19 secondary rhinaria; u.r.s. with 4 secondary hairs ..... *gravelii*

4(3) Hind tibiae without such spine-like hairs 5

5(6) Head with spinules at least on venter, sometimes these may be distinctly or indistinctly developed, and may also be present on dorsum; siphunculi dark at middle, pale at base and apex ....*aulocorthoides*

6(5) Head smooth both dorsally and ventrally 7

7(8) p.t.shorter than a.s. III; siphunculi about 0.22-0.30 times as long as body .... *rosaeformis*

8(7) p.t. longer than a.s. III 9

9(10) Abdominal dorsum with central patch; a.s. III black with few rhinaria near base .....*indicum*

10(9) Abdominal dorsum never without any patch 11

11(12) Hairs on abdominal dorsum atmost up to 12 μ 13

12(11) Hairs on abdominal dorsum never less than 18 μ 15

13(14) Apical hairs on cauda with blunt apex and much shorter than basal hairs with fine apices .....*takahashii*

14(13) Apical hairs on cauda with subacute to acute apices, about as long as basal ones; cauda elongate with a median constriction; antesiphuncular sclerite absent..... ..... *akebiae*

15(16) A.s. III imbricated throughout its length *sikkimense*

16(15) A. s. III smooth except the very base being imbricated ..... *miscanthi*

97. ***Sitobion akebiae*** (Shinji)

1935. *Macrosiphum akebiae* Shinji, *Kontyu,* **9**(5):243

1997. *Sitobion (Sitobion) akebiae* (Shinji); G. Remaudiere and M. Remaudiere *Catalogue of the World's Aphididae* : 144

Material : Apterae and nymphs, on Grass, Singtam, 27.xii.1969, Coll. M.R.Ghosh.

Measurements (Aptera) : Length of body 1.90; width of body 0.90; antenna 2.15; a.s. III 0.45, IV 0.30, V 0.30, VI(0.12+0.60); u.r.s. 0.09; h.t. 2 0.11; siphunculus 0.50; cauda 0.29.

Distribution : India : Sikkim (East Sikkim), West Bengal. *Elsewhere* : Japan; Korea.

98. ***Sitobion aulacorthoides*** David, Narayanan and Rajasingh

1970. *Macrosiphum aulacorthoides* David, Narayanan and Rajasingh, *Oriental Ins.,* **4** : 420

1980. *Macrosiphum (Macrosiphum) aulacorthoides* David *et al.;* Raychaudhuri, D.N. *(ed.)* In : *Aphids of North East India and Bhutan* : 180

1997. *Marcosiphum aulacorthoides* David *et al.;* G. Remaudiere and M. Remaudiere *Catalogue of the World's Aphididae* : 144

Material : Nil

Measurements (Aptera) : [After Raychaudhuri, D.N. (*ed.* 1980.)] Length of body 2.27; width of body 1.05; antenna 2.94; a.s. III 0.65, IV 0.51, V 0.39, VI (0.16+0.85); u.r.s. 0.13; h.t.2 0.10; siphunculus 0.60; cauda 0.24.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Himachal Pradesh, Meghalaya, Sikkim and West Bengal.

99. ***Sitobion gravelii*** (van der Goot)

1917. *Macrosiphum gravelii* van der Goot, *Rec. Indian Mus.,* **13** (4) : 175–183

1970. *Macrosiphum spinotibium* Ghosh, Ghosh and Raychaudhuri, *Oriental Ins.,* **4**(4) : 381

1997. *Macrosiphum gravelii* (van der Goot); G. Remaudiere and M. Remaudiere, *Catalogue of the World's Aphididae* : 145

Material : Apterae, on *Artemisia* Sp., Singtam, 29.x.1971, Coll. M.R.Ghosh.

Measurements (Aptera) : Length of body 3.60; width of body 1.50; antenna 3.90; a.s. III 0.90; IV 0.72, V 0.72, VI (0.25+0.88); u.r.s. 0.20; h.t.2 0.12; siphunculus 0.90; cauda 0.60.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Manipur, Meghalaya, West Bengal.

Remarks : The species is characterised by the pale unpigmented body, the two rows of thick, lanceolate, subacute rounded hairs on the ventral and distal parts of tibiae. Each abdominal tergite bears about 30 hairs. The species is endemic to Northeastern part of India.

100. *Sitobion indicum* Basu

1964. *Sitobion indicum* Basu, *J. Linn. Soc, (Zool.)* **45** : 230

1980 *Macrosiphum (Sitobion) indicum* (Basu); Raychaudhuri, D.N. *(ed.), Aphids of Northeast India and Bhutan* : 184

1997. *Sitobion indicum* Basu; G. Remaudiere and M. Remaudiere, *Catalogue of the World's Aphididae* : 145

Material : 1 aptera and 2 nymphs, on *Dendrobium densiflorum,* Gangtok, 20.x.1962, Coll. A. K. Ghosh.

Measurements (Aptera) : Length of body 2.40; width of body 1.17; antenna 2.70; a.s. III 0.62, IV 0.55, V 0.42, VI (0.15+0.75); u.r.s. 1.10; h.t.2 0.11; siphunculus 0.50; cauda 0.34.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Meghalaya and West Bengal.

Remarks : The species is endemic to North East India. It lives by anholocyclic reproduction in conservatories and other places in the hilly regions of northeastern part of India.

101. *Sitobion miscanthi* (Takahashi)

1921. *Macrosiphum miscanthi* Takahashi, *Aphididae of Formosa* **1** : 8

1980. *Macrosiphum (Sitobion) miscanthi* Takahashi; Raychaudhuri, D.N. *(ed.), Aphids of Northeast India and Bhutan* : 185

Material : 5 apterae and 3 nymphs, on *Andropogon* sp., Gangtok, 23.ix.1971 Coll. M.R.Ghosh.

Measurements (Aptera) : Length of body 3.00; width of body 1.25; antenna 3.50; a.s. III 0.80; IV 0.65, V 0.60, VI (0.14+1.15); u.r.s. 0.12; h.t.2 0.14; siphunculus 0.75; cauda 0.52

Distribution : India : Sikkim (East Sikkim), widely distributed; Elsewhere : Australia; China; England and Taiwan.

102. *Sitobion pseudoluteum* Ghosh

1969. *Sitobion pseudoluteum* Ghosh, *Proc.zool.Soc., Calcutta,* **22** : 125

1980. *Macrosiphum (Neomacrosiphum) pseudoluteum* (Ghosh); Raychaudhuri, D.N. *(ed.), Aphids of Northeast India and Bhutan* : 183

1997. *Sitobion psudoluteum* Ghosh; G.Remaudiere and M. Remaudiere, *Catalogue of the World's Aphididae* : 146

Material : 1 aptera, on *Dendrobium densiflorum,* Gangtok, 20.xi.1962, Coll. A.K. Ghosh.

Measurements (Aptera) : Length of body 2.48; width of body 1.10; antenna 2.80; a.s. III 0.60, IV 0.44, V 0.39, VI (0.15+0.75); u.r.s. 0.12; h.t.2 0.18, siphunculus 0.40; cauda 0.30.

Distribution : India : Sikkim (East Sikkim), West Bengal.

Remarks : The species is closely related to *Sitobion indicum* Basu, but differs in the smaller reticulated area on the siphunculi and 4 hairs on each of the basal tarsal segments. The species is endemic to Northeast India.

103. *Sitobion rosaeformis* (Das)

1918. *Macrosiphum rosaeformis* Das, *Mem Indian Mus.,* **6**(4) : 158

1968. *Macrosiphum (Sitobion) rosaeformis* Das; Ghosh and Raychaudhuri, *Proc. zool. Soc., Calcutta,* **21** : 185

1997. *Sitobion rosaeformis* (Das); G.Remaudiere and M Remaudiere, *Catalogue of the World's Aphididae* : 146

Material : 4 apterae and 2 nymphs, on *Rosa* sp., Gangtok, 30.x.1962. Coll. A. K. Ghosh.

Measurements (Aptera) : Length of body 3.75; width of body 1.50; antenna 3.50; a.s. III 0.90, IV 0.75, V 0.60, VI (0.13+0.80); u.r.s. 0.10; h.t.2 0.12; siphunculus 1.10; cauda 0.62.

Distribution : India : Sikkim (East Sikkim), all over. *Elsewhere* : Nepal; Pakistan.

Remarks : The reddish brown species lives on varieties of garden and wild roses at places with milder climate. It easily spreads to the plains during winter and produces green and pinkish brown morphs. In India, it enjoys holocyclic reproduction. The data reveal that the species is confined to the Indian subcontinent where it occurs in all localities.

104. ***Sitobion sikkimense*** (Ghosh and Raychaudhuri)

1968. *Macrosiphum (Sitobion) sikkimensis* Ghosh and Raychaudhuri, *Ann. ent. Soc. America,* **61**(3) : 753

1968. *Macrosiphum (Sitobion) smilacicola sikkimensis* Ghosh and Raychaudhuri, *Proc. zool. Soc., Calcutta,* **21** : 185

1997. *Sitobion sikkimense* (Ghosh and Raychaudhuri); G. Remaudiere and M. Remaudiere, *Catalogue of the World's Aphididae* : 146

Material : Apterae and nymphs, on *Smilax* sp., Jamalingaon, 23.iii.1970, Coll. H. Banerjee; alatae, on *Smilax* sp., Gangtok, 28.x.1962, Coll. A.K.Ghosh.

Measurements (Aptera) : Length of body 2.73; width of body 1.13; antenna 3.0; a.s. III 0.68, IV 0.55, V 0.44, VI (0.14+0.80); u.r.s. 0.09; h.t.2 0.14; siphunculus 0.65; cauda 0.42.

Measurements (Alata) : Length of body 2.89; width of body 0.90; antenna 2.92; a.s. III 0.74, IV 0.60, V 0.45, VI (0.15+0.80); u.r.s. 0.11; h.t.2 0.13; siphunculus 0.64; cauda 0.35.

Distribution : India : Sikkim (East Sikkim), Meghalaya and West Bengal.

Remarks : The brown to brownish black species is again an endemic one and is restricted so far in the eastern states of the country.

105. ***Sitobion takahashii*** (Eastop)

1959. *Macrosiphum (Sitobion) takahashii* Eastop, *Entomologist,* **92** : 104

1980. *Macrosiphum (Sitobion) takahashii* Eastop; Raychaudhuri, D.N. *(ed.)* In : *Aphids of Northeast India and Bhutan* : 188

1997. *Sitobion takahashii* Eastop; G. Remaudiere and M. Remaudiere, *Catalogue of the World's Aphididae* : 146

Material : Nil

Measurements (Aptera) : (After D. N. Raychaudhuri, *ed.* 1980) Length of body 2.06; width of body 0.90; antenna 2.51; a.s. III 0.63, IV 0.44, V 0.42, VI (0.13+0.78); u.r.s. 0.11; h.t.2. 0.12; siphunculus 0.56; cauda 0.33.

Measurements (Alata) : (After D. N. Raychaudhuri *ed.* 1980) Length of body 1.94; width of body 0.76; antenna 2.51; a.s. III 0.52; IV 0.44, V 0.41, VI (0.18+0.89); u.r.s. 0.08; h.t.2 0.10; siphunculus 0.45; cauda 0.21.

Distribution : India : Sikkim (North Sikkim), Meghalaya, South India, West Bengal. *Elsewhere* : Africa; Japan; Taiwan.

Remarks : The species has much resemblance with *Sitobion africanum* Hille Ris Lambers in more caudal hairs and less reticulation on siphunculi but differs in the shape of caudal hairs.

Genus 50. ***Subovatomyzus*** Basu

1964. *Subovatomyzus* Basu, *J.Linn.Soc.(Zool.)* **45**(305) : 124

Type Species : *Subovatomyzus leucosceptri* Basu, 1964

106. ***Subovatomyzus leucosceptri*** Basu

1964. *Subovatomyzus leucosceptri* Basu, *J.Linn.Soc.(zool.),* **45**(305) : 241

1971. *Subovatomyzus leucosceptri* Basu; Ghosh, Ghosh and Raychaudhuri, *Proc.zool.Soc.Calcutta,* **24** : 166

Material : Apterae and nymphs, on *Leucosceptrum canum,* Gangtok, 22.xii.1970, Coll. M. R. Ghosh; apterae and nymphs on *Leucosceptrum canum,* Gangtok, 16.xi.1974, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 1.70; width of body 0.85; antenna 2.5; a.s. III 0.50; IV 0.32, V 0.25, VI (0.11+0.89); u.r.s. 0.13; h.t.2 0.09; siphunculus 0.40; cauda 0.14.

Distribution : India : Sikkim (East Sikkim), Meghalaya and West Bengal.

Remarks : The pale green species has a longitudinal green line along the mid dorsum and is characterised by its flanged siphunculi, with a distinct preapical circumcision and 3:3:3 chaetotaxy. It is originally described from Darjeeling (West Bengal) and so far restricted to northeast area of India.

Genus 51. ***Tricaudatus*** Narzikulov

1953. *Rhopalosiphoninus polygoni* Narzikulov, *Izv.Akad. Nauk Tadzhik* SSR, (4) : 62

Type species : *Rhopalosiphoninus polygoni* Narzikulov, 1953

107. ***Tricaudatus polygoni*** (Narzikulov)

1953. *Rhopalosiphoninus polygoni* Narzikulov, *Izv, Akad. Nauk Tadzik* SSR, (4) : 62

1957. *Tricaudatus polygoni* (Narzikulov); *Rev. Entomol.*, **36** (3) : 683

1969. *Tricaudatus indicus* Ghosh, Basu and Raychaudhuri, *Oriental Ins.*, **3** (3) : 251

1971. *Tricaudatus polygoni tuberculatus* Hill Ris Lambers and Basu; Ghosh, Ghosh and Raychaudhuri, *Proc. zool. Soc., Calcutta,* **24** : 166

1980. *Tricaudatus polygoni* (Narzikulov); Raychaudhuri, D.N. *(ed.).* In : *Aphids of Northeast India and Bhutan*: 259

Material : Aptera, on *Polygonum molle,* Deorali, 22.xii.1970; aptera, alatae and nymphs, on *Polygonum molle,* on North Sikkim Highway, 20.xii.1970, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 1.58; width of body 0.80; antenna 0.81; a.s. III 0.20, IV 0.13, V 0.13, VI (0.09+0.20); u.r.s. 0.08; h.t.2 0.09; siphunculus 0.32; cauda 0.15.

Measurements (Alata) : Length of body 1.94; width of body 0.70; antenna 1.70; a.s. III 0.50, IV 0.25, V 0.24, VI (0.13+0.34); u.r.s. 0.08; h.t.2 0.09; siphunculus 0.32; cauda 0.12.

Distribution : India : Sikkim (East and North Sikkim), Arunachal Pradesh, Himachal Pradesh, Meghalaya, Uttar Pradesh and West Bengal. *Elsewhere* : Japan; Java; Korea; Taiwan and U.S.S.R.

Genus 52. ***Trichosiphonaphis*** Takahashi

1922. *Trichosiphonaphis* Takahashi, *Proc. Entomol. Soc. Wash.*, **24** (7&8) : 205

Type species : *Myzus polygoniformosanus* Takahashi, 1921

108. ***Trichosiphonaphis gerberae*** Ghosh and Raychaudhuri

1972. *Trichosiphonaphis gerberae* Ghosh and Raychaudhuri, *Oriental Ins.*, **6**(3) : 381.

1980. *Trichosiphonaphis gerberae* Ghosh and Raychaudhuri; Raychaudhuri, D.N. *(ed.).* In : *Aphids of Northeast India and Bhutan* : 262.

Material : Apterae and nymphs, on *Polygonum* sp., Jorethang, 24.x.1975, Coll. P. K. Mondal

Measurements (Aptera) : Length of body 2.00; width of body 1.15; antenna 1.80; a.s. III 0.50, IV 0.28, V 0.26, VI (0.11+0.50); u.r.s. 0.11; h.t.2 0.11; siphunculus 0.42; cauda 0.16.

Distribution : India : Sikkim (South Sikkim), Meghalaya and West Bengal.

Remarks : The species is endemic and so far known from Northeastern part of India. It is recorded from *Gerbera* spp. (Asteraceae) and *Polygonum* spp. (Polygonaceae) occurring in the Northeast states of the country.

Genus 53. ***Tuberocephalus*** Shinji

1917. *Tuberocephalus* Shinji, *Lansania, Tokyo,* **1** (3) : 39

Type species : *Tuberocephalus artemisiae* Shinji, 1929

109. ***Tuberocephalus sasaki*** (Matsumura)

1917. *Myzus sasaki* Matsumura, *J. Coll. Agric. Tohoku Imp. Univ,* **7** : 404

1973. *Tuberocephalus sasaki* (Matsumura); Basu, Ghosh and Raychaudhuri, *Proc.zool.Soc.,Calcutta* **26** : 93

1980. *Tuberocephalus sasaki* (Matsumura); Raychaudhuri, D.N. *(ed.).* In : *Aphids of Northeast India and Bhutan*: 265

Material : Apterae and nymph, on *Artemisia vulgaris,* Lingdong, hee–Gyathang, 10.xi.1974, Coll. P.K.Mondal.

Measurements (Aptera) : Length of body 1.00; width of body 0.55; antenna 0.82; a.s. III 0.25, IV 0.11, V 0.09, VI (0.07+0.24); u.r.s. 0.06; h.t.2 0.06; siphunculus 0.20; cauda 0.06.

Distribution : India : Sikkim (North Sikkim), Meghalaya and West Bengal. *Elsewhere* : Japan

Remarks : The yellow to light green aphids are usually Asteraceae feeder and are associated with red ants.

Genus 54. ***Uroleucon*** Mordvilko

1914. *Uroleucon* Mordvilko, *Faune de la Russie* **1** : 64.

Type species : Aphis sonchi Linnaeus, 1767, designated by Borner 1930

Key to the species of the genus *Uroleucon*

Apterous viviparous female

1(2) Antennal segment III with protuberant secondary rhinaria distributed over its entire length ..... *formosanus crepidis*

2(1) Antennal segment III with protuberant secondary rhinaria distributed upto 0.75 portion 3

3(4) Antennal segment III pale; longest hair on 8th tergite about 2.0–2.40 times as long as b. d. III; antesiphuncular sclerite distinct. ..... *pseudotanaceti*

4(3) Antennal segment III dark; longest hair on 8th tergite 1.20–1.60 times as long as b.d.III; antesiphuncular sclerite indistinct .... *sonchi*

110. ***Uroleucon formosanus crepidis*** (Ghosh, Ghosh and Raychaudhuri)

1971. *Dactynotus formosanus crepidis* Ghosh, Ghosh and Raychaudhuri, *Oriental Ins.*, **5**(3) : 332

1994. *Uroleucon (Uroleucon) formosanus crepidis* (Ghosh *et al.);* Ghosh and Basu, *State Fauna Series* 3, *Fauna of West Bengal* : 230

Material : Apterae, on *Sonchus* sp., Singtam, 2.xi.1969, Coll. M.R.Ghosh; 1 alata, on indet host, Gangtok, 28.x.1962, Coll. A. K. Ghosh.

Measurements (Aptera) : Length of body 2.70; width of body 1.10; antenna 3.08; a.s. III 1.12, IV 0.30, V 0.30, VI (0.12+0.73); u.r.s. 0.14; h.t.2 0.15; siphunculus 0.65; cauda 0.30.

Distribution : India : Sikkim (East Sikkim), West Bengal.

111. ***Uroleucon (Uroleucon) pseudotanaceti*** (Verma)

1969. *Dactynotus pseudotanaceti* Verma, *Bull. Ent.*, **10** (2): 134–140

1971. *Uroleucon tanaceti indica* Ghosh, *Oriental Ins.*, **5** (1): 129

1976. *Uroleucon (Uroleucon) pseudotanaceti* (Verma); Eastop and Hille Ris Lambers, *Survey of World's Aphids*, Dr.W.Junk b.v., Publishers, The Hague:449

1997. *Uroleucon (Uroleucon) pseudotanaceti* (Verma), G.Remaudiere and M.Remaudiere, *Catalogue of the World's Aphididae* : 153

Material : Apterae, alatae and nymphs, on *Artemisia* sp., Gangtok, 26.v.1970, Coll. M.R. Ghosh.

Measurements (Aptera) : Length of body 2.69; width of body 1.30; Antenna 3.30; a.s. III 0.75, IV 0.66, V 0.61, VI (0.16+0.80); u.r.s. 0.15; h.t.2 0.14; siphunculus 0.60; cauda 0.24.

Measurements (Alata) : Length of body 2.90; width of body 1.10; antenna 3.62; a.s. III 0.82, IV 0.70, V 0.70, VI (0.18+1.05); u.r.s. 0.15; h.t.2 0.11, siphunculus 0.60; cauda 0.20.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Meghalaya, Northwest India

Remarks : The aphids are greenish brown in colour and originally described from Jammu and Kashmir state by Verma (1969a).

112. ***Uroleucon (Uroleucon) sonchi*** (Linnaeus)

1767. *Aphis sonchi* Linnaeus, *Syst. Nat*, (12th Ed.), **1** : 735

1997. *Uroleucon (Uroleucon) sonchi* (Linnaeus) : G Remaudiere and M. Remaudiere, *Catalogue of the World's Aphididae* : 154

Material : Apterae and nymphs, on *Sonchus* sp. Gangtok, 19.v.1975, Coll. P.K.Mondal.

Measurements (Aptera) : Length of body 2.90; width of body 1.30; antenna 3.00; a.s. III 0.85, IV 0.60, V 0.50, VI (0.17+0.75); u.r.s. 0.15; h.t.2 0.16; siphunculus 0.90; cauda 0.50.

Distribution : India : Sikkim (East Sikkim), all over. *Elsewhere* : Africa; Australia; Egypt; Europe; South America.

Remarks : These brown aphids usually infest the *Sonchus* spp. (Asteraceae) wherever the plant is found and usually attended by ants.

55. ***Vesiculaphis*** Hille Ris Lambers

1911. *Vesiculaphis* Hille Ris Lambers, *Redia*, **7** : 463

Type species : *Toxoptera caricis* Fullaway, 1810

Key to the species of *Vesiculaphis*

1(2) Abdominal tergite 8 produced caudad in the form of a triangular hood; frons with quadrangular median prominence; antennae 5-segmented ..... *pieridis*

2(1) Abdominal tergite not as above; frons without any projection; antennae 6-segmented ..... *sikkimensis*

113. ***Vesiculaphis pieridis*** Basu

1964. *Vesiculaphis pieridis* Basu, *J.Linn.Soc.(Zool.)*, **45** (305) : 237

1976. *Vesiculaphis pieridis* Basu; Ghosh, Basu and Raychaudhuri, *Oriental Ins.*, **10** (2) : 276

1997. *Vesiculaphis pieridis* Basu; G. Remaudiere and M. Remaudiere, *Catalogue of the World's Aphididae* : 158

Material : Apterae, on *Pieris ovalifolia*, Lachung, 6.vi.1975, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 1.80; width of body 1.10; antenna 0.52; a.s. III 0.20, IV 0.07, V (0.06+0.05); u.r.s. 1.10; h.t.2 0.09; siphunculus 0.30; cauda 0.12.

Distribution : India : Sikkim (North Sikkim), Meghalaya, Uttar Pradesh, West Bengal.

Remarks : Dusky aphid is an endemic species which was originally described from Darjeeling hills by Basu (1964).

114. ***Vesiculaphis sikkimensis*** Mondal, Agarwala and Raychaudhuri (Figs. 31–32)

1979. *Vesiculaphis sikkimensis* Mondal, Agarwala and Raychaudhuri, *Entomon*, **4** (2) : 193

1997. *Vesiculaphis sikkimensis* Mondal *et al.*; G. Remaudiere and M. Remaudiere, *Catalogue of the World's Aphididae* : 158

Material : Apterae and alatae on *Carex* sp., Namchi, 22.x.1975, Coll. P.K.Mondal.

Measurements (Aptera) : Length of body 1.56; width of body 0.98; antenna 1.11; a.s. III 0.30, IV 0.14, V 0.13, VI (0.10+0.26); u.r.s. 1.10; h.t.2 0.09; siphunculus 0.09; cauda 0.15.

Measurements (Alata) : Length of body 1.58; width of body 0.72; antenna 1.22; a.s. III 0.31, IV 0.16, V 0.15, VI (0.11+0.29); u.r.s. 0.09; h.t.2 0.08; siphunculus 0.27; cauda 0.12.

Distribution : India : Sikkim (South Sikkim)

Remarks : The brownish species is originally described from Sikkim and is so far known only from the State. The aphid is characterised by its smooth or faintly scabrous head, and pale abdominal dorsum.

Genus 56. ***Xenomyzus*** Aizenberg

1935. *Xenomyzus* Aizenberg, *Zap. bolsevek biol. Sta.*, 7–8 : 152

Type species : *Xenomyzus corticis* Aizenberg, 1935.

115. ***Xenomyzus scabripes*** Basu, Ghosh and Raychaudhuri

1976. *Xenomyzus scabripes* Basu, Ghosh and Raychaudhuri, *Entomon*, **1** (1) : 64

1980. *Xenomyzus scabripes* Basu *et al.*; Raychaudhuri, D.N. *(ed.)*. In : *Aphids of Northeast India and Bhutan*: 276

Material : Alatae, on *Nicotiana tabacum*(?), Gangtok, 25.x.1962, Coll. A. K. Ghosh.

Measurements (Alata) : Length of body 1.60; width of body 0.75; antenna 1.70; a.s. III 0.34, IV 0.24, V 0.24, VI (0.10+0.50); u.r.s. 0.08; h.t.2 0.08; siphunculus 0.25; cauda 0.09.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Meghalaya, Uttar Pradesh.

Remarks : The species is characterised in having longer dorsal cephalic hairs, dark siphunculi, scabrous femora and tibiae.

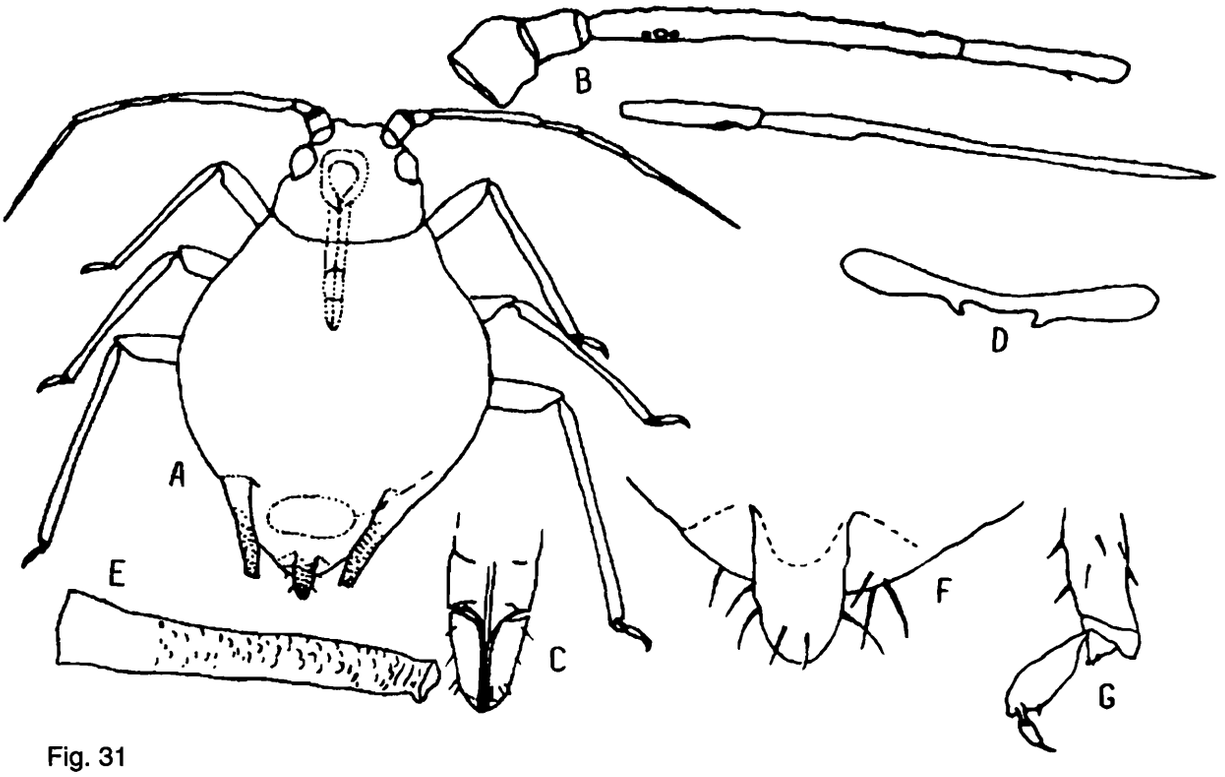


Fig. 31

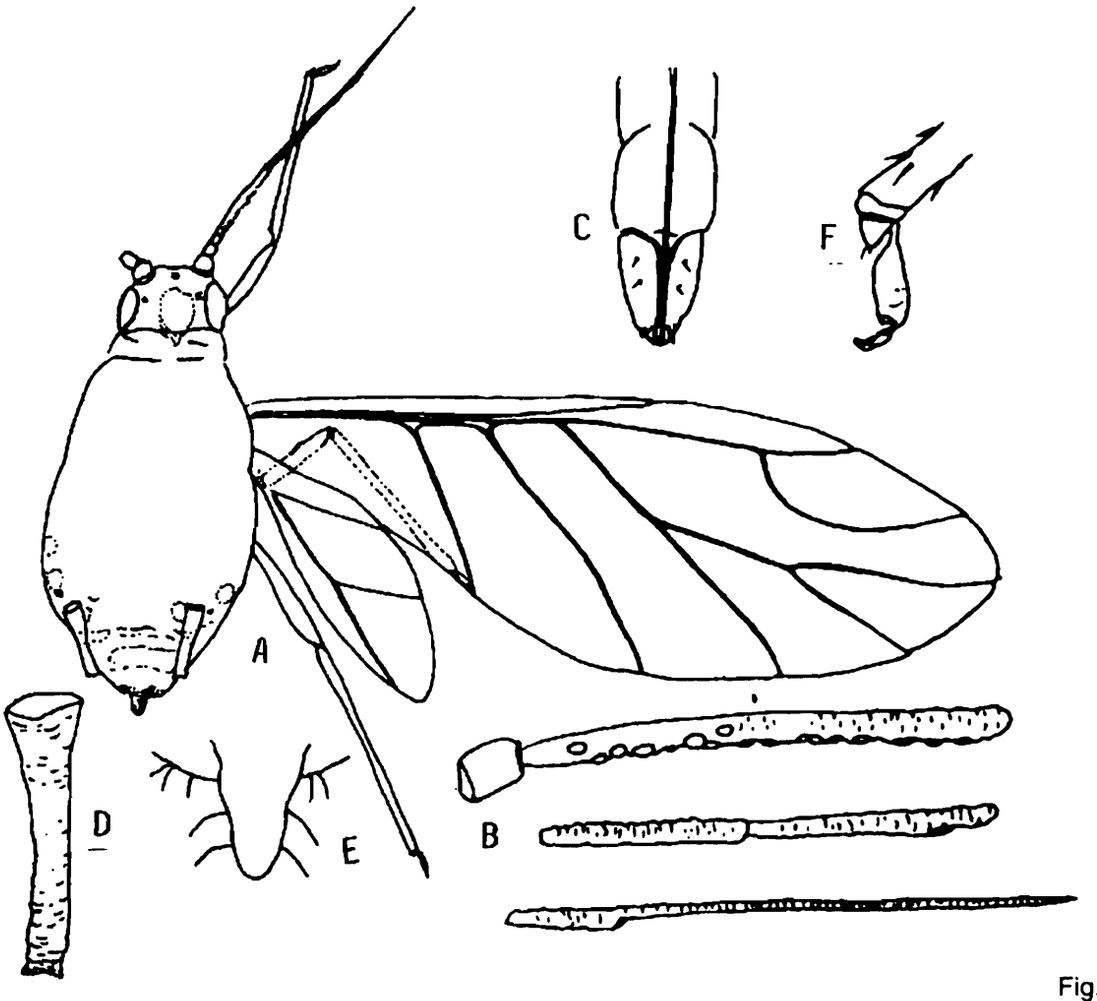


Fig. 32

Figs. 31-32 : 31. *Vesiculaphis sikkimensis* Mondal *et al.*: Aptera: A, Entire body; B, Antenna; C, U.r.s.; D, Mid thoracic furca; E, Siphunculus; F, Cauda; G, Tarsi; 32. *Vesiculaphis sikkimensis* Mondal *et al.*: Alata: A, Entire body; B, Antenna; C, U.r.s.; D, Siphunculus; E, Cauda; F, Hind tarsi with portion of tibia

Tribe **Pterocommatini**

Genus 57 ***Pterocomma*** Buckton

1879. *Pterocomma* Buckton, *Monograph of the British Aphides*, **2** : 142

Type species : *Pterocomma pilosa* Buckton, 1979.

116. ***Pterocomma*** sp.
(Fig. 33)

Material : Not examined.

Measurements (Aptera) : (after Mondal, Ph.D.Thesis, University of Calcutta, 1977) Length of body 3.38; width of body 2.36; antenna 1.61; a.s. III 0.47, IV 0.29, V 0.27, VI (0.15+0.23); u.r.s. 0.15; h.t.2 0.14; siphunculus 0.37; cauda 0.13.

Distribution : India : Sikkim (North Sikkim).

Remarks : According to Mondal (*Loc. cit.*) many apterae were collected on barks of indet host plant at Lachung (Sikkim) during June, 1975. Due to lack of comparable material specific identification could not be done. Another *Pterocomma sp.* (colony) was collected on indet tree of Bucklandaceae from Darjeeling, West Bengal. Therefore, it appears that *Pterocomma* is so far known from Northeastern Himalaya where it enjoys anholocyclic life cycle.

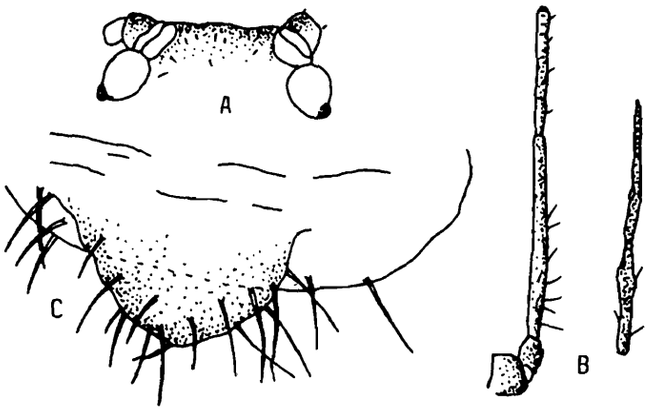


Fig. 33. *Pterocomma* sp. : A, Head; B, Antenna; C, Terminal portion of abdomen showing cauda

Subfamily DREPANOSIPHINAE

Key to the genera of Subfamily DREPANOSIPHINAE

1(2) Cauda semioval; subanal plate entire; body with wax pores ..... ***Clethrobius***

2(1) Cauda knobbed or elongated; subanal plate never entire; weekly or strongly bilobed 3

3(4) Venter of head with a dark transverse band; subanal plate divided; lateral abdominal tubercles well developed and distinct on segment 4 and 5..... ***Betacallis***

4(3) Venter of head without any band as above 5

5(6) Siphunculi cone-shaped with 2 hairs appended to its base; abdominal dorsum with hair-bearing marginal sclerites; a.s. III stouter than other antennal segments ..... ***Taiwanaphis***

6(5) Siphunculi elongate, truncated with 1 or 2 hairs 7

7(8) Lateral frontal tubercles well developed; a.s. III both in apterae and alatae with secondary rhinaria; antennae longer than body; abdomen with hair–being lateral tubercles ..... ***Taoia***

8(7) Lateral frontal tubercles usually absent. 9

9(10) Abdominal dorsum with wax plates..... 11

10(9) Abdominal dorsum without wax plates. 13

11(12) Siphunculi on distinct elevated wax plate bearing cones, without any hair appended to base; wax pores well developed on head, thorax, abdomen, siphunculi and appendages, sometimes at least some of these arranged in plates; wing veins bordered brown or faintly indicated..... ..... ***Shivaphis***

12(11) Siphunculi without wax plates but a hair appended to its base; spinal hairs on abdominal dorsum in parallel longitudinal rows excepting those on tergite 7; tergite 8 with 6 hairs; apterae not known .... ***Tinocalloides***

13(14) First tarsal segments with 5 ventral hairs and without any dorsal hair; head with a median rectangular process ..... ***Neobetulaphis***

14(13) First tarsal segments with 5–7 ventral hairs besides 2 dorsal hairs 15

15(16) Clypeus with a nose-like process; abdomen without spinal processi ..... ***Takecallis***

16(15) Clypeus without such process; abdomen with paired spinal processi at least on anterior tergites ..... ***Tinocallis***

Genus 58. ***Betacallis*** Matsumura

1919. *Betacallis* Matsumura, *Trans. Sapporo Natur. Hist. Soc.* : **7** (2) : 110

Type species : *Betacallis alnicolense* Matsumura, 1910

Key to the species of *Betacallis*

1(2) Dorsal cephalic hairs 1.25–1.60 times as long as b.d. III; a.s. III with 26–40 secondary rhinaria; u.r.s. 1.10–1.20 times as long as h.t. 2 ..... *querciphaga*

2(1) Dorsal cephalic hairs subequal to b.d. III; a.s. III with 18–22 secondary rhinaria; u.r.s. 1.30–1.40 times as long as h.t.2 ..... *sikkimensis*

117. ***Betacallis querciphaga*** Basu, Ghosh and Raychaudhuri

(Fig. 40)

1974. *Betacallis querciphaga* Basu, Ghosh and Raychaudhuri, *Oriental Ins.* **8** (2) : 236

Material : Alatae, on undet host, Gangtok, 20.x.1962, Coll. A. K. Ghosh.

Measurements (Alata) : Length of body 3.17; width of body 1.13; antenna 4.25; a.s. III 1.44, IV 0.96, V 0.82, VI (0.31+0.61); u.r.s. 0.18; h.t.2 0.14; siphunculus 0.19.

Distribution : India : Sikkim (East Sikkim), Meghalaya, Manipur, West Bengal. *Elsewhere* : Philippines.

Remarks : The light green yellow aphid is an endemic species. It is so far known from North East India.

118. ***Betacallis sikkimensis*** Basu, Ghosh and Raychaudhuri

(Fig. 34)

1974. *Betacallis sikkimensis* Basu, Ghosh and Raychaudhuri, *Oriental Ins.*, **8** (2) : 234

1990. *Betacallis sikkimensis* Basu *et al.*; Ghosh and Quednau, Fauna of India, Aphidoidea, pt. V : Family Drepanosiphinae : 29

Material : Alatae on *Quercus* sp., Gangtok, 23.xii.1971, Coll. M. R. Ghosh.

Measurements (Alata) : Length of body 2.40; width of body 0.83; antenna 3.70; a.s. III 1.32, IV 0.83, V 0.61, VI (0.27+0.47); u.r.s. 0.15; h.t.2 0.11; siphunculus 0.10.

Distribution : India : Sikkim (East Sikkim), Uttar Pradesh.

Remarks : The species is also an endemic one. Chakrabarti (1988) recorded apterous oviparous females and alate males and described the same for the first time. The specimens were collected from Garhwal, Uttar Pradesh.

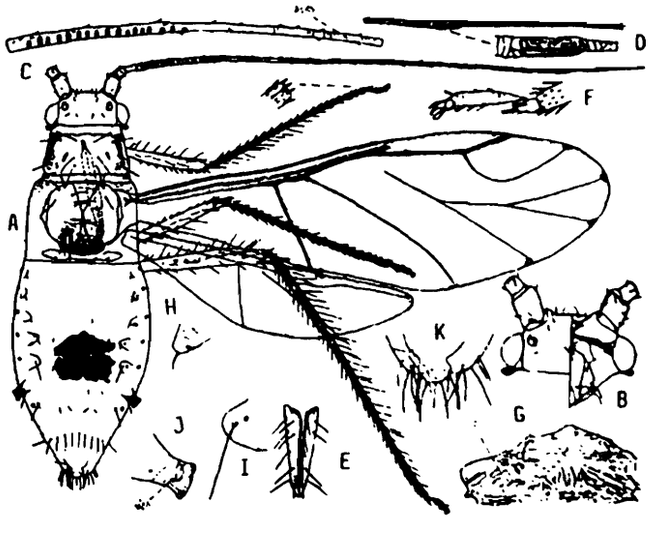


Fig. 34. *Betacallis sikkimensis* Basu *et al.*: Alata: A, Body; B, Head; C, A.s.III; D, A.s. IV; E, U.r.s.; F, Hind tarsus; G, Siphuncular sclerite of abdomen; H, lateral process of abdominal tergite III; I, Lateral process of abdominal tergite V; J, Siphunculus; K, Cauda and anal plate

Genus 59. *Clethrobius* Mordvilko

1928. *Clethrobius* Mordvilko, *In* Philipjev, Keys for identification of Russian insects : 181

Type species : *Clethrobius giganteus* Cholodkovsky, 1899.

119. *Clethrobius dryobius* Chakrabarti and Raychaudhuri

(Fig. 43)

1976. *Clethrobius dryobius* Chakrabarti and Raychaudhuri, *Oriental Ins.* **10** : 443

1990. *Clethrobius dryobius* Chakrabarti and Raychaudhuri; Ghosh and Quednau, *Fauna of India : Aphidoidea,* Pt. V, *Drepanosiphinae,* : 64

Material : Alatae and a few alatoid nymphs, on undet host plant, Gangtok, 27.xi.1971 (C. U. Coll.)

Measurements (Alata) : Length of body 3.84; width of body 1.40; antenna 2.62; a.s. III 1.24, IV 0.60, V 0.52, VI (0.20+0.15); u.r.s. 0.16; h.t.2 0.19; siphunculus 0.19.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Meghalaya, West Bengal.

Remarks : A typically palaearctic species has now been recorded over wide areas of North east India. Chakrabarti (1988) described alate males and apterous oviparous females for the first time.

Genus 60. *Neobetulaphis* Basu

1964. *Neobetulaphis* Basu, *J.Linn.Soc.(Zool),* **45** : 226

Type species : *Neobetulaphis pusilla* Basu

Key to the species of *Neobetulaphis*

Apterae :

1(2) Spinal and pleural hairs long (upto about 2.5 times as long as b.d. III) and arise from elevated basis ..... *pusilla*

2(1) Spinal pleural hairs rather minute (at most about 0.4 times as long as b.d. III) and never on elevated cones ..... *Chaetosiphon*

120. *Neobetulaphis chaetosiphon* Quednau and Chakrabarti

(Fig. 35)

1980. *Neobetulaphis chaetosiphon* Quednau and Chakrabarti, *Can. Ent.* **112** : 5

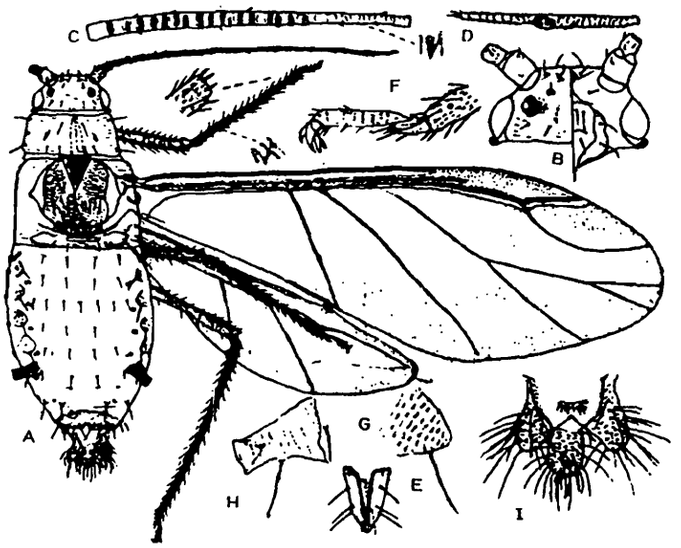


Fig. 35. *Neobetulaphis chaetosiphon* Quednau and Chakrabarti: Alata: A, Body; B, Head; C, A.s. III; D, A.s. VI; E, U.r.s.; F, Hind tarsus; G, lateral abdominal process; H, Siphunculus; I, Cauda and anal plate

1990. *Neobetulaphis chaetosiphon* Quednau and Chakrabarti; Ghosh and Quednau, *Fauna of India: Aphidoidea* pt. V, *Drepanosiphinae* : 135

Material : Apterae, on *Betula alnoides,* North Sikkim Highway, 23.xii.1970, Coll. M. R. Ghosh (C. U. Coll)

Measurements (Aptera) : Length of body 2.12; width of body 0.80; antenna 1.20; a.s. III 0.40, IV 0.21, V 0.21, VI (0.14+0.10); u.r.s. 0.09; h.t.2 0.11; siphunculus 0.10; cauda 0.18.

Distribution : India : Sikkim (North Sikkim), West Bengal.

Remarks : The species is an endemic one and is so far known from Darjeeling and Sikkim Hiamalaya

121. *Neobetulaphis pusilla* Basu

(Fig. 36)

1964. *Neobetulaphis pusilla* Basu, *J.Linn.Soc(Zool.),* **45** : 223

1978(1975). *Neobetulaphis pusilla* Basu; Chakrabarti and Raychaudhuri *Proc.zool.Soc.Calcutta,* **28** : 84

Material : Apterae and alata on *Alnus nepalensis,* Gangtok, 26.xii.1968, Coll. M.R. Ghosh (C. U. Coll.)

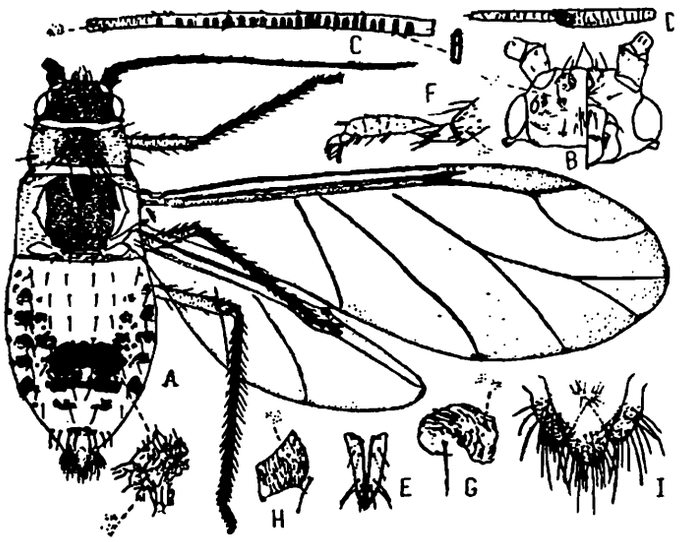


Fig. 36. *Neobetulaphis pusilla* Basu; Alata: A, Body; B, Head; C, A.s. III: D, A.S. VI; E, U.r.s.; F, Hind tarsus; G, Lateral abdominal process; H, Siphunculus; I, Cauda and anal plate

Measurements (Aptera) : Length of body 2.00; width of body 0.95; Antenna 1.00; a.s. III 0.32, IV 0.17, V 0.17, VI (0.12+0.09); u.r.s. 0.09; h.t.2 0.10; siphunculus 0.06.

Measurements (alata) : Length of body 1.95; width of body 0.70; antenna 1.60; a.s. III 0.60, IV 0.35, V 0.25, VI (0.11+0.10); u.r.s. 0.09; h.t.2 0.11; siphunculus 0.11.

Distribution : India : Sikkim(East Sikkim), Uttar Pradesh, West Bengal.

Remarks : The dark green species is also an endemic species and so far known from the Northeastern part of India. Apterous male and apterous oviparous females collected from Western Himalaya are described by Chakrabarti (1988).

Genus 61. ***Shivaphis*** Das

1918. *Shivaphis* Das. *Mem.Indian.Mus.*, **6**(4) : 243

Type species: *Shivaphis celti* Das, 1918

122. ***Shivaphis celti*** Das
(Fig. 37)

1918. *Shivaphis celti* Das., *Mem Indian Mus.*, **6**(4) : 246.

1990. *Shivaphis celti* Das; Ghosh and Quednau, *Fauna of India: Aphidoidea* pt. V, *Drepanosiphinae* : 195

Material : Alata, on *Celtis* sp., Gangtok, 10.iii.1971, Coll. M.R. Ghosh (C.U.Coll).

Measurements (Alata) Length of body 2.44; width of body 0.98; antenna 1.90; a.s. III 0.74, IV 0.36, V 0.33, VI (0.24+0.05); u.r.s. 0.08; h.t.2 0.13.

Distribution : India : Sikkim(East Sikkim), Assam, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, South India, Uttar Pradesh, West Bengal; Elsewhere : China; Japan; Korea; Nepal; Sri Lanka; Taiwan.

Remarks : The species was originally described from *Celtis autralis* (N.O.Ulmaceae) in Lahore,

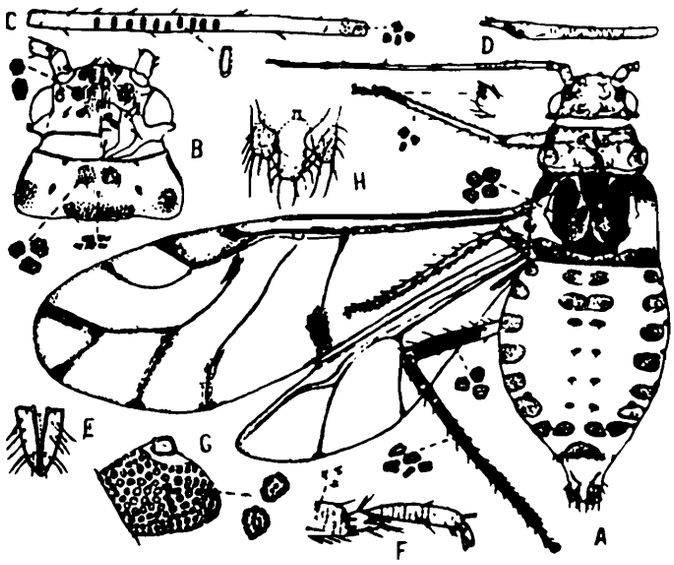


Fig. 37. *Shivaphis celti* Das: Alata: A, Body; B, Head and pronotum; C, A.s. III; D, A.s. VI; E, U.r.s.; F, Hind tarsus; G, Siphunculus with compound wax gland pores; H, Cauda with anal plate

Punjab (Now in Pakistan) by Das (1918). These insects are reported to be very sensitive to slightest touch and fall to the ground. The sexuales of the species are recorded by Chakrabarti (1988).

Genus 62. ***Taiwanaphis*** Takahashi

1934. *Taiwanaphis* Takahashi, *Stylops.* **36** : 56.

Type species : *Taiwanaphis decaspermi* Takahashi 1934.

123. *Taiwanaphis dineni* Mondal, Agarwala and Raychaudhuri (Fig. 38-39)

1979. *Taiwanaphis dineni* Mondal, Agarwala and Raychaudhuri, *Entomon,* 4(2) : 189

1990. *Taiwanaphis dineni* Mondal, Agarwala and Raychaudhuri; Ghosh and Quednau, *Fauna of India:Aphidoidea,* pt. V, *Drepanosiphinae* : 216

Material : 3 Alatae, alate males, apterous ovipara(Paratypes), on undet plant of Combretaceae, Tinbong, North Sikkim, 10.x.1975 Coll. P. K. Mondal (C.U. Coll.)

Measurements (Alata) : Length of body 1.97; width of body 0.90; antenna 1.15; a.s. III 0.47, IV 0.16, V 0.18, VI (0.15+0.08); u.r.s. 0.06; h.t.2 0.09.

Measurements (Alate male) : Length of body 1.78; width of body 0.69; antenna 1.26; a.s. III 0.50, IV 0.20, V 0.18, VI (0.18+0.09); u.r.s. 0.06; h.t.2 0.08; cauda 0.13.

Measurements (Apterous ovipara) : Length of body 1.62; width of body 0.82; antenna 0.70; a.s. III 0.40, IV (0.10+0.08); u.r.s. 0.06; h.t.2 0.09.

Distribution : India : Sikkim(North Sikkim).

Remarks : The find of sexuales as well as viviparous females suggests the possibility of holocyclic life cycle of the species in the state of Sikkim.

Genus 63. *Takecallis* Matsumura

1917. *Tekecallis* Matsumura, *J.Coll.Agric.Tohoku imp.Univ.*, 7 : 373

Type species : *Takecallis bambusae* Matsumura = *Callipterus arundicolens* Clarke

124. *Takecallis aurandinariae* (Essig) (Fig. 42)

1917. *Myzocallis arundinariae* Essig, *Univ.Calif,Publs.Ent.*, 1 : 308

1990. *Takecallis aurandinariae* (Essig), Ghosh and Quednau, *Fauna of India : Aphidoidea,* pt. V, *Drepanosiphinae* : 232

Material : Alatae, on *Bambusa arundinacea,* North Sikkim Highway, 22.xii.1970, Coll. M. R. Ghosh (C.U. Coll.).

Measurements (Alata) : Length of body 2.20; width of body 0.90; antenna 3.00; a.s. III 1.10, IV 0.65, V 0.52, VI (0.30+0.26); u.r.s. 0.05; h.t.2 0.10; siphunculus 0.06; cauda 0.15.

Distribution : India : Sikkim(North Sikkim), Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Meghalaya, Nagaland, West Bengal. *Elsewhere* : Europe; Korea; Formosa; North America; Southeast Asian Countries.

Genus 64. *Taoia* Quednau

1973. *Taoia* Quednau, *Can.Entomol.*, **105** : 217

Type species : *Euceraphis chuansinensis* Tao

125. *Taoia India* (Ghosh and Raychaudhuri) (Fig. 41)

1969. *Euceraphis chuansinensis* David and Rajasingh, *Proc.zool.Soc., Calcutta,* **22** : 153.

1990. *Taoia indica* (Ghosh and Raychaudhuri); Ghosh and Quednau, *Fauna of India: Aphidoidea,* pt. V : *Drepanosiphinae* : 244.

Material : Apterae, on *Alnus nepalensis,* Gangtok, 26.xii.1969, Coll. M. R. Ghosh.

Measurements (Aptera) : Length of body 3.25; width of body 1.20; antenna 4.82; a.s. III 1.27, IV 1.26, V 1.07, VI (0.60+0.32); u.r.s. 0.11; h.t.2 0.17; siphunculus 0.20; cauda 0.18.

Distribution : India : Sikkim(East Sikkim), Arunachal, Assam, Manipur, Meghalaya, Himachal Pradesh, J. & K. State, West Bengal, Nagaland, Uttar Pradesh. *Elsewhere* : Nepal, Pakistan.

Remarks : According to Ghosh and Quednau(1990) the species appears to have a monoecious holocyclic on *Alnus* and *Betula.*

Genus 65. *Tinocallis* Matsumura

1919. *Tinocallis* Matsumura, *Trans.Sapporo. Natur. Hist. Soc.*, 7 : 100

Type species : *Tinocallis ulmiparvifoliae* Matsumura

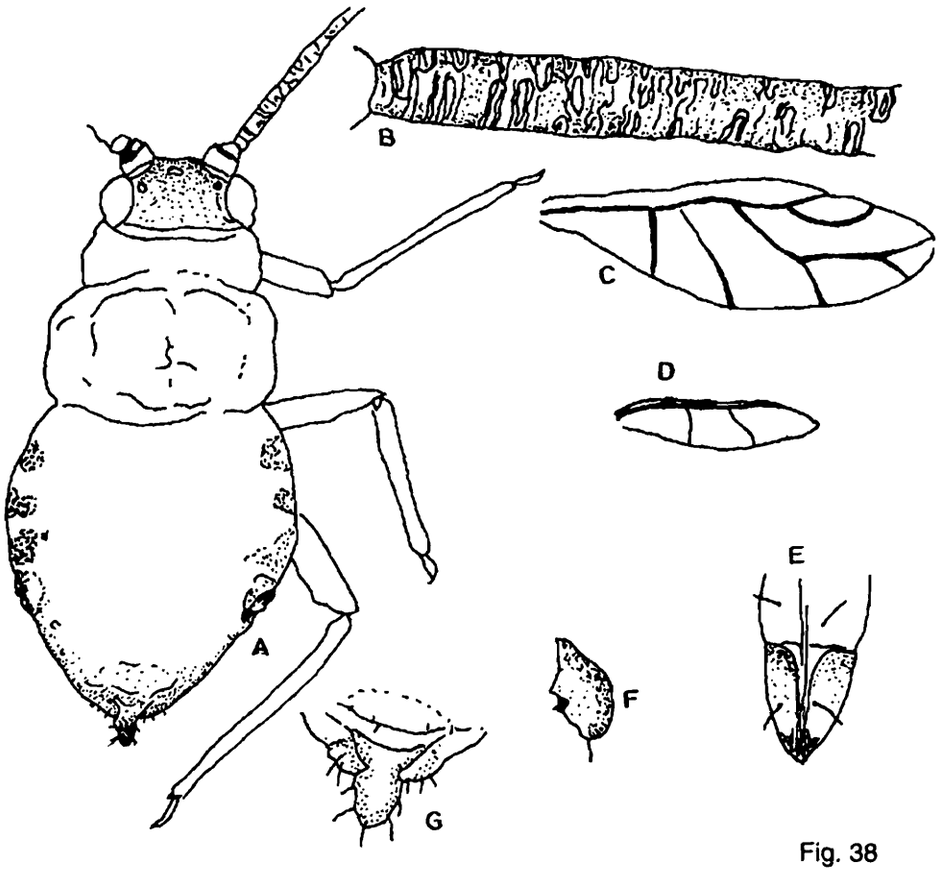


Fig. 38

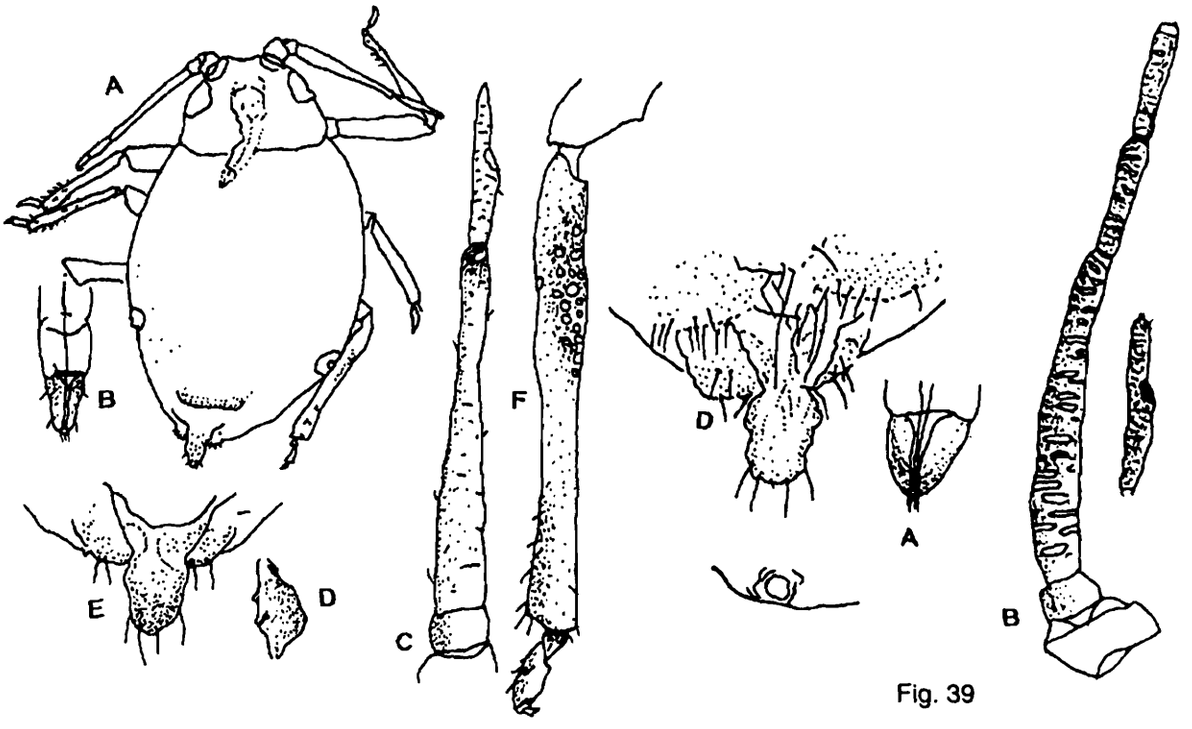


Fig. 39

Figs. 38-39 : 38. *Taiwanaphis dineni* Mondal *et al.*: Alata: A, body (wingless); B, portion of a.s. III; C, Fore wing; D, Hindwing; E, U.r.s.; F, Siphunculus; G, Cauda; 39. *Taiwanaphis dineni* Mondal *et al.*: Ovipara: A, Body (entire); B, U.r.s.; C, Antenna; D, Siphunculus; E, Cauda; F, Hind tibia showing pseudosensoria; Alata male : A, U.r.s.; B, Antenna; C, Siphunculus; D, Posterior end of abdomen showing cauda and genitalia

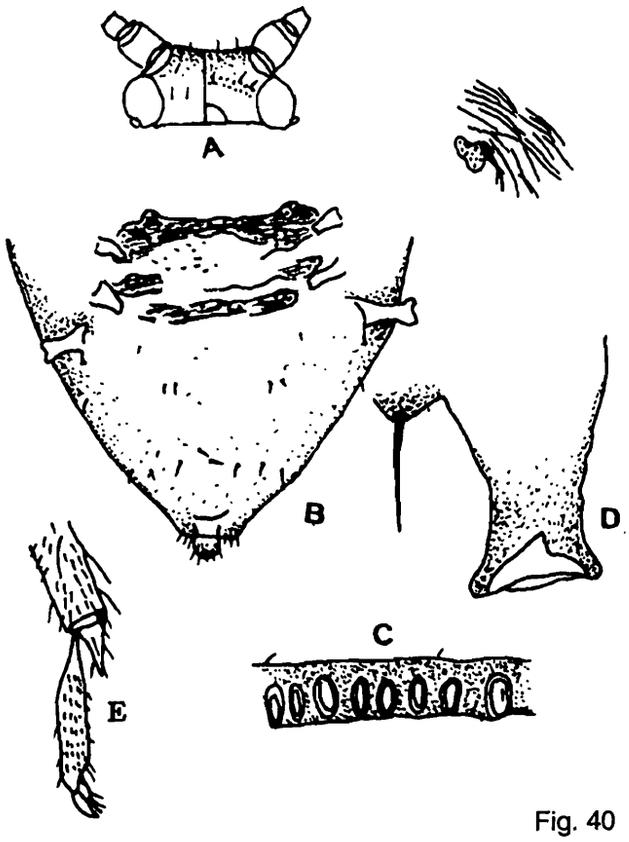


Fig. 40

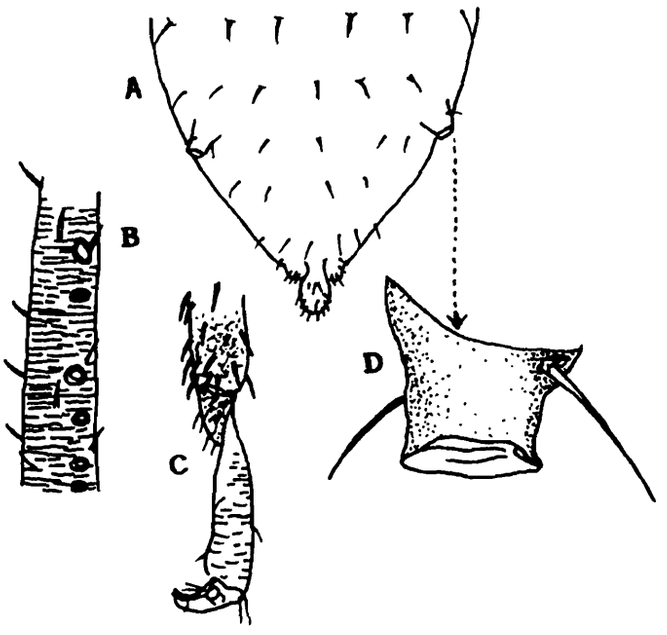


Fig. 41

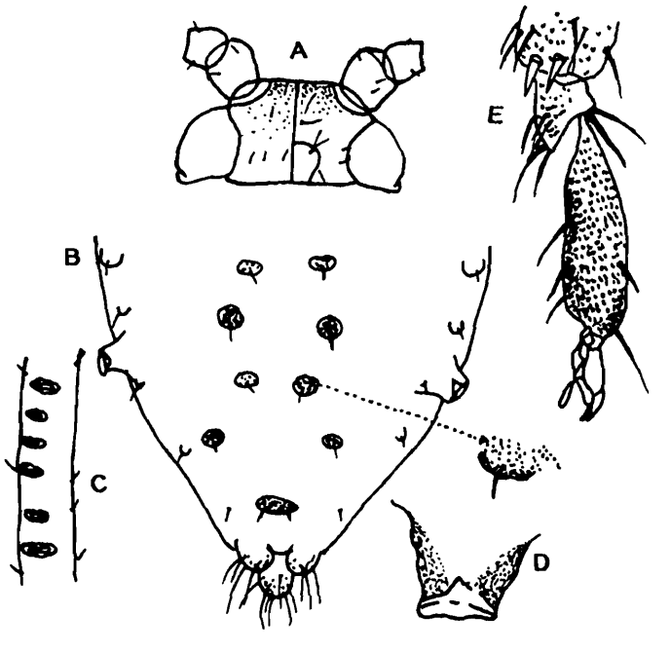


Fig. 42

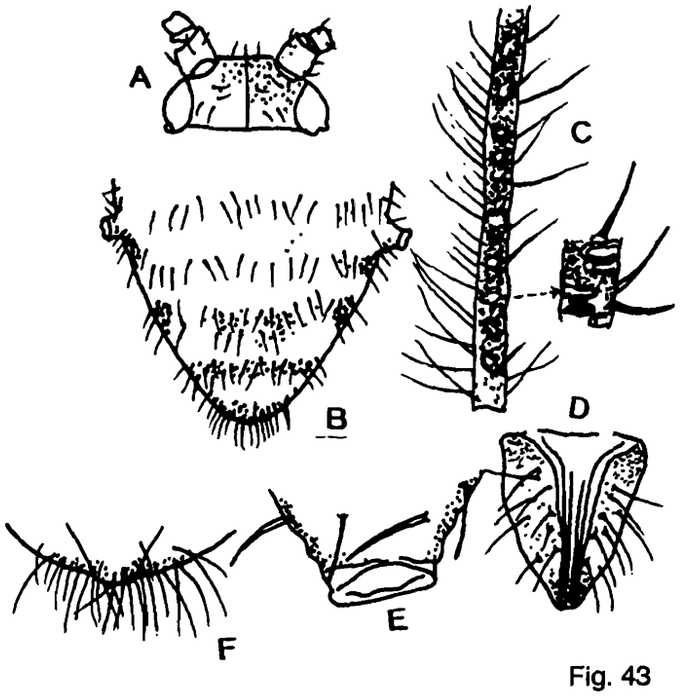


Fig. 43

Figs. 40-43 : 40. *Betacallis querciphaga* Basu *et al.*: Alata: A, Head; B, Posterior abdominal dorsum; C, Portion of a.s. III; D, Siphunculus; E, apical portion of hind tibia and tarsus; 41. *Taoia indica* Ghosh *et al.*: Aptera: A, Posterior abdominal dorsum; B, Portion of a.s. III; C, Apical portion of hind tibia and tarsus; E, Siphunculus (enlarged); 42. *Takecallis aurandinariae* (Essig): Alata: A, Head; B, Posterior abdominal dorsum; C, Portion of a.s. III; D, Siphunculus; E, Apical portion of hind tibia and tarsus; 43. *Clethrobius dryobius* Chakrabarti and Raychaudhuri: Alata: A, Head; B, Posterior abdominal dorsum; C, Portion of a.s. III; D, U.r.s.; E, Siphunculus; F, Cauda

126. ***Tinocallis himalayensis*** Ghosh, Ghosh and Raychaudhuri (Fig. 44)

1971. *Tinocallis himalayensis* Ghosh, Ghosh and Raychaudhuri, *Oriental Ins.*, 5(2) : 218

1990. *Tinocallis himalayensis* Ghosh *et al.* ; Ghosh and Quednau, *Fauna of India: Aphidoidea*, pt. V, *Drepanosiphinae* : 269

Material : Alatae and nymphs, on *Duabanga* sp., Singtam, East Sikkim, 24.xii.1970, Coll. M. R. Ghosh.

Measurements : Length of body 1.40; width of body 0.55; antenna 1.50; a.s. III 0.44, IV 0.24, V 0.24, VI (0.23+0.22); u.r.s. 0.07; h.t.2 0.08; siphunculus 0.06.

Distribution : India : Sikkim(East Sikkim), West Bengal.

Remarks : The species has been recorded only from Darjeeling and Sikkim in Eastern Himalaya during winter.

Genus 66. ***Tinocalloides*** Basu

1969. *Tinocalloides* Basu, *Oriental Ins.*, **3** : 367

Type species : *Tinocalloides montanus* Basu

127. ***Tinocalloides montanus*** Basu (Fig. 45)

1969. *Tinocalloides montanus* Basu, *Oriental Ins.*, **3** : 367

1990. *Tinocalloides montanus* Basu; Ghosh and Quednau, *Fauna of India : Aphidoidea*, pt. V, *Drepanosiphinae*: 287

Material : Alate male, on undet host plant, Gangtok, East Sikkim, 26.xii.1969 Coll. M. R. Ghosh.

Measurements (Alate male) : Length of body 1.55; width of body 0.55; antenna 1.85; a.s. III 0.64, IV 0.34, V 0.34, VI (0.20+0.22); u.r.s. 0.07; h.t.2 0.08; siphunculus 0.05; cauda 0.10.

Distribution : India : Sikkim(East Sikkim), Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Nepal.

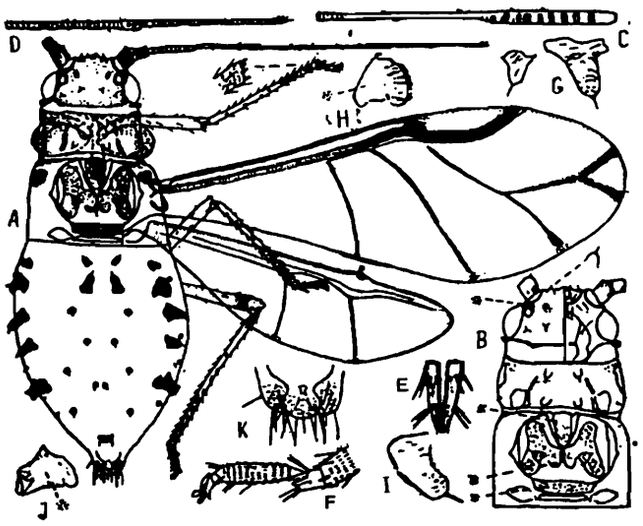


Fig. 44

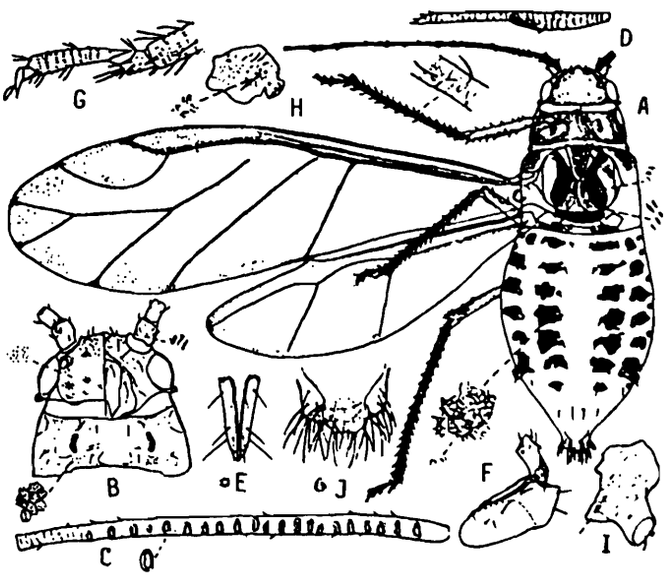


Fig. 45

Fig. 44-45. *Tinocallis himalayensis* Ghosh *et al.*: Alata: A, Body; B, Head and Thoracic region; C A.s. III; D, A.s. VI; E, U.r.s.; F, Hind tarsus; G, Spinal abdominal process; H, Lateral process of abdominal tergite II; I, Lateral process of abdominal tergite III; J, Siphunculus; K, Cauda and anal plate; 45. *Tinocalloides montanus* Basu: Alata: A, Body; B, Head and pronotum; C, A.s. III; D, A.s. VI; E, U.r.s.; F, Fore coxae; G, Hind tarsus; H, Lateral abdominal process; I, Siphunculus; J, Cauda and anal plate

Remarks : The species enjoys holocyclic life cycle on *Prunus* in the temperate hill region of North West and Eastern India (Ghosh and Quendau, 1990).

Subfamily GREENIDEINAE

Key to the Tribes of Greenideinae

Body with processi; siphunculi usually with a few hairs ; eyes 3 or multifaceted; Media once branched in alatae ..... **Cervahidini**

Body without any process; siphunculi densely hairy; eyes multifaceted; Media usually twice branched in alatae ..... **Greenideinae**

Tribe **Cervaphidini**

Key to the genera of the Tribe Cervaphidini

1(2) F.T.C. 5,5,5 ; cauda without median style; eyes 3-faceted in apterae..... ***Sumatraphis***

2(1) F.T.C. 3,3,3 ; cauda with or without median style 3

3(4) Cauda trasversely oval with a median style; body with a pair of processi on each tergites 7 & 8; in alatae these somewhat reduced ..... ***Anomalosiphum***

4(3) Cauda transversely oval and without a median style ; eyes in apterae 3–faceted ..... ***Schoutedenia***

Genus 67. ***Anomalosiphum*** Takahashi

1934. *Anomalosiphum* Takahashi, *Stylops,* **3** : 54

Type species : *Anomalosiphum pithecolobii* Taskahashi, 1934

128. ***Anomalosiphum indigoferae*** Ghosh, Ghosh and Raychaudhuri (Fig. 46)

1971. *Anomalosiphum indigoferae* Ghosh *et al., Oriental Ins.,* **5**(2) : 209

1993. *Anomalosiphum indigoferae* Ghosh *et al.*; Ghosh and Agarwala, *Fauna of India.pt.6,Greenideinae :* **15**

Material : Apterae, on indet host, Sikkim, 24.iii.1970, C.U.Coll ; apterae and alatae, on indet Fabaceae, Signtam, 21,x.1975, Coll. P. K. Mondal

Measurements (Aptera) : Length of body 1.20; width of body 0.07; antenna 0.46; a.s. III 0.23, IV (0.10+0.05); u.r.s. 0.14; h.t. 2 0.07 ; siphunculus 0.12.

Measurements (Alata) : Length of body 1.55; width of body 0.60; antenna 1.12; a.s. III 0.50, IV 0.30, V (0.16+0.06); h.t.2 0.08; siphunculus 0.16.

Distribution : India : Sikkim(East Sikkim), Arunachal Pradesh, Assam and West Bengal.

Biological notes : Apterae are cream to reddish brown and alatae blackish, mainly infest undersurface of leaves.

Genus 68. ***Schoutedenia*** Rubsaamen

1915. *Schoudenia* Rubsaamen, *Mercellia,* **4** : 19

Type species : *Schoutedenia ralumensis* Rubsaamen, 1905

129. ***Schoutedenia ralumensis*** Rubsaamen (Fig. 47)

1905. *Schoutedenia ralumensis* Rubsaamen, *Marcellia,* **4**: 5-25

1993. *Schoutedenia relumensis* Rubsaamen; Ghosh and Agarwala, *Fauna of India : Aphidoidea,* pt.6, *Grenideinae* : 52

Material : Apterae, host indet, Mangan, Sikkim, 22.ix.1984, Tripura University, Coll.

Measurements (Aptera) : Length of body 1.29; width of body 0.90; antenna 0.88; a.s. III 0.32, IV 0.17, V (0.15+0.12); u.r.s. 0.08; h.t.2 0.12; siphunculus 0.06.

Distribution : India : Sikkim(North Sikkim), Meghalaya, Tripura, West Bengal; Elsewhere : Africa; Australia; Indonesia; Malayasia; Pakistan; Taiwan.

Remarks : Hales and Carver(1976) reported sexuales from Australia. In India same is unknown so far.

Genus 69. ***Sumatraphis*** Takahashi

1935. *Sumatraphis* Takahashi, *Misc.Zool.Sumatra* **91** : 3

Type Species : *Sumatraphis celti* Takahashi 1935

130. ***Sumatraphis celti*** Takahashi
(Fig. 48)

1935. *Sumatraphis celti* Takahashi, *Misc. Zool. Sumatra* **97**: 2

1983. *Sumatraphis celti* Takahashi ; Das and Raychaudhuri, *Rec. zool. Surv. India* Occ. paper no. **51** : 41

Material : Apterae and nymphs, on *Quercus* sp., Lingdong, 24.V.1975, Coll. P. K. Mondal.

Distribution : India : Sikkim(North Sikkim), Manipur, Meghalaya, Tamil Nadu, West Bengal. *Elsewhere* : Indonesia (Sumatra); Nepal; Taiwan.

Tribe **Greenideini**

Key to the genera of the Tribe Greenideini

1(2) Cauda transversely oval, with a median stylus ; siphunculi reticulated with transversely elongated cells on one or both surfaces ..... ***Greenidea***

2(1) Cauda never with a median stylus; siphunculi never reticulated as above.....3

3(4) U.r.s. usually pointed; segment 4 and 5 distinctly separated 5

4(3) U.r.s. blunt; segments 4 and 5 distinctly divided ..... ***Greenideoida***

5(6) Hind tibiae with stridulatory ridges; flagellar and siphuncular hairs long and fine ; siphunculi long and cylindrical ..... ***Mollitrichosiphum***

6(5) Hind tibiae without any stridulatory ridge; flagellar hairs long short; siphunculi usually curved onwards .....***Eutrichosiphum***

Genus 70. ***Eutrichosiphum*** Essig and Kuwana

1918. *Eutrichosiphum* Essig and Kuwana, *Proc. Calif. Acad. Sci.* **8** (3) : 97

Type species : *Trichosiphum passaniae* Okajima, 1908

Key to the species of the Genus *Eutrichosiphum*

1(2) Dorsal hairs on abdominal dorsum never with furcated apices 3

2(1) At least some of the dorsal hairs with furcated apices 7

3(4) Hairs on abdominal dorsum thick and stiff ..... ***davidi***

4(3) Hairs on abdominal dorsum with acute, acuminate, blunt apices or a few thorny.. 5

5(6) Dorsum of abdomen entirely spinulose; siphunculi densely spinulose ..... ***arunachali***

6(5) Dorsum of abdomen smooth or locally spinulose; siphunculi sparsely spinulose... ..... ***tapatii***

7(8) Most of the dorsal hairs on abdomen with branched apices, a few shorter ones with acute or blunt apices; dorsum of head smooth; none of the siphuncular hairs with furcated apices ..... ***pseudopasaniae***

8(7) Some or a few hairs on abdominal dorsum with branched apices 9

9(10) Antennae 6–segmented 11

10(9) Antennae 5–segmented 13

11(12)Dorsum of abdomen smooth .....***betulae***

12(11) Dorsum of abdomen wrinkled and sclerotic ..... ***alnicola***

13(14)Dorsal hairs on abdomen long, longest on anterior tergites about 4.6 times as long as b.d. III ..... ***sikkimense***

14(13)Dorsal hairs on abdomen rather short, longest ones on anterior tergites less than 4 times as long as b.d. III ..... ***quercifoliae***

131. ***Eutrichosiphum alnicola*** (Basu)

1967. *Paratrichosiphum alnicola* Basu, *Bull. Ent.*, **18** : 14

1980. *Eutrichosiphum (Paratrichosiphum) alnicola* (Basu); Raychaudhuri *(ed.)* In : *Aphids of Northeast India and Bhutan* : 336

1993. *Eutrichosiphum alnicola* (Basu); Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea, pt. 6, Greenideinae* : 76.

Material : Apterae, on *Alnus nepalensis*, Gayzing, 2.xii.1983, Tripura Univ. Coll.

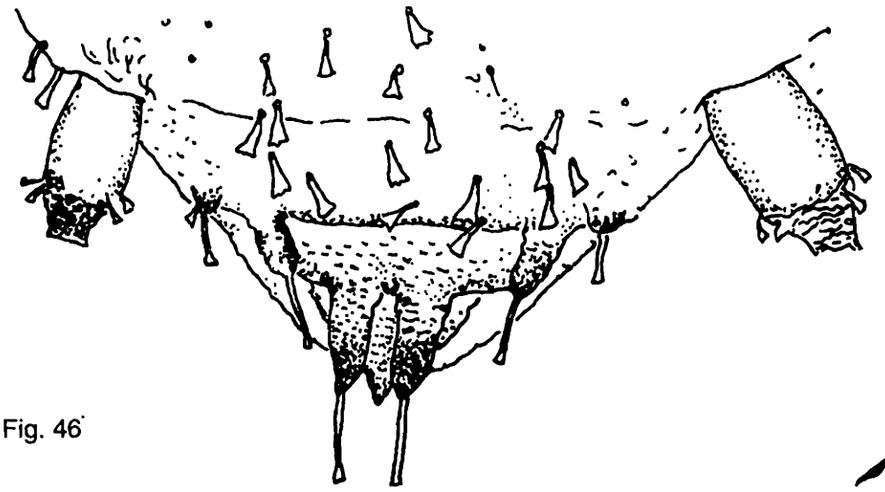


Fig. 46

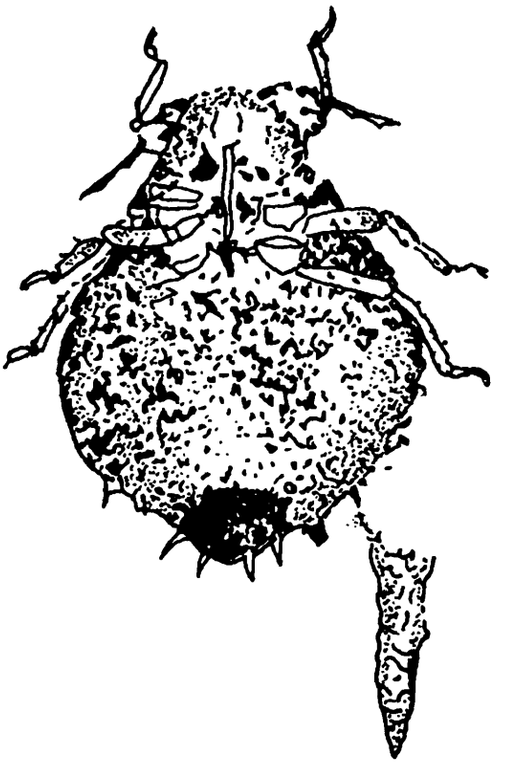
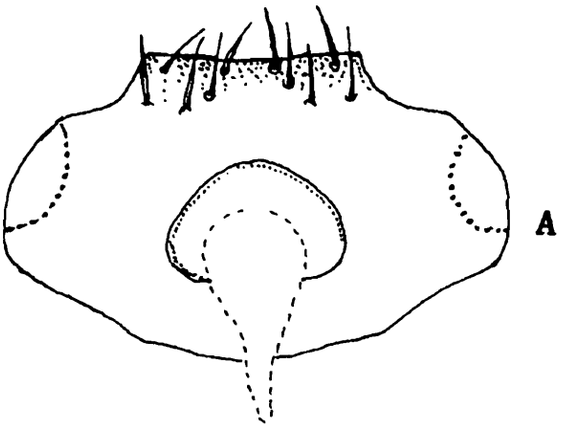


Fig. 48



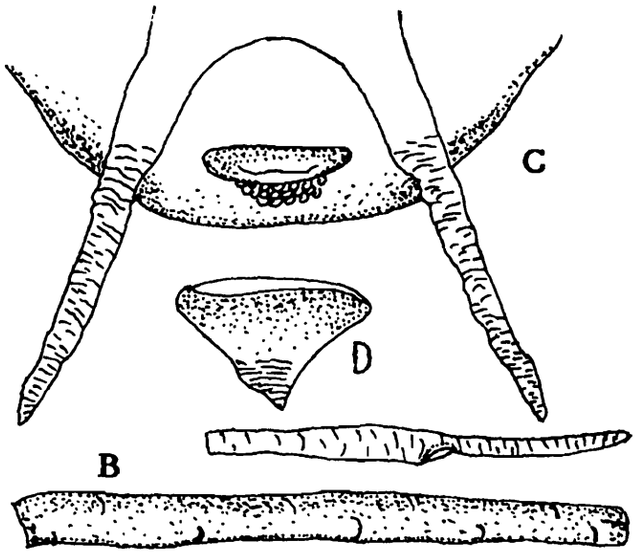


Fig. 47

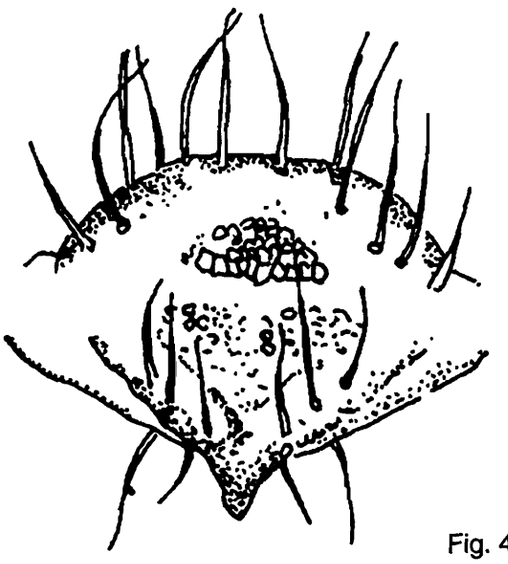


Fig. 49

Figs. 46-49 : 46. *Anomalosiphum indigoferae* Ghosh *et al.*:Aptera: : Posterior abdominal dorsum; 47. *Schoutedenia ralumensis* Rubsaamen: Aptera: A, Dorsum of head; B, A.s. III & IV; C, Posterior portion of abdomen; D, Siphunculus; 48. *Sumatraphis celti* Takahashi: Alata: Whole body; 49. *Greenidea (Trichosiphum) formosana heeri* Raychaudhuri *et al.* : Portion of posterior abdominal dorsum showing subgenital, subanal plates and cauda.

Measurements (Aptera) : Length of body 2.16; width of body 1.05; antenna 1.35; a.s. III 0.38, IV 0.17, V 0.20, VI (0.17+0.28); u.r.s. 0.10; h.t.2 0.11; siphunculus 2.92

Distribution : India : Sikkim (West Sikkim), Himachal Pradesh, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Nepal.

Remarks : According to Ghosh and Agarwala (1993) the species has monoecious holocyclic life cycle at least in parts of its distribution range. It is interesting to note that the aphid sheds off one of the two siphunculi when disturbed with a pointed object.

132. ***Eutrichosiphum arunachali*** Basu, Ghosh and Raychaudhuri

1972. *Eutrichosiphum (Eutrichosiphum) arunachali* Basu, Ghosh and Raychaudhuri, *Sci. Cult.*, **38** : 494

1980. *Eutrichosiphum (Eutrichosiphum) arunachali* Basu *et al.*; Mondal and Raychaudhuri, *Entomon*, **6** : 363

1993. *Eutrichosiphum (Eutrichosiphum) arunachali* Basu *et al.*; Ghosh and Agarwala, *Fauna of India : Homoptera : Aphidoidea* pt. 6, *Greenideinae* : 81

Material : Apterae, on *Quercus* sp., Tinbong, Sikkim, 19.x.1975., C.U.Coll.

Measurements (Aptera) : Length of body 1.64; width of body 0.90; antenna 0.77; a.s. III 0.33, IV 0.10, V (0.09+0.13); u.r.s. 0.19; h.t.2 0.09; siphunculus 0.41.

Distribution : India : Sikkim (North Sikkim), Arunachal Pradesh.

Remarks : The species is characterised by its having body hairs exclusively with acute or acuminate apices. It is originally described from Arunachal Pradesh (Basu *et al.*, 1972).

133. ***Eutrichosiphum betulae*** Mondal, Chatterjee and Raychaudhuri (Fig. 50)

1979. *Eutrichosiphum (Neoparatrichosiphum) betulae* Mondal, Chatterjee and Raychaudhuri,*Entomon*, **4** : 77

1993. *Eutrichosiphum betulae* Mondal *et al.*; Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea*, pt. 6, *Greenideinae* : 91

Material : Apterae, on *Betula* sp., Phodang, Sikkim, 19.x.1975, Coll. P.K.Mondal.

Measurements (Aptera) : Length of body 3.40; width of body 1.72; antenna 2.60; a.s. III 0.65, IV 0.35, V 0.40, VI (0.28+0.78); u.r.s. 0.30; h.t.2 0.15; siphunculus 1.60.

Distribution : India : Sikkim (North Sikkim)

Remarks : The species is distinguishable from its nearest ally *Eutrichosiphum raychaudhurii* Ghosh in having very long processus terminalis and long and thin hairs in the body. It is known only from its type locality (Sikkim).

134. ***Eutrichosiphum davidi*** Raychaudhuri

1956. *Eutrichosiphum davidi* Raychaudhuri, *Zool. verh.* Leiden, **31** : 11

1993. *Eutrichosiphum davidi* Raychaudhuri; Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea*, pt. 6, *Greenideinae* : 94

Material : Aptera, on *Quercus* spp., Gangtok, Sikkim, Date nil., Coll. M.R.Ghosh.

Measurements (Aptera) : Length of body 3.08; width of body 1.58; antenna 1.25; a.s., III 0.47, IV 0.18, V(0.19+0.30); u.r.s. 0.50; h.t.2 0.19; siphunculus 0.56.

Distribution : India : Sikkim (East Sikkim), Karnataka, Tamil Nadu. *Elsewhere* : Nepal.

Remarks : The presence of distinct spinules on the dorsum of thorax and abdomen is the distinguishing features of the species.

135. ***Eutrichosiphum pseudopasaniae*** Szelegiewicz

1968. *Eutrichosiphum pseudopasaniae* Szeligiewicz, *Annls. Zool. Warsz.*, **25** : 466

1993. *Eutrichosiphum pseudopasaniae* Szelegiewicz; Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea*, pt. 6, *Greenideinae* : 119

Material : Apterae, on *Quercus* sp., Namchi, Sikkim, 22.x.1975, C.U. Coll.

Measurements (Aptera) : Length of body 1.70; width of body 1.00; antenna 0.95; a.s. III 0.40, IV 0.12, V (0.11+0.19); u.r.s. 0.18; h.t.2 0.10; siphunculus 0.48.

Distribution : India : Sikkim (South Sikkim), Arunachal Pradesh, Manipur, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Nepal; Vietnam.

136. ***Eutrichosiphum quercifoliae*** Raychaudhuri, Ghosh, Banerjee and Ghosh

1973. *Eutrichosiphum (Eutrichosiphum) quercifoliae* Raychaudhuri, Ghosh, Banerjee and Ghosh, *Kontyu*, **41** : 57

1993. *Eutrichosiphum quercifoliae* Raychaudhuri *et al.*; Ghosh and Agarwala, Fauna of India, Homoptera: Aphidoidea, pt. 6, Greenideinae : 125.

Material : Aptera, on *Quercus* sp., Gangtok, Sikkim, 27.xi.1971, C.U. Coll.

Measurements (Aptera) : Length of body 2.37; width of body 1.00; antenna 1.25; a.s. III 0.55, IV 0.22, V (0.15+0.24); u.r.s. 0.36; h.t.2 1.10; siphunculus 1.07.

Distribution : India : Sikkim (East Sikkim), West Bengal.

Remarks : Oak trees are infested by the species in the eastern Himalaya. Ghosh and Agarwala (1993) consider *Eutrichosiphum monoji* Chatterjee *et al.*, 1981 as a synonym of *Eutrichosiphum quercifoliae* Raychaudhuri *et al.*, because they did not find any discontinuous variation in the morphological characters of the two species.

137. ***Eutrichosiphum sikkimense*** Raychaudhuri, Ghosh, Banerjee and Ghosh

1973. *Paratrichosiphum (Paratrichosiphum) sikkimense* Raychaudhuri, Ghosh, Banerjee and Ghosh *Kontyu*, **41** : 71

1993. *Eutrichosiphum sikkimense* Raychaudhuri *et al.*, Ghosh and Agarwala, Fauna of India, Homoptera : Aphidoidea, pt. 6. Greenideinae : 143

Material : 1 apterous viviparous female and 3 nymphs, on *Duabanga sonneratoides*, Singtam, Sikkim, 24.xii.1970, C.U. Coll.

Measurements (Aptera) : Length of body 2.00; width of body 0.85; antenna 0.87; a.s. III 0.30, IV 0.12, V (0.13+0.18); u.r.s. 0.15; h.t.2 0.12; siphunculus 0.63.

Distribution : India : Sikkim (East Sikkim).

Remarks : The species is hitherto known only from Sikkim in the Eastern Himalaya.

138. ***Eutrichosiphum tapatii*** Mondal, Chatterjee and Raychaudhuri (Fig. 51)

1979. *Eutrichosiphum (Eutrichosiphum) tapatii* Mondal, Chatterjee and Raychaudhuri, *Entomon*, **4** : 77

1993. *Eutrichosiphum tapatii* Mondal *et al.*; Ghosh and Agarwala, Fauna of India, Homoptera : Aphidoidea, pt. 6, Greenideinae : 148

Material : 1 apterous viviparous female, on indet host, Sanklang, Sikkim, 3.xi.1974, C.U.Coll.

Measurements (Aptera) : Length of body 2.20; width of body 1.12; antenna 1.00; a.s. III 0.45, IV 0.16, V (0.13+0.17); u.r.s. 0.11; h.t.2 0.11; siphunculus 1.50.

Distribution : India : Sikkim (North Sikkim), Himachal Pradesh, Uttar Pradesh.

Remarks : The species is so far known by apterous viviparous morph only.

Key to the subgenera of genus *Greenidea*

1(2) Hind tibiae with a variable number of transverse cuts ..... ***Paragreenidea***

2(1) Hind tibiae without any transverse cut... 3

3(4) Siphunculi in apterous viviparous morph distinctly reticulated near the base on one surface ..... ***Trichosiphum***

4(3) Siphunculi in apterae viviparae distinctly reticulated on both surfaces throughout the length ..... ***Greenidea* s.s.**

Key to the species of the subgenus *Greenidea*

Apterous viviparous female

1(2) None of the hairs on siphunculi with furcated apices; antennae shorter than body ..... *decuspermi*

2(1) At least some of the hairs on siphunculi with furcated apices 3

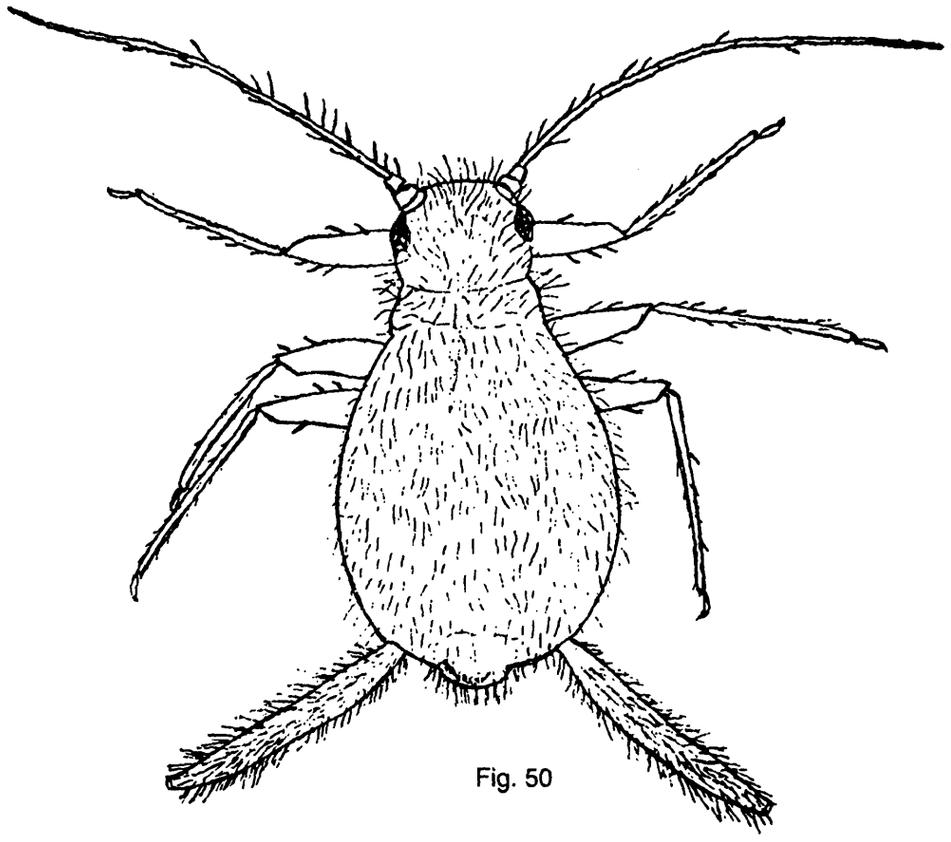


Fig. 50

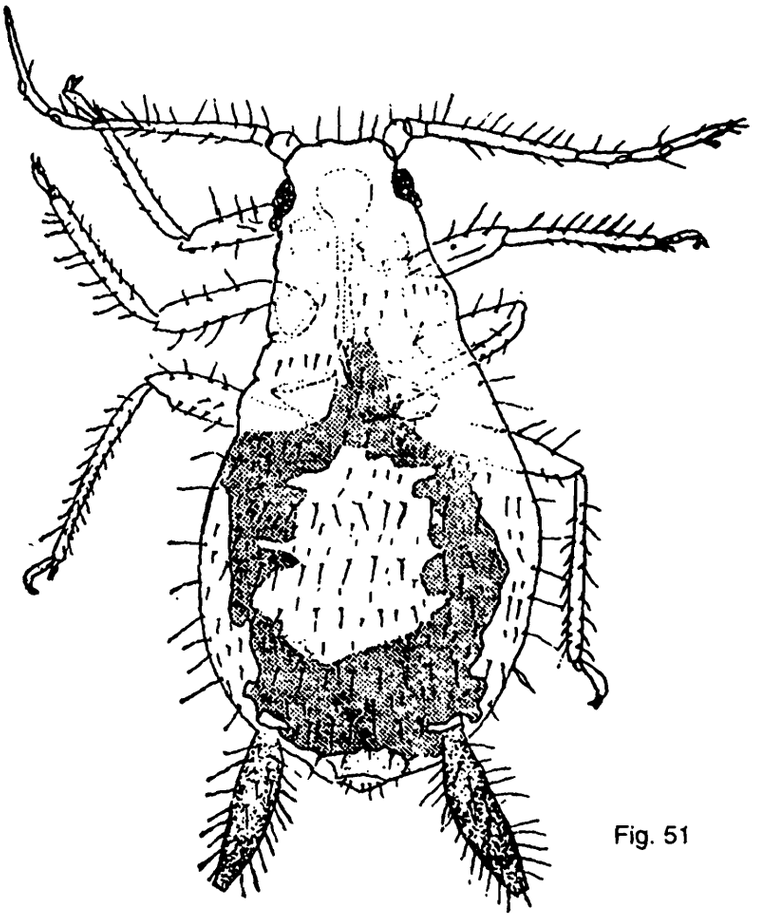


Fig. 51

Figs. 50-51 : 50. *Eutrichosiphum (Neoparatrichosiphum) butulae* Mondal *et al.*: Aptera; 51. *Eutrichosiphum (Eutrichosiphum) tapatii* Mondal *et al.* : Aptera

3(4) Siphunculi upto about 0.40 times as long as body; siphunculi sparsely spinulose except near the apical region which is densely spinulose ..... *ficicola*

4(3) Siphunculi 0.42 – 0.87 times as long as body 5

5(6) Siphunculi long, 0.57—0.70 times as long as body; segment 4 of u.r.s. with less than 10 accessory hairs ..... *longicornis*

6(5) Siphunculi much shorter, 0.42–0.57 times as long as body; segment 4 of u.r.s. with more than 10 accessory hairs; u.r.s. upto about 2.70 times as long as h.t.2 .... *longirostris*

Key to the species of subgenus *Trichosiphum*

1(2) Antennal segment III and tibiae partly or entirely smooth 3

2(1) Antennal segment III and tibiae imbricated 5

3(4) Siphunculi long, 0.80–0.90 mm long .... *brachyunguis*

4(3) Siphunculi short, less than 0.55 mm long; cauda with 4 hairs ..... *sikkimensis*

5(6) Abdominal venter with a dark spinopleural sclerotic patch, evenly spinulose .... *prunicola*

6(5) Abdominal venter with median region smooth, laterally variably spinulose 7

7(8) P.t. longer than a.s. III; u.r.s. 1.20–1.70 times as long as h.t.2 ..... *formosana heeri*

8(7) P.t. shorter to subequal to a.s.III; dorsum of abdomen brown, sclerotic and wrinkled ..... *bucktonis*

139. *Greenidea (Greenidea) decaspermi* Takahashi

1933. *Greenidea decaspermi* Takahashi, *Philipp. J. Sci.*, **52** : 294

1993. *Greenidea (Greenidea) decasspermi* Takahashi; Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea, pt. 6 Greenideinae* : 178

Material : Apterae, on *Quercus* sp., Gangtok, Sikkim date nil, C.U. Coll.

Measurements (Apterae) : Length of body 2.55; width of body 1.26; antenna 2.55; a.s. III 0.65, IV 0.34, V 0.40, VI (0.34+0.62); u.r.s. 0.22; h.t.2 0.11; siphunculus 1.30.

Distribution : India : Sikkim (East Sikkim), Karnataka, Meghalaya. *Elsewhere* : Nepal; Taiwan.

Remarks : The species can be easily recognised by its siphunculi longer than hind tibiae and venter of abdomen evenly spinulose throughout.

140. *Greenidea (Greenidea) ficicola* Takahashi

1916. *Trichosiphum formosanum* Maki, *Essays for Nowa for Nowa Gifu* : 13(Partim)

1921. *Greenidea ficicola* Takahashi, *Aphids of Formosa*, **1** : 66.

1993. *Grenidea (Greenidea) ficicola* Takahashi; Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea, pt. 6, Greenideinae* : 181

Material : Aptera, on *Ficus* sp., Gangtok, Sikkim, 21.xi.1984, Coll. S. Mahapatra.

Measurements (Aptera) : Length of body 2.08; width of body 1.17; antenna (broken); a.s. III 0.52, IV broken, V broken, VI broken; u.r.s. 0.24; h.t.2 0.10; siphunculus 0.72.

Distribution : India : Sikkim (East Sikkim), Delhi, Himachal Pradesh, Tamil Nadu, Uttar Pradesh, West Bengal. *Elsewhere* : Australia; Bangladesh; East China; Indonesia; Malayasia; Nepal; Russia; Taiwan.

141. *Greenidea (Greenidea) longicornis* (Ghosh, Ghosh and Raychaudhuri)

1970. *Greenidea longicornis* Ghosh, Ghosh and Raychaudhuri, *Oriental Ins.*, **4** : 380.

1993. *Greenidea (Greenidea) longicornis* (Ghosh *et al.*); Ghosh and Agarwala *Fauna of India, Homoptera : Aphidoidea, pt. 6, Greenideinae* : 187.

Material : Alata on an indet host, Gangtok, Sikkim, 26.iii.1970, C.U. Coll.

Measurements (Alata) : Length of body 2.60; width of body 1.00; antenna 3.80; a.s. III 0.96, IV 0.55, V 0.55, VI (0.40+0.11); u.r.s. 0.22; h.t.2 0.14; siphunculus 2.90.

Distribution : India : Sikkim (East Sikkim), Meghalaya.

Remarks : The species has very long and slender siphunculi (upto 0.87 times as long as body).

142. ***Greenidea (Greenidea) longirostris*** Basu

1969. *Greenidea longirostris* Basu, *Oriental Ins.*, **3** : 358

1993. *Greenidea (Greenidea) longirostris* Basu; Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea, pt. 6, Greenideinae* : 189

Material : Apterae, on *Schima wallichii*, Chubba, 25.xii.1970., Coll. C.U.

Measurements (Aptera) : Length of body 2.20; width of body 1.04; antenna 2.20; a.s. III 0.50, IV 0.30, V 0.34, VI (0.30+0.70); u.r.s. 0.25; h.t.2 0.12; siphunculus 1.20.

Distribution : India : Sikkim (East Sikkim), Meghalaya, West Bengal.

143. ***Greenidea (Paragreenidea) symplocosis*** Ghosh, Basu and Raychaudhuri

1969. *Greenidea symplocosis* Ghosh, Basu and Raychaudhuri, *Oriental Ins.*, **3** (3) : 248.

1993. *Greenidea (Paragreenidea) symplocosis* Ghosh *et al.*; Ghosh and Agarwala, *Fauna of India, Homoptera: Aphidoidea, pt. 6, Greenideinae* : 205

Material : Alata, on indet plant Gangtok, Sikkim, 26.iii.1969; apterae, on *Symplocos* sp., Jamlongaon, 23.iii.1970, C.U. Coll.

Measurements (Aptera) : Length of body 2.68; width of body 1.10; antenna 3.65; a.s. III 0.80, IV 0.50, V 0.55, VI (0.38+1.20); u.r.s. 0.17; h.t.2 0.14; siphunculus 2.20.

Measurements (Alata) : Length of body 2.20; width of body 0.80; antenna 1.85; a.s. III 0.60, IV 0.25, V 0.25, VI (0.20+0.40); u.r.s. 0.20; h.t.2 0.11; siphunculus 1.62.

Distribution : India : Sikkim (East Sikkim), Meghalaya, West Bengal.

144. ***Greenidea (Trichosiphum) brachyunguis*** Chatterjee, Mondal and Raychaudhuri

1981. *Greenidea (Trichosiphum) brachyunguis* Chatterjee, Mondal and Raychaudhuri, *Entomon*, **6** : 364

1993. *Greenidea (Trichosiphum) brachyunguis* Chatterjee *et al.*; Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea, Pt. 6, Greenideinae* : 211

Material : Apterae, on *Quercus* sp., Gangtok, 27.xi.1971, C.U.Coll.

Measurements (Aptera) : Length of body 2.75; width of body 1.62; antenna 1.80; a.s. III 0.62, IV 0.20, V 0.22, VI (0.19+0.40); u.r.s. 0.24; h.t.2 0.15; siphunculus 0.82.

Distribution : India : Sikkim (East Sikkim).

Remarks : The species is so far known only from the State of Sikkim.

145. ***Greenidea (Trichosiphum) bucktonis*** Ghosh, Basu and Raychaudhuri

1970. *Greenidea (Trichosiphum) bucktonis* Ghosh, Basu and Raychaudhuri, *Oriental Ins.*, **4** : 69

1993. *Greenidea (Trichosiphum) bucktonis* Ghosh *et al.*; Ghosh and Agarwala, *Fauna of India, Homoptera: Aphidoidea, pt. 6, Greenideinae* : 212

Material : Apterae and nymphs, on *Duabonga sonneritodes*, Singtam, 25.xii.1970. C.U.Coll.

Measurements (Aptera) : Length of body 2.20; width of body 1.23; antenna 1.68; a.s. III 0.52, IV 0.18, V 0.22, VI (0.23+0.34); u.r.s. 0.22; h.t.2 0.12; siphunculus 0.50.

Distribution : India : Sikkim (East Sikkim), Meghalaya, Uttar Pradesh and West Bengal.

Remarks : This is an endemic species.

146. ***Greenidea (Trichosiphum) formosana heeri*** Raychaudhuri, Ghosh, Banerjee and Ghosh (Fig. 49)

1993. *Greenidea (Trichosiphum) heeri* Raychaudhuri *et al.*; Ghosh and Agarwala, *Fauna of India, Homoptera: Aphidoidea, pt. 6 Greenideinae* : 221

Material : Apterae, on *Psidium guajava*, Singhik, 4.xi.1974; Alata, on *Eugenia jambolana*, Singtam, 24.xii.1970., C.U. Coll.

Measurements (Aptera) : Length of body 2.10; width of body 1.18; antenna 1.70; a.s. III 0.42, IV 0.23, V 0.25, VI (0.20+0.46); u.r.s. 0.19; h.t.2 0.11; siphunculus 0.50.

Measurements (Alata) : Length of body 2.20; width of body 0.95; antenna 2.15; a.s. III 0.62, IV 0.32, V 0.30, VI (0.30+0.46); u.r.s. 0.19; h.t.2 0.11; siphunculus 1.36.

Distribution : India : Sikkim (East Sikkim), Manipur, Meghalaya, Nagaland South India, Uttar Pradesh, West Bengal. *Elsewhere* : Nepal.

147. ***Greenidea (Trichosiphum) prunicola*** Ghosh, Banerjee and Raychaudhuri

1971. *Greenidea (Trichosiphum) prunicola* Ghosh, Banerjee and Raychaudhuri, *Proc. zool. Soc. Calcutta,* **26** : 104

1993. *Greenidea (Trichosiphum) prunicola* Ghosh *et al.;* Ghosh and Agarwala, *Fauna of India, Homoptera: Aphidoidea, pt. 6, Greenideinae* : 230

Material : Apterae and nymphs, on *Prunus* sp., Tashiding, 3.iv.1970, C.U.Coll.

Measurements (Aptera) : Length of body 2.30; width of body 1.32; antenna 1.72; a.s. III 0.40, IV 0.22, V 0.23, VI (0.20+0.48); u.r.s. 0.45; h.t.2 0.11; siphunculus 0.62.

Distribution : India : Sikkim (South Sikkim), Meghalaya.

Remarks : The species infests leaf bases and apical stem of the host plant.

148. ***Greenidea (Trichosiphum) sikkimensis*** Raychaudhuri, Ghosh, Banerjee and Ghosh

1973. *Greenidea (Trichosiphum) sikkimensis* Raychaudhuri, Ghosh, Banerjee and Ghosh *Kontyu,* **41**(1) : 69

1993. *Greenidea (Trichosiphum) sikkimensis* Raychaudhuri, *et al.;* Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea, pt.6, Greenideinae* : 231

Material : 1 aptera and 1 alata, on *Quercus* sp., Gangtok, 29.xii.1972, C.U.Coll.

Measurements (Aptera) : Length of body 2.57; width of body 1.17; antenna 1.62; a.s. III 0.56, IV 0.23, V 0.23, VI (0.19+0.32); u.r.s. 0.28; h.t.2 0.12; siphunculus broken.

Measurements (Alata) : Length of body 2.51; width of body 1.15; antenna 1.63; a.s. III 0.55, IV 0.22, V 0.23, VI (0.19+0.30); u.r.s. 0.27; h.t.2 0.12; siphunculus broken.

Distribution : India : Sikkim (East Sikkim), Meghalaya.

Remarks : The species is characterised in having abdominal hairs with furcated apices and mid ventral area of abdomen spinulose.

Genus 72. ***Greenideoida*** van der Goot

1917. *Greenideoida* van der Goot, *Contrib. Faunae Indes Neerl.,* **1** : 140.

Type species : *Greenideoida elongata* van der Goot 1917

149. ***Greenideoida (Paratrichosiphum) luteum*** (Basu)

1969. *Paratrichosiphum luteum* Basu, *Oriental Ins.,* **3** : 183

1993. *Greenideoida (Paratrichosiphum) luteum* Basu; Ghosh and Agarwala, *Fauna of India, Homoptera: Aphidoidea, pt. 6, Greenideinae* : 263

Material : Apterae, alata and nymphs, on *Quercus* sp., Deorali, 16.xi.1974, C.U.Coll.

Measurements (Aptera) : Length of body 2.30; width of body 0.85; antenna 0.97; a.s. III 0.50, IV 0.17, V (0.15+0.26); u.r.s. 0.18; h.t.2 0.09; siphunculus 1.20.

Measurements (Alata) : Length of body 2.60; width of body 1.0; antenna 1.32; a.s. III 0.56, IV 0.19, V (0.18+0.25); u.r.s. 0.15; h.t.2 0.10; siphunculus 1.30.

Distribution : India : Sikkim (East Sikkim), Arunachal Pradesh, Meghalaya, West Bengal. *Elsewhere* : Bhutan.

Remarks : The species is characterised in having 5-segmented antennae, first tarsal segments with 7 hairs, forewings with Media twice branched and hindwings with one oblique vein.

Genus 73. ***Mollitrichosiphum*** Suenaga

1934. *Mollitrichosiphum suenaga, Bull. Kagoshima Imp. Coll. Agric. For.,* **1** : 798.

Type species : *Trichosiphum tenuicorpus* Okajima 1908

Key to the subgenera of genus *Mollitrichosiphum*

1(2) Flagellum with long and short hairs; radial sector curved ..... ***Metatrichosiphon***

2(1) Flagellum with hairs almost of equal lengths; radial sector nearly straight..... ..... ***Mollitrichosiphum***

Key to the species of the subgenus *Mollitrichosiphum*

Apterous viviparous female

1(2) Dorsum of abdomen sclerotic, pale or yellowish brown but never with a solid patch *tenuicorpus*

2(1) Dorsum of abdomen with a solid brown or dark brown patch extending spinopleurally on 2nd–6th tergites 3

3(4) Antennae 0.58–0.63 times as long as body ..... *trilocum*

4(3) Antennae 0.46–0.57 times as long as body ..... *nigriabdominalis*

150. ***Mollitrichosiphum (Mollitrichosiphum) nigriabdominalis*** Agarwala, Mondal and Raychaudhuri

1982. *Mollitrichosiphum nigriabdominalis* Agrawala, Mondal and Raychaudhuri *Entomon, Z* : 41

1993. *Mollitrichosiphum (Mollitrichosiphum) nigriabdominalis* Agarwala *et al.*; Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea, pt. 6, Greenideinae* : 272

Material : 4 apterae, on *Quercus rubra*, Sanklang, Sikkim, 3.xi.1974, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 2.15; width of body 1.00, antenna 1.56; a.s. III 0.57, IV 0.19, V 0.22, VI (0.16+0.24); u.r.s. 0.26; h.t.2 0.12; siphunculus 1.15

Distribution : India : Sikkim (North Sikkim).

Remarks : The species is so far known from its type locality. It is characterised in having a distinct median brown patch on abdominal dorsum.

151. ***Mollitrichosiphum (Mollitrichosiphum) tenuicorpus*** Okajima

1908. *Trichosiphum tenuicorpus* Okajima, *Bull. Coll. Agric. Tokyo Imp. Univ.* **8** : 22

1973. *Mollitrichosiphum (Mollitrichosiphum) shinji* Raychaudhuri, Ghosh, Banerjee and Ghosh, *Kontyu*, **41** : 70

1993. *Mollitrichosiphum (Mollitrichosiphum) tenuicorpus* Okajima, Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea pt. 6, Greenideinae* : 273

Material : Apterae, on *Quercus rubra*, Sanklang, Sikkim, 2.ix.1974, C.U.Coll.; alata, on *Castanopsis* sp., Gangtok, 28.x.1962, C.U. Coll.

Measurements (Aptera) : Length of body 2.78; width of body 1.27; antenna 2.14; a.s. III 0.20, IV 0.22, V 0.29, VI (0.18+0.30); u.r.s. 0.25; h.t.2 0.13; siphunculus 1.86.

Measurements (Alata) : Length of body 2.16; width of body 0.90; antenna 2.30; a.s. III 1.04, IV 0.27, V 0.32, VI (0.20+0.35); u.r.s. 0.24; h.t.2 0.12; siphunculus 2.24

Distribution : India : Sikkim (East Sikkim), Meghalaya, West Bengal. *Elsewhere* : Indonesia; Japan.

152. ***Mollitrichosiphum (Mollitrichosiphum) trilocum*** Agarwala and Ghosh

1993. *Mollitrichosiphum (Mollitrichosiphum) trilocum* Agarwala and Ghosh, *Fauna of India, Homoptera: Aphidoidea, pt. 6, Greenideinae* : 279

Material : Not examined

Measurements (Aptera, Holotype – after Ghosh and Agarwala, 1983 : 280) Length of body 2.72; width of body 1.15; antenna 1.73; a.s. III 0.73, IV 0.21, V 0.28, VI (0.19+0.30); u.r.s. 0.26; h.t.2 0.11; siphunculus 1.60.

Distribution : India : Sikkim (East Sikkim).

Remarks : The species is known only by apterous viviparous females collected on *Quercus* sp. in Gangtok, Sikkim. It is closely allied to *Mollitrichosiphum nigriabdominalis* Agarwala *et al.* but differs in the central brown patch much

darker, antennae and siphunculi much longer and also longer flageller hairs (longest hair on a.s. III about 4 times as long as b.d. III. [Ghosh and Agarwala (1993)].

Key to the species of subgenus *Metatrichosiphon*

Apterous viviparous female

1(2) Longest hair on a.s. III 5.50–6.5 times as long as b.d. III ..... *montanum*

2(1) Longest hair on a.s. III 2.30–4.70 times as long as b.d. III 3

3(4) Abdominal dorsum locally spinulose; 7th tergite with 9–12 hairs ..... *nandii*

4(3) Abdominal dorsum never spinulose; hind tibiae with 18–22 ridges all over the length ..... *buddleiae*

153. ***Mollitrichosiphum (Metatrichosiphon) buddeleiae*** Ghosh, Banerjee and Raychaudhuri

1971. *Mollitrichosiphum (Metatrichosiphon) buddleiae* Ghosh, Banerjee and Raychaudhuri, *Proc.zool.Soc. Calcutta,* **26** : 107

1980. *Mollitrichosiphum (Metatrichosiphon) acutihirsutam* Maity and Chakrabarti, *Annals Zoologici,* **35** : 312

1993. *Mollitrichosiphum (Metatrichosiphon) buddleiae,* Ghosh *et al.;* Ghosh and Agarwala, *Fauna of India, Homoptera; Aphidoidea, pt. 6 Greenideinae* : 281

Material : Apterae and alata, on *Buddleia* sp. Pelling, Sikkim, 14.iii.1970, C.U. Coll.

Measurements (Aptera) : Length of body 2.42; width of body 1.14; antenna 1.20; a.s. III 0.40, IV 0.14, V 0.18, VI (0.15+0.17); u.r.s. 0.17; h.t.2 0.13; siphunculus 0.69.

Measurements (Alata) : Length of body 2.37; width of body 0.91; antenna broken; a.s. III broken. IV broken, V broken, VI broken; u.r.s. 0.16; h.t.2 0.10; siphunculus 1.50.

Distribution : India : Sikkim (West Sikkim), Uttar Pradesh.

154. ***Mollitrichosiphum (Metatrichosiphon) montanum*** (van der Goot)

1917. *Trichosiphum montanum* van der Goot, *Rec. Indian. Mus.,* **13** : 179

1970. *Mollitrichosiphum (Metatrichosiphon) alini* Ghosh, Ghosh and Raychaudhuri, *Oriental Ins.,* **4** : 200

1978. *Mollitrichosiphum (Metatrichosiphon) alnifoliae* Chakrabarti and Raychaudhuri, *Entomon,* **3** : 98

1993. *Mollitrichosiphum (Metatrichosiphon) montanum* (van der Goot); Ghosh and Agarwala, *Fauna of India, Homoptera : Aphidoidea, pt. 6, Greenideinae*: 287

Material : Apterae, alata and nymphs, on *Alnus nepalensis,* Gangtok, Sikkim, 28.x.1971; Apterae, alata and nymphs, on *Alnus nepalensis,* Ranipal, 29.x.1971; Alate oviparous females, alata, on *Alnus nepalensis,* N.S.H., 23.xii.1970; Alate male, alata and nymphs, on *Alnus nepalensis,* Gangtok, 16.xi.1974, C.U.Coll.

Measurements (Aptera) : Length of body 1.90; width of body 0.75; antenna 1.40; a.s. III 0.40, IV 0.16, V 0.17, VI (0.16+0.24); u.r.s. 0.18; h.t.2 0.10; siphunculus 1.60.

Measurements (Alata) : Length of body 2.00; width of body 0.70; antenna 1.60; a.s. III 0.52, IV 0.22, V 0.24, VI (0.20+0.25); u.r.s. 0.19; h.t.2 0.10; siphunculus 1.92.

Measurements (Ovipara) : Length of body 2.65; width of body 0.82; antenna 1.60; a.s. III 0.55, IV 0.20; V 0.22, VI (0.16+0.19); u.r.s. 0.18; h.t.2 0.11; siphunculus 1.80.

Measurements (Alate male) : Length of body 1.83; width of body 0.51; antenna broken; a.s. III 0.55, IV 0.24, V 0.24, VI (0.18+ ?); u.r.s. 0.17; h.t.2 0.10; siphunculus 1.19.

Distribution : India : Sikkim (East Sikkim), Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Nepal.

Remarks : Mondal (1977, Ph.D. Thesis) recorded alate male and alate oviparous female of the species for the first time. Find of both the sexual forms along with parthenogenetic morphs in Sikkim suggests the possibility of holocyclic life cycle of the species at least in the north east Himalaya.

155. ***Mollitrichosiphum (Metatrichosiphon) nandii*** Basu

1964. *Mollitrichosiphum (Metatrichosiphon) nandii* Basu, *J. Linn. Soc. (Zool.),* **45** : 233

1993. *Mollitrichosiphum (Metatrichosiphon) nandii* Basu: Ghosh and Agarwala, *Fauna of India, Homoptera: Aphidoidea, pt. 6, Greenideinea* : 292

Material : Apterae and alatae, on *Betula alnoides,* Mangan, 2.xi.1974; Apterae and nymphs, on *Betula alnoides,* Gangtok, 16.x.1975, C.U.Coll.

Measurements (Aptera) : Length of body 2.20; width of body 1.00; antenna 1.28; a.s. III 0.42; IV 0.15, V 0.19, VI (013+0.22); u.r.s. 0.16; h.t.2 0.11; siphunculus 1.32.

Measurements (Alata) : Length of body 2.30; width of body 1.00; antenna 1.80; a.s. III 0.55, IV 0.22, V 0.24, VI (0.17+0.28); u.r.s. 0.18; h.t.2 0.12; siphunculus 1.40.

Distribution : India : Sikkim (East Sikkim, North Sikkim), West Bengal.

Remarks : The species is characterised in having abdominal dorsum locally spinulose. It is an endemic species. It has been reported to attack the tender portion of leaf axils of its host plant make heavy infestations.

Subfamily HORMAPHIDINAE

Key to the Tribes of Subfamily Hormaphidinae

1(2) Frons with a pair of horn-like processi at least in apterae; siphunculi present, usually pore-like, on Poaceae or Asteraceae, Loranthaceae and Styracaceae ..... **Ceratiphidini**

2(1) Frons without horn-like processi; siphunculi pore-like or entirely absent; usually on Fagaceae, also on Fauraceae and Hammamelidaceae ..... **Nipponaphidini**

Key to the genera of the Tribe Ceratiphidini

1(2) Frons in both apterae and alatae normal without any process or tubercles 3

2(1) Frons in apterae and often alatae with distinct frontal process or lowly developed tubercles 5

3(4) Body aleurodiform in apterae, with row of wax glands arranged along the entire margin, ultimate rostral segment longer than second joint of hind tarsus ..... ***Aleurodaphis***

4(3) Body without lateral wax glands; ultimate rostral segment distinctly shorter than second joint of hind tarsus ..... ***Glyphinaphis***

5(6) Wax glands in localised groups absent in apterae; tergum pale; frontal horns rounded; abdominal dorsum with distinct marginal hair–bearing sclerites ..... ***Pseudoastegopteryx***

6(5) Wax glands present in localised group on the margin of body of apterae; tergum usually with segmentation on abdomen... 7

7(8) Subanal plate entire; apterae with numerous wax pores; cauda broadly semilunar; frontal horns in apterae long, pointed, in alatae reduced ..... ***Ceratoglyphina***

8(7) Subanal plate distinctly bilobed; cauda broader than long, distinctly constricted at base 9

9(10) Pronotum in apterae with two pleural grooves, seperated by a median ridge; vertex covered with irregular denticles; one dorsoapical hair of second tarsal segments in both apterae and alatae, first instar larvae of two types ..... ***Pseudoregma***

10(9) Pronotum in apterae without deep pleural grooves, evenly rounded in apterae; first instar larvae of one type, with normal legs 11

11(12) Wax gland groups composed of rounded cells or some irregularly shaped ones; dorsoapical hairs on second tarsal segments in both apterae and alatae swollen at apices; siphunculi poriform, often with a sclerotic rim ..... ***Ceratovacuna***

12(11) At least marginal wax gland groups on abdomen with transversely oval cells arranged in a row; both the dorso apical hairs on second tarsal segment in apterae swollen at apices, in alatae one with normal apex; siphunculi on elevated cones encircled by a few hairs ..... ***Astegopteryx***

Genus 74. *Aleorodaphis* van der Goot

1917. *Aleurodaphis* van der Goot, *Contr. Faune Indes Neerl.* **1** (3) : 239

Type species : *Aleurodaphis blumeae* van der Goot

156. *Aleurodaphis blumeae* van der Goot (Fig. 52)

1917. *Aleurodaphis blumeae* van der Goot, *Contr. Faune Indes Neerl.*, **1**(3) : 240

1988. *Aleurodaphis blumeae* van der Goot; Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt.4, Hormaphidinae* : 256

Material : Apterae and nymphs, on *Myosotis paulutris,* Dzongu Lik, 28.v.1975. C.U.Coll.

Measurements (Aptera) : Length of body 1.35; width of body 0.68; antenna 0.42; a.s. III 0.10; IV 0.07; V (0.08+0.04); u.r.s. 0.15; h.t.2 0.09; cauda 0.07.

Distribution : India : Sikkim (North Sikkim), Arunachal Pradesh, Meghalaya, West Bengal. *Elsewhere* : Indonesia; Japan; Korea; Taiwan.

Remarks : The species was originally described from Java on *Blumea* by van der Goot (1917). It infests *Blumea* in Formosa, *Carpesium* in Japan and *Cynoglossum, Montana and Myosotis* in Indian region.

Genus 75. *Astegopteyx* Karsch

1890. *Astegopteryx* Karsh, *Ber.dt.bot.Geo.*, **8** : 51

Type species : *Astegopteryx styracophila* Karsch, 1890

157. *Astegopteryx minuta* (van der Goot) (Figs. 53, 54, 55)

1917. *Oregma minuta* van der Goot, *Contr. Faune. Indes. Neerl.*, **3** : 201

1980. *Astegopteryx minuta* (van der Goot); Raychaudhuri *et al.* In *Aphids of Northeast India and Bhutan* : 364

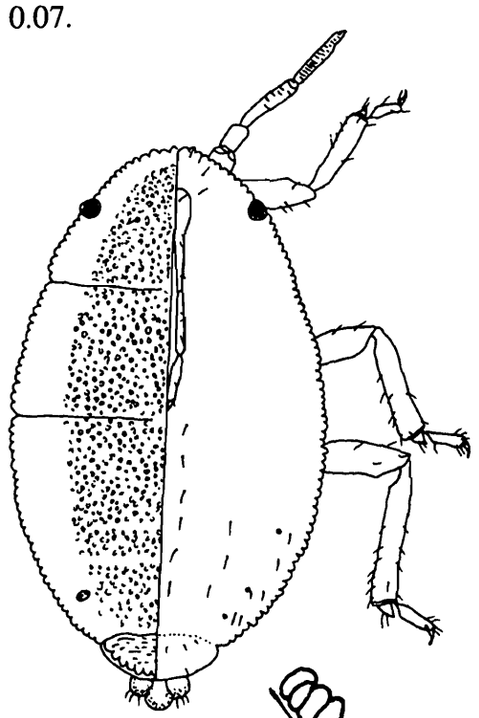


Fig. 52

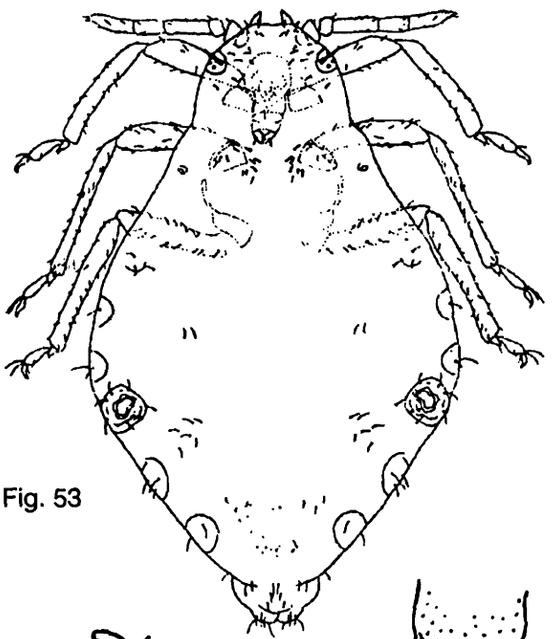


Fig. 53

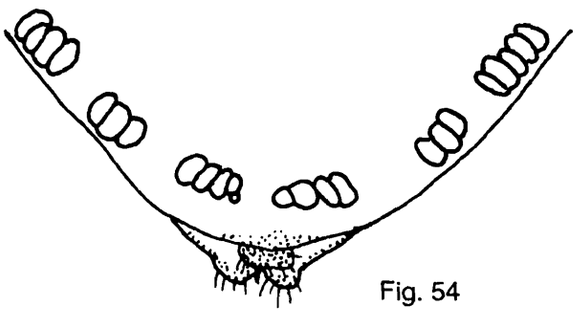


Fig. 54

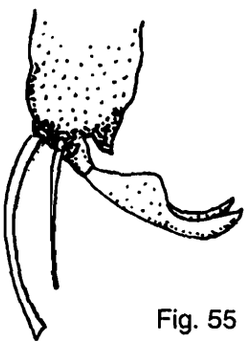


Fig. 55

Figs. 52-55 : 52. *Aleurodaphis blumeae* van der Goot : Apterous viviparous female; 53. *Astegopteryx minuta* (van der Goot) : Apterous viviparous female; 54. *Astegopteryx minuta* (van der Goot) : Aptera: posterior abdominal; 55. *Astegopteryx minuta* (van der Goot) : Alata: Distal portion of h.t.2

1988. *Astegopteryx minuta* (van der Goot); Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 4, Hormaphidinae* : 274

Material : Apterae and nymphs, on *Bambusa* sp., Gangtok, 27.xiii.1971, Coll. M.R. Ghosh.

Measurements (Aptera) : Length of body 1.85; width of body 1.40; antenna 0.52; a.s. III 0.15, IV 0.20, V (0.10+0.02); u.r.s. 0.05; h.t.2 0.08

Distribution : India : Sikkim(East Sikkim), Arunachal Pradesh, Manipur, Meghalaya, Nagaland, South India, West Bengal. *Elsewhere* : Indonesia.

Remarks : Pale green apterae with dark green streaks or patches and scanty wax secretion in life are noticed. The species infests underdurface of leaves of host plants.

Genus 76. ***Ceratoglyphina*** van der Goot

1917. *Ceratoglyphina* van der Goot, *Contr. Faune. Indes. Neerl.*, **3** : 237

Type species : *Ceratoglyphina bambusae* van der Goot.

158. ***Ceratoglyphina bambusae bengalensis*** Ghosh

(Fig. 56)

1972. *Ceratoglyphina bambusae bengalensis* L.K. Ghosh, *Oriental Ins.*, **6** : 301

1988. *Ceratoglyphina bambusae bengalensis* Ghosh; A.K. Ghosh, *Fauna of India, Homoptera: Aphidoidea, pt.4, Hormaphidinae* : 300

Material : Apterae and nymphs, on *Bambusa aurandinacea*, Phodong, 18.x.1975, Coll. M.R.Mondal.

Measurements : (Aptera) : Length of body 1.80; width of body 1.42; antenna 0.38; a.s. III 0.15, IV (0.05+0.05); u.r.s. 0.06; h.t.2 0.09.

Distribution : India : Sikkim(North Sikkim), Assam, Manipur, West Bengal and Northwest India.

Biological notes : Yellow to brown insects with waxy secretion infest nodal region within the leaf sheath of the host plant. The species is attended by black ants *Paratrechina bourbonica*.

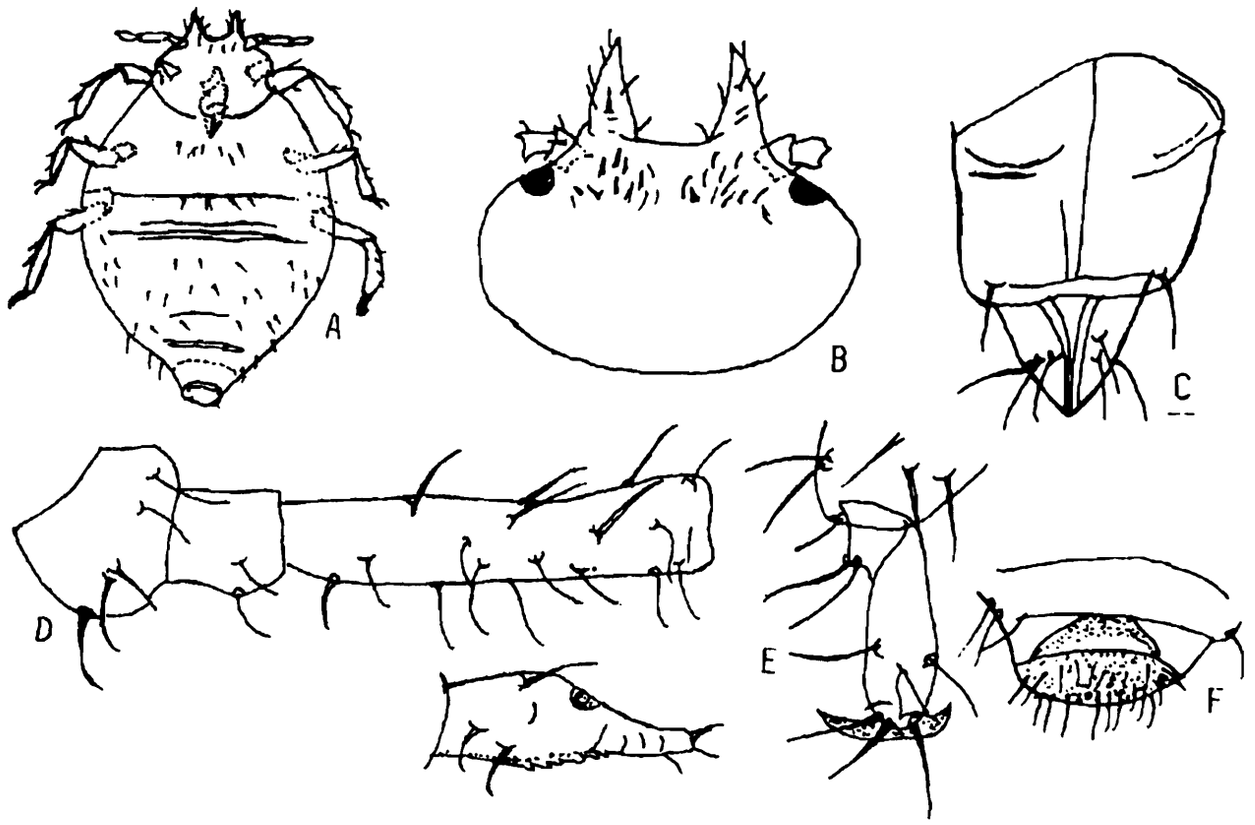


Fig. 56. *Ceratoglyphina bambusae bengalensis* Ghosh: Aptera: A, Body; B, Head; C, U.r.s.; D, Antenna; E, Hind tarsus; F, Portion of abdomen showing cauda

Powdery white secretion may be noted along with margin of body (Ghosh,1988).

Genus 77. ***Ceratovacuna*** Zehntner

1897. *Ceratovacuna* Zehntner, *Archif.Java.Suikerindust.*, **5** : 553

Type species : *Ceratovacuna lanigera* Zehntner, 1897

Key to the species of *Ceratovacuna*

1(2) Abdominal dorsum with spinal wax gland cell groups 3

2(1) Abdominal dorsum without spinal wax gland cell groups 5

3(4) Dorsal abdominal hairs with acute apices, longest hair on a.s. III at least twice as long as b.d. III ..... *perglandulosa*

4(3) Dorsal abdominal hairs with normal or swollen apices; longest hair on a.s. III at most as long as b.d.III ..... *silvestrii*

5(6) Hairs on siphuncular cone long and fine; wax gland cells arranged in transverse row on 8th tergite ..... *indica*

6(5) Hairs on siphuncular cone short and not discernible; wax gland cells arranged irregularly on 8th tergite; antennal segment III, IV nearly smooth; longest hair on a.s. III 0.9-1.0 times as long as b.d.III ..... *lanigera*

159. ***Ceratovacuna indica*** Ghosh, Pal and Raychaudhuri

(Fig. 57)

1974. *Ceratovacuna indica* Ghosh, Pal and Raychaudhuri, *Proc.zool.Soc.Calcutta*, **27** : 96

1988. *Ceratovacuna indica* Ghosh, Pal and Raychaudhuri; Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 4, Hormaphidinae* : 312

Material : Apterae and nymphs, on *Bambus* sp., Ringon, 26.v.1975, Coll. P.K.Mondal.

Measurements (Aptera) : Length of body 1.60; width of body 0.80; antenna 0.32; a.s. III 0.15, IV (0.80+0.02); u.r.s. 0.04; h.t.2 0.06.

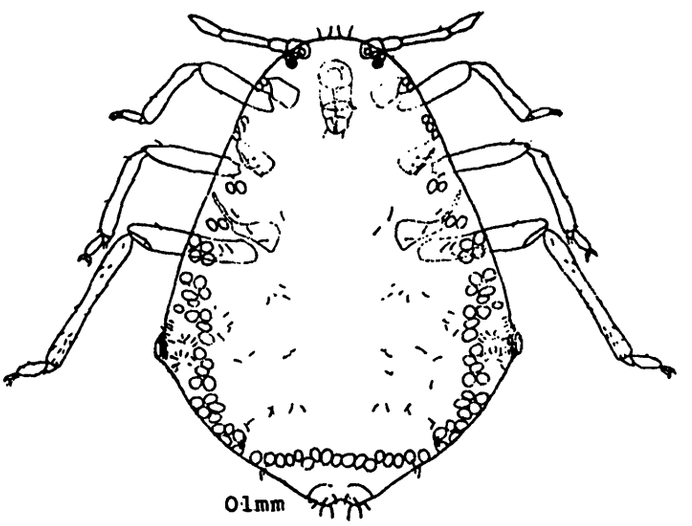


Fig. 57. *Ceratovacuna indica* Ghosh *et al.* : Apterous viviparous female

Distribution : India : Sikkim(North Sikkim), West Bengal.

Remarks : The species forms moderate-sized colony on lower surface of older leaves of host plant which remains covered with powdery secretion (Ghosh, 1988).

160. ***Ceratovacuan lanigera*** Zehntner

(Fig. 58)

1897. *Ceratovacuna lanigera* Zehntner, *Meded. Profester. Java* (N.S.) **33** : 29

1988. *Ceratovacuna lanigera* Zehntner; Ghosh, *Fauna of India, Homoptera: Aphidoidea,pt.4,Hormaphidinae* : 315

Material : Apterae, alatae and nymphs, on indet plant, Gangtok, 21.x.1962, Coll. A.K.Ghosh; Apterae and nymphs, on *Saccharum officinarum*, Singhik, 4.xi,1974, C.U. Coll.

Measurements (Aptera) : Length of body 2.25; width of body 1.42; antenna 0.40; a.s. III 0.15, IV (0.07+0.03); u.r.s. 0.07; h.t.2 0.13.

Measurements (Alata) : Length of body 1.00; antenna 0.70; a.s. III 0.27, IV 0.12, V (0.14+0.02); u.r.s. 0.05; h.t.2 0.11.

Distribution : India : Sikkim(North Sikkim), Arunachal Pradesh, Assam, Tripura, Uttar Pradesh, West Bengal. *Elsewhere* : Formosa; Indonesia; Japan; Philippines; Sri Lanka.

Biological notes : The species infests the leaf surfaces of the host plants heavily, particularly during September and October. Profuse wax secretion covers the body of the pale green aphids. Black ants attend the species. (Mondal, Ph. D. thesis, University of Calcutta, 1977).

161. ***Ceratovacuna perglandulosa*** Basu, Ghosh and Raychaudhuri (Fig. 59)

1973. *Ceratovacuna perglandulosa* Basu, Ghosh and Raychaudhuri *Proc.zool.Soc.Calcutta,* **26** : 98

1988. *Ceratovacuna perglandulosa* Basu *et al.;* Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt.4, Hormaphidinae* : 325

Material : Apterae and nymphs, on *Saccharum officinarum,* Gangtok, 9.xi.1971; Apterae and nymphs, on *Setaria* sp., Sanklang, 9.xi.1974, C.U. Coll.

Measurements (Aptera) : Length of body 1.78; width of body 1.05; antenna 0.40; a.s. III 0.16, IV (0.09+0.02); u.r.s. 0.08; h.t.2 0.15.

Distribution : India : Sikkim(East Sikkim), Arunachal Pradesh, Assam, Meghalaya, West Bengal.

Remarks : This is an endemic species. It is originally described from Meghalaya and is now known from entire north eastern region from *Bambusa* spp., *Grassum prothama, Sacccharum officinarum, Setaria* and indet grasses, mostly occurring during September to March (Ghosh, 1988). The species was recorded for the first time from Sikkim by Ghosh, Pal and Raychaudhuri (1974).

162. ***Ceratovacuna silvestrii*** (Takahashi) (Fig. 60)

1927. *Oregma silvestrii* Takahashi, *Bull. Lab zool. Gen. agric. Portici,* **20** : 148

1932. *Ceratovacuna aurandinariae* Takahashi, *Philippine J.Sci.,* **48** : 71

1988. *Ceratovacuna silvestrii* (Takahashi); Ghosh, *Fauna of India, Homoptera : Aphidoidea,* pt.4, *Hormaphidinae* : 325

Material : Apterae and nymphs, on *Bambusa* sp., Rangrang, 5.xi.1974; apterae and nymphs, on *Bambusa* sp., Singhik, 27.v.1975, C.U. Coll.

Measurements (aptera) : Length of body 1.95; width of body 1.20; antenna 0.30; a.s. III 0.10; IV (0.70+0.02); u.r.s. 0.09; h.t.2 0.12.

Distribution : India : Sikkim(North Sikkim), Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Tripura, West Bengal. *Elsewhere* : China; Japan; Taiwan.

Remarks : Blackish species originally described from China. They form colonies on undersurface of the older leaves of bamboo and secrete profuse honey dew, resulting in the formation of sooty moulds. Ants often attend these aphids. *Trioxys indicus* acts as a primary parasite of this species during March and Coccinellid predators are known to predate on the species in India (Agarwala, Saha and Ghosh, 1984)

Genus 78. ***Glyphinaphis*** van der Goot

1917. *Glyphinaphis* van der Goot, *Contributions. Faune. ds. Indes. Neerl., Contrib.,* **1**(3) : 232

Type species : *Glyphinaphis bambusae* van der Goot, 1917

163. ***Glyphinaphis bambusae*** van der Goot (Fig. 61)

1917. *Glyphinaphis bambusae* van der Goot, *Contrib. Faune Indes* Neerl, **1**(3) : 232

1988. *Glyphinaphis bambusae* van der Goot; Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 4, Subfamily Hormaphidinae* : 349

Material : Apterae and nymphs, on *Thysolaena* sp., Dzongu-Lik, 6.xi.1974; apterae and nymphs on *Thysanolaena* sp. Paksyak, 1.vi.1975, C.U. Coll.

Measurements (Aptera) : Length of body 1.60; width of body 1.35; antenna 0.30; a.s. III 0.10, IV (0.09+0.02); u.r.s. 0.05; h.t.2 0.08.

Distribution : India : Sikkim (North Sikkim), Arunachal Pradesh, Manipur, Meghalaya, West Bengal. *Elsewhere* : Indonesia.

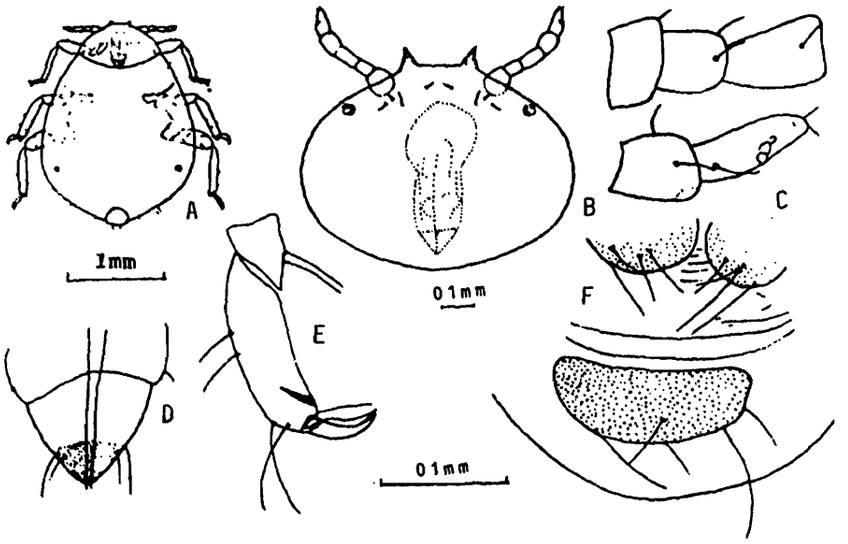


Fig. 58

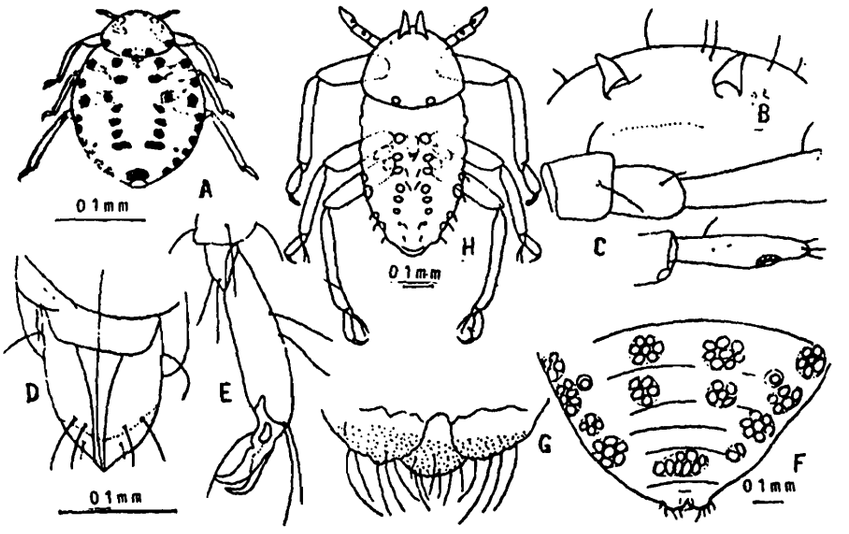


Fig. 59

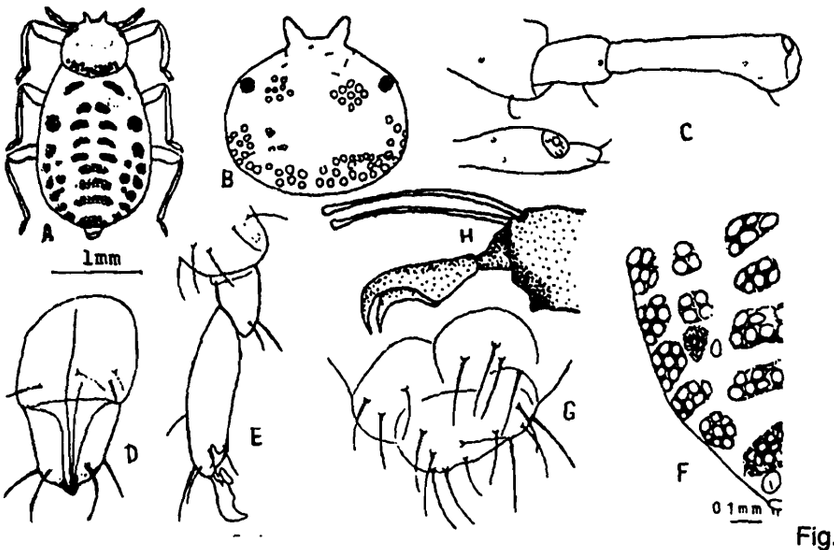


Fig. 60

Fig. 58-60. *Ceratovacuna lanigera* Zehntner: Aptera: A, Body; B, Head; C, Antenna; D, U.r.s.; E, Hind tarsus; F, Caudal region; 59. *Ceratovacuna perglandulosa* Basu *et al.* : Aptera: A, Whole body; B, Head; C, Antenna; D, Ultimate rostral segment; E, Hind tarsus; F, Posterior portion of abdomen; G, Caudal region, Apterous nymph; H, Whole body; 60. *Ceratovacuna silvestrii* (Tikahashi) : Aptera : A, Whole body; B, Head; C, Antenna; D, Ultimate rostral segment; E, Hind tarsus; F, Portion of abdomen; G, Caudal region.

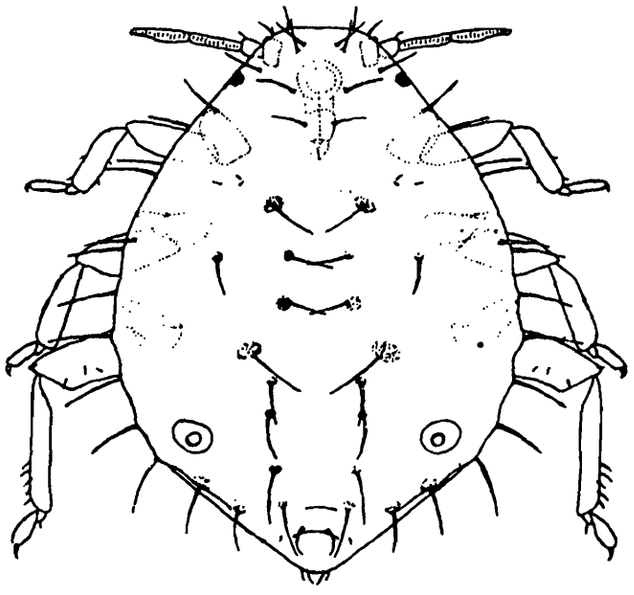


Fig. 61. *Glyphinaphis bambusae* van der Goot. : Apterous viviparous female

Remarks : Raychaudhuri *et al.* (1980) noted great variations in the ratio of length of longest hair on 1st, 7th, 8th tergite to b.d.III. According to Ghosh(1988) the species usually infests tender shoots of Bamboo and *Thysanolaena maxima* and form large colonies. In colonies, aphids are noted with white waxy secretion. These are often attended by ants. Apterous generations appear to be much more predominant than alatae in the hills during winter. Life colour brownish.

Genus 79. ***Pseudoregma*** Doncaster

1966. *Pseudoregma* Doncaster, *Entomologist*, **99** : 159

Type species : *Pseudoregma bucktoni* Doncaster

Key to the species of Genus *Pseudoregma*

1(2) Distinct wax gland cell groups absent; head and body with numerous small wax pores; frontal horns short, bluntly conical ..... *bucktoni*

2(1) Distinct wax gland cell groups always present but variably distributed over body 3

3(4) Frontal horns short, rounded apex; head thorax and abdomen with wax gland groups .....*panicola*

4(3) Frontal horns long, stout, sharply pointed at apex curved outward; head, thorax and basal abdominal segment without well developed wax glands ..... *alexanderi*

164. ***Pseudoregma alexanderi*** (Takahashi) (Fig. 62)

1924. *Oregma alexanderi* Takahashi, *Aphididae of Formosa*, **3** : 81

1988. *Pseudoregma alexanderi* (Takahashi); Ghosh, *Fauna of India, Homoptera: Aphidoidea, pt.4, Hormaphidinae* : 366

Material : apterae and nymphs, on *Bambusa aurandinacea*, Namchi, 20.x.1975, C.U.Coll.

Measurements (Aptera) : Length of body 3.12; width of body 2.0; antenna 0.62; a.s. III 0.27, IV (0.12+0.04); u.r.s. 0.10; h.t.2 0.25.

Distribution : India : Sikkim(South Sikkim), Manipur, Meghalaya, Nagaland, West Bengal. *Elsewhere* : Nepal; Taiwan.

Remarks : The species was originally described under *Oregma*. Later, Basu (1968) transferred it to *Pseudoregma*. It was subsequently made type species of the newly erected genus

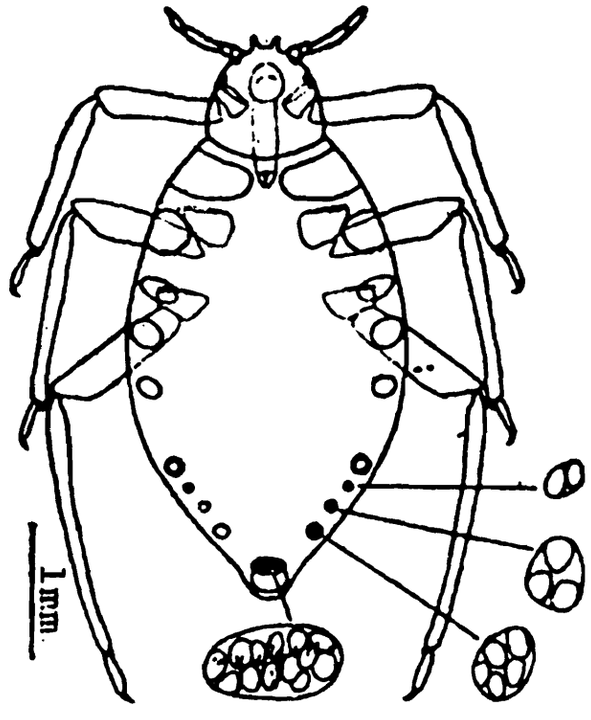


Fig. 62. *Pseudoregma alexandri* (Takahashi) : Apterous viviparous female

Paraoregma by Ghosh, Pal and Raychaudhuri(1974). Considering the range of variations of morphological characters and its close affinity with other members of Pseudoregma, this species is treated here under Pseudoregma.

165. ***Pseudoregma bucktoni*** Ghosh, Pal and Raychaudhuri (Fig. 63)

1893. *Oregma bambusae* Buckton, *Indian Mus. Notes,* **3** : 7

1980. *Pseudoregma bucktoni* Buckton: Raychaudhuri *et al.,* In : *Aphids of Northeast India and Bhutan* : 391

1988. *Pseudoregma bucktoni* Buckton; Ghosh, *Fauna of India, Homoptera : Aphidoidea : pt. 4. Hormaphidinae* : 373

Material : Apterae and nymphs, on undet. *Bambusa,* Singtam, 24.xii.1970, C.U. Coll.

Measurements (Aptera) : Length of body 2.90; width of body 1.60; antenna 0.42; a.s. III 0.11, IV 0.80, V (0.07+0.02); u.r.s. 0.10; h.t.2 0.20.

Distribution : India : Sikkim(East Sikkim), Karnataka, Manipur, Meghalaya, Tamil Nadu, West Bengal. *Elsewhere* : China; Sri Lanka; Taiwan; Vietnam

Remarks : The species infests young stems and undersurface of leaves of *Bambusa arundacea* and other indet Bamboo species and produces honey dew.

166. ***Pseudoregma panicola*** (Takahashi) (Fig. 64

1918. *Oregma panicola* Takahashi, *Aphidoidea of Formosa,* **1** : 90

1988. *Pseudoregma panicola* Takahashi, Ghosh, *Fauna of India, Homoptera: Aphidoidea, pt. 4, Hormaphidinae* : 386

Material : Apterae and alatae, on undet Bamboo, Majhitar, 21.i.1971; apterae, on *Oplismenus* sp., Sanklang, 3.xi.1974, apterae and nymphs, on *Andropogon* sp., Gangtok, 15.xi.1974., C.U.Coll.

Measurements (Aptera) : Length of body 1.80; width of body 1.12; antenna 0.24; a.s. III 0.07, IV (0.06+0.15); u.r.s. 0.07; h.t.2 0.12.

Measurements (Alata) : Length of body 2.00; width of body 0.70; antenna 0.75; a.s. III 0.35, IV 0.14, V (0.13+0.02); u.r.s. 0.05; h.t.2 0.12.

Distribution : India : Sikkim(East Sikkim, North Sikkim, South Sikkim), Arunachal Pradesh, Manipur, Meghalaya, Tamil Nadu, West Bengal. *Elsewhere* : Africa; Australia; Cuba; Formosa; Japan; Mauritius; New Zealand, Puerto Rico.

Remarks : The wax covered aphids form dense colonies on leaves of the host plants or seed heads of its host in the bush. The species was originally described from Taiwan, infesting *Panicum patens.* In the Indian region, its hosts are *Andropogon* sp., *Bambusa* sp., *Capillipedium assimilax, Eragrostris* sp. *Oplismenus compositus, Panicum* spp., indet grass and bamboo.

Genus 80. ***Pesudoastegopteryx*** Ghosh, Pal and Raychaudhuri

1974. *Pseudoastegopteryx* Ghosh, Pal and Raychaudhuri, *Proc.zool.Soc.Calcutta,* **27** : 109

Type species : *Pseudoastegopteryx himalayensis* Ghosh, Pal and Raychaudhuri

167. ***Pseudoastegopteryx himalayensis*** Ghosh, Pal and Raychaudhuri (Fig. 65)

1974. *Pseudoastegopteryx himalayensis* Ghosh, Pal and Raychaudhuri, Ghosh, Pal and Raychaudhuri, *Proc.zool.Soc.Calcutta,* **27** : 109

1988. *Pseudoastegopteryx himalayensis* Ghosh *et al.;* Ghosh, *Fauna of India, Homoptera: Aphidoidea, pt.* **4**, *Hormaphidinae* : 355

Material : Not examined

Measurements (Aptera : After Ghosh, 1988:357) : Length of body 2.10; width of body 1.17; antenna 0.41; a.s. III 0.20, IV (0.10+0.02); u.r.s. 0.07; h.t.2 0.09.

Measurements (Alata : After Ghosh, 1988:359) : Length of body 2.51; width of body 1.10; antenna 1.0; a.s. III 0.48, IV 0.19, V (0.15+0.13); u.r.s. 0.07; h.t.2 0.10.

Distribution : India : Sikkim; Manipur, Nagaland, West Bengal.

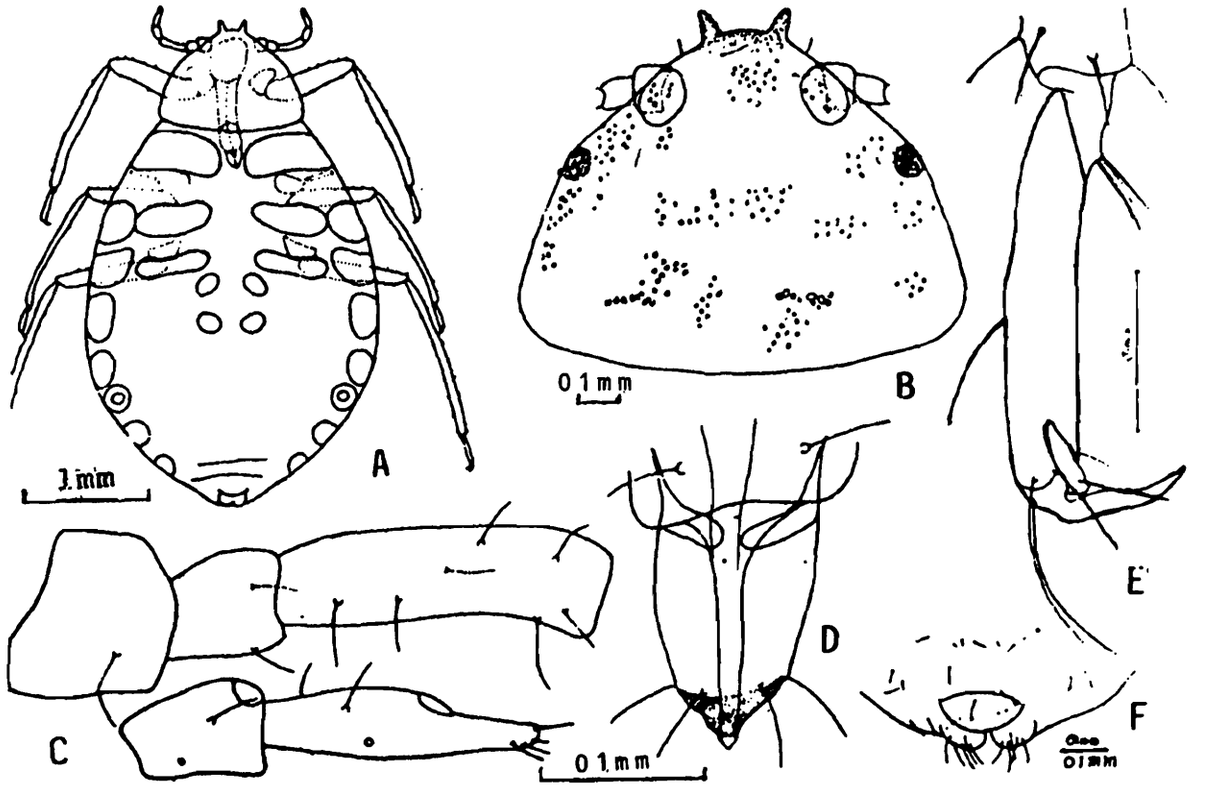


Fig. 63

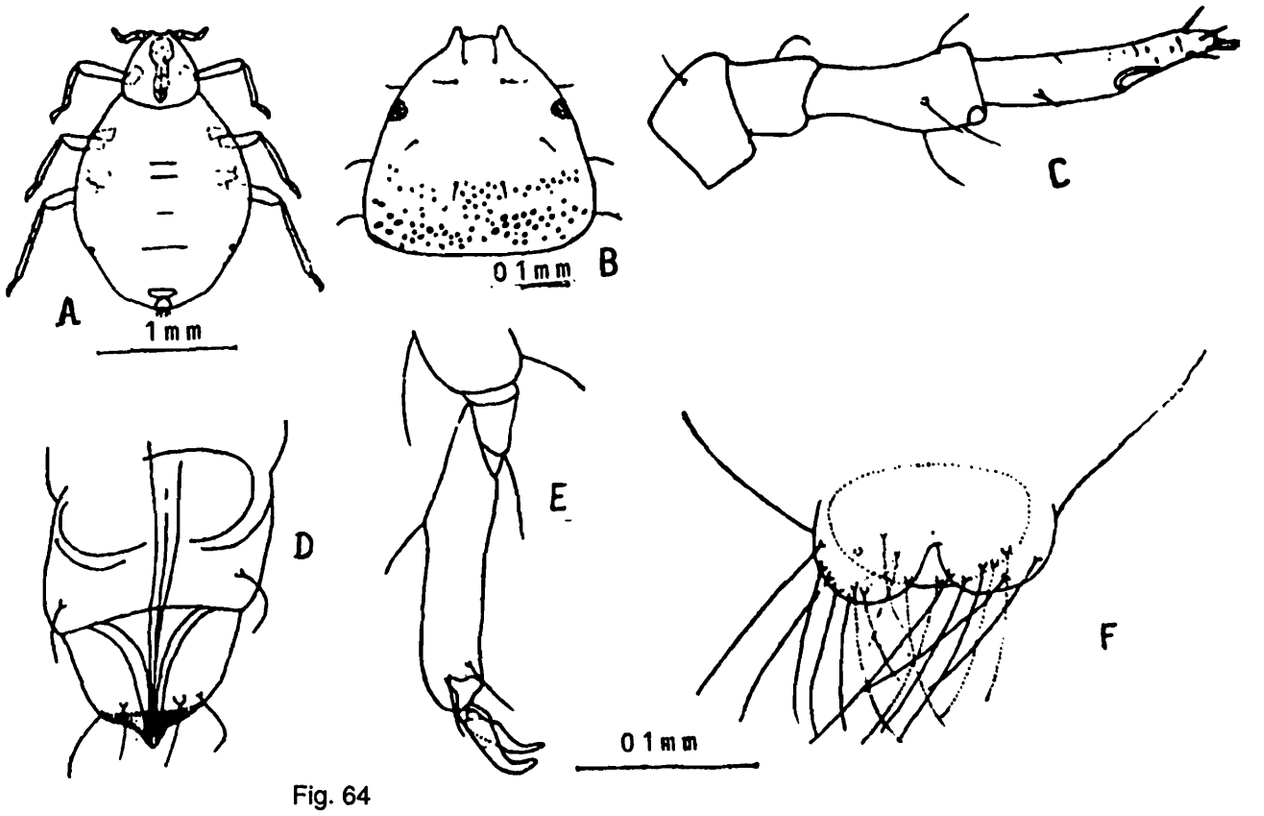


Fig. 64

Figs. 63-64 : 63. *Pseudoregma bucktoni* (Buckton) : Aptera: A, Whole body; B, Head; C, Antenna; D, Ultimate rostral segment; E, Hind tarsus; F, Caudal region; 64. *Pseudoregma panicola* (Tak.) : Aptera : A, whole body; B, Head; C, Antenna; D, Ultimate rostral segment; E, Hind tarsus; F, Caudal portion.

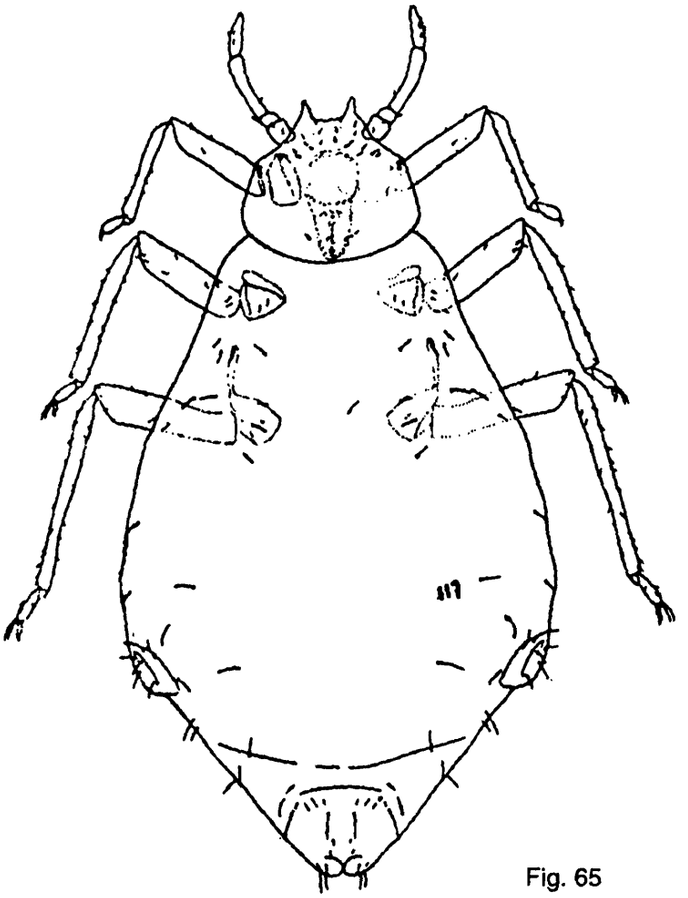


Fig. 65

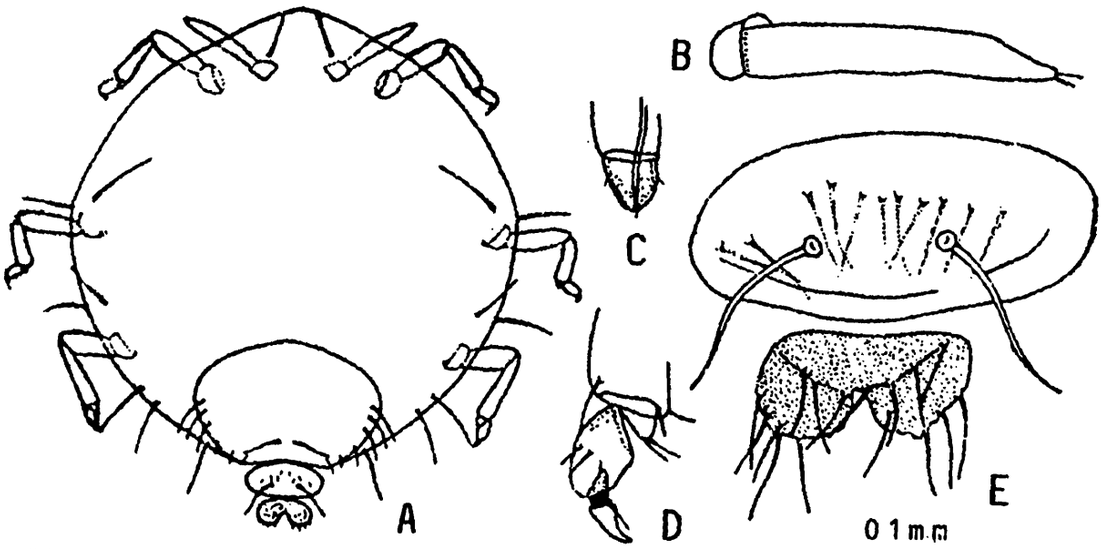


Fig. 66

Fig. 65-66 : 65. *Pseudoastegopteryx himalayensis* Ghosh *et al.*: Apterous viviparous female; 66. *Nipponaphis querciphaga* Ghosh and Raychaudhuri: Aptera: A, Whole body; B, Antenna; C, Ultimate rostral segment; D, Hind tarsus; E, Caudal region

Remarks : The species is an endemic one and is so far known only from North East India. It forms colonies on undersurface of leaves of *Bambusa arundinacea* and other Bamboo species. The colonies remain covered with scanty powdery secretion (Ghosh, 1988).

Tribe **Nipponaphidini**

Genus 81. ***Nipponaphis*** Pergande

1906. *Nipponaphis* Pergande, *Ent. News.*, **17** : 205

Type species : Nipponaphis distychii Pergande

168. ***Nipponaphis (Pseudonipponaphis) querciphaga*** Ghosh and Raychaudhuri (Fig. 66)

1973. *Nipponaphis (Pseudonipponaphis) querciphaga* Ghosh and Raychaudhuri *Kontyu*, **41**(4) : 484

1988. *Nipponaphis (Pseudonipponaphis) querciphaga* Ghosh and Raychaudhuri; Ghosh, *Fauna of India, Homoptera: Aphidoidea, pt. 4, Hormaphidinae* : 191

Material : Apterae, on *Quercus* sp., Jamlingaon, 29.iii.1970, C.U. Coll.

Measurements (Aptera) : Length of body 1.60; width of body 1.20; antenna 0.23; a.s. III 0.12, IV 0.06, u.r.s. 0.13; h.t.2 0.07.

Distribution : India : Sikkim (South Sikkim). *Elsewhere* : Nepal.

Remarks : The species was originally described from Sikkim. It is characterised in dorsal hairs atmost half as long as antennae, subgenital hairs on fused abdominal segments (2–7) almost of similar lengths. The species has been noted to occur during the months of March and April.

Subfamily LACHNINAE

Key to the Tribes of Subfamily LACHNINAE

1(2) Ultimate rostral segment usually acuminate, distinctly divided into segment 4 and 5; siphunculi on hairy cones or mere rings surrounded by a few hairs; radius of fore wing straight and short..... **Cinarini**

2(1) Ultimate rostral segment always blunt, rostral segment 5 reduced; siphunculi always on hairy cones; radius of forewing curved and of moderate length .... **Lachnini**

Tribe **Cinarini**

Genus 82. ***Cinara*** Curtis

1835. *Cinara* Curtis, *J. British Entomology*, **12** : 576

Type species : Aphis pini Linnaeus, 1758

Key to the species of Genus *Cinara*

1(2) Processus terminalis 0.15–0.20 times as long as base VI..... *tujafilina*

2(1) Processus terminalis always more than 0.30 times as long as base VI.....3

3(4) Processus terminalis 0.45–0.50 times as long as base VI; rostral segment (4+5) 0.30–0.33 times as long as h.t.2 .... *tistaensis*

4(3) Processus terminalis 0.33–0.35 times as long as base VI; rostral segment (4+5) about 1.2–1.3 times as long as h.t. 2 .... *atrotibialis*

169. ***Cinara atrotibialis*** David and Rajasingh

1968. *Cinara atrotibialis* David and Rajasingh, *Oriental Ins.*, **2**(1) : 103

1976. *Cinara (Cinarella) atrotibialis* Eastop, *Bull. Br. Mus. nat. Hist. (Ent.)* **35**(1) : 7

1982. *Cinara atrotibialis* David and Rajasingh; Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 2, Subfamily Lachninae : 20*

Material : Apterae and nymphs, on *Pinus* sp. Namchi, 22.x.1975, C.U.Coll.

Measurements (Aptera) : Length of body 3.28; width of body 2.00; antenna 1.50; a.s. III 0.52, IV 0.22, V 0.35, VI (0.18+0.09); u.r.s. 0.43; h.t.2 0.28; siphunculan diameter 0.44.

Distribution : India : Sikkim (South Sikkim), Himachal Pradesh, Manipur, Meghalaya. *Elsewhere* : Phillipine Is.; Thailand.

Remarks : The species is closely related to *Cinara piniformosana* (Takahashi) but can be separated in its longer body and longer rostral

segments 4+5. So far, the host plant is recorded as *Pinus* spp. (Pinaceae). Spiderlike brown species with black legs infests the bases of the apical needles.

170. ***Cinara tistaensis*** Agarwala and Raychaudhuri (Fig. 67)

1982. *Cinara tistaensis* Agarwala and Raychaudhuri, *Akitu.* N.S. 46 : 2

Material : Aptera (Holotype), on *Abies* sp., Lachung, 14.v.1978, Coll. B.K.Agarwala.

Measurements of the Holotype : Length of body 3.89; width of body 2.40; antenna 1.36; a.s. III 0.49, IV 0.19, V 0.22, VI (0.18+0.08); rostral segments (4+5) 0.30; h.t.2 0.31; siphuncular diameter 0.22.

Distribution : India : Sikkim (North Sikkim)

Remarks : The species is so far known only from type locality. It approaches *Cinara abieticola* in p.t. bearing 3 or 4 subapical hairs, primary rhinarium on a.s. V without chitinised rim and a.s. III without secondary rhinaria but differs in 4th segment of rostrum. 8th abdominal tergite bearing 8–14 hairs, base of a.s. VI bearing 5 or 6 hairs besides other characters. It also resembles *Cinara abieticola tenuipes* Chakrabarti and Ghosh but can be seperated in p.t. 0.46–0.51 times as long as base VI., much longer hairs (126 μ–182μ) on a.s. III and legs uniformly dark except basal 0.3 portion of femora.

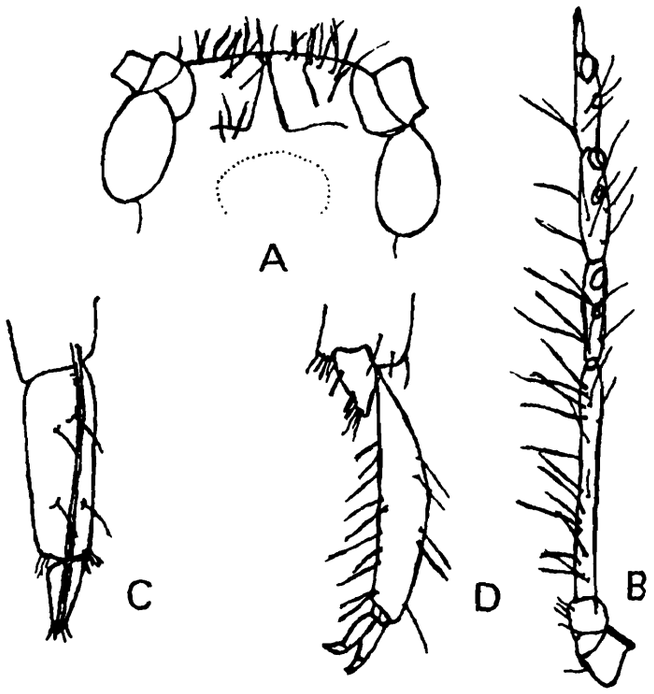


Fig. 67. *Cinara tistaensis* Agarwala and Raychaudhuri: Aptera: : A, Head; B, Antenna: C, U.r.s.; D, Hind tarsus

171. ***Cinara tujafilina*** (del Guercio) (Figs. 68–69)

1909. *Lachniella tujafilina* del Guercio, *Redia* **5** : 311

1966. *Cinara (Cupressobium) tujafilina* (del Guercio); Eastop, *Aust. J. Zool.* **14** : 528

1982. *Cinara tujafilina* (del Guercio); Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 2, Subfamily Lachninae* : 55

Material : Apterae and nymphs, on *Juniperus* sp., Gangtok, 19.v.1975, apterae and nymphs, on *Cupressus* sp., Sanklang, 24.v.1975, Coll. P. K. Mondal.

Measurements (Aptera) : Length of body 2.70; width of body 1.70; antenna 0.85; a.s. III 0.30, IV 0.13, V 0.15, VI (0.12+0.02); u.r.s. 0.22; h.t.2 0.23; siphuncular diameter 0.18.

Distribution : India : Sikkim (East and North Sikkim). *Elsewhere* : Africa; Australia; England; Germany; Holland; Italy; Japan; Middle East; Nepal, U.S.A.

Remarks : According to Eastop (1972) large number of apterae occur in the month of June, on the under surface of branches of the host plants, near the trunk. These are brown aphids, inhibit localities in altitudes ranging between *Ca.* 1000m and *Ca.* 1675m. The species is mostly attended by ants (Mondal, Ph.D. Thesis, Calcutta University, 1977).

172. ***Cinara cupressi*** (Buckton)

1881. *Lachnus cupressi* Buckton, *Monograph of the British Aphides, Ray Society,* London : 46

1982. *Cinara cupressi* (Buckton) : Agarwala and Raychaudhuri, *Akitu,* New Series, 46 : 1

Material : Not examined

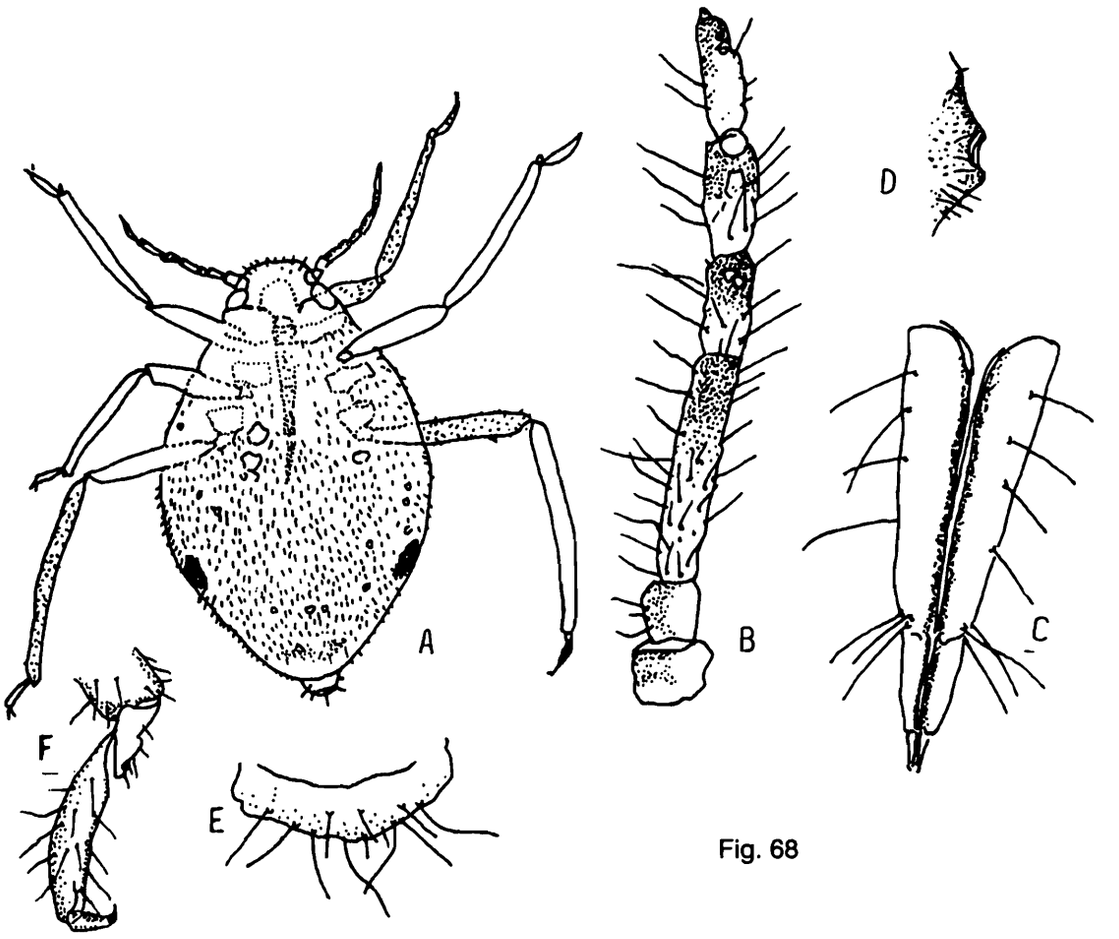


Fig. 68

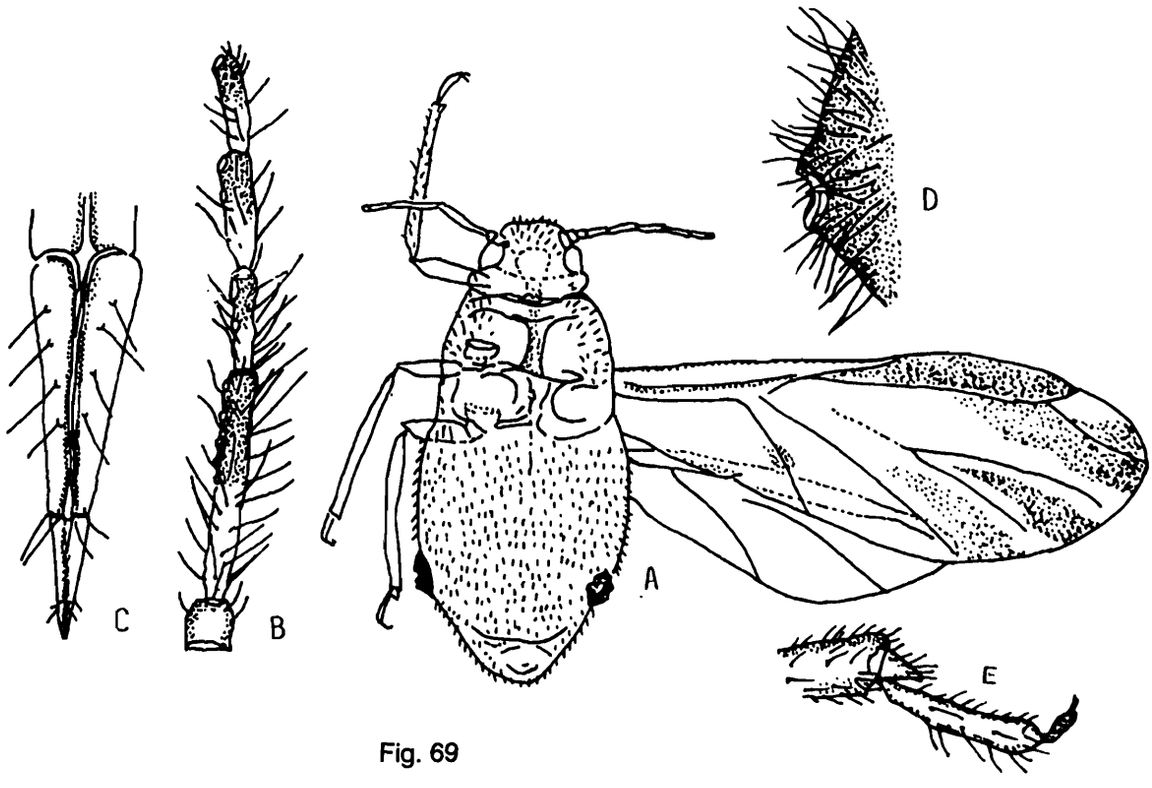


Fig. 69

Figs. 68-69 : 68. *Cinara tujafilina* (Del Guercio) : Aptera: A, Entire body; B, Antenna: C, U.r.s.; D, Siphunculus; E, Cauda; F, Hind tarsi; 69. *Cinara tujafilina* (Del Guercio): Alata: A, Entire body; B, Antenna; C, U.r.s.; D, Siphunculus; E, Hind tibia

Distribution : India : Sikkim (North Sikkim). *Elsewhere* : Canada; Europe; Middle East.

Remarks : According to Agarwala and Raychaudhuri (1982), 3 apterous viviparous females, an alate viviparous female and 18 apteroid nymphs were collected on *Juniperus recarva* from Lachung (North Sikkim) at 2900m on 6.iv.1975. They recorded the species for the first time from India.

Tribe **Lachnini**

Key to the genera of the Tribe Lachnini

1(2) Body elongately oval; dorsal abdominal hairs long with pointed apices; eyes without distinct triommatidia; apterae with or without ocular tubercles and sometimes with a single tubercle on 4th abdominal tergite ..... ***Nippolachnus***

2(1) Body globular; dorsal abdominal hairs long with bluntish apices; eyes with distinct triommatidia; apterae with ocular tubercles and never with a single dorsal tubercle on 4th tergite ..... ***Lachnus***

Genus 83. ***Lachnus*** Burmeister

1835. *Lachnus* Burmeister, *Handbuch der Entomologie,* **2**(1) : 91

Type species : Aphis roboris Linnaeus, 1758

173. ***Lachnus tropicalis*** (van der Goot)

1916. *Pterochlorus tropicalis* van der Goot, *Rec. Indian Mus.,* **12** : 3

1950. *Lachnus tropicalis* Takahashi, *Annls, Ent.Soc.Am.,* **43** : 592

1982. *Lachnus tropicalis* (van der Goot); Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 2, Subfamily Lachninae* : 91

Material : Apterae and nymphs, on *Quercus* sp., Gangtok, 26.v.1970, Coll. M.R.Ghosh.

Measurements (Aptera) : Length of body 4.80; width of body 2.80; antenna 2.35; a.s. III 1.00, IV 0.40, V 0.38, VI (0.16+0.09); u.r.s. 0.26; h.t.2 0.28; siphunculur diameter 0.40.

Distribution : India : Sikkim (East Sikkim), Manipur, Meghalaya, W.Bengal. *Elsewhere* : China; Indonesia; Japan; Korea; Vietnam

Remarks : The blackish aphid, originally described from Dibrugarh in Assam, enjoys distribution in Northeastern India and elsewhere. It usually occurs on *Quercus* and *Castanopsis* belonging to Natural Order Fagaceae. Ghosh, Ghosh and Raychaudhuri (1971) reported the species for the first time from Sikkim. In India, it is known by parthenogenetic form only. Sometimes ants *Pheidole* sp. have been noted in association with the aphid

Genus 84. ***Nippolachnus*** Matsumura

1917. *Nippolachnus* Matsumura, *J. Coll. Agric. Taihoku. imp. Univ.,* **7** : 382

Type species : Nippolachnus piri Matsumura, 1917

174. ***Nippolachnus piri*** Matsumura

1917. *Nippolachnus piri* Matsumura, *J.Coll.Agric.Tahaku imp. Univ.,* **7**(6) : 382

1962. *Nippolachnus piri* Matsumura; Ghosh and Raychaudhuri, *J. Asiatic Soc.,* (3&4) : 107

1982. *Nippolachnus piri* Matsumura; Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 2, Subfamily Lachninae* : 118

Material : Apterae and nymphs, on *Pyrus communis,* Gangtok, 15.xi.1974; apterae and nymphs, on *Pyrus communis,* Jorethang, 24.x.1975, C.U.Coll.

Measurements (Aptera) : Length of body 3.20; width of body 1.40; antenna 0.85; a.s. III 0.30, IV 0.06, V 0.16, VI (0.09+0.05); u.r.s. 0.23; h.t.2 0.21; siphunculus diameter 0.30.

Distribution : India : Sikkim (East Sikkim, South Sikkim), Meghalaya, West Bengal. *Elsewhere* : Japan; Malaya; Korea; Taiwan.

Remarks : In Eastern India, this species has only been recorded from *Pyrus communis and Pyrus khasiana.* The pale green aphids usually arrange themselves in rows on undersurface of leaves along midrib. The species is so far known to infest plants of Rosaceae. It is so far known only by parthenogenetic form in India.

Subfamily PEMPHIGINAE

Key to the Tribes of Subfamily Pemphiginae

1(2) Siphunculi present in the form of cones or rings; usually surrounded by a few hairs; secondary rhinaria in alatae annular; tarsi in apterae 1–2 segmented... **Eriosomatini**

2(1) Siphunculi absent or hardly indicated, without any hair; secondary rhinaria in alatae oval, elongate or subannular; tarsi usually 2 segmented 3

3(4) Wax gland groups in apterae each bearing a hair; u.r.s. with a few or without accessory hairs; secondary rhinaria in alatae strongly transverse and narrow; cauda may be fused with anal plate forming anocaudal process, or normal and bearing a few hairs; apterae usually with trochanters and femora seperate **Pemphigini**

4(3) Wax gland groups absent or indistinct, in apterae never with hair; u.r.s. with a few to many accessory hairs; secondary rhinaria in alatae round, oval or transversely oval; cauda never forms anocaudal process; apterae occasionally with fused femora and trochanters .....**Fordini**

Tribe **Fordini**

Genus 85. ***Chaetogeoica*** Remaudiere and Tao

1957. *Chaetogeoica* Remaudiere and Tao, *Revue Path. veg. Eng. agric. Fr,* **36** : 226

Type species : Pemphigella foliodenta Tao

175. ***Chaetogeoica graminiphaga*** Raychaudhuri, Pal and Ghosh (Fig. 70)

1978. *Chaetogeoica graminiphaga* Raychaudhuri, Pal and Ghosh, *Entomon,* **3**(2) : 242

1984. *Chaetogeoica graminiphaga* Raychaudhuri *et al.*; Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 3, Subfamily Pemphiginae* : 359

Material : Apterae and nymphs, on grass, Gangtok, Rimbik, 20.iv.1972, Coll. P. K. Pal.

Measurements : (Aptera) : Length of body 1.85; width of body 1.49; antenna 0.43; a.s. III 0.11, IV 0.06, V (0.08+0.04); u.r.s. 0.20; h.t.2 0.11

Distribution : India : Sikkim (West Sikkim), Manipur, West Bengal.

Remarks : The orange coloured species is an endemic one and infests the roots of grasses. The colony remains covered with powdery secretion. Earlier, Ghosh and Raychaudhuri (1968) recorded the species as *Chaetogeoica foliodentata* (Tao) (misidentification) from a single alata collected at Sikkim.

Genus 86. ***Geoica*** Hart

1894. *Geoica* Hart, *Rep. Ill. St. Ent.,* **18** : 101

Type species : Geoica squamosa Hart = *Pemphigus urticularius* Passerini

Key to the species of *Geoica*

Apterous viviparous female

1(2) Subanal plate very large with at least 14–16 thick hairs; hairs on 8th tergite 1.2–3.5 times as long as b.d. III; F.T.C. 3,3,3... .. .. *lucifuga*

2(1) Subanal plate not large as above, with about 10 thick hairs; hairs on 8th tergite 1.2–1.3 times or at most 1.6 times as long as b.d. III; F.T.C. 3,3,2 ..... *sikkimensis*

176. ***Geoica lucifuga*** (Zehntner) (Fig. 71)

1898. *Tetraneura lucifuga Zehntner, Arch.Suikerind.Ned. Ind.* **6** : 555

1921. *Geoica lucifuga,* Takahashi, *R.Agric. Exp. St. Formosa spec. Rept.,* **20** : 96

1984. *Geoica lucifuga* (Zehntner); Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 3, Subfamily Pemphiginae* : 389

Material : Apterae and nymphs, on Grass roots, Jorethang, 3.x.1972; apterae and nymphs, on Grass, 22.iv.1972, C.U. Coll.

Measurements (Aptera) : Length of body 2.18; width of body 1.78; antenna 0.36; a.s. III 0.09, IV 0.95, V (0.07+0.01); u.r.s. 0.17; h.t.2 0.10

Distribution : India : Sikkim (South Sikkim, West Sikkim), Manipur, Meghalaya, West Bengal. *Elsewhere* : Australia, Central Asia; China; Java; Malaya; Middle East; Pakistan; Philippines; Sri Lanka

Remarks : In the region of Northeast India, apterae appear to be common throughout the year on roots of several economic crops like barley, wheat, rice, maize and sugarcane. The colonies are formed at depth between 1.25–7.00 cm and are always attended by ants (Pal, Ph.D. Thesis, Calcutta University, 1975).

177. *Geoica sikkimensis* Raychaudhuri, Pal and Ghosh (Fig. 72)

1978. *Geoica sikkimensis* Raychaudhuri, Pal and Ghosh, *Entomon,* **3**(2) : 248

1984. *Geoica sikkimensis* Raychaudhuri *et al.;* Ghosh, *Fauna of India, Homoptera; Ahidoidea, pt.3, Subfamily Pemphiginae* : 396

Material : Apterae and nymphs, on indet Grass, Rimbik, 7.x.1972, C.U.Coll.

Measurements (Aptera) : Length of body 1.90; width of body 1.70; antenna 0.37; a.s. III 0.06, IV 0.05, V (0.07+0.04); u.r.s. 0.15; h.t.2 0.10.

Distribution : India : Sikkim (West Sikkim), West Bengal.

Remarks : The pink aphid species can be easily distinguished from other species of *Geoica* in peculiar reticulated dorsum, short dorsal hairs and longer processus terminalis. The apterae form colonies at a depth of 4.0–6.0 cm on the roots, in semimoist sandy soil and are associated with ants (Pal, 1975). This is endemic to Northeast India.

Tribe **Pemphigini**

Genus 87. *Epipemphigus* Hille Ris Lambers

1966. *Epipemphigus* Hille Ris Lambers, *Tijdschr. Ent.,* **109** : 204

Type species : Pemphigus indicus Cholodkovsky

178. *Epipemphigus imaicus* (Cholodkovsky)

1912. *Pemphigus imaicus* Cholodkovsky, *Revue Ruses d' Entom.,* **12** : 495

1966. *Eipemphigus imaicus* (Cholodkovsky); Habib, Rehana and Ghani, *Tech. Bull. Commw Inst. Biol. Control,* **13** : 49

1984. *Epipemphigus imaicus* (Cholodkovsky); Ghosh, *Fauna of India, Homoptera: Aphidoidea, pt. 3, Subfamily Pemphiginae* : 172

Material : Alatae and nymphs, on galls of undet. host plant, Lachung, 6.vi.1975, C.U. Coll.

Measurements (Alata) : Length of body 2.50; width of body 1.80; a.s. III 0.39; a.s. III 0.13, IV (0.10+0.02); u.r.s. 0.10; h.t.2 0.11 (after Ghosh, 1984).

Distribution : India : Sikkim (North Sikkim), North West India. *Elsewhere* : Japan; Pakistan; U.S.S.R.

Remarks : The species appears to be common in Hills of Northwest India and forms galls on *Populus ciliata* and *Ailanthus glandulosus,* the latter host is unusual for a popular infesting aphid (Ghosh, 1984).

Genus 88. *Pemphigus* Hartig

1939. *Pemphigus* Hartig, *Jber Fortschr, Forstwiss U, farstl. natark. in Jahre 1836* U 1837, **1**(4) : 645

Type species : Aphis bursaria Linnaeus (designated by Fitch, 1855, p. 73)

Key to the species of *Pemphigus*

1(2) Dorsal cephalic hairs 0.016–0.030 mm long; p.t. 0.13–0.15 times as long as b.d. III; subanal plate with 24 and subgenital plate with 16 hairs; u.r.s. 0.62–0.64 times as long as h.t.2; F.T.C. 2,2,2 ..... *eastopi*

2(1) Dorsal cephalic hairs 0.007–0.015 mm long; p.t. 0.16–0.19 times as long as b.d. III; subanal plate with 6–7 and subgenital plate with 10–12 hairs; u.r.s. 0.08–0.90 times as long as h.t.2; F.T.C. 3,2,2 ..... *vulgaris*

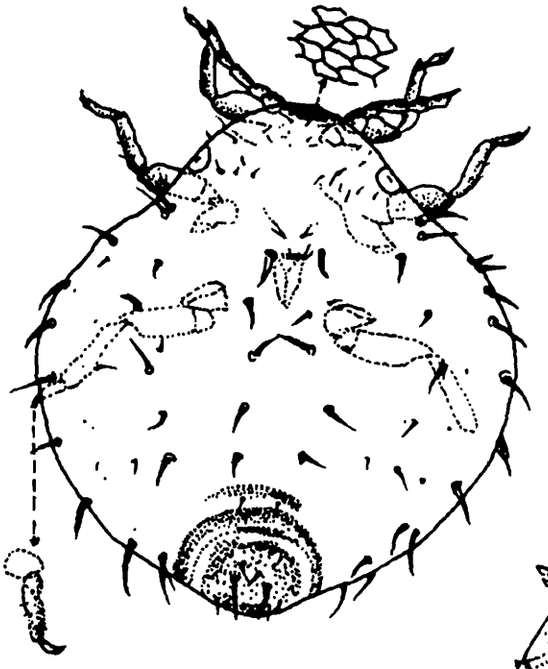
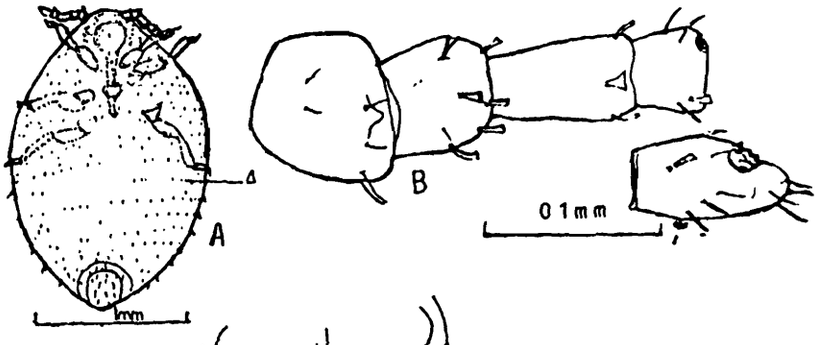


Fig. 70



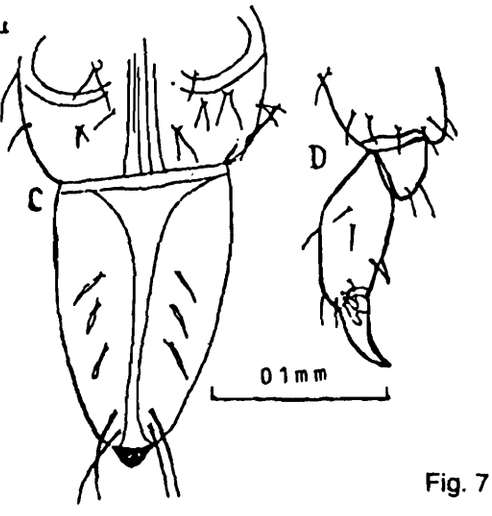


Fig. 71

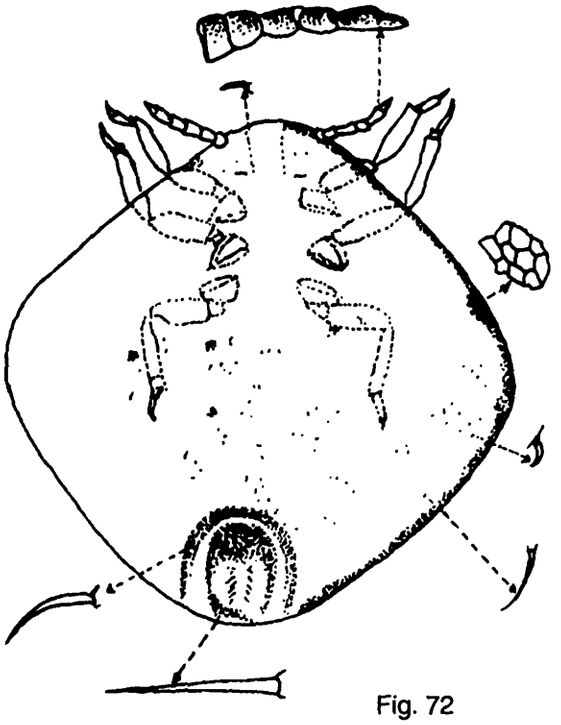


Fig. 72

Figs. 70-72 : 70. *Chaetogeoica graminiphaga* Raychaudhuri *et al.* : Apterous viviparous female; 71. *Geoica lucifuga* (Zehntner): Aptera: A, Body; B, Antenna; C, U.r.s.; D, Hind tarsus; 72. *Geoica sikkimensis* Raychaudhuri *et al.*: Apterous viviparous female

179. *Pemphigus eastopi* Mondal
(Figs. 73–74)

1977. *Pemphigus eastopi* Mondal, *Aphids of Sikkim, Ph.D. Thesis, Univ. Calcutta,* p. 345

1984. *Pemphigus eastopi* Mondal; Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 3, Subfamily Pemphiginae* : 191

Material : Apterae on leaf galls of unidentified plant, Tsungthang, 9.vi.1975; Apterae on leaf galls of unidentified plant, Lachung, 6.vi.1975, C.U.Coll.

Measurements (Aptera) : Length of body 2.80; width of body 2.20; antenna 0.50; a.s. III 0.23, IV (0.11+0.01); u.r.s. 1.10; h.t.2 0.16.

Distribution : India : Sikkim (North Sikkim).

Remarks : The species is easily separable from other species of the genus by shorter u.r.s. and F.T.C. 2,2,2. This is an endemic species, so far known only from Sikkim. Life colour is pale with head and legs dusky, remains covered with powdery waxy coating.

180. *Pemphigus vulgaris* Raychaudhuri, Pal and Ghosh
(Fig. 75)

1978. *Pemphigus vulgaris* Raychaudhuri, Pal and Ghosh, *Entomon,* 3(2) : 250

1984. *Pemphigus vulgaris* Raychaudhuri *et al;* Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 3, Subfamily Pemphiginae* : 237

Material : Apterae, on *Triticum vulgare* (roots), Rimbik, 20.iv.1972, C.U. Coll.

Measurements (Aptera) : Length of body 2.00; width of body 1.75; antenna 0.40; a.s. III 0.11, IV 0.05, V (0.09+0.02); u.r.s. 0.10; h.t.2 0.14.

Distribution : India : Sikkim (West Sikkim), West Bengal.

Remarks : The aphids were collected from the roots from 5–7 cm. under soil. Ants were found to attend the aphids (Mondal, Ph.D.thesis, University of Calcutta, 1977). It is also an endemic species so far known from Eastern Himalayas and can be separated from all other species of the genus by its long u.r.s., feeble wax pores, slender legs and antennae and sparse minute flageller hairs. The species is so far known by its apterous viviparous form.

Tribe **Eriosomatini**

Key to the genera of the Tribe Eriosomatini

1(2) Tarsi 1-segmented in apterae; hind wing of alatae with oblique vein ..... ***Tetraneura***

2(1) Tarsi 2-segmented in apterae; hind wing with 2 oblique veins; siphunculi present either as truncated cones or as mere rings and surrounded by a ring of hairs ..... ***Eriosoma***

Genus 89. *Eriosoma* Leach

1818. *Eriosoma* Leach, *Trans Hort. Soc. Lond.,* **3** : 60

Type species : Eriosoma mali Leach, 1818 = *Aphis mali* Hausmann

181. *Eriosoma lanigerum* (Hausmann)
(Figs. 76 - 77)

1802. *Aphis lanigera* Hausmann, *Illigers' Mag. Insekt.* **1**(3–4) : 440

1953. *Eriosoma lanigerum* (Hausmann); Cottier, *New Zeal. Dep. Sci. Ind. Res. Bull.,* 106 : 332

1984. *Eriosoma lanigerum* (Hausmann); Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt. 3, Subfamily Pemphiginae* : 25

Material : Apterae and nymphs, on *Pyrus malus,* Lachung, 6.vi.1975, C.U.Coll.

Measurements (Aptera) : Length of body 1.80; width of body 1.20; antenna 0.48; a.s. III 0.14, IV 0.60, V 0.56, VI (0.06+0.01); u.r.s. 0.14; h.t.2 0.08.

Distribution : India : Sikkim (North Sikkim), widely distributed. *Elsewhere* : Cosmopolitan.

Remarks : It is serious pest of apple in Sikkim. In most parts of the World, where the species is now distributed, it remains confined to monoecious cycle (holocyclic or anholocyclic) on *Pyrus malus* (Rosaceae). According to Hausmann (1902) the species was found well settled in India as far back in 1891 and is now widely known as major

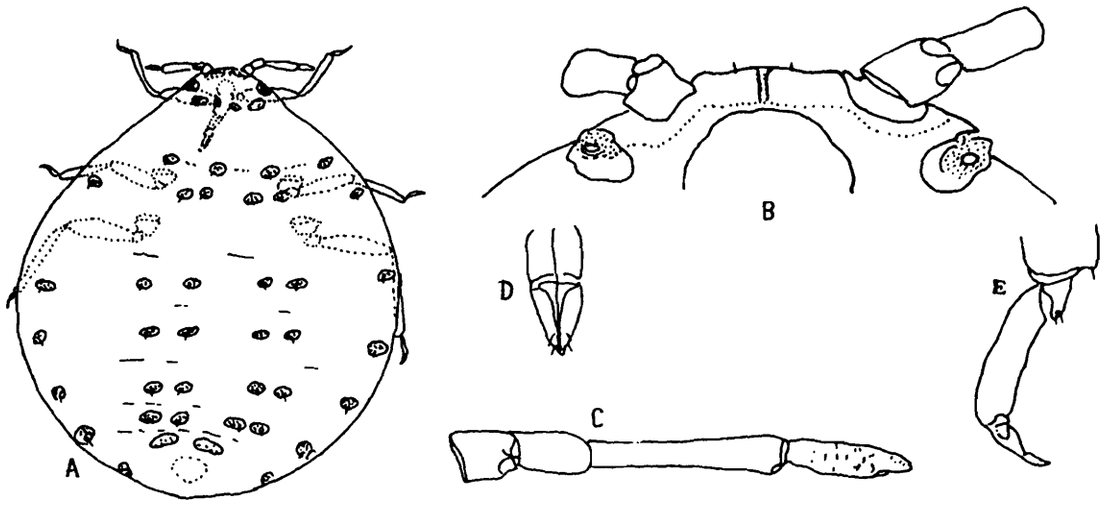


Fig. 73

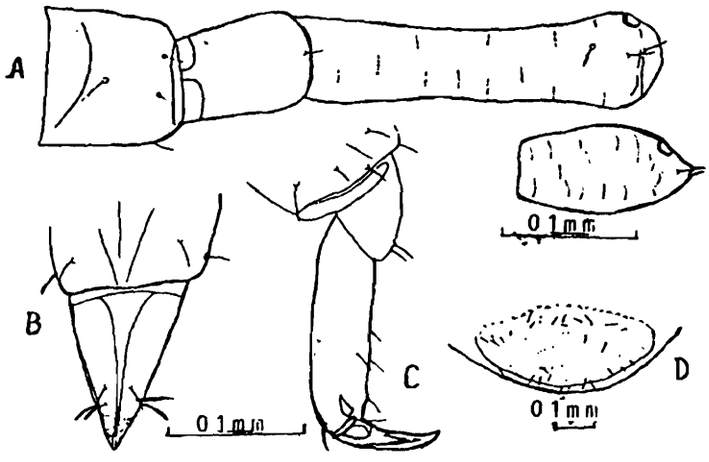


Fig. 75

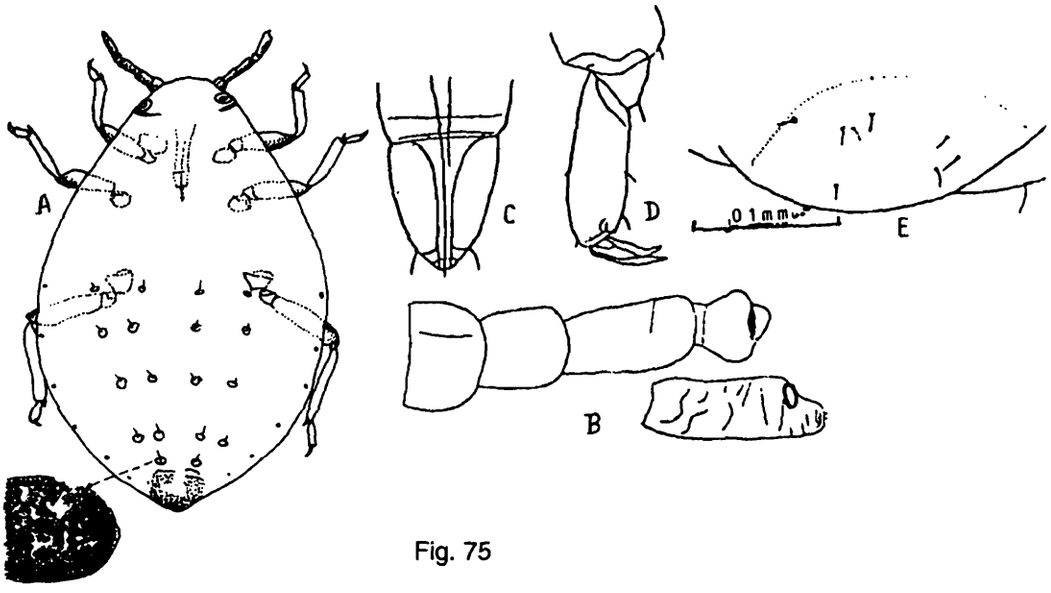


Fig. 75

Figs. 73-75 : 73. *Pemphigus eastopi* Mondal: Aptera: A, Whole body; B, Head; C, Antenna; D, U.r.s.; E, Hind tarsus; 74. *Pemphigus eastopi* Mondal: Fundatrix: A, Antenna; B, U.r.s.; C, Hind tarsi; D, Cauda; 75. *Pemphigus vulgaris* Raychaudhuri *et al.*: Aptera: A, Whole body: B, Antenna; C, U.r.s.; D, Hind tarsus; E, Posterior portion of abdomen

Table 2 : Showing the aphid species infesting economically important groups in Sikkim

Subfamilies	No. of aphid spp.	Economically Important Plant Group								
		Vegetables	Cereals	Pulses	Fruits	Sugarcane	Spices	Ornamental	Bamboo	Forest
Anoeciinae	1									1
Aphidinae	68	17	5	1	7		5	23	3	7
Drepanosiphinae	10	1			2		1		1	5
Greenideinae	18	1			2					15
Hormaphidinae	10				1	1		1	5	2
Lachninae	5				1			1		3
Pemphiginae	2				1					3
Thelaxinae	1									1
Total	**115**	**19**	**5**	**1**	**14**	**1**	**6**	**25**	**9**	**35**

apple-pest in all apple growing areas in the Northeast and in the Southern part. Baker (1915) has given a detailed account of biology of this wooly apple aphid. *Aphelinus mali* Haldm. a parasite is now known as major control agent for this aphid. In India, Behura (1963) listed *Adonia variegata* (Goeze), *Ballia eucharis* Mats., *Chiloconis bijugens infernalis* Muls., *Coccinella septempunctata* Linn. (Coccinellidae) as predator of this apple aphid. Wooly waxy deposition over the body of the aphid is often noticed on the stem of the apple tree. Fotedar and Kapur (1943) described its life cycle in Kashmir for the first time in India.

Genus 90. ***Tetraneura*** Hartig

1841. *Tetraneura* Hartig, *Z. ent. (Germar)* **3** : 336

Type species : Aphis ulmi Linnaeus, 1758

Key to the Subgenera of Genus *Tetraneura*

1(2) Nymph of 1st instar with tarsal claws equal and shorter than the tarsal segments; embroys with hind tarsal claws less than 0.050 mm long ..... ***Tetraneura***

2(1) Tarsal claws variable, equal to or longer than the tarsal segments of 1st instar nymph; embryos with only hind tarsal claws enlarged or unequal 3

3(4) Tarsal claws unequal, at least in hind legs of embroys and first instar nymph .... ***Indotetraneura***

4(3) Tarsal claws never unequal on the same tarsal sgement, enlarged on hind tarsal segment ..... ***Tetraneurella***

182. ***Tetraneura (Tetraneura) sikkimensis*** Raychaudhuri, Pal and Ghosh (Fig. 78)

1978. *Tetraneura sikkimensis* Raychaudhuri, Pal and Ghosh, *Entomon,* **3** (2) : 262.

1984. *Tetraneura sikkimensis* Raychaudhuri *et al.;* Ghosh, *Fauna of India Homoptera : Aphidoidea, pt. 3, Subfamily Pemphiginae* : 136

Material : Aptera, on *Eragrostris nigra,* Geyzing, 22.iv.1972, C.U. Coll.

Measurements (Aptera) : Length of body 2.17; width of body 1.50; antenna 0.46; a.s. III 0.09, IV 0.15, V 0.05; u.r.s. 0.20; h.t.2 0.06.

Distribution : India : Sikkim (West Sikkim).

Remarks : These aphids form large colonies on the host plant roots at depth of 3–4 cm. in semimoist sandy loam soil and secrete wax which covers their entire body; ants attend the aphids (Pal; P.K. 1975). The species is characterised in having longer hairs on abdominal dorsum much

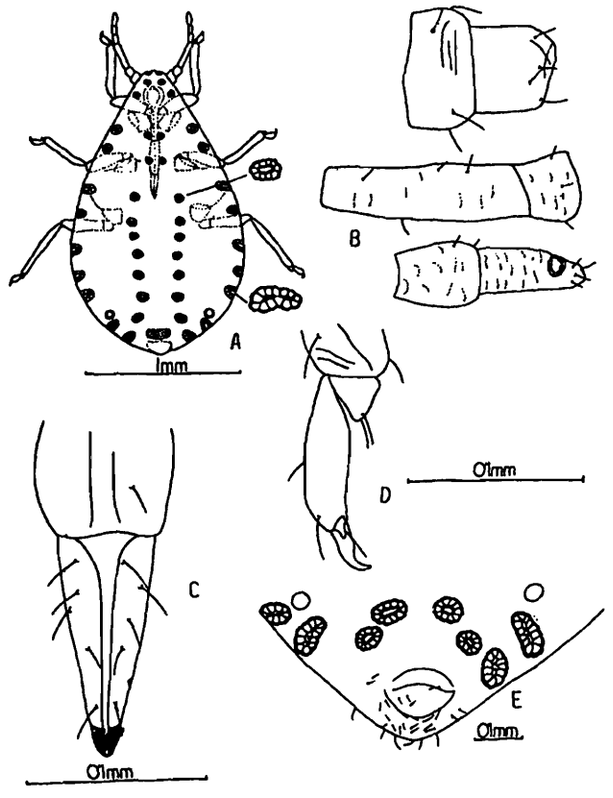


Fig. 76

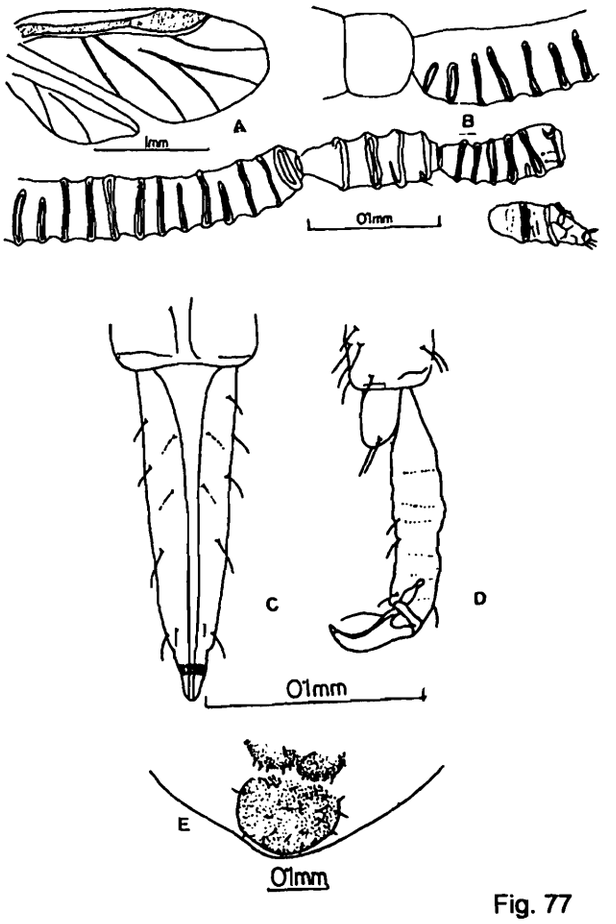


Fig. 77

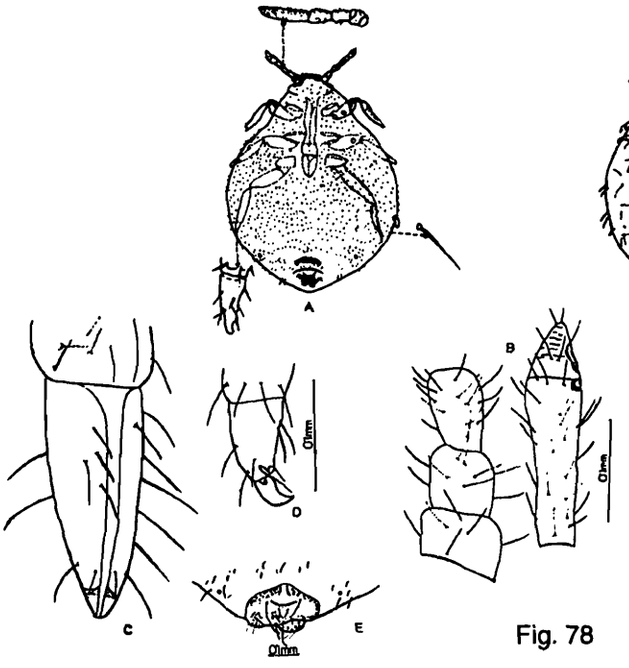


Fig. 78

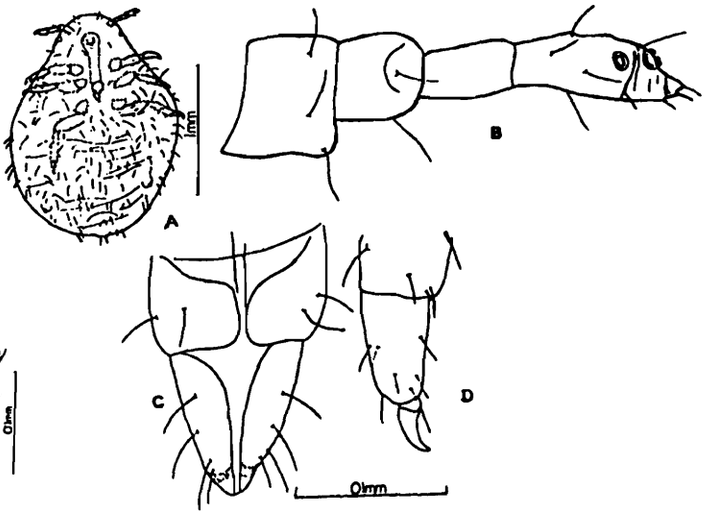


Fig. 79

Figs. 76-79 : 76. *Eriosoma lanigerum* (Hausmann) : Aptera: A, Whole body; B, Antenna: C, U.r.s.; D, Hind tarsus; E, Posterior portion of abdomen with wax glands; 77. *Eriosoma lanigerum* (Hausmann): Alata: A, Wings; B, Antenna; C, U.r.s.; D, Hind tarsus; E, Posterior portion of abdomen; 78. *Tetraneura sikkimensis* Raychaudhuri *et al.* Aptera: A, Whole body; B, Antenna; C, U.r.s.; D, Hind tarsus; E, Posterior portion of abdomen; *78. Tetraneura basui* Hille Ris Lambers: Aptera: A, Whole body; B, Antenna; C, U.r.s.; D, Hind tarsus.

fewer hairs on a.s. III and 5-segmented antennae when compared to related species like *Tetraneura radicicola* Strand and *T. yezoensis* Matsumura. It is an endemic species and so far known only from Sikkim.

183. ***Tetraneura (Indotetraneura) basui*** Hille Ris Lambers

(Fig. 79)

1968–69. *Tetraneura (Indotetraneura) basui* Hille Ris Lambers, *Boll. Zool. agr. Bachie.*, Ser. II : 44

1978. *Tetraneura (Indotetraneura) basui* Hille Ris Lambers; Chakrabarti and Maity, *Entomon*, **3**(2) : 269

1984. *Tetraneura (Indotetraneura) Basui* Hille Ris Lambers; Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt.* **3**, *Subfamily Pemphiginae* : 86

Material : Aptera and nymphs, on Grass roots, Geyzing, 20.iv.1972, C.U. Coll.

Measurements (Aptera) : Length of body 1.80; width of body 1.70; antenna 0.28; a.s. III 0.05, IV 0.08, V (0.03+0.01); u.r.s. 0.10; h.t.2 0.07.

Distribution : India : Sikkim (West Sikkim), Manipur, Nagaland, West Bengal.

Remarks : The species is chiefly distinguished in having long, stout abdominal hairs and by the presence of 4 hairs on penultimate rostral segment in apterae exuales. Colonies on roots are normally formed at a depth of 1.2–7.6 cm in dry to wet soils. Ants are found to be in association with the aphid species (Pal, Ph.D. Thesis, C.U., 1975) This is also an endemic species known from the Northeastern part of India.

184. ***Tetraneura (Tetraneurella) nigriabdominalis*** (Sasaki)

1899. *Schizoneura nigriabdominalis* Sasaki, *Manual of Insect Pests of crops in Japan* : 435

1984. *Tetraneura (Tetraneurella) nigriabdominalis* (Sasaki); Ghosh, *Fauna of India, Homoptera : Aphidoidea, pt.* **3** *Subfamily Pemphiginae* : 111

Material : Apterae, alatae and nymphs on Grass roots, Jorethang, 18.iv.1972, Geyzing, 22.iv.1972, C.U. Coll.

Measurements (Aptera) : Length of body 1.92; width of body 1.40; antenna 0.40; a.s. III 0.09, IV 0.15, V 0.06; u.r.s. 0.12; h.t.2 0.07.

Measurements (Alata) : Length of body 2.20; width of body 1.00; antenna 0.75; a.s. III 0.23, IV 0.06, V 0.20, VI 0.06; u.r.s. 0.11; h.t.2 0.15.

Distribution : Sikkim (South Sikkim), Manipur, Nagaland, Uttar Pradesh, Southern India. *Elsewhere* : Widely distributed except in Europe (Ghosh, 1984)

Remarks : This is a widely distributed species. In the hills of Eastern India the brown species infests roots of Poaceae growing in dry sandy to wet dry soil, at depths of 0.88–1.02 cm throughout the year (Pal, 1975). Ants are found in association with this species. Raychaudhuri *et al.* (1978, 1980) mentioned that specimens from India exhibits variable number of hairs (2–6) on 8th tergite, the hairs being 0.057-0.165 mm. long. Ghosh and Raychaudhuri (1968) reported the species for the first time from India.

Subfamily THELAXINAE

Genus 91. ***Kurisakia*** Takahashi

1924. *Kurisakia* Takahashi, *Philippines J. Sci.*, **24** : 715

Type species : *Anoicea onigurami* Shinji, 1923

185. ***Kurisakia indica*** Basu

1967. *Kurisakia indica* Basu, *Bull. Entomol.*, **8**(2) : 7

1974. *Kurisakia indica* Basu; Raychaudhuri, *Sci.Cult.*, **40** : 107

1980. *Kuriskia indica* Basu; Raychaudhuri, D.N. (*ed.*) *Aphids of Northeast India and Bhutan* : 978

Material : Apterae and alatae, on *Litsea polyantha,* Phodong, 18.x.1975; apterae, alata and nymphs, on *Litsea* sp., Namchi, 22.x.1975, C.U.Coll.

Measurements(Aptera) : Length of body 1.90; width of body 1.15; antenna 0.70; a.s. III 0.30, IV 0.11, V (0.01+0.04); u.r.s. 0.12; h.t.2 0.11.

Measurements(Alata) : Length of body 2.09; width of body 0.90; antenna 0.89; a.s. III 0.40, IV 0.15, V (0.12+0.04); u.r.s. 0.12; h.t.2 0.12.

Distribution : India : Sikkim(North Sikkim, South Sikkim), West Bengal. *Elsewhere* : China; Japan.

Remarks : The species is characterised in having usually less than 20 hairs on a.s. III and u.r.s. longer than h.t.2 in apterae. Alatae of the species differ from those of other species in lacking marginal sclerites. Raychaudhuri *et al.* (1980) provided additional characters not included in the original description given by Basu(1967).

DISCUSSION

The present study has been undertaken with a view to provide an up-to-date account of all the known species of Aphididae of the state of Sikkim which represents an array of diverse ecological conditions. A total of 4702 world species under 599 genera of aphids are known (Remaudiere and Remaudiere 1987) of which India represents 653 species under 200 genera. A subfamily-wise break up of Aphididae of Sikkim indicates that out of 653 species in India as many as 185 species belonging to 91 genera under 8 subfamilies are known to occur in Sikkim(*vide* Table-I). Analysis of the available data reveals that Aphididae of Sikkim represents 04% of world fauna, 18% of Oriental Fauna and 27.7% of Indian Fauna.

Dense tropical rain forests, high precipitation, varying altitudinal gradients, lush vegetation and relatively less eco-disturbances have possibly atributed to the richness and diversity of aphid fauna in this region. It is significant that representatives from all the eight subfamilies of aphids are available in the State. Out of about 200 genera so far recorded from Indian region, 91 genera occur in Sikkim. Out of 185 species recorded from the region 86 species are endemic to Indian region i.e., endemism is 46.48% as compared to 63.8% endemism of total Indian fauna. On the other hand, total endemic species in India is 417, whereas Sikkim represents 86 endemic species i.e., 20.6% species are endemic as compared endemism in India as a whole.

Analysis of the avilable data depicts that out of 185 species, about 115 species of aphids infest economically important group of plants in the State.

The Table-2 indicates that the subfamily Aphidinae is the most predominent aphid group being more frequent on vegetables and ornamental plants. The bamboos are effected mostly by the members of Hormaphidinae while forest trees by Greenideinae. On the otherhand, infestation by Anoecinae and Thelaxinae is negligible, each affecting only forest tree.

Further, subfamilywise break up (Table-I) indicates that 2 species under 2 genera belong to subfamily Anoeciinae, 114 species in 55 genera to the subfamily Aphidinae, 11 species under 9 genera to Drepanosiphinae, 28 species in 7 genera to Greenideinae, 13 species belonging to 8 genera to Hormaphidinae, 6 species in 3 genera to Lachninae, 10 species under 6 genera to Pemphiginae and single species to Thelaxinae.

The break up also indicates the number of endemic genera and species under each subfamily. Thus, it appears that the subfamily Aphidinae is the most predominent group followed by Greenideinae, Hormaphidinae, Drepanosiphinae, Pemphiginae, Lachninae, Anoeciinae and Thelaxinae. Similarly, endemism is highest in Aphidinae (43 spp.) followed by Greenideinae(20), Drepanosiphinae(9), Hormaphidinae(5), Pemphiginae(5), Anoeciinae(1) and Lachninae(1).

Analysis of the data also reveals that maximum concentration of aphids occurs in localities situated in altitude ranging between *ca* 1000m to *ca* 2300m. Most favoured host plants of the aphids in Sikkim belong to Asteraceae family.

A look into the host plant association clearly depicts polyphagism for some of the aphid species and host restriction for quite a few.

Among 300 plus plant species in Sikkim, about 50 plant species of economic importance are infested by aphids. Analysis also reveals that 5 species of aphids infest cereal plants., 1 species each on sugarcane and pulse crops, 19 species on vegetable plants, 6 species on spices and narcotic plants, 14 species on fruit plants, 25 on ornamental plants, 35 on forest trees and 9 species on bamboo plants.

Also, the find of sexuales in some species of aphids of Sikkim hints at the possibility of completion of holocycly for these aphids although anholocyclic type of life cycle is shown by majority of the aphids found in the State.

A perusal of literature reveals that rich diversity of aphid is found in Northeastern and Eastern Himalayas including Sikkim where the aphid fauna is an admixture of Palaearctic, Chinese and Malayasian fauna. The country like Taiwan, Japan, Korea have in common quite an appreciable number of genera found in Sikkim. The similarity and diversity of fauna may be explained by the fact that warm temperate climate is prevalent in the area.

In view of the foregone account, the area shows not only rich and diverse types of vegetations but also harbours diverse aphid fauna under various ecological and climatic conditions and shows variety of damage symptoms. Endemicity of the fauna is well reflected through the present study.

SUMMARY

1. Aphid fauna of Sikkim State has been studied in a comprehensive way.

2. The family Aphididae as understood here, includes Anoeciinae, Aphidinae, Drepanosiphinae, Greenideinae, Hormaphidinae, Lachninae, Pemphiginae and Thelaxinae.

3. A subfamilywise break up of the species and subspecies known so far from Sikkim has been shown(Table-1).

4. A total of 185 species(excluding those under Addendum) belonging to 91 genera under eight subfamulies are known from Sikkim.

5. Keys to various taxa, literature references, geographical distribution of each within Sikkim, India and abroad have been provided.

6. Morphometric measurements of available morphs of all the species/subspecies (unless otherwise mentioned) have been given.

7. Analysis of data reveals that 115 species of aphids infest various economically important plants in Sikkim(Table-2).

8. Biological notes and taxonomic affinity with related species have been included wherever possible.

9. The percentage of endemism of aphids in Sikkim is 46.48 as compared to 63.8% endemism of total Indian fauna.

10. A look into the host plant association depicts polyphagism for some of the aphid species and host restriction for quite a few.

11. Charts showing districtwise distribution of species known from Sikkim have been furnished.

12. Necessary illustrations have been incorporated.

13. Distribution maps have been presented for the species/subspecies.

14. A list of a few species reported earlier by different authorities but not available for the present study have been appended with reference.

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Table 3 : Distribution of Aphid species/subspecies in different districts of Sikkim

Name of species / subspecies			Districts			
			East Sikkim	West Sikkim	North Sikkim	South Sikkim
Family		APHIDIDAE				
Subfamily-I		ANOECIINAE				
Tribe		**Aiceonini**				
Genus 1.		***Aiceona***				
Species	1.	*Aiceona titabarensis*	√			
Tribe		**Anoeciini**				
Genus 2.		***Anoecia***				
Species	2.	*Anoecia vagans*			√	
Subfamily II		APHIDINAE				
Tribe		**Aphidini**				
Subtribe		Aphidina				
Genus 3.		***Aphis***				
Species	3.	*Aphis craccivora*	√		√	
	4.	*Aphis fabae solanella*	√			
	5.	*Aphis gossypii*	√			√
	6.	*Aphis kurosawai*	√		√	
	7.	*Aphis nasturtii*			√	
	8.	*Aphis nerii*	√			√
	9.	*Aphis ruborum longisetosa*	√		√	√
	10.	*Aphis spiraecola*	√			
Genus 4.		***Toxoptera***				
Species	11.	*Toxoptera aurantii*	√			
	12.	*Toxoptera citricidus*			√	
	13.	*Toxoptera odinae*	√			

Table 3 *Continued*

Name of species / subspecies		Districts			
		East Sikkim	West Sikkim	North Sikkim	South Sikkim
Subtribe	Rhopalosiphina				
Genus	5. ***Hysteroneura***				
Species	14. *Hysteroneura setariae*	√			
Genus 6.	***Melanaphis***				
Species	15. *Melanaphis bambusae*	√			
	16. *Melanaphis pahanensis*	√			
	17. *Melanaphis sacchari indosachari*			√	
Genus 7.	***Rhopalosiphum***				
Species	18. *Rhopalosiphum maidis*	√			
Species	19. *Rhopalosiphum nymphaeae*				√
	20. *Rhopalosiphum padi*				√
	21. *Rhopalosiphum rufiabdominalis*	√			
	22. *Rhopalosiphum yoksumi*		√		
Genus 8.	***Schizaphis***				
Species	23. *Schizaphis graminum*	√			
	24. *Schizaphis rotundiventris*	√			
Tribe	**Macrosiphini**				
Genus 9.	***Acutosiphuon***				
Species	25. *Acutosiphon obliquoris*	√			
Genus 10.	***Acyrthosiphon***				
Species	26. *Acyrthoriphon rubi*	√			
Genus 11.	***Akkaia***				
Species	27. *Akkaia bengalensis*	√			
	28. *Akkaia neopolygoni*			√	
	29. *Akkaia sikkimensis*	√			

Table 3 *Continued*

Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
Genus 12. ***Amphorophora***				
Species 30. *Amphorophora ampullata bengalensis*	√			
Genus 13. ***Arthromyzus***				
Species 31. *Arthromyzus smilacifoliae*	√			
Genus 14. ***Aulocorthum***				
Species 32. *Aulocorthum (Aulocorthum) dasi*		√		
33. *Aulocorthum (Aulocorthum) linderae**				
34. *Aulocorthum (Aulocorthum) magnoliae*	√			
35. *Aulocorthum (Aulocorthum) nipponicum*				√
36. *Aulocorthum (Aulocorthum) rhamni*		√		
37. *Aulocorthum (Aulocorthum) solani*		√		
38. *Aulocorthum (Neomyzus) circumflexum*	√			
39. *Aulocorthum (Neomyzus) primulum*				√
Genus 15. ***Brachycaudus***				
Species 40. *Brachycaudus helichrysi*		√		
Genus 16. ***Brachymyzus***				
Species 41. *Brachymyzus jasmini*			√	
Genus 17. ***Brevicoryne***				
Species 42. *Brevicoryne brassicae*	√			
Genus 18. ***Capitophorus***				
Species 43. *Capitophorus eleagni*		√		
44. *Capitophorus formosartemisiae*				√
45. *Capitophorus hippophaes javanicus*	√			
46. *Capitophorus hippophaes mitegoni*		√		
47. *Capitophorus indicus*	√			

Table 3 *Continued*

Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
Genus 19. ***Cavariella***				
Species 48. *Cavariella araliae*	√			
49. *Cavariella nigra*			√	
Genus 20. ***Cryptosiphum***				
Species 50. *Cryptosiphum artemisiae*	√			
Genus 21. ***Elatobium***				
Species 51. *Elabobium sclerotica*			√	
Genus 22. ***Ericolophium***				
Species 52. *Ericolophium sikkimensis*			√	
Genus 23. ***Eumyzus***				
Species 53. *Eumyzus himalaya*	√			
Genus 24. ***Hyadaphis***				
Species 54. *Hyadaphis coriandri*	√			
Genus 25. ***Hyalomyzus***				
Species 55. *Hyalomyzus raoi*		√		
Genus 26. ***Hyperomyzus***				
Species 56. *Hyperomyzus carduellinus*	√			
Genus 27. ***Impatientinum***				
Species 57. *Impatientinum impatiens*	√			
58. *Impatientinum (Neoimpatientinum) smilaceti*			√	
Genus 28. ***Indiaphis***				
Species 59. *Indiaphis rostrata*				√
Genus 29. ***Jacksonia***				
Species 60. *Jacksonia sikkimensis*			√	
Genus 30. ***Liosomaphis***				
Species 61. *Liosomaphis berberidis**				

* Exact locality not known

Table 3 *Continued*

Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
62. *Liosomaphis himalayensis*			√	
Genus 31. ***Lipaphis***				
Species 63. *Lipaphis erysimi*			√	
Genus 32. ***Macromyzus***				
Species 64. *Macromyzus (Macromyzus) woowardiae*	√			
65. *Macromyzus (Anthracosiphoniella) maculatus*		√		
Genus 33. ***Macrosiphoniella***				
Species 66. *Macrosiphoniella (Macrosiphoniella) kikungshana*	√			
67. *Macrosiphoniella (Macrosiphoniella) pseudoartimisiae*	√			
68. *Macrosiphoniella (Macrosiphoniella) sanborni*	√			
69. *Macrosiphoniella (Macrosiphoniella) sikkimartemisiae*			√	
70. *Macrosiphoniella (Macrosiphoniella) yomogifoliae*	√			
71. *Macrosiphoniella (Chosoniella) spinipes*	√			
Genus 34. ***Macrosiphum***				
Species 72. *Macrosiphum (Macrosiphum) pachysiphon*			√	
73. *Macrosiphum (Macrosiphum) rosae*			√	
Genus 35. ***Matsumuraja***				
Species 74. *Matsumuraja capitophoroides*	√			
Genus 36. ***Metopolophium***				
Species 75. *Metopolophium (Metopolophium) rubifoliae*	√			
Genus 37. ***Micromyzus***				
Species 76. *Micromyzus kalimpongensis*	√			
77. *Micromyzus niger*				√
Genus 38. ***Myzakkaia***				
Species 78. *Myzakkaia kuwanis*	√			
79. *Myzakkaia verbasci*	√			

Table 3 *Continued*

Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
Genus 39. ***Myzus***				
Species 80. *Myzus ceraci*	√			
81. *Myzus dycei*	√			
82. *Myzus formosanus*			√	
83. *Myzus ornatus*	√			
84. *Myzus persicae*	√		√	
85. *Myzus siegesbeckicola*			√	
Genus 40. ***Neoacyrthosiphon***				
Species 86. *Neoacyrthosiphon holsti*				√
Genus 41. ***Neomasonaphis***				
Species 87. *Neomasonaphis anaphilidis*	√			
88. *Neomasonaphis inulae*			√	
Genus 42. ***Oedisiphum***				
Species 89. *Oedisiphum soureni*			√	
Genus 43. ***Pentalonia***				
Species 90. *Pentalonia nigronervosa*	√			
Genus 44. ***Phorodon***				
Species 91. *Phorodon(Paraphorodon) cannabis*			√	
Genus 45. ***Rhopalosiphoninus***				
Species 92. *Rhopalosiphoninus(Myzosiphon) smilacifoliae*	√			
Genus 46. ***Semiaphis***				
Species 93. *Semiaphis heraclei*			√	
Genus 47. ***Shinjia***				
Species 94. *Shinjia orientalis*	√			
Genus 48. ***Sinomegoura***				
Species 95. *Sinomegoura citricola*	√			

Table 3 *Continued*

Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
96. *Sinomegoura photiniae*	√			
Genus 49. ***Sitobion***				
Species 97. *Sitobion akebiae*	√			
98. *Sitobion aulocorthoides*	√			
99. *Sitobion gravelii*	√			
100. *Sitobion indicum*	√			
101. *Sitobion miscanthi*	√			
102. *Sitobion pseudoluteum*	√			
103. *Sitobion rosaeformis*	√			
Species 104. *Sitobion sikkimense*	√			
105. *Sitobion takahashii*			√	
Genus 50. ***Subovatomyzus***				
Species 106. *Subovatomyzus leucosceptri*	√			
Genus 51. ***Tricaudatus***				
Species 107. *Tricaudatus polygoni*	√		√	
Genus 52. ***Trichosiphonaphis***				
Species 108. *Trichosiphonaphis gerbarae*	√			√
Genus 53. ***Tuberocephalus***				
Species 109. *Tuberocephalus sasaki*			√	
Genus 54. ***Uroleucon***				
Species 110. *Uroleucon formosanus crepidis*	√			
111. *Uroleucon pseudotanaceti*	√			
112. *Uroleucon sonchi*	√			
Genus 55. ***Vesiculaphis***				
Species 113. *Vesiculaphis pieridis*			√	
114. *Vesiculaphis sikkimensis*				√

Table 3 *Continued*

Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
Genus 56. ***Xenomyzus***				
Species 115.*Xenomyzus scabripes*	√			
Tribe **Pterocommatini**				
Genus 57. ***Pterocomma***				
Species 116.*Pterocomma* sp.				
Subfamily III DREPANOSIPHINAE				
Genus 58. ***Betacallis***				
Species 117.*Betacallis querciphaga*	√			
118.*Betacallis sikkimensis*	√			
Genus 59. ***Clethrobius***				
Species 119.*Clethrobius dryobius*	√			
Genus 60. ***Neobetulaphis***				
Species 120.*Neobetulaphis chaetosiphon*			√	
121.*Neobetulaphis pusilla*	√			
Genus 61. ***Shivaphis***				
Species 122.*Shivaphis celti*	√			
Genus 62. ***Taiwanaphis***				
Species 123.*Taiwanaphis dineni*			√	
Genus 63. ***Takecallis***				
Species 124.*Takecallis aurandinariae*			√	
Genus 64. ***Taoia***				
Species 125.*Taoia indica*	√			
Genus 65. ***Tinocallis***				
Species 126.*Tinocallis himalayensis*	√			
Genus 66. ***Tinocalloides***				
Species 127.*Tinocalloides montanus*	√			

Table 3 *Continued*

Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
Subfamily IV GREENIDEINAE				
Tribe **Cervaphidini**				
Genus 67. ***Anomalosiphum***				
Species 128.*Anomalosiphum indigoferae*	√			
Genus 68. ***Schoutedenia***				
Species 129.*Schoutedenia ralumensis*			√	
Genus 69. ***Sumatraphis***				
Species 130.*Sumatraphis celti*			√	
Tribe **Greenideini**				
Genus 70. ***Eutrichosiphum***				
Species 131. *Eutrichosiphum alnicola*		√		
132. *Eutrichosiphum arunachali*			√	
133.*Eutrichosiphum betulae*			√	
134.*Eutrichosiphum davidi*	√			
135.*Eutrichosiphum pseudopasaniae*				√
136.*Eutrichosiphum quercifoliae*	√			
137.*Eutrichosiphum sikkimense*	√			
138.*Eutrichosiphum tapatii*			√	
Genus 71. ***Greenidea***				
Species 139.*Greenidea(Greenidea)decaspermi*	√			
140.*Greenidea(Greenidea) ficicola*	√			
141.*Greenidea(Greenidea) longicornis*	√			
142.*Greenidea(Greenidea) longirostris*	√			
143.*Greenidea(Paragreenidea)symplocosis*	√			
144.*Greenidea(Trichosiphum)brachyunguis*	√			
145.*Greenidea(Trichosiphum)bucktonis*	√			
146.*Greenidea(Trichosiphum)formosana heeri*	√			
147.*Greenidea(Trichosiphum) prunicola*				√

Table 3 *Continued*

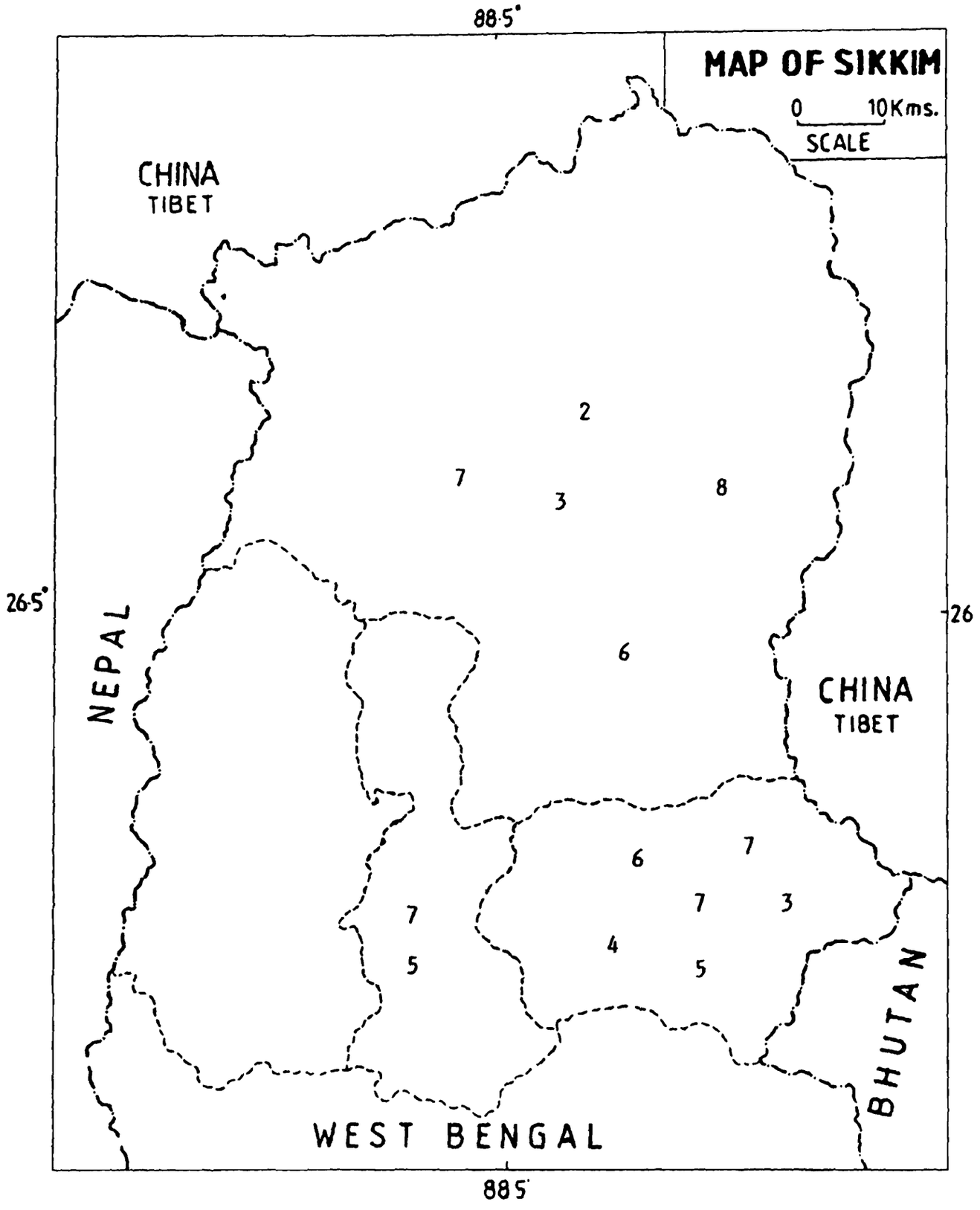
Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
148. *Greenidea(Trichosiphum) sikkimensis*	√			
Genus 72. ***Greenideoida***				
Species 149. *Greenideoida(Paratrichosiphum)luteum*	√			
Genus 73. ***Mollitrichosiphum***				
Species 150. *Mollitrichosiphum(Mollitrichosiphum)nigriabdominalis*		√		
151. *Mollitrichosiphum(Mollitrichosiphum)tenuicorpus*	√			
152. *Mollitrichosiphum(Mollitrichosiphum) tricolum*	√			
153. *Mollitrichosiphum(Mollitrichosipum) buddeliae*				
154. *Mollitrichosiphum(Metatrichosiphum)montanum*	√			
155. *Mollitrichosiphum(Metatrichosiphum)nandii*	√		√	
Subfamily V HORMAPHIDINAE				
Tribe **Ceraphidini**				
Genus 74. ***Aleurodaphis***				
Species 156. *Aleurodaphis blumeae*			√	
Genus 75. ***Astegopteryx***				
Species 157. *Astegopteryx minuta*	√			
Genus 76. ***Ceratoglyphina***				
Species 158. *Ceratoglyphina bambusae bengalensis*			√	
Genus 77. ***Ceratovacuna***				
Species 159. *Ceratovacuna indica*			√	
160. *Ceretovacuna lanigera*	√		√	
161. *Ceratovacuna perglandulosa*	√			
162. *Ceratovacuna silvestrii*			√	
Genus 78. ***Glyphinaphis***				
Species 163. *Glyphinaphis bambusae*			√	
Genus 79. ***Pseudoregma***				
Species 164. *Pseudoregma alexanderi*				√

Table 3 *Continued*

Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
165. *Pseudoregma bucktoni*	√			
166. *Pseudoregma panicola*	√		√	√
Genus 80. ***Pseudoastegopteryx***				
Species 167. *Pseudoastegopteryx himalayensis*				
Tribe **Nipponaphidini**				
Genus 81. ***Nipponaphis***				
Species 168. *Nipponaphis(Pseudonipponaphis) querciphaga*				√
Subfamily VI LACHNINAE				
Tribe **Cinarini**				
Genus 82. ***Cinara***				
Species 169. *Cinara(Cinara) atrotibialis*				√
170. *Cinara (Cinara) tistaensis*			√	
171. *Cinara (Cinara) tujafilina*	√		√	
172. *Cinara (Cupressabium) cupressi*			√	
Tribe **Lachnini**				
Genus 83. ***Lachnus***				
Species 173. *Lachnus tropicalis*	√			
Genus 84. ***Nippolachnus***				
Species 174. *Nippolachnus piri*	√			√
Subfamily VIII PEMPHIGINAE				
Tribe **Fordini**				
Genus 85. ***Chaetogeoica***				
Species 175. *Chaetogeoica graminiphaga*		√		
Genus 86. ***Geoica***				
Species 176. *Geoica lucifuga*		√		√
177. *Geoica sikkimensis*		√		

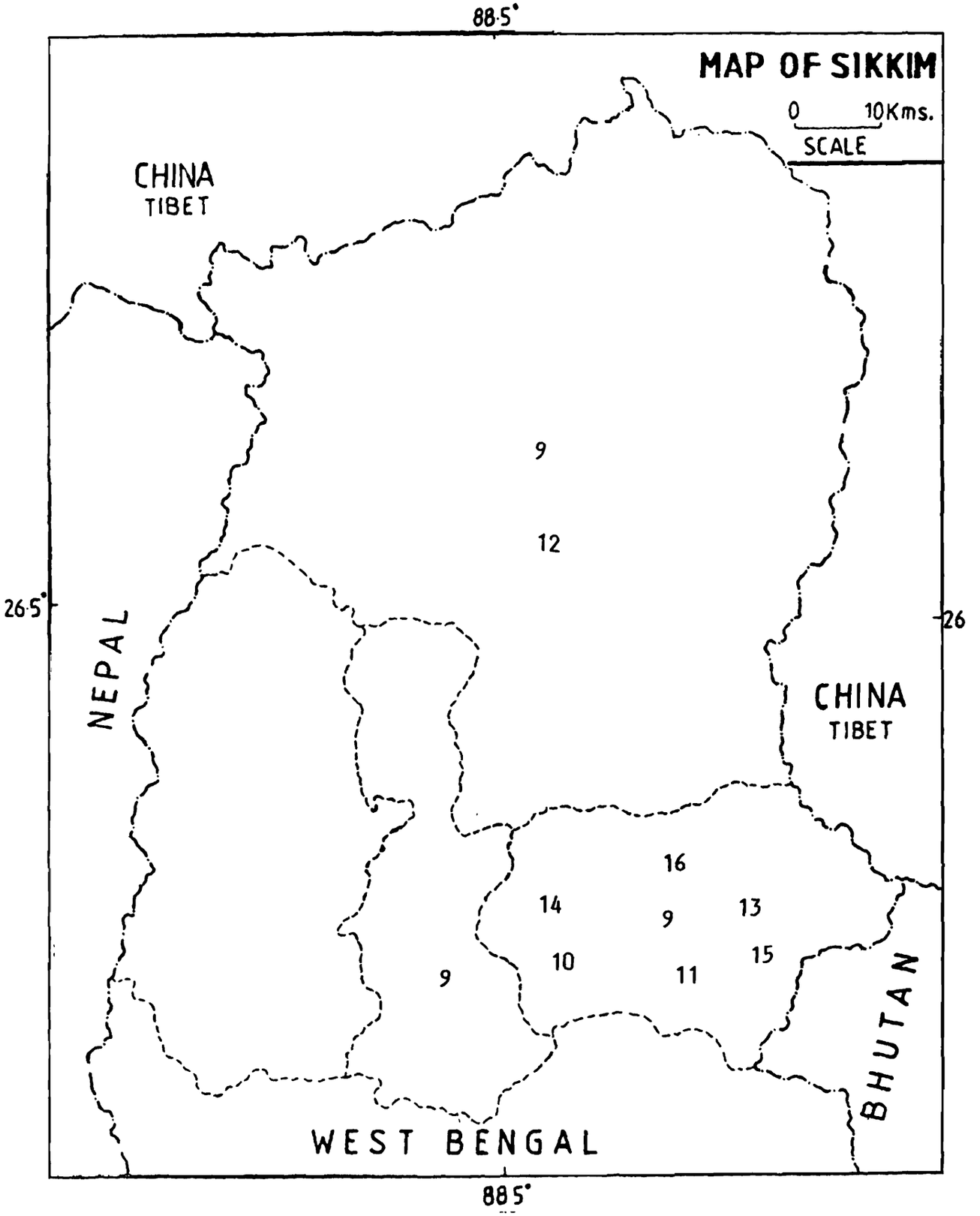
Table 3 *Continued*

Name of species / subspecies	Districts			
	East Sikkim	West Sikkim	North Sikkim	South Sikkim
Tribe **Pemphigini**				
Genus 87. ***Epipemphigus***				
Species 178. *Epipemphigus eastopi*			√	
Genus 88. ***Pemphigus***				
Species 179. *Pemphigus eastopi*			√	
180. *Pemphigus vulgaris*		√		
Tribe **Erisomatini**				
Genus 89. ***Eriosoma***				
Species 181. *Eriosoma lanigerum*			√	
Genus 90. ***Tetraneura***				
Species 182. *Tetraneura (Tetraneura) sikkimensis*		√		
183. *Tetraneura (Indotetraneura) basui*		√		
184. *Tetraneura (Tetraneurella) nigriabdominalis*			√	
Subfamily VIII THELAXINAE				
Genus 91. ***Kurisakia***				
Species 185. *Kurisakia indica*			√	√



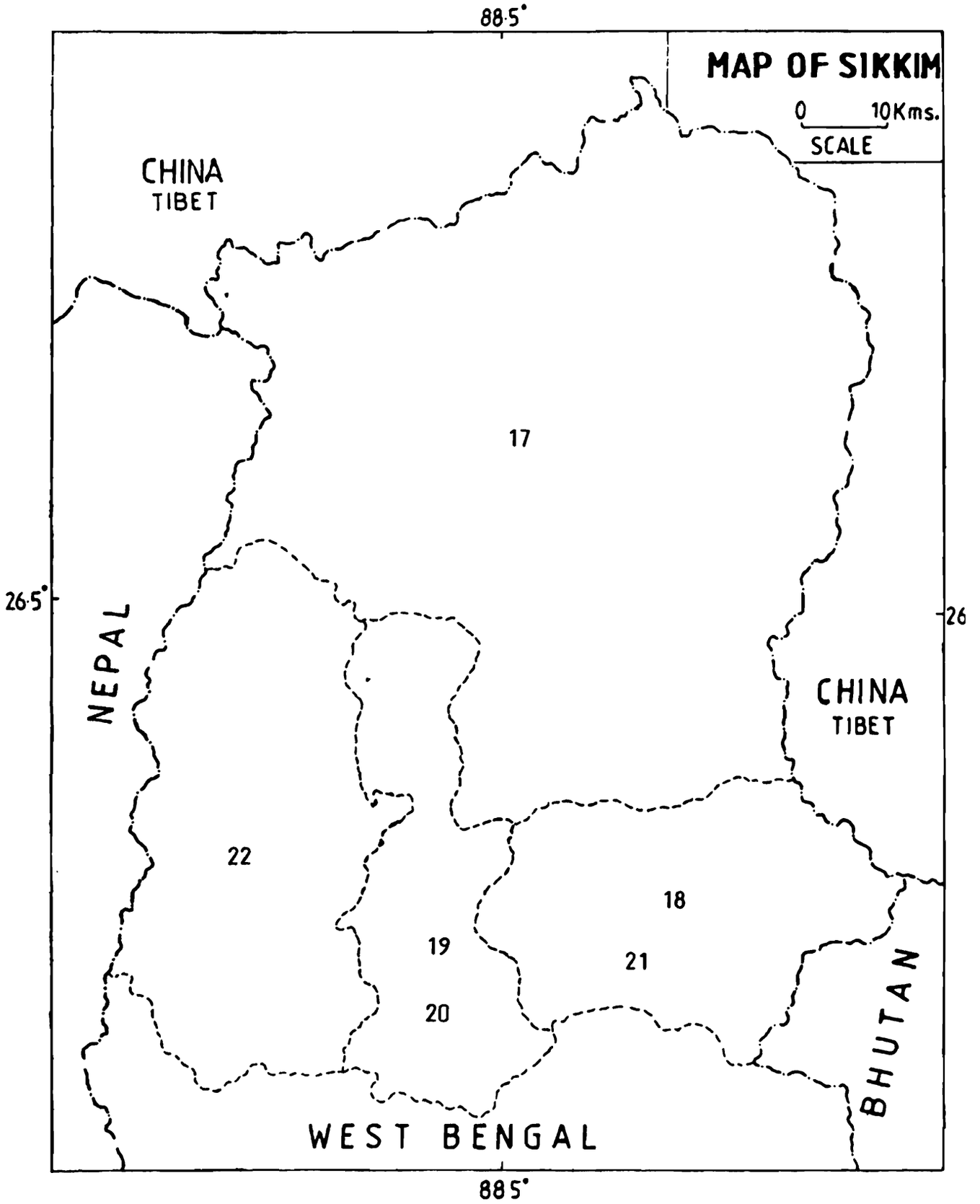
Map 1. Distribution of Aphididae Species 1–8 as indicated

1. *Aiceona titabarensis*
2. *Anoecia vagans*
3. *Aphis craccivora*
4. *Aphis fabae solanella*
5. *Aphis gossypii*
6. *Aphis kurosawai*
7. *Aphis longisetosa*
8. *Aphis nasturtii*



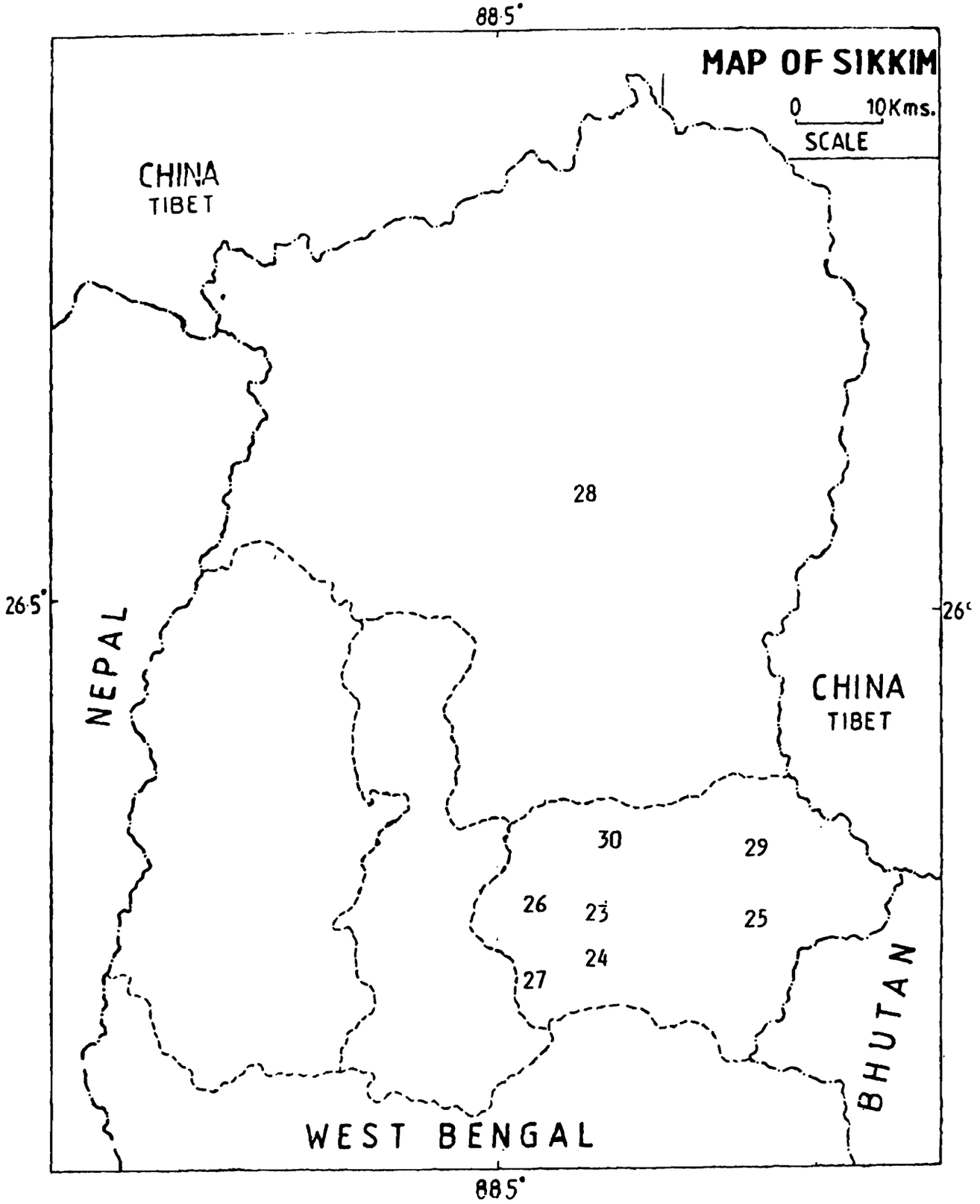
Map 2. Distribution of Aphididae Species 9–16 as indicated

9. *Aphis nerii*
10. *Aphis spiraecola*
11. *Toxoptera aurantii*
12. *Toxoptera citricidus*
13. *Toxoptera odinae*
14. *Hysteroneura setariae*
15. *Melanaphis bambusae*
16. *Melanaphis pahanensis*



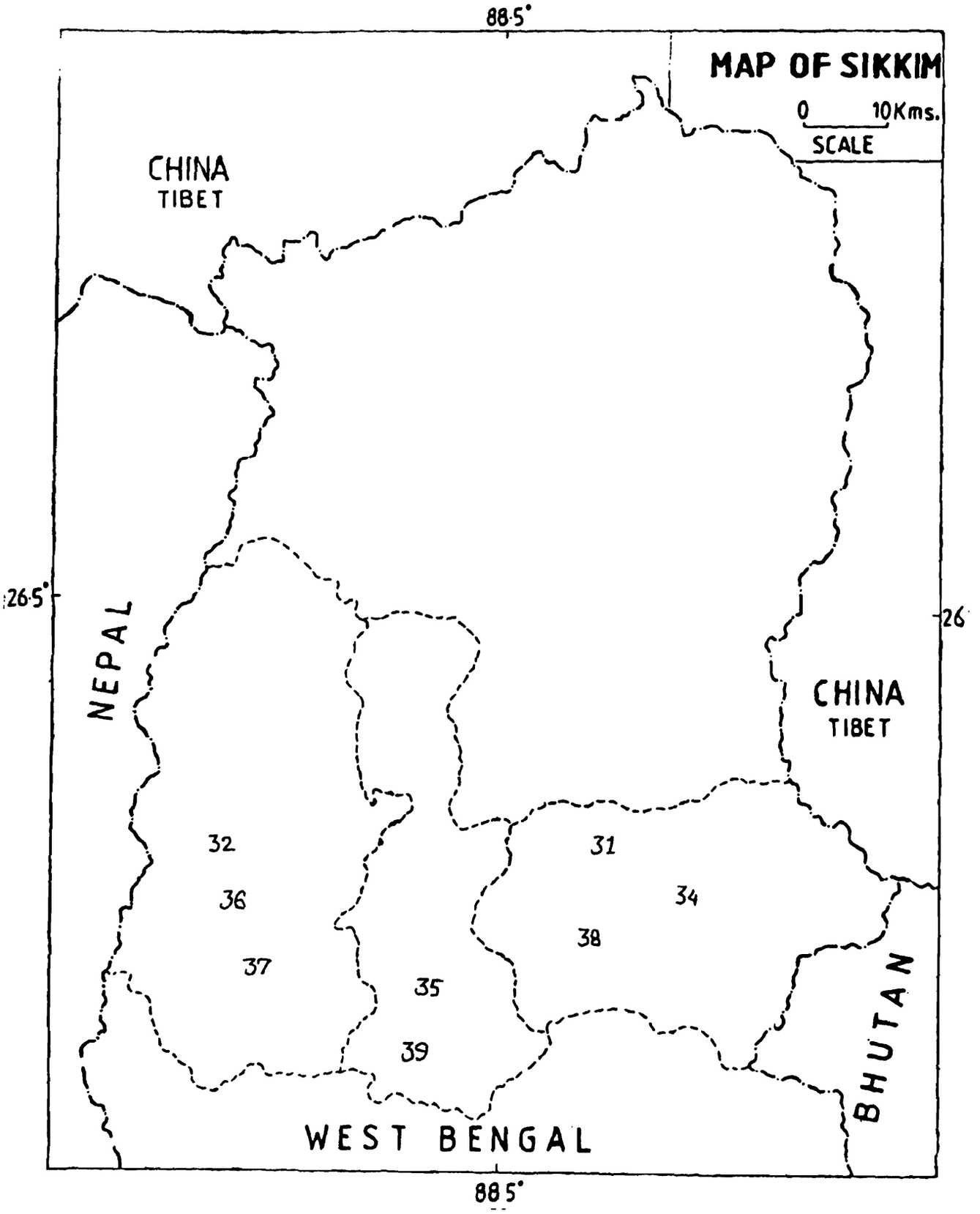
Map 3. Distribution of Aphididae Species 17–22 as indicated

17. *Melanaphis sacchari indosacchari*
18. *Rhopalosophum maidis*
19. *Rhopalosiphum nymphaeae*
20. *Rhopalosiphum padi*
21. *Rhopalisiphum rufiabdominalis*
22. *Rhopalosophum yoksumi*



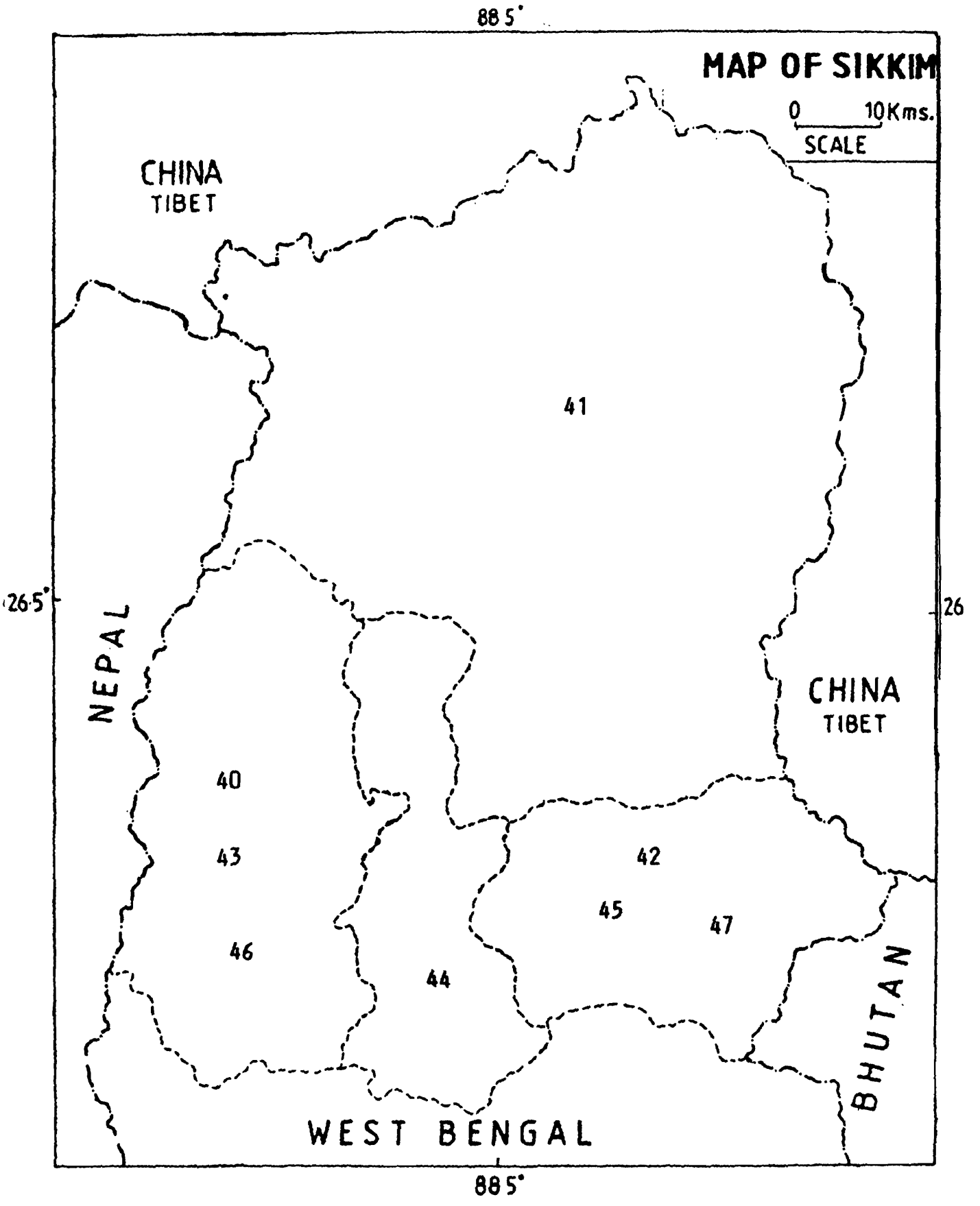
Map 4. Distribution of Aphididae Species 23–30 as indicated

23. *Schizaphis graminum*
24. *Schizaphis rotundiventris*
25. *Acutosiphon obliquoris*
26. *Acyrthosiphon rubi*
27. *Akkaia bengalensis*
28. *Akkaia neopolygoni*
29. *Akkaia sikkimensis*
30. *Amphorophora ampullata bengalensis*



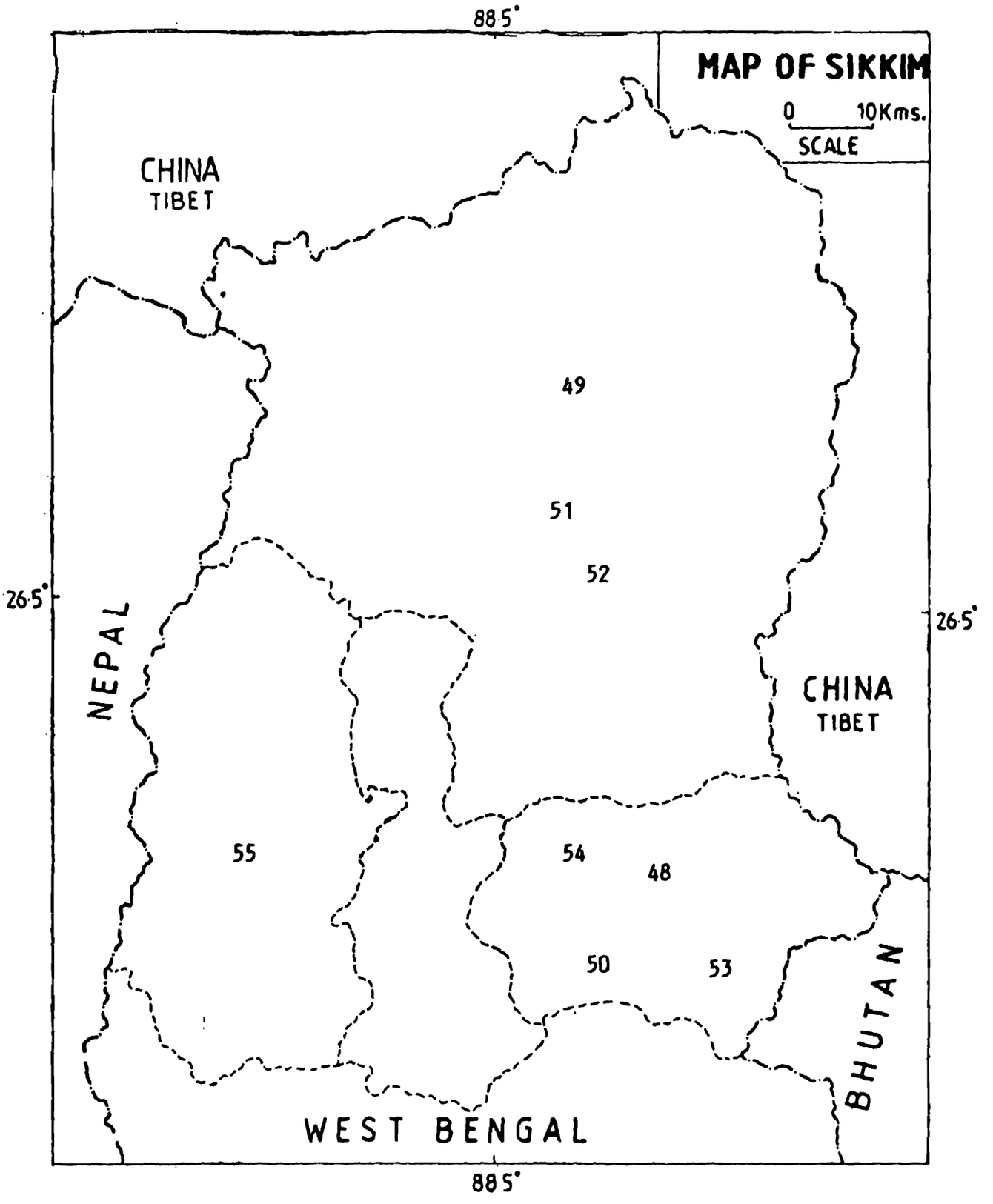
Map 5. Distribution of Aphididae Species 31–39 as indicated

31. *Arthromyzus smilacifoliae*
32. *Aulocorthum (Aulocorthum) dasi*
33. *Aulocorthum (Aulocorthum) linderae*
34. *Aulocorthum (Aulocorthum) magnoliae*
35. *Aulocorthum (Aulocorthum) nipponicum*
36. *Aulocorthum (Aulocorthum) rhamni*
37. *Aulocorthum (Aulocorthum) solani*
38. *Aulocorthum (Neomyzus) circumflexum*
39. *Aulocorthum (Neomyzus) primulum*



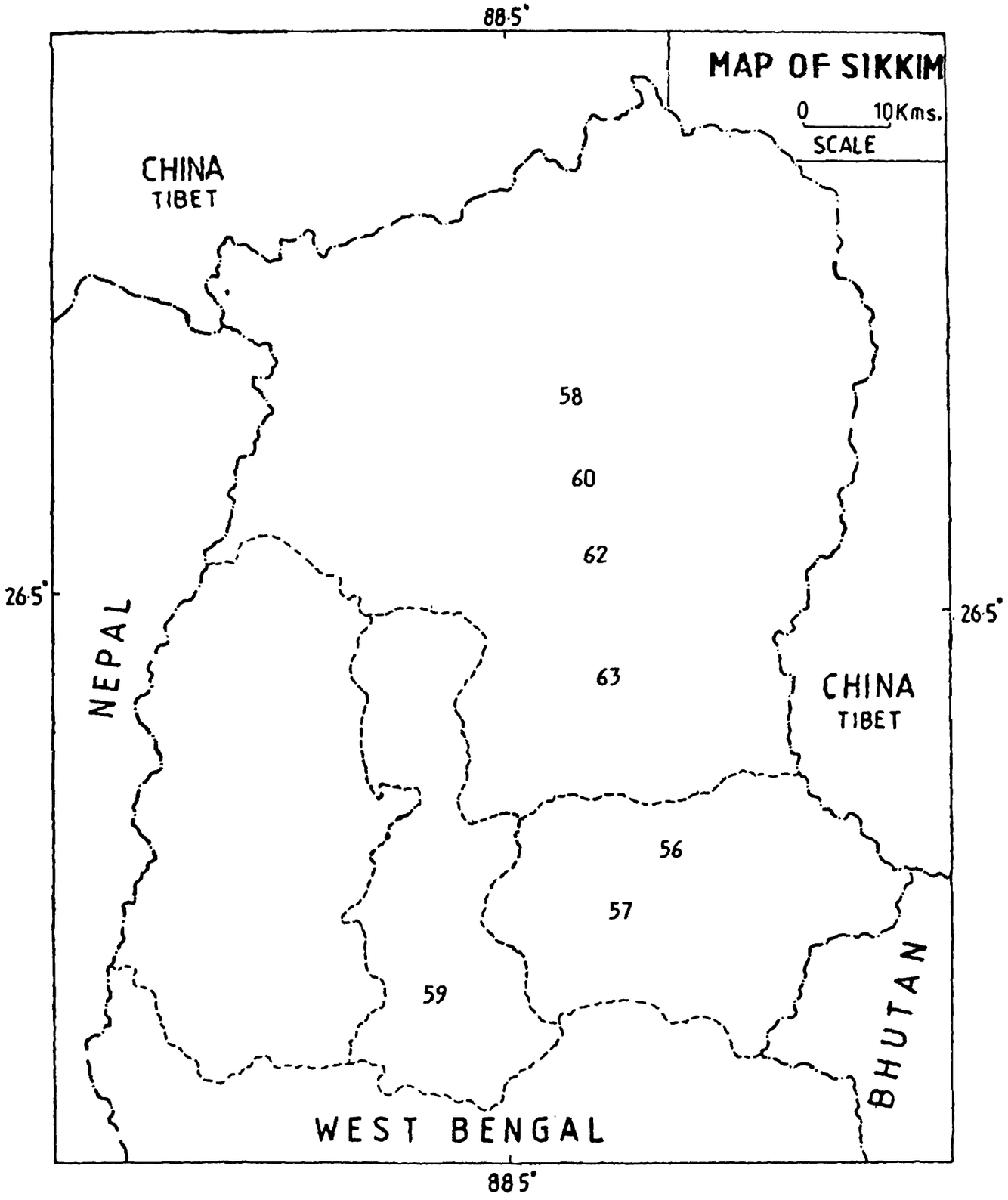
Map 6. Distribution of Aphididae Species 40–47 as indicated

40. *Brachycaudus helichrysi*
41. *Brachymyzus jasmini*
42. *Brevicoryne brassicae*
43. *Capitophorus eleagni*
44. *Capitophorus formosartemisiae*
45. *Capitophorus hippophaes javanicus*
46. *Capitophorus hippophaes mitegoni*
47. *Capitophorus indicus*



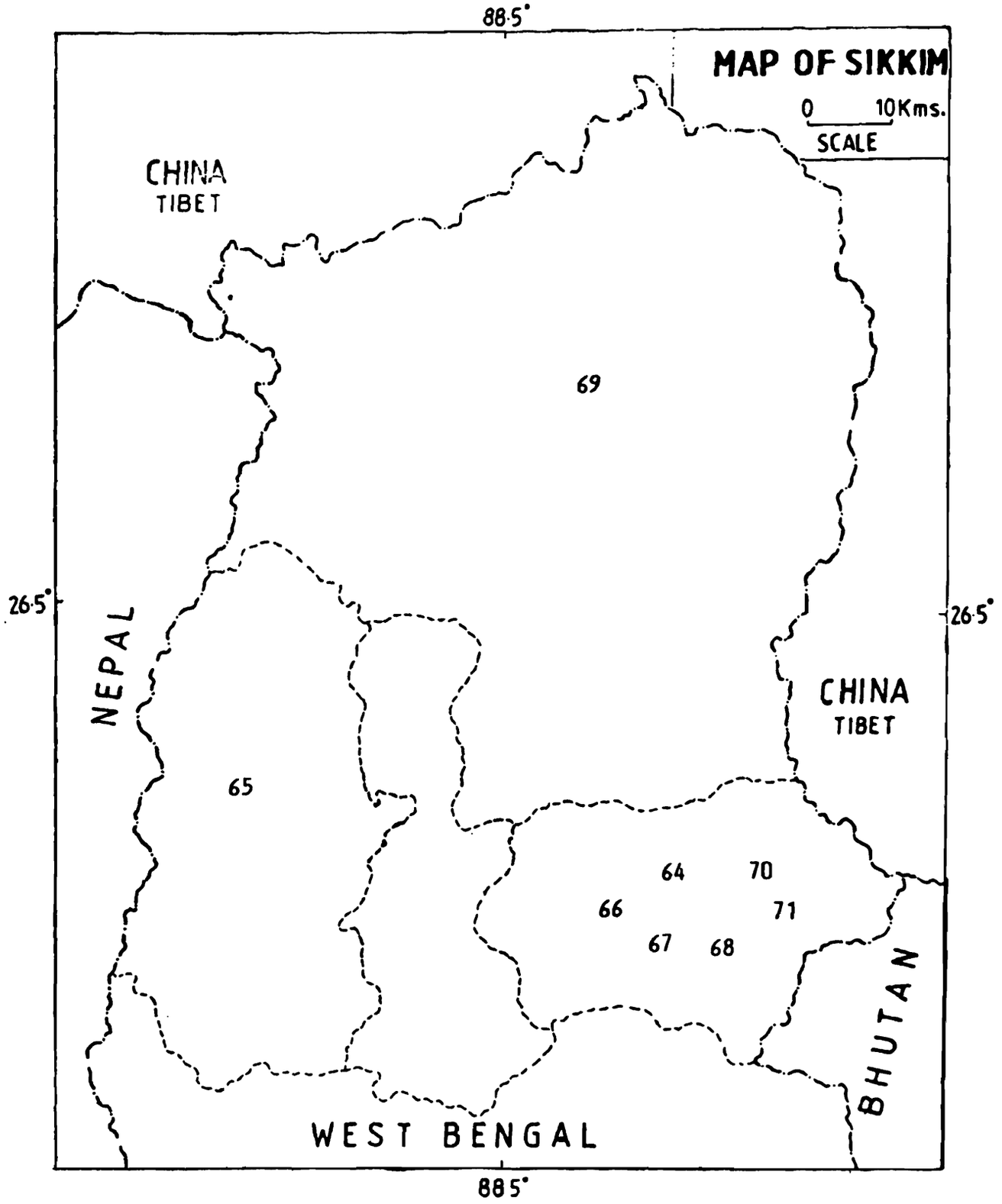
Map 7. Distribution of Aphididae Species 48–55 as indicated

48. *Cavariella araliae*
49. *Cavariella nigra*
50. *Cryptosiphum artemisiae*
51. *Elatobium sclerotica*
52. *Ericolophium sikkimensis*
53. *Eumyzus himalaya*
54. *Hyadaphis coriandri*
55. *Hyalomyzus raoi*



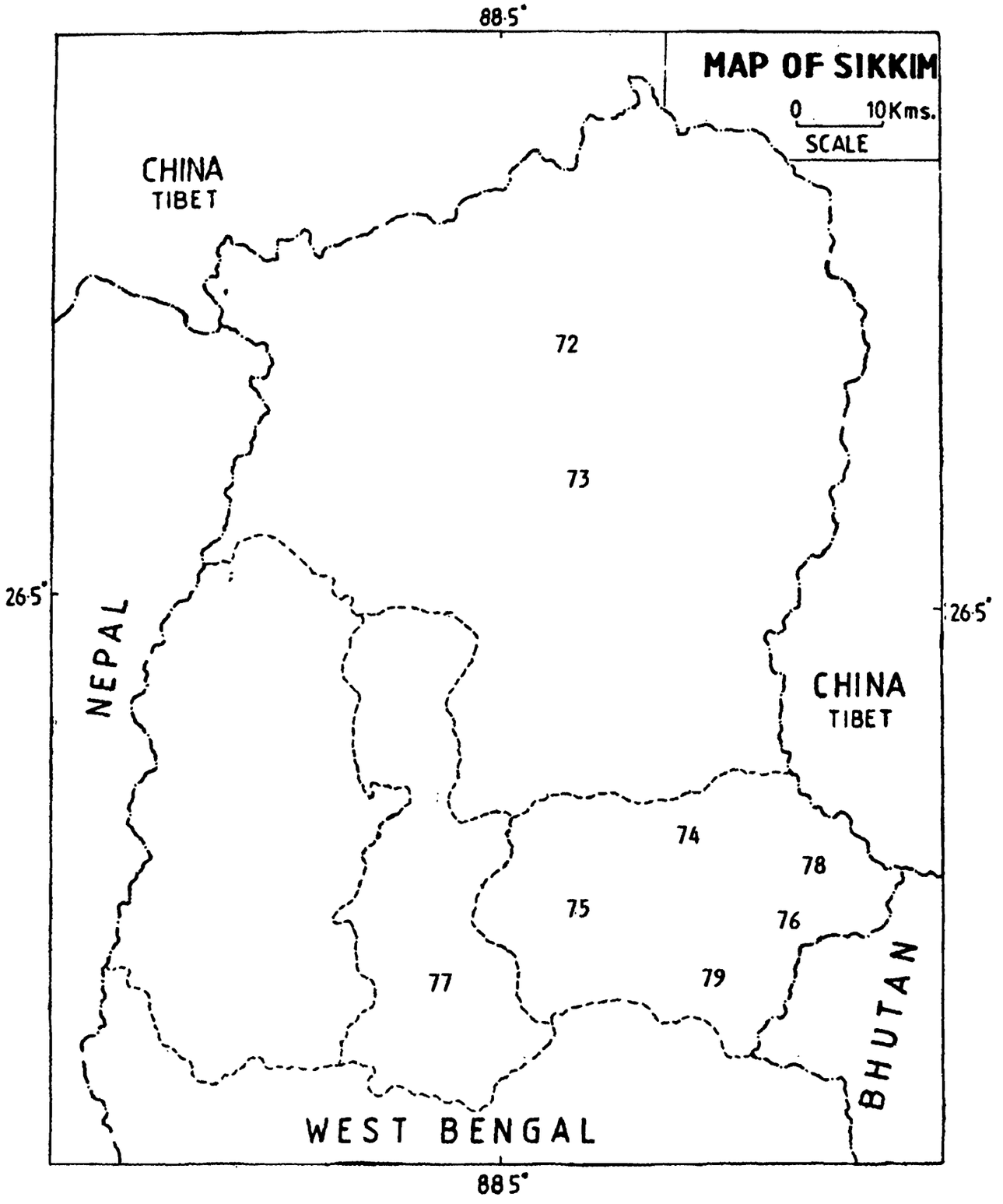
Map 8. Distribution of Aphididae Species 56–63 as indicated

56. *Hyperomyzus carduellinus*
57. *Impatientinum impatiens*
58. *Impatientinum (Neoimpatientinum) smilaceti*
59. *Indiaphis rostrata*
60. *Jacksonia sikkimensis*
61. *Liosomaphis berberidis*
62. *Liosomaphis himalayensis*
63. *Lipaphis erysimi*



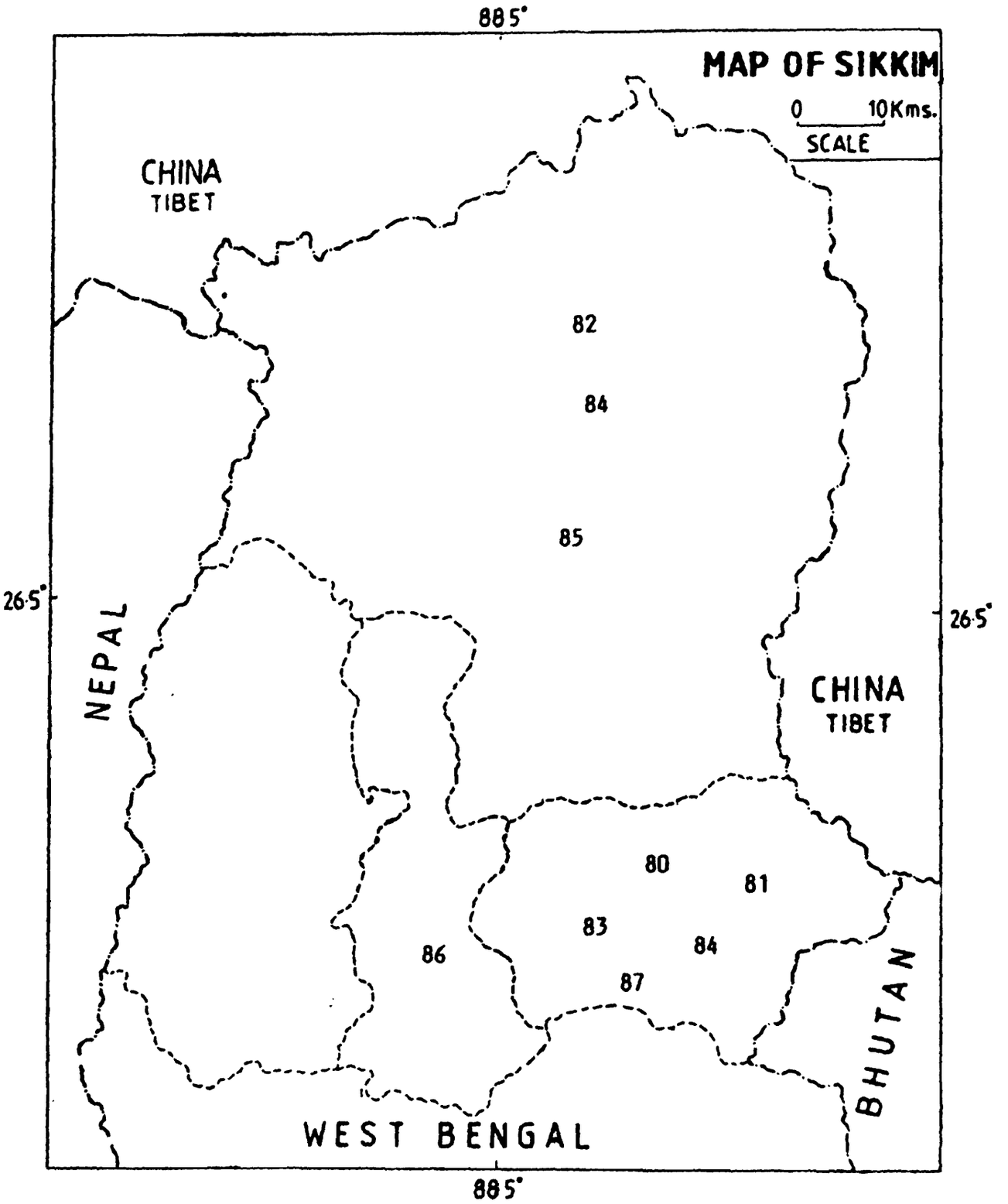
Map 9. Distribution of Aphididae Species 64–71 as indicated

64. *Macromyszus (Macromyzus) woodwardiae*
65. *Macromyzus (Anthracosiphoniella) maculatus*
66. *Macrosiphoniella (Macrosiphoniella) kikungshana*
67. *Macrosiphoniella (Macrosiphoniella) pseudoartemisiae*
68. *Macrosiphoniella (Macrosiphoniella) sanbornii*
69. *Macrosiphoniella (Macrosiphoniella) sikkimartemisiae*
70. *Macrosiphoniella (Macrosiphoniella) yomogifoliae*
71. *Macrociphoniella (Chosoniella) spinipes*



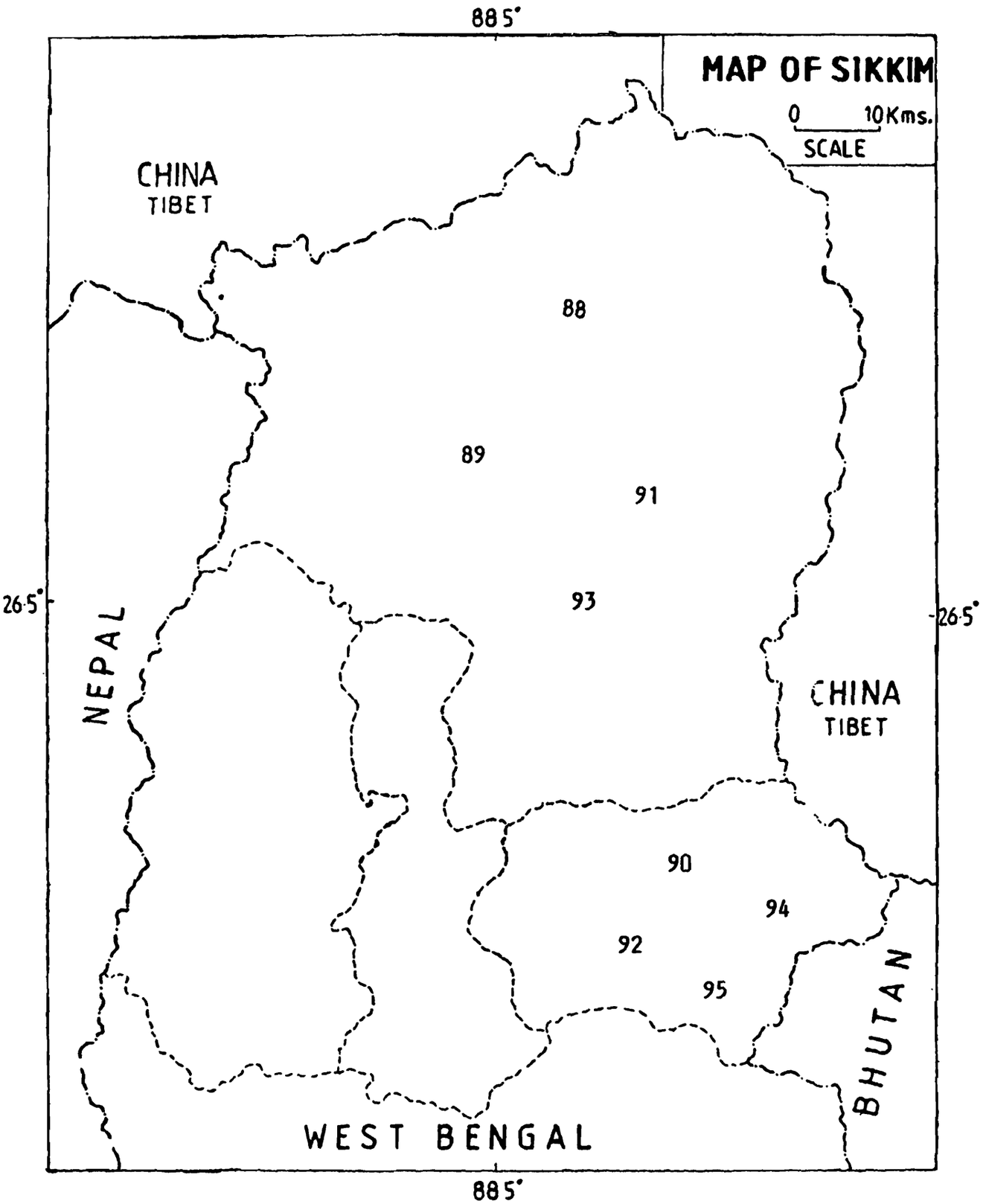
Map 10. Distribution of Aphididae Species 72–79 as indicated

72. *Macrosiphum (Macrosiphum) pachysiphon*
73. *Macrosiphum (Macrosiphum) rosae*
74. *Matsumuraja capitophoroides*
75. *Metopolophium (Metopolophium) rubifoliae*
76. *Micromyzus kalimpongensis*
77. *Micromyzus niger*
78. *Myzakkaia kuwanis*
79. *Myzakkaia verbasci*



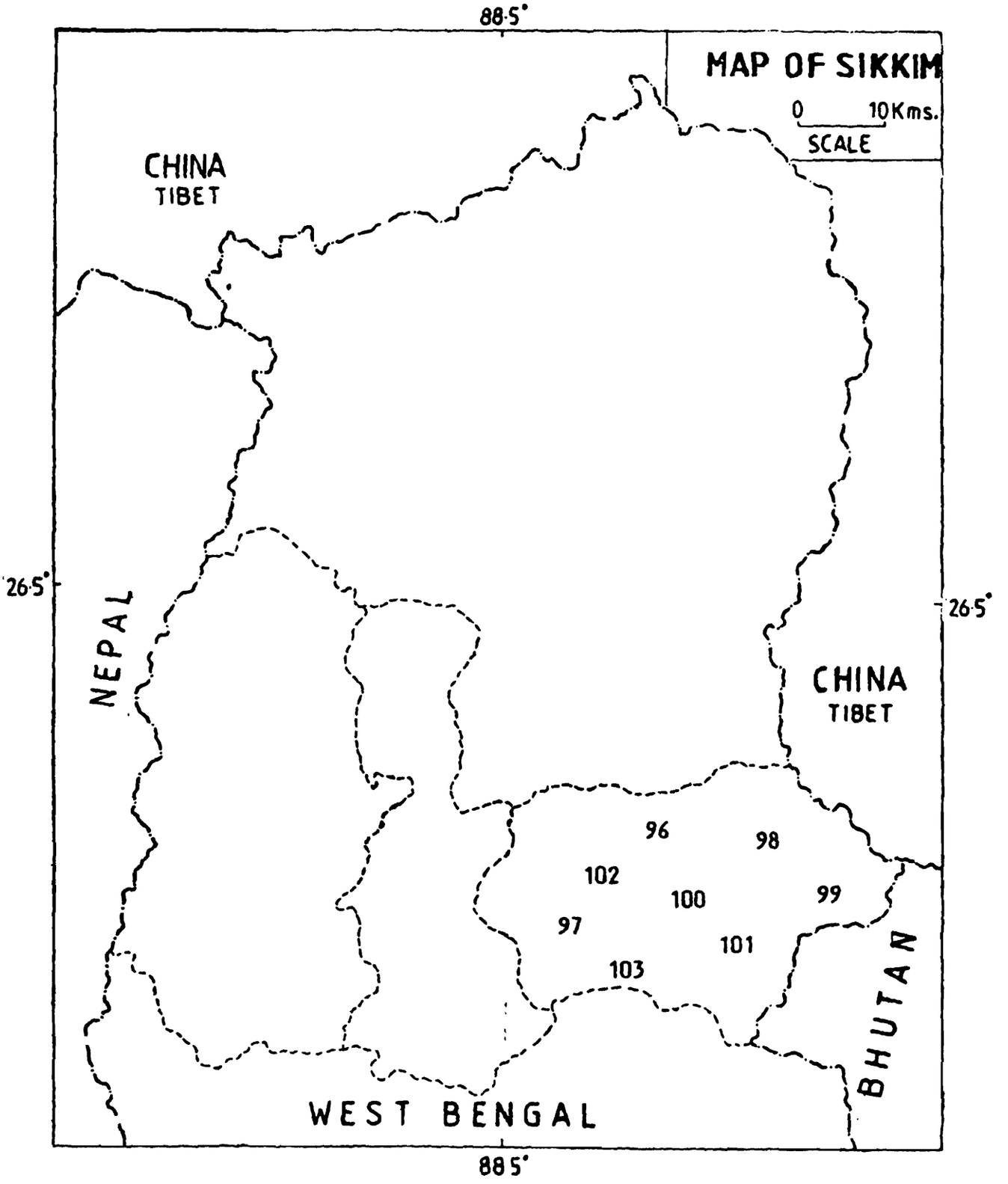
Map 11. Distribution of Aphididae Species 80–87 as indicated

80. *Myzus ceraci*
81. *Myzus dycei*
82. *Myzus formosanus*
83. *Myzus ornatus*
84. *Myzus persicae*
85. *Myzus siegesbeckicola*
86. *Neoacyrthosiphon holsti*
87. *Neomasonaphis anaphilidis*



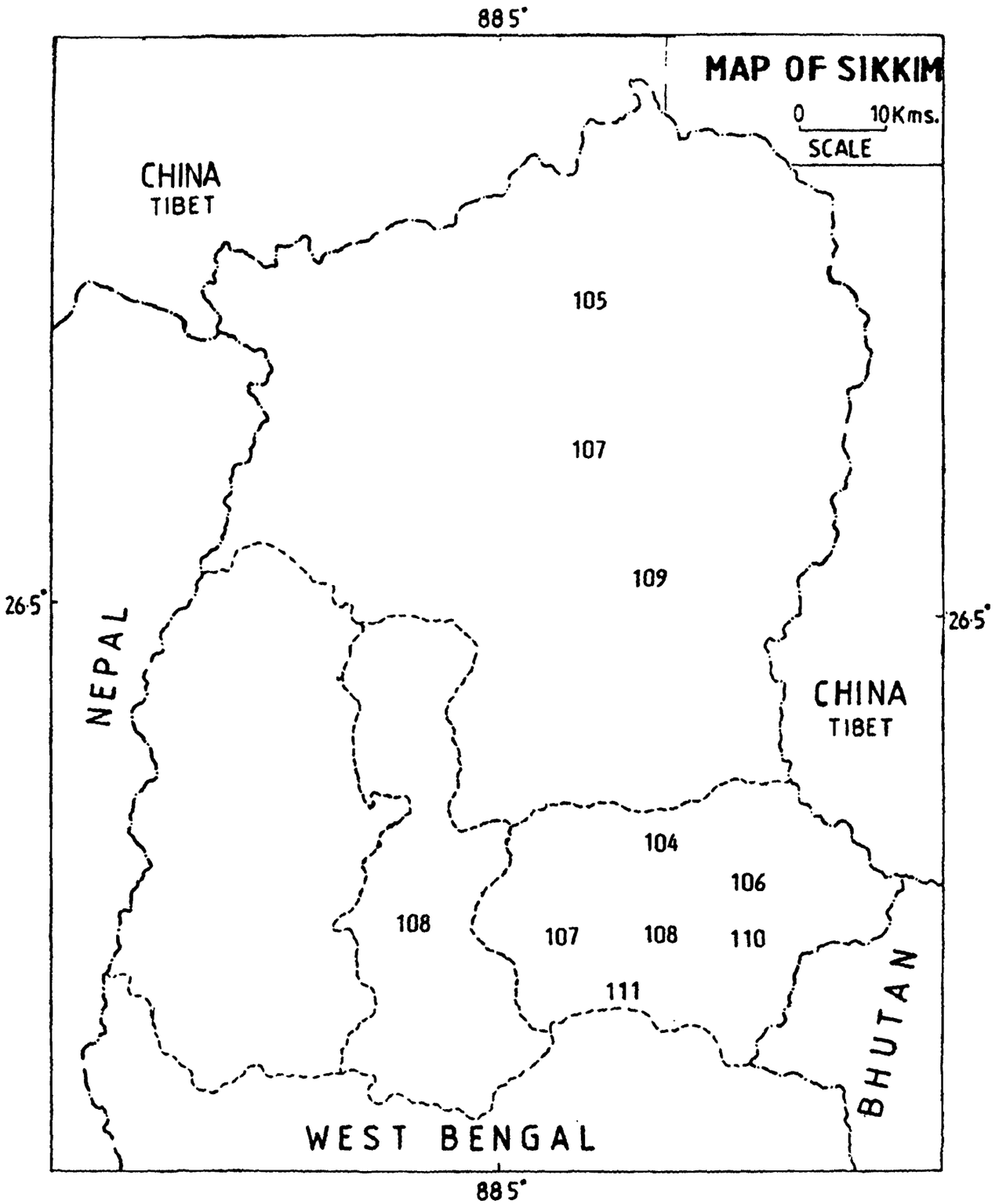
Map 12. Distribution of Aphididae Species 88–95 as indicated

88. *Neomasonaphis inulae*
92. *Oedisiphum soureni*
90. *Pentalonia nigronervosa*
91. *Phorodon (Paraphorodon) cannabis*
92. *Rhopalosiphoninus (Myzosiphon) smilacifoliae*
93. *Semiaphis heraclei*
94. *Shinjia orientalis*
95. *Sinomegoura citricola*



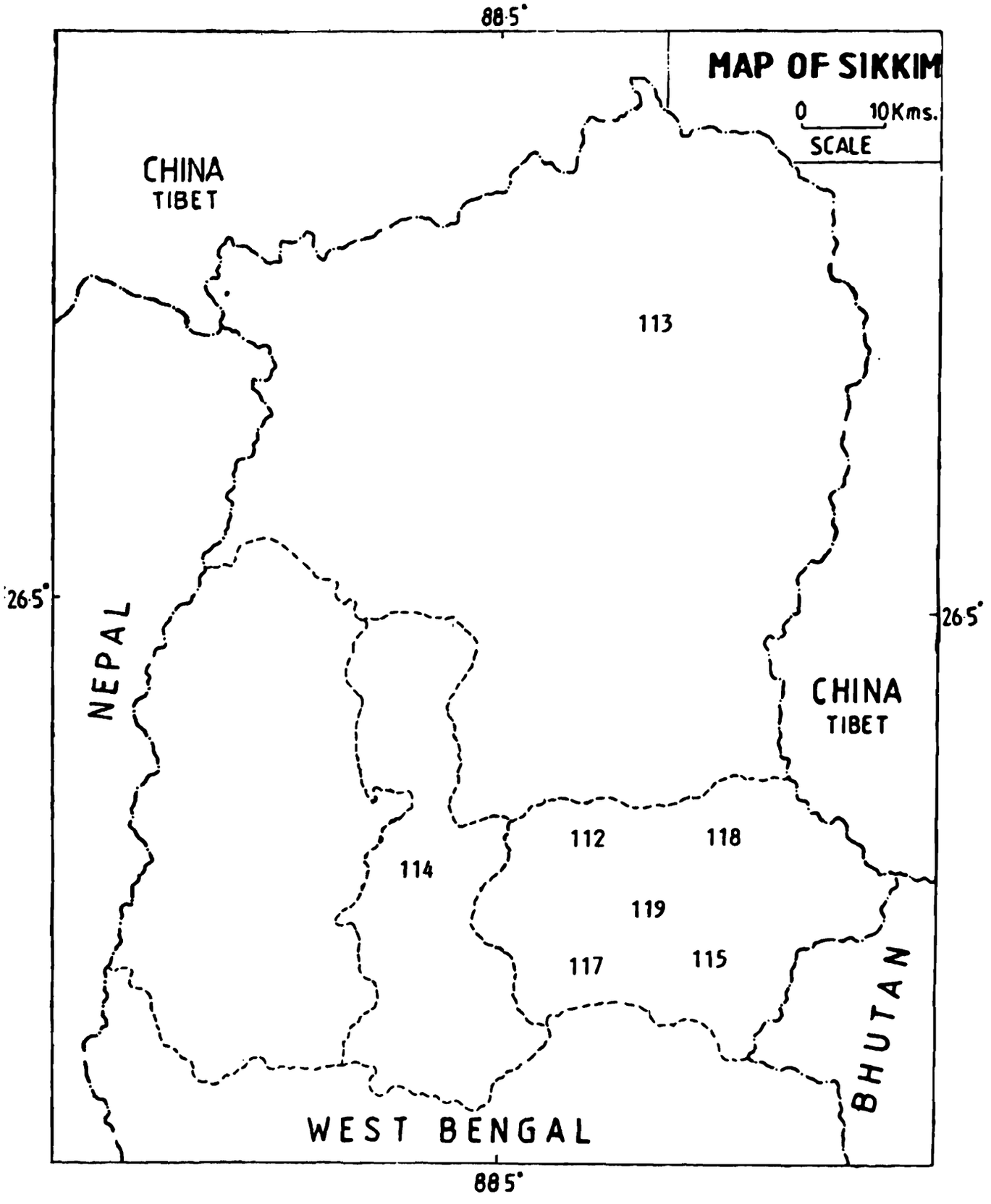
Map 13. Distribution of Aphididae Species 96–103 as indicated

96. *Sinomegoura photiniae*
97. *Sitobion akebiae*
98. *Sitobion aulocorthoides*
99. *Sitobion gravelii*
100. *Sitobion indicum*
101. *Sitobion miscanthi*
102. *Sitobion pseudoluteum*
103. *Sitobion rosaeformis*



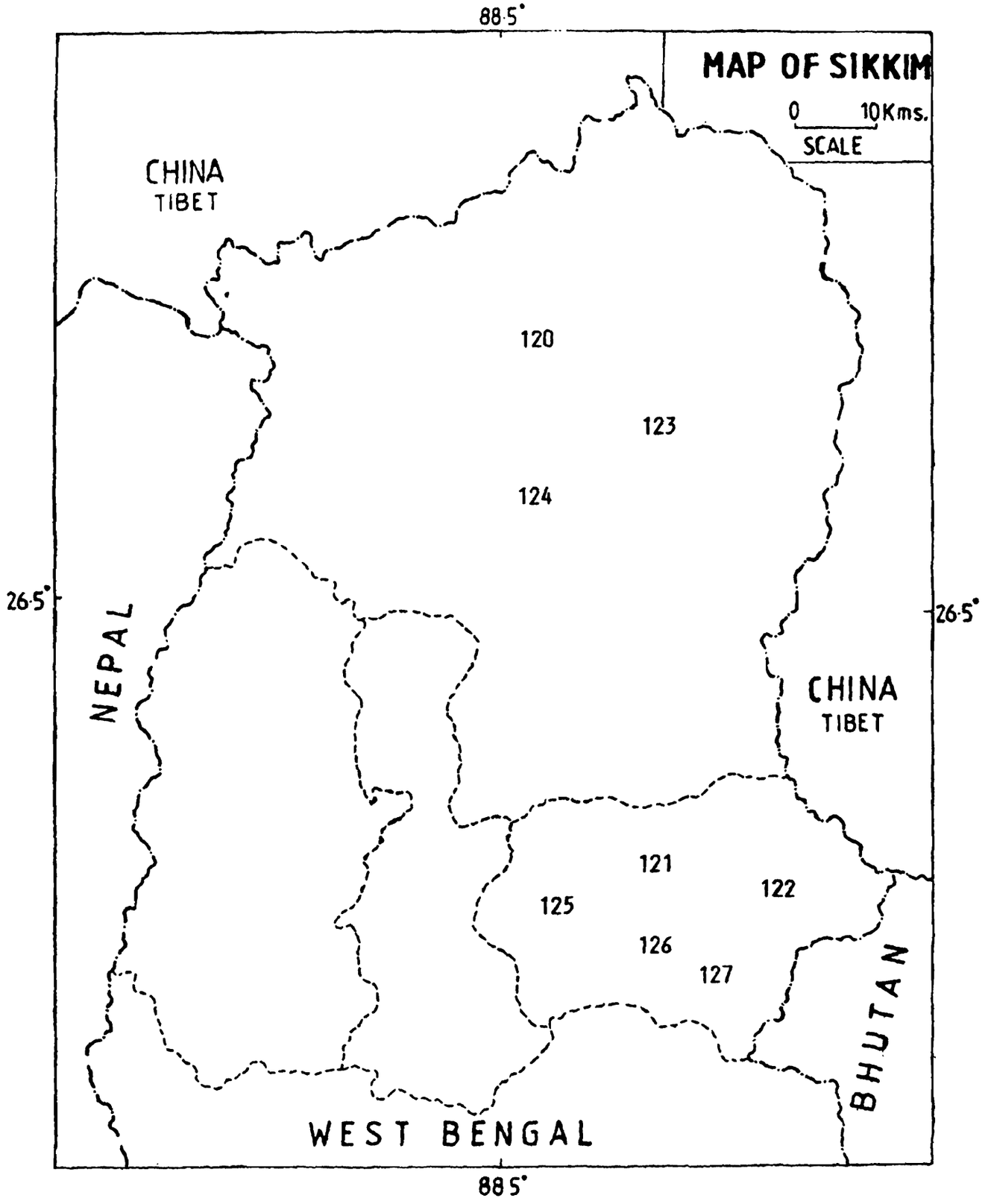
Map 14. Distribution of Aphididae Species 104–111 as indicated

104. *Sitobion sikkimense*
105. *Sitobion takahashii*
106. *Subovatomyzus leucosceptri*
107. *Tricaudatus polygoni*
108. *Trichosiphonaphis gerbarae*
109. *Tuberocephalus sasaki*
110. *Uroleucon formosanus crepidis*
111. *Uroleucon pseudotanaceti*



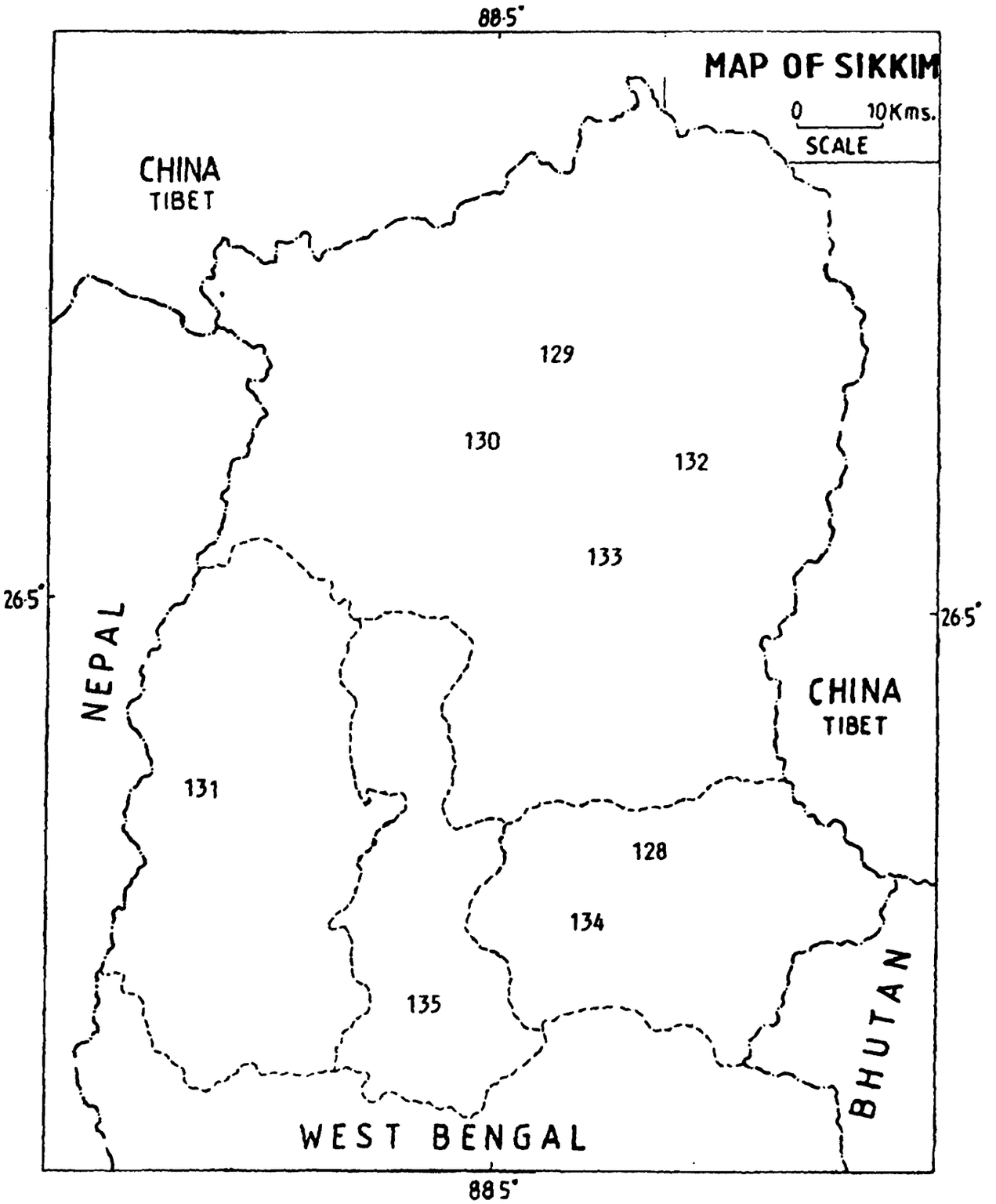
Map 15. Distribution of Aphididae Species 112–119 as indicated

112. *Uroleucon sonchi*
113. *Vesiculaphis pieridis*
114. *Vesiculaphis sikkimensis*
115. *Xenomyzus scabripes*
116. *Pterocomma sp.*
117. *Betacallis querciphaga*
118. *Betacallis sikkimensis*
119. *Clethrobius dryobius*



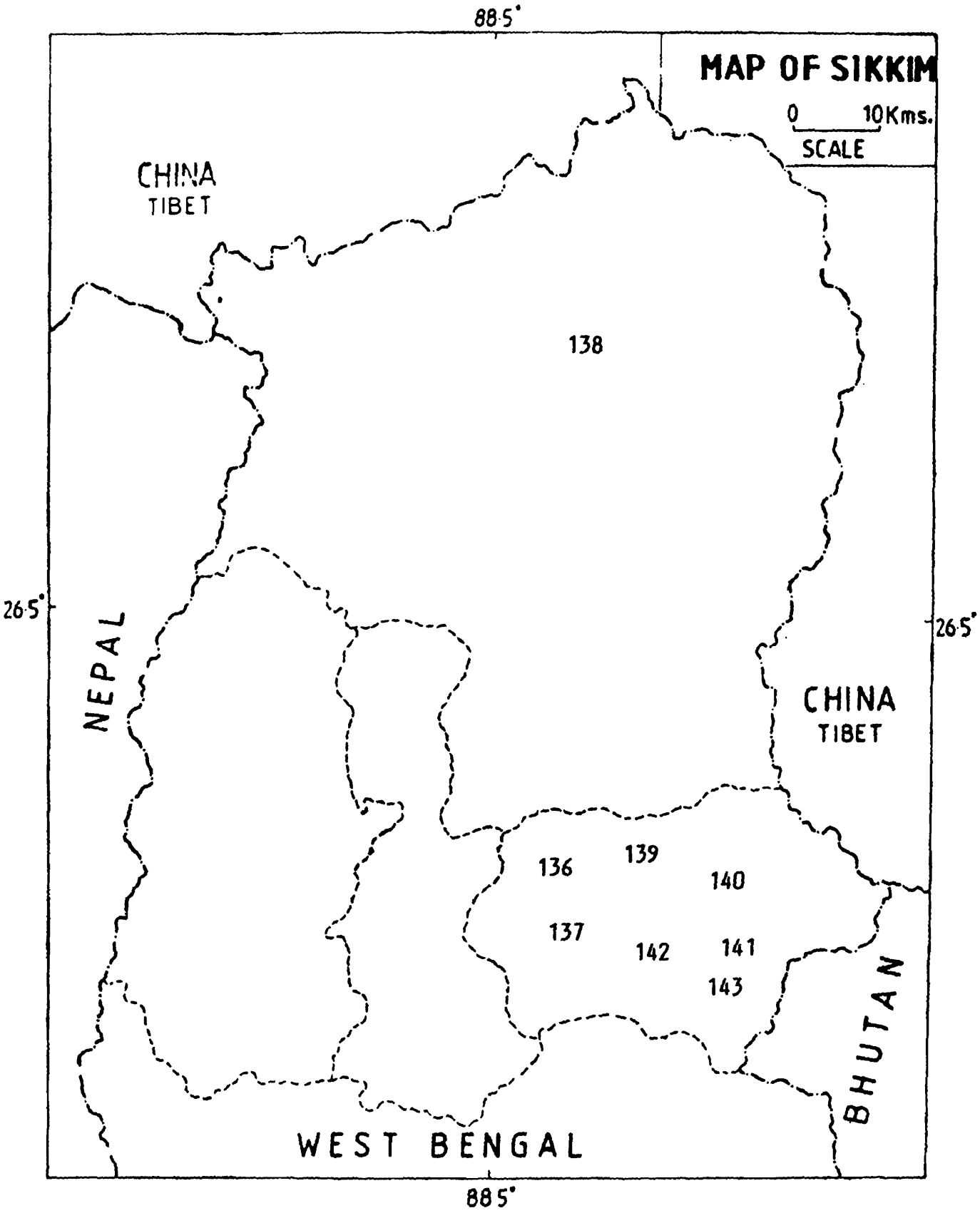
Map 16. Distribution of Aphididae Species 120–127 as indicated

120. *Neobetulaphis chaetosiphon*
121. *Neobetulaphis pusilla*
122. *Shivaphis celti*
123. *Taiwanaphis dineni*
124. *Takecallis aurandinariae*
125. *Taoia indica*
126. *Tinocallis himalayensis*
127. *Tinocalloides montanus*



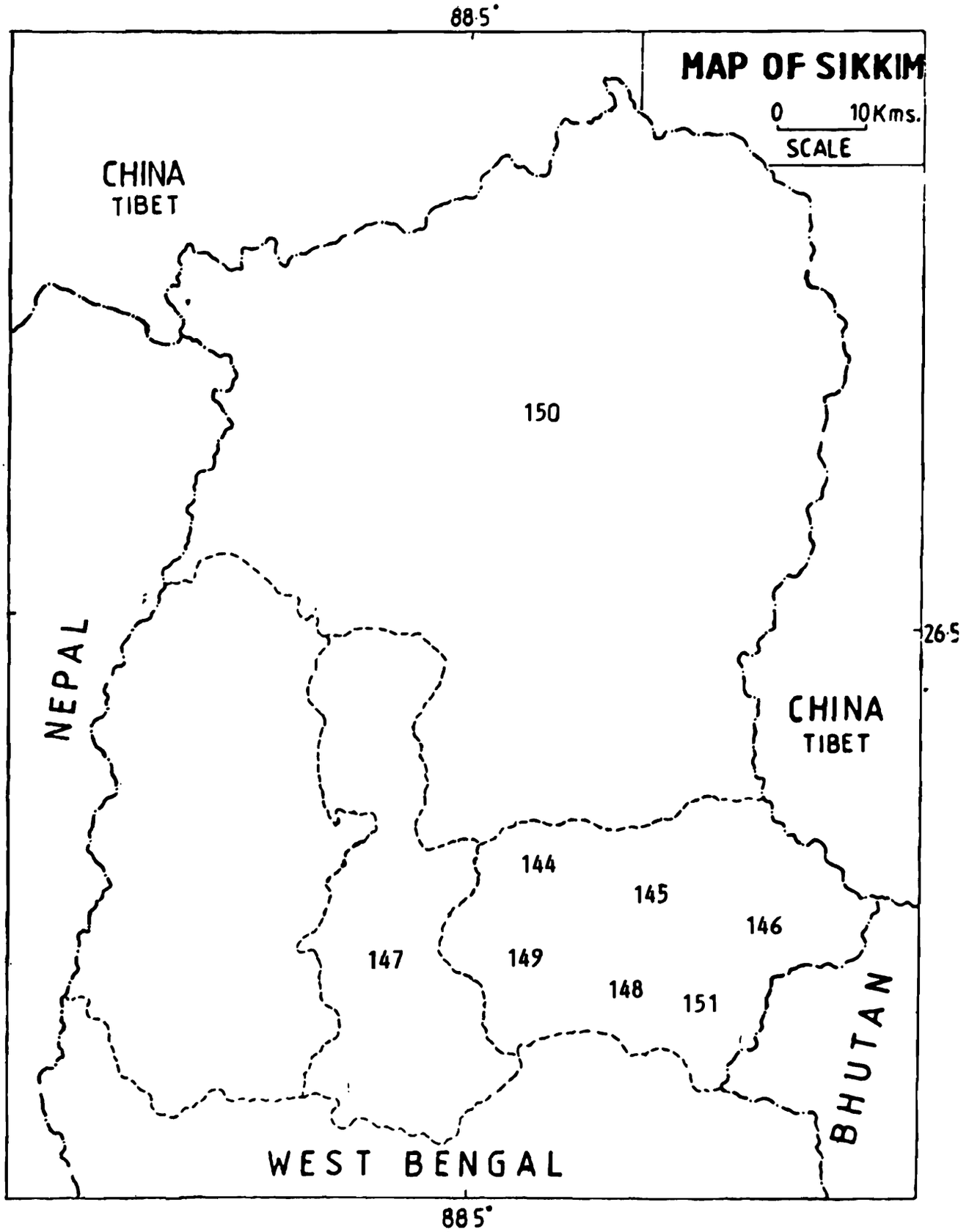
Map 17. Distribution of Aphididae Species 128–135 as indicated

128. *Anomalosiphum indigoferae*
129. *Schoutedenia ralumensis*
130. *Sumatraphis celti*
131. *Eutrichosiphum alnicola*
132. *Eutrichosiphum arunachali*
133. *Eutrichosiphum betulae*
134. *Eutrichosiphum davidi*
135. *Eutrichosiphum pseudopasaniae*



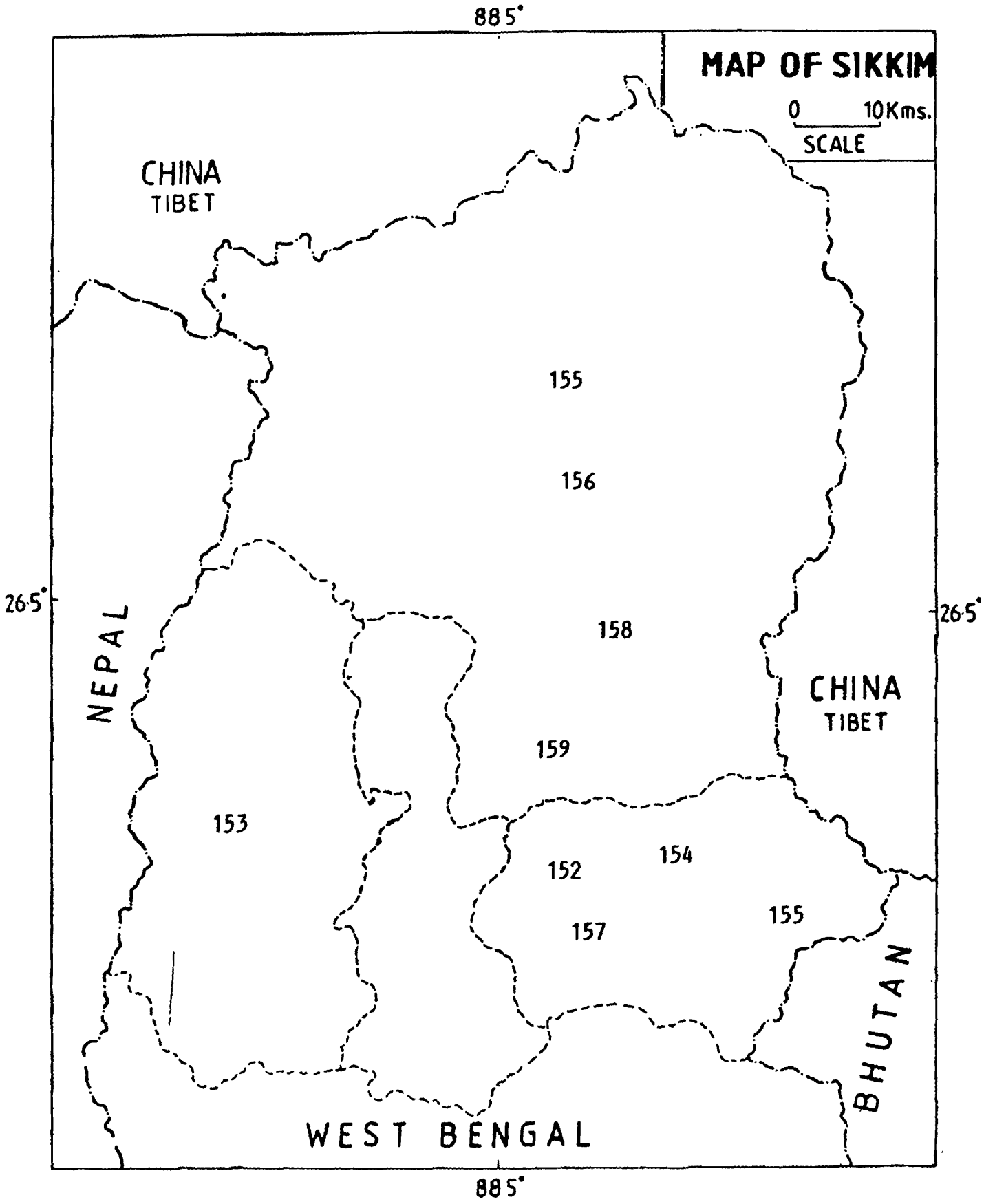
Map 18. Distribution of Aphididae Species 136–143 as indicated

136. *Eutrichosiphum quercifoliae*
137. *Eutrichosiphum sikkimense*
138. *Eutrichosiphum tapatii*
139. *Greenidae (Greenidea) decaspermi*
140. *Greenidea (Greenidea) ficicola*
141. *Greenidea (Greenidea) longicornis*
142. *Greenidea (Greenidea) longirostris*
143. *Greenidea (Paragreenidea) symplocosis*



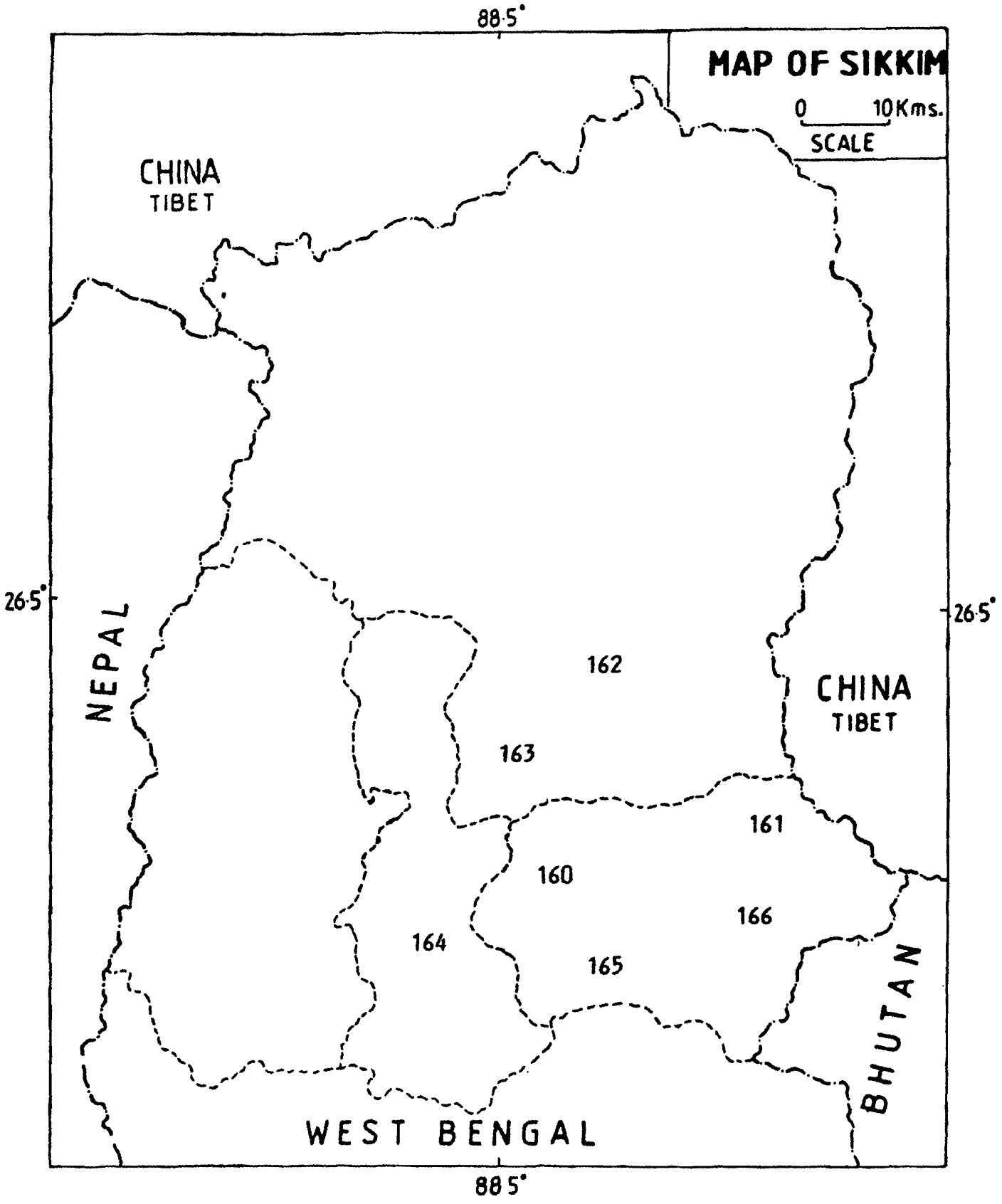
Map 19. Distribution of Aphididae Species 144–151 as indicated

144. *Greenidea (Trichosiphum) brachyunguis*
145. *Greenidea (Trichosiphum bucktonis*
146. *Greenidea (Trichosiphum) bucktonis heeri*
147. *Greenidea (Trichosiphum) prunicola*
148. *Greenidea (Trichosiphum) sikkimensis*
149. *Greenideoida (Paratrichosiphum) luteum*
150. *Mollitrichosiphum (Mollitrichosiphum) nigriabdominalis*
151. *Mollitrichosiphum (Mollitrichosiphum) tenuicorpus*



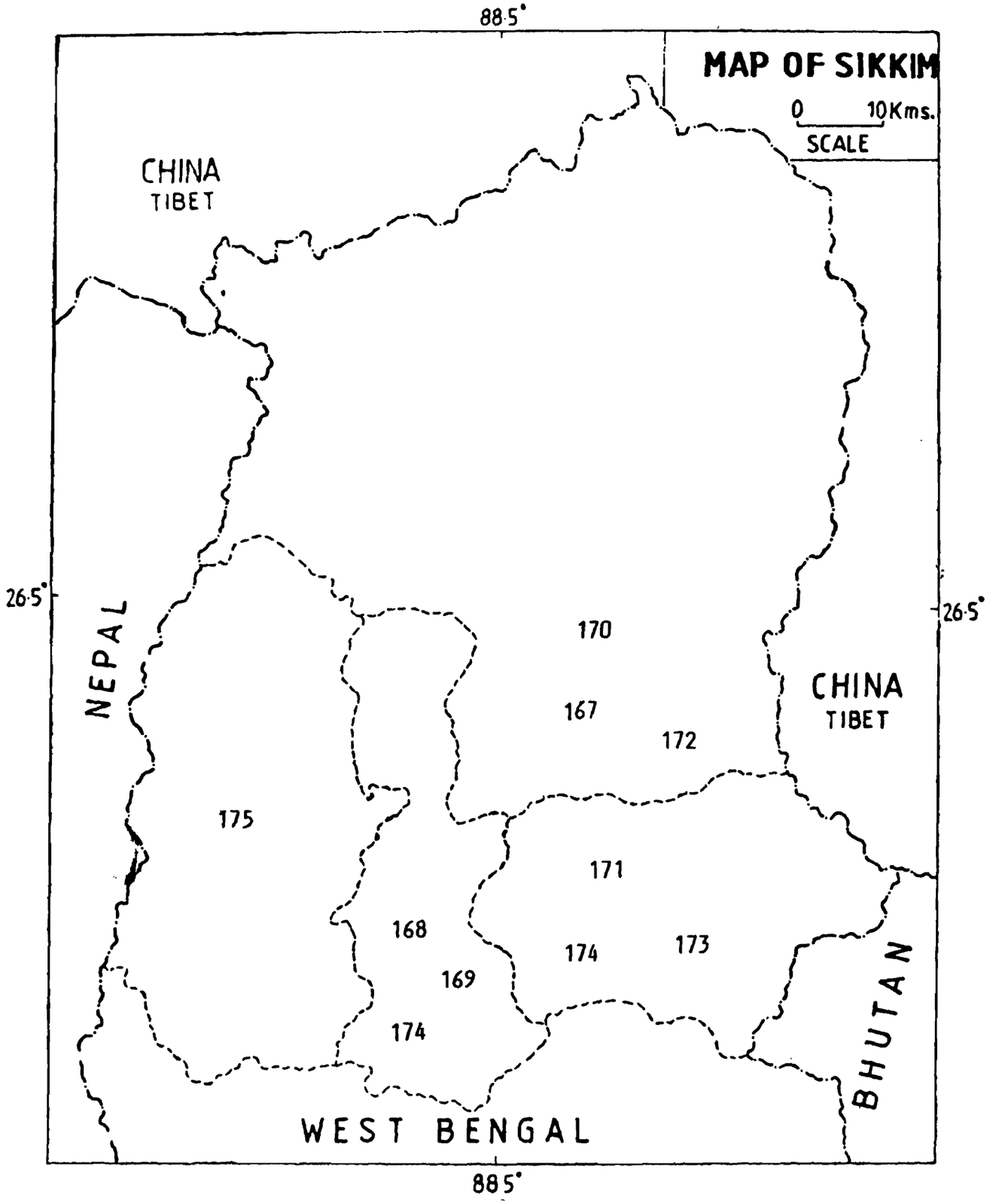
Map 20. Distribution of Aphididae Species 152–159 as indicated

152. *Mollitrichosiphum (Mollitrichosiphum) trilocum*
153. *Mollitrichosiphum (Metatrichosiphum) buddleiae*
154. *Mollitrichosiphum (Metatrichosiphum) montanum*
155. *Mollitrichosiphum (Metatrichosiphum) nandii*
156. *Aleurodaphis blumeae*
157. *Astegopteryx minuta*
158. *Ceratoglyphina bambusae bengalensis*
159. *Ceratovacuna indica*



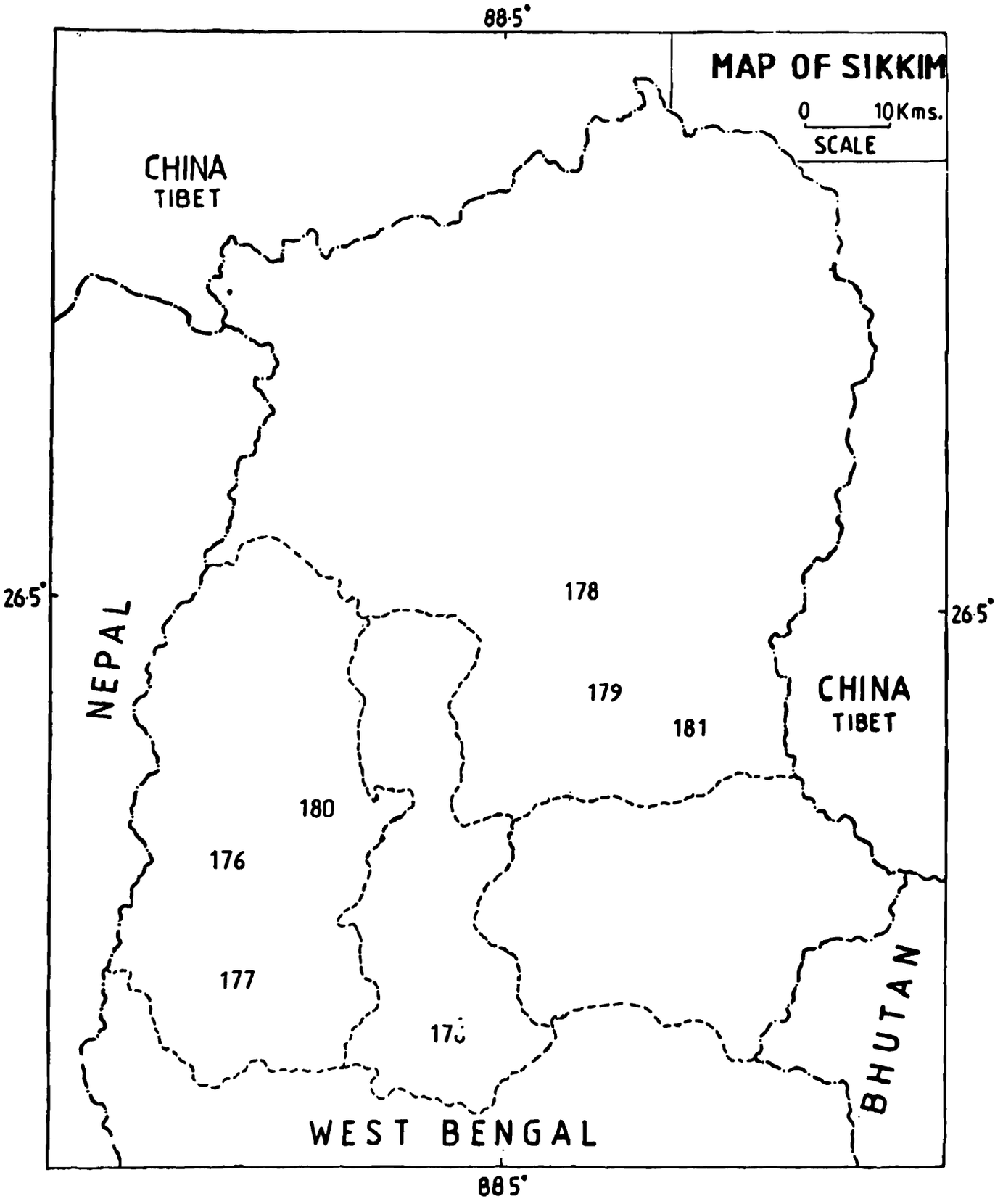
Map 21. Distribution of Aphididae Species 160–167 as indicated

160. *Ceratovacuna lanigera*
161. *Ceratovacuna perglandulosa*
162. *Ceratovacuna silvestri*
163. *Glyphinaphis bambusae*
164. *Pseudoregma alexanderi*
165. *Pseudoregma bucktoni*
166. *Pseudoregma panicola*
167. *Pseudoastegopteryx himalayensis*



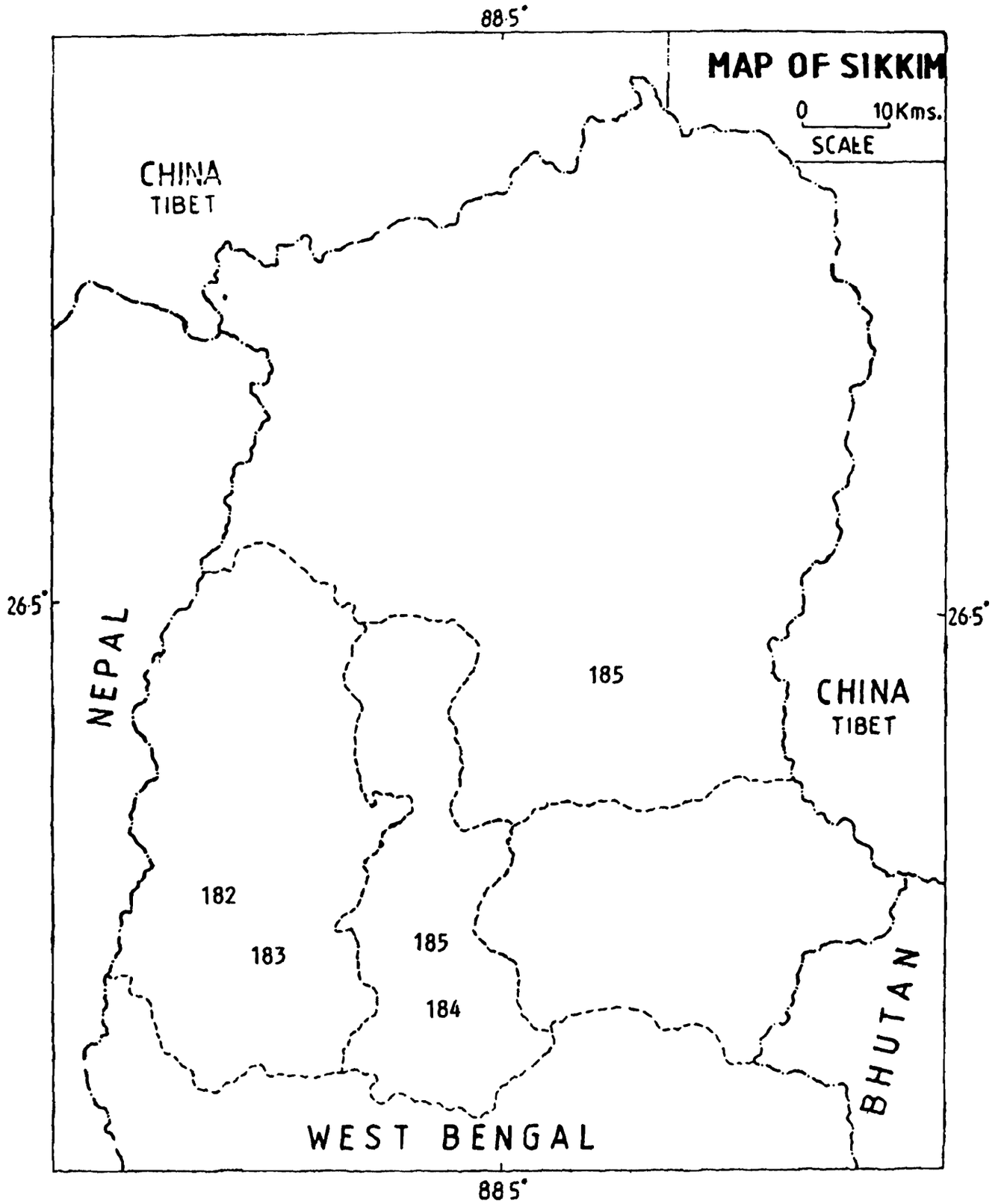
Map 22. Distribution of Aphididae Species 168–175 as indicated

168. *Nipponaphis (Pseudonipponaphis) querciphaga*
169. *Cinara (Cinara) atrotibialis*
170. *Cinara (Cinara) tistaensis*
171. *Cinara (Cinara) tujafilina*
172. *Cinara (Cupressabium) cupressi*
173. *Lachnus tropicalis*
174. *Nippolachnus piri*
175. *Chaetogeoica graminiphaga*



Map 23. Distribution of Aphididae Species 176–181 as indicated

176. *Geoica lucifuga*
177. *Geoica sikkimensis*
178. *Epipemphigus imaicus*
179. *Pemphigus eastopi*
180. *Pemphigus vulgaris*
181. *Eriosoma lanigerum*



Map 24. Distribution of Aphididae Species 182–185 as indicated

182. *Tetraneura (Tetraneura) sikkimensis*
183. *Tetraneura (Indotetraneura) basui*
184. *Tetraneura (Tetraneurella) nigriabdominalis*
185. *Kurisakia indica*

ADDENDUM

Although known from Sikkim, the following species and subspecies could not be examined and are not included in the key. The reference is given under each taxon.

Subfamily APHIDINAE

Tribe **Aphidini**

Schizaphis hypersiphonata Basu (Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N. 1971, *Proc. zool. Soc., Calcutta,* **24** : 165.)

Tribe **Macrosiphini**

Acyrthosiphon rubiformosanus Takahashi (Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N. 1971. *Proc. zool. Soc., Calcutta,* **24**: 164.)

Anthracosiphoniella maculata Basu (Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N. 1971, *Proc. zool. Soc., Calcutta,* **24** : 164.)

Capitophorus vernoniae Ghosh and Raychaudhuri (Ghosh, A.K. and Raychaudhuri, D.N. 1968. *Proc. zool. Soc., Calcutta* **21** : 182.)

Jacksonia conandri (Takahashi) Ghosh, A.K. and Raychaudhuri, D.N. 1968, *Proc. zool. Soc., Calcutta,* **21** : 183.)

Macrosiphoniella kikusanensis Moritsu (Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N. 1971. *Proc. zool. Soc., Calcutta,* **24**: 165.)

Metaphorodon polygoni (van der Goot) Ghosh, A.K. and Raychaudhuri, D.N. 1968. *Proc. zool. Soc., Calcutta,* **21** : 186.

Sinomegoura rhododendri (Takahashi) (Ghosh, A.K. and Raychaudhuri, D.N. 1968. *Proc. zool. Soc., Calcutta,* **21** : 189.)

Sitobion luteum (Buckton) (Ghosh, A.K. and Raychaudhuri, D.N. 1968. *Proc. zool. Soc., Calcutta,* **21** : 184.)

Sitobion smilacicola sikkimensis Ghosh and Raychaudhuri (Ghosh, A.K. and Raychaudhuri, D.N. 1968. *Proc. zool. Soc, Calcutta,* **21** : 185.)

Tricaudatus polygoni tuberculatus H.R.L. and Basu (Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N. 1971. *Proc. zool. Soc., Calcutta,* **24** : 166.)

Vesiculaphis kuwanis Ghosh, Basu and Raychaudhuri (Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N. 1971. *Proc. zool. Soc., Calcutta,* **24** : 166.)

Subfamily DREPANOSIPHINAE

Betacallis odaiensis Takahashi (Ghosh, A.K. and Raychaudhuri, D.N. 1969, *Proc. zool. Soc., Calcutta,* **21** : 190.)

Subfamily HORMAPHIDINAE

Pseudoregma bambusicola (Takahashi) (Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N. 1971. *Proc. zool. Soc., Calcutta,* **24**: 167.)

Pseudoregma subgladulosa (H.R.L. and Basu) (Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N. 1971. *Proc. zool. Soc., Calcutta,* **24**: 167.)

Subfamily PEMPHIGINAE

Chaetogeoica foliodentata (Tao) (Ghosh, A.K. and Raychaudhuri, D.N. 1968. *Proc. zool. Soc., Calcutta,* **21** : 190.)

Zool. Surv. India
State Fauna Services 9, Fauna of Sikkim (Part 2), 403-437, 2003

APHID–HOST PLANT ASSOCIATION IN SIKKIM
(INSECTA : HOMOPTERA : APHIDIDAE)

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INTRODUCTION

Aphids are considered as obligatory parasites of plants. The plants exhibit symptoms of damage of varied nature as a result of close association between aphids and plants.

Out of about 650 species of aphids belonging to 200 genera known from India, nearly 200 definite species in 92 genera under eight subfamilies are so far recorded from Sikkim (Ghosh and Basu in Press).

During last several years since 1968, intensive surveys for exploring the aphid fauna was carried out in Sikkim where variation in altitude is notable and associated with it is the variation of pattern in vegetation in the area. Since vegetational pattern and aphids of a locality are considered to form one complex, it is imperative that the changed vegetational pattern will influence the distributional pattern of aphids. The pattern of vegetation in Sikkim has been provided by Biswas (1966). The different associations have been indicated to reveal substantial overlap of pattern in vegetation in succeeding altitudinal strata (*c* 150 metres 2,400 metres). The forest of this region has been categorised as tropical, semi evegreen forest, subtropical hill forest, montane wet temperate forest and Himalayan moist temperate forest (Sagreiya, 1967). Ghosh and Raychaudhuri (1979) provided the altitudinal distribution of the species of Aphidinae from Darjeeling district (West Bengal) and Sikkim. But correlation with vegetational belts were not considered in the work.

Sikkim is one of the botanically richest States of India and more than 4000 plant species under about 160 Natural Orders are known to occur here against a total of 45,364 plant species including 17,000 species of Angiosperm so far known from India. The present contribution is an attempt to throw light on the association of aphid taxa with the host plants available in various ecological niches of Sikkim.

The work is divided into two parts (Part I and Part II). Part I deals with Aphid Host plant list and Part II with Host plant Aphid List.

PART - I

APHID - HOST PLANT LIST

The names of subfamilies of aphids are listed alphabetically. The names of genera within a subfamily and the names of species within a genus have also been likewise listed. If more than one host plant is recorded for an aphid species, then such host plants have been listed alphabetically.

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Name of Aphid	Name of Plant	Plant family
Family APHIDIDAE		
Subfamily ANOECIINAE		
Tribe **Aiceonini**		
Aiceona litsae Basu and Hille Ris Lambers	*Litsea polyantha*	Lauraceae
Tribe **Anoeciini**		
Anoecia vagans (Koch)	Indet Grasses (Roots)	Poaceae
Subfamily APHIDINAE		
Tribe **Aphidini**		
Aphis craccivora Koch	*Amaranthus spinosa*	Amaranthaceae
	Calotropis juncea	Apocynaceae
	Cassia sophera	Fabaceae
	Dolichos lablab	Fabaceae
	Phaseolus roxburghii	Fabaceae
	Tephrosia caudida	Fabaceae
	Zea mays (?)	Poaceae
	Indet	Abietaceae
	Indet	Amaranthaceae
	Indet	Asteraceae
	indet	Polygonaceae
Aphis fabae solanella Theobald	*Cestrum* sp.	Solanaceae
	Solanum nigrum	Solanaceae
	Quercus sp.	Fagaceae
	Rumex nepalensis	Ploygonaceae
	Rumex sp.	Ploygonaceae
	Indet	Asteraceae
	Indet	Poaceae
	Indet	Rosaceae
	Indet	Scrophulariaceae
Aphis gossypii Glover	*Alocasia indica*	Araceae
	Artemisia caruifolia	Asteraceae
	Artemisia vulgaris	Asteraceae
	Artemisia sp.	Asteraceae
	Ageratum conyzoides	Asteraceae
	Bidens pilosa	Asteraceae
	Blumia cohitia	Asteraceae
	Blumia lacera	Asteraceae
	Capsicum annum	Solanaceae
	Chrysanthemum sp.	Asteraceae
	Clerodendron incana	Verbenaceae
	Clerodendron sp.	Verbenaceae
	Commelina bengalensis	Commelinaceae
	Crepis sp.	Asteraceae
	Cucurbito pepo	Cucurbitaceae
	Curcuma domestica	Zingiberaceae
	Cyphomendra betaceae	Solanaceae
	Duranta plumeri	Verbenaceae

Name of Aphid	Name of Plant	Plant family
	Dryomaria cordata	Caryophyllaceae
	Eupatorium odoratum	Asteraceae
	Erechtitis sp.	Asteraceae
	Emelia sp.	Asteraceae
	Gallentsuga perviflora	Asteraceae
	Gynura nepalensis	Asteraceae
	Gynura nepalensis	Compositae
	Hydrangia sp.	Saxifragaceae
	Hibiscus esculentus	Malvaceae
	Hibiscus rosa-sinensis	Malvaceae
	Impatiens sp.	Balsaminaceae
	Litsea sp.	Lauraceae
	Maesa chisa	Myrsinaceae
	Momordica charantia	Cucurbitaceae
	Malachra capitata	Malvaceae
	Mussaenda frondosa	Rubiaceae
	Nicotiana sp.	Solanaceae
	Osbeckia crinata	Melastomaceae
	Pieris ovalifolia	Eriocaceae
	Pilea microphylla	Urticaceae
	Pouzolzia hirta	Urticaceae
	Pouzolzia sp.	Urticaceae
	Platago majora	Plantagoniaceae
	Polygonum runcinatum	Polygonaceae
	Psidium guajava	Myrtaceae
	Pyrus communis	Rosaceae
	Pyrus malus	Rosaceae
	Prunus persica	Rosaceae
	Salvia aspera	Labiatae
	Shorea robusta	Dipterocarpaceae
	Sida palmata	Malvaceae
	Sida sp.	Malvaceae
	Solanum melangana	Solanaceae
	Solanum sp.	Solanaceae
	Spermacea hispida	Rubiaceae
	Splanum tervum	Solanaceae
	Tibouchina rosaeformis	Melastomaceae
	Tridax procumbens	Asteraceae
	Indet	Acanthaceae
	Indet	Amaranthaceae
	Indet	Boraginaceae
	Indet	Araceae
	Indet	Caryophyllaceae
	Indet	Commetinaceae
	Indet	Asteraceae
	Indet	Convolvulaceae
	Indet	Poaceae
	Indet	Melastomaceae
	Indet	Myrtaceae
	Indet	Plantagonaceae
	Indet	Rosaceae

Name of Aphid	Name of Plant	Plant family
	Indet	Rubiaceae
	Indet	Scrophulariaceae
	Indet	Sterculiaceae
	Indet	Urticaceae
	Indet	Zingiberaceae
Aphis kurosawai Takahashi	*Artemisia vulgaris*	Asteraceae
	Artemisia sp.	Asteraceae
Aphis nasturtii Kalt.	*Eucalyptus globosus*	Myrtaceae
	Eucalyptus sp.	Myrtaceae
	Manibot utilissima	Euphorbiaceae
	Melastoma indica	Melastomaceae
	Michelia champaka	Magnoliaceae
	Momordica charantia	Cucurbitaceae
	Osbecxia chinensis	Melastomaceae
	Polygonum runcinatum	Polygonaceae
Aphis nerii Boyer de Fonscolombe	*Asclepias* sp.	Asclepiadaceae
	Calotropis sp.	Asclepiadaceae
Aphis longisetosa Basu	*Cucurbita moschata*	Cucurbitaceae
	Rubus ellipticus	Rosaceae
	Rubus palmata	Rosaceae
Aphis spiraecola Patch	*Ageratum conyzoides*	Asteraceae
	Aphomendra betaceae	Solanaceae
	Artemisia caruifolia	Asteraceae
	Artemisia vulgaris	Asteraceae
	Bidens pilosa	Asteraceae
	Boerhavia repens	Nyctaginaceae
	Canna sp.	Cannaceae
	Cleredendron sp.	Verbenaceae
	Cosmos sp.	Asteraceae
	Erechtites	Asteraceae
	Eupatorium odoratum	Asteraceae
	Gerbera sp.	Asteraceae
	Gynura angutosa	Asteraceae
	Helianthus sp.	Asteraceae
	Lucula sp.	Rubiaceae
	Maesa sp.	Myrsinaceae
	Maesa indica	Myrsinaceae
	Melia azadirachta	Meliaceae
	Mikania scandens	Asteraceae
	Nicotiana sp.	Solanaceae
	Prunus persica	Rosaceae
	Pyrus communis	Rosaceae
	Rubia cordifolia	Rubiaceae
	Spiraea bella	Rosaceae
	Spiraea corymbosa	Rosaceae
	Vitex sp.	Verbenaceae

Name of Aphid	Name of Plant	Plant family
	Xanthxyllum ornatum	Rutaceae
	Indet.	Acanthaceae
	Indet.	Alletaceae
	Indet.	Asteraceae
	Indet.	Brassicaceae
	Indet.	Poaceae
	Indet.	Lythraceae
	Indet.	Myrsinaceae
	Indet.	Polygonaceae
	Indet.	Pterocarpaceae
	Indet.	Rosaceae
	Indet.	Rubiaceae
	Indet.	Solanaceae
	Indet.	Verbenaceae
Toxoptera aurantii (B.d.F.)	*Artemisia vulgaris*	Asteraceae
	Atrocarpus vulgaris	Moraceae
	Atrocarpus sp.	Moraceae
	Camellia japonicum	Theaceae
	Camellia sp.	Theaceae
	Cestrum nocturnum	Solanaceae
	Cestrum sp.	Solanaceae
	Dubgiya sp.	Saxifragaceae
	Eugenia sp.	Myrtaceae
	Eurya sp.	Ternstroemiaceae
	Eucalyptus globulus	Myrtaceae
	Ficus sp.	Moraceae
	Jacranda mimosifolia	Bignoniaceae
	Lagerstroemia flos-reginae	Lythraceae
	Litsea polyantha	Lauraceae
	Loranthus sp.	Loranthaceae
	Lycopersicum esculentum	Solanaceae
	Maesa chisa	Myrsinaceae
	Maesa sp.	Myrsinaceae
	Manibot utilissima	Euphorbiaceae
	Michelia sp.	Magnoliaceae
	Olea purpurea	Oleaceae
	Osbekia crinata	Ternstromiaceae
	Picris ovalifolia	Ericaceae
	Prunus persica	Rosaceae
	Pyrus communis	Rosaceae
	Pyrus malus	Rosaceae
	Rubus ellipticus	Rosaceae
	Sanebiera sp.	Brassicaceae
	Sarcococca sp.	Sarcococcaceae
	Schima wallichii	Ternstromiaceae
	Spiraea sp.	Rosaceae
	Sterculina foetida	Sterculiaceae
	Sterculina sp.	Sterculiaceae
	Indet.	Amaryllidaceae
	Indet.	Apocynaceae

Name of Aphid	Name of Plant	Plant family
	Indet.	Bignoniaceae
	Indet.	Asteraceae
	Indet.	Euphorbiaceae
	Indet.	Poaceae
	Indet.	Fabaceae
	Indet.	Lauraceae
	Indet.	Magnoliaceae
	Indet.	Moraceae
	Indet.	Myrsinaceae
	Indet.	Myrtaceae
	Indet.	Oleaceae
	Indet.	Rosaceae
	Indet.	Sarcocaceae
	Indet.	Saxifragaceae
	Indet.	Solanaceae
	Indet.	Sterculiaceae
	Indet.	Theaceae
	Indet.	Verbenaceae
Toxoptera citricidus (Kirkaldy)	*Citrus aurantifolium*	Rutaceae
	Citrus aurantium	Rutaceae
	Citrus temonum	Rutaceae
	Citrus sp.	Rutaceae
	Pyrus communis	Rosaceae
	Pyrus malus	Rosaceae
	Rhus sp.	Anacardiaceae
Toxoptera odinae (van der Goot)	*Engelhardtin spicta*	Juglandaceae
	Erythrina indica	Fabaceae
	Mussaenda frondosa	Rubiaceae
	Rhus semialata	Anacardiaceae
	Rhus spp.	Anacardiaceae
	Tagetes patula	Asteraceae
	Indet.	Asteraceae
	Indet.	Diascopriaceae
	Indet.	Rosaceae
	Indet.	Sterculiaceae
Hysteroneura setariae (Thomas)	*Carex* sp.	Cyperaceae
	Cynodon dactylon	Poaceae
	Eleusine coracana	Poaceae
	Hordeum vulgare	Poaceae
	Opligmenus compositus	Poaceae
	Paspalum dilatum	Poaceae
	Paspalum sorbiculatum	Poaceae
	Paspalum sp.	Poaceae
	Poa sp.	Poaceae
	Sporobolus indicus	Poaceae
	Sporobolus sp.	Poaceae
	Indet Grasses	Poaceae

Name of Aphid	Name of Plant	Plant family
Melanaphis bambusae (Fullaway)	Napier Grass	Poaceae
Melanaphis pahanenis (Takahashi)	Indet Grass	Poaceae
Rhopalosiphum maidis (Fitch)	*Cynodon dactylon*	Poaceae
	Eleusine coracana	Poaceae
	Hordeum vulgare	Poaceae
	Polygonum runcinatum	Polygonaceae
	Setaria sp.	Poaceae
	Triticum vulgare	Poaceae
	Zea mays	Poaceae
Rhopalosiphum padi (Linn.)	*Eleusine coracana*	Poaceae
	Vernonia cinaria	Asteraceae
Rhopalosiphum rufiabdominalis (Sasaki)	*Lycopersicum esculentum*	Solanaceae
	Osbexia chinensis	Melastomaceae
Rhopalosiphum yoksumi Ghosh, Banerji and Raychaudhuri	*Poa* sp.	Poaceae
Schizaphis graminum (Rondani)	Indet. Grass	Poaceae
Schizaphis rotundiventris (Signoret)	*Cyperus exhaltans*	Cyperaceae
Schizaphis hypersiphonata Basu	*Cyperus exhaltans*	Cyperaceae
Tribe **Macrosiphini**		
Acutosiphon obliquoris Basu, Ghosh and Raychaudhuri	*Carex filicosa*	Cyperaceae
	Carex sp.	Cyperaceae
Acyrthosiphon rubiformosanus Takahashi	*Rubus ellipticus*	Rosaceae
Akkaia bengalensis Basu	*Polygonum alatum*	Polygonaceae
	Ploygonum berbatum	Polygonaceae
	Polygonum glabrum	Polygonaceae
	Polygonum molle	Polygonaceae
	Ploygonum sp.	Polygonaceae
Akkaia neopolygoni Ghosh,Ghosh and Raychaudhuri	*Ploygonum molle*	Polygonaceae
Akkaia sikkimensis Agarwala and Raychaudhuri	*Raphanus salivus*	Brassicaceae
Amphorophora ampullata bengalensis H.R.L. and Basu	*Gymnogramma* sp.	Gymnogrammaceae
	Pteris sp.	Pteridaceae
Anthracosiphoniella maculata Basu	Indet. Fern	Pteridaceae
Arthromyzus smilacifoliae (Ghosh and Raychaudhuri)	*Smilax* sp.	Liliaceae

Name of Aphid	Name of Plant	Plant family
Aulacorthum dasi Ghosh, Basu and Raychaudhuri	*Solanum torvum*	Solanaceae
Aulacorthum linderae (Shinji)	*Cucurbita moschata*	Cucurbitaceae
Anlacorthum magnoliae (Essig and Kuwana)	Indet host	
Aulacorthum nipponicum (Essig and Kuwana)	Indet host	
Aulacorthum rhamni Ghosh, Basu and Raychaudhuri	*Sarumia* sp.	Ternstroemiaceae
Aulacorthum (Neomyzus) circumflexum (Buckton)	*Tropaeolum majus*	Tropaeolaceae
Aulacorthum (Neomyzus) primulum Ghosh, Banerjee and Raychaudhuri	*Primula* sp.	Primulaceae
Aulacorthum solani (Kalt.)	Indet host	
Brachycaudus helichrysi (Kalt.)	*Ageratum conyzoides*	Asteraceae
	Ageratum sp.	Asteraceae
	Anaphalis sp.	Asteraceae
	Bidens pilosa	Asteraceae
	Caianus cajan	Fabaceae
	Crepis japonica	Asteraceae
	Crepis sp.	Asteraceae
	Digitalis sp.	Scrophulariaceae
	Duabanga sonneratioides	Sonneratiaceae
	Eupatorium odoratum	Asteraceae
	Maesa chisea	Myrsinaceae
	Prunus persica	Rosaceae
	Senecio scandens	Asteraceae
	Indet.	Aroideae
	Indet.	Boraginaceae
Brachymyzus jasmini Basu	*Nellia* sp.	Rosaceae
	Pilea macrocarpa	Urticaceae
	Pilea microphylla	Urticaceae
Brevicoryne brassicae (Linn.)	*Brassica* sp.	Brassicaceae
Capitophorus elaeagni (del Guercio)	*Cnicus* sp.	Asteraceae
C. formosartemisiae (Takahashi)	*Artemisia vulgaris*	Asteraceae
	Artemisia sp.	Asteraceae
C. hippophaes javanicus H.R.L.	*Polygonum alatum*	Polygonaceae
	Polygonum barbatum	Polygonaceae
	Polygonum molle	Polygonaceae
Capitophorus hippophaes mitegoni Eastop	*Polygonum* sp.	Polygonaceae
Capitophorus indicus Ghosh and Raychaudhuri	*Polygonum molle*	Polygonaceae
	Polygonum sp.	Polygonaceae

Name of Aphid	Name of Plant	Plant family
Capitophorus vernoniae Ghosh and Raychaudhuri	*Vernonia* sp.	Asteraceae
Cavariella araliae Takahashi	*Salix* sp.	Salicaceae
Cavariella nigra Basu	Indet host	
Cryptosiphum artemisiae Buckton	*Artemisia vulgaris* *Artemisia* sp.	Asteraceae Asteraceae
Hyadaphis coriandri (Das)	*Rubus fruticorus*	Rosaceae
Hyperomyzus carduellinus (Theobald)	*Emilia sonchifolia* *Sonchus arvensis* *Sonchus oleracea*	Asteraceae Asteraceae Asteraceae
Impatientinum impatiens (Shinji)	*Impatiens* sp.	Balsaminaceae
Impatientinum (Neoimpatientinum) smilaceti Agarwala, Mondal and Raychaudhuri	*Smilax macrophylla*	Liliaceae
Indiaphis rostrata Ghosh and Raychaudhuri	*Rhododendron* sp.	Ericaceae
Indumasonaphis inulae (Ghosh and Raychaudhuri)	Indet host	
Jacksonia conandri (Takahashi)	Etiolated leaf of indet plant	Poaceae
Jacksonia sikkimensis Ghosh, Basu and Raychaudhuri	Indet.	Poaceae
Liosomaphis berberidis (Kalt.)	*Azelia* sp.	Connaraceae
Liosomaphis himalayensis Basu	*Berberis* sp. *Crataegus spimosa*	Berberidaceae Rosaceae
Lipaphis erysimi (Kalt)	*Brassica* sp. *Raphanus sativus*	Brassicaceae Brassicaceae
Macromyzus woodwardiae Takahashi	Fern Indet. Fern	Pteridaceae Pteridaceae
Macromyzus (Anthroacosiphoniella) maculatus (Basu)	*Gymnogramme aurita*	Gymnogramnaceae
Macrosiphoniella artemisiae (B.d.F.)	*Artemisia vulgaris*	Asteraceae
Macrosiphoniella kikungshana Takahashi	*Artemisia cornifolia* *Artemisia* sp. *Artemisia vulgaris*	Asteraceae Asteraceae Asteraceae
Macrosiphoniella hikosanensis Moritsu	*Artemisia* sp.	Asteraceae
Macrosiphoniella pseudoartemisiae Shinji	*Artemisia vulgaris* *Artemisia* sp.	Asteraceae Asteraceae

Name of Aphid	Name of Plant	Plant family
Macrosiphoniella sanborni (Gillette)	*Chryanthemum* sp.	Asteraccae
	Artemisia sp.	Asteraceae
	Chrysanthemum coronarium	Asteraceae
Macrosiphoniella sikkimartimisiae Agarwala and Raychaudhuri	*Artemisia* sp.	Asteraceae
Macrosiphoniella spinipes Basu	*Artemisia vulgaris*	Asteraceae
	Artemisia caruifolia	Asteraceae
	Artemisia sp.	Asteraceae
M. yomogifoliae (Shinji)	*Artemisia* sp.	Asteraceae
	Artemisia caruifolia	Asteraceae
	Artemisia vulgaris	Asteraceae
Macrosiphurn aulacorthoides David *et al.*	*Rubus* sp.	Rosaceae
Macrosiphum spinotibium Ghosh *et al.*	*Artemisia* sp.	Asteraceae
Macrosiphum pachysiphon H.R.L.	Indet.	Rosaceae
Macrosiphum rosae (Linn.)	*Rosa* sp.	Rosaceae
	Rosa cania	Rosaceae
Matsumuraja capitophoroides H.R.L.	Indet.	
Metaphorodon polygoni (v.d.G.)	*Nicotiana tabacum*	Solanaccae
Metopolophium rubi (Nwrs.)	*Rubus* sp.	Rosaceae
	Rumex sp.	Rosaceae
M. rubifoliae (Raychaudhuri, Ghosh and Basu)	*Rubus ellipticus*	Rosaceae
Macromyzus kalimpongensis Basu	*Elettaria cardamomum*	Zingiberaceae
	Orchid sp.	Orchidaceae
Micromyzus niger v.d.G.	Fern	Pteridaceae
	Indet Fern	Pteridaceae
Micromyzus sp.	*Corylopsis* sp.	Hamamelidaceae
Myzakkaia kuwanis (Ghosh *et al.*)		
M. verbasci Chowdhuri *et al.*	*Polygonum alatum*	Polygonaceae
Myzus dycei Carver	*Urtica parviflora*	Urticaceae
	Glycine max	Asteraceae
M. formosanus (Basu)	*Polygonum alatum*	Polygonaceae
M. ornatus Laing	*Dahlia* sp.	Asteraceae
	Indet	Asteraccae

Name of Aphid	Name of Plant	Plant family
Myzus persicae (Sulzer)	*Ageratum* sp.	Asteraceae
	Brassica napus	Brassicaceae
	Brassica nigra	Brassicaceae
	Brassica oleracea	Brassicaceae
	Brassica sp.	Brassicaceae
	Datura sp.	Solanaceae
	Eupatorum odoratum	Asteraceae
	Gynura angutosa	Asteraceae
	Ipomoea gloribunda	Convolvulaceae
	Nicotiana tabacum	Solanaceae
	Pyrus communis	Rosaceae
	Raphanus sativus	Brassicaceae
	Solanum tuberosum	Solanaceae
Myzus siegesbeckicola Strand	*Sigesbeckia orientalis*	Asteraceae
Neoacyrthosiphon holsti (Takahashi)	*Rhododendron* sp.	Ericaceae
Neomasonaphis anaphalidis (Basu)	*Anaphalis* sp.	Asteraceae
Neomasonaphis inulae (Ghosh and Raychaudhuri)	Indet	Ericaceae
Oedisiphum soureni Basu	*Anaphalis contorta*	Asteraceae
Pentalonia nigronervosa Coquerel	*Musa paradisiaca*	Musaceae
	Musa sp	Musaceae
Phorodon (Paraphorodon) cannabis Passerini	*Cannabis sativa*	Moraceae
Rhopalosiphoninus (Myzosiphon) smilacifoliae (Ghosh and Roychaudhuri)	*Smilax* sp.	Liliaceae
Semiaphis heraclei (Takahashi) Roychaudhuri)	*Schizium* sp.	Umbelliferae
Shinjia orientalis (Mordvilko)	*Dryopteris* sp.	Polypodiaceae
	Pteris sp.	Pteridaceae
	Gymnogramma aurita	Gymnogramnaceae
Sinomegoura citricola (v.d.G)	*Bambusa* sp.	Poaceae
	Smilax sp.	Liliacea
	Cleredeoron sp.	Verbenaceae
Sinomegoura rhododendri (Tak.)	*Smilax* sp.	Liliaceae
Sinomegoura photinae (Tak.)	*Photinia* sp.	Rosaceae
Sitobion akebiae (Shinji)	Grass	Poaceae
Sitobion gravelii (v.d.G.)	*Artemisia* sp.	Asteraceae
Sitobion indicum Basu	*Dendrobium densiflorum*	Orchidaceae
	Dendrobium sp.	

Name of Aphid	Name of Plant	Plant family
Sitobion miscanthi (Tak.)	*Andropogon* sp.	Poaceae
	Cinerium sp.	Poaceae
	Crepis japonica	Asteraceae
	Eragrostris gangetica	Poaceae
	Paspalum dilatum	Poaceae
Sitobion pseudoluteum Ghosh	*Dendrobium densiflorum*	Orchidaceae
Sitobion resaeformis (Das)	*Brassica* sp.	Brassicaceae
	Granotia sp.	Poaceae
	Rosa sp.	Rosaceae
Sitobion sikkimensis (Ghosh and Raychaudhuri)	*Smilax* sp.	Liliaceae
Sitobion smilacifoliae Takahashi	*Smilax* sp.	Liliaceae
Sitobion takahashii (Eastop)		
Subovatomyzus leucosceptri Basu	*Leucosceptrum conum*	Labiatae
Tricaudatus polygoni (Narzikulov)	*Polygonum molle*	Polygonaceae
T. polygoni tuberculatus H.R.L.	*Polygonum molle*	Polygonaceae
Trichosiphonaphis gerberae Ghosh and Raychaudhuri	*Polygonum* sp.	Polygonaceae
Tuberocephalus sasaki Takahashi)	*Artemisia cornifolia*	Asteraceae
	Artemisia vulgaris	Asteraceae
Uroleucon formosanus crepidis (Ghosh *et al.*)	*Sonchus* sp.	Asteraceae
Uroleuon (Uroleucon) pseudotanaceti (Verma)	*Artemisia* sp.	Asteraceae
U. (U.) sonchi (Linnaeus)	*Sonchus oleracea*	Asteraceae
	Sonchus sp.	Asteraceae
Vesiculaphis kuwanis Ghosh, Basu and Raychaudhuri	Indet.	
Vesiculaphis pieridis Basu	*Pieris ovalifolia*	Ericaceae
Vesiculaphis sikkimensis Mondal *et al.*	*Carex filicosa*	Cyperaceae
	Carex sp.	Cyperaceae
Xenomyzus scabripes Basu *et al.*	*Nicotiana tabacum*	Solanaceae
Subfamily DREPANOSIPHINAE		
Betacallis odaiensis Tak.		

Name of Aphid	Name of Plant	Plant family
Betacallis querciphaga Basu, Ghosh and Raychaudhuri	*Castanospermum* sp.	Fabaceae
	Engelhardia sp.	Juglandaceae
	Prunus persica	Rosaceae
	Quercus sp.	Fagaceae
Betacallis sikkimensis Basu *et al.*	*Quercus* sp.	Fagaceae
	Prunus persica	Rosaceae
Clethrobius dryobius Chakrabarti and Raychaudhuri	Indet. host-plant (Tree)	
	Glycine max	Fabaceae
Neobetulaphis chaetosiphon Quednau and Chakrabarti	*Betula alnoides*	Betulaceae
Neobetulaphis sp.	*Betula alnoides*	Belulaceae
Neobetulaphis pusilla Basu	*Alnus nepalensis*	Betulaceae
Shivaphis celti Das	*Celtis* sp.	Ulmaceae
Taiwanaphis dineni Mondal *et al.*	Indet. host	Combretaceae
Takecallis arundinariae (Essig)	*Bambusa arundinacea*	Poaceae
Taoia indica Ghosh and Raychaudhuri	*Alnus nepalensis*	Betulaceae
	Betula alnoides	Betulaceae
	Betula sp.	Betulaceae
Tinocallis himalayensis Ghosh *et al.*	*Duabanga sonneritoides*	Lythraceae
Tinocalloides montanus Basu	Indet host	Fabaceae
	Prunus caresus	Rosaceae
Subfamily GREENIDEINAE		
Tribe **Cervaphidini**		
Anomalosiphum indigoferae Ghosh *et al.*	*Mimosa* sp.	Fabaceae
	Indet.	Fabaceae
Schoutedenia lutea (v.d.G)	*Prunus ceresus*	Rosaceae
Schoutedenia ralumensis Rubsaamen	Indet host	
Sumatraphis celti Takahashi	*Quercus* sp.	Fagaceae
Tribe **Greenideini**		
Eutrichosiphum alnicola (Basu)	*Alnus nepalensis*	Betulaceae

Name of Aphid	Name of Plant	Plant family
Eutrichosiphum arunachali Basu *et al.*	*Quercus* sp.	Fagaceae
Eutrichosiphum betulae Mondal *et al.*	*Betula* sp.	Betulaceae
Eutrichosiphum davidi Raychaudhuri	*Quercus* sp.	Fagaceae
Eutrichosiphum pseudopassaniae Szelegiewicz	*Quercus* sp. *Castonopsis tribuloidea*	Fagaceae Capuliferae
Eutrichosiphum quercifoliae Raychaudhuri *et al.*	*Quercus* sp.	Fagaceae
Eutrichosiphum sikkimense Raychaudhuri *et al.*	*Duabanga sonneratioides*	Lythraceae
Eutrichosiphum tapatii Mondal *et al.*	*Eugenia* sp. *Maesa* sp. *Quercus serrata* *Quercus* sp.	Myrtaceae Myrsinaceae Fagaceae Fagaceae
Eutrichisiphum (Neoparatrichosiphum) raychaudhurii (Ghosh)	*Alnus nepalensis* *Betula* sp.	Betulaceae Betulaceae
Greenidea (Greenidea) decaspermi Takahashi	*Quercus* sp.	Fagaceae
Greenidea (Greenidea) ficicola Takahashi	*Ficus* sp. *Maesa* sp. *Litsea polyantha* *Quercus* sp.	Moraceae Myrsinaceae Lauraceae Fagaceae
Greenidea (Greenidea) longicornis Ghosh *et al.*	*Engelhardtia spicata*	Juglandaceae
Greenidea (Greenidea) longirostris Basu	*Schima wallichii*	Ternstroemiaceae
Greenidea (Paragreenidea) symplocosis Ghosh *et al.*	*Symplocos* sp.	Styraceae
Greenidea (Trichosiphum) brachyunguis Chatterjee *et al.*	*Quercus* sp.	Fagaceae
Greenidea (Trichosiphum) bucktonis Ghosh *et al.*	*Duabanga sonneritodes*	Lythraceae
Greenidea *(Trichosiphum) formosana heeri* Raychaudhuri *et al.*	*Engelhardtia spicata* *Eugenia jambolana* *Litasea polyantha* *Psidium guajava*	Juglandaceae Myrtaceae Lauraceae Myrtaceae

Name of Aphid	Name of Plant	Plant family
Greenidea (Trichosiphum) prunicola Ghosh *et al*	*Prunus* sp.	Rosaceae
Greenidea (Trichosiphum) sikkimensis Raychaudhuri *et al.*	*Quercus* sp.	Fagaceae
Greenideoida (Paratrichosiphum) luteum (Basu)	*Quercus* sp.	Fagaceae
Mollitrichosiphum (Mollitrichosiphum) nigriabdominalis Agarwala *et al.*	*Quercus rubra*	Fagaceae
Mollitrichosiphum (Mollitrichosiphum) shinjii Raychaudhuri *et al.*	*Quercus rubra*	Fagaceae
Mollitrichosiphum (M.) tenuicorpus (Okajima)	*Quercus serrata* *Castanospermum* sp.	Fagaceae Fabaceae
Mollitrichosiphum (Mollitrichosiphum) trilocum Agarwala and Ghosh	*Quercus* sp.	Fagaceae
Mollitrichosiphum (Metatrichosiphon) buddeleiae Ghosh *et al.*	*Buddleja* sp.	Logamiaceae
Mollitrichosiphum (M.) alni Ghosh *et al.*	*Alnus nepalensis*	Betulaceae
Mollitrichosiphim (Metatrichosiphon) montanum (van der Goot)	*Alnus nepalensis*	Betulaceae
Mollitrichosiphum (Metatrichosiphum) nandii Basu	*Alnus nepalensis* *Betula incides* *Betula alnoides* *Betula* sp. *Erigelhardtia* sp.	Betulaceae Betulaceae Betulaceae Betulaceae Juglandaceae
Subfamily HORMAPHIDINAE		
Tribe **Ceraphidini**		
Aleurodaphis blumeae van der Goot	*Myosotis paulutris*	Boraginaceae
Astegopteryx minuta (v.d. Goot)	*Bambusa* sp.	Poaceae
Cerutoglyphina bambusuc bengalensis Ghosh	*Bambusa aurandinacea*	Poaceae
Ceratovacuna indicus Ghosh *et al.*	*Bambusa* sp.	Poaceae
Ceratovacuna lanigera Zehntner	*Saccharum officinarum* *Oplismenus* sp. Indet.	Poaceae Poaceae Combritaceae

Name of Aphid	Name of Plant	Plant family
Ceratovucuna perglandulosa Basu *et al.*	*Saccharum officinarum*	Poaceae
	Setaria sp.	Poaceae
Ceratovacuna silvestrii (Takahashi)	*Bambusa* sp.	
	Engelhardtia spicata	Juglandaceae
Glyphinaphis bambusae van der Goot	*Dendrocalamus* sp.	Poaceae
	Thysanolaena marima	Poaceae
	Thysanolaena sp.	Poaceae
Pseudoregma alexanderi (Takahashi)	*Bambusa aurandinacea*	Poaceae
Pseudoregma bucktoni Ghosh, Pal and Raychaudhuri	*Bambusa* sp.	Poaceae
Pseudoregma panicola (Takahashi)	*Andropogon* sp.	Poaceae
	Granotia sp.	Poaceae
	Oplismenus compositus	Poaceae
	Oplismenus sp.	Poaceae
Pseudoastegopteryx himalayensis Ghosh, Pal and Raychaudhuri	*Bambusa arundinacea*	Gramineae
Tribe **Nipponaphidini**		
Nipponaphis querciphaga Ghosh and Raychaudhuri	*Quercus* sp.	Fagaceae
Subfamily LACHNINAE		
Tribe **Cinarini**		
Cinara atrotibialis David and Rajasingh	*Araucaria* sp.	Anacardiaceae
	Pinus sp.	Pinaceae
Cinara tistaensis Agarwala and Raychaudhuri	*Abies* sp.	Pinaceae
Cinara tujafilina (del Guercio)	*Cupressus* sp.	Cupressaceae
	Juniperus sp.	Cupressaceae
Cinara cupressi (Buckton)	*Juniperus recarva*	Cupressaceae
Tribe **Lachnini**		
Lachnus tropicalis (v.d. Goot)	*Quercus* sp.	Fagaceae
Nippolachnus piri Matsumura	*Pyrus communis*	Rosaceae
Subfamily PEMPHIGINAE		
Tribe **Fordini**		
Chaetogeoica foliodentata (Tao)	*Vicia fiba*	Fabaceae

Name of Aphid	Name of Plant	Plant family
Chaetogeoica graminiphaga Raychaudhuri, Pal and Ghosh	Grass	Poaceae
Geoica lucifuga (Zehntner)	*Cyperus rotundus*	Poaceae
	Grass (Roots)	Poaceae
	Triticum vulgare	Poaceae
Geoica sikkimensis Raychaudhuri, Pal and Ghosh	Indet. Grass	Poaceae
Tribe **Pemphigini**		
Epipemphigus imaicus (Cholodkovsky)	Galls of indet plants	
Pemphigus eastopi Mondal	Leaf Galls of Indet. Plants	
Pemphigus vulgaris Raychaudhuri, Pal and Ghosh	Roots of *Triticum vulgare*	Poaceae
Tribe **Eriosomatini**		
Eriosoma lanigerum (Hausmann)	*Pyrus malus*	Rosaceae
Tetraneura (Tetraneura) sikkimensis Raychaudhuri, Pal and Ghosh	*Eragrostris. nigra*	Poaceae
Tetraneura (Indotertraneura) basui Hille Ris Lambers	Grass (Roots)	Poaceae
Tetraneura (Tetraneurella) nigriabdominalis (Sasaki)	Grass (Roots)	Poaceae
Subfamily **Thelaxinae**		
Kurisakia indica Basu	*Chrysanthemum* sp.	Asteraceae
	Nicotiana sp.	Solanaceae
	Pisum sativum	Fabaceae
	Litsea polyantha	Lauraceae
	Litsea sp.	Lauraceae
	Quercus sp.	Fagaceae

PART - II
HOST PLANT - APHID LIST

Name of the host plants are listed alphabetically with the plant family under parenthesis against each plant name. The aphid species/subspecies against each host plant has/have also been listed.

Name of Plant	Name of Aphid
Ageratum conyzoides (Asteraceae)	*Aphis gossypii* Glover *Aphis spiraecola* Patch *Brachycaudus helichrysi* (Kaltenbach)
Ageratum sp. (Asteraceae)	*Brachycaudus helichrysi* (Kalt.) *Myzus persicae* (Sulzer)
Alnus nepalensis (Betulaceae)	*Eutrichosiphum alnicola* (Basu) *Eutrichosiphum (Neoparatrichosiphum) raychaudhurii* (Ghosh) *Mollitrichosiphum (Metatrichosiphon) montanum* (van der Goot) *Mollitrichosiphon (M.) nandii* Basu *Neobetulaphis pusilla* Basu *Taoia indica* Ghosh and Raychaudhuri
Alocasia indica (Araceae)	*Aphis gossypii* Glover
Amaranthus spinosa (Amaranthaceae)	*Aphis craccivora* Koch
Anaphalis contorta (Asteraceae)	*Oedisiphum soureni* Basu
Anaphalis sp. (Asteraceae)	*Brachycaudus helichrysi* Kalt. *Neomasonaphis anaphalidis* (Basu)
Andropogon sp. (Poaceae)	*Pseudoregma panicola* (Takahashi) *Sitobion miscanthi* (Takahashi)
Araucharia sp. (Araucariaceae)	*Cinara atrotibialis* David and Rajasingh
Artemisia cornifolia (Asteraceae)	*Aphis gossypii* Glover *Aphis spiraecola* Patch *Macrosiphoniella kikungshana* Takahashi *Macrosiphoniella spinipes* Basu *Tuberocephalus sasaki* (Takahashi)
Artemisia vulgaris (Asteraceae)	*Aphis gossypii* Glover *Aphis kurosawai* Takahashi *Aphis spiraecola* Patch *Capitophorus formosartemisae* (Tak.) *Cryptosiphum artemisiae* Buckton *Macrosiphoniella artemisiae* (B.d.F.) *Macrosiphoniella pseudoartemisiae* Shinji

Name of Plant	Name of Aphid
	Macrosiphoniella spinipes Basu
	Macrosiphoniella yomogifoliae (Shinji)
	Toxoptera aurantii (B.d.F.)
Artemisia sp. (Asteraceae)	*Aphis gossypii* Glover
	Aphis kurosawai Takahashi
	Capitophorus formosartemisiae (Tak.)
	Macrosiphoniella hikosanensis Moritsu
	Macrosiphoniella kikungshana Takahashi
	Macrosiphoniella pseudoartemisiae Shinji
	Macrosiphoniella sanborni (Gillette)
	Macrosiphoniella spinipes Basu
	Macrosiphoniella yomogifoliae (Shinji)
	Macrosiphum spinotibium Ghosh *et al.*
	Sitobion gravelii (van der Goot)
Asclepias sp. (Ascepiadaceae)	*Aphis nerii* Boyer de Fonscolombe
Atrocarpus sp. (Moraceae)	*Toxoptera aurantii* (Bd.F.)
Azelia sp. (Connaraceae)	*Liosomaphis berberidis* (Kalt.)
Bambusa arundinacea (Poaceae)	*Ceratoglyphina bambusae bengalensis* Ghosh
	Pseudoastegopteryx himalayensis Ghosh *et al.*
	Pseudoregma alexandri (Tak.)
	Takecallis arundinariae (Essig)
Bambusa sp. (Poaceae)	*Astegopteryx minuta* (v.d.G.)
	Ceratovacuna indica Ghosh
	Ceratovacuna silvestrii (Takahashi)
	Liosomaphis himalayensis Basu
	Sinomegoura citricola v.d.G.
Betula alnoides (Betulaceae)	*Mollitrichosiphum (Metatrichosiphon) nandii* Basu
	Neobetulaphis chaetosiphon Quednau and Chakrabarti
	Neobetulaphis sp.
Betula incides (Betulaceae)	*Mollitrichosiphum (Metatrichosiphon) nandii* Basu
	Taoia indica Ghosh and Raychaudhuri
Betula sp. (Betulaceae)	*Eutrichosiphum betulae* Mondal *et al.*
	Eutrichosiphum (Neoparatrichosiphum) raychaudhurii (Ghosh)
	Mollitrichosiphon (Metatrichosiphon) nandii Basu
	Taoia indica Ghosh and Raychaudhuri
Berberis sp. (Berberidaceae)	*Astegopteryx minuta* (v.d.G.)
	Ceratovacuna indica Ghosh
	Ceratovacuna silvestrii (Takahashi)
	Liosomaphis himalayensis Basu
	Sinomegoura citricola (v.d.G.)

Name of Plant	Name of Aphid
Bidens pilosa (Asteraceae)	*Aphis gossypii* Glover *Aphis spiraecola* Patch *Brachycaudus helichrysi* (Kalt.)
Blumia lacera (Asteraceae)	*Aphis gossypii* Glover
Blumia whitia (Asteraceae)	*Aphis gossypii* Glover
Boerhavia repens (Nyctaginaceae)	*Aphis spiraecola* Patch
Brassica oleracea (Brassicaceae)	*Myzus persicae* (Sulzer)
Brassica napus (Brassicaceae)	*Myzus persicae* (Sulzer)
Brassica nigra (Brassicaceae)	*Myzus persicae* (Sulzer)
Brassica sp. (Brassicaceae)	*Brevicoryne brassicae* (Linnaeus) *Myzus persicae* (Sulzer)
Cajanus cajan (Fabaceae)	*Aphis craccivora* Koch *Brachycaudus helichrysi* (Kalt.)
Calotropis juncea (Asclepiadaceae)	*Aphis craccivora* Koch
Calotropis sp. (Asclepiadaceae)	*Aphis nerii* (B.d.F.)
Camellia japonicum (Theaceae)	*Toxoptera aurantii* (B.d.F.)
Camellia sp. (Theaceae)	*Toxoptera aurantii* (B.d.F.)
Cannabis sativa (Moraceae)	*Phorodon (Diphorodon) cannabis* Passerini
Canna sp. (Moraceae)	*Aphis spiraecola* Patch
Castanospernum sp. (Fabaceae)	*Betacallis odonensis* Takahashi *Betacallis querciphaga* Basu *et al.*
Capsicum annum (Solanaceae)	*Aphis gossypii* (Glover)
Carex felicosa (Cyperaceae)	*Acutosiphon obliquoris* Basu *et al.* *Vesiculaphis sikkimensis* Mandal *et al.*
Carex sp. (Cyperaceae)	*Acutosiphon obliquoris* Basu *et al.* *Hysteronera setariae* (Thomas)
Cassia sophera (Fabaceae)	*Aphis craccivora* Koch *Toxoptera citricidus* (Kirkaldy) *Vesiculaphis sikkimensis* Mondal *et al.*
Celtis sp. (Ulmaceae)	*Shivaphis celti* Das

Name of Plant	Name of Aphid
Cestrum nocturnum (Solanaceae)	*Toxoptera aurantii* B.d.F.
Cestrum sp. (Solanaceae)	*Aphis fabae solanella* Theobald *Toxoptera aurantii* (B.d.F.)
Chrysanthemum coronarium (Asteraceae)	*Macrosiphoniella sanborni* (Gillette)
Chrysanthemum sp. (Asteraceae)	*Aphis gossypii* Glover *Macrosiphoniella sanborni* (Gillette) *Tetraneura (Tetraneurella) negriabdominalis* (Sasaki)
Cinerium sp. (Poaceae)	*Sitobion miscanthi* (Takahashi)
Citrus aurantifolium (Rutaceae)	*Toxoptera citricidus* (Kirkaldy)
Citrus aurantium (Rutaceae)	*Toxoptera citricidus* (Kirkaldy)
Citrus lemonum (Rutaceae)	*Toxoptera citricidus* (Kirkaldy)
Citrus sp. (Rutaceae)	*Acutosiphon obliquoris* Basu *et al.* *Toxoptera citricidus* (Kirkaldy) *Vesiculaphis sikkimensis* Mondal *et al.*
Cleredendron sp. (Verbenaceae)	*Aphis gossypii* Glover *Aphis spiraecola* Patch *Sinomegoura citricola* (van der Goot)
Commelina bengalensis (Commelinaceae)	*Aphis gossypii* Glover
Conicus sp. (Asteraceae)	*Capitophorus eleagni* (del Guercio)
Cosmos sp. (Asteraceae)	*Aphis spiraecola* Patch
Crataegus spinosa (Rosaceae)	*Liosomaphis himalayensis* Basu
Crepis japonica (Asteraceae)	*Sitobion miscanthi* (Takahashi)
Crepis sp. (Asteraceae)	*Aphis gossypii* Glover *Brachycaudus helichrysi* (Kalt.)
Cucurbita moschata (Cucurbitaceae)	*Aulacorthum linderae* (Shinji)
Cucurbita pepo (Cucurbitaceae)	*Aphis gossypii* Glover *Aphis longisetosa* Basu
Curcuma domestica (Zingiberaceae)	*Aphis gossypii* Glover
Cupressus sp. (Cupressaceae)	*Cinara tujafilina* (del Guercio)
Cynodon dactylon (Poaceae)	*Hysteroneura setariae* (Thomas)

Name of Plant	Name of Aphid
Cyperus exhaltans (Cyperaceae)	*Schizaphis hypersiphonata* Basu *Schizaphis rotundiventris* (Signoret)
Cyperus rotundus (Cyperaceae)	*Geoica lucifuga* (Zehntner)
Cyphomendra betaceae (Solanaceae)	*Aphis gossypii* Glover
Dahlia sp. (Asteraceae)	*Myzus ornatus* Laing
Datura sp. (Solanaceae)	*Myzus persicae* (Sulzer)
Dendrobium densifolium (Orchidaceae)	*Sitobion indicum* Basu *Sitobion pseudoluteum* Ghosh
Dendrobium sp. (Orchidaceae)	*Glyphinaphis bambusae* v.d.G. *Sitobion indicum* Basu
Digitalis sp. (Scrophulariaceae) *Dolichos lablab* (Fabaceae)	*Brachycaudus helichrysi* (Kalt.) *Aphis craccivora* Koch
Dryomaria cordata (Caryophyllaceae)	*Aphis gossypi* Glover
Dryopteris sp. (Polypodiaceae)	*Shinjia orientalis* (Mordvilko)
Duabanga sonneratioides (Sonneratiaceae)	*Brachycaudus helichrysi* (Kalt.) *Entrichosiphum sikkimense* Raychaudhuri *et al.* *Greenidea (Trichosiphum) bucktonis* Ghosh *et al.* *Tinocallis himalayensis* Ghosh *et al.*
Dubgiva sp. (Saxifragaceae)	*Toxoptera autrantii* (B.d.F.)
Duranta plumeri (Verbenaceae)	*Aphis craccivora* Koch
Eleusine coracana (Poaceae)	*Hysteroneura setariae* (Thomas) *Rhopalosiphum maidis* (Fitch) *Rhopalosiphum padi* (Linnaeus)
Elettaria cardamomum (Zingiberaceae)	*Micromyzus kalimpongensis* Basu
Emilia sonchifolia (Asteraceae)	*Hyperomyzus carduellinus* (Theobald)
Emilia sp. (Asteraceae)	*Aphis gossypii* Glover
Egnelhardtin spicta (Juglandaceae)	*Ceratovacuna silvestrii* (Takahashi) *Greenidea (Greenidea) longicornis* Ghosh *et al.* *Greenidea (Trichosiphum) formosana heeri* Raychaudhuri *et al.* *Toxoptera odinae* (B.d.F.)
Engelhardtin sp. (Juglandaceae)	*Mollitrichosiphum (Metatrichosiphum) nandii* Basu
Eragrostris gigantica (Poaceae)	*Sitobion miscanthi* (Takahashi)

Name of Plant	Name of Aphid
Eragrostris nigra (Poaceae)	*Tetraneura (Tetraneura) sikkimensis* Raychaudhuri *et al.*
Erechtitis sp. (Asteraceae)	*Aphis gossypii* Glover *Aphis spiraecola* Patch
Erythrina indica (Fabaceae)	*Toxoptera odinae* (van der Goot)
Etiolated leaf (Poaceae)	*Jacksonia sikkimensis* Ghosh *et al.*
Eugenia jambolana (Myrtaceae)	*Greenidea (Greenidea)formosana heeri* Raychaudhuri *et al.*
Eugenia sp. (Myrtaceae)	*Entrichosiphum tapatii* Mondal *et al.* *Toxoptera aurantii* (B.d.F.)
Eucalyptus globosus (Myrtaceae)	*Aphis nasturtii* Kaltenbach *Toxoptera aurantii* (B.d.F.)
Eucalyptus sp. (Myrtaceae)	*Aphis nasturtii* Kaltenbach
Eurya sp. (Ternstroemiaceae)	*Toxoptera aurantii* (B.d.F.)
Eupatorium odoratum (Asteraceae)	*Aphis gossypii* Glover *Aphis spiraecola* Patch *Brachycaudus helichrysi* (Kalt.) *Myzus persicae* (Sulzer)
Fern (Pteridaceae)	*Micromyzus niger* v.d.G.
Ficus sp. (Moraceae)	*Greenidea (Greenidea) ficicola* Takahashi
Galls (Indet plants)	*Epipemphigus imaicus* (Cholodkovsky)
Gerbera sp. (Asteraceae)	*Aphis spiraecola* Patch
Glycine max (Fabaceae)	*Myzocallis* sp. *Myzus dycei* Corver
Granotia sp. (Poaceae)	*Pseudoregma panicola* (Takahashi)
Grass (Poaceae)	*Anoecia vagans* (Koch) *Chaetogeoica graminiphaga* Raychaudhuri *et al.* *Geoica lucifuga* (Zehntner) *Geoica sikkimensis* Raychaudhuri *et al.* *Melanaphis bambusae* (Fullaway) *Melanaphis pahanensis* (Takahashi) *Sitobion akebiae* (Shinji) *Tetraneura (Indotetraneura) basui* H.R.L. *Tetraneura (Tetraneurella) nigriabdominalis* (Sasaki)

Name of Plant	Name of Aphid
Gymnogramma aurita (Gymnogramnaceae)	*Shinjia orientalis* (Mordvilko)
Glycine max (Fabaceae)	*Myzocallis* sp. *Myzus dycei* Carver
Granotia sp. (Poaceae)	*Pseudoregma panicola* (Takahashi)
Grass (Gramineae)	*Anoecia vagans* (Koch) *Chaetogeoica graminiphaga* Raychaudhuri *et al.* *Geoica lucifuga* (Zehntner) *Geoica sikkimensis* Raychaudhuri *et al.* *Melanaphis bambusae* (Fullaway) *Melanaphis pahanensis* (Takahashi) *Sitobion akebiae* (Shinji) *Tetraneura (Indotetraneura) basui* H.R.L. *Tetraneura (Tetraneurella) nigriabdominalis* (Sasaki)
Gymnogramma aurita (Gymnogramnaceae)	*Shinjia orientalis* (Mordvilko)
Gymnogramma sp. (Gymnogrammaceae)	*Amphorophora ampullata bengalensis* H.R.L and Basu
Gynura angulos (Asteraceae)	*Myzus persicae* (Sulzer)
Gynura nepalensis (Asteraceae)	*Aphis gossypii* Glover
Helianthus sp. (Asteraceae)	*Aphis spiraecola* Patch
Hibiscus esculentus (Malvaceae)	*Aphis gossypii* Glover
Hibiscus rosasinensis (Malvaceae)	*Aphis gossypii* Glover
Hordeum vulgare (Poaceae)	*Hysteroneura setariae* (Thomas) *Rhopalosiphum maidis* (Fitch)
Hydrangia sp. (Saxifragaceae)	*Aphis gossypii* Glover
Impatiens sp. (Balsaminaceae)	*Aphis gossypii* Glover *Impatientinum impatiens* (Shinji)
Ipomoea floribunda (Convolvulaceae)	*Myzus persicae* (Sulzer)
Jacranda mimosifolia (Bignoniaceae)	*Toxoptera aurantii* (B.d.F.)
Juniperus recarva (Cupressaceae)	*Cinara cupressi* (Buckton)
Leucosceptrum canum (Labiatae)	*Subovatomyzus leucosceptri* Basu
Litsea polyantha (Lauraceae)	*Aiceona litsae* Basu and H.R.L. *Greenidea (Greenidea) ficicola* Takahashi *Greenidea (Trichosiphum) formosana heeri* Raychaudhuri *et al.* *Kurisakia indica* Basu

Name of Plant	Name of Aphid
Litsea sp. (Lauraceae)	*Aphis gossypii* Glover *Kurisakia indica* Basu
Lycopersicum esculentum (Şolanaceae)	*Rhopalosiphum rufiabdominalis* (Sasaki)
Maesa chisa (Myrsinaceae)	*Aphis gossypii* Glover *Brachycaudus helichrysi* (Kalt.) *Toxoptera aurantii* (B.d.F.)
Maesia indica (Myrsinaceae)	*Aphis spiraecola* Patch
Maesia sp. (Myrsinaceae)	*Aphis spiraecola* Patch *Entrichosiphum tapatii* Mondal *et al.* *Greenidea (Greenidea) ficicola* Takahashi *Toxoptera aurantii* (B.d.F.)
Malachra capitata (Malvaceae)	*Aphis gossypii* Glover
Manibot utilissima (Melas Euphorbiaceae)	*Aphis nasturtii* Kaltenbach
Michelia champaka (Magnoliaceae)	*Aphis gossypii* Glover
Michelia sp. (Magnoliaceae)	*Toxoptera aurantii* (B.d.F.)
Melastoma indica (Melastomaceae)	*Aphis nasturtii* Kaltenbach
Mikania scandens (Asteraceae)	*Aphis spiraecola* Patch
Mimosa sp. (Fabaceae)	*Anomalosiphum indigoferae* Ghosh *et al.*
Molia azadirachta (Meliaceae)	*Aphis spiraecola* Patch
Momordica charatia (Cucurbitaceae)	*Aphis nasturtii* Kaltenbach
Musa paradisiaca (Musaceae)	*Pentalonia nigronervosa* Coquerel
Musa sp. (Musaceae)	*Pentalonia nigronervosa* Coquerel
Mussaenda frondosa (Rubiaceae)	*Toxoptera odinae* (van der Goot)
Myosotis paulutris (Boraginaceae)	*Aleurodaphis blumeae* (van der Goot)
Napier Grass (Poaceae)	*Melanaphis bambusae* (Fullaway)
Olea purpurea (Oleaceae)	*Toxoptera aurantii* (B.d.F.)
Olea sp. (Oleaceae)	*Toxoptera aurantii* (B.d.F.)
Oplisonenus compositus (Poaceae)	*Hysteroneura setariae* (Thomas)
Oplismenus sp. (Poaceae)	*Ceratovacuna lanigera* Zehntner *Pseudoregma panicola* (Takahashi)
Orchid sp. (Orchidaceae)	*Micromyzus kalimpongensis* Basu
Osbeckia chinensis (Melastomaceae)	*Aphis nasturtii* Kaltenbach

Name of Plant	Name of Aphid
	Rhopalosiphum rufiabdominalis (Sasaki)
Osbackia crinata (Melastomaceae)	*Aphis gossypii* Glover
	Toxoptera aurantii (B.d.F.)
Paspalum dilatum (Poaceae)	*Hysteroneura setariae* (Thomas)
	Sitobion miscanthi (Takahashi)
Paspalum sorbiculatum (Poaceae)	*Hysteroneura setariae* (Thomas)
Paspalum sp. (Poaceae)	*Hysteroneura setariae* (Thomas)
Phaseolus roxburghii (Fabaceae)	*Aphis craccivora* Koch
Photinia sp. (Rosaceae)	*Sinomegoura photinae* (Takahashi)
Pieris ovalifolia (Ericaceae)	*Aphis gossypii* Glover
	Toxoptera aurantii (B.d.F.)
	Vesiculaphis pieridis Basu
Pilea macrocarpa (Urticaceae)	*Aphis gossypii* Glover
	Brachymyzus jasmini Basu
Pinus sp. (Pinaceae)	*Cinara atrotibialis* David and Rajasingh
Pisum sativum (Fabaceae)	*Tetraneura* (Tetraneurella) *nigriabdominalis* (Sasaki)
Platago majora (Plantagoniaceae)	*Aphis gossypii* Glover
Poa sp. (Poaceae)	*Hysteroneura setariae* (Thomas)
	Rhopalosiphum yoksumi Ghosh *et al.*
Polygonum alatum (Polygonaceae)	*Akkaia bengalensis* Basu
	Capitophorus hippophaes javanicus H.R.L.
	Myzakkaia verbasci (Chowdhuri *et al.)*
	Myzus formosanus (Basu)
Polygonum barbatum (Polygonaceae)	*Akkaia bengalensis* Basu
Polygonum gabrum (Polygonaceae)	*Akkaia bengalensis* Basu
Polygonum molle (Polygonaceae)	*Akkaia bengalensis* Basu
	Akkaia neopolygoni Ghosh and Raychaudhuri
	Capitophorus indicus Ghosh and Raychaudhuri
	Capitophorus hippophaes javanicus H.R.L.
	Tricaudatus polygoni Narzikulov

Name of Plant	Name of Aphid
Polygonum runciratum (Polygonaceae)	*Aphis gossypii* Glover
	Aphis nasturtii Kaltenbach
	Rhopalosiphum maidis (Fitch)
Polygonum sp. (Polygonaceae)	*Capitophorus hippophaes javanicus* H.R.L.
	Capitophorus hippophaes nitegoni Eastop
	Capitophorus indicus Ghosh and Raychaudhuri
	Trichosiphonaphis gerberae Ghosh and Raychaudhuri
Pouzolzia hirta (Urticaceae)	*Aphis gossypii* Glover
Pouzolzia sp. (Urticaceae)	*Aphis gossypii* Glover
Primula sp. (Primulaceae)	*Aulacorthum (Neomyzus) primulum* Ghosh *et al.*
Prunus caresus (Rosaceae)	*Schoutederia lutea* (van der Goot)
Prunus persica (Rosaceae)	*Aphis gossypii* Glover
	Aphis spiraecola Patch
	Betacallis querciphaga Basu *et al.*
	Betacallis sikkimensis Basu *et al.*
	Brachycaudus helichrysi Kalt.
	Toxoptera aurantii B.d.F.
Prunus sp. (Rosaceae)	*Greenidea (Trichosiphum) prunicola* Ghosh *et al.*
Psidium guajava (Myrtaceae)	*Aphis gossypii* Glover
	Greenidea (Trichosiphum) formosana heeri Raychaudhuri *et al.*
Pteris sp. (Pteridaceae)	*Shinjia orientalis* (Mordvilko)
Pyrus communis (Rosaceae)	*Aphis gossypii* Glover
	Aphis spiraecola Patch
	Myzus persicae (Sulzer)
	Nippolachnus piri Matsumura
	Toxoptera aurantii (B.d.F.)
	Toxoptera citricidus (Kirkaldy)
Pyrus malus (Rosaceae)	*Aphis gossypii* Glover
	Eriosoma lanigerum Hausmann
	Toxoptera aurantii (B.d.F.)
	Toxoptera citricidus (Kirkaldy)

Name of Plant	Name of Aphid
Quercus rubra (Fagaceae)	*Mollitrichosiphum (Mollitrichosiphum) nigriabdominalis* Agarwala *et al.*
	Mollitrichosiphum (M.) shinjii Raychaudhuri *et al.*
Quercus serrata (Fagaceae)	*Eutrichosiphum tapatii* Mondal *et al.*
Quercus sp. (Fagaceae)	*Betacallis querciphaga* Basu *et al.*
	Betacallis sikkimensis Basu *et al.*
	Entrichosiphum arunachali Basu *et al.*
	Eutrichosiphum davidi Raychaudhuri
	Eutrichosiphum pseudopassaniae Szelegiewicz
	Eutrichosiphum quercifoliae Raychaudhuri *et al.*
	Eutrichosiphum tapatii Mondal *et al.*
	Greenidea (Greenidea) decaspermi Takahashi
	Greenidea (Greenidea) ficicola Takahashi
	Greenidea (Trichosiphum) brachyunguis Chatterjee *et al.*
	Greenidea (Trichosiphum) sikkimensis Raychaudhuri *et al.*
	Greenidea (Paratrichosiphum) luteum (Basu)
	Lachnus tropicalis (van der Goot)
	Mollitrichosiphum (Mollitrichosiphum) tenuicorpus (Okajima)
	Mollitrichosiphum (Mollitrichosiphum) trilocum Agarwala and Ghosh
	Nipponaphis querciphaga Ghosh and Raychaudhuri
	Nipponaphis sp.
	Sumatraphis celti Takahashi
Raphanus sativus (Cruciforae)	*Akkaia sikkimensis* Agarwala and Raychaudhuri
	Lapaphis erysimi Kaltenbach
	Myzus persicae (Sulzer)
Rhododendron sp. (Ericaceae)	*Indiaphis rostrata* Ghosh and Raychaudhuri
	Neoacyrthosiphon holsti (Takahashi)
Rhus semialata (Anacardiaceae)	*Toxoptera odinae* van der Goot
Rhus sp. (Rosaceae)	*Macrosiphum rosae* (Linn.)
	Sitobion rosaeformis (Das)

Name of Plant	Name of Aphid
Rubia cordifolia (Rubiaceae)	*Aphis spiraecola* Patch
Rubus ellipticus (Rosaceae)	*Aphis longisetosa* Basu
	Acyrthosiphon rubiformosanus
	Metopolophium rubifoliae (Raychaudhuri *et al.*)
Rubus fruticorus (Rosaceae)	*Hyadaphis coriandri* (Das)
Rubus palmata (Rosaceae)	*Aphis longisetosa* Basu
Rubus sp. (Rosaceae)	*Macrosiphum aulacorthoides* David *et al.*
	Metopolophium rubi (Narzikulov)
Rumex nepalensis (Rosaceae)	*Aphis fabae solanella* Theobald
Rumex sp. (Rosaceae)	*Aphis fabae solanella* Theobald
Saccharum officinarum (Poaceae)	*Ceratovacuna lanigera* Zehntner
	Ceratovacuna perglandulosa Basu *et al.*
Salix sp. (Salicaceae)	*Cavariella araliae* Takahashi
Salvia aspera (Labiatae)	*Aphis gossypii* Glover
Sarcococca sp. (Sarcococcaceae)	*Toxoptera aurantii* (B.d.F.)
Sarumia sp. (Ternstromiaceae)	*Anlacorthum rhamni* Ghosh *et al.*
Schima wallichii (Ternstromiaceae)	*Greenidea (Greenidea) longirostris* Basu
	Toxoptera aurantii (B.d.F.)
Schizium sp. (Umbelliferae)	*Semiaphis heraclei* (Takahashi)
Senebiera sp. (Brassicaceae)	*Toxoptera aurantii* (B.d.F.)
Senecio scandens (Asteraceae)	*Brachycaudus helichrysi* (Kaltenbach)
Setaria sp. (Poaceae)	*Ceratovacuna perglandulosa* Basu *et al.*
Shorea robusta (Dipterocarpaceae)	*Aphis gossypii* Glover
	Rhopalosiphum maidis (Fitch)
Sida palmata (Malvaceae)	*Aphis gossypii* Glover
Sida sp. (Malvaceae)	*Aphis gossypii* Glover
Sigesbeckia orientalis (Asteraceae)	*Myzus siegesbeckicola* Strand
Smilax macrophylla (Liliaceae)	*Impatientinum (Neoimpatientinum) smilaceti* Agarwala *et al.*
Smilax sp. (Liliaceae)	*Arthromyzus smilacifoliae* Ghosh and Raychaudhuri
	Rhopalosiphoninus (Myzosiphon) smilacifoliae (Ghosh and Raychaudhuri)

Name of Plant	Name of Aphid
	Sinomegoura citricola (v.d.G.)
	Sinomegoura rhododendri (Takahashi)
	Sitobion sikkimensis (Ghosh and Raychaudhuri)
	Sitobion takahashii (Eastop)
Solanum melongena(Solanaceae)	*Aphis gossypii* Glover
Solanum nigrum (Solanaceae)	*Aphis fabae solanella* Theobald
Solanum tervum (Solanaceae)	*Aphis gossypii* Glover
	Aulacorthum dasi Ghosh *et al.*
Solanum tuberosum (Solanaceae)	*Myzus persicae* (Sulzer)
Solanum sp. (Solanaceae)	*Aphis gossypii* Glover
Spermacea hispida (Rubiaceae)	*Aphis gossypii* Glover
Spiraea bella (Rosaceae)	*Aphis spiraecola* Patch
Spiraea corymbosa (Rosaceae)	*Aphis spiraecola* Patch
Spiraea sp. (Rosaceae)	*Toxoptera aurantii* (B.d.F.)
Sonchus arvensis (Asteraceae)	*Hyperomyzus carduellinus* (Theobald)
Sonchus oleracea (Asteraceae)	*Hyperomyzus carduellinus* (Theobald)
	Uroleucon (Uroleucon) sonchi (Linnaeus)
Sonchus sp. (Asteraceae)	*Uroleucon (Uroleucon) sonchi* (Linnaeus)
Sporobolus indicus (Poaceae)	*Hysteroneura setariae* (Thomas)
Sporobolus sp. (Poaceae)	*Hysteroneura setariae* (Thomas)
Sterculina foetida (Sterculiaceae)	*Toxoptera aurantii* (B.d.F.)
Sterculina sp. (Sterculiaceae)	*Toxoptera aurantii* (B.d.F.)
Symplocos sp. (Styraceae)	*Greenidea (Paragreenidea) symplocosis* Ghosh *et al.*
Tagetes patula (Asteraceae)	*Toxoptera odinae* (B.d.F.)
Tephrosia caudida (Fabaceae)	*Aphis craccivora* Koch
Thysanolaena maxima (Poaceae)	*Glyphinaphis bambusae* v.d.Goot
Thysanolaena sp. (Poaceae)	*Glyphinaphis bambusae* v.d.Goot
Tibouchina rosaeformis (Melastomaceae)	*Aphis gossypii* Glover
Tridax procumbens (Asteraceae)	*Aphis gossypii* Glover
Triticum vulgare (Poaceae)	*Geoica lucifuga* (Zehntner)

Name of Plant	Name of Aphid
	Pemphigus vulgaris Raychaudhuri *et al.*
	Rhopalosiphum maidis (Fitch)
Urtica parviflora (Urticaceae)	*Myzus dycei* Carver
Vernonia cinaria (Asteraceae)	*Rhopalosiphum padi* (Linnaeus)
Vicia fiba (Fabaceae)	*Chaetogeoica foliodentata* (Tao)
Vitex sp. (Verbenaceae)	*Aphis spiraecola* Patch
Xanthoxyllum ornatum (Rutaceae)	*Aphis spiraecola* Patch
Zea mays (Poaceae)	*Rhopalosiphum maidis* (Fitch)

Indet Plant Families	Aphid
Apietaceae	*Aphis craccivora* Koch
Acanthaceae	*Aphis gossypii* Glover
	A. spiraecola Patch
Alletaceae	*Aphis spiraecola* Patch
Amaranthaceae	*Aphis craccivora* Koch
	Aphis gossypii Glover
Amaryllidaceae	*Toxoptera aurantii* (B.d.F.)
Apocynaceae	*Toxoptera aurantii* (B.d.F.)
Araceae	*Aphis gossypii* Glover
Aroideae	*Brachycaudus helichrysi* (Kalt.)
Bignoniaceae	*Toxoptera aurantii* (B.d.F.)
Boraginaceae	*Aphis gossypii* Glover
	Brachycaudus helichrysi (Kalt.)
Caryophyllaceae	*Aphis gossypii* Glover
Combretaceae	*Ceratovacuna lanigera* Zehntner
	Taiwanaphis dineni Mondal *et al.*
Commetinaceae	*Aphis gossypii* Glover
Asteraceae	*Aphis craccivora* Koch

Indet Plant Families	Aphid
	Aphis fabae solanella Theobald
	Aphis gossypii Glover
	Aphis spiraecola Patch
	Myzus ornatus Laing
	Toxoptera aurantii (B.d.F.)
	Toxoptera odinae van der Goot
Convolvulaceae	*Aphis gossypii* Glover
Brassicaceae	*Aphis spiraecola* Patch
Diascopriaceae	*Toxoptera odinae* V.d.Goot
Ericaceae	*Neomasonaphis inulae* (Ghosh and Raychaudhuri)
Euphorbiaceae	*Toxoptera aurantii* (B.d.F.)
Poaceae	*Anoecia vagans* (Koch)
	Aphis fabae solanella Theobald
	Aphis gossypii Glover
	Aphis spiraecola Patch
	Geoica sikkimensis Raychaudhuri *et al.*
	Hysteronera setariae (Thomas)
	Jacksonia sikkimensis Ghosh *et al.*
	Melanaphis pahanensis (Takahashi)
	Schizaphis graminum (Rondani)
	Tetraneura (Tetraneurella) nigriabdominalis (Sasaki)
	Toxoptera aurantii (B.d.F.)
Lauraceae	*Toxoptera aurantii* (B.d.F.)
Fabaceae	*Anomalosiphum indigoferae* Ghosh *et al.*
	Tinocalloides montanus Basu
	Toxoptera aurantii (B.d.F.)
Lythraceae	*Aphis spiraecola* Patch
Magnoliaceae	*Toxoptera aurantii* (B.d.F.)
Melastomaceae	*Aphis gossypii* Glover
Moraceae	*Toxoptera aurantii* (B.d.F.)

Indet Plant Families	Aphid
Myrsinaceae	*Aphis soiraecola* Patch
	Toxoptera aurantii (B.d.F.)
Oleaceae	*Toxoptera aurantii* (B.d.F.)
Plantagonaceae	*Aphis gossypii* Glover
Polygonaceae	*Aphis craccivora* Koch
	Aphis spiraecola Patch
Pterocarpaceae	*Aphis spiraecola* Patch
Pteridaceae	*Micromyzus niger* van der Goot
	Macromyzus woodwardiae Takahashi
Rosaceae	*Aphis fabae solanella* Theobald
	Aphis gossypii Glover
	Aphis spiraecola Patch
	Macrosiphum pachysiphon H.R.L.
	Toxoptera aurantii (B.d.F.)
	Toxoptera odinae v.d.Goot
Rubiaceae	*Aphis gossypii* Glover
	Aphis spiraecola Patch
Sarcococcaceae	*Toxoptera aurantii* (B.d.F.)
Saxifragaceae	*Toxoptera aurantii* (B.d.F.)
Scrophulariaceae	*Aphis fabae solanella* Theobald
	Aphis gossypii Glover
Solanaceae	*Aphis spiraecola* Patch
	Toxoptera aurantii (B.d.F.)
Sterculiaceae	*Aphis gossypii* Glover
	Toxoptera aurantii (B.d.F.)
	Toxoptera odinae v.d.Goot
Theaceae	*Toxoptera aurantii* (B.d.F.)
Verbenaceae	*Aphis spiraecola* Patch
	Toxoptera aurantii (B.d.F.)
Zingiberaceae	*Aphis gossypii* Glover

DISCUSSION

Aphid infestation with host plants plays important role in the establishment of holocycly as this may become a limiting factor when primary host plants on which sexual females lay eggs are not available. In India, aphids infest about 1456 plant species [Raychaudhuri, D.N. (ed.) 1983; Chakrabarti and Sarkar 2001.]

Compliation of data reveals that about 200 species of aphids have been found to infest the plants belonging to 63 plant families distributed over 156 genera and 235 plant species excluding some indet plants belonging to various Natural Orders in Sikkim. It has been observed that most of the species live on higher dicotyledonous plants while a few on monocotyledonous ones. It has also been noticed that plant family Asteraceae harbours the maximum number of species (30) followed by Poaceae (29), Rosaceae (22), Fagaceae (20) and Polygonaceae (12). Hence, these plant families act as predominant ones for the host association with aphids encountered in Sikkim.

The Aphidine aphids have been considered to be highly evolved among the aphids. This can be evidenced by the fact that they have host plants belonging to such distantly related plants like the Bryophyta to the highly evolved of Dicotyledonous and they are the most abundant species among aphids found in different climate zones of the state. The species belonging to subfamily Greenideinae are mostly associated with older groups of dicotyledonous plants which are abundant in particular sets of climatological condition. Same is true with the aphids of subfamily Hormaphidinae. However, the hormaphidine aphids and related genera mostly occur on poaceous plants, the grasses abound in almost all temperature zones. The plant lice belonging to Drepanosiphinae, Lachninae and Pemphiginae are not so abundant in Sikkim. The Drepanosiphine aphids are mostly found on Fagaceae—Betulaceae group of plants. The Pemphigids are mostly associated with older groups of plants. These aphids have mostly been collected in this region from the roots of grasses which are secondary hosts of these aphids and apparently they are adapted to the anholocyclic life cycle on these plants. The lachnids that are recorded in this region are members of the tribes Lachnini and Cinarini and are also found in high altitude areas mostly on older groups of dicotyledonous plants.

Analysis of data reveals that many species like *Aphis gossypii* Glover, *Aphis spiraecola* Patch, *Myzus persicae* (Sulzer), *Toxoptera aurantii* (B.d.F.) are highly polyphytophagous. They belong to the Subfamily Aphidinae and show host alteration, where primary hosts are somewhat definite but with a wide range of secondary hosts. The species *Brachycaudus helichrysi* (Kalt.) alternates between *Prunus* (Rosaceae) as primary host and *Anaphalis* (Asteraceae), *Ageratum* (Asteraceae) as secondary hosts. Likewise, *Capitophorus hippophaes javanicus* H.R.L. alternates between *Hippophae* (Elaeagnaceae) as primary host and *Polygonum* (Polygonaceae) as secondary host. In case of many other species of aphid the host alternating habit is still to be found out. Extensive and intensive surveys in various ecological niches may reveal many more interesting results as to the host alternating and holocyclic life pattern of this complicated group of insects in Sikkim.

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INSECTA : HOMOPTERA : CICADELLOIDEA

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INTRODUCTION

The Cicadellidae (Jassidae) are usually known as Leafhoppers. They constitute the largest family in Hemiptera and have been considered insects of economic importance. Nielson (1979) listed 128 species of these insects as vectors of plant pathogens in the world. The Cicadellids usually cause damage to the plants by sucking plant's sap, injecting toxins while sucking, by laying eggs covering the leaf circle. Though the leafhopper fauna of the Western parts of the world are well known, studies on Oriental leaf hoppers with special reference to India including Sikkim are much limited.

Hamilton (1984) estimated that about 15000 species of leafhoppers were described so far from the world. In India about 680 species are known through the contributions made by Distant (1908, 1916, 1918); Pruthi (1930, 1934, 1936); Ghauri (1963, 1967, 1974); Rao (1967, 1973, 1989); Ramakrishnan and Menon (1971, 1972a, 1972b, 1973, 1974); Singh (1969); Bindra *et al.* (1970); Bindra *et al.* (1973); Datta (1972, 1973, 1988); Datta and Ghosh (1973a, 1973b, 1974); Viraktamath (1976a, 1976b, 1979a, 1973b, 1974); Viraktamath (1976a, 1976b, 1979a, 1979b, 1980a, 1980b, 1981, 1982, 1983); Datta and Dhar (1984); Sohi and Dworakowska (1984).

Perusal of literature reveals that only 26 species are on record from the State of Sikkim (Distant 1908, 1916, 1918).

The present paper provides a comprehensive account of the family Cicadellidae of Sikkim, comprising 34 species belonging to 22 genera spread over 8 subfamilies. It is based on the recent as well as the old collections made by different survey parties of Zoological Survey of India.

The species marked (*) are new records from Sikkim.

The paper includes literature reference keys to taxa, diagnosis measurement and geographical distribution of each species.

Distribution of each species is also shown in different districts of Sikkim in charts as well as in Maps.

SYSTEMATIC ACCOUNT

Classified List of Cicadelloidea of Sikkim

Family I. CICADELLIDAE

Subfamily 1. CICADELLINAE

Genus 1 ***Bothrogonia*** Melichar

1. *Bothrogonia ferruginea* (Fabricius)

Genus 2. ***Cicadella*** Melichar

2. *Cicadella spectra* (Distant)

Genus 3. ***Cofana*** Melichar

3. *Cofana mimica* (Distant)

Genus 4. ***Kolla*** Distant

*4. *Kolla canida* Distant
5. *K. maculifrons* Schmidt.
6. *K. mungphuensis* Distant
*7. *K. opponens* Walker

Genus 5. ***Soibanga*** Distant

8. *Soibanga bella* Walker

Genus 6. ***Tettigella***

9. *Tettigella rubromaculata* (Signoret)

10. *T. sikkimensis* Distant

Family II. PENTHIMIDAE

Subfamily 2. PENTHIMINAE

Genus 7. ***Penthimia*** Germer

11. *Penthimia maculosa* Distant

Family III. LEDRIDAE

Subfamily 3. LEDRINAE

Genus 8. ***Ledra*** Fabricius

12. *Ledra dorsalis* Walker

Genus 9. ***Ledropsis*** White

13. *Ledropsis obligens* Walker

Genus 10. ***Petalocephala*** Stal

14. *Petalocephala cultellifera* Walker

15. *P. hearsayi* Distant

16. *P. insignis* Distant

17. *P. latifrons* Walker

Family IV. EVACANTHIDAE

Subfamily 4. EVACANTHINAE

Genus 11. ***Evacanthus*** Le Peletier and Serville

18. *Evacanthus extremus* Walker

19. *E. repexus* Distant

Family V. APHRODIDAE

Subfamily 5. APHRODINAE

Genus 12. ***Gurawa*** Distant

20. *Gurawa intermediatus* Singh and Pruthi

21. *G. vexillum* Distant

Family IV. HECALIDAE

Subfamily 6. HECALINAE

Genus 13. ***Parabolocratus*** Fieber

*22. *Parabolocratus albomaculatus* (Distant)

Family VII. DELTOCEPHALIDAE

Subfamily 7. DELTOCEPHALINAE

Genus 14. ***Balclutha*** Kirkaldy

23. *Balclutha indica* Melich.

Genus 15. ***Cicadula*** Setterstedt

24. *Cicadula maculata* Pruthi

Genus 16. ***Deltocephalus*** Burmeister

25. *Deltocephalus nigrifacialis* Distant

Genus 17. ***Dio*** Distant

*26. *Dio facialis* Distant

Genus 18. ***Exitianus*** Ball

27. *Exitianus atkinsoni* (Distant)

28. *E. indicus* (Distant)

29. *E. nanus* (Distant)

Genus 19. ***Goniagnathus*** Fieber

30. *Goniagnathus punctifer* Walker

Genus 20. ***Nephotettix*** Matsumura

31. *Nephotettix nigropicta* Stal

32. *N. virescens* (Fabricius)

Genus 21. ***Thomsoniella*** Signoret

33. *Thomsoniella porrecta* Walker

Family VIII. AGALLIDAE

Subfamily 8. AGALLINAE

Genus 22. ***Nehela*** White

34. *Nehela montana* Distant

Key to subfamilies

1(2) Pygofer and male valve fused, genital plate narrowly basally rectangular 3

2(1) Pygofer and male valve usually more or less triangular; plate triangular 5

3(4) Face without carinate, frontal suture above terminating at antennal pits, pronotum not extending to forwards beyond anterior margin of eyes ..... AGALLINAE

4(3) Face with median carina with a pair of additional convergent cariane on crown ..... EVACANTHINAE

5(6) Frontoclypeus not medially carinate.....7

6(5) Frontoclypeus with median carina.....11

7(8) Head not produced; lateral facial sutures extending over margin. CICADELLINAE

8(7) Head usually produced; lateral facial sutures not briefly extending on to crown.....9

9(10) Squat-shaped insects; hind tibial spines normal, large and densely packed .... PENTHIMINAE

10(9) Large elongate insects; hind tibial setae short, ocelli nearer to hind margin of head, fine, widely spaced ..... LEDRINAE

11(12) Ocello–ocular area with distinct transverse edge above antennal pit; face broad .... APHRODINAE

12(11) Ocello–ocular area not produced as above, face variable 13

13(14) Lateral margin of pronotum carinate; margin of gena usually incised; dorsoventrally flattened ... HECALINAE

14(13) Lateral margin of pronotum usually not carinate; margin of gena not incised; not dorsoventrally flattened .... DELTOCEPHALINAE

Subfamily 1. CICADELLINAE

Key to genera of subfamily CICADELLINAE

1(2) Wings wider than tegmina and their apices subtruncate ..... ***Soibanga***

2(1) Wings narrower than tegmina and their apices rounded 3

3(4) Face distinctly transversely striate, flattened and medially smooth 5

4(3) Face without such striation, elongate and moderately globose 7

5(6) Vertex strongly produced, anterior margin subconicate ..... ***Kolla***

6(5) Vertex not produced as above, anterior margin rounded ..... ***Cofana***

7(8) Tegmina longer than abdomen, fore wings with five apical cells; posterior tibiae longly spinulose 9

8(7) Tegmina shorter than abdomen; fore wings with four apical cells; posterior tibiae not longly spinulose ..... ***Cicadella***

9(10) Lateral margin of vertex in a line with inner margins of the eyes ..... *Tettigella*

10(9) Lateral margin of vertex not in line with inner margins of the eyes .... ***Bothrogonia***

Genus 1. ***Bothrogonia*** Melichar

1926. *Bothrogonia* Melichar, *Ann. Mus. nat. Hist. Hung.*, **23** : 341.

1. ***Bothroginia ferruginea*** (Fabricius)

1794. *Tettigoniella ferruginea* Fabricius, *Entomologia Syst.* **4** : 32.

1988. *Bothrogonia ferruginea* (Fabricius) : Datta. *Rec. zool. Surv. India*, Occ. Paper **90** : 4.

1998. *Bothrogonia ferruginea* (Fabricius) : M. Ghosh & L. K. Ghosh, *State Fauna Series* **4**, *Fauna of Meghalaya*, pt. **4** : 5.

Material examined : 2 exs., Sikkim : Gangtok, East Sikkim; 11.ix.1993, coll. S. K. Saha.

General Diagnosis : Body robust, vertex with two black spots, one at apex and one at basal portion; between the ocelli face with transverse black spots; pronotum with three black spots one at anterior margin and other two at base; Scutellum centrally with a black spot; tegmina piceous, claval suture with black patches, its apical cell blackish; leg blackish; abdomen blackish.

Length : 15 mm.

Distribution : India : Sikkim (E. Sikkim), Assam, Maharashtra, Meghalaya, Tamil Nadu, Uttar Pradesh, West Bengal. *Elsewhere* : Borneo, Burma, China, Coorg, Dutch, Philippines, Singapore, Sri Lanka, Sumatra.

Genus 2. ***Cicadella*** Latreille

1817. *Cicadella* Latreille, *Contenant Crustaces Arachnida insectes* **3** : 406.

2. ***Cicadella spectra*** (Distant)

1853. *Tettigonia albida* Signoret, *Ann. Soc. Ent. Fr.*, **21** : 663.

1908. *Tettigoniella spectra* Distant, *Fauna Brit. India, Rhynchota*, **4** : 211.

1910. *Cicadella spectra* (Distant), *Insect. Trans.*, **10** : 234.

1998. *Cicadella spectra* (Distant) : M. Ghosh & L. K. Ghosh, *State Fauna Series* **4**, *Fauna of Meghalaya*, **4** : 5.

Material examined : Sikkim : 5 exs., Yumthang; N. Sikkim, 8.viii.1989, coll. *S. Chatterjee.*

General Diagnosis : Body white with yellow tint in colour, vertex with four black spots, two spots at central position, and other two black spots one at apex another at base, pronotum with a central line and transverse striatiae, face darker in colour and transverse striation; tegmina white with a flavous tint, veins fuscuous; legs ochraceous.

Length : 9 mm.

Distribution : India : Sikkim (North Sikkim), Assam, Bihar, Karnataka, Maharashtra, Madhya Pradesh, Orissa. *Elsewhere* : Australia, Bangladesh, Nepal, Sri Lanka.

Remarks : The species is commonly found on paddy during winter. It also feeds on wild grasses.

Genus 3 ***Cofana*** Melichar

1926. *Cofana* Melichar, *Ann. Mus. Nat. Hist.*, **23** : 345.

3. ***Cofana mimica*** (Distant)

1908. *Kolla mimica* Distant, *Fauna Brit. India, Rhynchota,* **4** : 225.

1988. *Cofana mimica* (Distant) : Datta, *Rec. zool. Surv. India,* Occ. Paper No. **90** : 12.

1993. *Cofana mimica* (Distant) : M.Ghosh & L.K. Ghosh, *State Fauna Series* **4**, *Fauna of Meghalaya,* pt. **4** : 8.

Material examined : 2 exs., Sikkim : Tadong, I.C.A.R.; East Sikkim, 30.iv.92, coll. S. R. Banerjee.

General Diagnosis : Body light green in colour, sometime whitely tomentose; three transverse series of black spots on the vertex, one black spot at central, the other two near ocellus; a small black spot near inner margin of each eyes, scutellum yellowish colour, with distinct dark longitudinal line; tegmina greyish white in colour, its vein infuscate, wings pale milky colour or semihyaline, legs light green in colour, abdomen yellowish.

Length : 5.5 mm.

Distribution : India : Sikkim (East Sikkim), Bihar, Meghalaya, Uttar Pradesh, West Bengal.

Genus 4. ***Kolla*** Distant

1908. *Kolla* Distant, *Fauna Brit. India, Rhynchota,* **4** : 223.

Key to the species of Kolla

1(2) Tegmina with longitudinal fasciate; but with out pale costal margin.. ..... *maculifrons*

2(1) Tegmina without longitudinal fasciate, but with pale costal margin 3

3(4) Vertex with three black spots, two spots on anterior margin and one transverse spot at basal margin 5

4(3) Vertex with two large spots, one at base other at apex .....*mungphuensis*

5(6) Pronotum with a broad transverse black spot; face with central testaceous spot..... ..... *opponens*

6(5) Pronotum with two large milky white spots; face with a central milky white spot..... *canida*

*4. ***Kolla canida*** Distant

1908. *Kolla canida* Distant, *Fauna Brit. India, Rhynchota,* **4** : 226.

1965. *Kolla canida* Metcalf, *General Catalogue of Homoptera,* **1** : 440.

Material examined : 1 ex., Sikkim : Chungtham; North Sikkim; 4.xi.1992, coll., M.S. Shishodia.

General Diagnosis : Vertex brownish yellow, on anterior margin of vertex two united spots and at base one transverse spot, eyes, black, face black; pronotum also black; and two transverse milky white spots on pronotum, tegmina blood red in colour, its anterior, posterior and caval margin black, tegmina with longitudinal, discal black fascia; legs milky white, abdomen black.

Length : 6.5 mm.

Distribution : India : Sikkim (North Sikkim).

Remarks : The species is a new record from Sikkim.

5. ***Kolla maculifrons*** Schmidt

1911. *Kolla maculifrons* Schmidt, *Stett Ent. Zeit.*, **72** : 293.

1965. *Kolla maculifrons* Metcalf, *General Catalogue of Hompt,* **1** : 442.

Material examined : 5 exs., Sikkim : Tadong, Dt. East Sikkim; 10.ix.1993, coll. *S.K. Saha.*

General Diagnosis : Body black, vertex with three brick-red spots, of which one triangular spot on middle, and later two spots at eyes and extend at base of the antennae, on face an orange-red longitudinal mark present; ptonotum with medial black longitudinal line uniting two margins; scutellum with two bricked spots; tegmina black, a broad brick-red stripe on claval suture; wings suffused with smoky black; legs white in colour; abdomen black.

Length : 7 mm.

Distribution : India : Sikkim (East Sikkim), West Bengal.

Remarks : Ghosh, M (1974) has redescribed the species.

6. ***Kolla mungphuensis*** Distant

1908. *Kolla mungphuensis* Distant, *Fauna Brit. India, Rhynchota,* **4** : 225.

1965. *Kolla mungphuensis* Distant : Metcalf; *General Catalogue of Homp.,* **1** : 443.

Material examined : "Sikkim"

General Diagnosis : Body bright yellow in colour, two black spots on vertex, one at base, other at apex, a longitudinal black narrow fascia at central of the face; scutellum with a black large spot on each basal angle; tegmina greyish, two longitudinal red-brownish fasciae, one at clavus, other in subcostal margin, wings subhyaline; legs brownish yellow.

Length : 6 mm.

Distribution : India: "Sikkim", "Bengal", Eastern Himalayas.

*7. ***Kolla opponens*** (Walker)

1851. *Tettigonia oppenens* Walker, *List. Hom. B. M.* **3** : 757.

1988. *Kolla opponens* (Walker), Datta, *Rec. zool. Surv. India,* Occ. Paper **90** : 12.

1998. *Kola opponens* (Walker) : M. Ghosh & L. K. Ghosh, *StateFauna Series,* **4** *Fauna of Meghalaya* **4** : 10.

Material examined : 3 exs., Sikkim : Tadong, I.C.A.R., East Sikkim ; 30.iv.92, coll. *S. R. Banerjee.*

General Diagnosis : Body reddish in colour, three black spots on vertex; two sports on anterior margin and one transverse spot at base; face with red spot centrally; anterior margin of pronotum black, being connected with an angulated basal margin; a large black spot on each basal angle of scutellum; tegmina with costal and claval area, black broad longitudinal fascia; legs brownish yellow; abdomen with black transverse fascia.

Length : 8.5 mm.

Distribution : India : Sikkim (East Sikkim), Assam, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Burma, Netherland.

Genus 5. ***Soibanga*** Distant

1908. *Soibanga* Distant, *Fauna Brit. India, Rhynchota,* **4** : 236.

8. ***Soibanga bella*** Walker

1851. *Soibanga bella* Walker, *List Hom.,* **111** : 778.

1953. *Soibanga bella* Walker; Mathur, *Indian Forest Leaflet* (Ent) **121**(3) : 168.

1965. *Soibanga bella* Walker; Metcalf, *General Catalogue of Homp.,* **1** : 91.

1984. *Soibanga bella* Datta & Dhar, *Bull. zool. Surv. India,* **6**(1-3) : 181-207.

Material examined : 1 ex., Sikkim : Lachen, North Sikkim, 24.iv.1992, coll. *J.K.Prasad.*

General Diagnosis : Body black in colour; on vertex one central longitudinal brownish line present and with two transverse discal lines its anterior area with macular mottlings; behind each eye a transverse brownish spot present; on pronotum two broadly transverse brownish discal fasciae and submarginal discal anterior line present; scutellum with four small discal brownish spots; two large brownish spots on clypeus; tegmina black and apical margin greyish brown with different brownish maculation; wings palely reddish; legs brown; abdomen creamy white.

Length : 5 mm.

Distribution : India : Sikkim (North Sikkim), Assam, Himachal Pradesh, Northern India, Uttar Pradesh.

6. ***Tettigella*** China and Fennah

1945. *Tettigella* China and Fennah, *Ann. Mag. Nat. Hist.*, **12**(11) : 711.

Key to the species of Genus *Tettigella*

1(2) Pronotum with transverse and lateral fascia not maculate ..... *rubromaculata*

2(1) Pronotum without such fascia, more or less maculate ..... *sikkimensis.*

9. ***Tettigella rubromaculata*** Signoret

1853. *Tettigonia rubromaculata* Signoret, *Ann. Soc. Ent. Fr.*, **21** : 668.

1965. *Tettigella rubromaculata* Metcalf, *General Catalogue of Homop*, **1** : 138.

Material examined : "Sikkim"

General Diagnosis : Body tobust, black, vertex, red in colour, with black mark which extend to posterior margin; pronotum black with transverse and lateral red band; scutellum red in colour, with a large black spot near each basal margin; tegmina black, with longitudinal red stripes not extended on the apical area, wings smoky brown in colour, its veins pitchy black; legs reddish in colour; abdomen black.

Length : 13 mm.

Distribution : India : "Sikkim", Assam. *Elsewhere* : Nepal, British India.

10. ***Tettigella sikkimensis*** Distant

1908. *Tettigella sikkimensis* Distant, *Fauna Brit. India, Rhynchota*, **4** : 217.

1988. *Tettigella sikkimensis* Dutta, *Rec. zool. Surv. India*, Occ. Paper No. **90** : 24.

Material examined : "Sikkim"

General Diagnosis : Body robust, vertex black with red spots, one at central portion which bifid porteriorly and other two spots at inner margin of eyes; pronotum black, four red transverse series of spots; scutellum red, at bast two triangular black spots; tegmina black, its veins yellow, with three longitudinal fasciae, one fascia to subcostal, another above clavus and third in clavus and two upper fascia do not extend to apical area; legs testaceous.

Length : 11.5 mm.

Distribution : India : "Sikkim", Assam.

Subfamily 2. PENTHIMINAE

Genus 7. ***Penthimia*** Germar

1821. *Penthimia* Germar, *Mag. Ent.* **4** : 46.

11. ***Penthimia maculosa*** Distant

1908. *Penthimia maculosa* Distant, *Fauna Brit. India, Rhynchota*, **4** : 244.

1962. *Penthimia maculosa* Distant : Metcalf, *General Catalogue of Homp.*, **iii** : 201.

Material examined : "Sikkim"

General Diagnosis : Body pale black in colour, vertex with a transverse ridge and striation; face also with transversely broadly striation at its basal margin; pronotum punctate and transversely wrinkled, at middle of pronotum, a few small reddish spots present; disk of scutellum punctate and transverse winkled, tegmina pale black and finely and thickly reddish speekled, and apical area with a cluster of white spots; legs black; abdomen testaceous.

Length : 4.5 mm.

Distribution : India : "Sikkim", Assam, Maharashtra, West Bengal. *Elsewhere* : Tenasserim.

Subfamily 3. LEDRINAE

Key to genera of sub-family LEDRINAE

1(2) Posterior tibiae foliaceously dilated ..... *Ladra*

2(1) Posterior tibiae not foliaceously dilated 3

3(4) Vertex of head more or less flat, not prominently deflected on each side, narrow and more or less angulated anteriorly .... *Petalocephala*

4(3) Vertex of head prominently deflected on each side ..... *Ledropsis*

Genus 8. ***Ledra*** Fabricius

1803. *Ledra* Fabricius, *Syst. Rhynch.*, **21**.

12. ***Ledra dorsalis*** Walker

1851. *Ledra dorsalis* Walker, *List. Hom,* **iii** : 810.

1962. *Ledra dorsalis* Walker : Metcalf, *General Catalogue of Homp.*, **iii** : 36.

Material examined : 1 ex., Sikkim : Dinchu, N. Sikkim.

General Diagnosis : Body greyish in colour, vertex with strong central and oblique ridges, and its basal part with a central and two black fasciae, roughly granulate; pronotum with laminate like two ridge processes and strongly granulate, tegmina with brownish yellow oblique patch and scattered small tubercles.

Length : 20 mm.

Distribution : India : Sikkim (North Sikkim), Assam. *Elsewhere* : Sylhet.

Genus 9. ***Ledropsis*** White

1944. *Ledropsis* White, *A.M.N.H.* (1) **xiv** : 425.

13. ***Ledropsis obligens*** Walker

1858. *Ledropsis obligens* Walker, *List. Hom. Suppl.*, : **251**.

1962. *Ledropsis obligens* Walker : Metcalf, *General Catalogue of Homp.*, **iv** : 91.

Material examined : "Sikkim"

General Diagnosis : Body bronish yellow, head long, apex subtriangular, with its central longitudinal incision line; face elongate triangular; pronotum short, transversely wrinkled; tegmina brownish yellow, its veins darker; wings hyaline; legs brownish yellow; abdomen brownish yellow.

Length : 14 mm.

Distribution : India : "Sikkim", "Bengal", South India. *Elsewhere* : Fukien, Singapore Island, Sri Lanka.

Genus 10. ***Petalocephalus*** Stål

1853. *Petalocephalus* Stål, *Ofv. Vet. A.K. Forh.*, : 266.

Key to species of the genus *Petalocephala*

1(2) Tegmina punctate 3

2(1) Tegmina not punctate, usually shinning rusty brown, pronotum more or less coarsely punctate ..... *latifrons*

3(4) Pronotum finely punctate, posteriorly finely rugulose ..... *cuitellifera*

4(3) Pronotum coarsely and thickly punctate 5

5(6) Scutellum obscurely regularly striate; pronotum sinuate; pronotum with disk sparingly punctate, anteriorly and posteriorly thickly punctate ..... *hearsayi*

6(5) Scutellum irregularly striate, with disk punctate; pronotum not sinuate, finely transversely wrinkled ..... *insignis*

14. ***Petalocephalus cultellifera*** Walker

1856. *Ledra cultellifera* Walker, *J. Linn. Soc. Zool.*, : **98**.

1962. *Petalocephalus cultellifera* Metcalf, *General Catalogue of Homp.*, **iv** : 71.

Material examined : "Sikkim"

General Diagnosis : Body greenish in colour, vertex long and conically produced at apex and thickly punctate; at centre a longitudinal carinate present; pronotum finely punctate, posteriorly rugolose; tegmina strongly punctate; legs dentate.

Length : 16 mm.

Distribution : India : "Sikkim", West Bengal.

Elsewhere : Formosa, Japan, Malay Peninsula, Philippines, Singapore.

15. ***Petalocephala hearsayi*** Distant

1908. *Petalocephala hearsayi* Distant, *Fauna Brit. India, Rhynchota*, **4** : 163.

1962. *Petalocephala hearsayi* Distant; Metcalf, *General Catalogue of Homp.*, **iv** : 73.

Material examined : "Sikkim"

General Diagnosis : Vertex as long as width, finely punctate and with strongly longitudinal ridge at central, pronotum with coarsely sparingly disk; posterior margin of pronotum strongly punctate, centrally longitudinally furrowed; scutellum irregularly striated; tegmina thick, claval area strongly punctate and at apices of tegmina obliquely truncate.

Length : 15 mm.

Distribution : India : "Sikkim", West Bengal.

16. ***Petalocephala insignis*** Distant

1908. *Petalocephala insignis* Distant, *Fauna of Brit. India, Rhynchota,* **4** : 167.

1962. *Petalocephala insignis* Distant; Metcalf, *General Catalogue of Homp.* **iv** : 74.

Material examined : "Sikkim"

General Diagnosis : Body brownish yellow; vertex with sublateral margin ridged, apical area black and longitudinally carinate; and subrugulose; pronotum punctate and with finely transverse wrinkled and centrally with a longitudinally carination; scutellum punctate and transversely striated; tegmina hyaline, its vein brownish; punctate, its costal and claval area coarsely punctate, abdomen testaceous.

Length : 11.5 mm.

Distribution : India : "Sikkim"

Remarks : This species is originally described from Sikkim.

17. ***Petalocephala latifrons*** Walker

1851. *Ledra latifrons* Walker, *List. Hom.*, **iii** : 824.

1962. *Petalocephala latifrons* Walker : Metcalf, *General Catalogue of Homp.*, **iv** : 74.

Material examined : "Sikkim"

General Diagnosis : Body greenish in colour; vertex about as long as breadth, finely punctate and distinctly central longitudinal area carinate; pronotum coarsely punctate and its lateral margins black; scutellum finely punctate; tegmina rusty brown in colour and claval area purplish brown.

Length 13.5 mm.

Distribution : India : "Sikkim", Assam, "Bengal", Maharashtra. *Elsewhere* : Sri Lanka, Sylhet.

Subfamily 4. EVACANTHINAE

Genus 11. ***Evacanthus*** Lep. & Serv.

1825. *Evacanthus* Lep. & Serv., *Enc. Meth,* **x** : 612.

Key to the species of *Evacanthus*

1(2) Scutellum black, but strongly transversely impressed before apical area; tegmina black, the costal and calval margin narrowly brownish yellow ..... *repexus*

2(1) Scutellum black, but not impressed before apical area; tegmina piceous, the costal and inner, sometimes whole claval margin pale yellow in colour ..... *extremus*

18. ***Evacanthus extremus*** (Walker)

1851. *Tettigonia extremus* Walker, *List. Hom.*, **iii** : 761.

1963. *Evacanthus extremus* Metcalf, *General Catalogue of Homp.*; **vi** : 25.

Material examined : 2 exs., Sikkim, Geyzing, West Sikkim., 7.xi.92, coll. *M.S. Shisodia.*

General Diagnosis : Head black; vertex with brownish ridge at central area; pronotum pale yellow, with a broad black fascia at central area and two black spots on lateral area; scutellum black; tegmina pitchy black in colour, inner, costal whole claval area pale yellow, apical area much paler; wings bronzy brown; legs brownish.

Length : 7.5.

Distribution : India : Sikkim (West Sikkim), Assam, Northern India, Punjab, West Bengal. *Elsewhere* : Pakistan.

19. ***Evacanthus repexus*** Distant

1908. *Eucanthus reprxus* Distant, *Fauna Brit. India, Rhynchota,* **4** : 228.

1963. *Evacanthus repexus* Distant : Metcalf, *General Catalogue of Homp., p.*, **vi** : 43.

Material examined : 8 exs., Sikkim; Tadong, 30.iv.92, coll. *S. R. Banerjee;* 4 exs., Chungthan, 15.iv.92, coll. *J. K. Prasad;* 4 exs., Geyzing, West Sikkim, 7.xi.92, coll. *M. S. Shisodia.*

General Diagnosis : Body black in colour; anterior and posterior margin of vertex brownish yellow, vertex with fine and distinct ridge, face smooth, with a distinct central longitudinal ridge, pronotum brownish yellow, finely and transversely striate; scutellum black, strongly transverse impressed before apical area; tegmina black, costal, inner claval margin pale yellowish in colour, finely punctate and upper surface pubescent; legs brownish, posterior tibiae longly spinulose.

Length : 7.5 mm.

Distribution : India : Sikkim (East Sikkim, West Sikkim), Himachal Pradesh, North Bengal, Punjab, Uttar Pradesh and West Bengal.

Family V. APHRODIDAE

Subfamily 5. APHRODINAE

Genus 12. *Gurawa* Distant

1908. *Gurawa* Distant, *Fauna Brit. India, Rhynchota,* **4** : 263.

Key to the species of *Gurawa*

1(2) Vertex reflexed; proximal region faintly wrinkled ..... *intermediatus*

2(1) Vertex not reflexed; proximal region strongly wrinkled ..... *vexillum*

20. *Gurawa intermediatus* Singh-Pruthi

1936. *Gurawa intermediatus* Singh Pruthi, *Mem. Ind. Mus.*, **xi** : 107-108.

1988. *Gurawa intermediatus* Singh-Pruthi : Datta, *Rec. zool. Surv. India,* Occ. Paper No. **90** : 73.

Material examined : 1 ex., Sikkim : Gangtok, East Sikkim, (Ind. Mus.), Z.S.I., Calcutta.

General Diagnosis : Body brownish in colour, stout; vertex reflexed at apex, and with black spot at middle; proximal region faintly wrinkled; pronotum coarsely regulose, scutellum brownish, rugulose; tegmina leather like with thick vein, cross vein between sector; legs brownish; abdomen brownish.

Length : 8.3 mm.

Distribution : India : Sikkim (East Sikkim), North Bengal.

21. *Guruwa vexillum* Distant

1908. *Guruwa vexillum* Distant, *Fauna Brit. India, Rhynchota,* **4** : 263.

1988. *Gurawa vexillum* Distant : Datta, *Rec. zool. Surv. India,* Occ. Paper. No. **90** : 75.

Material examined : 'Sikkim'

General Diagnosis : Body light brownish yellow in colour, vertex broad, flat, subtriangular, with a longitudinal central dark brown band extending from base to apex containing darker dots, at lateral margin two dark brown spots, face with minute black spots, ocelli dark brown; pronotum strongly wrinkled, with a series of transverse linear black spots at basal angle; scutellum near each basal angle with two dark brown spots, granulated; tegmina semi transparent, apical cells short; legs dark brown.

Length : 4.5 mm.

Distribution : India : Sikkim, Eastern Himalayas, Madras, South India.

Family V. HECALIDAE

Subfamily 6. HECALINAE

Genus 13. *Parabolocratus* Fieber

1866. *Parabolocratus* Fieber, *Zool. Bot. Gesellwien. Verhandl.*, **16** : 502.

*22. *Parabolocratus albomaculatus* (Distant)

1908. *Parabolocratus albomaculatus* (Distant), *Fauna Brit. India, Rhynchota,* **4** : 280.

1988. *Parabolocratus albomaculatus* Distant : *Datta, Rec. zool. Surv. India,* Occ. Paper No. **90** : 82

1998. *Parabolocratus albomaculatus* Distant : M. Ghosh & L. K. Ghosh, *State Fauna Series* **4**, *Fauna of Meghalaya* **4** : 15.

Material examined : 2 exs., Sikkim; 1 ex., Tadong, East Sikkim, 11.9.1993, coll. *S.K.Saha;* 1 ex., Rongpo, East Sikkim, 11.ix.1993, coll. *S. K. Saha.*

General Diagnosis : Body greenish yellow; vertex smooth, lateral and apical margin strongly reflexed; pronotum with finely transversely striate; scutellum with two darker spots at each basal area; tegmina greenish, apical area brownish with white spots; legs brownish; abdomen black.

Length : 5 mm.

Distribution : India : Sikkim (East Sikkim), Meghalaya, Orissa, Tamil Nadu, West Bengal. *Elsewhere* : Belgian Congo, Luzon, Philippine Islands, Sri Lanka.

Subfamily 7. DELTOCEPHALINAE

Key to genera of the subfamily DELTOCEPHALINAE

1(2) Vertex as long as broad, pointed or obtusely, angularly produced 3

2(1) Vertex shorter than long, not as above 5

3(4) Pronotum wider than long at base; face symmetrically hexagonal ... ***Deltocephalus***

4(3) Pronotum about half as long as broad at base; face very long ..... ***Dio***

5(6) Head shorter than pronotum; pronotum with striped or wrinkled 7

6(5) Head wider than pronotum; pronotum without carina or striation 11

7(8) Tegmina usually punctate; clypeus rectriangular at base somewhat narrower ..... ***Goniagnathus***

8(7) Tegmina usually not punctate, rather hyaline; clypeus not as above 9

9(10) Clypeus quadrangular, broadest at base, extending beyond the margin of cheek; vertex without such fasciae .... ***Nephotettix***

10(9) Clypeus almost parallel, rounded at tip, one and half times longer than broad at base; vertex with of some obscure longitudinal orange-red fasciae .... ***Thomsoniella***

11(12) Wings with two anteapical cells .... ***Balclutha***

12(11) Wings with three anteapical cells 13

13(14) Vertex with a black curved transverse fascia between eyes; apices of tegmina rectriangular ..... ***Exitianus***

14(13) Vertex without such fascia; apices of tegmina rectangular ..... ***Cicadula***

Genus 14. ***Balclutha*** Kirkaldy

1901. *Balclutha* Kirkaldy, *Entomologist.*, **34** : 338.

23. ***Balclutha indica*** (Pruthi)

1930. *Eugnathodus indica* Pruthi, *Mem. Ind. Mus.*, **xi** : 48-49.

1967. *Balclutha indica* Pruthi : Metcalf, *General Catalogue of Homp.*, **x** : 2407.

Material examined : 5 exs., Sikkim : Gangtok, East Sikkim.

General Diagnosis : Body pale yellow in colour; vertex very short, one fourth as long as pronotum, sulcate medially;semicircular apical; pronotum wider posteriorly, dull in colour; scutellum also dull coloured, later impressed medially; tegmina hyaline; abdomen dorsally black.

Length : 4 mm.

Distribution : India : Sikkim (East Sikkim), Madras, Madhya Pradesh, Punjab.

Genus 15. ***Cicadula*** Zetterstedt

1840. *Cicadula* Zetterstedt, *Insecta Lappionica*, **1** : 296.

24. ***Cicadula maculata*** Singh-Pruthi

1930. *Cicadula maculata* Singh-Pruthi, *Mem. Indian Mus.*, **11** : 58.

1988. *Cicadula maculata* Singh-Pruthi; Datta, *Rec. zool. Surv. India.* Occ. Paper No. **90** : 108.

1998. *Cicadula maculata* Singh-Pruthi : M. Ghosh and L. K. Ghosh, *State Fauna Series*, **4**, Fauna of Meghalaya **4** : 16.

Material examined : 1 ex., Sikkim : Gangtok, East Sikkim, coll. *H.S.P.*

General Diagnosis : Body grey in colour; vertex with two black spots at apex; a black patch at the base of antennae; pronotum with piceous patches at anterior portion; scutellum with black spot at basal angle; tegmina pale brown in colour; wings dark-grey in colour; abdomen dark-brown.

Length : 3.5 mm.

Distribution : India : Sikkim (East Sikkim), Meghalaya, West Bengal.

Genus 16. ***Deltocephalus*** Burmeister

1838. *Deltocephalus* Burmeister, *Genera Insectorum*, **1** : 15.

25. ***Deltocephalus nigrifacialis*** Distant

1918. *Deltocephalus nigrifacialis* Distant, *Fauna Brit. India, Rhynchota*, **7** : 81.

1988. *Deltocephalus nigrifacialis* Distant : Datta, *Rec. zool. Surv. India*, Occ. Paper No. **90**.

Material examined : 2 exs., Sikkim; Gangtok; East Sikkim.

General Diagnosis : Body pale brownish yellow in colour; vertex with two pairs of large pale brownish spots, one pair of spots between eyes, another pair on central area, two pairs connecting with a greyish apical marginal fascia; pronotum with four longitudinal brownish fascia; face with three black spots and black striation. scutellum with a black spot at each basal angle and a similar spot at apex; tegmina pale brownish, with dark spots before apical margin, the apical area distinctly with darker spots, apical area greyish; legs brownish yellow, tibiae finely spotted; abdomen brownish.

Length : 4 mm.

Distribution : India : Sikkim (East Sikkim), North Bengal.

Genus 17. ***Dio*** Distant

1918. *Dio* Distant, *Fauna Brit. India, Rhynchota*, **7** : 56.

*26. ***Dio facialis*** Distant

1918. *Dio facialis* Distant, *Fauna Brit. India, Rhynchota*, **7** : 56.

1988. *Dio facialis* Distant; Datta, *Rec. zool. Surv. India*, Occ. Paper No. **90** : 125.

1998. *Dio facialis;* M. Ghosh & L. K. Ghosh, *State Fauna Series*, **4**, Fauna of Meghalaya **4** : 17.

Material examined : 1 ex., "Sikkim"

General Diagnosis : Body pale greenish yellow; vertex subtriangulate, with many black small spots extending up to the base of pronotum; face with very small black spots on upper side and lateral side with black striation, scutellum multilated; tegmina greenish yellow with dark marking, at costal area a bluish oblong spot; legs greenish yellow, abdomen piceous.

Length : 2.5 mm.

Distribution : India : "Sikkim", Eastern Himalaya, Meghalaya.

Genus 18. ***Exitianus*** Ball

1929. *Exitianus* Ball, *Trans. Amer. Ent. Soc.*, **53** : 5.

Key to species of genus *Exitianus*

1(2) Vertex with an arcuated transverse black fascia between the eyes 3

2(1) Vertex without an arcuated transverse black fascia between the eyes ..... ***nanus***

3(4) Scutellum with two small central oblique black linear spots on disk ..... ***atkinsoni***

4(3) Scutellum without such central oblique black linear spots on disk ..... ***indicus***

27. ***Exitianus atkinsoni*** (Distant)

1908. *Athysanus* Distant, *Fauna Brit. India, Rhynchota*, **4** : 345.

1967. *Exitianus indicus* Metcalf, *General Catalogue of Homp.*, **x** : 308.

1994. *Exitianus indicus* : M. Ghosh & L. K. Ghosh, *State Fauna Series*, **3** *Fauna of West Bengal*, **5** : 41.

Material examined : 5 exs., Sikkim; Rongpo, 23.9.1993; coll. *S. K. Saha.*

General Diagnosis : Body brownish yellow, vertex with two black spots at apical margin; pronotum greyish in colour, with a series of linear transverse black spots; scutellum brownish yellow, with a large subtriangular black spot at each basal angle and two small central oblique black linear spots at disk; a transverse impression before apical area; tegmina subhyaline, its vein darker; legs pale brownish yellow; abdomen fuscous.

Length : 5 mm.

Distribution : India : Sikkim (East Sikkim), "Bengal", Bihar, Madras, Uttar Pradesh, West Bengal. *Elsewhere* : Luzon, Philippine Islands.

28. ***Exitianus indicus*** (Distant)

1908. *Athysanus indicus* Distant, *Fauna Brit. India, Rhynchota,* **4** : 344.

1994. *Exitianus indicus* (Distant) : M. Ghosh & L. K. Ghosh, *State Fauna Series* **3** *Fauna of West Bengal,* **5** : 42.

Material examined : 8 exs., Sikkim : Geyzing, 7.ix.1992, coll. *M. S. Shisodia.*

General Diagnosis : Body brownish yellow; vertex with a transverse black fascia and at base with a distinct longitudinal line; pronotum, at anterior margin more or less distinct piceous spots, base with transverse brown striae at lateral area; scutellum brownish yellow, with a black spot at each basal angle; tegmina greyish, subhyaline its veins brownish; legs with brownish streaks; abdomen pale brown.

Length : 4.5 mm.

Distribution : India : Sikkim (West Sikkim), Madras, Meghalaya, Orissa, Punjab, Uttar Pradesh, West Bengal. *Elsewhere* : China, Formosa.

29. ***Exitianus nanus*** (Distant)

1908. *Athysanus nanus* Distant, *Fauna Brit. India, Rhynchota,* **4** : 345.

1988. *Exitianus nanus* (Distant) : B. Datta, *Rec. zool. Surv. India,* Occ. Paper No. **90** : 69.

1998. *Exitianus nanus* (Distant) : M.Ghosh & L. K. Ghosh, *State Fauna Series,* **4,** *Fauna of Meghalaya* **4** : 18.

Material examined : 3 exs., Sikkim, Rongpo, 23.ix.1993, coll. *S. K. Saha.*

General Diagnosis : Body pale brownish yellow, a slender piceous line at vertex, at base with a longitudinal pronotum greyish, on each of its anterior margin two piceous spots; scutellum brownish; on each basal side a rounded black spot; tegmina subhyaline, its vein brownish yellow, at intermediate coxae a piceous spot present; abdomen pale brownish.

Length : 4.5 mm.

Distribution : India : Sikkim (East Sikkim), Bihar, Meghalaya, Orissa, Punjab, Himachal Pradesh, Tamil Nadu, West Bengal. *Elsewhere* : China, Formosa, Nepal, Philippines.

Genus 19. ***Goniagnathus*** Fieb.

1866. *Goniagnathus* Fieb, *Vesh. c-b. Ges. Wiem.,* **16** : 506.

30. ***Goniagnathus punctifer*** (Walker)

1858. *Bythoscopus punctifer* Walker, *Insecta Saundersiana* : 108.

1988. *Goniagnathus punctifer* Walker : Datta, *Rec. zool. Surv. India,* Occ. Paper No. **90** : 130.

1998. *Goniagathus punctifer* Walker : M. Ghosh & L. K. Ghosh, *State Fauna Series,* **4,** *Fauna of Meghalaya* **4** : 19.

Material examined : 1 ex., Sikkim, Rongpo, 15.ix.1993, coll. *S. K. Saha;* 2 exs., 22.ix.1993, coll. *S. K. Saha.*

General Diagnosis : Body brownish yellow, some dark brown spots on vertex; face with transversely fine striation interrupted by a longitudinal strip; pronotum finely transversely striate, anterior margin smooth; tegmina brownish yellow, vein and costal margin dark with fuscous spots; wing smoky, with a grey white streak at radial area; legs castaneous brown, with piceous fascia; abdomen black.

Length : 6 mm.

Distribution : India : Sikkim (East Sikkim), Bihar, Maharashtra, Meghalaya, Uttar Pradesh,

West Bengal. *Elsewhere* : Burma, Maldive, Malagasy, Sri Lanka.

Genus 20. ***Nephotettix*** Matsumura

1902. *Nephotettix* Matsumura, *Term Fuzetek.*, **25** : 356.

Key to the species of *Nephotettix*

Head shorter and obtusely rounded, anteriorly within the margin impressed; tegmina with a black spot before middle extending to the claval suture .... *nigropicta*

– Head not short and not obtusely rounded, and anteriorly within the margin not impressed; tegmina with a black spot before middle not extending to claval suture .... *virescence*

31. ***Nephotettix nigropicta*** (Stal)

1870. *Thamnotettix nigropicta* Stål, *Ofv. -vet. A K. Forh* : 74.

1908. *Nephotettix apicalis* Distant, *Fauna Brit. India, Rhynchota,* **4** : 360.

1971. *Nephotettix nigropicta* : Ghauri, *Bull. ent. Res.*, **60**(3) : 481-572.

1998. *Nephotettix nigropicta* : M. Ghosh & L. K. Ghosh, *State Fauna series,* **4**, *Fauna of Meghalaya* **4** : 20.

Material examined : 2 exs., Sikkim, Dikchu, 9.9.1993. Coll. *S. K. Saha.*

General Diagnosis : Body yellow-greenish in colour; smooth and shining; vertex with a black line between the eyes, pronotum and anterior margin with a black line; tegmina greenish yellow, commissural margin of clavus black, a black spot before the middle extending to the claval suture and there acutely produced; legs black; posterior tibiae spinule with black spots; abdomen black.

Length : 4.5 mm.

Distribution : India : Sikkim, Bihar, Meghalaya, Orissa, Punjab, West Bengal. *Elsewhere* : East Africa, Philippines, Sri Lanka.

32. ***Nephotettix virescens*** (Fabricius)

1803. *Nephotettix bipunctatus* Fabricius, *Syst. Rhyn.* : 78.

1971. *Nephotettix virescens* (Fabricious) : Ghauri, *Bull. Ent. Res.*, **60** : 481-512

1998. *Nephotettix virescens* (Fabricious) : M. Ghosh & L.K. Ghosh, *State Fauna Series* **4**, *Fauna of Meghalaya,* **4** : 20.

Material examined : 2exs., Sikkim. Dikchu; 9.ix.93, coll. *S. K. Saha.*

General Diagnosis : Body greenish yellow in colour, shining and smooth; face with lateral transverse darker line and a black spot on each side of clypeus; tegmina with a black spot before the middle and apical two-fifth black; in female specimen usually without discal spot at tegmina and face; legs black; abdomen black.

Length : 4.5 mm.

Distribution : *India* : Sikkim, Bihar, Meghalaya, Orissa, Tripura, West Bengal. *Elsewhere* : Ethiopian region, Indonesia, Japan, Korea, Malayasia Nepal.

Genus 21. ***Thomsoniella*** Signoret

1879. *Thomsoniella* Signoret, *Ann. Soc. Ent. de France* **9**(5) : 51.

33. ***Thomoniella porrecta*** Signoret

1858. *Accocephalus porrecta* Walker, *List. Hom. Suppl.* : 262.

1988. *Thomsoniella porrecta* Datta, *Rec. zool. Surv. India* Occ. Paper **90** : 158.

1998. *Thomsoniella porrecta*; M. Ghosh & L. K. Ghosh, *State Fauna Series* **4**, *Fauna of Meghalaya,* **4** : 21.

Material examined : 3 exs., Sikkim, Rongpo, East Sikkim, 23.ix.1993, coll. *S. K. Ghosh.*

General Diagnosis : Body pale greenish in colour, vertex with four longitudinal orange fascia and its anterior margin blackish, pronotum with six orange longitudinal and scutellum with three orange – red fascia; tegmina pale greenish, with a small spot at the apex; claval and its apical area black; legs pale brownish; abdomen also pale brownish.

Length : 5.5 mm.

Distribution : India : Sikkim (East Sikkim), Bihar, Meghalaya, Orissa, Punjab, Tripura.

Elsewhere : Burma, Formosa, Maldive, Philippines Islands, Queensland.

Family VIII. AGALLIDAE

Subfamily 8. AGALLINAE

Genus 22. ***Nehala*** White

1878. *Nehala* White, *Proc. Zool. Soc.*, : 473.

34. ***Nehala montana*** (Distant)

1912. *Agallia montana* Distant, *A. M. N. H. (8)* **x**, : 607.

1966. *Nehala montana* Metcalf, *General Catalogue of Homoptera,* **xiv** : 145.

Material examined : 1 ex., Sikkim, Yumthang; North Sikkim, 7.8.1987, coll. *S. Chatterjee.*

General Diagnosis : Body brownish yellow; two longitudinal black spots at the central area of vertex a small black spot between them and small black spot near inner margin of eyes; pronotum with two large black fascia on each lateral area of anterior margin; scutellum black; front with a black longitudinal line; the whole clypeus with irregular black spots; tegmina subhyaline, legs brownish yellow; abdomen also brownish yellow.

Length : 5.5 mm.

Distribution : India : Sikkim (North Sikkim), Punjab, Himachal Pradesh.

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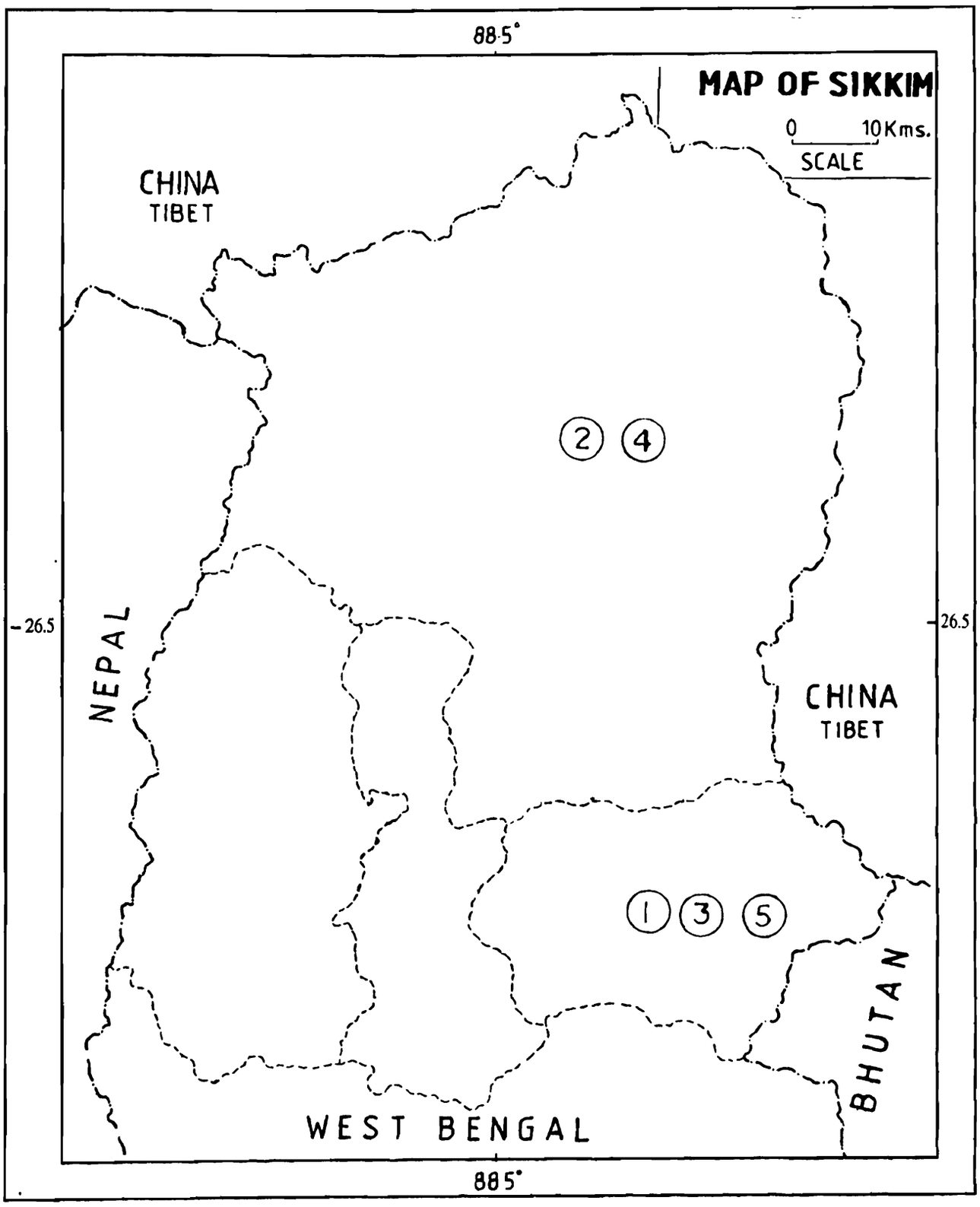
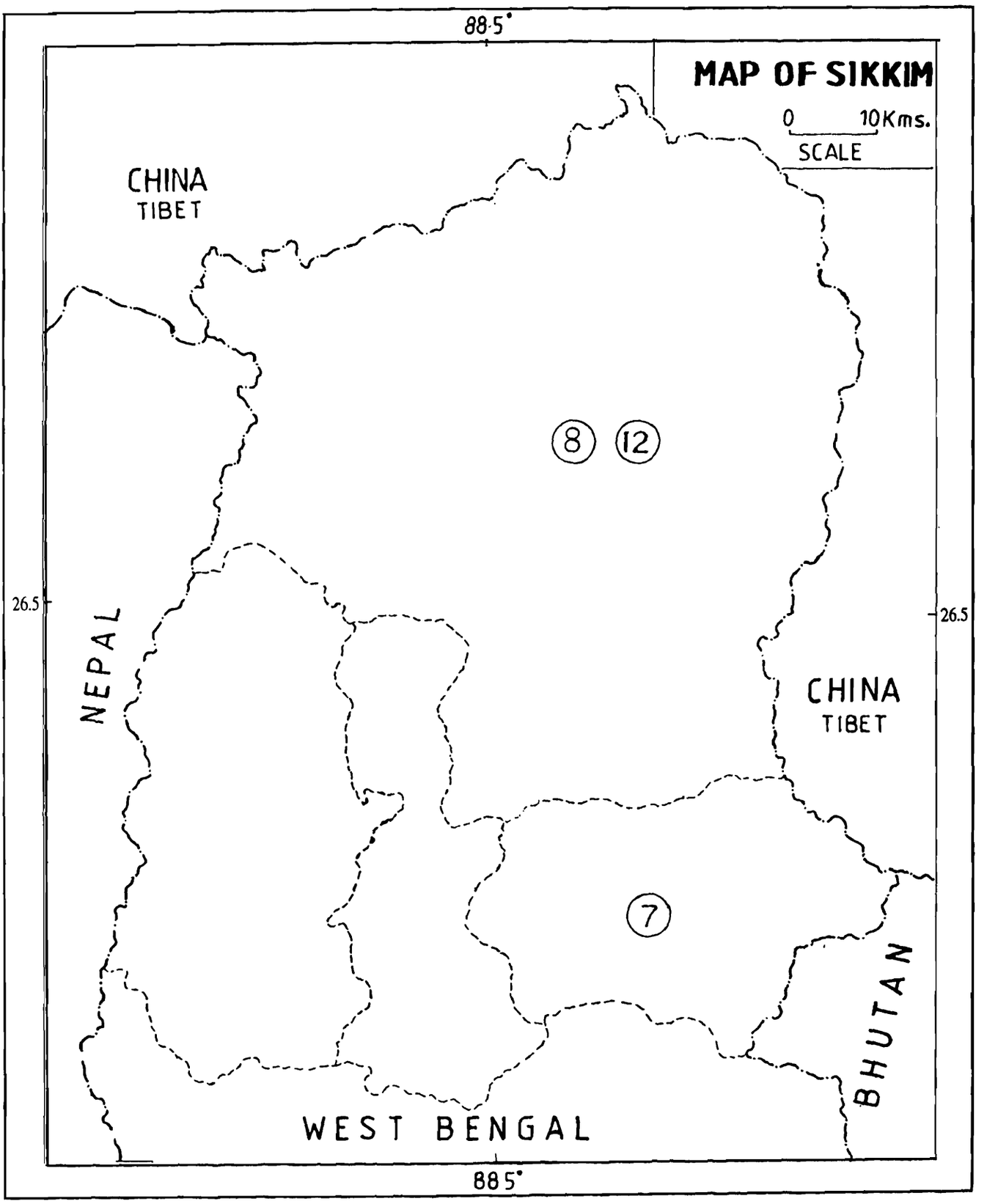
Map 1. Showing the distribution of Cicadellid species in Sikkim



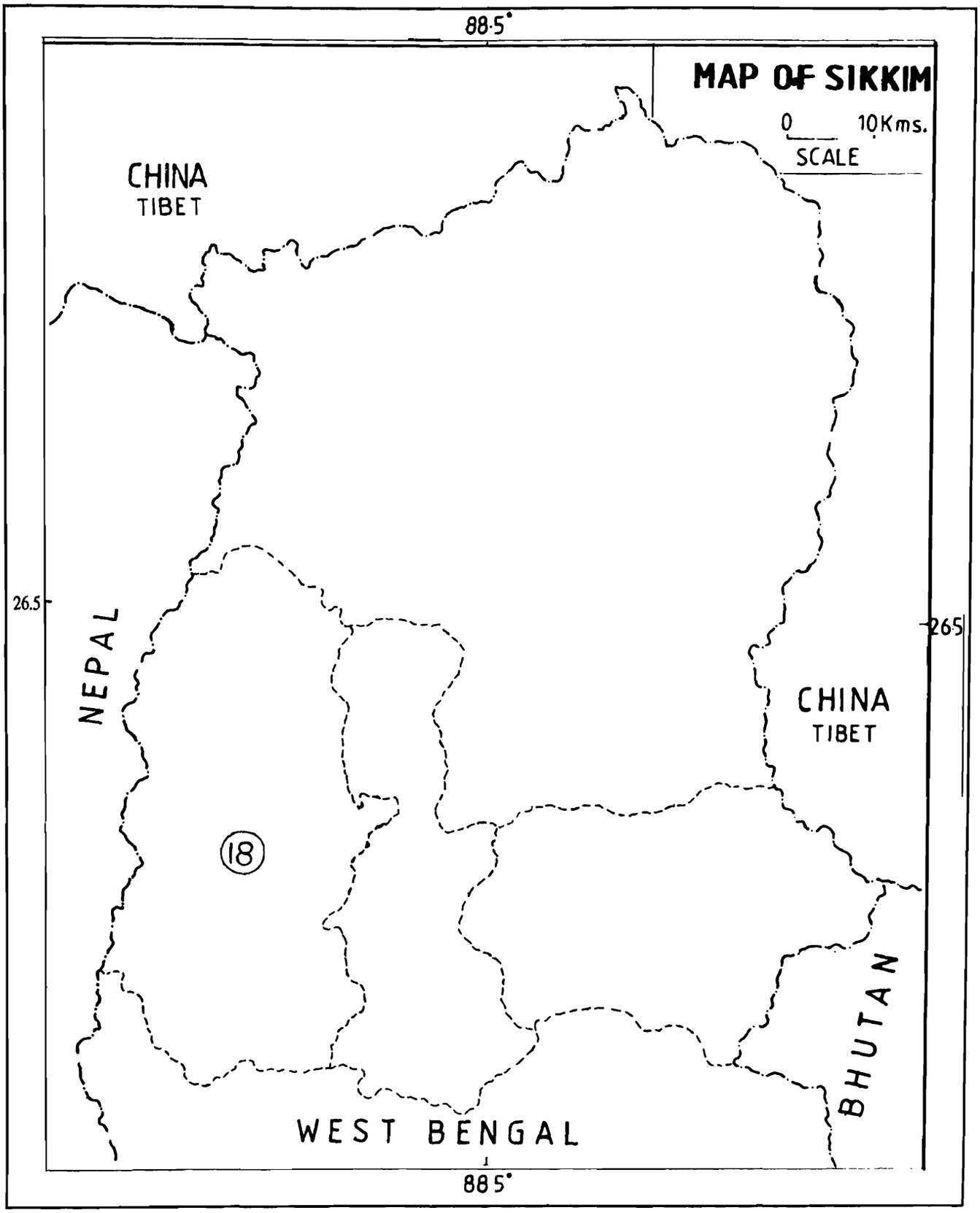
1. *Bothrogonia ferruginea* (Fabricius)
2. *Cicadella spectra* (Distant)
3. *Cofana mimica* (Distant)
4. *Kolla canida* Distant
5. *Kolla maculifrons* Schmidt
6. * *Kolla mungphuensis* Distant

Map 2. Showing the distribution of Cicadellid species in Sikkim



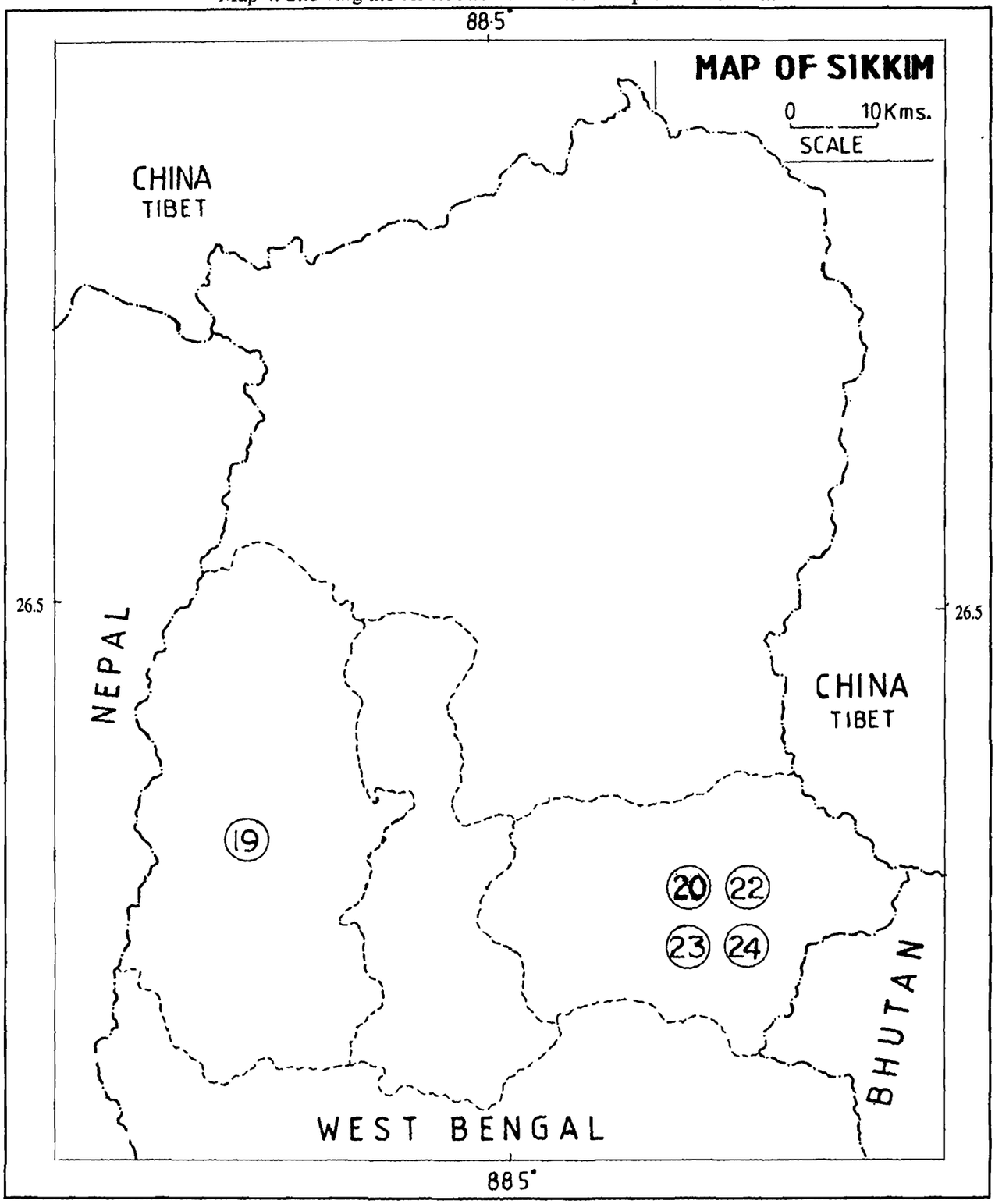
7. *Kolla opponens* Walker
8. *Soibanga bella* Walker
9. * *Tettigella rubromaculata* (Signoret)
10. **Tettigella sikkimensis* Distant
11. **Penthimia maculosa* Distant
12. *Ledra dorsalis* Walker

Map 3. Showing the distribution of Cicadellid species in Sikkim



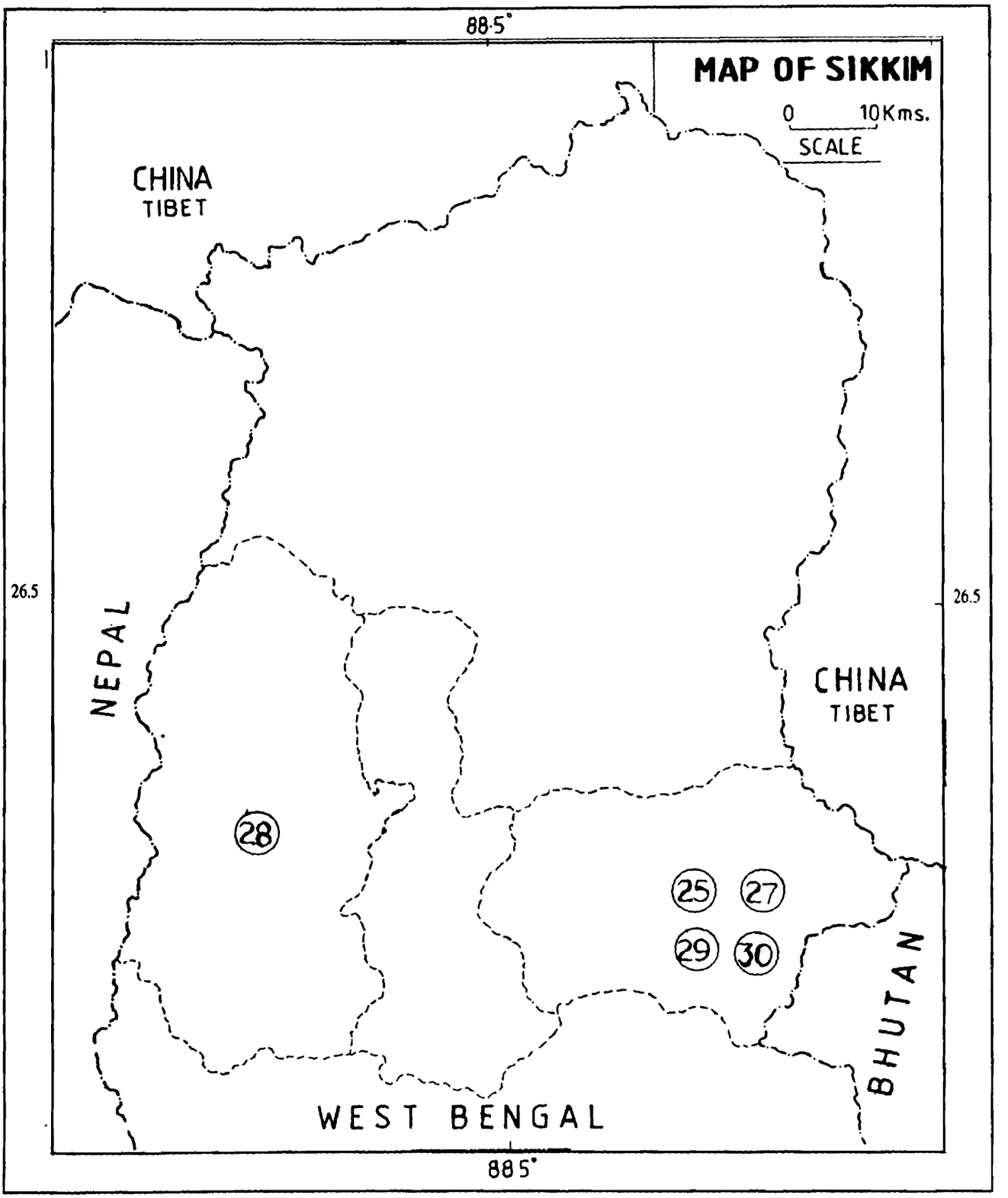
13. * *Ledropsis obligens* Walker
14. * *Petalocephala cultellifera* Walker
15. * *Petalocephala hearsayi* Distant
16. * *Petalocephala insignis* Distant
17 * *Petalocephala latifrons* Walker
18. *Evacanthus extremus* Walker

Map 4. Showing the distribution of Cicadellid species in Sikkim



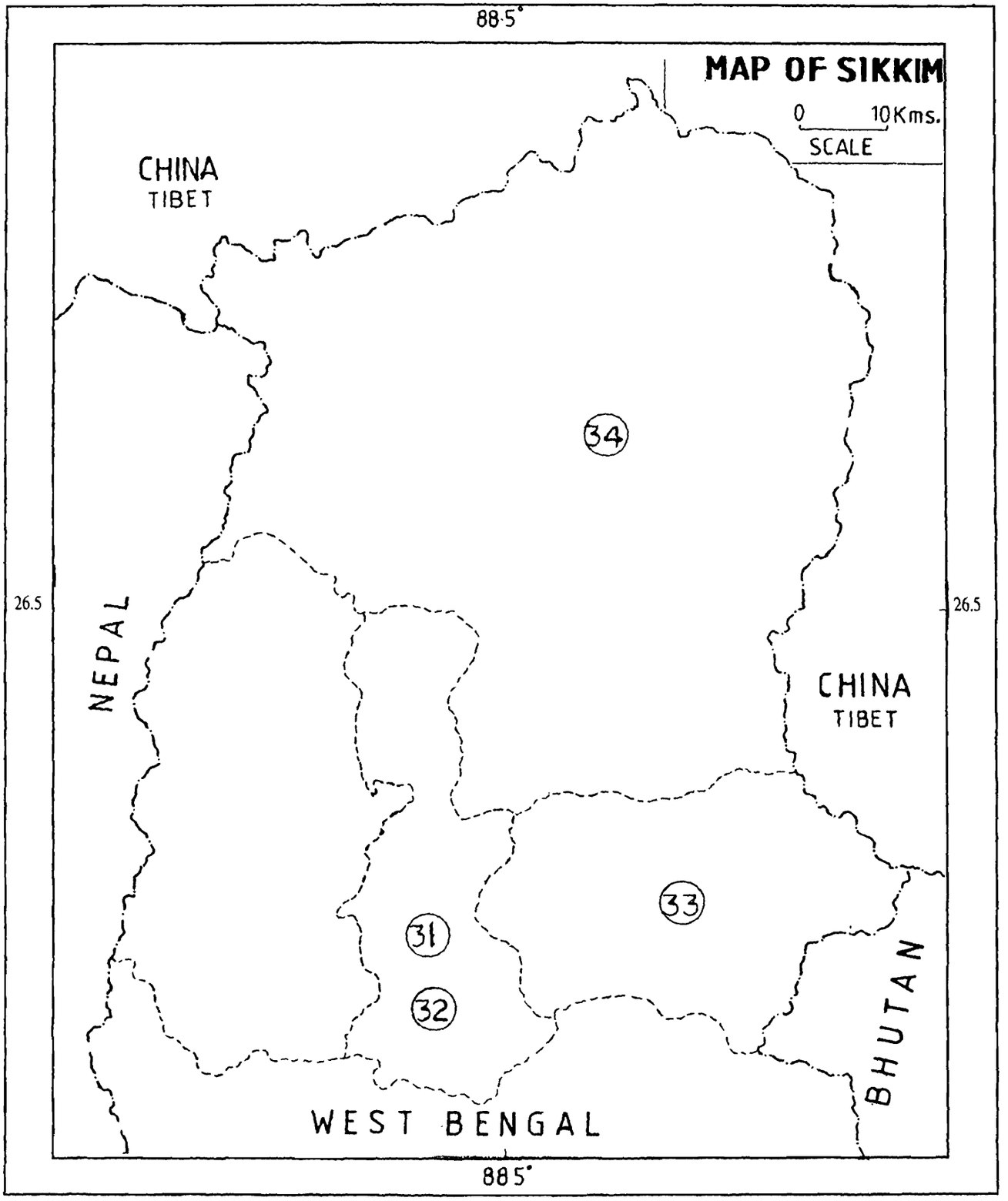
19. * *Evacanthus repexus* Distant
20. *Gurawa Intermediatus* Singh-Pruthi
21. * *Gurawa vexillum* Distant
22. *Parabolocratus albomaculatus* (Distant)
23. *Balclutha indica* Melich
24. *Cicadula maculata* Pruthi

Map 5. Showing the distribution of Cicadellid species in Sikkim



25. *Deltocephalus nigrifacialis* Distant
26. * *Dio facialis* Distant
27. *Exitianus atkinsoni* (Distant)
28. *Exitianus indicus* (Distant)
29. *Exitianus nanus* (Distant)
30. *Goniagnathus punctifer* Walker

Map 6. Showing the distribution of Cicadellid species in Sikkim



31. *Nephotettix nigropicta* Stal
32. *Nephotettix virescens* (Fabricius)
33. *Thomsoniella porrecta* Walker
34. *Nehela montana* (Distant)

Districtwise distribution of Cicadellid fauna of Sikkim

	Name of the species	East Sikkim	West Sikkim	North Sikkim
1.	*Bothrogonia ferruginea* (Fabricius)	+	–	–
2.	*Cicadella spectra* (Distant)	–	–	+
3.	*Cofana mimica* (Distant)	+	–	–
4.	*Kolla canida* Distant	–	–	+
5.	*Kolla maculifrons* Schimidt	+	–	–
6.	*Kolla mungphuensis* * Distant	–	–	–
7.	*Kolla opponens* Walker	+	–	–
8.	*Soibanga bella* Walker	–	–	+
9.	*Tettigella rubromaculata* * Signoret	–	–	–
10.	*Tettigella sikkimensis* * Distant	–	–	–
11.	*Penthimia maculosa* * Distant	–	–	–
12.	*Ledra dorsalis* * Walker	–	–	+
13.	*Ledropsis obligens* * Walker	–	–	–
14.	*Petalocephala cultellifera* * Walker	–	–	–
15.	*Petalocephala hearsayi* * Distant	–	–	–
16.	*Petalocephala insignis* * Distant	–	–	–
17.	*Petalocephala latifrons* * Walker	–	–	–
18.	*Evacanthus extremus* Walker	–	+	–
19.	*Evacanthus repexus* Distant	–	+	–
20.	*Gurawa intermediatus* Singh-Pruthi	+	–	–
21.	*Gurawa vexillum* Distant			
22.	*Parabolocratus albomaculatus* (Distant)	+	–	–
23.	*Balclutha indica* Melich.	+	–	–
24.	*Cicadula maculata* Pruthi	+	–	–
25.	*Deltocephalus nigrifacialis* Distant	+	–	–
26.	*Dio facialis* Distant *	–	–	–
27.	*Exitianus atkinsoni* (Distant)	+	–	–
28.	*E. indicus* (Distant)	–	+	–
29.	*E. nanus* (Distant)	+	–	–
30.	*Goniagnathus punctifer* Walker	+	–	–
31.	*Nephotettix nigropicta* Stal	–	–	+
32.	*N. virescens* (Fabricius)	–	–	+
33.	*Thomsoniella porrecta* Walker	+	–	–
34.	*Nehela montana* (Distant)	–	–	+

* Exact locality not known.

Zool. Surv. India
State Fauna Series 9, Fauna of Sikkim (Part 2), 463-475, 2003

INSECTA : HOMOPTERA : CICADOIDEA

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INTRODUCTION

The Cicadids are the homopteran insects. The Cicada's "Song" (Buzzing sound) is usually heard in forest. It is clearly of sexual nature. The group exhibits a remarkable variety in form, colouration and habits. It reaches its highest development in tropical and warm temperate regions. The group is represented by about 1162 species belonging to 131 genera in the world (Metcalf 1963). Of these, about 206 species are known to occur in oriental region. A perusal of literature reveals that nearly 150 species are so far known from the Indian subregion [Distant 1889, 1890, 1891, 1892, Kato 1932, Mathur 1953, Paiva, 1917 Sen *et al.* 1998].

Our knowledge on Cicadid fauna of Sikkim is scanty. Compilation of available data reveals that only 18 species belonging to 11 genera are so far known from the State of Sikkim (Distant 1889-92, 1916, Mathur 1953). The present work is an attempt to provide a comprehensive account of 20 species belonging to 12 genera in 2 subfamilies and 3 families of Cicadoidea from the State of Sikkim. Of these, 2 species (marked *) in 2 genera are new records from the state. The account deals with keys to various texa, diagnosis and geographical distribution of each species and literature references. The distribution of the species are indicated in the Map (1-4). Charts showing the districtwise distribution of 20 species from Sikkim have also been included in this paper.

The work is based on the recent collections made by different party members and also on the old collections represented in Zoological Survey of India.

CLASSIFIED LIST OF SPECIES

Superfamily CICADOIDEA
Family CICADIDAE
Subfamily GAEANINAE
Genus 1. ***Gaeana*** Amyot and Serville

1. *Gaeana festiva* Fabr.
2. *G. maculata* Drury
3. *G. sulphurea* (Hope)

Genus 2. ***Balinta*** Distant

4. *Balinta octonotata* Westwood

Genus 3. ***Platylomia*** Stal

5. *Platylomia radha* Distant
6. *P. saturata* Walker
7. *P. similis* (Distant)
8. *P. umbrata* (Distant)

Subfamily II. TIBICENINAE
Genus 4. ***Dundubia*** Amyot and Serville

*9. *Dundubia intermerata* Walker
10. *D. manifera* Linnaeus

Genus 5. ***Graptotettix*** Stål

11. *Graptotettix guttatus* Stål

Genus 6. ***Haphsa*** Distant

12. *Haphsa nicomache* Walker

Genus 7. ***Huechys*** Amyot and Serville

13. *Huechys sanguinea* (De Geer)

Genus 8. ***Mogannia*** Amy. & Serv.

14. *Mogannia obliqua* Walk.

Genus 9. ***Oncotympana*** Stal

15. *Oncotympana expansa* (Walk.)

Genus 10. ***Scieroptera*** Stal

16. *Scieroptera splendidula* Fabr.

Genus 11. ***Euterpnosia*** Distant

*17.*Euterpnosia crowfooti* (Distant)

Genus 12. ***Tosena*** Amyot & Serville

18. *Tosena dives* Westwood

19. *T. mearesiana* Westwood

20. *T. melanoptera* (Kirkadly)

GENERAL DIAGNOSIS

Three ocelli present; antennae short, inserted close to the eyes, seven-segmented. Head short, broad and transverse, terminating beneath in an elongated rostrum; mesonotum very large and terminates behind in a small basal cruciform elevation. Abdomen six-segmented and with an anal segmental appendage. Anterior femora incrassated and more or less spinose beneath. Tegmina usually hyaline, sometimes opaque, venation usually distinct and furcate in ramification and sometimes reticulate.

Key to the Subfamilies

1(2) Tympanal coverings being always present, tympana more or less incompletely exposed ..... GAEANINAE

2(1) Tympanal covering being entirely absent, tympana are completely exposed .... TIBICININAE

Subfamily I. GAEANINAE

Key to genera of Subfamily GAEANINAE

1(2) Head (including eyes) wider than base of mesonotum, lateral margin distinctly strongly and generally acutely toothed..... ..... *Platylomia*

2(1) Head (including eyes) about equal in width to base of mesonotum, lateral margin of pronotum not acutely produced 3

3(4) Head obliquely depressed in front of eyes ..... *Balinta*

4(3) Head somewhat porrectly produced in front of eyes ..... *Gaeana.*

Genus 1. ***Gaeana*** Amyot and Serville

1843. *Gaeana* Amyot & Serville, *Hem.* : 463.

Key to species of the genus *Gaeana*

1(2) Pronotum with a distinct central longitudinal fascia. Head with a broad reddish fascia behind eyes ..... *festiva*

2(1) Pronotum without distinct central longitudinal fascia but with a transverse series of linear spots. Head without fascia but with discal spots behind the eyes 3

3(4) Tegmina greyish brown towards apex, with five ochraceous spots in two transverse series, two near base and three near at centre ..... *maculata*

4(3) Tegmina not greyish, sulphur yellow, without spots, presence of angulated fascia crossing near middle and the whole apical area ..... *sulphurea*

1. ***Gaeana festiva*** (Fabricius)

1808. *Tettigonia festiva* Fabricius, *Syst. Rhyng.*, : 41.

1963. *Gaeana festiva* Fabricius, *General Catalogue of Homp.*, **viii** : 595.

Material examined : 10 exs., Sikkim, Ranjit valley, East Sikkim, v.1911, F. Hamington.

General Diagnosis : Body robust, black; head behind the eyes with a broad reddish fascia; and reddish spot on apical half of face; pronotum with four discal fasciae, one distinct pale longitudinal at central place, other angulated; tegmina greenish in colour, with a transverse fascia crossing from apex of radial cell and three irregular and angulated greenish spots at apex, and outer and inner margin with a small subapical spot; legs black; wings pale bluish green, with pale bluish spot.

Length : 26 mm.

Distribution : India : Sikkim (East Sikkim).

2. ***Gaeana maculata*** (Drury)

1773. *Cicada maculata* Drury, *Ins., ii* : 68.

1963. *Gaeana maculata* Metcalf, *General Catalogue Homp., viii* Part I : 590.

1998. *Gaeana maculata* Metcalf; Sen, G.C., Ghosh, M. and Ghosh, L.K., *State Fauna Series* 4, *Fauna of Meghalaya,* 4 : 274.

Material examined : 4 exs., : India : Sikkim, Ranjit valley, East Sikkim, v.1911, F. Hamington.

General Diagnosis : Body robust, black in colour, with a black spot between eyes and ocelli of head; and a black spot on each side of face; mesonotum with four discal black spots, a spot on each lateral margin and a spot on each side of cruciform elevation; tegmina black, greyish brown towards apex; tegmina with five brownish spots in transverse series, two spots near base and three at centre; wings black, with two continuous, brown spots near costal margin. Legs black, a small brown spot near posterior coxae; abdomen brownish.

Length : 35 mm.

Distribution : India : Sikkim (East Sikkim), Assam, Meghalaya, Nagaland. *Elsewhere* : China, Dhansiri valley, Marennea, Samagooting, Tonkin.

3. ***Gaeana sulphurea*** (Hope)

1839. *Cicada sulphuria* Hope, *Royle's Illustr. Bot. Himal, Introd.,* x.

1963. *Gaeana sulphurea,* Metcalf, *General Catalogue of Homp.*: viii : 600.

Material examined : 2 exs., Sikkim, Ranjit Valley, East Sikkim; v.1911, F. Hamington.

General Diagnosis : Body robust; reddish brown in colour, lateral margin of vertex reaching beyond the inner margin of eyes; pronotum with two brownish oblique spots on each side; mesonotum with four transverse linear brownish spots; tegmina sulphur yellow in colour, with a reddish fascia crossing middle; costal membrane yellow in colour, wings reddish brown, legs black; abdomen brownish yellow.

Length : 36 mm.

Distribution : India : Sikkim (East Sikkim), Uttar Pradesh, West Bengal. *Elsewhere* : Nepal.

Genus 2. ***Balinta*** Distant

1905. *Balinta* Distant, *A.M.N.H.* (7) xv : 383.

4. ***Balinta octonotata*** (Westwood)

1842. *Cicada octonotata* Westwood, *Arc. Ent., ii* : 34.

1963. *Balinta octonotata* (Westwood) : Metcalf *General Catalogue of Homp.,* viii : 603.

Material examined : 1 ex., Sikkim, Badamtam, Ranjit Valley, East Sikkim; v. 1911; F. Hamington.

General Diagnosis : Body black in colour, vertex and front of head dark brown in colour; pronotum with two basal transverse dark brownish yellow colour spots, and two central angulated brownish fascia connected to the mesonotum with cruciform elevation; tegmina dark reddish in colour and shining, its costal membrane and venation brownish, tegmina with four pale creamy spots, one at base, two at central and two at costal area; wings blood-red; legs black, abdomen reddish brown, with central black longitudinal fascia.

Length : 26 mm.

Distribution : India : Sikkim (East Sikkim), Assam, Margherita. *Elsewhere* : Burma.

Genus 3. ***Platylomia*** Stal

1870. *Platylomia* Stal, *Ofv. vet. A. K. Forth* : 708.

Key to the species of the genus *Platylomia*

1(2) Opercula in male reaching penulimate abdominal segment ..... *similis*

2(1) Opercula in male not reaching penulimate abdominal segment 3

3(4) Opercula with their apices obtusely angulate a central olivaceous fascia present between face and eyes ..... *umbrata*

4(3) Opercula with their apices not angulate; narrowed directly onward; without a central fascia between face and eyes 5

5(6) Tegmina spotted mesonotum with a central longitudinal black fascia connected with two anterior fused spots ..... *saturata*

6(5) Tegmina unspotted; mesonotum without fascia, with two black margined obconical spots ..... *radha*

5. ***Platylomia radha*** (Distant)

1881. *Dundubia radha* Distant, *Tr. E.S.* : **634.**

1998. *Platylomia radha* Distant : *State Fauna Series* **4**, *Fauna of Meghalaya* **4** : 274.

Material examined : 3 exs., Sikkim : Naga, N. Sikkim, 4.viii.1959, A. G. K. Menon.

General Diagnosis : Body brownish, ocelli area black; pronotum brownish yellow with two transverse black spots on inner margin; mesonotum with two black margin obconical spots, and a black small spot on each side of anterior margin; five indistinct black basal spots and three black spots in front of cruciform elevation, one on each side of same; tegmina hyaline, its costal membrane, basal cell and claval area dull brownish; wings hyaline; legs blood red in colour; abdomen rather dark.

Length : 54 mm.

Distribution : India : Sikkim (North Sikkim); Assam, Meghalaya, Nagaland, Tamil Nadu. *Elsewhere* : Burma, Teinzo

6. ***Platylomia saturata*** (Walker)

1858. *Dundubia saturata* Walker, *List. Hom. Supl.* : **6**

1963. *Platylomia saturata* Metcalf, *General Catalogue of Homp.*, **viii** : 625.

Material examined : 3 exs., Sikkim, Maneshithang, North Sikkim, 26.vii.1959, A. G. K. Menon.

General Diagnosis : Head olive green in colour; pronotum with two longitudinal black fasciae, inwardly curved and posteriorly united; mesonotum with two black longitudinal fasciae connected with two black fused spots; and two black spots in front of cruciform elevation; tegmina with bright olive green tinge, its venation, basal half, costal area, claval area reddish in colour, and a series of marginal spots at apical area; wings hyaline, with base, apical area reddish in colour; legs olive green in colour; abdomen pitch black in colour, lateral area brownish, pilose.

Length : 44 mm.

Distribution : India : Sikkim (N. Sikkim), Assam, Nagaland, Uttar Pradesh, West Bengal. *Elsewhere* : Indonesia, Malay Peninsula, Nepal.

7. ***Platylomia similis*** (Distant)

1888. *Dundubia similis* Distant, *A. M. N. H.*, (6) **1** : 292.

1998. *Platylomia similis* Distant : Sen, G. C., Ghosh, and M. Ghosh, L. K., *State Fauna Series* **4**, *Fauna of Meghalaya* **4** : 275.

Material examined : 3 exs., Sikkim : Naga, N. Sikkim, 4. vii. 1959, A. G. K. Menon.

General Diagnosis : Body pale green, head blood-red in colour; posterior and inner margin of pronotum black; mesonotum with two longitudinal black fasciae on each side and a short oblique black fascia on its outer margin, and two black spots in front of cruciform elevation; tegmina hyaline, its venation and costal membrane greenish; wings hyaline; legs pale greenish; abdomen brownish.

Length : 51 mm.

Distribution : India : Sikkim (N. Sikkim), Assam, Meghalaya. *Elsewhere* : Malay Peninsula, Siam.

8. ***Platylomia umbrata*** (Distant)

1888. *Cosmopsaltrea umbrata* (Distant), *A. M. N. H.*, **6** : 293.

1998. *Platylomia umbrata* (Distant) : Sen, G. C. Ghosh, M. and Ghosh, L. K. *State Fauna Series* **4**, *Fauna of Meghalaya* **4** : 275.

Material examined : 3 exs., Sikkim : Naga, N. Sikkim, 4.vii.1959, A. G. K. Menon.

General Diagnosis : Body olive green in colour, head with some black irregular spots on each lateral margin; pronotum with two central longitudinal black fasciae and a black spot at posterior margin; mesonotum with two margined black spots and a central lanceolate fascia and two black spots at cruciform elevation; tegmina hyaline, its basal costal membrane, apical area and veniation reddish in colour; wings hyaline; legs black; abdomen olive green with black shadings.

Length : 47 mm.

Distribution : India : Sikkim (N. Sikkim), Assam, Meghalaya, Uttar Pradesh, West Bengal. *Elsewhere* : Burma, Bhamo.

Subfamily TIBICENINAE

Key to genera of Subfamily TIBICENINAE

1(2) Head (including eyes) equal in width to the base of mesonotum 3

2(1) Head (including eyes) not equal in width, distinctly narrower than base of mesonotum 9

3(4) Pronotum as long as mesonotum 15

4(3) Pronotum distinctly shorter than mesonotum 5

5(6) Lateral margin subacutely toothed ..... ***Haphsa***

6(5) Lateral margin not as above 7

7(8) Posterior angle moderately produced ..... ***Terpnosia***

8(7) Posterior angle distinctly produced ..... ***Huechys***

9(10) Tympanal covering very globose, and projecting beyond lateral abdominal margin 11

10(9) Tympanal covering entirely absent 13

11(12) Opercula in male short, transverse ..... ***Oncotympana***

12(11) Opercula in male obliquely convex ..... ***Mogannia***

13(14) Tegmina with eight apical areas ..... ***Scieroptera***

14(13) Tegmina with ten apical areas ..... ***Graptotettix***

15(16) Lateral margin more or less ampliated ..... ***Tosena***

16(15) Lateral margin not ampliated, but distinctly toothed ..... ***Dundubia***

Genus 4. ***Dundubia*** Amyot and Serville

1843. *Dundubia* Amyot and Serville, *Hem.* : 470.

Key to species of the genus *Dundubia*

1(2) Opercula in male reaching abdominal segment, near base concavely sinuate, specially on inner margin apices narrowed and obtusely rounded ..... *mannifera*

2(1) Opercula in male, near base not sinuate, elongate, curved, reaching abdominal segment, inner margin curved at apices long slender, acutely pointed ..... *intemerata*

*9. ***Dundubia intemerata*** Walker

1856. *Dundubia intemerata* Walker, *J. Linn. Soc. Zool.*, **1** : 84.

1998. *Dundubia intemerata* Walker : Sen, G. C. Ghosh, M. and Ghosh, L. K. *State Fauna Series* 4, *Fauna of Meghalaya* **4** : 277.

Material examined : 2 exs., Sikkim, Keozing, South Sikkim; Date nil; B. K. Tikader.

General Diagnosis : Body greenish brown in colour; vertex triangularly elongated; ocelli red and eyes light brownish; pronotum as long as mesonotum, its lateral margin not prominently ampliated but distinctly toothed; tegmina hyaline, its extreme base, venation and costal membrane greenish brown; wings hyaline; legs black; abdomen brownish yellow.

Length : 76 mm.

Distribution : India : Sikkim (South Sikkim), Assam, Meghalaya. *Elsewhere* : Borneo, Burma, Laos, Malay Peninsula, Penang, Perak, Siam, Singapore, Sumatra, Tenasserim.

Remarks : The species is hitherto reported for the first time from the state of Sikkim.

10. ***Dundubia mannifera*** (Linn.)

1754. *Cicada mannifera* Linn., *Mus. Ad. Fried*, 84.

1998. *Dundubia mannifera* (Linn.) : Sen, G.C., M., Ghosh and Ghosh, L. K. *State Fauna Series, Fauna of Meghalaya* **4** : 277.

Material examined : 2 exs., Sikkim; Keozing, South Sikkim, Date-nil, B. K. Tikader.

General Diagnosis : Body long, greenish brown, head triangularly produced; protonum as long as mesonotum; tegmina pale hyaline, its venation, costal membrane brownish yellow and a bronzy tinge on apical area; wings pale hyaline; legs black; abdomen dark brownish yellow, with some black spots at lateral area.

Length : 32 mm.

Distribution : India : Sikkim (South Sikkim); Assam, Meghalaya. *Elsewhere* : Burma, Bhamo, Borneo, China, Java, Sumatra, Tenasserim.

Genus 5. ***Graptotettix*** Stål

1866. *Graptotettix* Stål, *Hem. Afr. iv* : 4.

11. ***Graptotettix guttatus*** Stål

1866. *Graptotettix guttatus* Stål, *Berl. ent. Zeit. x* : 170.

1963. *Graptotettix guttatus* Metcalf, *General Catalogue of Homop. viii* : 10.

Material examined : 2 exs., Sikkim, Bugtan, West Sikkim; 9.iv.1959, A.G.K. Menon.

General Diagnosis : Body black in colour, head bright brownish yellow, pronotum with two black oblique spots in front of each lateral area; mesonotum with two small obconical brownish spots and a large brownish spot at each lateral area; tegmina reddish brown, its venation brownish yellow, its base, basal cell and costal membrane pitchy black; wings shinning and bronze in colour; legs black; obdomen pale brownish.

Length : 28 mm.

Distribution : India : Sikkim (West Sikkim), Assam, Bhutan, Nagaland.

Genus 6. ***Haphsa*** Distant

1905. *Haphsa* Distant, *A. M. N. H.* (7) ***xv*** : 64.

12. ***Haphsa nicomache*** (Walker)

1850. *Dundubia nicomache* Walker, *List. Hom. i.* : **67.**

1998. *Haphsa nicomache* (Walker) : Sen, G. C., Ghosh, M. and Ghosh, L. K. *State Fauna Series, Fauna of Meghalaya* **4** : 278.

Material examined : 2 exs., Sikkim, Rangli Valley, East Sikkim, v. 1911; F. Hamington.

General Diagnosis : Body brownish yellow in colour; vertex with two large transverse black spots at lateral margin; pronotum with two black longitudinal lines which are united posteriorly and at its lateral area with two transverse black spots, and also two black spots at cruciform elevation, tegmina hyaline, its venation brownish, and its costal area and apical area smooth, wings hyaline; legs black; abdomen also black, with some black spots at lateral segment.

Length : 27 mm.

Distribution : India : Sikkim (East Sikkim), Assam, Meghalaya, Nagaland and Uttar Pradesh.

Genus 7. ***Huechys*** Amyot & Serville

1843. *Huechys* Amyot & Serville, *Hem.* 464.

13. ***Huechys sanguinea*** (De Geer)

1773. *Cicada sanguinea* De Geer, *Mem.*, **iii.** : 221.

1998. *Huechys sanguinea* (De Geer) : Sen, G. C. Ghosh, M. and Ghosh, L. K. *State Fauna Series, Fauna of Meghalaya* **4** : 279.

Material examined : 2 exs., Sikkim, Rangli Valley, East Sikkim, v. 1911, F. Hamington.

General Diagnosis : Body black; head with two black spots in between front and face; mesonotum with two black spots, covering the whole disk; tegmina blackish, with greyish white streaks in apical area and costal margin; wings blackish with greyish white streaks; legs black; abdomen also black.

Length : 18 mm.

Distribution : India : Sikkim (East Sikkim), Assam, Meghalaya, Orissa, West Bengal. *Elsewhere* : Borneo, Burma, China, Malay Peninsula, Rangoon, Sri Lanka, Sumatra.

Genus 8. ***Mogannia*** Amyot and Serville

1843. *Mogannia* Amy & Serv., *Hem.* : 467.

14. ***Mogannia obliqua*** Walker

1859. *Mogannia obliqua* Walker, *List. Hom. Suppl.* : 39

1963. *Mogannia obliqua,* Metcalf, *General Catalogue of Homp.,* **viii** : 885.

Material examined : 2 exs., Sikkim, Badamtala, Rangli Valley, East Sikkim, v. 1911, F. Hamington.

General Diagnosis : Body greenish brown, basal area and apex of vertex blackish red; pronotum with a triangular black fascia at central place; mesonotum with a broad black fascia at central place being constricted near middle; tegmina hyaline, its venation reddish, with a brownish red transverse fascia from radial area to apex; wings hyaline; legs black; abdomen castaneous.

Length : 13 mm.

Distribution : India : Sikkim (East Sikkim), Assam, Nagaland, West Bengal. *Elsewhere* : Burma, Momeit, Rangoon, Karenhee.

Genus 9. ***Oncotympana*** Stål

1870. *Oncotympana* Stål, *Ofv. vet. AK. Forh.* : 710.

15. ***Oncotympana expansa*** (Walker)

1858. *Carineta expansa* Walker, *Ins. Saund. Hom* : 26.

1963. *Oncotympana expansa,* Metcalf, *General Catalogue of Homp.* **viii** : 507.

Material examined : 4 exs., Sikkim, Maneshithang, N. Sikkim; 26.vii.1959, A.G.K. Menon.

General Diagnosis : Body greenish brown; vertex with its lateral area with striae and an oblique black fascia between ocelli and outer margin, and a black spot on inner margin; pronotum with two central black fasciae united posteriorly, each side with two black spots, mesonotum with two central obconical black spots and a sublateral broken black fascia; tegmina hyaline, its venation alternately reddish brown, its apical area smooky, and with marginal series of small reddish spots; wings hyaline; legs black; abdomen black.

Length : 27 mm.

Distribution : India : Sikkim (North Sikkim), Assam, West Bengal. *Elsewhere* : China.

Genus 10. ***Scieroptera*** Stal

1866. *Scieroptera* Stal, *Hem. Afr.,* **iv.** : 4

16. ***Scieroptera splendidula*** (Fabricius)

1775. *Tetigonia splendidula* Fabricius, *Syst. Ent.* : 681

1998. *Tettigonia splendidula* Fabricius : Sen, G.C., Ghosh, M. and Ghosh, L. K., *State Fauna Series, Fauna of Meghalaya* **4** : 282.

Material examined : 2 exs., Sikkim, Rangli Valley, East Sikkim, v. 1911, F. Hamington.

General Diagnosis : Body black in colour, vertex with purplish mark at the front, lateral area of the vertex brownish yellow; pronotum with brownish yellow central fascia, mesonotum brownish yellow; tegmina hyaline blackish in colour; wings hyaline, with very slight tinged brownish yellow colour. Legs reddish brown; abdomen brownish yellow, with a central dorsal longitudinal black macular fascia.

Length : 16 mm.

Distribution : India : Sikkim (East Sikkim), Assam, Meghalaya. *Elsewhere* : Burma, Borneo, China, Momeit.

Genus 11. ***Euterpnosia*** Matsumura

1917. *Euterpnosia* Matsumura, *Nat. Hist. Soc. Trans.,* **6** : 202.

*17. ***Euterpnosia crowfooti*** (Distant)

1912. *Terpnosia crowfooti* Distant, A.M.N.H.(S) **X** : 439.

1932. *Euterpnosia crowfooti* Kato, *Monograph of Cicadidae* : 160.

1963. *Euterpnosia crowfooti* Metcalf, *General Catalogue of Homp.,* **viii** : 452.

Material examined : 11 exs., Sikkim, Ligship, Dambang; N. Sikkim, 28.iv.1956, A. G. K. Menon.

General Diagnosis : Body oblivaceous green, vertex with its anterior marginal line to front, lateral margin black; pronotum with two curved longitudinal black lines and a transverse black spot at lateral angle and a small black spot near at base; mesonotum with a central longitudinal black line, two curved black line at lateral angle

and two black spots on each nasal angle; tegmine hyaline, its venation and costal membrane reddish brown; wings hyaline; legs brownish abdomen brownish, covered with greyish piles.

Length : 25 mm.

Distribution : India : Sikkim (North Sikkim), Northern India, West Bengal. Elsewhere : Indochina.

Remarks : The species is being reported for the first time from the State of Sikkim.

Genus 12. ***Tosena*** Amy. & Serv.

1843. *Tosena* Amy. & Serv., *Hem.* : 462.

Key to the species of the genus *Tosena*

1(2) Tegmina indistinctly black, crossed by a white fascia; wings black. Tympanal covering black 3

2(1) Tegmina distinctly black, without crossed by a white fascia; wings reddish, apex black; tympanal covering ochraceous .... *mearesiana*

3(4) A black spot on base of abdomen, a black spot on second and a double segmental series of black spots to abdomen .... *melanopteryx*

4(3) Abdomen without black spot and without segmental series of spots to abdomen .... *dives*

18. ***Tosena dives*** (Westwood)

1842. *Cicada dives* Westwood, *Arc. Ent.*, **i.** 98.

1998. *Tosena dives* (Westwood) : Sen, G. C., Ghosh, M. and Ghosh, L. K. *State Fauna Series, Fauna of Meghalaya* **4** : 283.

Material examined : 3 exs., Sikkim, Rangli valley, East Sikkim, v. 1911, F. Hamington.

General diagnosis : Body black in colour, apex of head brownish, and face castaneous, pronotum as long as mesonotum, lateral margin of pronotum ampliated and distinctly toothed, tegmina black; its venation, costal membrane, radial cells radish brown; a transverse raddish brown fascia crossing at apex of radial cell terminating to posterior margin, wings reddish brown; apical third black; legs black; abdomen black.

Length : 25 mm.

Distribution : India : Sikkim (East Sikkim), Assam, Meghalaya, West Bengal.

19. ***Tosena mearesiana*** (Westwood)

1842. *Cicada mearesiana* Westw., *Arc. Ent.* **i** : 98.

1963. *Tosena mearesiana,* Metcalf, *General Catalogue of Homp.* **viii** : 568.

Material examined : 3 exs., Sikkim, Rangli valley, East Sikkim, v. 1911, F. Hamington.

General Diagnosis : Body dark brown, head dark brown, face with a small spot on each side; posterior margin of pronotum black, pronotum with a large spot on its posterior lateral margin, posterior lateral margin of mesonotum dark brown, tegmina black, opaque; wings reddish brown, its venation, posterior margin and anal area dark brown; legs dark brown; abdomen black.

Length : 55 mm.

Distribution : India : Sikkim (East Sikkim), North India, West Bengal. *Elsewhere* : Sylhet, Malaya Archipelago.

20. ***Tosena melanopteryx*** (Kirkaldy)

1846. *Cicada melanoptera* White, *A.M.N.H.* **xvii** : 331.

1998. *Tosena melanopteryx* (Kirkaldy) : Sen, G. C., Ghosh. M. and Ghosh, L. K. *State Fauna Series, Fauna of Meghalaya* **4** : 283.

Material examined : 2 exs., Sikkim, Rangli valley, East Sikkim, v.1911, F. Hamington.

General Diagnosis : Body black in colour, head black; posterior margin of pronotum and lateral margin of mesonotum brownish yellow; tegmina black, crossed by a broad transverse white fascia; wings black; legs black; abdomen black, with a series of brownish spots.

Length : 61 mm.

Distribution : India : Sikkim (East Sikkim), Assam, Meghalaya, West Bengal. *Elsewhere* : Burma, Bhamo, Indochina, Tonkin.

SUMMARY

The paper incorporates an account of 20 species belonging to 12 genera in 2 subfamilies under 3 families of Superfamily Cicadoidea from the State of Sikkim in Eastern Himalaya. Keys to taxa, general diagnosis of each species, geographical distribution, literature references are provided in the paper. Two species (marked*) are hitherto reported for the first time from Sikkim. Maps showing the distribution of the species are provided. Also, charts showing the districtwise distribution of the species from Sikkim are given.

ACKNOWLEDGEMENT

Gratitude is expressed to Dr. J. R. B. Alfred, Director, Zoological Survey of India for laboratory facilities. Thanks are also due to Dr. R. K. Varshney, Scientist-'SF' (Retd.), and Dr. A. Bal, Scientist 'SE' for helpful cooperation.

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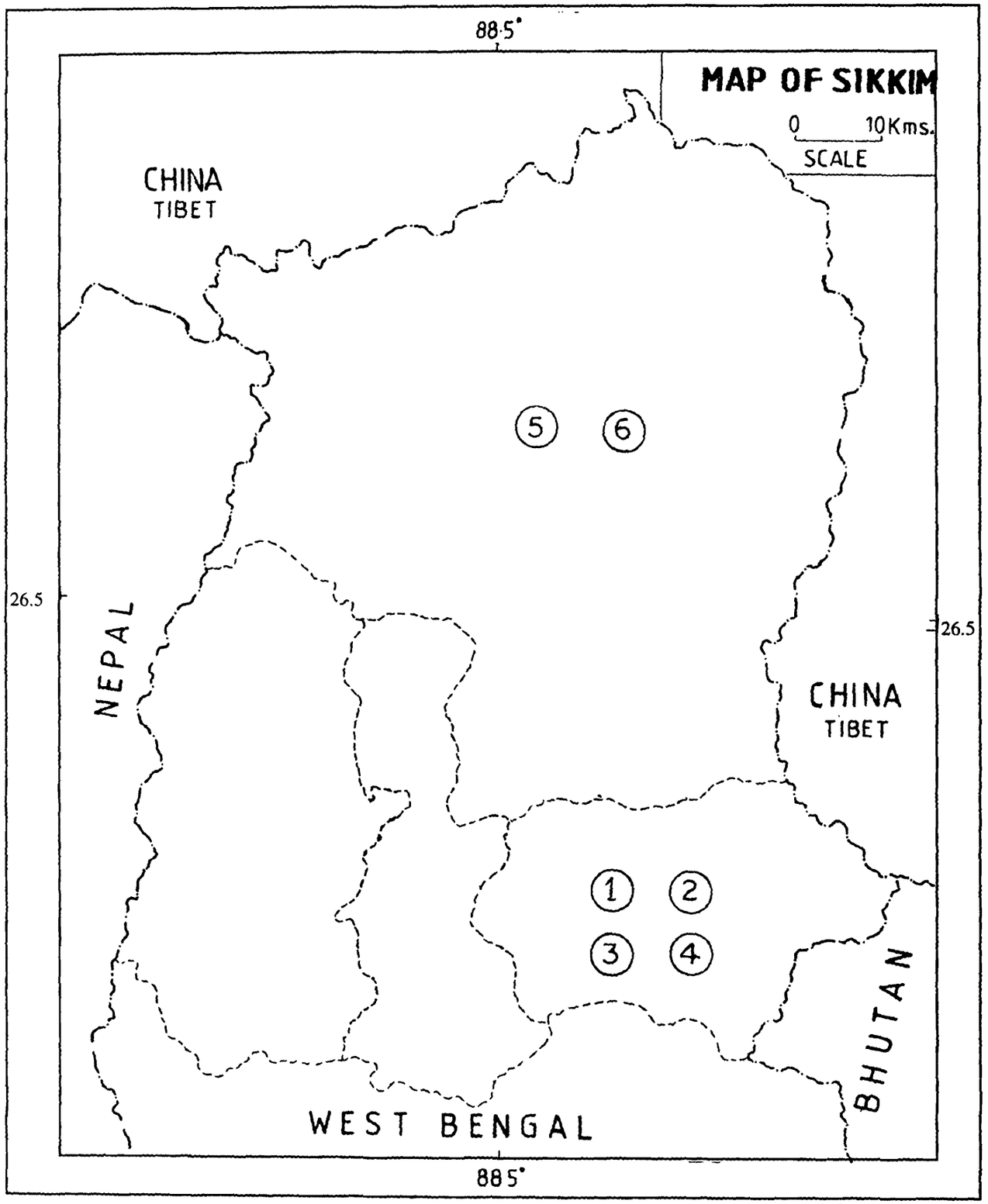
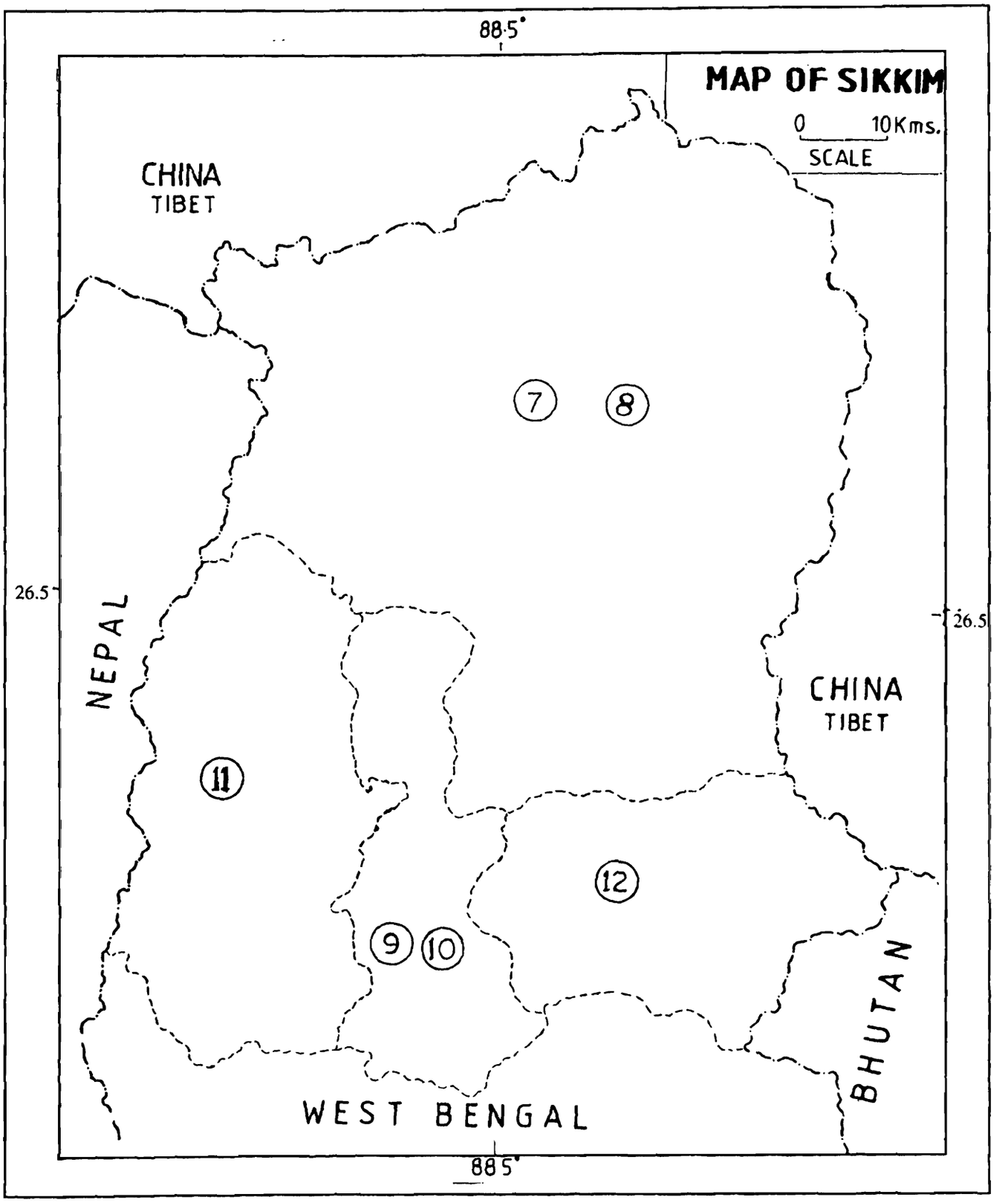
MAP 1. Showing the distribution of Cicadid species in Sikkim



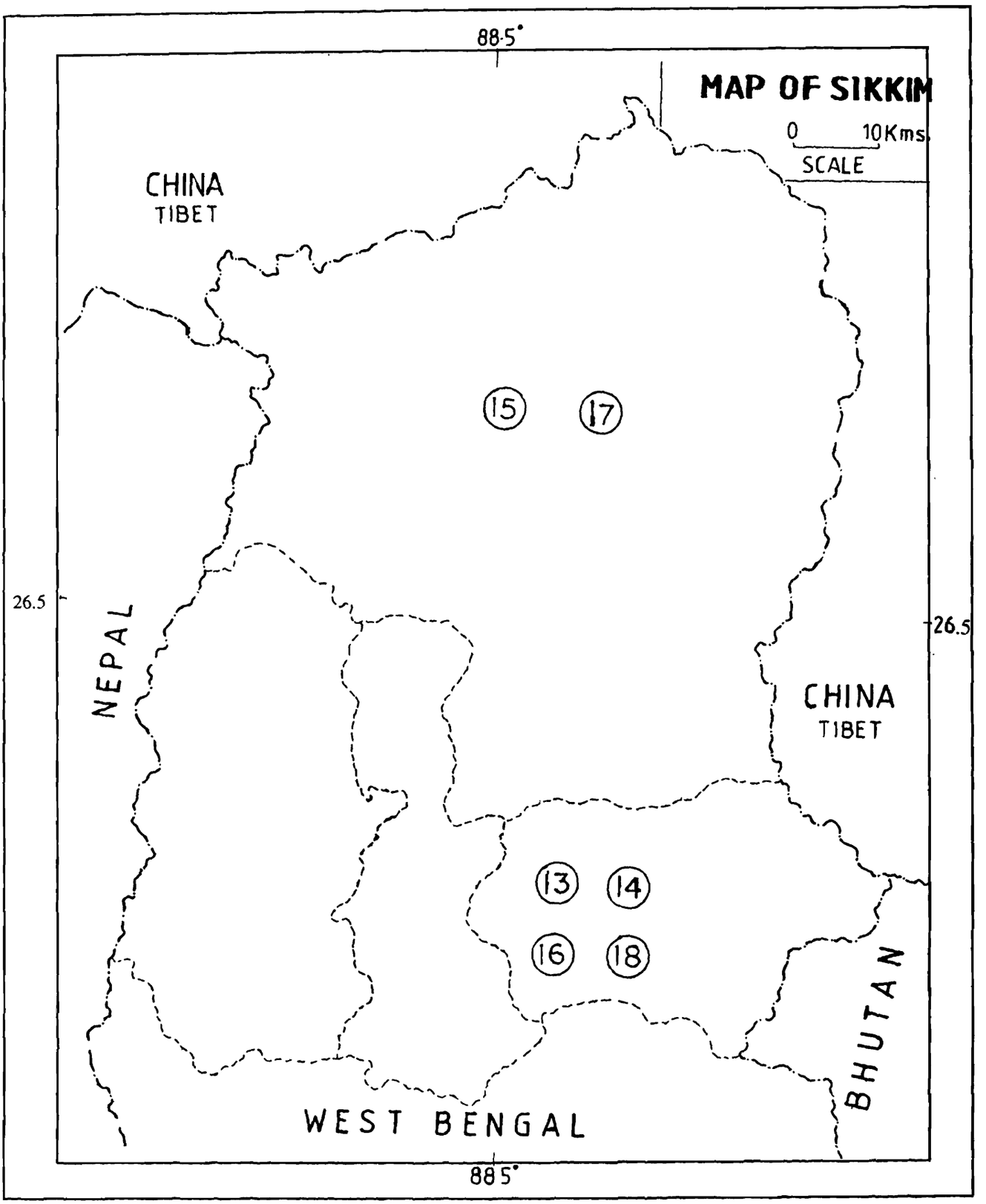
1. *Gaeana festiva* Fabr.
2. *G. maculata* Drury
3. *G. sulphurea* (Westw.)
4. *Balinta octonotata* Westw.
5. *Platylomia radha* Distant
6. *P. saturata* Walker

MAP 2. Showing the distribution of Cicadid species in Sikkim



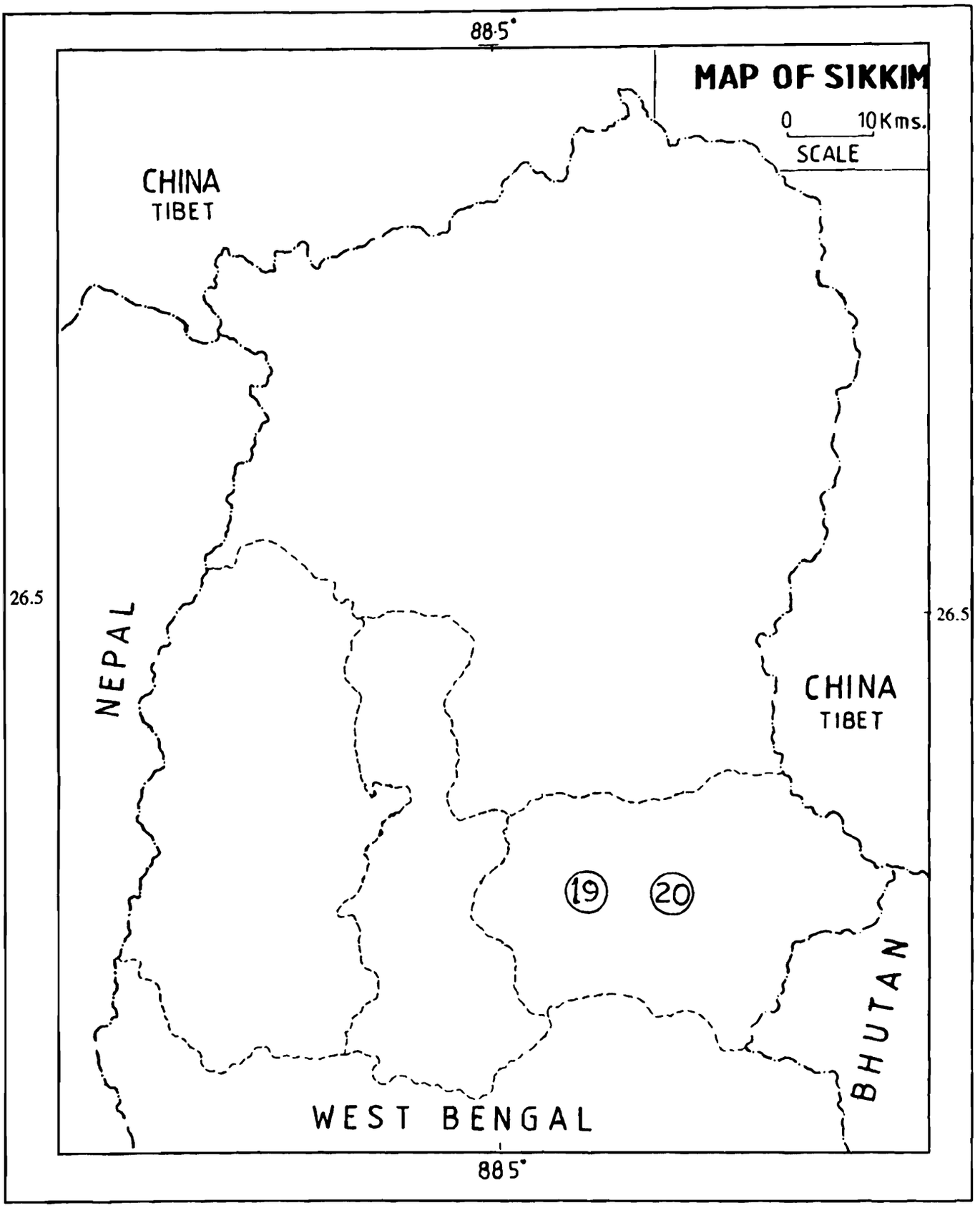
7. *P. similis* Distant
8. *P. umbrata* (Distant)
9. *Dundubia intermerata* Walker
10. *Dundubia manifera* Linnaeus
11. *Graptotettix guttatus* Stal
12. *Hapsha nicomache* Walker

MAP 3. Showing the distribution of Cicadid species in Sikkim



13. *Huchy sanguinea* (De Geer)
14. *Mogannia obliqua* Walker
15. *Oncotympana expansa* Walker
16. *Scieroptera splendidula* Fabr.
17. *Euterpnosia crowfooti* Distant
18. *Tosana dives* Westwood

MAP 4. Showing the distribution of Cicadid species in Sikkim



19. *Tosana mearesiana* Westwood
20. *T. melanopteryx* (Kirkadly)

Zool. Surv. India
State Fauna Series 9, Fauna of Sikkim (Part 2) : 477-487, 2003

INSECTA : HOMOPTERA : CERCOPOIDEA

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INTRODUCTION

The cercopids, commonly known as 'Frog hoppers' or 'Cuckoo spits' bugs, are one of the economically important families of the insect order Hemiptera.

The group can be recognised by its two ocelli, on vertex, hind tibiae with stout teeth and with short spines at the tip. It is also characterised by postclypeus greatly expanded, hind coxae mobile, short, conical and tegmina opaque. The nymphs inhabit on grasses or spittle like froth on the aerial shoots of plants or underground at the roofs of the plants in cavities filled with froth.

The group is represented by about 2368 species belonging of 326 genera in the world (Animal Resources of India, State of the Art, 1991). In India, about 200 species belonging to 40 genera are known. Gardiner, 1874; Atkinson, 1885; Distant, 1908; Lallemand, 1949; MetCalf, 1960; Dutta and Ghosh, 1976; Biswas, Ghosh and Basu, 1992; Biswas, Ghosh and Ghosh, 1998.

The cercopid fauna of Sikkim is poorly known. Earlier, 22 species under 7 genera are recorded from the State. 19 species belonging to 9 genera under three families *viz.*, Aphrophoridae, Cercopidae and Machaerotidae are dealt with in this paper. Of these, 7 species (marked*) are hitherto reported for the first time from Sikkim. Thus, the total number of species of cercopoidea so far known from Sikkim, stands at 28, a list of which is given at the end.

The present paper is a consolidated account of Cercopoidea from Sikkim for the first time. It provides key for easy identification of various taxa. For each species the original reference and subsequent reference (s), particularly relating to nomenclatural changes are given. Moreover, general diagnosis, distributional records of each species within the State and elsewhere are also provided.

The work is based on the collections made by different servey parties of Zooological Survey of India and also on the old collections represented in the department.

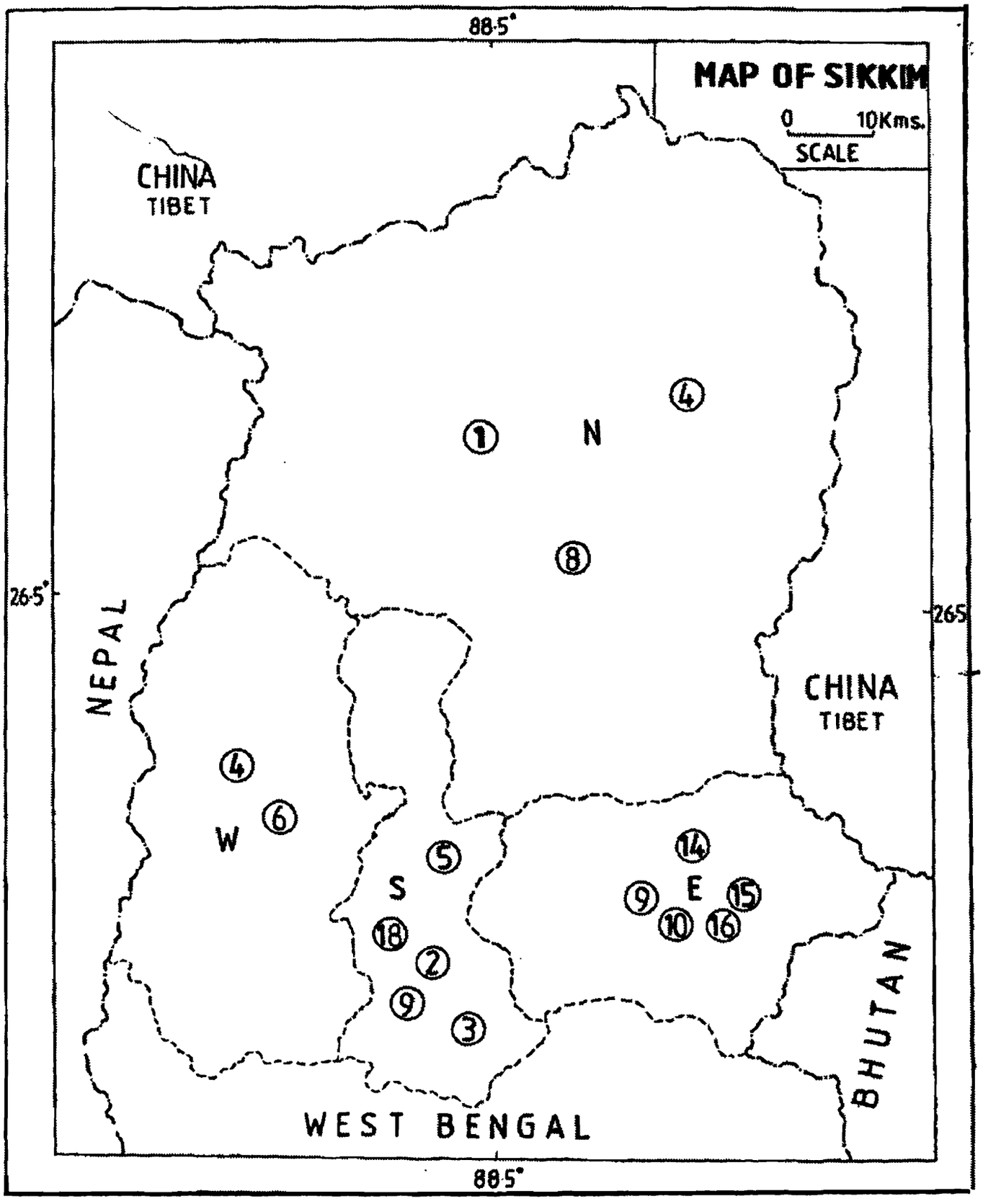
The classification is chiefly adopted after Distant (1908) and Lallemand (1949).

MATERIAL AND METHOD

Cercopids like most other hemipterans are Phytophagous in habit and feed usually on agricultural crops, vegetables etc. These insects are usually collected by sweeping with the help of insect nets or by light trap methods.

The collected materials are killed in a killing bottle specially prepared with the help of potasium cyanide and plaster of paris, or in a killing jar using benzene / chloroform vapour and preserved dry with paradichlorobenzene and Napthelene. The specimens are kept in the insect envelope and lebelled properly mentioning locality, altitude, date of collection and name of collector with ecological

Map showing the distribution of Cercopid species in Sikkim



Numbers of different districts of the map correspond with the serial numbers of species in the text.

notes etc. In the laboratory the specimens are set, pinned and mounted to display properly for easy handling under the binocular microscope during the process of identification.

SYSTEMATIC ACCOUNT

Super Family CERCOPOIDEA

Family I. APHROPHORIDAE

Genus I. ***Aphrophora*** Germ.

1. *Aphrophora bisignata* Distant

Genus 2. ***Clovia*** Stal

*2. *Clovia bipunctata* Kirby

3. *C. punctata* (Walker)

Genus 3. ***Philagra*** Walker

4. *Philagra fuciformis* Walker

Family II. CERCOPIDAE

Genus 4. ***Abidama*** Distant

*5. Abidama producta (Walker)

Genus 5. ***Callitettix*** Stal

6. *Callitettix varsicolor* (Fabricius)

Genus 6. ***Cosmoscarta*** Stal

*7. *Cosmoscarta bispecularis* (White)

8. *C. decisa* (Walker)

9. *C. dimidiata* (Dallas)

10. *C. dorsimaculata* (Walker)

11. *C. egens* (Walker)

*12. *C. fictilis* Butler

13. *C. septempunctata* (Walker)

14. *C. trigona* (Walker)

Genus 7. ***Paphnutius*** Distant

15. *Paphnutius ostentus* Distant

Genus 8. ***Leptataspis*** (Dallas)

16. *Leptataspis fulviceps* (Dallas)

*17. *L. fuscipennis* (Le Peletier and Serville)

Family III. MACHAEROTIDAE

Genus 9. ***Machaerota*** Brum.

*18. *Machaerota assamensis* Distant

Key to the families of the Superfamily CERCOPOIDEA

1(2) Eyes as long as broad; anterior margin of pronotum straight ..... CERCOPIDAE

2(1) Eyes transverse; anterior margin of the pronotum rounded or angulate 3

3(4) Scutellum posteriorly compressed, and strongly elevated armed with a long apical spine ..... MACHAEROTIDAE

4(3) Scutellum triangular and flat .... APHROPHORIDAE

Key to the genera of the family APHROPHORIDAE

1(2) Vertex of head broader than long, convexly rounded anteriorly 3

2(1) Vertex of head subangularly or elongately produced, as long as or longer than broad; face centrally carinate, ocelli nearer to eyes than to each other ..... *Philagra*

3(4) Head and protonum with a single distinctly longitudinal and central carination .... *Aphrophora*

4(3) Head and pronotum not longitudinally, centrally carinate, face not convexly produced, more or less flattened ... *Clovia*

Family I. APHROPHORIDAE

Genus 1. ***Aphrophora*** Germar, 1831.

1831. *Aphrophora* Germar, *Mag. Ent.*, 4 : 48.

Type species : *Aphrophora corticea* Germar.

1. ***Aphrophora bisignata*** Distant

1908. *Aphrophora bisignata* Distant, *Fauna Brit. India*, 4 : 100.

Material examined : 2 exs., Yumthang, North Sikkim, 8. vii. 1989, coll. *S. Chattopadhaya and party.*

Diagnostic characters : Vertex and anterior half of pronotum dull ochraceous, punctate, tegmina, scutellum and posterior area of pronotum umber brown; apical margin of vertex containing two prominent transverse spots.

Length : 13 mm.

Distribution : Sikkim (North Sikkim).

Genus 2. ***Clovia*** Stal, 1866.

1866. *Clovia* Stal, *Hem. Afr.*, **4** : 75.

Type species : *Clovia bigoti* Signoret.

2. ***Clovia bipunctata*** Kirby

1891. *Clovia bipunctatus* Kirby, *Linn. Soc. London. Jour. Zool.*, **24** : 163.

1908. *Clovia bipunctata* : Distant, *Fauna Brit. India*, **4** : 94.

Material examined : 7 exs., Jorethang, South Sikkim, 8. xi. 1994, coll. *G. C. Sen and party.*

Diagnostic characters : Tegmina subhyaline with a small black spot at posterior angle of inner margin, crossed by two irregularly bent oblique fasciae; head as long as medial length of pronotum.

Length : 6 8 mm.

Distribution : Sikkim (South Sikkim), Tamil Nadu.

Elsewhere : Japan, Java, Sri Lanka.

3. ***Clovia puncta*** (Walker)

1851. *Ptyelus punctum* Walker, *List of specimens of Homopterus Ins. in the coll. of Brit. Mus.*, **3** : 718.

1908. *Clovia puncta* : Distant, *Fauna Brit. India*, **4** : 94.

Material examined : 8 exs., Majhitan, South Sikkim, 22. ix. 1993, coll. *S. K. Saha and party.*

Diagnostic characers : Plae brown species; tegmina with a small black spot at posterior angle of inner margin, head with three anterior longitudinal lines; sternum with a piceous spot, behind each anterior coxa, face piceous, lateral margins of sternum greyish.

Length : 6 mm.

Distribution : Sikkim (South Sikkim), Bihar, Gujarat, Maharashtra, West Bengal.

Elsewhere : China, Hongkong, Japan, Java.

Genus 3. ***Philagra*** Walker, 1851

1851. *Philagra* Walker, *List of specimens of Homopterus in the coll. of Brit. Mus.*, **3** : 731.

Type species : *Philagra hastata* Walker.

4. ***Philagra fuciformis*** Walker

1858. *Philagra fuciformis* Walker, *List Hom. Suppl.*, : 47.

Material examined : 1 ex., Geyzing, West Sikkim, 7. xi. 1992, coll. *M. S. Shishodia and party*; 1 ex., Mallidhen, North Sikkim, 15. vii. 1959, coll. *A. G. K. Menon*; 1 ex., Sichhu, North Sikkim 14. vii. 1959, coll. *A. G. K. Menon.*

Diagnostic characters : Body, legs, abdomen tegmina ochraceous; tegmina with scattered irregular marking head above half as long as pronotum, rostrum almost reaching the posterior coxae, face centrally carinate with posterior area transversely straite.

Length : Excluding tegmina 10 14 mm. Expansion tegmina 18 27 mm.

Distribution : Sikkim (West Sikkim, North Sikkim), Arunachal Pradesh, Assam, West Bengal.

Elsewhere : Myanmar, China.

Key to the genera of the family CEROPIDAE

1(2) Anterior femora much extending the lateral margin of the body; anterior legs elongate 3

2(1) Anterior femora only slightly passing the lateral margin of the body; anterior legs of moderate lengths 7

3(4) Anterior femora distinctly longer than the intermediate femora 5

4(3) Anterior femora not or only slightly longer than the intermediate femora; vertex of the head is centrally carinate ..... *Paphnutius*

5(6) Head in male longly and acutely produced in front of eyes ..... *Abidama*

6(5) Head not elongately produced in front of eyes; tegmina narrow; face less than twice as long as broad; tegmina narrow, oblong, moderately ampliated towords apices.... ..... *Callitettix*

7(8) Anterior margin of the pronotum foliaecous without any protruberances .... *Leptataspis*

8(7) Anterior margin of the pronotum not foliaceus ..... *Cosmoscarta*

Family II. CERCOPIDAE

Genus 4. ***Abidama*** Distant

1906. *Abidama* Distant, *Fauna Brit. India*, **4** : 114.

Type species : *Abidama producta* Walker.

5. ***Abidama producta*** (Walker)

1851. *Sphenorhina producta* Walker, *List. Hem.*, **3** : 696.

1908. *Abidama producta* (Walker) : Distant, *Fauna Brit. India*, **4** : 114.

Material examined : 1 ex., Jorethang, South Sikkim, 8. xi. 1994, coll. G. C. Sen and party.

Diagnostic characters : Apical margin of tegmina, head, pronotum, scutellum, body beneath black; metasternum and legs dark sanguineous; apex of scutellum and the tegmina rufo-testaceous; apices of the tibiae and tarsi piceous, face longitudinally striate, wings hyaline with dark veins.

Length : Including tegmina 7 9 mm.

Distribution : Sikkim (South Sikkim), Assam, Bihar, Meghalaya.

Elsewhere : Myanmar.

Genus 6. ***Callitattix*** Stal, 1865

1865. *Callitattix* Stal, *Ofv. Vet. AK. Forh.*, : 152.

Type species : *Callitattix braconoides* Walker.

6. ***Callitattix varsicolor*** (Fabricius)

1794. *Callitattix varsicolor Fabricius, Ent. Syst.*, **4** : 50.

1908. *Callitattix varsicolor* : Distant, *Fauna Brit. India*, **4** : 113.

Material examined : 2 exs., Namthang, West Sikkim 20. ix. 1993, coll. *S. K. Saha and party*; 5 exs., Namthang, West Sikkim 18. ix. 1993, coll. *S. K. Saha and party*; 1 ex., Sombare, West Sikkim, 19. ix. 1993, coll. *S. K. Saha and party*.

Diagnostic characters : Black, tegmina with a white spot before the middle of the clavus and a subtransverse white spot between the middle of claval margins and costal margin with two spots beyond the middle of tegmen, the external being large and transverse the internal being small with the apex of clavus sanguineous; wings hyaline.

Length : Expansion of tegmina 20 22 mm; excluding tegmina 9 mm.

Distribution : Sikkim (West Sikkim), Assam, Kashmir, Maharashtra, Uttar Pradesh.

Elsewhere : China, Malay Peninsula, Myanmar.

Genus 6. ***Cosmoscarta*** Stal

1869. *Cosmoscarta* Stal, *Hem. Fabr.*, **2** : 11.

Type species : *Cosmoscarta heros* Fabricius.

Key to the species of the genus *Cosmoscarta*

1(2) Tegmina with the pale transverse fasciae 5

2(1) Tegmina not transversly fasciate 3

3(4) Apical area of the tegmina black, basal area generally moer or less spotted; pronotum red or luteous, spotted with black .... *bispecularis*

4(3) Apical area of the tegmina ochraceous basal area distinctly spotted 11

5(6) Pronotum black, bluish black or castaneous 7

6(5) Pronotum black, with a pale transverse fasciae or with pale discal spots ..... *dimidiata*

7(8) Scutellum, legs, anal appendages, abdominal, segmental and lateral margins testaceous or sanguineous 9

8(7) Scutellum legs, anal segments, abdominal segmental margin / margins ochraceous; tegmina with three transverse fasciae, mesonotum with two short tubercles..... ..... *decisa*

9(10) Tegmina piceous, crossed by two transverse angulate fasciae, the first near middle and second just before apical area and also along the costal area mesonotum with two broad compressed tubercles ..... *trigona*

10(9) Tegmina black, a basal short slender longitudinal streak, a broader curved fascia at base of clavus, and a transverse fascia before apical area, mesonotum with two short but acutely pointed tubercles ..... *egens*

11(12) Four spots on pronotum, the smaller near anterior margin, the larger discal; two foveate impressions near anterior margin at the location of the smaller black spots and a transverse foveation in each of the larger black spots..... 13

12(11) Pronotum usually without any spot but sometimes with two small spots near anterior margin; tegmina with six spots but sometimes with seventh subapical and subcoastal black spots ... *septempunctata*

13(14) Tegmina and body testaceous red, the seventh subapical black spot to tegmina and two posterior spots to pronotum smaller in size, thorax narrower, black spots to pronotum much smaller and not regularly uniform ..... *dorsimaculata*

14(13) Tegmina and body is ochraceous, seventh subapical black spot is frequently obliterated and so also the two posterior spots to pronotum, more regularly uniform ..... *ficitilis*

7. ***Cosmoscrata bispecularis*** (White)

1844. *Cercopis bispicularis* White, A. M. N. H., **14** : 426.

1908. *Cosmoscarta bispecularis* : Distant, *Fauna Brit. India*, **4** : 147.

Material examined : 1 ex., "Sikkim"

Diagnostic characters : Body below and legs testaceous red, pronotum with four black spots, two very larger and inwardly oblique on disk, two smaller near anterior margin; tegmina pale testaceous red, with six large rounded spots arranged in transverse series and a longitudinal spot at base black.

Length : Excluding tegmina 11 mm.; Expansion tegmina 24 25 mm.

Distribution : Sikkim, Assam.

Elsewhere : Malay Peninsula.

8. ***Cosmoscarta decisa*** (Walker)

1858. *Cercopis decisa* Walker, *List. Hem. Suppl.*, : 175.

1908. *Cosmoscarta decisa* Distant, *Fauna Brit. India*, **4** : 130.

Material examined : 4 exs., Lachung, North Sikkim, 15.vii.1959, coll. *A. G. K. Menon.*

Diagnostic characters : Head, pronotum, sternum, scutellum bluish black, tegmina black with three transverse ochraceous fasciae; first irregular, basal angularly produced in the costal area, connected at the inner margin with the second which is straight and sinuate before middle and third fascia before apical area, tegmina strongly arched at base of costal margin, not much more than twice as long as broad.

Distribution : Sikkim (North Sikkim), Assam, Nagaland, West Bengal.

Elsewhere : Bhutan, China, Tibet.

9. ***Cosmoscarta dimidiata*** (Dallas)

1886. *Cercopis dimidiata* Dallas, *Tr, E. S.*, : 11.

1908. *Cosmoscarta dimidiata* : Distant, *Fauna Brit. India*, **4** : 136.

Material examined : 1 ex., Tadong, E. Sikkim, 25.ix.1993, coll. *B. N. Das and party*; 1 ex., Jorethang, South Sikkim, 4. x. 1993, coll. *B. N. Das and party.*

Diagnostic characters : Head, scutellum, pronotum, legs, sternum black, abdomen bluish black; tegmina black, with about middle, the second broken and sanguineous near apical area; pronotum finely punctate; lateral margin slightly reflexed; mesonotum with two subtriangular tubercles; posterior tibiae with a long spine beyond middle and a short spine near base.

Length : Excluding tegmina 11 13 mm.; expansion tegmina 29 -31 mm.

Distribution : Sikkim (East Sikkim).

Elsewhere : Bhutan, China, Malay Peninsula, Singapore.

10. *Cosmoscarta dorsimaculata* (Walker)

1834. *Carcopis bifasciata*, Guerin and Menevillae, *Zoologi Insects* : 502.

1908. *Cosmoscarta dorsimaculata* : Distant, *Fauna Brit. India*, **4** : 147.

Material examined : Ranipool, East Sikkim, 24. v. 1994, coll. *B. C. Das and party.*

Diagnostic characters : Tegmina, legs and body testaceous red; four spots to pronotum, tegmina with apical area ochraceous, seven large black spots, six in two irregular transverse series, the seventh subapical and subcostal; pronotum with two foveate impressions near anterior margin at the place of the two smaller black spots.

Length : Excluding tegmina 13 15 mm.; Expansion tegmina 36 - 38 mm.

Distribution : Sikkim (East Sikkim); Assam, Punjab, Uttar Pradesh, West Bengal.

Elsewhere : Borneo, China, Malay Peninsula.

11. *Cosmoscarta egens* (Walker)

1858. *Crocopis egens* Walker, *List. Hom. Suppl.*, : 171.

1908. *Cosmoscarta egens* : Distant, *Fauna Brit. India*, **4** : 135.

1976. *Cosmoscarta egens* : Datta and Ghosh, *Eos. Tomol* **3** : 59.

Material examined : 4 exs., "Sikkim"

Diagnostic characters : Scutellum, lateral margins of abdominal segment and anal appendage sanguineous; Body and tegmina black, with a slender basal longitudinal streak, a broad fascia at base of clavus, and a transverse fascia before apical area sanguineous or testaceous; pronotum strongly foveate on either side near anterior margin, mesonotun with two short, acutely pointed tubercles.

Length : Excluding tegmina 5 8 mm. Expansion tegmina 27 33 mm.

Distribution : Sikkim, Assam, Nagaland and West Bengal.

Elsewhere : Myanmar, China and Oriental region.

12. *Cosmoscarta fictilis* Butler

1874. *Cosmoscarta fictilis* Butler, *Gst. Ent.*, **1** : 259.

1908. *Cosmoscarta fictilis* : Distant, *Fauna Brit. India*, **4** : 148.

1976. *Cosmoscarta fictilis* : Datta and Ghosh, *Eos. Tomol* **3** : 59.

Material examined : 3 exs., "Sikkim"

Diagnostic characetrs : Body and tegmina ochraceous, the seventh apical black spots to tegmina and two posterior spots to pronotum frequently obliterated; differs from *C. dorsimaculata* in smaller size and black spots to pronotum and tegmina, thorax narrow and duller.

Length : Excluding tegmina 11 - 12 mm.; Expansion tegmina 32 mm.

Distribution : "Sikkim", Assam, Meghalaya, Nagaland.

13. *Cosmoscarta septempunctata* (Walker)

1857. *Cercopis septempunctata* Walker, *List. Hom.*, **3** : 659.

1908. *Cosmoscarta septempunctata* : Distant, *Fauna Brit. India*, **4** : 148.

1976. *Cosmocarta septempunctata*, Datta and Ghosh, *Eos. Tomol* **3** : 62.

Material examined : 2 exs., "Sikkim"

Diagnostic characters : Body, legs, testaceous red, pronotum, thickly finely and indistinctly punctate, transversely foveate near each lateral angle; a double series of large spots on each side of the abdomen beneath, and sometimes with two small spots near anterior margin of pronotum, mesosternal tubercles broad, compressed, subprominent; tegmina with six black spots arranged in two irregular transverse series, sometimes with a seventh subapical and subcostal spot; posterior tibiae with a short spine near base and a strong spine beyond middle.

Length : Excluding tegmina 10 11 mm.; Expansion tegmina 28 31 mm.

Distribution : "Sikkim", Assam, Meghalaya, Uttar Pradesh and West Bengal.

Elsewhere : Java, Myanmar and Siam.

14. ***Cosmoscarta trigona*** (Walker)

1857. *Cercopis trigona* Walker, *List. of specimens of Homopterus insects in the collection of British Museum*, **3** : 660.

1908. *Cosmoscarta trigona* : Distant, *Fauna Brit. India*, **4** : 131.

1976. *Cosmoscarta trigona* : Datta and Ghosh, *Eos. Tomol* **3** : 62.

Material examined : 40 exs., Rongli, East Sikkim 2. v. 1982, coll. *G. Ramakrishna*; 8 exs., Singhik, East Sikkim coll. *G. Ramakrishna*; 1 ex., Mangan, N. Sikkim, 11. iv. 1992, coll. *A. R. Lahiri*; 1 ex., Chritine jan, East Sikkim, 19. iv. 1994, coll. *S. Chattopadhay*.

Diagnostic characters : Head, pronotum, body beneath black, scutellum and legs brownish yellow; pronotum yellowish brown, tomen, tose and transversely impressed, tegmina piceous, crossed by two dark brown transversely angulate fasciae, face globose, rostrum not reaching the intermediate coxae; tibiae and tarsi brown, posterior tibiae with a single short spine beyond middle.

Length : Excluding tegmina 5.5 6 mm.; Expansion tegmina 22 29 mm.

Distribution : Sikkim (East Sikkim, N. Sikkim), Assam, Kerala, Meghalaya and Nagaland.

Elsewhere : China, Hongkong and Tibet.

Genus 7. ***Paphnutius*** Distant, 1916

1916. *Paphnutius* Distant, *Fauna Brit. India*, **6** : 200.

15. *Paphnutius ostentus* Distant

1916. *Paphnutius ostentus* Distant, *Fauna Brit. India*, **6** : 200.

1949. *Paphnutius ostentus* Lallemand, *Belgique Inst. Roy, Sci. Nat. Mem.* (2) **32** : 39.

Material examined : 1 ex., Gangtok, E. Sikkim, 2. iv. 1928, coll. *F. N. Bailey*.

Diagnostic characters : Face black and vertex of the head with black spot before each eye; netasternum sanguineous; pronotum thickly wrinkled and moderately foveate near each lateral margins, scutellum roundly foveate, centrally.

Length : Including tegmina : 4.5 mm. 5 mm.

Distribution : Sikkim (East Sikkim), West Bengal.

Elsewhere : China and Yunnam.

Genus 8. ***Leptataspis*** Schimidt

1911. *Leptataspis Schmidt*, Stett. Ent. Zeit., **72** : 81.

1(2) Tegmina black with a blood reddish basal streak to clavus; mesosternal tubercle moderately angularly prominent .... *fulviceps*

2(1) Tegmina with the basal two thirds of costal area luteous, sometimes base and claval area more faintly of the same colour; mesosaranal tubercle broadly acute..... ..... *fuscipennis*

16. ***Leptataspis fulviceps*** (Dallas)

1850. *Cercopsis fulviceps* Dallas, *Ent. Soc. London Trans.* **2** (1) : 10.

1908. *Cosmocarta fulviceps* : Distant, *Fauna Brit. India*, **4** : 152.

Material examined : 1 ex., I. C. A. R. farm, Tadong, E. Sikkim, 25. ix. 93, coll. *B. N. Das and party*; 1 ex., Rumtek, E. Sikkim, 1. x. 1993, coll. *B. N. Das and party.*

Diagnostic characters : Head, pronotum and lateral margin of prosternum luteous; tegmina black with a blood reddish basal streak to calvus; pronotum very finely and thickly punctate with three transverse foveations before anterior margin; one central and the others behind it on each side; scutellum and legs pitchy black.

Length : Excluding tegmina 14 16 mm.; Expansion tegmina 38 44 mm.

Distribution : Sikkim (E. Sikkim), Assam, Meghalaya, Nagaland, West Bengal.

Elsewhere : China, Hongkong, Java, Laos, Malaya, Myanmar, Siam.

17. ***Leptataspis fuscipennis*** (Le Peletier and Serville)

1825. *Cercopsis fuscipennis* Le Peletier and Serville, *Ene. Meth.* **10** : 605.

1939. *Leptataspis fuscipennis* : Distant, *Fauna Brit. India, Rhyncota*, **4** : 153.

Material examined : 1 ex., Sikkim, coll. *Knyvett.*

Diagnostic characters : Head, legs, pronotum luteous; pronotum with three transverse foveations before anterior margin, one central and the latter containing one or two small black spots, mesosternal tubercle compressed and broadly acute; tegmina black with the basal two third of costal area luteous.

Length : Excluding tegmina 12 14 mm; Expansion tegmina 31 40 mm.

Distribution : Sikkim, Tamil Nadu.

Elsewhere : Malay Peninsula.

Family III. MACHAEROTIDAE

Genus 9. ***Machaerota*** Burmeister, 1835

1835. *Machaerota* Burm., *Handb. Ent.* **2** (1) : 128.

Type species : *Machaerota ensifera* Burmeister

18. ***Machaerota assamensis*** Distant

1916. *Machaerota assamensis* Distant, *Fauna Brit. India*, **6** : 183.

Material examined : 1 ex., Jorethang, South Sikkim, 8. xi. 1994, coll. *G. C. Sen and party.*

Diagnostic characters : Head pronotum dark testaceous; anterior area of pronotum black but centrally divided by the testaceous central carinations; face centrally black but laterally ochraceous with blackish striation; scutellar process pale testaceous with a lateral longitudinal spot on each side of base and strongly convexly depressed to reach the terminal apices; tegmina pale hyaline with the basal areas of extreme costal and inner margin black.

Length : Including tegmina 6 mm.

Distribution : Sikkim (South Sikkim), Assam.

A list of Cercopid species so far recorded from the State of Sikkim

1. *Abidama producta* Walker
2. *Aphrophora bisignata* Distant
3. *Callitattix branconoides* (Walker)
4. *Callitattix varsicolor* (Fabricious)
5. *Clovia bipunctata* (Walker)
6. *Clovia conifera* Walker
7. *Clovia punctata* (Walker)
8. *Cosmoscarta bispecularis* White
9. *Cosmoscarta decisa* Walker
10. *Cosmoscarta dimidiata* (Dallas)
11. *Cosmoscarta dorsalis* (Walker)
12. *Cosmoscarta dorsimaculata* (Walker)
13. *Cosmoscarta egens* (Walker)
14. *Cosmoscarta ficitilis* Butler
15. *Cosmoscarta macgillivrayi* Distant
16. *Cosmoscarta minor* Atkinson
17. *Cosmoscarta moorei* Distant
18. *Cosmoscarta nigra* Atkinson

19. *Cosmoscarta septempunctata* (Walker)
20. *Cosmoscarta trigona* (Walker)
21. *Leptataspis fulviceps* (Dallas)
22. *Leptataspis fuscipennis* (Lep. & Serv.)
23. *Leptataspis striatus* Var. *simplex* Lallemand
24. *Machaerota assamensis* Distant
25. *Paphautius ostentus* Distant
26. *Philagra fucifornis* Walker
27. *Phymatostetha basiclava* (Walker)
28. *Phymatostetha pudens* (Walker)

SUMMARY

The paper is a first consolidated report on the Cercopid fauna from Sikkim. It deals with 18 species belonging to 9 genera. Of these, seven species (marked *) are hithero reported for the first time from the state. Keys to various taxonomic categories are provided for easy recognition. Besides, general diagnosis, original reference, subsequent reference (s), distributional records both in India and abroad for each species are also given. A list of species of Cercopoidea so far known from Sikkim is also appended.

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DISTRICTWISE DISTRIBUTION OF SPECIES OF SIKKIM

(Hemiptera : Cercopoidea)

Name of the Species / Subspecies	North Sikkim	South Sikkim	East Sikkim	West Sikkim
1. Aphrophora bisignata Distant	+			
2. Clovia bipunctata Kirby		+		
3. Clovia punctata (Walker)		+		
4. Philagra fuciformis Walker	+			
5. Abidama producta (Walker)		+		
6. Callitettis varsicolor (Fabr.)				
7. *Cosmoscarta bispecularis (White)	?	?	?	?
8. Cosmoscarta descisa (Walker)	+			
9. Cosmoscarta dimidiata (Dallas)		+	+	
10. Cosmoscarta dorsimaculata (Walker)			+	
11. *Cosmoscarta egens (Walker)	?	?	?	?
12. *Cosmoscarta fictilis Butler	?	?	?	?
13. *Cosmoscarta septempunctata (Walker)	?	?	?	?
14. Cosmoscarta trigona (Walker)	+		+	
15. Paphnutius ostentus Distant			+	
16. Leptataspis fulviceps (Dallas)	+			
17. * Leptataspis fuscipennis (Lep. & Serv.)	?	?	?	?
18. Machaerota assamensis Distant		+		

* Originally mentioned as "Sikkim" instead of exact collection locality.

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INSECTA : HEMIPTERA : HETEROPTERA : COREOIDES

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INTRODUCTION

Coreids are commonly known as the leaf-footed bugs. They are phytophagous in nature and include some pests of cultivated plants. This Superfamily includes four families viz., Alydidae, Coreidae, Rhopalidae and Stenocephalidae. Among these, members belonging to the family Coreidae are important pest of crops. In Sikkim the Coreid species mostly belong to families Alydidae and Coreidae.

The Stenocephalidae and Rhopalidae are the most primitive among Coreoidea is also reported by Schaefer (1965) on the basis of series of characters which he studied. The representatives of the family Stenocephalidae are probably the most primitive, and from similar ancestors probably arose Rhopalids. Similar ancestors probably gave rise on one hand to Alydids and on other hand the most advanced Coreidae. This conclusion goes hand in hand with the findings of Schaefer (1965) and Ahmed and Shadab (1975).

The Coreid fauna in the oriental region comprises of 212 species and according to Distant (1918) the Indian Fauna pertains to 148 species belonging to 53 genera which is about 11% of the World Fauna.

Record of Coreid fauna from the State of Sikkim is mainly done by the Distant (1904,1908,1918) who has reported 29 species under 18 genera. The present work brings the total number of species to 38 under 20 genera. In connection with this work the material collected through faunastic survey's and those are lying in the National Zoological Collection could be studied. Where ever material in good condition were available and studied the working key to the species level have been provided but in only a few cases key could not be prepared since the material could not be studied properly in those cases only the species names have been given with salient charasterstic features for identification.

MATERIAL AND METHOD

Coreids like most of the Hemipteran Insects are phytophgous in nature and feed on agricultural gardens, vagetable gardens, crop field ect. As these insects are weak fliers like other hemipteran insects they are being collected by sweeping the habitat with insect net or by hand picking with forceps and by light trapping during night time.

The collected materials are killed in a killing jar using benzene or chloroform vapour and preserved dry with paradrichlorobenzene & napthelene. The insects are kept in the insect envelops and labelled properly mentioning locality, altitude, date of collection and name of the collector with ecological and field notes. In the Laboratory the specimens are set, pinned and mounted to display properly for easy handling under binocular microscope during the process of identification. Sometimes for detailed specific identification the genital structures are dissected out and mounted on slides for further study, otherwise by studying visible morphological characters under naked eyes and under bionocular microscopes these are being identified.

SYSTEMATIC ACCOUNT

List of Coreid species studied from the state of Sikkim and provided in this paper are given below. Species with asteric marks indicate as new from the State.

Superfamily COREOIDEA

Family ALYDIDAE

Subfamily LEPTOCORISINAE

Genus 1. ***Leptocorisa*** Latreille 1825

1. *Leptocorisa acuta* (Thunberg)

Subfamily : PSEUDOPHLOENAE

Genus 2. ***Clavigralla*** Spin 1837

2. *Clavigralla horrens* Distant

Subfamily ALYDINAE

Genus 3. ***Riptortus*** Stal 1859

3. *Riptortus* linearis (Fabricius)

4. *Riptortus strenuus* (Horvath)

5. *Riptortus fuscus* (Fabricius)

6. *Riptortus pedestris* (Fabricius)

Family COREIDAE

Subfamily COREINAE

Division DALADERARIA

Genus 4. ***Daladar*** Amy. & Surv. 1843

7. *Daladar planiventris* (Westwood)

Division PETASCELARIA

Genus 5. ***Petillia*** Stal, 1865

8. *Petillia calcer* (Dallas)

9. *Petillia lobipes* (Westwood)

10. *Petillia notatipes* Walker

11. *Petillia palulicollis* (Walker)

Genus 6. ***Petalocnemis*** Stal 1853

12. *Petalocnemis obscura* Dallas

Tribe **Mictini**

Genus 7. ***Helcomeria*** Stal 1873

13. *Helcomeria spinosa* Signoret

Genus 8. ***Prinolomia*** stal 1873

14. *Prinolomia fulvicornis* (Fabricius)

15. *Prinolomia gigus* Distant

Genus 9. ***Ochrochira*** Stal 1873

16. *Ochrochira biplagiata* (walker)

17. *Ochrochira albiditarsis* (Westwood)

Division MICTARIA

Genus 10. ***Mictis*** Leach 1814

18. *Mictis tenebrosa* (Fabricius)

Genus 11. ***Anoplocnemis*** Stal 1873

19. *Anoplocnemis phasiana* (Fabricius)

Tribe **Clorescerini**

Genus 12. ***Cloresmus*** Stal 1859

20. *Cloresmus antennatus* Distant

Genus 13. ***Notobitus*** Stal 1859

21. *Notobitus meleagris* (Fabricius)

Tribe **Gonocerini**

Genus 14. ***Cletus*** Stal 1859

22. *Cletus bipunctatus* (Westwood)

23. *Cletus punctulatus* (Westwood)

Genus 15. ***Cletomorpha*** Mayr 1888

24. *Cletomorpha raja* Distant

Tribe **Homoeocerini**

Genus 16. ***Aschistocoris*** Bergr 1909

25. *Aschistocoris brevicornis* Dall

Genus 17. ***Homoeocerus*** Burmeister 1835

26. *Homoeocerus albiguttulus* Stal

27. *Homoeocerus inornatus* Stal

28. *Homoeocerus simiolus* Distant

29. *Homoeocerus serrifer* (Westwood)

30. *Homoeocerus signatus* (Walker)

31. *Homoeocerus stricornis* Scott

32. *Homoeocerus walkeri* Kirby

33. *Homoeocerus variabilis* Dall

Genus 18. ***Physomerus*** Burmeister 1835

34. *Physomerus grossipes* (Fabricius)

Genus 19. ***Acanthocoris*** Amyot & Surville 1843

35. *Acanthocoris scabrator* (Fabricius)

Subfamily CORIZINAE

Genus 20. ***Serinetha*** Stal 1873

36. *Serinetha abdominalis* Fabricius

37. *Serinetha augur* (Fabricius)

38. *Serinetha rufomarginata* (Fabricius)

GENERAL DIAGNOSIS OF THE SUPERFAMILY COREOIDEA

The coreid bugs are generally medium to large insects, head much narrower than pronotum, antennae four segmented inserted well on sides of the head, ocelli present and rostrum are four segmented, Clavus of wing extending beyond scuttelum. Scant glands opening on thorax are conspicuous. Mostly dull coloured and capable of producing pungent scent. In some genera they exhibit extra ordinary dialation of the antennae, many species have flattened and leaf-like legs called leaf footed bugs. A few species are known to be predaceous also.

Key to the families of Superfamily COREOIDEA found in Sikkim

1. Bucculae short, not extending to the insertion of antennae, pronotum posteriorly slightly longer than the head along the mid longitudinal axis; scuttellum not reaching the base of mentanotum and generally narrower than the interocular space..... ALYDIDAE

2. Bucculae long, extending to near insertion of antennae, pronotum posteriorly three times or more longer than head along with the mid longitudinal axis; scuttelum reaching or surpassing the base of metanotum and generally broader than the interoculer space..... ..... COREIDAE

Key to the Subfamilies of ALYDIDAE

1(2) Odoriferus orifices distinct; dorsal surface of 4th and 5th abdominal segments at bases medially sinuate 3

2 (1) Ororiferus orifices usually indistinguishable ..... LEPTOCORIXINAE

3 (4) Bucculae usually long as extending to near insertion of antennae; pronotum posteriorly usually thrice or more than twice the width of head; dorsal surface of first abdominal segment posteriorly truncated; scuttelum reaching or passing base of metanotum... ..... PSEUDOPHLOEINAE

4 (3) Bucculae small, short, placed before insertion of antennae; pronotum posteriorly not or slightly broader than width of head; dorsal surface of first abdominal segment posteriorly rounded; scuttelum frequently not reaching base of mentanotum .... ALYDINAE

Subfamily LEPTOCORISINAE

Genus 1. ***Leptocorisa*** Latr.

1825. *Leptocorisa* Latr. *Fam. Nat.*, **3** : 86

Type species : *Leptocorisa tipuloides* del Geer.

1. *Leptocorisa acuta* (Thunb.)

1783. *Cimax acuta* Thunb. *Nov. Ins. sp.* **2** : 34

1904. *Leptocorisa acuta : Distant, Fauna Brit. India,* **1** : 410

Material examined : 10 exs., Rongpoo, 12.XII.1975, G. K. Srivastava Coll.

Diagnostic characters : Body above brownish, beneath pale greenish, antennae fuscous, base of second, third and fourth joint luteus, a small distinct tubercle near each lateral pronotal angle, a distinct central carinate line to pronotum.

Distribution : India, Sikkim (Rangpoo), Assam, Bihar, Karnataka : Meghalaya, West Bengal, Tamil Nadu. *Elsewhere* : China and Islands of Malaya Archipelago.

Remarks : Generally infest on paddy and millet crop.

Subfamily PSEUDOPHLOENAE

Genus 2. *Clavigralla* Spin

1837. *Clavigralla* Spin. *Ess.* 2000

Type species : *Clavigralla gibbosa* Spin.

2. *Clavigralla horrens* Dehrn

1860. *Clavigralla horrens* Dohrn, *Stett ent. Zeit.* XXI, : 403.

Diagnostic character : Pronotum and scuttelum brownish ochraceous, coarsely punctate, somewhat granulose, moderately pilose; corium ochraceous, its apex castaneous; connexivum ochraceous with castaneous spots; legs luteus, apical areas of the posterior femora, bases and apices of posterior tibiae castaneous, each femur with a leteous spot before apex; body beneath obscure brownish ochraceous, the lateral areas of sternum and abdomen distinctly marked with cretaceous, abdomen more or less suffused with ochraceous; pronotum with two or more or less distinct central longitudial ridges, the lateral angular spines long, black; antennae ochraceous, the apical joint a little darker, second joint slightly longer than the third; posterior segments strongly spined. Length 7 mm; breadth between pronotal angles 3 mm.

Distribution : India, Sikkim, Assam, Maharashtra (Mumbai). *Elsewhere* : Burma, Ceylon

Subfamily ALYDINAE

Genus 3. *Riptortus* Stal

1859. *Riptortus* Stal, *Ofv. vet. Ak. Fourth.*, : 460.

Type species : *Riptortus dentipes* Fabricius.

Key to the species of the genus *Riptortus*

1 (2) Partial or total absence of the pale laevigate sternal spots which even when present are small and usually obliterated on the metasternum. ..... *fuscus*

2 (1)Sternal spots always present and very prominent. 3

3 (4) Pronotal disk with no distinct rugosities, lateral pronotal spines not acute and small. .... *linearis*

4 (3) Pronotal disk with scattered rugosities; lateral pronotal spines acute and long 5

5 (6) Body cinemon brown, one single long lateral pronotal spine on each angle; posterior femur with thick row of ventro-lateral spines. ..... *strenuus*

6 (5) Body dark brown ochraceous; one moderately long and another small two spines on lateral pronotal angle on each side; posterior femur with moderate spine row on ventro-lateral side. ..... *pedestris*

3. *Riptortus fuscus* (Fabr.)

1798. *Lygaeus fuscus* Fabr., *Ent. Syst. Suppl.*, 539.

1904. *Riptortus fuscus* Fabr. : Distant, *Fauna Brit. India*, **1** : 414.

Material Examined : 3 exs. Rangpoo, 19.IV.1976, A. R. Bhowmik Coll.

Diagnostic characters : Closely allied to *Riptortus pedestris* but slightly differ from it by the partial or total absence of and usually obliterated on the metasternum.

Distribution : India, Sikkim : Rangpoo, Assam, Bihar, Kerala, Maharashtra, Murshidabad. Purulia. *Elsewhere* : Burma, Ceylon; Malay Peninsula.

Remarks : Infest on peageon pea or red gram (*Cajanus cajan*).

* The species is recorded for the first time from the State of Sikkim.

4. ***Riptortus linearis*** (Fabricius)

1775. *Lygaeus linearis* Fabricius, *Syst. Ent.*, : 710.

1904. *Riptortus linearis* : Distant, *Fauna Brit. India,* **1** : 415.

Material examined : 2 exs. Rangpoo, 19.IV.1976, A. R. Bhowmik Coll.

Diagnostic characters : Dark cinnamon brown, pronotum, scuttelum, corium and lateral areas of sternum distinctly punctate; first, second and third joint of antennae, fascia at base of head between eyes, central fascia to head beneath, lateral angular spines to pronotum, disk of sternum, and abdomen black, a sublateral leavigate pale ochraceous fascia margined with black on each side of head and sternum; lateral areas, base and some spots on discal black of abdomen., luteous, a small spot at the middle of posterior pronotal margin and the apex of the scuttelum, pale luteous.

Adult insects may be upto 14 16 mm. in length.

Distribution : India, Sikkim, Meghalaya Karnataka, West Bengal. *Elsewhere* : Burma, Malaya Archipelago, Sri Lanka.

5. ***Riptortus pedestris*** (Fabricius)

1775. *Lygaeus pedestris* Fabricius, *Syst. Ent.*, : 727.

1904. *Riptortus pedestris* : Distinct, *Fauna Brit. India*, **1** : 414.

Material examined : 2 exs. Rongli, N. E. Sikkim, 20.XII.1975.

Diagnostic characters : Dark brownish ochraceous, finely and obscurely pilose; posterior margin of the pronotum and a lateral fascia on each side of the head, not extending beyond base of antennae, dark castaneous posterior and reddish brown, lateral pronotal spine black.

Distribution : India, Sikkim : Rongli, Karnataka, Maharashtra, Uttar Pardesh, West Bengal. *Elsewhere* : Burma, Ceylon, Malay Peninsula.

Remarks : This coreid species generally infest on various crops and vegetable like pigeon pea or red gram, wheat, black gram, cow pea and also on cardamom.

* The species is recorded for the first time from the State of Sikkim.

6. ***Riptortus strenuus*** Horvath

1889. *Riptortus strenuus* Horvath, Term. Fuzetek. : 35.

1904. *Riptortus strenuus* : Distant, *Fauna Brit. India*, **1** : 415.

Material examined : 3 exs. Sikkim, Bungtan, 11.IV.1959, A G. K. Menon Coll.

Diagnostic characteres : Cinnamon brown, greyish silky, antennae unicolours, body concolourous head with the vertex behind eyes and between ocelli and eyes black; head beneath, a long spine at the lateral frontal angles, disks of sternum and abdomen black. A lateral fascia to head and sternum pale luteous, abdomen with the base and lateral areas pale luteous, a median broad black vitta on each side and at apex of fourth and fifth segments angularly produced, posteror femora beneath and apices of posterior tibiae black, rostrum extending to the intermediate coxae.

Adult about 13.5 mm. in length.

Distribution : India : Sikkim, Meghalaya, NEFA, Uttar Pradesh.

Family COREIDAE

Key to the Subfamilies of COREIDAE

—Tibiae sulcated or dialated above; head near central lobe disinctly and longitudinally impressed. ..... COREINAE

—Tibae non sulcated and rounded above; dorsal surface of 4th abdominal segment at base and apex more or less medially sinuate .... CORIZINAE

Key to the Divisions of Subfamily COREINAE

1 (2) Posterior femora rarely incrassate or spined ..... DALADERARIA

2 (1) Posterior femora distinctly incrassated and more or less spinous or tuberculate 3

3 (4) Posterior femora in males profoundly thickend; tibiae outwordly dialated in both the sexes ..... MICTARIA

4 (3) Posterior femora in males moderately thickend; tibiae not dialated as above.... ..... PHYSOMERARIA

Key to genera of Division *Mictiria*

1(2) Abdomen beneath in male distinctly tuberculate; posterior tibiae dentate on inner margin in male ..... *Mictis*

2(1) Abdomen beneath in male very strongly gibbously tuberculate; posterior tibiae not dentate in either sex ..... *Anoplocnemis*

Subfamily COREINAE

Genus 4. ***Daladar*** Amy. Serv.

1843. Daladar Amy. and Serv., Hem. 187.

Type species : *Daladar acuticosta* Amy. and Serv.

7. ***Daladar planiventris*** (Westwood)

1842. *Acanonicus planiventris* Amy. and Surv., in *Hope cat.* **2** : 8.

1904. *Daladar planiventris* : Distant, *Fauna Brit. India*, **1** : 352.

Material examined : 1 ex., Rangpoo, 19.IV.1976, A. R. Bhowmik Coll.

Diagnostic characters : Frontal angles more horaizontally and less lunately produced, their apices obtusely reduced and moderately dentate before the anterior angles; the third joint of the antennae less broadly dialated.

Distribution : India : Sikkim : Rongpoo, Assam, Maharashtra, Tamil Nadu. *Elsewhere* : Burma, Ceylon, Malay Peninsula and Sumatra.

Remarks : * The species is recorded for the first time from the State.

Genus 5. ***Petillia*** Stal

1865. *Petillia* Stal, *Hem. Afr.*, **2** : 2.

Type Species : *Petillia tragus* Fabricius.

8. ***Petillia petulicollis*** (Walker)

1871. *Trematocoris patulicollis* Walker, *Cat. Het.*, **4** : 37.

1904. *Petallia patulicollis* : Distant, *Fauna Brit. India*, **1** : 350

Material examined : 2 exs., Gangtok, 7.x.1995, S. C. Mitra Coll.

Diagnostic characters : Pale brownish or brownish ochraceous moderately ochraceously pilose; pronotum finely darkly crenulate, the lateral angles broadly and somewhat convexly produced, their margins serrated and each terminating in a small spines directed backword; posterior tibiae dialated on inner margin and very irregularly dentate, broadest near base, and most strongly spined a little before apex.

Distribution : India : Sikkim : Gangtok, : Naga Hills, West Bengal.

Remarks : * The species is recorded for the first time from the State of Sikkim.

9. ***Petillia calcer*** (Dall.)

1852. *Myctis calcer* Dall., *List. Hem.*, **2** : 397.

1904. *Petillia calcer* : Distant, *Fauna Brit. India,* **1** : 351.

Diagnostic characters : Pronotum with some scattered black; tuberculous points and sometimes with distinct longitudinal dark fascie, the lateral margin darkly serrate, the lateral angles only moderately produced, their apices pointed and slightly directed backword, veins of the corium piceous; posterior femora incrassated, more strongly so in males, with small scattered dark tubercles; obsolately spined beneath, and with a broad black central and apical annulation; posterior tibiae inwordly dilated and strongly dentate.

Distribution : India : Sikkim, West Bengal, Maharashtra, Naga Hills. *Eslewhere* : Burma, Ceylon and Phillipines Islands.

10. ***Petillia lobipes*** (Westwood)

1842. *Myctis lobipes* Westwood, In *Hope cat.*, **2** : 11.

1904. *Petillia lobipes* : Distant, *Fauna Brit. India,* **1** : 349.

Material examined : 3 exs., Sikkim, Rongli, 2.V.1962, G. Ramakrishna Coll.

Diagnostic characters : Body above and legs pale brownish, moderately ochraceously pilose; pronotum with scattered black tuberculous spots on anterior area; posterior tibiae dentately dilated near base and then spinose to apex, the dentate dialation black with an ochraceous spot near base; body beneath with scattered small dark tuberculous spots, the surrounding areas of the intermediate and posterior coxae somewhat broadly piceous; antennae fuscous.

Distribution : India : Sikkim : Rongli, Maharashtra. *Elsewhere* : China, Java and Pakistan.

Remarks : * The species is recorded for the first time from the state

11. ***Petillia notatipes*** (Walker)

1871. *Trematocoris notatipes* Walker in *Cat. Het.* **4** : 34.

1904. *Petillia lobipes* : Distant, *Fauna Brit. India,* **1** : 349.

Diagnostic character : Very closely allied to *Petillia lobipes* but only differs in by the shorter and less produced pronotal angles in both the sexes. Adult with 20-22 mm. body length.

Distribution : India : Sikkim, West Bengal : Calcutta.

Genus 6. ***Petalocnemis*** Stal

1853. *Petalocnemis* Stal. *Ofe. Vet. - Ak. Fourth.* 259.

Type species : *Petlocnemis pachycera* Stal.

12. ***Petalocnemis obscura*** Dallas

1852. *Petalocnemis obscura* Dallas, *List. Hem.* **II** : 518.

1904. *Petalocnemis obscura* : Distant, *Fauna Brit. India,* **1** : 386.

Diagnostic characters : Body obscure brownish ochraceous, clothed with short hairs; pronotal angles broadly truncate; head and pronotum with a distinct central pale carinate line, body beneath and legs paler, posterior femora incrassated with a double series of tuberculate on the other area; anterior tibiae compressed, somewhat dialated with a double series of spinous tubercles on outer margin, intermediate tibiae tuberculate internally, posterior tibiae inwardly dialated and distinctly angulate at middle; antennae hirsute, the first, second and third joints concolorous with the body, apices of second and third joints black, apical joint brownish-ochraceous, its base paler. Adult one nearly 14 to 15 mm. long.

Distribution : India : Sikkim, Khasi Hills, Maharashtra. *Elsewhere* : Ceylon.

Genus 7. ***Helcomeria*** Stal

1873. *Helcomeria* Stal. En. Hem., **3** : 40.

Type species : *Helcomeria spinosa* Signoret.

13. ***Helcomeria spinosa*** Signoret

1851. *Helcomeria spinosa* Signoret, *Ann. Soc. ent. France,* : 123.

1904. *Helcomeria spinosa* : Distant, *Fauna Brit. India,* **1** : 336.

1919. *Helcomeria spinosa* : *Paiva, Rec, Indian Mus.*, **16** : 356.

Material examined : 2 exs. Sikkim, Mongan, 29.X.1992, M. S. Shishodia Coll.

Diagnostic characters : Body elongate 34 to 38 mm. long, anterior margin pronotum strongly spined, lateral margines of the dialated processes more regularly spinose, upper side finely tuberculated and rugose; posterior femora strongly tuberculate in both sexes, in male strongly spined before apex; posterior tibiae dialated on both sides, inwardly spined in male only; middle and anterior tibiae outwordly dialated.

Distribution : India : Sikkim, Assam, Nagaland.

Genus 8. ***Prionolomia*** Stal

1873. *Prionolomia* Stal, *En. Hem.*, **3** : 37.

Type species : *Prinolomia malaya* Stal.

14. ***Prinolomia fulvicornis*** (Fabricius)

1787. *Cimex fulvicornis* Fabricius, *Mant.*, **2** : 288.

1904. *Prionolomia fulvicornis* : Distant, *Fauna Brit. India,* **1** : 338.

Material examined : 2 exs. Tumi (North Sikkim), 24.X.1986, V. C. Agrawal Coll.

Diagnostic characters : Adult about 26-28 mm. in length, pronotum distinctly granulated anteriorly; lateral process of pronotum produced horizontally with the apices narrowed and obtusely pointed; posterior femora in male tuberculated on both above and beneath; posterior tibiae in male dialated on the inner side with prominently angulated.

Distribution : India : Sikkim, Khasi & West Garo Hills.

15. ***Prionolomia gigas*** Distant

1879. *Prionolomia gigas* Distant, *Ann. Mag. nat. Hist.*, **5** (2) : 128.

1904. *Prionolomia gigas* : Distant, *Fauna Brit. India,* **1** : 337.

Material examined : 2 exs. Rongpoo (East Sikkim), 10.V.1995, S. C. Mitra Coll.

Diagnostic characters : Adult about 43 mm. in length, pronotum rugose and obscurely granulated; lateral process of pronotum produced somewhat upward and forward, gradually narrowed to the apex; posterior femora in the male tuberculated above and prominantly spined beneath near apex; posterior tibiae in male prominantly dialated on both sides with strongly angulated beyond middle on the inner side.

Distribution : India : Sikkim, Khasi Hills, West Garo Hills. *Elsewhere* : Burma.

Genus 9. ***Ochrochira*** Stal

1873. *Ochrochira* Stal, En. Hem., **3** : 39.

Type species : *Ochrochira albiditaris* Westwood.

Key to the species of the genus *Ochrochira*

—Pronotum with distinct mid-longitudinal depression; Pronotal angles more produced and dentation on the posterior margin of lateral angles; first and fourth antennal joints subequal in length, while second and third joints almost equal; male with posterior femoral spine on each more stronger and longer structure .... *biplagiata*

—Pronotum with insconspicuous or no mid-longitudinal depression; Pronotum with lateral margins prominently produced, strongly and coarsely dentated; posterior femur of male with prominent spine placed a little beyond the middle ..... *albiditarsis*

16. ***Ochrochira albiditarsis*** (Westwood)

1842. *Myctis albiditarsis* Westwood, *in Hope Cat.*, 2 : 11.

1873. *Ochrochira albiditarsis* : Stal, *En. Hem.*, **3** : 44.

1904. *Ochrochira albiditarsis* : Distant, *Fauna Brit., India,* **1** : 342.

Material examined : 2 exs., Singtam (East Sikkim), 1.XI.1992, M. S. Shishodia Coll.

Diagnostic characters : Body length 23 mm. breadth between pronotal angles 8 mm.; other characters as in the key.

Distribution : India : Sikkim (East Sikkim) Himachal Pradesh, West Garo Hills. *Elsewhere* : Bangladesh.

17. ***Ochrochira biplagiata*** (Walker)

1971. *Prinolomia biplagiata* Walker, *Cat. Het.*, **4** : 22.

1893. *Ochrochira biplagiata* : Distant, *Ann. Mag. nat. Hist.*, **6** (12) : 121.

1904. *Ochrochira biplagiata* : Distant, *Fauna Brit. India,* **1** : 343.

Material examined : 2 exs., Sikkim, Ranipale, 15.V.1995, S. C. Mitra Coll.

Diagnostic characters : Body above ohraceous; antennae, eyes lateral dentation to pronotum transverse striae to scuttelum, membranous, body beneath and legs fuscous; apical joint of antennae and the tarsi pale ochraceous; pronotum with a somewhat distinct central longitudinal impression; other characters as in the key.

Distribution : India : Sikkim, Ranipole, Meghalaya, West Bengal. *Elsewhere* : Burma.

Remarks : *Both genus and species are the new record from the State of Sikkim.

Division MICTARIA

Genus 10. ***Mictis*** Leach

1843. *Mictis* Leach, *Zool. Misc.*, **1** : 92.

Type species : *Mictis profana* Fabricius.

18. ***Mictis tenebrosa*** (Fabricius)

1887. *Cimex tenebrosa* Fabricius, *Mant.*, **2** : 288.

1904. *Mictis tenebrosa* : Distant, *Fauna Brit. India,* **1** : 344.

Material examined : 6 exs., Sikkim, Mongan, 2.VI.1994, B. C. Das Coll.

Diagnostic characters : Greyish brown to brownish ochraceous; antennae, legs and body beneath somewhat darker in hue; abdomen above black with two large central ochraceous spots sometimes narrowly connected; pronotum with the lateral margins finely serrated, the lateral angles moderately, prominently subacutely rounded.

Distribution : India : Sikkim : Mongaon, Assam, Meghalaya, West Bengal. *Elsewhere* : Burma, China and Malay Peninsula.

Remarks : *Both the genus and species recorded for the first time from the State of Sikkim.

Genus 11. ***Anoplocnemis*** Stal

1973. *Anoplocnemis* Stal, En. Hem., **3** : 47.

Type species : *Anoplocnemis* curvipes (Fabricius).

19. ***Anoplocnemis phasciana*** Fabricius

1781. *Lygaeus phasciana* Fabricius, *Spec. Ins.*, **2** : 361.

1904. *Anoplocnemis phasciana* : Distant, *Fauna Brit. India,* **1** : 346.

Material examined : 2 exs., Sikkim, 6.V.1995, S. C. Mitra Coll.

Diagnostic characters : Colour varies from ochraceous, castaneous, piceous or piceous with the corium castaneous; antennae fuscous or piceous with the apical joint ochraceous; extreme apex of scutelum ochraceous; posterior femora in male much curved at base then strongly incrassate inwardly broadly dentate near apex, in both sexes; segmental margines are more or less distinctly ochraceous.

Distribution : India : Sikkim, Assam, Meghalaya, Karnataka, Maharashtra, Naga Hills. *Elsewhere* : Burma, Ceylon and Malay Peninsula

Remarks : Mostly infest brinjal.

* The species is recorded for the first time from the State of Sikkim.

Tribe **Cloresmini**

Key to the genera of the Tribe Cloresmini

1 (2) Rostrum almost reaching the base of mesosternum; antennae with 1st, 2nd and 3rd joints of nearly equal length .... *Notobitus*

2(1) Rostrum not reaching the base of mesosternum; antennae with 1st joint shorter than the 2nd ..... *Cloresmus*

Genus 12. *Cloresmus* Stal

1859. *Cloresmus* Stal *Ofv. Mant.*, **2** : 297.

Type species : *Cloresmus signoreti* Stal.

20. *Cloresmus antennatus* Distant

1908. *Cloresmus antennatus* Distant, *Fauna Brit. India,* **4** : 471.

Material examined : 2 exs. Sikkim Nongstain, 21.VIII.1991, R. S. Burman Coll.

Diagnostic characters : Body length 12-13 mm.; antennal basal joints clothed with long hairs; rostrum reaching the anteriior coxae; posterial femora conspicuously spined underside on the apical half, other characters as in the key.

Distribution : India : Sikkim (East Khasi Hills).

Genus 13. *Notobitus* Stal

1859. *Notobitus* Stal, *Ofv. Vet. - Ak. Forh.* : 451.

Type Species : *Notobitus meleagris* Fabricius.

21. *Notobitus meleagris* (Fabricius)

1787. *Cimex meleagris* Fabricius, *Mant.*, **2** : 297.

1835. *Nematopus meleagris* : Burmeister, *Handb,* **2** : 337.

1904. *Notobitus meleagris* : Distant, *Fauna Brit. India,* **1** : 371.

Material examined : 2 exs., Jorthan, West Sikkim, 8.V.1995, S. C. Mitra Coll.

Diagnostic characters : Body Length 22-25 mm., breadth between pronotal angles 6-7 mm; posterior tibiae of male with inner margins strongly serrate, posterior femur of male on the inner side with strong and prominent spine placed a little beyond the middle, and the femur reaching considerably beyond the apex of abdomen.

Distribution : India : Sikkim, Maharashtra, Tamil Nadu. *Elsewhere* : Burma, China, Malaya Archipelago.

Tribe **Gonocerini**

Key to the of the Tribe Gonocerini

1 (2) Lateral angles of pronotum horizontally produced; abdominal segmental angles externally acutely produced .... *Cletomorpha*

2 (1) Lateral angles of pronotum acutely upwardly produced; abdominal segmental angles not anteriorly acutely produced ..... *Cletus*

Genus 14. *Cletus* Stal

1859. *Cletus* Stal, *Freg. Eug. Resa, Ins. Hem,* 236.

Type species : *Cletus triginus* Thunb.

Key to the species of the genus *Cletus*

1 (2) Breadth between the pronotal angles 3-5.4 mm.; pronotal angles shortly but acutely produced, apices ending with sharp pointed fuscous spines; femora without castaneous spots ..... *bipunctatus*

2 (1) Breadth between the pronotal angles 4.5-5 mm.; pronotal angles widely and acutely produced, apices ending with short thick castaneous spines; all femora covered with numerous castaneous spots ..... *punctulatus*

22. *Cletus bipunctatus* (Westwood)

1842. *Cletus bipunctatus* Westwood, in *Hope Cat.*, **2** : 23.

1904. *Cletus bipunctatus* : Distant, *Fauna Brit. India,* **1** : 393.

1919. *Cletus bipunctatus* : Pairu, *Rec. Indian Mus.*, **16** : 358.

Material examined : 2 exs., Sikkim : Singlik, 9.V.1962, S. M. Ali Coll.

Diagnostic characters : Body beneath and legs luteous, a small spot on the lateral area of each sternal segment and a few small discal spots to abdomen black; antennae pale reddish ochraceous, the apical joint fuscous, pronotal lateral angles shortly but acutely produced, the apices of the spines fuscous.

Distribution : India : Sikkim, Singlik, Karnataka and Maharashtra. *Elsewhere* : Burma, Ceylon.

Remarks : Known as sugar cane black bug, also infest on paddy.

23. ***Cletus punctutatus*** (Westwood)

1842. *Coreus punctutatus* Westwood, *in Hope Cat.*, **2** : 23.

1904. *Cletus punctutatus* Distant, *Fauna Brit. India,* **1** : 392.

1919. *Cletus punctutatus* Paiva, *Rec. Indian Mus.*, **16** : 358.

Diagnostic characters : Body length scarcely 10 mm., breadth between pronotal angles 4.5 5 mm. Other characters as in the key.

Distribution : India : Sikkim, Assam, Khasi Hills, Nagaland, West Bengal.

Remarks : Material could not be examined. Following Distant (1904) included in the fauna from the State of Sikkim.

Genus 15. ***Cletomorpha*** Mayr

1866. *Cletomorpha* Mayr, *Reise Nov. Hem.*, 118.

Type species : *Chitomorpha bellula* Stal.

24. ***Cletomorpha raja*** Distant

1901. *Cletomorpha raja* Distant, *Amer. Mus. Nat. Hist.* (7) vii, 423.

1904. *Cletomorpha raja* Distant, *Fauna Brit. India,* **1** : 397.

1919. *Cletomorpha raja* : Paiva, *Rec. Indian Mus.*,**16** : 359.

Material examined : 2 exs., Tura, West Garo Hills, 19.VI.1991 B. N. Das Coll.

Diagnostic characters : Body length 9 mm.; breadth between pronotal angles 4 mm.; antennae dark brown in colour; antennal first and second joints subequal in length; pronotum with lateral angles acutely produced and distinctly recurved.

Distribution : India : Sikkim, Assam, West Bengal, West Garo Hills. *Elsewhere* : Burma.

Tribe **Homoeocerini**

Key to the genera of the Tribe Homoeocerini

1 (2) Posterior femora and tibiae modified; pronotal angles not prominent or moderately prominent 3

2 (1) Posterior femora and tibiae not modified; pronotal angles moderately prominent .... *Homoeocerus*

3 (4) Claval suture a little longer than the apical margin of corium; 4th antennal segment distictly shorter than the 3rd segment .... *Acanthocoris*

4 (3) Claval suture about as long as apical margin of corium; 4th antennal segment rather shorter than the 3rd segment *Physomerus*

Genus 16. ***Homoeocerus*** Burm.

1835. *Homoeocerus* Burm. *Handb*, ii (1) : 316.

Type species : *Homoeocerus puncticornis* Burm.

Key to the species of the genus *Homoeocerus*

1 (2) Pronotal angles moderately prominent to from small process on each 3

2 (1) Pronotal angles conspicuously prominent and each terminating with an acute spine-like structure 7

3 (4) Corium without any spot ..... *simiolus*

4 (3) Corium with spot 5

5 (6) Corium more or less shaded with castaneous, the anterior lateral and apical margins and a marginal spot at inner angle ..... *variabilis*

6 (5) Corium with a thin transverse rather pale spot near the inner angle..... *albiguttulus*

7 (8) Antennal 3rd joint shortest and considerably shorter than the 4th; corium without pale spot but with a subcostal black line .. *streicornis*

8 (7) Antennal 4th joint shortest and longer than 3rd; corium with pale spot but no subcostal black line 9

9 (10) Antennal 1st joint considerably shorter than second 11

10 (9) Antennal 1st joint a little shorter than second 13

11 (12) Corium with a small discal fuscus spot on the apical area ..... *serrifer*

12 (11) Corium with two small transverse spots placed at the inner angle ..... *walkeri*

13 (14) Antennal 3rd joint a little shorter than first; rostral segment 3rd about as long as 4th segment; corium with a large transverse pale spot placed only near the inner angle ..... *signatus*

14 (13) Antennal 1st and 3rd joints subequal in length; rostral 3rd segment longer than 4th; corium with a large transverse pale spot which laterally touches both inner and outer margin ..... *inornatus*

25. ***Homoeocerus albiguttulus*** Stal

1873. *Homoeocerus albiguttulus* Stal, *En. Hem.*, **3** : 61.

1904. *Homoeocerus albiguttulus* : Distant, *Fauna Brit. India*, **1** : 361.

Material examined : 2 exs., Sikkim, Rangpoo, 14.V.1995, S. C. Mitra Coll.

Diagnostic characters : Corium with a small pale luteous transverse spot near inner angle, broadly marginated posteriorly with piceous; antennae very pale custaneous; long, slender, second joint largest, first, third and fourth joints subequal in length, fourth joint luteous with its apical half black; rostrum with the third and fourth joint subequal in length.

Distribution : India : Sikkim : Ranipole, Assam, Meghalaya, West Bengal. *Elsewhere* : Burma, China.

Remarks : * The species is recorded for the first time from the State of Sikkim.

26. ***Homoeocerus inornatus*** Stal

1873. *Homoeocerus inornatus* Stal, *En. Hem.*, **3** : 58.

1904. *Homoeocerus inornatus* : Distant, *Fauna Brit. India*, **1** : 355.

Diagnostic characters : Antennae very pale castaneous; meso and metasterna with a very small fuscous spot on each lateral area; antenne with the second joint longest than the first, third joint subequal to the length to the first, fourth shortest; pronotum with the lateral angles moderately and subacutely produced between them, the disk is somewhat indistinctly infuscated.

Distribution : India : Sikkim, Pondicherry, West Bengal. *Elsewhere* : Burma, China and Rangoon.

27. ***Homoeocerus serrifer*** (Westwood)

1842. *Coreus serrifer* Westwood, in *Hope cat.* **2** : 24.

1904. *Homoeocerus serrifer* : Distant, *Fauna Brit. India*, **1** : 366.

Material examined : 2 exs., Gangtok, Sikkim, 20.IV.1978, A. N. T. Joseph Coll; 1 ex., Geyzing, Sikkim, 18.V.1995, S. C. Mitra Coll.

Diagnostic characters : Body ochraceous, thick and somewhat darkly punctate; lateral margins of pronotum and basal lateral margin of corium pale luteous; antennae with second joint longest, second and third subequal in length, fourth shortest, much shorter than first; pronotum with the lateral angles moderately angulately prominent.

Distribution : India : Sikkim : Gayzing, Maharashtra, Meghalaya and West Bengal. *Elsewhere* : Burma, Ceylon, China, Java and Malaya Peninsula.

Remarks : *Recorded for the first time from the State of Sikkim.

28. ***Homoeocerus signatus*** (Walker)

1871. *Homoeocerus signatus* Walker, *Cat. Het.*, **4** : 97.

1904. *Homoeocerus signatus* : Distant, *Fauna Brit. India*, **1** : 355.

Material examined : 3 exs., Chungthang (North Sikkim), 1.X.1993 T. K. Paul Coll; 1 ex., Mongan, Sikkim, 1.VI.1994, B. C. Das Coll.

Diagnostic characters : Corium with a large transverse mascular spot at inner angle and the lateral margins luteous; head with a narrow fascia on each side before eyes and the subangular lateral margines of the pronotum black; antennae with the

first and second joint pale castaneous, third joint black, lateral angles of the pronotum moderately and subacuately produced.

Distribution : India : Sikkim : Chungthung, Mongan; Maharashtra, West Bengal. *Elsewhere* : Ceylon.

Remarks : * Recorded for the first time from the State of Sikkim.

29. ***Homoeocerus simiolus*** Distant

1904. *Homoeocerus simiolus* Distant, *Fauna Brit. India*, **1** : 363.

1919. *Homoeocerus simiolus* : Paiva, *Rec. Indian Mus.*, **16** : 356.

Material examined : 2 exs., Sikkim, Ranipole, 25.V.1994, B. C. Das Coll.

Diagnostic characters : Head, pronotum, scuttelum, basal lateral margin of corium, body beneath and legs ochraceous; pronotum and the corium purplish brown; two small spots placed transversely and sometimes amalgamated at inner angles of corium luteous; antennae pale castaneous, apical joint infuscated, apices of second and third joints piceous, first joint much shorter than second and slightly longer than third, the apex of which is a little dialated.

Distribution : India : Sikkim : Jorthung, Assam, Meghalaya, Naga Hills and West Bengal. *Elsewhere* : Burma, Ceylon.

Remarks : *This species is a new record from the State of Sikkim.

30. ***Homoeocerus striicornis*** Scott

1874. *Homoeocerus striicornis* Scott, Ann. Mag. nat. Hist., **14** (4) : 362.

1904. *Homoeocerus striicornis* : Distant, Fauna Brit. India, **1** : 360.

Material examined : 2 exs., Gangtok, East Sikkim, 21.IV.1978, A. N. T. Joseph Coll.

Diagnostic characters : Body length 17-20 mm., breadth between pronotal angles 4.5 - 5.5 mm.; third antennal joint shortest and considerably shorter than fourth; corium with no pale spot but a subcostal black line.

Distribution : India : Sikkim (East Sikkim), Assam, East Khasi Hills, Maharashtra. *Elsewhere* : Japan, Sri Lanka

31. ***Homoeocerus variabilis*** Dall

1852. *Homoeocerus variabilis* Dall, List. Hem, **ii** : 502.

1904. *Homoeocerus variabilis* : Distant, *Fauna Brit. India*, **1** : 375.

Diagnostic characters : Head, pronotum and scuttelum ochraceous or greenish ochraceous ; lateral margines of the head and pronotum and a broad basal fascia between the pronotal angles dark, castaneous; membrane dark bronzy; body beneath and legs pale ochraceous, apices of femora, the tibiae and tarsi castaneous; antennae stout, bases of second and third joints luteous, first and third joints luteous, first and third joints subequal in length, second the longest, fourth shorter, third somewhat dialated at apex, pronotum with the lateral angles subprominent. Length about 13 to 16 mm., breadt between pronotal angles 4.5 to 5 mm.

Distribution : India : Sikkim, Tamil Nadu.

Remarks : * This species is recorded from the first time from the State of Sikkim.

32. ***Homoeocerus walkeri*** Kirby

1891. *Homoeocerus walkeri* Kirby, *J. Linn. Soc. Zool.*, **24** : 91.

1904. *Homoeocerus walkeri* : Distant, *Fauna Brit. India*, **1** : 358.

Diagnostic characters : Head, pronotum, scutellum, basal lateral margins of corium, body beneath and legs ochraceous; ponotum and the corium purplish brown; two small spots placed transversely and some times amalgamated in inner angles of corium luteous, antennae pale castaneous, apical joint infuscated, apicas of second and third joint piceous, first joint much shorter than second and slightly longer than third, the apex of which a little dialated, antennal fourth joint shortest and longer than third.

Distribution : India : Sikkim. Assam, Meghalaya (Khasi Hills, East garo Hills, Nagaland). *Elsewhere* : Burma, Sri Lanka.

Genus 17. *Physomerus* Burmeister

1853. *Physomerus* Burmeister, *Hanbd.*, **2** : 341.

Type species : *Lygaeus grossipes* Fabricius.

33. *Physomerus grossipes* (Fabricius)

1794. *Lygaeus grossipes* Fabricius, *Ent. Syst.*, **4** : 135.

1871. *Physomerus dilineatus* : Walker, *Cat. Het.*, **4** : 59.

1904. *Physomerus grossipes* : Distant, *Fauna Brit. India*, **1** : 383.

Material examined : 3 exs., Phudong (North Sikkim), 21.IV.1994, S. K. Saha Coll.

Diagnostic Characters : Body length 20-24 mm., breadth between pronotal angles 5.5-6.5 mm.; posterior tibiae femora modified, pronotum either not prominent or moderately prominent; claval suture as long as apical margin of corium; 4th antennal joint slightly shorter than the 3rd joint, posterior femora strongly incrassate, finely longitudinally tuberculate on upper and outer areas and obtusely spinous beneath, each with a long spine at the middle of inner margin and finely serrated upto spex; rostrum reaching the intermediate coxae.

Distribution : India : Sikkim, Phudong; Andaman & Nicobar Islands, Assam, East Khasi Hills, Maharashtra and West Bengal. *Elsewhere* : Burma, Malaya Archipelago, Sri Lanka.

Genus 18. *Acanrthocoris* Amyot and Surville

1843. *Acanthocoris* Amyot and Surville, *Hem.*, : 213.

Type species : *Acanthocoris scabrator* (Fabricius).

34. *Acanrthocoris* scabrator (Fabricius)

1803. *Coreus scabator* Fabricius, *Syst. Rhyng.*, : 195.

1904. *Acanrthocoris* scabrator : Distant, *Fauna Brit. India*, **1** : 385.

Material examined : 1 ex., Sikkim, Bungtan, 11.IV.1959, A. G. K. Menon Coll.

Diagnostic characters : Fuscous or brown with numerous brownish ochraceous points; antennae hirsute, the apical joint ochraceous with its base fuscous; pronotum with the lateral angles acutely produced, their anterior margin serrate; posterior femora moderately incrassated toothed or serrate on inner margin; rostrum reaching the intermediate coxae.

Distribution : India : Sikkim, Assam, Karnataka, Maharashtra, Meghalaya, West Bengal. *Elsewhere* : Burma, Ceylon.

Remarks : *This species is recorded for the first time from the State of Sikkim.

Genus 19. *Aschistocoris* Bergr

1909. *Aschistocoris* Bergr. *Ann. Soc. Ent. Belg.* 1.iii. : 185.

Type species : *Aschistus brevisiphon* Dall.

35. *Aschistocoris brevisiphon* (Dall)

1873. *Aschistus brevisiphon* Dall *Stal. En. Hem.*iii : 63.

!908. *Aschistocoris brevisiphon* (Dall) : *Bergr. Ann. Soc. Ent. Belg.* : 185.

Material Examined : Damaged specimen described from literature with the help of damaged specimen available.

Diagnostic characters : In this genus central lobe of the head is not deflected; the sixth abdominal segment in the female is posteriorly truncated, centrally emerginate, but not profoundly cleft; the female anal abdominal segment as seen above about twice, not three times broader than long, hemielytra not reaching the apex of the abdomen. In *Aschistocoris brevisiphon* the body is elongate; ochraceous, thickly and rather darkly punctate, membrane not reaching the apex of abdomen, body beneath and legs very pale ochraceous, sternum very coarsely punctate, abdomen finely and darkly punctate; antennae with the first, second and third joints minutely dark spotted; first, third and fourth joints subequal in length; second joint longest. Body length about 15 mm.

Distribution : India : Sikkim, Karnataka (Mumbai), North India.

Subfamily CORIZINAE

Genus 20. ***Serinetha*** Stal

1837. *Serinatha* Stal, *En. Hem.*, **iii** : 99.

Type species : *Serinatha abdominalis* Fabricius.

Key to the species of genus *Serinetha*

1 (2) Body pale, smaller in size 14-15 mm. in length, pronotum distinctly centraly carinate and finely punctate ..... *augur*

2 (1) Body piceous, larger in size 16-21 mm. in length 3

3 (4) Head with a distinct incision in front of and between the ocelli; head, lateral areas of pronotum, lateral margin of sternum and abdomen pale; pronotum obtusely centrally carinate ..... *rufomaculata*

4 (3) Head never with the distinct incision in front of and in between ocelli, head rugously excavated, pronotum thickly and some what coarsely punctate, legs longly pilose .... *abdominalis*

36. ***Serinetha abdominalis*** Fabricius

1803. *Serrnetha abdominalis* Fabricius, *Syst. Rhyng.*, : 226

1904. *Serrnetha abdominalis* : Distant, *Fauna Brit. India*, **1** : 419

Material examined : 2 exs., Sikkim, Singlik, 9.V.1962, S. M. Ali Coll.

Diagnostic characters : Body 16-20 mm. in length; antennae, legs membranous, disks of sternum and abdomen beneath piceous; head rugously excavated; pronotum thickly and somewhat coarsely punctate, the lateral margins hirsute; legs longly pilose.

Distribution : India : Sikkim, Assam, Maharashtra, West Bengal. *Elsewhere* : Ceylon.

37. ***Serinetha augur*** (Fabricius)

1781. *Cimex augur* Fabricius, Spec. Ins., **11** : 366.

1904. *Serinetha augur* : Distant, *Fauna Brit. India* **1** : 420.

Material examined : 2 exs., Sikkim, Mongan, 2.IV.1994, B. C. Das Coll.

Diagnostic Characters : Body 14-15 mm. in length, pale, antennae, rostrum, legs and membrane piceous; pronotum very distinctly and centrally carinate and finely punctate; lateral margins moderately hirsute.

Distribution : India : Sikkim, Assam, Chennai, Maharashtra, West Bengal. *Elsewhere* : Ceylon, Malaya Peninsula.

38. ***Serinetha rufomarginata*** (Fabricius)

1974. *Lygaeus rufomarginata* Fabricius, *Ent. Syst.*, **iv** : 152.

1852. *Serinetha rufomarginata* : Dall, *List. Hem.*, **ii** : 460.

1904. *Serinetha rufomaculata* : Distant, *Fauna Brit. India*, **1** : 419.

Material examined : 2 exs., Sikkim, Rongpoo, 14.V.1995, S. C. Mitra Coll.

Diagnostic Characters : Body 18-21 mm. in length; Piceous, head, lateral margins of corium, both above and beneath, lateral margins of sternum and abdomen apex of abdomen sanguineous; pronotum obtusely centrally carinate; apical joint of antennae somewhat greyishly pilose, head with a very distinct incision in front of and between ocelli.

Distribution : India : Sikkim, West Bengal. *Elsewhere* : Borneo and Phillipines

SUMMARY

The paper presents an account of 38 species belonging to 20 genera of the Superfamily Coreoidea. Out of the four families of Coreoidea only two families viz., Alydidae and Coreidae are represented in the State of Sikkim. Most of the species also belong to Coreidae which is the largest family and good number of species infest on most of the economically important crops like cereals, pulses, vegetables etc. and cause considerable damage to the agricultural yeild. In the present paper two genera and 9 species are newly recorded from the State of Sikkim. Key to different Subfamilies, Divisions, Genera and

species are provided for easy differentiation and identification of coreid species. Diagnostic characters of each species have been provided. Distribution pattern of all the species available in the state have also been provided for knowing the range of distribution of those species in India and other countries in the world. Only a few species have been recorded and their salient identifying features have been mentioned from the literature only in those cases where sufficient materials were not available for study. The present contributon is an comprehensive account of the Coried fauna so far known from the State of Sikkim.

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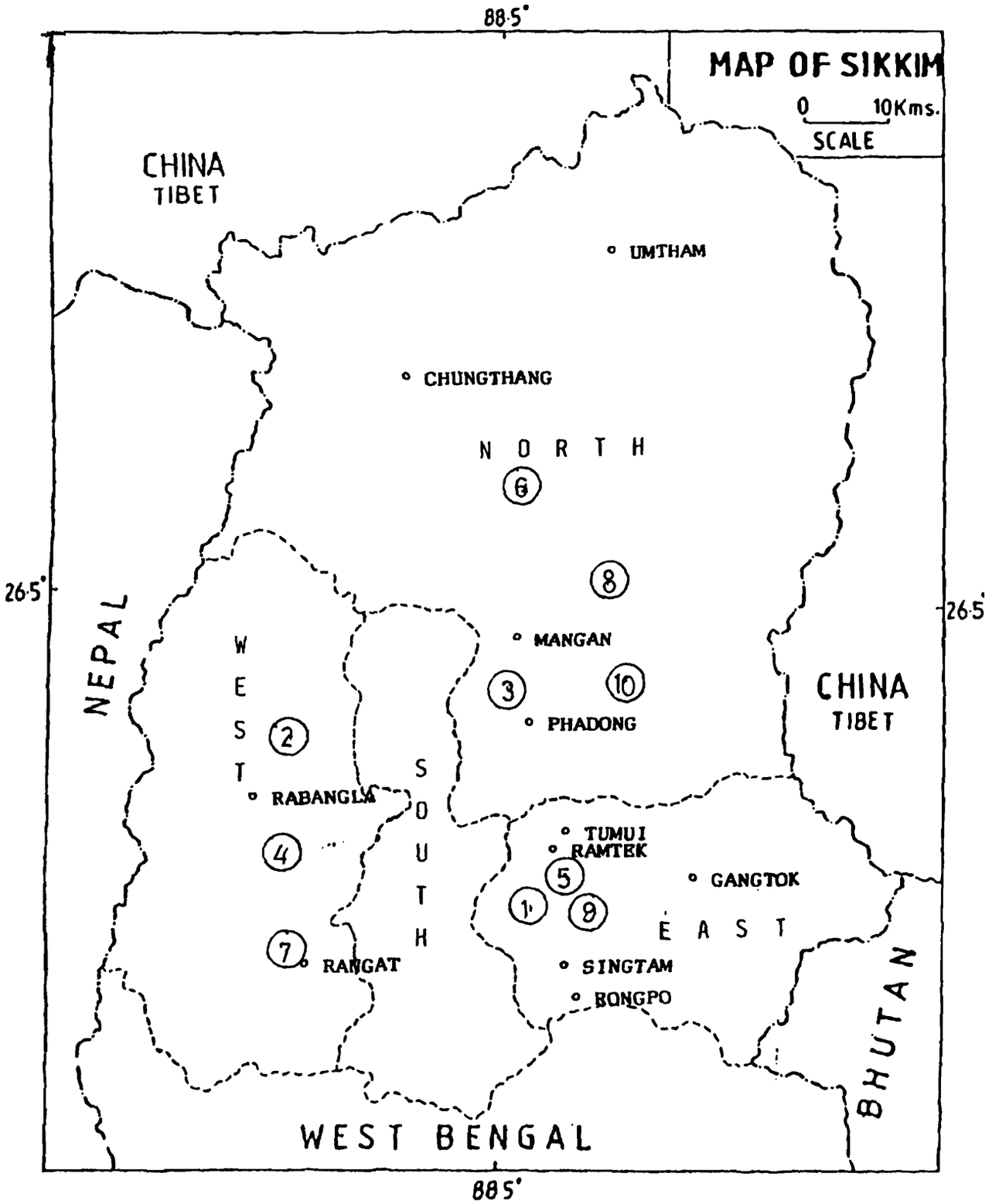
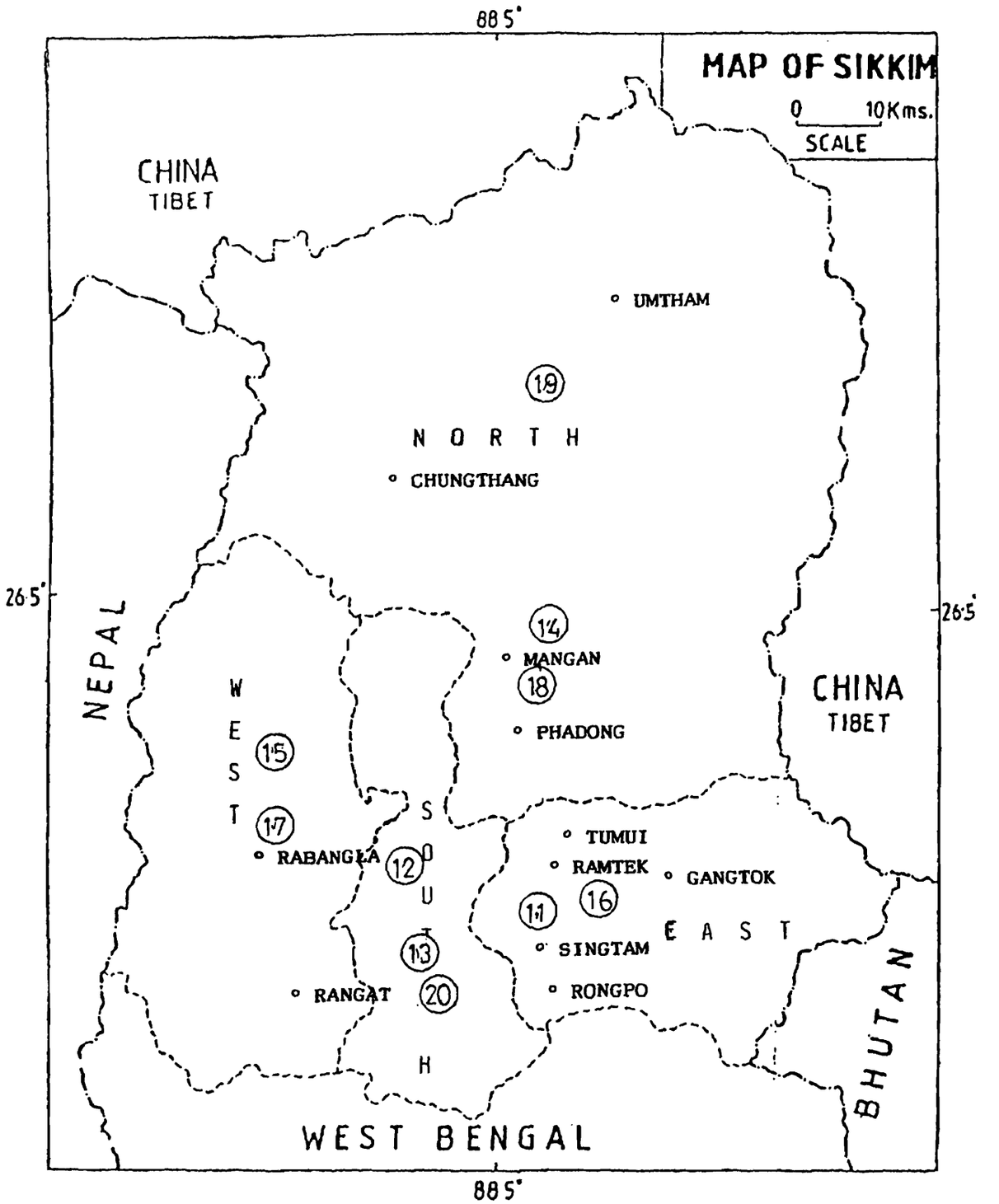


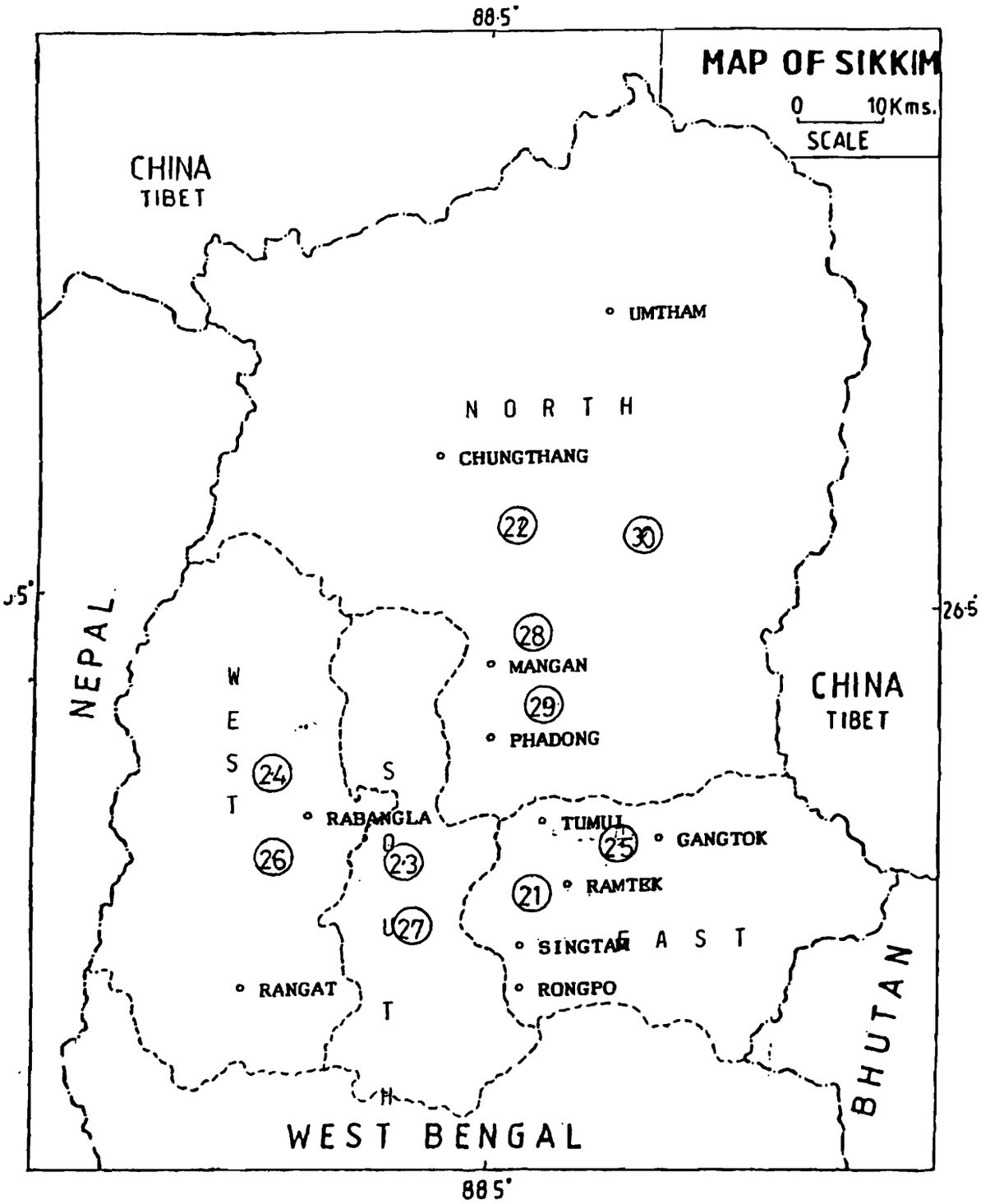
Map 1. Distribution of Coreid bugs in Sikkim (Species No. 1-10)

1. *Leptocorisa acuta*
2. *Clavigralla horrens*
3. *Riptortus linearis*
4. *Riptortus sternuus*
5. *Riptortus fuscus*
6. *Riptortus pedestris*
7. *Daladar planiventri*
8. *Petillia calcer*
9. *Petilla lobipes*
10. *Petillia notatipes*



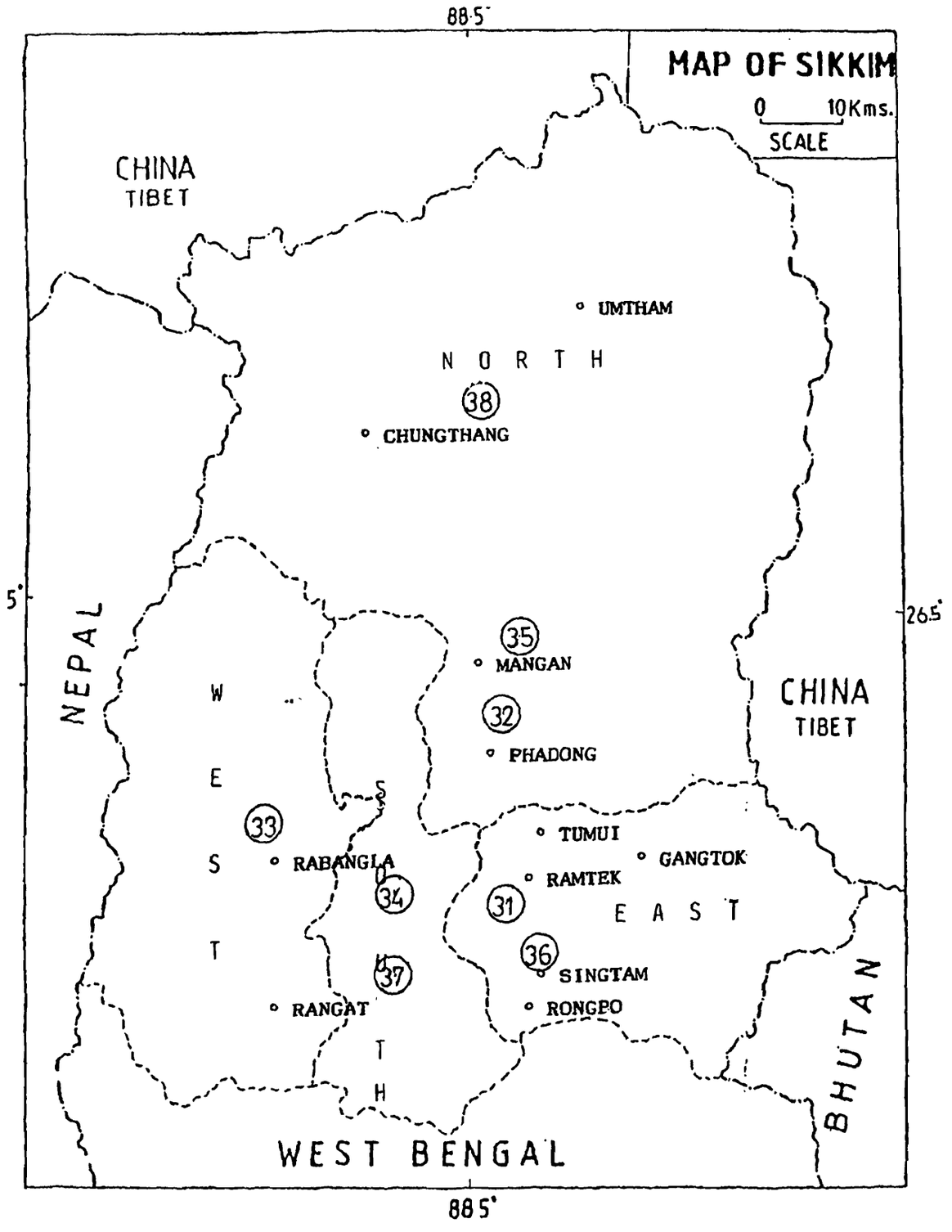
Map - 2 : Distribution of Coreid bugs in Sikkim (Species No. 11-20)

11. *Petillia palulicollis*
12. *Petalocnemis obscura*
13. *Helcomeria spinosa*
14. *Prilomia fulvicornis*
15. *Prinolomia gigus*
16. *Ochrochira bipagiata*
17. *Ochrochira albiditarsis*
18. *Mictis tenebrosa*
19. *Anplocnemis phasiana*
20. *Cloresmus antennatus*



Map - 3 : Distribution of Coreid Bugs in Sikkim (Species No. 21-30)

21. *Notobitus meleagris*
22. *Cletus bipunctatus*
23. *Cletus bipunctatus*
24. *Cletomorpha raja*
25. *Aschistocoris brevicornis*
26. *Homoeocerus albiguttulus*
27. *Homoeocerus inornatus*
28. *Homoeocerus siniolus*
29. *Homoeocerus signatus*
30. *Homoeocerus signatus*



Map - 4. Distribution of Coreid Bugs in Sikkim (Species 31-38)

31. *Homoeocerus stricornis*
32. *Homoeocerus walleri*
33. *Homoeocerus variabilis*
34. *Physomerus grossipes*
35. *Acanthocoris scabrator*
36. *Serinatha abdominalis*
37. *Serinatha augur*
38. *Serinatha rofumarginata*

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INSECTA : HEMIPTERA : HETEROPTERA : PENTATOMOIDE

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INTRODUCTION

The Pentatomids or "Shield Bugs" are mostly phytophagous. Some are carnivorous in habit. Some are pests on vegetable crops. A few families like Asopidae are predaceous on lepidopterous larvae. The insects exhibit beautiful colouration and emit nauseous odour. The group is distributed over tropical and temperate zones.

About 350 species of Pentatomoidea are known from India through the works of Distant. 1902, 1908, 1918; Nayar *et. al.* 1978, Datta *et al.* 1985; Mathew 1986; and Chakraborty *et al.* 1993.

Our knowledge on Pentatomid fauna of Sikkim is scanty. A perusal of literature reveals that altogethr 107 species belonging to 62 genera in 9 families are so far known from the State of Sikkim (Distant 1902, 1908, 1918). The present work is an attempt to provide a comprehensive account of 22 species (out of 107species) belonging to 17 genera under 5 families of Pentatomiodea. The material for remaining species could not be studied. As such, these are not dealt with in this paper. Five species marked (*) are new records from Sikkim and the species marked (**) is hithero reported for the first time from India. The work is based on the recent collections made by different party members of Zoological Survey of India and also the old collections represented in the department. It is also supplemented by the materials deposited in the National Zoological Collection made by the earlier survey parties of Zoological Survey of India. A list of species so far known from Sikkim is appended.

Material and Methods, general diagnosis of the group have been dealt with in the Fauna of West Bengal (State Fauna Series 3, 1993).

The classification is basically followed after Distant 1902. The material is in the Zoological Survey of India, Kolkata.

The account deals with keys to taxa, diagnostic characters, geographical distribution of each species and literature reference Charts showing the districtwise distribution of 22 species from Sikkim are included in this paper. [Besides, Maps showing the distribution of the species within the the State of Sikkim is also provided.]

CLASSIFIED LIST OF PENTATOMOIDEA OF SIKKIM

Order HEMIPTERA
Sub order HETEROPTERA
Super Family PENTATOMOIDEA
Family PENTATOMIDAE
Division I ANTESTIARIA
Genus 1 ***Plautia*** Stal

1. *Plautia fimbriata* (Fabricius)

Division II CARPOCORARIA
Genus 1 ***Cappaea*** Ellenr

2. *Cappaea taprobanensis* (Dallas)

Genus 3 ***Olumnia*** Stal

3. *Tolumnialatipes* (Dallas)

Division III URYDEMARIA
Genus 4 ***Eurydema*** Laporte

4. *Eurydema pulchrum* (Westwood)

Division IV EUSARCOCORIARIA
Genus 5 ***Eysarcoris*** Hahn.

5. *Eysarcoris guttiger* (Thunberg)
6. *Eysarcoris montivagus* (Distant)
7. *Eysarcoris ventralis* (Westwood)

Division V HALYARIA

Genus 6 ***Dalpada*** Amyot & Serville

8. *Dalpada jugatoria* Leth
9. *Dalpada oculata* (Fabricius)
10. *Dalpada* sp.

Division VI NEZARIA

Genus 7 ***Zangis*** Stal

*11. *Zangis crassa* (Westwood)

**12. *Zangis dorsalis* (Dohrn)

Family II SOPIDAE

Genus 8 ***icrona*** Amyot & Serville

*13. *Zicrona caerulea* (Linnaeus)

Family III SCUTELLERIDAE

Genus 9 ***Cantao*** Amyot & Serville

14. *Cantao ocellatus* (Thunberg)

Genus 10 ***Chrysocoris*** Hahn

15. *Chrysocoris grandis* (Thunberg)

Genus 11 ***Hotea*** Amyot & Serville

*16. *Hotea curculionoides* (Harr.-Sch)

Genus 12 ***Lamprocoris*** Stal

17. *Lamprocris* Sp.

Genus 13 ***Poecilocoris*** Dallas

*18. *Poecilocoris hardwickii* (Westwood)

Family IV TESSARATOMIDAE

Genus 14 ***Eusthenes*** Laporte

*19. *Eusthenes cupreus* (Westwood)

Family V UROSTYLIDAE

Genus 15 ***Urochela*** Dallas

20. *Urochela guttulata* Stal

Genus 16 ***Urolabida*** Westwood

21. *Urolabida* sp.

Genus 17 ***Urostylis Westwood***

22. *Urostylis* sp.

SYSTEMATIC ACCOUNT

Key to families of PENTATOMOIDEA

1. Hamus present; scutellum covering the whole of the hemelytra, excepting extreme of outer margin ..... SCUTELLERIDAE

— Hamus absent; scutellum extending to or rarely beyond middle of adbomen 2

2. Spiracles of basal ventral segment not hidden by metasternum ..... TESSARATOMIDAE

— Spiracles at basal ventral segment hidden by metasternum 3

3. Rostrum short, not usually passing anterior coxae ..... UROSTYLIDAE

— Rostrum long, always passing anterior coxae, membrane small 4

4. Basal segment of rostrum inserted at labrum ..... ASOPIDAE

— Basal segment of rostrum not inserted at labrum ..... PENTATOMIDAE.

Family 1. PENTATOMIDAE

Key to the Division

1. Scutellum broad 2

— Scutellum triangular 3

2. Body obovate; lateral lobes of head never meet infront of central lobe ..... EUSARCOCORIARIA

3. Abdomen armed at base 4

— Abdomen unarmed at base 5

4. Lateral pronotal angle usually rounded .... NEZARIA

5. Lateral margin of pronotum serrate or dentate ..... HALYARIA

— Lateral margin of pronotum normal 6

6. Abdomen with a short basal furrow ..... CARPOCORARIA

— Abdomen without basal furrow 7

7. Body abovate, head subtriangular ..... ANTESTIARIA

— Body elongate, head obovate ..... EURYDEMARIA

Division 1. ANTESTIARIA

Genus 1. ***Plautia*** Stal, 1867

1867. *Plautia Stal Ofv. Vet. Ak. Forth, : 514*

Type Species : *Plautia fimbriata* (Fabricius)

1. ***Plautia Fimbriata*** (Fabricius)

1787. *Cimex Fimbriata* Fabricius Mant. Ins., **11** : 295

1904. *P.lautia Fimbriata* (Fabr.); Distant, *Fauna Brit. India, Rhyn.* **I** : *191.*

1989. *Plautia fimbraiata* (Fabr.); Ghosh L.K., Biswas, Chakraborty & Sen, *Fauna of Orissa : State Fauna Series No.* **1** : *205.*

Material examined : 2 exs., Jorethang, South Sikkim, 5 xi. 1994, coll *G.C. Sen and party.*

Diagnostic characters : Head, pronotum and scutellum bright pale olivaceous green; corium pur-plish-red with greenish lateral margins and usually with posterior discal spots; membrane fuliginous with two brown spots on base; abodomen above red; the central disc of abdomen beneath greenish ochraceous.

Length : 10-11 mm.

Distribution : India : Sikkim (South Sikkim); Maharashtra, Meghalaya, Nagaland, Tamil Nadu, West Bengal.

Elsewhere : Burma, China, Japan, Madagaskar, Malaya Peninsula, Malayan Archipelago, Sri Lanka.

Division II. CARPOCORARIA

Key to genera

1. Lateral pronotal margin oblique; rostrum extended to the base of 2nd abdominal segment; base of abdomen with the short furrow ..... CAPPAEA

— Lateral pronotal margin elevated; rostrum extended beyond posterior coxae; base of abdomen normal ..... TOLUMNIA

Genus 2. ***Cappaea*** Ellenr, 1862

1862. *Cappaea* Ellenr. *Nat. Tjdeschr. Nederl. Ind.,* **24** : 146.

Type species : *Cappaea taprobanensis (Dallas)*

2. ***Cappaea taprobanensis*** (Dallas)

1851. *Pentatoma taprobanensis* Dallas, *List. Hem.,* **1** : 244

1904. *Cappaea taprobanensis,* Distant, *Fauna Brit. India, Rhyn.,* **1** : 149.

1994. *Cappaea taprobanensis,* Chakraborty, Ghosh & Basu, *Rec. zool. Surv. India Occ.* Paper No. **161** : 144.

Material examined : 1 ex, East Sikkim, Tumin, 29 ix. 85, coll. V.C. Agrawal.

Diagnostic characters : Body above black except lateral margins and three longitudinal lines to head; lineate reticulations on lateral areas of pronotum; a central fasciate line and two curved united lineson base of scutellum. margins and submarginal lines to corium luteous; body beneath and legs also luteous, also legs spotted with black; antennae fuscous with basal segments ochraceously spotted; membrane fuliginous with brown spots.

Length : 10-11 mm.

Distribution : India : Sikkim (East Sikkim); Kerala, Meghalaya, Tamil Nadu.

Elsewhere : Java, Sumatra, Sri Lanka.

Remarks : This species is a pest on *Citrus* spp. (Rutaceae).

Genus 3. ***Tolumnia*** Stal, 1867

1867. *Tolumunia* Stal, *Ofv. Vet. Ak. Forh.* : 515

Type species : *Tolumnia trinotaba* Westwood

*3. ***Tolumnia latipes*** (Dallas)

1857. *Pentatoma latipes* Dallas *List hem.* **1** : *238*

1904. *Tolumnia latipes,* Distant, *Fauna Brit. India, Rhyn.,* 154.

Material examined : 3 exs., North Sikkim, Chunthang, 15.v.92; coll. *J.H. Prasad and party.*

Diagnostic charecters : Body above dark brown, thickly punctate and faintly irrorated with ochraceous; scutellum with apex and two large spots at basal angles luteous; body beneath and legs luteous; three small spots on each lateral area of the sternum, apices of femora, tibiae and tarsi and apex of rostrum black. Antennae ochraceous with 1st segment black.

Length : 9 11 mm.

Distribution : India : Sikkim (North Sikkim); Kerala, Nagaland.

Elsewhere : Burma, Hong Kong, Indonesia and Malaya Peninsula.

Division III. EURYDEMARIA

Genus 4. ***Eurydema*** Laporte, 1832

1832. *Eurydema* Laporte, *Ess. Hem. :* **61**

Type Species : *Eurydema oleraceum* (Linnaeus)

*4 ***Eurydema pulchrum*** (Westwood)

1837. *Pentatoma pulchrum Westwood, Hope Cat.,* **1** *:* 34.

1904. *Eurydema pulchrum (Westood), Distant, Fauna Brit. India, Rhyn.,* **1** : 190-191.

1998. *Eurydema pulchrum,* Chakraborty and Ghosh, *Fauna of Meghalaya,* State Fauna Series **4** : 400.

Material examined : 1 ex., North Sikkim (Mongan); 11. iv. '92, coll. *A.S. Risha and party;* 2 exs., East Sikkim (Daragaon); *11. iii.94, Col. L.K. Ghosh and Party; 11 exs.* East Sikkim (Tadong); *10. iii. 94. coll. L.K. Ghosh and Party; 6 exs.* South Sikkim (Namchi) *21. iii. 94, coll. L.K. Ghosh and Party.*

Diagnostic characters : Reddish-ochraceous, spotted with black; pronotum with 6 black spots, 2 anterior and transverse, four discal; scutellum with a large basal spot and two marginal subapical spots black; body beneath and legs luteous; lateral and central sternal and abdominal margins are marked with series of transverse black spots.

Distribution : India : Sikkim (East Sikkim, North Sikkim and South Sikkim), Assam, Meghalaya, Nagaland.

Elsewhere : Burma, China, Sumatra and Queensland.

Remarks : This species is hitherto reported as new from the state is found infesting mustard plants in Sikkim.

Division IV. EUSARCOCORIARIA

Genus 5. ***Eysarcoris*** Hahn, 1834

1834. *Eysarcoris Hahn.* Wanz., **11** : 66

Type species : Eysarcoris aeneus (Scopoli)

Key to species of *Eysarcoris*

1. Ventral abdominal disc is wholly black... 2

— Ventral abdominal disc is not wholly black but with a central angulate fascia being black; apical joint of antennae brownish yellow; lateral angles of pronotum acutely prominent ..... *Montivagus*

2. Anterior area of pronotum normal, without any spot; apical joint of antennae shining black; lateral angles of pronotum obtusely prominent ..... *Sluttiger*

— Anterior area of pronotum with two large brassy-black spots, pronotal angles simple .....*Slentralis*

5. ***Eysarcoris guttiger*** (Thunberg)

1783. *Cimex guttiger Thunberg, Nov. Ins. Sp.,* **2** : 32

1857. *Eysarcoris guttiger* (Thunberg), Dallas, *List. Hem.,* **1** : 288

1998. *Eysarcoris guttiger* (Thunberg), Chakroborty and Ghosh, Fauna of *Meghalaya :* State Fauna Series **4** : 402.

Material examined : 1 ex., East Sikkim (Ranipool), 30.x.1992, coll. *A.K. Hazra and Party;* 1 ex., East Sikkim (Ranipool), 23.x.1994, coll. *G.C. Sen and Party;* 1 ex., South Sikkim (Jorethang), 8. xi. 1994, coll. *G. C. Sen and Party,* 1 ex., East Sikkim (Tadong), 31.x.1994, coll. *G.C. Sen and Party;* * 1ex., Sikkim (Reg. No. 9239/7).

Diagnostic characters : Body above obscure luteous, thickly punctured with bronzy-black; extreme lateral margins of the pronotum, a large spot near each basal angle of the scutellum luteous; body beneath and legs ochraceous; central area of sternum black, opaque. Other characters as shown in key.

Length : 5.25-5.5. mm

Distribution : India : Sikkim (East Sikkim, South Sikkim); Maharashtra, Meghalaya, Nagaland, Orissa, South India, West Bengal.

Elsewhere : Sri Lanka.

Remarks : Material (*) is represented in N.Z.C. without collection data.

6. *Eysarcoris montivagus* (Distant)

1904. *Eysarcoris montivagus* (Distant) *Fauna Brit. India.*, 1 : 166.

1989. *Eysarcoris montivagus* (Distant), L.K. Ghosh *et al., Fauna of Orissa : State Fauna Series No.* 1 *: 204.*

1998. *Eysarcoris montivagus* (Distant) Chakraborty and L.K. Ghosh, *Fauna of Meghalaya : State Fauna Series* 4 : 402.

Material examined : 1 ex., South Sikkim, Tarku, 27.iv.94,coll. *S.N.Saha and party;* 1 ex., South Sikkim, Jorethang, 8.xi.94, coll. *G.C. Sen and Party* 4 exs., Sikkim (Reg. No. 9236.7, 9238/7, 2057/8 and 399/6).

Diagnostic characters : Body above obscure luteous; central lobe of head usually defined by a levigate ochraceous line; the lateral margin of scutellum more or less brassy (-) black. Other characters as shown in key.

Length : 5-5.5 mm.

Distribution : India : Sikkim (South Sikkim); Assam, Meghalaya, Nagaland, Orissa, West Bengal.

7. *Eysarcoris ventralis* (Westwood)

1837. *Pentatoma ventralis* Westwood, *Hope. Cat.*, 1 : 36.

1904. *Eysarcoris ventralis,* Distant, *Fauna Brit. India, Rhyn.*, 1 : 167.

1998. *Eysarcoris ventralis,* Chakraborty & L.K. Ghosh, *Fauna of Meghalaya : State Fauna Series* 4 : 402.

Material examined : 1 ex., East Sikkim, Pakyang, 21. v. 94, coll. *S. Chattopadhyay,* *2 exs., Sikkim (Reg. No. 3447/6 and 9311/7)

Diagnostic Characters : Body above brownish ochraceous; head brassy-black; body beneath and legs ochraceous, darkly punctate; large rounded spots near each basal angle of the scutellum levigate, luteous. Other characters as shown in key.

Length : 5.5-6.5 mm.

Distribution : India : Sikkim (East Sikkim); Arunachal Pradesh, Bihar, Karnataka, Maharashtra, Meghalaya, West Bengal.

Elsewhere : Burma, Malaya Peninsula.

Remarks : Material(*) is represented in N.Z.C. without *Collection data.*

Division V. HALYARIA

Genus 6. *Dalpada* Amyot & Serville, 1843

1843. *Dalpada* Amyot & Serville, Hem. : 105

Type species : *Dalpada aspera* Amyot and Serville

Key to species of *Dalpada*

Anterior tibiae prominently dilated; laterla pronotal angles subnodulose; membrane normal ..... *oculata*

— Anterior tibiae normal; lateral pronotal angles distinctly nodulose; membranes with a series of fuliginous apical spots .... *jugatoria*

8. *Dalpada jugatoria* Leth

1891. *Dalpada jugatoria* Leth, *Anun. Soc. Ent. Belg. Bull.* : 142.

1904. *Dalpada jugatoria,* Distant, *Fauna Brit. India Rhyn.*, 1 : 112.

Material examined : 1 ex., North Sikkim, Mongan, 12.iv.92, coll. *R.S. Mirdha.*

Diagnostic characters : Ohraceous mottled with dark olivaceous-green; antennae brownish with bases of 4th and 5th segments ochraceous; lateral pronotal angles inwardly distictly furrowed. Rostrum just passing the posterior coxae. other charecters as shown in key.

Length : 15-18 mm.

Distribution : India : Sikkim (North Sikkim); Meghalaya, Nagaland, West Bengal.

Elsewhere : Burma.

9. *Dalpada oculata* (Fabricius)

1775. *Cimex oculata* Fabricius, *Syst. Ent.*, : 703.

1985. *Dalpada oculata,* Dutta, L.K. Ghosh and Dhar, *Rec. Zool. Surv. India, Occ. Paper No.* 80 : 12.

1998. *Dalpada oculata,* Chakraborty and L.K. Ghosh, *Fauna Meghalaya, State Fauna Series* : 403.

Material examined : 1 ex., East Sikkim, Rongpo, 14.iv.94, coll. *P.H. Roy and Party;* * 2exs...Sikkim (Reg. No. 4467/6 and 9286/7).

Diagnostic characters : Body above ochraceous; apical fourth of scutellum luteous; connexivum alternately greenish and ochraceous; lateral margins of the head, sternum and abdomen shining metallic-green; antennae with the 3rd segment slightly shorter than the 2nd, 4th or 5th segments; lateral lobes of the head distinctly longer than the central lobe. Other characters as in Key.

Length : 13-17 mm.

Distribution : India, Sikkim (East Sikkim), Meghalaya, West Bengal.

Elsewhere : Burma, Malay Peninsula

Remarks : Material (*) is represented in NZC without collection data.

10. ***Dalpada*** sp.

Material examined : 1 exs., East Sikkim, Tumin, 28.ix.88, coll. *V.C. Agrawal and party.*

Remarks : The material could not be identified upto species level due to poor condition of the specimen.

Division VI. NEZARIA

Genus 7. *Zangis* Stål, 1867

1867. *Zangis* Stål. *Ofv. Vet.-A.K. Forh. :* 514.

Type species : Zangis beryllus Fabricius

Key to species *Zangis*

Larger (length) 16 mm); lateral margins of head and pronotum yellowish-brown .... *crassa*

— Smaller (length 12-14 mm); lateral margins of head and pronotum pitchy-black..... ..... *dorsalis*

* 11. ***Zangis crassa*** (Westwood)

1837. *Pentatoma crassa* Westwood, Hope Cat., **1** : 93.

1904. *Zangis crassa,* Distant, *Fauna Brit. India, Rhyn.,* **1**: 222

Material examined : 1 exs. South Sikkim, Dikchu, 5.IX.93; coll. *S.K. Chatterjee and party.*

Diagnostic Characters : Body above green or brownish-ochraceous; head, anterior area and lateral margins of pronotum pale ochraceous.

Length : 16 mm.

Distribution : India : Sikkim (South Sikkim) Assam.

Elsewhere : China.

Remarks : This species is hitherto reported for the first time from Sikkim.

** 12. ***Zangis dorsalis*** (Dohrn)

1860. *Rhaplhigaster dorsalis* Dohrn, *Stett. ent. Zeit.,* **21** : 401.

1904. *Zangis dorsalis,* Distant, *Fauna Brit. India Rhyn.,* **1** : 222-223

Material examined : 1 ex., E. Sikkim, Ranipool, 25.V.1994, coll *B.C. Das and Party.*

Diagnostic characters : Body above bright pale olivaceous green; lateral margins of head and pronotum very narrowly piceous; apical margins of the scutellum and the connexivum pale yellowishgreen; abdomen above pale purplish; disc of abdomen luteous; body beneath and legs pale green; stigmata and some sternal spots black; antennae greenish-ochraceous with apex of third and fourth segments pale castaneous.

In some specimens there is a distinct linear black marginal spot on each side of scutellum near apex and a black linear discal streak oncorium.

Length : 12-14 mm.

Distribution : India : Sikkim (East Sikkim).

Elsewhere : Sri Lanka.

Remarks : This species is a new record from the Indian Subcontinent.

Family II. ASOPIDAE

Genus 8. *Zicrona* Amyot & Serville, 1843

1843. *Zicrona Amyot & Serville, Hem., :* 86.

Type Species : *Zicrona caerulea* (Linnaeus)

* 13. ***Zicrona caerulea*** (Linnaeus)

1758. *Cimex caerulea* Linnaeus, *Syst. Nat. ed.*, **10** : 445.

1998. *Zicrona caerulea,* Chakraborty & *L.K. Ghosh, Fauna of Meghalaya, State Fauna Series* 4 : 412.

Material examined : 1 ex., South Sikkim, Jorethang, 4.VI.1994, coll. *B.C. Das and Party.*

Diagnostic characters : Body above either caerulean or blue or violaceous; and very finely and sparingly punctate; antannae and membrane black; scutellum a little gibbous at base.

Length : 9-10 mm.

Distribution : India : Sikkim (South Sikkim); Meghalaya, Nagaland, Gammu and Kashmir, West Bengal.

Elsewhere : Burma, China, Japan, Malayan Archipelago, Pakistan and Palaeartic Region.

Remarks : This is a new record from the State of Sikkim.

Family III. SCUTELLERIDAE

Genus 9. ***Cantao*** Amyot & Serville, 1843

1843. *Cantao* Amyot & Serville, *Hem. : 29*

Type species *: Cantao ocellatus* (Thunberg)

14. ***Cantao ocellatus*** (Thunberg)

1784. *Cimex ocellatus* Thunberg, *Nov. Ins. Sp. iii : 60.*

1904. *Cantao ocellatus,* Distant, *Fauna Brit. India, Rhyn.* **1** *: 43.*

1998. *Cantao ocellatus,* Chakraborty and L.K. Ghosh, *Fauna of Meghalaya, State Fauna Series* 4 : 407.

Material examined : 1 ex., E. Sikkim, Singtam, 23 III 1994, coll. *L. K. Ghosh and Party;* * 2ex., Sikkim (Reg. No. 9290/7 & 9288/7).

Diagnostic Characters : Ochraceous or reddishochraceous; base and central fascia to head and antennae bluish-black; pronotum sometimes with two black spots near anterior margin, sometimes containing 8 spots.

Length : 16 28 mm.

Distribution : India : Sikkim (East Sikkim); Meghalaya, Maharashtra, Uttar Pradesh.

Elsewhere : Bangladesh, Borneo, Burma, China, Java, Malabar, Malay Peninsula, Sumatra, Sri Lanka.

Remarks : Material * is represented in NZC without collection data.

Genus 10. ***Chrysocoris*** Hahn., 1834

1834. *Chrycoris* Hahn., *Wanz. Ins., ii :* 38.

Type species : Chrysocoris dilaticollis (Guerin)

15. ***Chrysocoris grandis*** (Thunberg)

1783. *Cimex grandis* Thunberg, *Nov. Ins. Sp.* **11** *: 31.*

1904. *Chrysocoris grandis,* Distant, *Fauna Brit. India. Rhyn.,* **1** *: 54-55.*

Material examined : 1 ex., East Sikkim, Rongpo, 14.IV.1994, coll. *M.S. Shisodia and Party; 2 exs.* East Sikkim, Ranipool, 21.X.1992,coll. *M.S. Shisodia and Party.*

Diagnostic characters : Above reddish-ochraceous except central lobe and base of head, an anterior subquadrate spot and spots near posterior angle of pronotum, 3 spots on scutellum black, abdomen beneath violaceous; head, sternum, antennae, rostrum, legs and fasciae to abdomen beneath black.

In some specimens basal pronotal spot obsolete or the all spots on pronotum wanting, also central spot to scutellum absent.

Length : 18-24 mm.

Distribution : India : Sikkim (East Sikkim); Assam, Meghalaya, Nagaland.

Elsewhere : Burma, China, Japan, Java.

Genus 11. ***Hotea*** Amyot & Serville, 1843

1843. *Hotea* Amyot & Serville, *Hem.,* : 41.

Type Species : *Hotea gambiae* Westwood

* 16. ***Hotea curculionoides*** (Herr.-Sch.)

1843. *Pachycoris curculionoides* Herrich Schaffer, *Wanz. Ins.,iii :* 106, 331.

1985. *Hotea curculionoides,* Dutta, Ghosh & Dhar, *Rec. zool. Surv. India, Occ. Paper No.* **80** : 18 -19.

1998. *Hotea curculionoides,* Chakraborty & L.K. Ghosh, *Fauna of Meghalaya : State Fauna Series* **4** : 408.

Material examined : 1 ex., East Sikkim, Namthang, 24.IX.1993, coll. *S.K. Saha & Party :* 2 exs., South Sikkim, Jorethang, 10.XI.1994; coll. *G.C. Sen & Party.*

Diagnostic characters : Ochraceous excepting central lobe to head, lateral margins and three obscure longitudinal fasciae to pronotum, a central lonitudinal line to scutellum terminating in an apical spot and a curved anterior discal area levigate; head and lateral prontal angles beneath piceous; 4th segment (excepting base) and 5th antennal segment piceous.

Length : 8-9.5 mm.

Distribution : India : Sikkim (East & South Sikkim); Meghalaya.

Elsewhere : China, Malayan Archipelago, Malay Peninsula.

Remarks : This species is hitherto recorded for the first time from the State of Sikkim.

Genus 12. ***Lamprocoris*** Stål, 1864

1864. *Lamprocoris Stål, Hem. Afr.,* **1** *: 34.*

17. ***Lamprocoris*** sp.

Material examined : 1 ex., East Sikkim, Tumin, 29.IX.1988, coll. *V.C. Agrawal.*

Remarks : Determination upto species level could not be possible due to paucity of material.

Genus 13. ***Poecilocoris*** Dallas, 1848

1848. *Poecilocoris* Dallas, *Trans. Ent. Soc.,* **V** *:* 100.

Type species : Poecilocoris druraei (Linnaeus)

*18. ***Poecilocoris hardwickii*** (Westwood)

1837. *Tectocoris hardwickii* Westwood, *Hope Cat.,* **1** *: 13.*

1848. *Poecilocoris hardwickii* Dallas, *Trans. Ent. Soc.,* **V** *:* 107

1998. *Poecilocoris hardwickii,* Chakraborty and L.K. Ghosh, *Fauna of Meghalaya : State Fauna Series* **4** : 409.

Material examined : 1 ex., North Sikkim Chungthan, 11.XI.1992, coll. *M.S. Shishodia and Party.*

Diagnostic characters : Dark reddish-yellow; head, anterior margin, and two large basal spots to pronotum black, usually eleven black spots on scutellum; ventrally (excluding lateral margins of pro and mesosterna and the central area of abdomen), legs, rostrum and antennae black or violet-black.

Length : 9-22 mm.

Distribution : India : Sikkim (North Sikkim); Assam, Meghalaya, Nagaland.

Elsewhere : Bhutan, Burma; Hong Kong, West China.

Remarks : This is a new record from the State of Sikkim. It is a minor pest of tea plantation.

Family TESSARATOMIDAE

Genus 14. ***Eusthenes*** Laporte, 1832

1832. *Eusthenes* Laporte, *Ess. Hem. :* 64.

Type species : *Eusthenes robustus* (Lepeletier & Serville).

19. ***Eusthenes cupreus*** (Westwood)

1837. *Tessaratoma cupreus* Westwood, *Hope Cat.,* **1** *: 27.*

1904. *Eusthenes cupreus* Distant, *Fauna Brit. India Rhyn.,* **1** *:* 266

Material examined : 1 ex., South Sikkim, Jorethang 10. xi. 194, coll. *G.C. Sen and Party.*

Diagnostic characters : Body above castaneous, cupreous or olivaceous-brown, scutellum always dark; antennae black with proximal portion of apical segment surfescent; body beneath pale brown; body somewhat narrow and elongate.

Length : 26 28 mm.

Distribution : India : Sikkim (South Sikkim); Assam, Himachal Pradesh, Meghalaya, Uttar Pradesh.

Family V. UROSTYLIDAE

Genus 15. ***Urochela*** Dallas, 1850

1850. *Urochela Dallas, Hem.,* **1** *: 313*

Type Species : *Urochela quadripunctala* Dallas

20. *Urochela guttulata* Stål

1876. *Urochela guttulata Stål, En. Hem.*, V : 115.

1904. *Urochela guttulata*, Distant, *Fauna of Brit. India, Rhyn.*, 1 : *310*

Material examined : 9 exs., East Sikkim, Tumin, 28. ix. 1988, coll. *V.C. Agrawal and Party.*

Diagnostic characters : Above brownish-ochraceous, posterior lateral margin to corium and a spot in basal lateral margin, a spot on disk and another near centre of apical margin black; connexivum lutous and black; abdomen beneath luteous; sternum, rostrum and legs ochraceous with apex of rostrum piceous; lateral margins of pronotum dilated, anteriorly roundly amplified; a pale levigate line on pronotum and scutellum; sternum with a distinct, broad, sublateral black fascia.

Length : 11 12 mm.

Distribution : India : Sikkim (East Sikkim); Bhutan, West Bengal.

Genus 16. *Urolabida* Westwood, 1837

1837. *Urolabida* Westwood, *Hope Cat., 1 : 45*

21. *Urolabida* sp.

Material examined : 1 ex., East Sikkim, Gangtok, 27. x. 1992, coll. *M.S. Shishodia and Party;* 2 exs., East Sikkim, Tumin, 25.x.1988, coll. *V.C. Agrawal and Party.*

Remarks : Could not be determined upto species level due to paucity of literature and comparative material.

Genus 17. *Urostylis* sp.

1837. *Urostylis* Westwood, *Hope Cat.*, 1 : *45*

22. *Urostylis* sp.

Material examined : 14 exs. East Sikkim, Tumin, 25.ix.1988.coll. *V.C. Agrawal and Party.*

Remarks : The material could not be identified upto species level for want of literature.

LIST OF SPECIES SO FAR RECORDED FROM STATE OF SIKKIM

Order HEMIPTERA
Suborder HETEROPTERA
Super Family PENTATOMOIDEA
Family I. PENTATOMIDAE

Genus 1. ***Aednus*** Dallas

1. ***Aednus ventralis*** Dallas

Genus 2. ***Aeschrocoris*** Bergroth

2. ***Aeschrocoris obscurus*** (Dallas)

Genus 3. ***Alcimocoris*** Bergroth

3. ***Alcimocoris flavicornis*** Distant

Genus 4. ***Antestia*** Stål

4. ***Antestia anchora*** (Thunberg)
5. ***Antestia cruciata*** (Fabricius)
6. ***Antestia modificata*** Distant
7. ***Antestia pulchra*** (Dallas)

Genus 5. ***Cappaea*** Ellenr

8. ***Cappaea taprobanensis*** (Dallas)

Genus 6. ***Carbula*** Stål

9. ***Carbula indica*** (Westwood)

Genus 7. ***Compastes*** Stål

10. ***Compastes bhutanicus*** (Dallas)
11. ***Compastes spinosus*** Distant
12. ***Compastes taurus*** Distant

Genus 8. ***Catacanthus*** Spinola

13. ***Catacanthus incarnatus*** (Dru)

Genus 9. ***Cratonotus*** Distant

14. ***Cratonotus coloratus*** Distant

Genus 10. ***Dalpada*** Amyot & Serville

15. ***Dalpada affinis*** Dallas
16. ***Dalpada jugatoria*** Leth
17. ***Dalpada oculata*** (Fabricius)

Genus 11. ***Diplostira*** Dallas

18. ***Diplostira valida*** Dallas

Genus 12. ***Dannius*** Distant

19. ***Dunnius fulvescens*** (Dallas)

Genus 13. ***Erthesina*** Spinola

20. ***Erthesina acuminata*** Dallas
21. ***Erthesina fullo*** (Thunberg)
22. ***Erthesina robertsi*** Distant

Genus 14. ***Eurydema*** Laporte

23. ***Eurydema lituriferum*** (Walker)
24. ***Eurydema pulchrum*** (Westwood)

Genus 15. ***Eysarcoris*** hahn

25. ***Eysarcoris guttiger*** (Thunberg)
26. ***Eysarcoris montivagus*** (Distant)
27. ***Eysarcoris ventralis*** (Westwood)

Genus 16. ***Fernelius*** Distant

28. ***Fernelius indicus*** Distant

Genus 17. ***Gynenica*** Dallas

29. ***Gynenica affinis*** Distant

Genus 18. ***Halys*** Westwood

30. ***Halys dentatus*** (Fabricius)

Genus 19. ***Halyomorpha*** Mayr

31. ***Halyomorpha murrea*** Distant

Genus 20. ***Hoplistodera*** Westwood

32. ***Hoptistodera incisa*** Distant
33. ***Hoplistodera virescens*** Dallas

Genus 21. ***Menida*** (Motschulski)

34. ***Menida atkinsoni*** Distant
35. ***Menida flavovaria*** (Dallas)
36. ***Menida formosa*** (Westwood)
37. ***Menida varipennis*** (Westwood)

Genus 22. ***Navisanus*** Distant

38. ***Navisanus alternans*** Westwood

Genus 23. ***Oncinoproctus*** Bredd

39. ***Oncinoproctus griseolus*** Bredd

Genus 24. ***Placosternum*** (Amyot & Serville)

40. ***Placosternum taurus*** (Fabricius)

Genus 25. ***Plautia*** Stal

41. ***Plautia fimbriata*** (Fabricius)

Genus 26. ***Paterculus*** Distant

42. ***Paterculus affinis*** (Distant)

Genus 27. ***Piezodorus*** Fieber

43. ***Piezodorus rubrofasciatus*** (Fabricius)

Genus 28. ***Prionaca*** Dallas

44. ***Prionaca nigricens*** Distant

Genus 29. ***Rhynchocoris*** Westwood

45. ***Rhynchocoris humeralis*** (Thunberg)

Genus 30. ***Scylax*** Distant

46. ***Scylax macrinus*** Distant

Genus 31. ***Tolumnia*** Stål

47. ***Tolumnia latipes*** (Dallas)

Genus 32. ***Tropicoris*** Hahn

48. ***Tropicoris punctipes*** Stal

Genus 33. ***Zangis*** Stål

** 49. ***Zangis crassa*** (Westwood)
* 50. ***Zangis dorsalis*** (Dohrn)

FAMILY II. ACANTHOSOMATIDAE

Genus 34. ***Anaxandra*** Stål

51. ***Anaxandra nigricornis*** (Walker)

Genus 35. ***Elasmostethus*** Fieber

52. ***Elasmostethus lineatum*** (Dallas)

Genus 36. ***Sastragala*** Amyot & Serville

53. ***Sastragala binotata*** Distant
54. ***Sastragala edessoides*** Distant

FAMILY III. ASOPIDAE

Genus 37. ***Andrallus*** Bergroth

55. ***Andrallus spinidens*** (Fabricius)

Genus 38. ***Blachia*** Walker

56. ***Blachia ducalis*** Walker

Genus 39. ***Cazira*** Amyot & Serville

58. ***Cazira verrucosa*** (westwood)

Genus 40. ***Picromerus*** Amyot & Serville

59. ***Picromerus obtusus*** Walker

Genus 41. ***Zicrona*** Amyot & Serville

* 60. ***Zicrona caerulea*** (Linnaeus)

FAMILY CYDNIDAE

Genus 42. ***Macroscytus*** Fieber

61. ***Macroscytus expansus*** Signoret

62. ***Macroscytus foveolus*** (Dallas)

FAMILY IV. DINIDORIDAE

Genus 43. ***Coridius*** Illiger

63. ***Coridius chinensis*** (Dallas)
64. ***Coridius nepalensis*** (Westwood)

Genus 44. ***Megymenum*** Laporte

65. ***Megymenum parallelum*** Voll.
66. ***Megymenum severini*** Bergroth

FAMILY V. PHYLLOCEPHALIDAE

Genus 45. ***Cressona*** Dallas

67. ***Cressona valida*** Dallas

Genus 46. ***Gonopsis*** Amyot & Serville

68. ***Gonopsis coccinea*** (Walker)
69. ***Gonopsis rubescens*** Distant

FAMILY VI. PLATASPIDAE

Genus. 47 ***Brachyplatys*** Boisd

70. ***Brachyplatys carolinae*** (Atkinson)
71. ***Brachyplatys subaeneus*** (Westwood)
72. ***Brachyplatys vahlii*** (Fabricius)

Genus 48. ***Coptosoma*** Laporte

73. ***Coptosoma contectum*** Montandon
74. ***Coptosoma duodecimpunctatum*** (Germ.)
75. ***Coptosoma feanum*** Montandon
76. ***Coptosoma fimbriatum*** Distant
77. ***Coptosoma lebongensis*** Distant
78. ***Coptosoma lethierryi*** Montandon
79. ***Coptosoma nazirae*** Atkinson
80. ***Cjoptosoma nepalense*** Westwood
81. ***Coptosoma variegatum*** Montandon

FAMILY VII. SCUTELLERIDAE

Genus 49. ***Brachyaulax*** Stal

82. ***Brachyaulax oblonga*** (Westwood)

Genus 50. ***Cantao*** Amyot & Serville

83. ***Cantao ocellatus*** (Thumberg)

Genus 51. ***Chrysocoris*** Hahn.

84. ***Chrysocoris grandis*** (Thumberg)
85. ***Chrysocoris fascialis*** (White)

Genus 52. ***Hotea*** Amyot & Serville

86. ***Hotea curculionoides*** (Hen-Sch.)

Genus 53. ***Lamprocoris*** Stal

87. ***Lamprocoris roylii*** (Westwood)
88. ***Lamprocoris spiniger*** (Dallas)

Genus 54. ***Poecilocoris*** Dallas

89. ***Poecilocoris hardwickii*** (Westwood)

Genus 55. ***Scutellera*** Lam.

90. ***Scutellera fasciata*** (Panz)

FAMILY VIII. TESSARATOMIDAE

Genus 56. ***Eusthenes*** Laporte

91. ***Eusthenes cupreus*** (Westwood)
92. ***Eusthenes saevus*** Stal

Genus 57. ***Eurostus*** Dallas

93. ***Eurostus grosspies*** Dallas

Genus 58. ***Pycanum*** Amyot & Serville

94. ***Pycanum ochraceum*** Distant
95. ***Pycanum ponderosum*** Stal

Genus 59. ***Tessaratoma*** Lepell & Serv.

96. ***Tessaratoma javanica*** (Thunberg)
97. ***Tessaratoma nigripes*** (Dallas)
98. ***Tessaratoma quadrata*** Distant

FAMILY IX. UROSTYLIDAE

Genus 60. ***Urochela*** Dallas

99. ***Urochela guttulata*** Stal
100. ***Urochela pulchra*** Distant
101. ***Urochela quadripunctata*** Dallas

Genus 61. ***Urolabida*** Westwood

102. ***Urolabida grayi*** (White)
103. ***Urolabida histrionica*** (Westwood)
104. ***Urolabida tenera*** Westwood

Genus 62. ***Urostylis*** Westwood

105. ***Urostylis gracilis*** Dallas
106. ***Urostylis pallida*** Dallas
107. ***Urostylis punctigera*** Westwood

SUMMARY

Out of 107 species so far known from Sikkim, the paper incorporates an account of 22 species belonging to 17 genera distributed over 5 families of the Superfamily Pentatomoidea from the state of Sikkim. Keys to texa, goegraphical distribution, literature references and diagnostic features of each species are provided in the paper. Besides, distribution of all the species dealt with here is shown in the Maps. Lastly, an up to date list of species of Pentatomoidea so far known from Sikkim is also incorporated.

ACKNOWLEDGEMENT

The authors are grateful to the Director, Zoological Survey of India for necessary laboratory facilities. Grateful thanks are due to Dr. S. K. Mitra and J. K. Jonathan, Joint Directors (Retd.), for encouragement. They are also thankful to Dr. A. Bal, Officer-in-Charge, Hemiptera section for courtesies.

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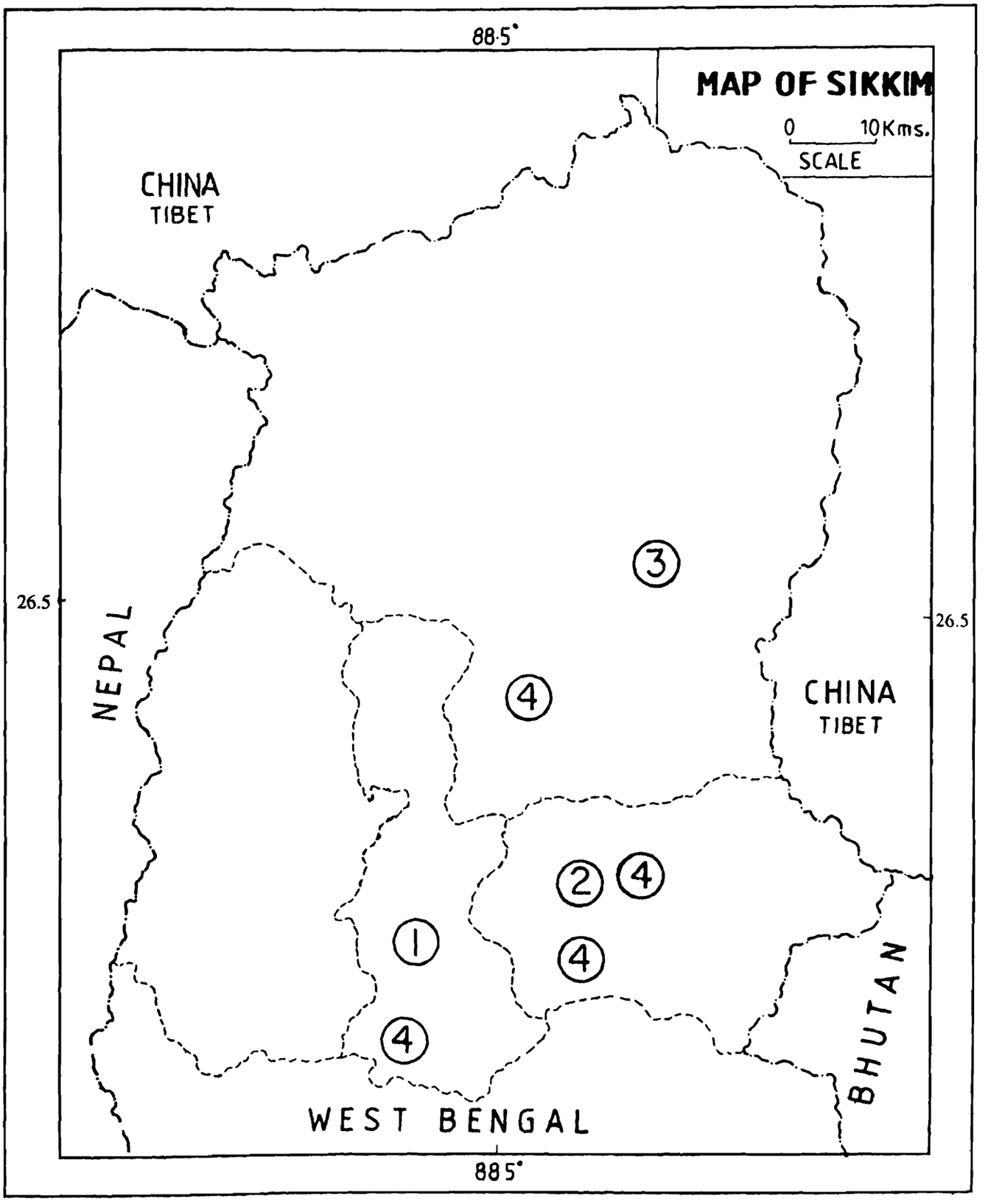
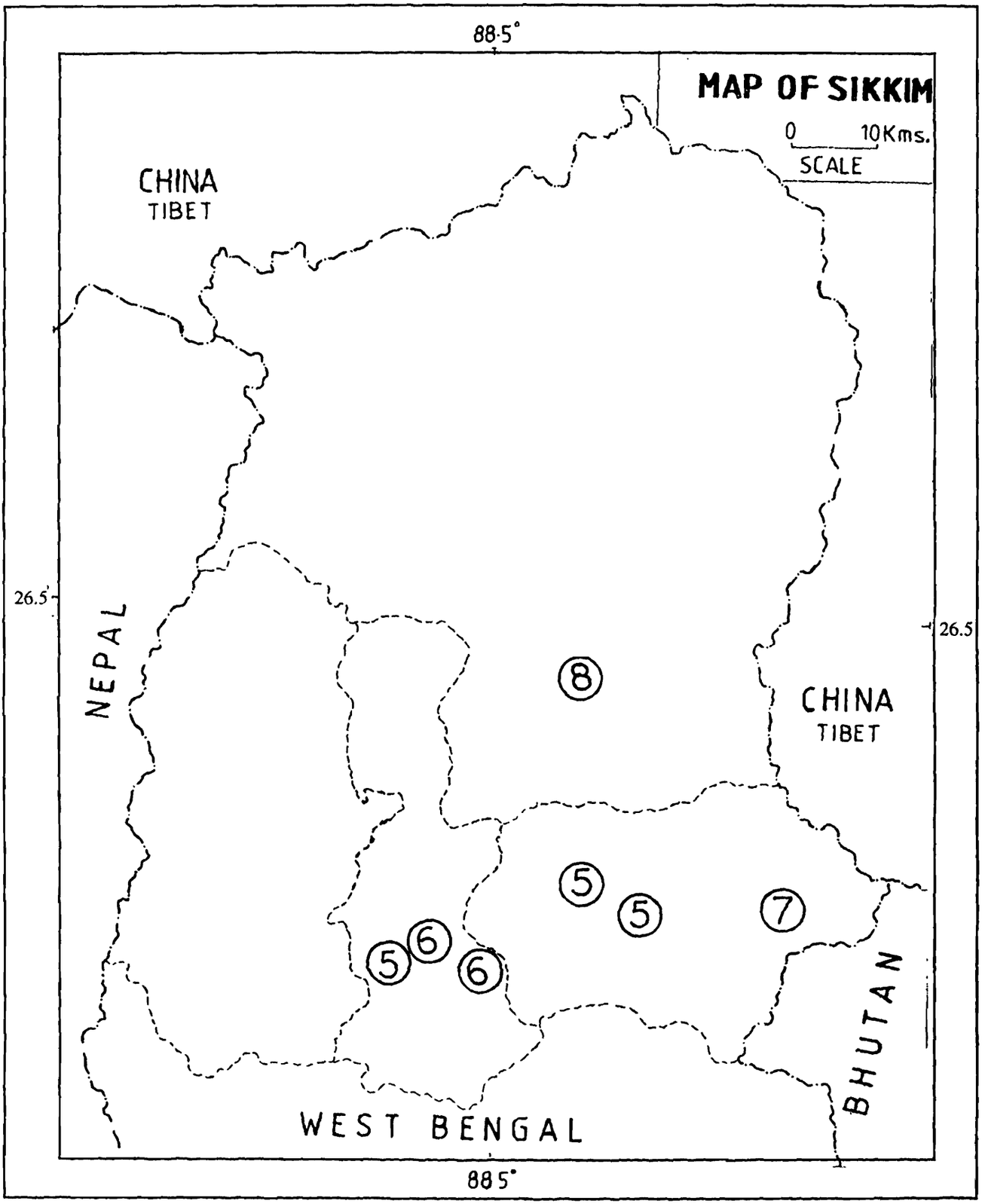
Map showing Districtwise distribution of
the species of Pentatomoidea (Heteroptera)



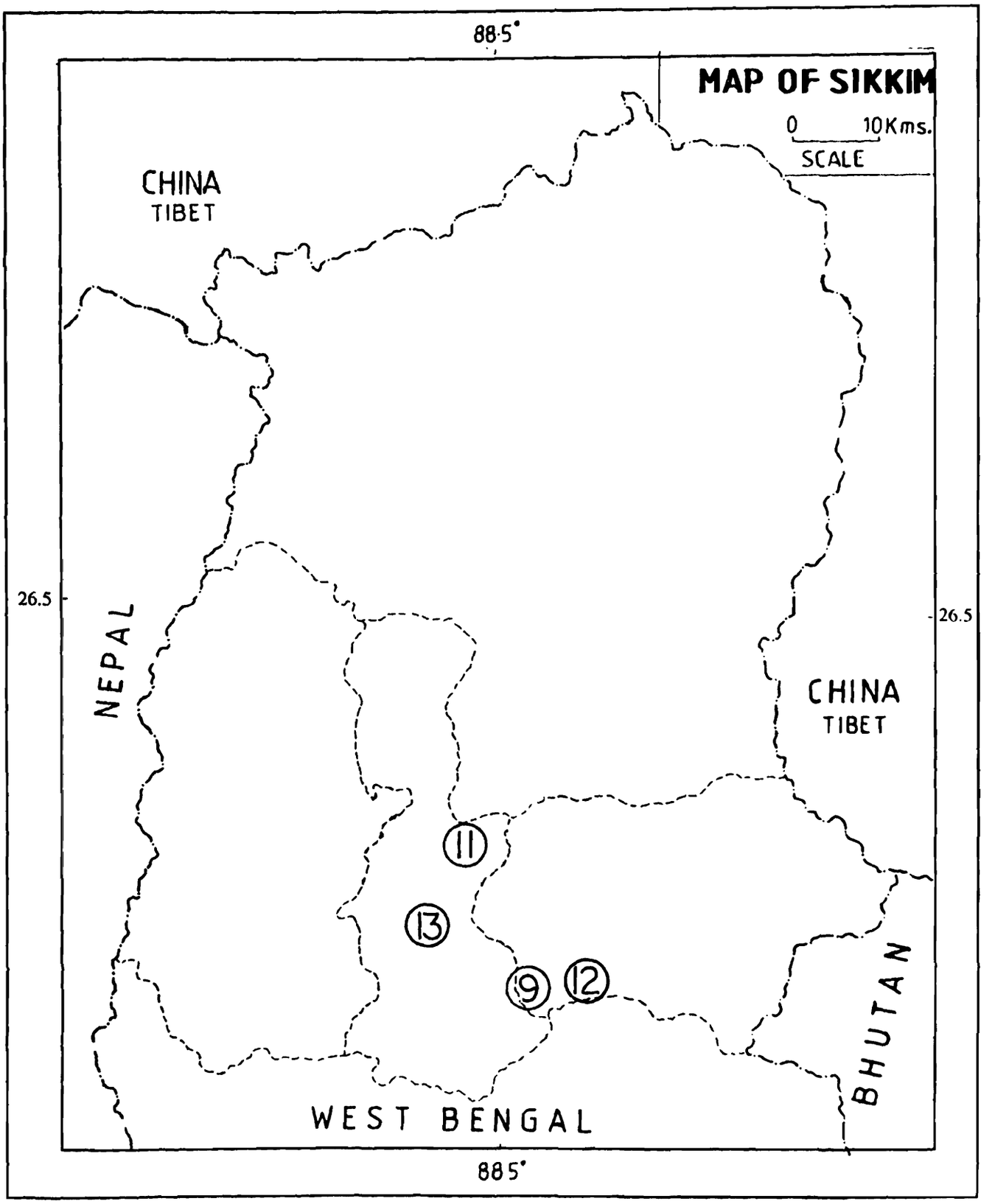
1. *Plautia fimbriata*
2. *Cappaea taprobanensis*
3. *Tolumnia latipes*
4. *Eurydema pulchrum*

Map showing Districtwise distribution of
the species of Pentatomoidea (Heteroptera)



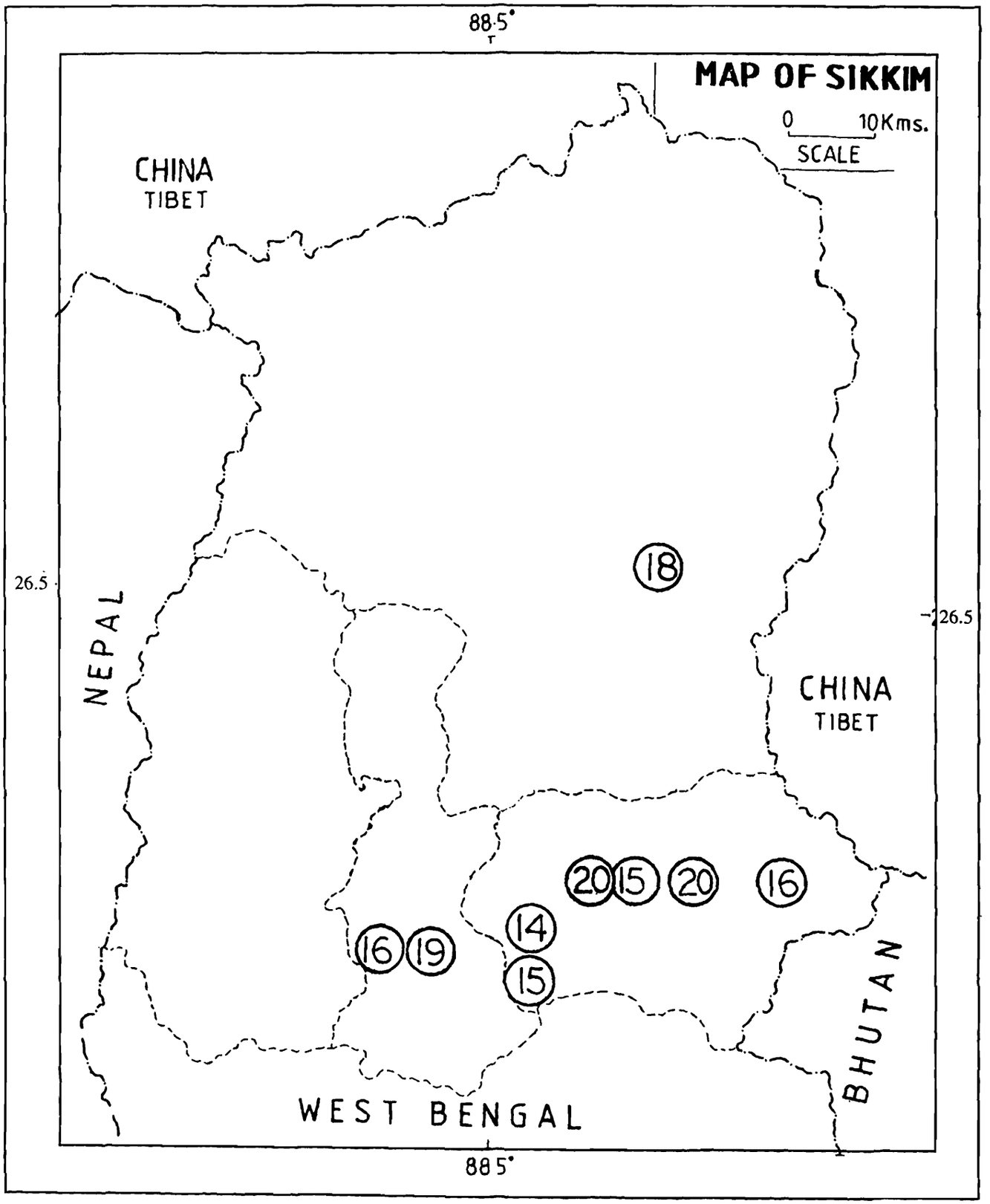
5. *Eysarcoris guttiger*
6. *Eysarcoris montivagus*
7. *Eysarcoris ventralis*
8. *Dalpada jugatoria*

Map showing Districtwise distribution of
the species of Pentatomoidea (Heteroptera)



9. *Dalpada oculata*
11. *Zangis crassa*
12. *Zangis dorsalis*
13. *Zicrona caerulea*

Map showing Districtwise distribution of
the species of Pentatomoidea (Heteroptera)



14. *Cantao ocellatus*
15. *Chrysocoris grandis*
16. *Hotea curculionoides*
18. *Poecilocoris hardwickii*
19. *Eusthenes cupreus*
20. *Urochela guttulata*

Zool. Surv. India
State Fauna Series 9, Fauna of Sikkim (Part 2), 525-540, 2003

INSECTA : HETEROPTERA : REDUVIIDAE

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INTRODUCTION

Reduviids, commonly known as 'Assaisan bugs', are one of the economically important predaceous insect belonging to the series sternorhyncha under the order Hemiptera.

This group is represented by more than 3000 species in the world (Richard & Davis, 1977), of which approximately 450 species under 29 genera are known to occur in India (Ambrose & Vennison 1989, Distant 1904, 1910, 1919; China 1924; Sammuel and Joseph 1953; Millar 1959a, b; Muraleedharan, 1976; Cook 1977, Livingstone et. al (1986a, b, 1987, 1990).

Distant (1904, 1910) had recorded some 31 species under 22 genera from Sikkim in his monumental work in the Fauna of British India, Rhynchota Volumes. After that the Reduviid fauna of Sikkim has not been studied comprehensively other than the present study, which is a part of the state fauna series projects adopted by the Zoological Survey of India. The present paper has dealt with 38 species under 26 genera from the State of Sikkim. Out of these 38 species, materials of 13 species marked (*) are available for the present study and the rest 25 species have been included as a part of Sikkim fauna recorded in the Fauna of British India, Rhynchota by Distant. The study materials for the present paper is comprised of the Reduviid collection from different survey parties of Z.S.I. as well as the named and unnamed collection housed in the Hemiptera Section.

General diagnosis

Reduviids are chiefly characterised by more or less elongated, mobile head, with the eyes generally well separated from the anterior margin of pronotum, rostrum three jointed except Nabidinae where rostrum is four jointed and head immersed to the eyes; rostrum generally stout, bent on base so that in repose it does not lie against the under surface of head.

SYSTEMATIC LIST

Family REDUVIIDAE

Subfamily I. STENOPODINAE

Genus 1. ***Canthesancus*** Amy. & Servy.

*1. *Canthesancus gulo* Stal

Genus 2. ***Oncocephalus*** Klug.

2. *Oncocephalus morosus* Distant

Genus 3. ***Pygolampis*** Germ.

*3. *Pygolampis unicolor* Walker

Genus 4. ***Sastrapada*** Amy & Serv.

*4. *Sastrapada baereasprungi* (Stål)

Subfamily II. ACANTHASPIDINAE

Division 1. ACANTHASPISARIA

Genus 5. ***Acanthaspis*** Amy. & Serv.

5. *Acanthaspis fulvipes* (Dallas)

6. *A. lineatipes* Reuter

7. *Acanthaspis rama* Distant

*8. *A. sexguttata* (Fabricius)

Division 2. EPIRODERARIA

Genus 6. ***Centrocnemis*** Signoret

9. *Centrocnemis stali* Reuter

Division 3. REDUVIARIA

Genus 7. ***Reduvius*** Lamarck

10. *Reduvius knyvetti* Distant

Division 4. LENAEARIA

Genus 8. ***Sminthocoris*** Distant

11. *Sminthocoris fuscipennis* (Stål)

Genus 9. ***Velitra*** Stål

12. *Velitra rubropicta* (Amy. & Serv.)

Subfamily III. PIRATINAE

Genus 10. ***Ectomocoris*** Mayr

*13. *Ectomocoris atrox* (Stål)

Genus 11. ***Pirates*** Serv.

*14. *Pirates atromaculatus* (Stål)

Subfamily IV. ECTRICHODIINAE

Genus 12. ***Ectrychotes*** Burm.

15. *Ectrychotes scutellaris* (Bredd.)

Subfamily V. HARPACTORINAE

Division I. HARPACTORARIA

Genus 13. ***Rhinocoris*** Hahn.

*16. *Rhinocoris costalis* (Stål)

17. *R. marginellus* (Fabricius)

18. *R. nigricollis* (Dallas)

19. *R. squalus* (Distant)

20. *R. tristicolor* (Reuter)

Genus 14. ***Sphedanolestes*** Stål

*21. *Sphedanolestes indicus* Reuter

*22. *S. pubinotum* Reuter

*23. *S. pulchriventris* Stål

Division 2. VESBIARIA

Genus 15. ***Vesbius*** Stål

24. *Vesbius sanguinosus* Stål

Division 3. EUAGORASARIA

Genus 16. ***Endochus*** Stål

25. *Endochus atricapillus* Distant

Genus 17. ***Platerus*** Distant

26. *Platerus pilcheri* Distant

Genus 18. ***Isyndus*** Stål

27. *Isyndus pilosipes* Reuter

Division 4. PANTHOUSARIA

Genus 19. ***Panthous*** Stål

28. *Panthous excellens* Stål

Division 5. CORANUSARIA

Genus 20. ***Coranus*** Curtis

*29 *Coranus obscurus* (Kirby)

Division 6. POLIDIDUSARIA

Genus 21. ***Polididus*** Stål

*30. *Polididus armatissimus* Stål

Genus 22. ***Scipinia*** Stål

31. *Scipinia horrida* (Stål)

Genus 23. ***Henricohahnia*** Bredd.

32. *Henricohahnia inermis* (Distant)

33. *H. montana* (Distant)

*34. *H. spinosa* (Distant)

35. *H. typica* (Distant)

Subfamily VI. NABIDINAE

Genus 24. ***Psilistus*** Stål

36. *Psilistus corallinus* Stål

Genus 25. ***Dodonaeus*** Distant

37. *Dodonaeus humeralis* Distant

Genus 26. ***Nabis*** Latr.

38. *Nabis funebris* Distant

SYSTEMATIC ACCOUNT

Key to the subfamilies of the family REDUVIIDAE

1(2) Rostrum four jointed ..... NABIDINAE

2(1) Rostrum three jointed 3

3(4) Hemelytra without a quadrangular cell at interior area of corium, near base of membrane 5

4(3) Hemelytra with a quadrangular cell at interior area of corium near base of membrane; first joint of rostrum generally elongate, space between the eyes transverse ..... HARPACTORINAE

5(6) Hemelytra with a discoidal cell somewhat sex angular, touching base of membrane or largely triangular ..... STENOPODINAE

6(5) Hemelytra without a discoidal cell 2

7(8) Scutellum with its apex triangular or subtriangular 9

8(7) Scutellum with its apex broad and two or three spined ..... Ectrichodinae

9(10) Pronotum constricted before or near middle anterior tarsi three jointed .....

..... Acanthaspidinae

10(9) Pronotum constricted behind middle .....

..... Piratinae

Subfamily I. STENOPODINAE

Key to the genera of the subfamily STENOPODINAE

1(2) Apical spine to scutellum erect or suberect, anterior lobe of pronotum spined on each side, apex of fifth dorsal abdominal segment truncate ..... ***Canthesancus***

2(1) Apical spine to scutellum laterally produced, neither erect not suberect. 3

3(4) First joing of rostrum longer than two apical joints together ..... ***Pygolampis***

4(3) First joint of rostrum not longer than two apical joints together 5

5(6) Anterior femora with two series of small spines beneath, pronotum longer than broad ..... ***Sastrapada***

6(5) Anterior femora incrassated and spined beneath ..... ***Oncocephalus***

Genus 1. ***Canthesancus*** Amy. & Serv. 1843

1843. *Canthesancus* Amy. & Serv., *Hem.*, : 389.

*1. ***Canthesancus gulo*** Stål

1863. *Canthesancus gulo* Stål, *Ann. Soc. Ent. Fr.*, : 44.

1902. *Canthesancus gulo :* Distant, *Fauna Brit. India,* **2** : 235.

Diagnostic characters : Head, scutellum, pronotum ochraceous, hemelytra brownish ochraceous, a black line to the head continued through pronotum, three irregular pale casteneous spots to hemelytra, the first smallest, subbasal, the second large and tranverse at the junction of membrane and corium, the third on disk of membrane; excepting at basal angle of corium, hemelytra mottled with brown; antennae black, its first joint as long as pronotum and scutellum together.

Length : 27–29; width between pronotal angles 7 mm.

Distribution : India : Sikkim, Assam. *Elsewhere* : Malay Peninsula, Mayanmar.

Remarks : This species could not be examined due to non-availability of the specimen. Recorded by W.L. Distant (1902) in *Fauna Brit. India,* Rhynchota. Vol – II.

Genus 2. ***Oncocephalus*** Klug., 1830

1830. *Oncocephalus klug, Symb. Phys.*

2. ***Oncocephalus morosus*** Distant

1902. *Oncocephalus morosus* Distant, *Fauna Brit. India,* **2** : 233.

1994. *Oncocephalus morosus* : Biswas, Sen and Ghosh, *State Fauna Series* – 3, *Fauna of West Bengal,* Part **5** : 378.

Disgnostic characters : Head broad and robust, anteocular much longer than postocular area, antennae with the first joint about as long as from insertion to eyes; two broad annulations to anterior and intermediate tibiae; posterior tibiae and a spot on under surface of anterior femora luteous.

Length : 20 mm.

Distribution : India : Sikkim.

Remarks : Due to non-availability of the specimen this species could not be examined. W.L. Distant (1902) recorded this species in *Fauna Brit. India,* Rhynchota vol. vi.

Genus 3. ***Pygolampis*** Germ., 1817

1817. *Pygolampis* Germ., *Fauna Ins. Eur.*, : 8.

* 3. ***Pygolampis unicolor*** Walker

1873. *Pygolampis unicolor* Walker, *Cat. Het.*, **8** : 36.

1902. *Pygolampis unicolor* : Distant, *Fauna Brit. India,* **2** : 223.

1994. *Pygolampis unicolor* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal,* **5** : 376.

Material examined : 1 ex., Singtam, Sikkim, 15.iv.1959, A.G.K. Menon.

Diagnostic characters : Head a little shorter than pronotum, the anteocular portion faintly longitudinally ridged, the postocular portion obsolately sulcate; anterior lobe of pronotum sulcate; posterior lobe with central two diverging and outer two shorter and straight discal carinae.

Length : 13.5 mm – 14.5 mm.

Distribution : India : Sikkim (West Sikkim), West Bengal.

Genus 4. ***Sastrapada*** Any. & Serv. 1843

1843. *Sastrapada* Amy. & Serv., *Hem.*, : 388

* 4. ***Sastrapada baereasprungi*** (Stål)

1859. *Harpagochares baereasprungi* Stal, *Ofv. Vet. A. K. Forth.*, : 381.

1902. *Sastrapada baereasprungi* : Distant, *Fauna Brit. India*, **2** : 224.

Material examined : 1 ex., Sikkim.

Diagnostic characters : Yellowish ochraceous; head a little shorter than pronotum, a small black spot to hemelytra and a series of black spots to the lateral side of the abdomen, first joint of antennae shorter than head; lateral area of head, disk of sternum and sometimes two central fasciae to abdomen piceous.

Length : 14–18 mm.

Distribution : India : Sikkim. *Elsewhere* : Madagascar, Malayan Archipelago, South Africa, Sri Lanka.

Remarks : The specimen examined contains no other information except Sikkim in its locality label.

Subfamily II. ACANTHASPIDINAE

Key to the division of the subfamily ACANTHASPIDINAE

1(2) Head pronotum spinulose or tuberculose, coxae and femora somewhat spinose ..... EPIRODERARIA

2(1) Head, pronotum unarmed 3

3(4) Body depressed, disc of the abdomen beneath distinctly flattened, antennae inserted close to eyes ..... LENAEARIA

4(3) Body oblong,disc of the abdomen beneath not flattened 5

5(6) Eyes and ocelli large and prominent, eyes extending transversely quite across the lateral area of head, pronotum broadly longitudinally impressed... REDUVIARIA

6(5) Eyes and ocelli usually small; rarely large but then never extending transversely across the lateral area of head; pronotum not broadly longitudinally impressed ..... ACANTHASPISARIA

Division 1. ACANTHASPISARIA

Genus 5. ***Acanthaspis*** Amy. & Serv., 1843

1843. *Acanthaspis* Amy. & Serv., *Hem.*, : 336.

Key to the species of the genus *Acanthaspis*

1(2) Posterior lobe of pronotum with two short but prominent discal tubercles; pronotum unicolorus unspotted ..... ***fulvipes***

2(1) Posterior lobe of pronotum discally unarmed 3

3(4) Pronotum with anterior and posterior lobe differently coloured ..... ***lineatipes***

4(3) Pronotum dark, with pale spots and markings 5

5(6) Posterior pronotal lobe with two rounded basal spots; corium with a small basal spot and a larger rounded subapical spot..... ***rama***

6(5) Posterior pronotal lobe with four transverse spots, corium with a subbasal and a larger somewhat rounded spot ..... ***sexguttata***

5. ***Acanthaspis fulvipes*** (Dallas)

1850 *Plytymeris fulvipes* Dallas, *Jr. Ent. Soc.*, : 6.

1902. *Acanthaspis fulvipes* Distant, *Fauna Brit. India*, **2** : 259.

1994. *Acanthaspis fulvipes* : Biswas, Sen and Ghosh, *State Fauna Series 3, Fauna of West Bengal*, Part **5** : 381.

Diagnostic characters : Pronotum with anterior lobe moderately sculptured and deeply centrally foveate on its posterior margin, posterior lobe rugulose, its lateral angles acutely spinous, scutellar spine long, obliquely ascendant, antennae, rostrum; legs and central disk of abdomen reddish brown; a large spot behind middle of corium and spots to connexivum above and beneath ochraceous.

Length : 25-26 mm.

Distribution : India : Sikkim, Assam. *Elsewhere* : Bangladesh, Bhutan

Remarks : No materials was available for present study but Distant (1902) in his *Fauna of Brit. India* reported this species from Sikkim. Thus this species has been included in this paper.

6. *Acanthaspis lineatipes* Reut.

1881. *Acanthaspis lineatipes* Reuter, *Act. Soc. Sc., Fenn.*, **12** : 328.

1902. *Acanthaspis lineatipes* : Distant, *Fauna Brit. India*, **2** : 268.

1994. *Acanthaspis lineatipes* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal*, Part **5** : 381.

Diagnostic characters : A small spot on the dorsal side of the postocular area of head, with the carinae of the anterior lobe of pronotum and a somewhat round spot behind middle of corium, ochraceous; a large subapical white spot to membrane, scutellum black apical spine slightly ascendant.

Length : 12.5 mm.

Distribution : India : Sikkim, West Bengal.

Remarks : This species could not be examined due to non-availability of specimen but Distant (1902) had reported this special from Sikkim in this *Fauna of Brit. India,* Rhynchota, Vol. II.

7. *Acanthaspis rama* Distant

1902. *Acanthaspis rama* Distant, *Fauna Brit. India*, **2** : 268.

Diagnostic characters : Pronotum with the anterior lobe moderately sculptured, posterior lobe transversely rugulose with a small basal and a larger rounded subapical spot, two broad annulation to tibiae and tarsi, apices of the femora and spots to the connexivum luteous, first joint of antennae equals to the length of head.

Length : 18–20 mm.

Distribution : India : Sikkim, Orissa.

Remarks : No specimen of this species was available for the present study but Distant (1902) had recorded this species from Sikkim in his *Fauna Brit. India* Rhynchota Vol. IV.

* 8. *Acanthaspis sexguttata* (Fabricius)

1775. *Reduvius sexguttata* Fabricius, *Syst. Ent.*, : 832.

1902. *Acanthaspis sexguttata* : Distant, *Fauna Brit. India*, **2** : 270.

1994. *Acanthaspis sexguttata* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal*, Part **5** : 381.

Material examined : 1 ex., Tumin, East Sikkim, 28.ix.1988, coll. V.C. Agarwal; 1 ex., Rongpou, East Sikkim, 12.xi.1992, coll. A.K. Hazra and party.

Diagnostic characters : Posterior pronotal lobe transversely rugulose with four flavous testaceous spots, anterior lobe distinctly sculptured, corium with a subbasal and a larger about rounded subapical spot and a large apical spot to membrance greyish flavescent, femora annulated near apex and the tibiae biannulated; scuteller spine obliquely ascendant.

Length : 16–20 mm.

Distribution : India : Sikkim (East Sikkim), Karnataka.

Division 2. EPIRODERARIA

Genus 6. *Centrocnemis* Signoret, 1852

1852. *Centrocnemis* Signoret, *Ann. Soc. Ent. Fr.*, : 545.

9. *Centrocnemsis stali* Reuter

1881. *Centrocnensis stali* Reuter, *Act. Soc. Sc. Fenn.*, **12** : 333.

1902. *Centrocnensis stali* : Distant, *Fauna Brit. India*, **2** : 246.

Disgnostic characters : Dull ochraceous, anterior lobe of pronotum with two long obliquely erect spines on disk, the lateral angles of posterior lobe with four long spines and some smaller spines on the lateral angle, membrance pale ochraceous, mottled with brown fuscous; anterior and intermediate tibiae pale ochraceous, biannulated with fuscous.

Length : 22.5 mm.

Distribution : India : Sikkim, Assam, Meghalaya, West Bengal.

Remarks : Due to nonavailability of the specimens, this species could not be examined. Distant (1902) had reported, this species from Sikkim in his Fauna Brit. India, Rhynchota Vol.II.

Division 3. REDUVIARIA

Genus 7. ***Reduvius*** Lamarck, 1801

1801. *Reduvius* Lamarck, *Syst.*, : 294.

10. ***Reduvius knyvetti*** Distant

1902. *Reduvius knyvetti* Distant, *Fauna Brit. India,* **2** : 251.

Diagnostic characters : Head, scutellum, anterior lobe of pronotum, meso and metrasterum, anterior area of prosternum pitchy black, hemelytra, coxae, posterior lobe of pronotum, brownish yellow. A large central spot and a small subobsolete spoton each lateral area of posterior lobe, clavus, an elongate pyriform spot on posterior lateral margin of corium fuscous brown, lateral margins and a central fascia to abdomen beneath luteous.

Remarks : No specimen was available for the present study. But Distant (1902) had reported this species from Sikkim in his Fauna Brit. India, Rhynchota, Vol. II.

Division 4. LENAEARIA

Key to the genera of the Division LENAEARIA

1(2) Prosternal process acute, sulcate, posteriorly recurved; posterior tibiae and femora almost subequal in length ..... ***Velitra***

2(1) Prosternal process straight not recurve, second joint of antennae, four or five times as long as first ..... ***Sminthocoris***

Genus 8. ***Sminthocoris*** Distant, 1902

1902. *Sminthocoris* Distant, *Fauna Brit. India,* **2** : 279.

11. ***Sminthocoris fuscipennis*** (Stål)

1874. *Sminthus fuscipennis* Stål, *En. Hem.*, **4** : 68.

1902. *Sminthocoris fuscipennis* : Distant, *Fauna Brit. India,* **2** : 280.

Diagnostic characters : Corium and first joint of antenae blood red, hemelytra black, rest of the antennae yellowish with slight browny tinge, posterior lobe of pronotum with three longitudinal series of punctures, a central and the other two sublateral, apex of the scutellum long and straightly produced.

Length : 15–17 mm.

Distribution : India : Sikkim, Assam, Meghalaya. Elsewhere : Mayanmar.

Remarks : As the specimen is not available for the present study this species could not be examined, but Distant (1902) had reported this species from Sikkim in his Fauna Brit. India, Rhynchota Vol. II.

Genus 9. ***Velitra*** Stal, 1865

1865. *Velitra* Stal, *Hem. Afr.*, **3** : 122.

12. ***Velitra rubropicta*** (Amy. & Serv.)

1984. *Opinus rubropicta* Amy. & Serv., *Hem.*, : 339.

1902. *Velitra rubropicta* : Distant, *Fauna Brit. India,* **2** : 276.

Diagnostic characters : Corium pale testaceous, an elongate spot on each side of claval apex, and a large irregular spot near to apical angle piceous; membrane with apical margin and most of the venation pale ochraceous; pronotum with anterior lobe sculptured posterior lobe with one central and two lateral longitudinal series of punctures.

Length : 18 to 20 mm.

Distribution : India : Sikkim, *Elsewhere* : Java, Malay Peninsula, Mayanmar.

Remarks : No specimen of this species was available for examination but Distant (1902) had reported the occurrence of this species from Sikkim in his Fauna of Brit. India, Rhynchota, Vol. II.

Subfamily III. PIRATINAE

Key to the genera of the subfamily PIRATINAE

1(2) Spongy furrow occupying more than half of the anterior tibiae ..... ***Ectomocoris***

2(1) Spongy furrow occupying less, or not more than half of anterior tibiae ..... ***Pirates***

Genus 10. ***Ectomocoris*** Mayr., 1865

1865. *Ectomocoris* Mayr. *Verh, Z.-b. Ges. Wien.*, **15** : 438.

* 13. ***Ectomocoris atrox*** (Stål)

1855. *Pirates atrox* Stål, *Ofv. Vet.-A.K. Forth.*

1902. *Ectomocoris atrox* : Distant, *Fauna Brit. India*, **2** : 296.

1994. *Ectomocoris atrox* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal*, Part **5**; 384.

Material examined : 1 ex., Rongli, Sikkim, 2.v.1992, coll. S.Ali and party, 1 ex., Sambak, 26.ix.1993, coll. S.K. Saha and party.

Diagnostic characters : Pitchy black species, spot at the base of membrane, spots to connexivum, apices of the coxae and legs yellowish brown; hemelytra black; anterior femora, trochanters, apical halves of intermediate and posterior femora black; antennae finely pilose, first joint black, its base yellowish brown.

Length : 12–18 mm.

Distribution : India : Sikkim, Bengal. *Elsewhere* : Malay Peninsula, Mayanmar, North China.

Genus 11. ***Pirates*** Serv., 1891

1891. *Pirates* Serv., *Ann. Sc. Nat.*, **23** : 215.

* 14. ***Pirates atromaculatus*** (Stål)

1890. *Cleptocoris atromaculatus* Stål, *Ofv. Vet. A.K.Forth.*, 692.

1902. *Pirates atromaculatus* : Distant, *Fauna Brit. India*, **2** : 301.

1994. *Pirates atromaculatus* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal*, Part **5** : 386.

Material examined : 1 ex., Sikkim, 1915–16, coll. Carmicheal.

Diagnostic characters : Black, corium with a medial yellowish brown, longitudinal, inwardly ampliated and angulated with their margin, black; hemelytra pitchy, a large discal spot to membrane and a small spot near base of clavus black; antennae pilose with the second joint is equal to the anterior lobe of pronotum; anterior femora unarmed beneath.

Length : 12 mm.

Distribution : India ; Sikkim, Assam, Meghalaya, Nagaland. *Elsewhere* : Hong Kong, Java, Philippines, Maynmar, Sri Lanka.

Subfamily IV. ECTRICHODINAE

Genus 12. ***Ectrychotes*** Burm, 1835

1835. *Ectrychotes* Burm., *Handb.*, **2** : 237.

15. ***Ectrychotes scutellaris*** (Bredd.)

1903. *Ectrychodia scutellaris* Bredd., *Zool. Anz.*, **24** : 512.

1904. *Ectrychotes scutellaris* Distant, *Fauna Brit. India*, 316.

Diagnostic characters : Head, sternum, pronotum green; lateral margin of posterior lobe of pronotum, corium, legs, abdomen beneath luteous; a large chocolate brown spot covering the whole disk and clavus, apex of membrane dark fuliginous.

Length : 9–11 mm.

Distribution : India ; Sikkim, Assam, Meghalaya.

Remarks : The specimen of this species was not available for the present study. But Distant (1902) has reported this species from Sikkim in his Fauna Brit. India, Rhynchota –Vol. V.

Subfamily V. HARPACTORINAE

Key to the genera of the subfamily HARPACTORINAE

1(2) Antennae long, its first joint longer than head 3

2(1) Antennae short; its first joint not longer than head ..... ***Coranusaria***

3(4) Head without any spine or tubercle 5

4(3) Head armed with a spineor tubercle behind the base of each antennae; lateral pronotal angles spinous or prominent ..... ***Euagorasaria***

5(6) Anterior femora granulate generally nodose or nodulose and always spinous ..... ***Polididusaria***

6(5) Anterior femora neither granulate nor nodulose and without any spine 7

7(8) Postocular and anteocular area almost subequal in length; abdominal segments lobately dialated; head almost as long as pronotum; body oblong and subelongate ..... ***Harpactoraria***

8(7) Postocular area much longer than anteocular 9

9(10) Anterior tibiae much longer than anterior femora and trochanters together; posterior lobe of pronotum not extended over the scutellum; eyes inserted near the apex of head ..... ***Vesbiaria***

10(9) Anterior tibiae a little longer than the anterior femora; posterior lobe of promotum dialated and posteriorly produced over the scutellum and base of corium ..... ***Panthousaria***

Division I. HERPACTORARIA

Genus 13. ***Rhinocoris*** Hohn., 1834

1834. *Rhinocoris* Hohn., *Wang. Ins.*, **2** : 20.

Key to the species of the genus *Rhinocoris*

1(2) Posterior lobe of pronotum not or very obscurely rugosely granulate 3

2(1) Posterior lobe of pronotum rugosely granulate; anterior pronotal lobe sculptured, with two small but distinct discal tubercles and posteriorly centrally excavated ..... *squalus*

3(4) First joint of rostrum not, or scarcely, longer than anteocular area of head ..... *costalis*

4(3) First joint of rostrum distinctly longer than anteocular area of head 5

5(6) Pronotal lobes concolorous 7

6(5) Pronotal lobes not concolorous; posterior lobe luteous; abdomen beneath unicolourous; anterior lobe of pronotum not sculptured and with a central cruciform impression ..... *nigricollis*

7(8) Pronotum with the anterior lobe obscurely sculptured; ante and post ocular area of head about equal in length ..... *marginellus*

8(7) Pronotum with the anterior lobe distinctly bituberculate; postocular a little longer than anteocular area ..... *tristicolor*

* 16. ***Rhinocoris costalis*** (Stål)

1866. *Reduvius costalis* Stål, *Ofv. Vet.-AK. Forth.*, : 285.

1994. *Rhinocoris costalis* : Biswass, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal,* Part 5 : 392.

Material examined : 1 ex., Jorethang, South Sikkim, 10.ix.1994, coll. G.C. Sen and party.

Diagnostic characters : Black;anterior lobe of pronotum lateral margin and basal area of posterior pronotal lobe, apex of scutellum, abdomen beneath, coxae and trochanters coral red;

Length : 12–14 mm.

Distribution : India : Sikkim (South Sikkim), Assam; Meghalaya, *Elsewhere* : Malay Peninsula, Mayanmar.

17. ***Rhinocoris marginellus*** (Fabricius)

1803. *Reduvius marginellus* Fabricius, *Syst. Rhyng.*, : 271.

1994. *Rhinocoris marginellus* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal,* Part 5, : 392.

Diagnostic characters : Black, head as long as pronotum; first joint of antennae about equal to anterior femora; ante and postocular area of head

about equal in length; pronotum with anterior lobe sculptured, posterior lobe sericeous, head and legs shinning black.

Length : 12–15 mm.

Distribution : India : Sikkim, Assam, Meghalaya.

Remarks : This species could not be studied due to non-availability of specimens but Distant (1902) had reported this species from Sikkim in his Fauna Brit. India, Rhynchota Vol.VI.

* 18. ***Rhinocoris nigricollis*** (Dalias)

1850. *Arilus nigricollis* Dallas, *Jr. E.S.*, : 8.

1994. *Rhinocoris nigricollis* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal,* Part 5 : 393.

Material examined : 1 ex. Nayabajar, West Sikkim, 9.ix.1994, coll. P.H. Roy and party.

Diagnostic characters : Head black as long as pronotum, anteocular area of head as long as postocular, pronotum with anterior lobe black and posterior lobe luteous, membrane pale brownish its apical area paler.

Length : 13–14 mm.

Distribution : India ; Sikkim (West Sikkim), West Bengal. *Elsewhere* : Mayanmar, Sumatra.

19. ***Rhinocoris squalus*** (Dist.)

1902. *Harpactor squalus* Dist., *Fauna Brit. India,* 2 : 333.

Diagnostic characters : Pronotum piceous, posterior lobe coarsely granulate, anterior lobe sculptured with two small discal tubercles and centrally excavated posteriorly, first joint of rostrum reaching eyes and longer than anteocular portion; anteocular and postocular areas of head about equal in length.

Length : 21 mm.

Distribution : India : Sikkim.

Remarks : No specimen of this species was available for the present study. Distant (1902) had reported this species from Sikkim in his Fauna. Brit. India. Rhynchota Vol. II.

20. ***Rhinocoris tristicolor*** (Reuter)

1881. *Diphymus tristicolor* Reuter, *Act. Soc. Sc. Fenn.,* 12 : 201.

Diagnostic characters : Pronotum with the anterior lobe bituberculate, head about as long as pronotum; postocular portion of head a little longer than anteocular; a testaceous transverse spot between eyes and base of antennae; antennae, rostrum and legs black, connexivum with large black spots, which are smaller in male.

Length : 13–14 mm.

Distribution : India ; Sikkim, Assam. *Elsewhere* : Combodia, Mayanmar.

Remarks : The specimen of this species was not available for examination but Distant (1902) had reported this species from Sikkim in his Fauna Brit. India – Rhynchota – Vol. II.

Genus 14. ***Sphedanolestes*** Stål, 1866

1866. *Sphedanolestes* Stål, *Ofv. Vet.-AK. Forth.,* : 284 & 288.

Key to the species of the genus *Sphedanolestes*

1(2) Membrane just passing the abdominal apex; anterior pronotal lobe centrally sulcate; posterior lobe discally broadly impressed ..... *indicus*

2(1) Membrane longly passing the abdominal apex; pronotum with a broad central impression which reaches middle of the posterior lobe 3

3(4) Head with anteocular and postocular region about equal in length; anterior femora distinctly nodulose; body violaceous black ..... pulchriventris

8(7) Head with the postocular a little longer than the anteocular area; anterior femora not nodulose; body black ..... *pubinotum*

* 21. ***Sphedanolestes indicus*** Reuter

1881. *Sphedanolestes indicus* Reuter, *Act. Soc. Sc. Fenn.,* 12 : 289.

1902. *Sphedanolestes indicus* : Distant, *FaunaBrit. India,* 2 : 340.

1994. *Sphedanolestes indicus* : Biswas, Sen and Ghosh, *State Fauna series 3 : Fauna of West Bengal*, Part 5 : 394.

Material examined : 1 ex., Chudfunfun, North Sikkim, 24.ix.1959, coll. A.G.K. Menon.

Diagnostic characters : Black, corium and bases of femora pitchy black, both connexivum and large spot before apex of abdomen below blood red; anterior pronotal lobe centrally sulcate, posterior lobe distally broadly impressed; membrane bronzy brown extending abdominal apex; first joint of antennae about as long as anterior femora.

Length : 12.5 mm.

Distribution : India : Sikkim (North Sikkim).

*22. ***Sphedanolestes pubinotum*** Reuter

1881. *Sphedanolestes pubinotum* Reuter, *Act. Soc. Sc. Fenn.*, **12** : 289.

1902. *Sphedanolestes pubinotum*, Distant, *Fauna Brit. India*, **2** : 339.

1994. *Sphedanolestes pubinotum* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal Part* 5 : 394.

Material examined : Makaibari, 30.v.1962, coll. G. Ramakrishnan.

Diagnostic characters : Shiningly black, abdomen blood red beneath with three or four transverse black fasciae which may be absent sometimes; first joint of rostrum a little longer than anteocular portion of head and shorter than second joint, head with the postocular a little longer than the anteocular area, membrane extending abdominal apex; Central impression to pronotum continued about middle of posterior lobe.

Length : 15–16.5 mm.

Distribution : India ; Sikkim, Assm; Meghalaya, West Bengal. *Elsewhere* : Mayanmar.

*23. ***Sphedanolestes pulchriventris*** Stål

1863. *Sphedanolestes pulchriventris* Stål, *Ann. Soc. Ent. Fr.*, : 37.

1902. *Sphedanolestes pulchriventris* : Distant, *Fauna Brit. India*, **2** : 340.

1994. *Sphedanolestes pulchriventris* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal*, Part 5 : *394.*

Material examined : 1 ex., Sikkim, 1959, coll. A.G.K. Menon.

Diagnostic characters : Violaceous black, connexivum blood red with black spots above and beneath, abdomen blood red with lateral fasciate spot beneath, black; head little shorter than pronotum, anteocular and postocular area about equal in length; basal joint of rostrum a little longer than anteocular portion of head.

Length : 14–15 mm.

Distribution : India ; Sikkim.

Division 2. VESBIARIA

Genus 15. ***Vesbius*** Stål, 1865

1865. *Vesbius* Stål, *Hem. Afr.*, **3** : 50.

24. ***Vesbius sanguinosus*** Stål

1874. *Vesbius sanguinosus* Stål, *En. Hem.*, 4 : 36.

1902. *Vesbius sanguinosus* : Stål, *Fauna Brit. India*, **2** : 345.

Diagnostic characters : Head, antennae, rostrum, black; trochanters and base of the femora blood red; the species is longer than the *Vesbius purpureus.*

Length : 8-11 mm.

Distribution : India ; Sikkim, Assam, Meghalaya; Borneo *Elsewhere* : Java, Malaypeninsula, Mayanmar.

Remarks : This specimen of this species is not available for examination but Distant (1902) had reported its occurrence from Sikkim in his Fauna Brit. India, Rhynchota, Vol. II.

Division 3. EUAGORASARIA

Key to the genera of the division EUAGORASARIA

1(2) Anterior lobe of pronotum prominently tuberculose on each side ..... ***Isyndus***

2(1) Anterior lobe of pronotum not prominently tuberculose on each side 3

3(4) Posterior lobe of pronotum not discally spined; head about as long as pronotum.. ..... ***Endochus***

4(3) Posterior lobe of pronotum discally spined; head about as long as pronotum..... ..... ***Platerus***

Genus 16. ***Endochus*** Stål, 1859

1859. *Endochus* Stål, *Ofv. Vet.-AK. Forth.,*: 194.

25. ***Endochus atricapillus*** Distant

1902. *Endochus atricapillus* Distant, *Fauna Brit. India,* **2** : 367.

1994. *Endochus atricapillus* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal,* Part **5** : 298.

Diagnostic characters : Golden yellow, membrane shining bronzy, head about as long as pronotum with a short acute spine behind base of both the antennae.

Length : 19 mm.

Distribution : India : Sikkim.

Remarks : No specimen of this species was available for examination but Distant (1902) had reported the occurrence of this species from Sikkim in his Fauna Brit. India, Rhynchota – Vol.II.

Genus 17. ***Platerus*** Distant, 1903

1903. *Platerus* Distant, *A.M.N.H.* (7) **11** : 247.

26. ***Platerus pilcheri*** Distant

1903. *Platerus pilcheri* Distant, *A.M.N.H.* (7) **11** : 248.

1994. *Platerus pilcheri* : Biswas, Sen and Ghosh, *State Fauna Series* 3 : *Fauna of West Bengal, Part* **5** : 398.

Diagnostic characters : Black; pronotum with the lateral angles spinously produced and their posterior margin distinctly notched, near base, lateral margin of anterior lobe and a transverse fascia to posterior lobe cretaceous white; membrane with inner area black apical area pale hyaline; first joint of rostrum luteous with its base and apex black.

Length : 23 mm.

Distribution : India ; Sikkim.

Remarks : This species could not be examined due to non-availability of specimens but Distant (1902) had reported this species from Sikkim in his Fauna Brit. India – Rhynchota Vol.II.

Genus 18. ***Isyndus*** Stål, 1881

1881. *Isyndus* Stål, *Ofv. Vet.-A.K. Forth.,* : 445.

27. ***Isyndus pilosipes*** Reuter

1881. *Isyndus pilosipes* Reuter, *Act. Soc. Sc. Fenn.,* **12** : 279.

1902. *Isyndeus pilosipes* : Distant, *Fauna Brit. India,* **2** : 377.

Diagnostic characters : Anterior pronotal lobe black with a tubercle on each lateral margin, lateral angles of posterior lobe straightly spinous, membrane bronzy; abdomen beneath, brownish ochraceous with a central longitudinal dark line; body and legs thickly pilose.

Length : 22–23 mm.

Distribution : India ; Sikkim, Assam, Nagaland, West Bengal. *Elsewhere* : Mayanmar.

Remarks : The specimens of this species is not available for examination in the present collection but Distant (1902) had recorded this species from Sikkim in his *Fauna Brit. India* – Rhynchota, Vol. II.

Division 4. PANTHAUSARARIA

Genus 19. ***Panthous*** Stål, 1863

1863. *Panthous* Stål, *Ann. Soc. Ent. Fr.,* : 42.

28. ***Panthous excellens*** Stal

1863. *Panthous excellens* Stål, *Ann. Soc. Ent. Fr.,* :42.

1902. *Panthous excellens* : Distant, *Fauna Brit. India,* **3** : 379.

Diagnostic characters : Ochraceous, anterior lobe of pronotum, head above, legs, most of the sternum black, membrane black with its apex paler; femora and tibiae prominently nodulose;

anterior lobe of pronotum medially longitudinally impressed, connexivum upwardly recurved, transverse spots to lateral area of abdomen black.

Length : 24–29 mm.

Distribution : India ; Sikkim, Assam, Nagaland.

Remarks : No specimen of this species was available for examination, Distant (1902) had reported the occurrence of this species in his *Fauna Brit. India* : Rhynchota Vol. II.

Division 5. CORANUSARIA

Genus 20. ***Coranus*** Curtis, 1833

1833. *Coranus* Curtis, *Brit. Ent.*, **10** : 453.

*29. ***Coranus obscurus*** (Kirby)

1891. *Harpactor obscurus* Kirby, *J. Linn. Soc. Zool.*, **24** : 120.

1994. *Coranus obscurus* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal,* Part **5** : 401.

Material examined : 1 ex., Yam chang, N. Sikkim, 15.vi.1959, coll. A.G.K. Menon; 1 ex., 19.iv.1959, coll. A.G.K. Menon.

Diagnostic characters : Head with postocular area with a central pale line; antennae piceous, basal joint ochraceous first joint of antennae as long as head; posterior pronotal lobe thickly granulate; first joint of rostrum shorter than second, tibiae ochraceous with three piceous annulations.

Length : 9–10 mm.

Distribution : India ; Sikkim (North Sikkim), Assam, Nagaland, West Bengal. *Elsewhere* : Sri Lanka.

Division 6. POLIDIDUSARIA

Key to the genera of the division POLIDIDUSARIA

1(2) Head with the central lobe not spinously produced 3

2(1) Head with the Central lobe longly, spinously produced ..... ***Henricohahnia***

3(4) First and second joints of rostrum subequal in length ..... ***Scipinia***

4(3) First joint of rostrum longer than second; Postocular area a little longer than anteocular, all the femora spined..... ..... ***Polididus***

Genus 21. ***Polididus*** Stål, 1858

1858. *Polididus* Stal, *Ofv. Vet. – A.K. Forh.*, : 448.

* 30. ***Polididus armatissimus*** Stål

1859. *Polididus armatissimus* Stål, *Ofv. Vet. – A. K. Forh,*: 376.

1994. *Polididus armatissimus* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal Part* **5** : 402.

Material examined : 1 ex., Nayabazar, West Sikkim, 28.v.1959, coll. A.G.K. Menon.

Diagnostic characters : Head with a long spine behind the base of each antenna and with a number of smaller discal spines; pronotum spinous, the longest being two erect on anterior lobe and the lateral spines to the posterior lobe; anterior pronotal lobe with greyish narrow vittae, abdomen beneath with a piceous sublateral fascia on each side, tibiae and femora spinous.

Length : 10 mm.

Distribution : India : Sikkim (West Sikkim), Maharashtra, West Bengal. *Elsewhere* : Japan, Mayanmar, Philippines.

Genus 22. ***Scipinia*** Stål, 1861

1861. *Scipinia* Stål, Stett. *Ent. Zeit.*, **22** : 137 and 138.

31. ***Scipinia horrida*** (Stål)

1859. *Sinea horrida* Stål, *Freg. Eng. Resa. Ins.*

1902. *Scipinis horrida* Distant, *Fauna Brit. India,* **2** : 394.

1994. *Scipinia horrida* : Biswas, Sen and Ghosh, *State Fauna Series 3 : Fauna of West Bengal, Part* 5 : 402.

Material examined : 1 ex., Rongpou, East Sikkim, 3.xi.1994, coll. G.C. Sen and party.

Diagnostic characters : Ochraceous with a black spot on base of head and on connexivum the largest on 4th and 5th segments, posterior lobe of pronotum granulate with its lateral angles

acute; membrane bronzy its apical area paler and sub-hyaline, intermediate and posterior femora subnodulose near apices.

Length : 10 mm.

Distribution : India ; Sikkim (East Sikkim). *Elsewhere* : Mayanmar, Sri Lanka, Philippines.

Genus 23. ***Henricohahnia*** Bredd., 1900

1900. *Henricohahnia* Bredd., *Deutsche Ent. Zeit.*, : 184.

Key to the species of the genus *Henricohahnia*

1(2) Lateral pronotal angles subprominent, not spinously produced, connexivum distinctly angulate, membrane bronzy, lateral angles of the posterior lobe subprominent and not spinous ..... *inermis*

2(1) Lateral pronotal angles produced 3

3(4) Lateral pronotal angles broadly produced, their apices notched or spinous ..... *typica*

4(3) Lateral pronotal angles spinously produced and curved 5

5(6) Pronotal carinae less produced, fourth and fifth segment of connexivum angulately produced ..... *spinosa*

6(5) Pronotal carinae more produced than *H.spinosa,* fourth and fifth segment of connexivum less produced ..... *montana*

32. ***Henricohahnia inermis*** (Distant)

1903. *Forestus inermis* Distant. *A.M.N.H.* (7) **11** : 253.

1905. *Henricohahnia inermis* Distant, *Fauna Brit. India,* **2** : 389.

Diagnostic Characters : Pronotum with five distinct carinae on anterior lobe, lateral angles of pronotum subprominent and not spinous; third joint and base of fourth jointof antennae luteous, connexivum with a series of luteous spots and membrane cupreous, anterior femora have a series of spines beneath.

Length : 13 m.m.

Distribution : India ; Sikkim.

Remarks : No spemimens of this species was available for examination but Distant (1902) had reported the occurrence of this species from Sikkim in his *Fauna Brit. India,* Rhynchota Vol.II.

33. ***Henricohahnia montana*** (Distant)

1903. *Forestus montana* Distant, *A.M.N.H.* (7) **11** : 252.

1902. *Henricohahnia montana* : Distant, *Fauna Brit. India,* **2** : 388.

Diagnostic characters : Pronotal lateral angles spinous and strongly recurved, a spot between eyes and central line to postocular portion of head and another on apical margin of corium which occupy the whole apical angle in

Length : 16 mm., o 13 mm.

Distribution : India : Sikkim, Assem Meghalaya.

Remarks : This species could not be examined due to nonavailability of specimens but Distant (1902) had reported the occurrence of this species in his Fauna Brit. India – Rhynchota – Vol. II.

34. ***Henricohahnia spinosa*** (Distant)

1903. *Forestus spinosa* Distant, *A.M.N.H.* (7) **11** : 252.

1902. *Henricohahnia spinosa* : Distant, *Fauna Brit. India,* **2** : 388.

Material examined : 1 ex., Chun fun, North Sikkim, 14.v.1959, coll. A.G.K.Menon.

Diagnostic characters : Central lobe of anteocular portion of head contain a streak on each side; postocular portion of head contain a broad central longitudinal fascia; and a large piceous spot on fourth and fifth segments of connexivum, membrane light cupreous, somewhat similar to *H.montana* or *H.typica* but the carinae to the pronotum are less pronounced than two.

Length : 14 mm.

Distribution : India : Sikkim (North Sikkim).

35. ***Henricohahnia typica*** (Distant)

1903. *Forestus typica* Distant, *A.M.N.H.*, (7) **11** : 257.

1902. *Henricohahnia typica* : Distant, *Fauna Brit. India,* **21** : 387.

Diagnostic characters : Pronotum with two discal curved and two other much more obscure carinae near lateral angles.

Length : 12.5 – 14 mm.

Distribution : India : Sikkim, Assam, Meghalaya.

Remarks : No specimen of this species was available for examination but Distant (1902) had reported the occurrence of this species from Sikkim in his *Fauna Brit. India* Rhynchota Vol. II.

Subfamily VI. NABIDINAE

Key to the genera of the subfamily NABIDINAE

1(2) Pronotum is not narrowed and developed anteriorly into distinct collar; head usually inmersed to the eyes which touch the anterior margin of pronotum; anterior femora densely spinulose beneath, not dentately ampliated ..... ***Psilistus***

2(1) Pronotum provided with a transverse impression a little beyond the anterior margin, thus constituting a distinct collar, the head always distinctly exserted, not immersed to eyes, which are well separated from the anterior margin of pronotum ... 3

3(4) Anterior coxae very long, reaching middle of the mesosternum; lateral angles of pronotum strongly produced .. ***Dodonaeus***

4(3) Anterior coxae of moderate length; posterior tibiae simple, not incrassated ..... ***Nabis***

Genus 24. *Psilistus* Stål, 1873

1873. *Psilistus* Stål, *En. Hem.*, **3** : 107.

36. *Psitistus corallinus* Stål

1873. *Psilistus corallinus* Stål, En. Hem., **3** : *109.*

1903. *Psilistus corallinus* : Distant, *Fauna Brit. India*, **2** : 395.

Diagnostic characters : Coral red, scutellum clavus internal area of the corium fuscous, sometimes coral red; membrane piceous not reaching the abdominal apex; antennae with basal joint red and passing apex of head; anterior and intermediate femora with black serration underneath.

Length : 9.5 mm to 11 mm.

Distribution : India ; Sikkim, *Elsewhere* : Borneo, Malay Peninsula, Mayanmar.

Remarks : The specimen of this species was not available for examination but Distant (1902) had reported this species from Sikkim in his *Fauna Brit. India,* Rhynchota – Vol. II.

Genus 25. *Dodonaeus* Distant, 1902

1902. *Dodonaeus* Distant, *Fauna Brit. India,* **2** : 396.

37. *Dodonaeus humeralis* Distant

1902. *Dodonaeus humeralis* Distant, *Fauna Brit. India,* **2** : 399.

Diagnostic characters : Head pronotum, sternum, membrane, antennae, legs, pale ochraceous; a subclaval fascia to corium, margins of the transverse fascia to corium, apices of the posterior femora and base of posterior tibiae rosaceous; the lateral angle of pronotum a little upwardly recurved and angulately produced.

Length : 13.5 mm.

Distribution : India ; Sikkim.

Remarks : This species could not be examined due to nonavailability of specimens but Distant (1902) had reported the occurrence of this species from Sikkim in his *Fauna Brit. India* –Rhynchota – Vol. II.

Genus 26. *Nabis* Latr., 1807

1807. *Nabis* Latr., *Gen.*, **3** : 127.

38. *Nabis funebris* Distant

1902. *Nabis funebris* Distant, *Fauna Brit. India,* **2** : 401.

Diagnostic characters : Head, antennae, rostrum; pronotum, two discal spots to scutellum, legs, margin of abdomen ochraceous, a central fascia to head, a central and two oblique fasciae on both the lateral area of pronotum, annulation

to first and second joint of antennae, apices to femora fuscous; abdomen a little dialated on each side beyond middle.

Length : 7.5 mm.

Distribution : India : Sikkim.

Remarks : This species could not be examined due to nonavailability of specimen but Distant (1902) had recorded this species from Sikkim in his *Fauna Brit. India,* Rhynchota Vol.II.

SUMMARY

The paper deals with 38 species of Reduviid bugs belonging to 26 genera under 6 subfamilies from the State of Sikkim. Diagnosis of each species, keys to various taxa and relevant literature references have been provided in the text. Distribution in different districts of Sikkim and other States in India as well as abroad have been incorporated in the present paper. Districtwise distribution of 13 species of those bugs have also been cited in the map of Sikkim. Out of those 13 species 10 species have been found for the first time from the state of Sikkim as new records.

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	Name of the species	Name of the Districts			
		North Sikkim	**South Sikkim**	**East Sikkim**	**West Sikkim**
1.	*Pygolampis unicolor* Walker	–	–	–	+
2.	*Acanthaspis sexguttata* (Fabr.)	–	–	+	–
3.	*Ectomocoris atrox* (Stal)	–	+	–	–
4.	*Rhinocoris costalis* (Stal)	–	+	–	–
5.	*Rhinocoris nigricollis* (Dallas)	–	–	–	+
6.	*Sphedanolestes indicus* Reuter	+	–	–	–
7.	*Sphedanolestes pubinotum* Reuter	–	–	–	+
8.	*Coranus obscurus* (Kirby)	+			
9.	*Polididus armatissimus* Stal	–	–	–	+
10.	*Scipinia horrida* (Stal)	–	–	+	–
11.	*Henricohahnia spinosa* (Dist.)	+	–	–	–

N.B. The districts and localities of the remaining 27 species from the state of Sikkim are not known. So these species are not included in this chart.

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INSECTA : HEMIPTERA : WATER-BUGS

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INTRODUCTION

In accordance with the policy decision, the Zoological Survey of India has taken up the project on the faunal diversity in different States of India for last couple of years and the yield is being published under the State Fauna Series Publication in various groups of animals. The present paper is the production of one of such studies based upon the water-bugs of the State of Sikkim. It consists a taxonomic treatment of seven families of water-bugs of the Order Hemiptera, of which four families are aquatic belonging to the Series Hydrocorisae, namely Gelastocoridae, Nepidae, Corixidae and Notonectidae while other three families are surface dwelling semi-aquatic bugs belonging to the Series Amphibicorisae, namely Hebridae, Veliidae and Gerridae (Classification is based upon Richards and Davies, 1977). The present work is targeted to bring out a faunistic-cum-taxonomic study of water-bugs of Sikkim, chiefly based upon the collections made by various survey parties of the Zoological Survey of India and other unnamed and a few named collections present in the National Zoological Collection.

Distant (1902, 1906, 1010) had recorded seven species of water-bugs from the State of Sikkim in the Fauna of British India, Rhynchota, volumes. Since then, only a few species of water-bugs have been recorded in the work of Hutchinson (1940), Hungerford and Matsuda (1965), Boer (1965), and Andersen (1982) including two new species from Sikkim.

The present study may be considered a comprehensive systematic work, first of its kind from the State of Sikkim, precisely includes the keys for different taxa, diagnostic characters for each species, distributional pattern of each species in the districts of Sikkim as well as their distribution in other states of India, and countrywise in the World. The present paper has recorded 24 species under 13 genera from the State of Sikkim, of which 12 species are being recorded for the first time from the State and cited in the text with asteric marks. The studied materials are kept properly in the National Zoological Collection, Kolkata.

MATERIAL AND METHOD

The water-bugs are of two major categories on the basis of their habitat, aquatic and semi-aquatic. The aquatic bugs, except the shore bugs, live beneath the water and belong to the Series Hydrocorisae. The specimens under this group have been studied and included in the present paper comprise four families of water-bugs, namely Gelastocoridae, Nepidae, Corixidae and Notonectidae. The semi-aquatic bugs, on the other hand, live on the surface of water and belong to the series Amphibicorisae, which are represented in the present paper by three families Hebridae, Veliidae and Gerridae from Sikkim.

The materials which have been studied for the present work, were mostly collected from different parts of Sikkim by the survey parties from the Zoological Survey of India. The examples of some of the previously recorded species from Sikkim were not available for studies but the species have been included in the present paper in compliance with the fauna of Sikkim.

The long handled water-nets, made up of closed meshed Nylon threads, had been used to collect

the samples of water-bugs from different water bodies. The collected specimens in the field were preserved in 70% Ethyl alcohol. In the laboratory, the specimens were studied under Stereoscopic Binocular Microscope. The studied materials have been kept as wet collection by preserving them in the freshly changed 70% Ethyl alcohol. Each species is labelled properly by depicting the systematic position and collection data.

SYSTEMATIC ACCOUNT

Following is the systematic list of all the species contained in the present paper. Asteric mark with the species denotes the new record from the State of Sikkim.

Series HYDROCORISAE

Family I. GELASTOCORIDAE

Genus 1. ***Nerthra*** Say 1932

1. *Nerthra asiatica* (Horvath)*
2. *Nerthra indica* (Atkinson)
3. *Nerthra turgidula* (Distant)*

Family II. NEPIDAE

Genus 2. *Laccotrephes* Stall 1865

4. *Laccotrephes ruber* (Linnaeous)*

Family III. CORIXIDAE

Genus 3. ***Corixa*** Geoffroy 1762

5. *Corixa (Callicorixa) gebleri* Fieber
6. *Corixa (Sigara) seistanensis* f. *randana* Distant
7. *Corixa (Vermicorixa) kempi* Hutchinson*

Family IV. NOTONECTIDAE

Genus 4. ***Anisops*** Spinola 1837

8. *Anisops batillifrons* Lundblad*

Series AMPHIBICORISAE

Family V. HEBRIDAE

Genus 5. ***Hyrcanus*** Distant 1910

9. *Hyrcanus capitatus* Distant

Family VI. VELIIDAE

Genus 6. *Microvelia* Westwood 1834

10. *Microvelia diluta* Distant *
11. *Microvelia douglasi* Scott *

Family VI. GERRIDAE

Subfamily PTILOMERINAE

Genus 7. ***Ptilomera*** Amyot & Serville 1843

12. *Ptilomera (Proptilomera) himalayensis* Hungerford & Matsuda
13. *Ptilimera (Ptilomera) laticaudata* (Hardwicke)

Subfamily HALOBATINAE

Genus 8. ***Metrocoris*** Mayr 1865

14. *Metrocoris stali* (Dohrn)
15. *Metrocoris compar* (Buchanan White)
16. *Metrocoris tenuicornis* Esaki*

Subfamily EOTRECHINAE

Genus 9. ***Chimarrhometra*** Bianchi 1896

17. *Chimarrhometra orientalis* (Distant)*

Genus 10. ***Eotrechus*** Kirkaldy 1902

18. *Eotrechus brevipes* Andersen
19. *Eotrechus terrestris* Andersen

Subfamily GERRINAE

Genus 11. ***Neogerris*** Matsumura 1913

20. *Neogerris parvula* (Stal)*

Genus 12. ***Limnogonus*** Stal 1868

21. *Limnogonus (Limnogonus) nitidus* (Mayr)*

Genus 13. ***Gerris*** Fabricius 1794

22. *Gerris lepcha* Distant
23. *Gerris spinolae* Lethierry & Severin*
24. *Gerris gracilicornis* (Horvath)

Key to the families

1. Antennae shorter than head, usually hidden in cavities beneath eyes and not visible from above. [Aquatic and shore bugs] Series HYDROCORISAE 2

   Antennae longer than head, inserted in front of eyes and clearly visible from above. [Semi-aquatic bugs] Series - AMPHIBICORISAE 5

2. Body short and broadly ovate; ocelli present; pronotum irregularly tuberculate

provided with carinations and ridges; middle and hind legs without fringe of swimming hairs ..... GELASTOCORIDAE

Body otherwise; ocelli absent; pronotum otherwise; middle and hind legs provided with more or less extensive fringe of long swimming hairs 3

3. Body elongate; abdomen with a pair of long, slender posterior appendages .... NEPIDAE

Body not elongate; abdomen without long, slender posterior appendages 4

4. Rostrum very short and broad with no distinct segmentation; front tarsi spatulate and developed into comblike palae; base of the head overlapping the anterior margin of pronotum; hind legs moderately long; abdomen without hair trough ....CORIXIDAE

Rostrum moderately elongate with distinct 3-4 segments; front tarsi normal and not modified into comblike palae; base of the head not overlapping the anterior margin of pronotum; hind legs considerably long; abdomen with hair trough .... NOTONECTIDAE

5. Ocelli well developed; under surface of head deeply grooved to form a rostral groove (rostral sulcate); scutellum exposed and double ..... HEBRIDAE

Ocelli absent or when present not well developed; under surface of head without any rostral sulcate; scutellum not exposed 6

6. Ocelli reducedly developed; head with a distinct longitudinal median impressed line on dorsal surface; fore tibia of male with a grasping comb of short spines along inner margin; hind femora usually stouter than middle femora ..... VELIIDAE

Ocelli absent; head without a median impressed line on dorsal surface; fore tibia of male without grasping comb; hind femora usually more slender than middle femora ..... GERRIDAE

Series HYDROCORISAE

Family I. GELASTOCORIDAE

Genus 1. ***Nerthra*** Say 1832

1832. *Nerthra* Say, *Descr. Het. Hem. N. Amer.*, : **37**.

Key to the species of the genus *Nerthra*

1. Body length of adult insect 11.0-12.0 mm and breadth of pronotum 8.0-8.5 mm; pronotum with lateral margins ampliately dilated somewhat rounded; basal marginsof corium convexly ampliate ..... *asiatica*

Body length of adult insect below 10.0mm; breadth of pronotum upto 6.5 mm; pronotal margins otherwise; basal margins of corium not convexly ampliate 2

2. Pronotal lateral margins angularly dilated; on the anterior angle of pronotum just beyond each eye a distinct anteriorly direct spine present; pronotum with three prominent nodules transversely present on the middle; dorsum of abdomen covered fully by elytra ..... *indica*

Pronotal lateral margins moderately, subtruncately produced; no spine on the anterior angle of pronotum beyond the eye; pronotum not prominently nodulose on the middle; elytra not covered fully the dorsum of abdomen, lateral and posterior parts remain exposed ..... *turgidula*

1. ***Nerthra asiatica*** (Horvath) *

1892. *Mononyx asiaticus* Horvath, *Termeszetrajzi Fuzetek*, **15** : 136

1899. *Mononyx grossus* : Montandon, *Bull. Soc. Sci. Bucarest*, **8** : 398.

1906. *Mononyx grossus* : Distant, *Fauna Brit. India, Rhynchota*, **3** : 16.

1955. *Nerthra asiatica* : Todd, *Kans. Univ. Sci. Bull.*, **37**(1) : 410.

Material examined : 3M, 8F exs., Tumin, 1800 metres, East Sikkim Dist., 23.9.1988, V. C. Agrawal coll.; 1 M, 1 F exs., Rabangla, 2010 metres, South Sikkim Dist., 8.10.1988, V. C.

Agrawal coll.; 1 F ex., Setipuol, East Sikkim Dist., 13.9.1993, S. K. Saha and H. N. Singh coll.

Diagnosis : As in key.

Distribution : India : Sikkim (Districts East Sikkim, South Sikkim); Assam. *Elsewhere* : China, Tibet.

2. ***Nerthra indica*** (Atkinson)

1889. *Mononyx indicus* Atkinson, *J. Asiat. Soc. Bengal,* **57** : 345.

1906. *Mononyx indicus* : Distant, *Fauna Brit. India, Rhynchota,* **3** : 15.

1910. *Mononyx projectus* : Distant, *Fauna Brit. India, Rhynchota,* **5** : 310.

1955. *Nerthra indica* : Todd, *Kans. Univ. Sci. Bull.,* **37**(1) : 405.

Material examined : 1 M, 3 F exs., Tashigang, West Sikkim Dist., 29.9.1959, B. K. Tikader coll.; 1 M ex., Tumin, 1800 metres, East Sikkim Dist., 23.9.1988, V. C. Agrawal coll.

Diagnosis : Adults attain a length of 9.0-10.0 mm; breadth between the pronotal angles approx. 7 mm.; head between eyes about three times wider than long and provided with two short distinct projecting spines at the middle of anterior margin; scutellum irregularly gibbous with no distinct tubercle. Other diagnostic characters as in key.

Distribution : India : Sikkim (Districts East Sikkim, West Sikkim), Assam; Meghalaya, West Bengal.

3. ***Nerthra turgidula*** (Distant) *

1906. *Mononyx turgidulus* Distant, *Fauna Brit. India, Rhynchota,* **5** : 311.

1955. *Nerthra turgidula* : Todd, *Kans. Univ. Sci. Bull.,* **37**(1) : 406.

Material examined : 1 F ex., Nagi lower Lake, South Sikkim District, 7.3.1995, B. N. Roy coll.

Diagnosis : Adult insect may be 9.5mm in body length, breadth of pronotum 6.5 mm; head between eyes about twice as broad as long, anterior margin shortly setose and with two short obscure spines at middle; posterior margin of pronotum with six prominent carinations; scutellum with setose elevations, one on each side near base, apex prominently tuberculous; abdomen with a sublateral fascia on each side united subapically. Other diagnostic characters as in key.

Distribution : India : Sikkim (District - South Sikkim). *Elsewhere* : Nepal.

Family II. NEPIDAE

Genus 2. ***Laccotrephes*** Stål 1865

1865. *Laccotrephes* Stål, *Hem. Africa.,* **3** : 186.

4. ***Laccotrephes ruber*** (Linnaeus) *

1764. *Nepa ruber* Linnaeus, *Mus. Lud. Ulr.,*: 165

1868. *Laccotrephes ruber* : Stal, *Hem. Fabr.,* **1**: 135.

1906. *Laccotrephes ruber* : Distant, *Fauna Brit. India, Rhynchota,* **3** : 18.

1986. *Laccotrephes ruber* : Thirumalai, *Rec. zool. Surv. India, Occ. Paper,* **118** : 29.

Material examined : 1 M ex., Rabangla, 2010 mts., South Sikkim Dist., 8.10.1988, V. C. Agarwal coll.; 3 M exs., Sikkim, Atkinson coll.; 3 F exs., Sikkim, Regn. Nos. 2167/8, 2168/8 and 3987/5; 1 F ex., P.R.H. Compound, Jorethang, South Sikkim Dist., 10.9.1994, G. C. Sen and party coll.; 3 M, 4 F exs., Nagi Lower Lake, South Sikkim Dist., 13.6.1995, B. N. Roy coll.; 2 F exs., Lopthing Pokhri Lake, West Sikkim Dist., B. N. Roy coll.

Diagnosis : Adults attain a length about 30-35 mm; abdominal appendages distinctly longer than the body; abdomen above yellowish red in colour; prosternum convex along the middle and provided with a tubercles in the anterior region and slightly raised medianly near the posterior margin.

Distribution : India : Sikkim (Districts - South Sikkim, West Sikkim); Bihar; Gujarat; Himachal Pradesh; Jammu & Kashmir; Kerala; Maharashtra; Nagaland; Orissa; Tamil Nadu; Uttar Pradesh; West Bengal. *Elsewhere* : China, Formosa, Japan, Nepal, Pakistan, Sri Lanka.

Family III. CORIXIDAE

Genus 3. *Corixa* Geoffroy 1762

1762. *Corixa* Geoffroy, *Hist. abreg. Ins.*, **1** : 477.

Key to the species of the genus *Corixa*

1. Pronotum with 10 black transverse stripes with intervening yellow spaces; males with palar peg row broken into two portions, proximal portion with 24 pegs and distal with 13 pegs ..... *C. (Callicorixa) gebleri*

   Pronotum with either 10 or 7 yellow transverse stripes with intervening black spaces; males with strigil present on sixth abdominal segment; males with palar peg row otherwise 2

2. Pronotum with 7 yellow transverse stripes; pronotal disk with a central carina present only in the anterior portion; males with palar peg row broken into two sections, proximal straight row of 16 pegs while distal arcuate row of 19 pags .... *C.(Sigara) seistanensis f. randana*

   Pronotum with 10 yellow transverse stripes; pronotal disk with no carina but a minute tubrcle anteriorly at the centre; males with single curved palar peg row of 34 pegs where apical pegs gradually elongated in shape ..... *C. (Vermicorixa) kempi*

5. *Corixa (Callicorixa) gebleri* Fieber

1848. *Corixa gebleri* Fieber, *Bull. Soc. Nat. Moscou.*, **21**(1) : 522.

1909. *Callicorixa gebleri* : Oshanin, *Annu. Mus. zool. Acad. St. Petersburg.*, **14** : 996.

1933. *Sigara gebleri* : Jaczewski, *Ann. Mag. nat. Hist.*, (10)**12** : 588.

1940. *Corixa (Callicorixa) gebleri* : Hutchinson, *Trans. Conn. Acad. Art Sci.*, **33** : 421.

Diagnosis : Adult insects may be 6.9 7.4 mm. in length; other diagnostic characters as in key.

Distribution : India : Sikkim (Sikkim Himalaya); Jammu & Kashmir (South and East of Leh). *Elsewhere* : Pakistan, Russia.

Remarks : No specimen was available for present study. Diagnostic characters and distributions have been incorporated in the present paper after consulting Hutchinson (1940).

6. *Corixa (Sigara) seistanensis* f. *randana* Distant

1920. *Corixa seistanensis* f. *randana* Distant, *Rec. Indian Mus.*, **18** : 206.

1933. *Sigara (Sigara) seistanensis* : Hutchinson, *Rec. Indian Mus.*, **35** : 401.

1940. *Corixa (Sigara) seistanensis* f. *randana* : Hutchinson, *Trans. Conn. Acad, Art Sci.*, **33** : 425.

Diagnosis : Adults may be 7.5 mm in length; other diagnostic characters as in key.

Distribution : India : Sikkim (District – East Sikkim); Himachal Pradesh; Uttar Pradesh; West Bengal. *Elsewhere* : Japan, Nepal, Pakistan, Sri Lanka.

Remarks : No specimen was available for present study. Diagnostic characters and distributions have been included here after consulting Distant (1920) and Hutchinson (1940).

7. *Corixa (Vermicorixa) kempi* Hutchinson *

1940. *Corixa (Vermicorixa) kempi* Hutchinson, *Trans. Conn. Acad. Art Sci.*, **33** : 432.

Material examined : 261 M, 255 F exs., Deorali village, 8 kms. South of Forest Rest House, Rabangla, East Sikkim District, 28.2.1989, Y Chaturvedi and K. C. Kansal coll.

Diagnosis : Adult insects may be 6.50-6.83 mm in length; other diagnostic characters as in key.

Distribution : India : Sikkim (District East Sikkim); Himachal Pradesh; Meghalaya; Uttar Pradesh; West Bengal.

Family IV. NOTONECTIDAE

Genus 4. *Anisops* Spinola 1837

1837. *Anisops* Spinola, *Ess. Ins. Hemipt.*, : **58**

8. *Anisops batillifrons* Lundblad *

1933. *Anisops batillifrons* Lundblad, *Ann. Mag. nat. Hist.*, **10**(12) : 463.

1951. *Anisops batillifrons* : Brooks, *Kans. Univ. Sci. Bull.*, **34**(8) : 420.

Material examined : 3 M, 6 F exs., P.R.H. Compound, Jorethang, South Sikkim District, 10.11.1994, G. C. Sen and party coll.; 3 M, 3F exs., Tami Lake, East Sikkim Dist., 27.11.1995, B. N. Roy coll.

Diagnosis : Body length of males 5.6 6.4 mm, for females 5.4 6.3 mm; greatest body width at about two-fifth of the body length; general body colour pale or pale yellowish or greyish; head of male with short cephalic horn, its frons excavate triangularly with rounded apex, bordered on each side by two carinae, the inner two carinae meet apically to form a median commissure; eyes not holoptic; stridulatory comb of male on the inner surface of anterior tibia composed of 13 teeth, basal 6 teeth much longer than the apical 7 teeth.

Distribution : India : Sikkim (Districts East Sikkim, South Sikkim); Assam; Delhi; Tripura; West Bengal. *Elsewhere* : Burma, China, Formosa, Japan, Philippines.

Series AMPHIBICORISAE

Family V. HEBRIDAE

Genus 5. ***Hyrcanus*** Distant 1910

1910. *Hyrcanus* Distant, *Fauna Brit. India, Rhynchota,* **5** : 134.

9. ***Hyrcanus capitatus*** Distant

1910. *Hyrcanus capitatus* Distant, *Fauna Brit. India, Rhynchota,* **5** : 134

Material examined : 1 F ex., Rani village, 6500 ft., 8 kms. east of Rabangla Forest Rest House, South Sikkim District, 1.3.1989, D. K. Mondal and party coll.

Diagnosis : Body length of adult insect may be upto 4 mm; colour of dorsal surface of the body is black, somewhat shining, the membrane opaque; head longer than broad, moderately attenuated anteriorly, the apex of head subtruncate; antennae short, first segment incrassate and as long as second segment which is carved and apically thickened, third segment shortest while fourth thickened, pyriform and longer than third; rostrum passing middle coxae; anterior pronotal margin moderately concave, posterior margin before scutellum almost truncate; legs of moderate length, the femora distinctly thickened at the middle and hairy.

Distribution : India : Sikkim (District – South Sikkim).

Family VI. VELIIDAE

Genus 6. ***Microvelia*** Westwood 1834

1834. *Microvelia* Westwood, *Ann. Soc. ent. France,* **33** : 647.

Key to the species of the genus *Microvelia*

1. Male with tibial comb very short and present in both anterior and middle tibiae; antennal fourth segment subequal in length to the third segment ..... ***diluta***

   Male with tibial comb present in anterior tibia only; antennal fourth segment longest than other segments ..... ***douglasi***

10. ***Microvelia diluta*** Distant *

1909. *Microvelia diluta* Distant, *Ann. Mag. nat. Hist.,* **8***(3)* : 500

1910. *Microvelia diluta* : Distant, *Fauna Brit. India, Rhynchota,* **5** : 139.

1934. *Microvelia diluta* : Lundblad, *Arch. Hydrobiol. Suppl.,* **12** : 307.

1989. *Microvelia diluta* : Thirumalai, *Rec. zool. Surv. India, Occ. Paper,* **118** : 52.

Material examined : 2 M apterous exs., Power Rest House Compound, Jorethang, South Sikkim District, 10.11.1994, G. C. Sen and party coll.

Diagnosis : Body length about 2.5 mm; anterior margin of pronotum reddish yellow; hemelytra scarcely reaching the abdominal apex; lateral angles of pronotum sub-equally prominent. Other diagnostic characters as in key.

Distribution : India : Sikkim (District - South Sikkim); Bihar; Tamil Nadu; West Bengal.

Elsewhere : Bangladesh, Burma, Siangapore, Sri Lanka, Sumatra.

11. *Microvelia douglasi* Scott *

1874. *Microvelia douglasi* Scott, *Ann. Mag. nat. Hist.*, **14** : 448.

1902. *Microvelia repentina* : Distant, *Fauna Brit. India Rhynchota*, **2** : 174.

1909. *Microvelia kumaonensis* : Distant, *Ann. Mag. nat. Hist.*, **8***(3)* : 500.

1934. *Microvelia douglasi* : Lundblad, *Arch. Hydrobiol.* Suppl., **12** : 347.

1947. *Microvelia douglasi* : Hafiz & Pradhan, *Rec. Indian Mus.*, **45** : 373.

1989. *Microvelia douglasi* : Thirumalai, *Rec. zool. Surv. India, Occ. Paper*, **118** : 53.

Material examined : 5M, 11F macropterous exs., Power Rest House Compound, Jorethang, South Sikkim District, 10.11.1994, G. C. Sen and party coll.; 7 M, 11F macropterous exs., 1F apterous exs.; Thinling, West Sikkim District, 20.10.1995, S. C. Mitra and party coll.

Diagnosis : Body length about 2.0 mm; anterior margin of pronotum pale ochraceous and centrally interrupted and not reaching anterior angles; lateral angles of pronotum subacutely prominent. Other diagnostic characters as in key.

Distribution : India : Sikkim (Districts South Sikkim, West Sikkim); Orissa; Tamil Nadu; Uttar Pradesh. *Elsewhere* : Indonesia, Japan, Sri Lanka.

Family VII. GERRIDAE

Key to the subfamilies and genera of the family GERRIDAE

1. Metacetabular groove dorsally reaching anterior end of first abdominal tergum; intersegmental suture between mesonotum and metanotum always distinct laterally, thus metacetabular region always divided into two areas. Hind tarsus fused; middle femur of male well developed with a fringe of long hairs.....subfamily .. PTILOMERINAE and genus *Ptilomera*

   Metacelabular suture dorsally not reaching to the anterior end of first abdominal tergum; intersegmental suture between mesonotum and metanotum either lost laterally or rarely present laterally, thus metacetabular region divided into two area, Hind tarsus not fused; middle femur of male otherwise 2

2. Metasternum represented by a short, transverse, subtriangular plate reaching metacetabular region laterally. Male with anterior femur may be provided with teeth; 7th abdominal segment of female with ventral apical margin excessively developed and modified into various shape..... ... subfamily HALOBATINAE and genus *Metrocoris*

   Metasternum distinctly present. 7th abdominal segment otherwise 3

3. Pronotal lobe always reduced in apterous forms; pretarsal arolia present; lateral suture between mesothorax and metathorax distinct .....subfamily EOTRECHINAE 4

   Pronotal lobe usually not reduced in apterous forms; if so, then pretarsal arolia absent or lateral suture between mesothorax and motathorax indistinct .... subfamily GERRINAE 5

4. First antennal segment with no spine like hairs; presence of a hair tuft on the metasternal scent orifice; hind tibia shorter than hind femur and middle tibia..... ..... *Chimarrhometra*

   First antennal segment armed with a few spine like hairs; no hair tuft on the metasternal scent orifice; hind tibia longer than both hind femur and middle tibia .... *Eotrechus*

5. Claws absent on middle legs; pronotum with single large pale spot anteriorly; pronotal lobe more or less shortened in apterous form .....*Neogerris*

   Claws present on middle legs; pronotum otherwise 6

6. First antennal segment equal or longer than second and third segments together; 7th segment of male with concave apical margin and without any median emergination; 8th segment of female always basally telescoped within tubular 7th segment ..... *Limnogonus*

First antennal segment shorter than second and third segments together; 7th segment of male with concave ventral apical margin and with a small median emergination; 8th segment of female always well exposed.. ..... *Gerris*

Subfamily PTILOMERINAE

Genus 7. ***Ptilomera*** Amyot & Serville 1843

1843. *Ptilomera* Amyot & Serville, *Hemipteres*, : 413.

Key to the species of the genus *Ptilomera*

1. Rear margin of metacoxa without thorn like projection in both the sexes; distal two-fifth of the middle femur provided with fringed long hairs in male; parameres small and dorsally upward directed in male; 7th abdominal segment without connexival spines in female ..... *himalayensis*

Rear margin of metacoxa armed with thorn like projection in both the sexes; almost all over the middle femur provided with fringed hairs in male; parameres very prominent, bent and laterally directed in male; 7th abdominal segment modified and provided with long prominent connexival spines in female ..... *laticaudata*

12. ***Ptilomera (Proptilomera) himalayensis*** Hungerford & Matsuda

1958. *Ptilomera (Proptilomera) himalayensis* Hungerford & Matsuda, *Bull. Brooklyn ent. Soc.*, **53**(5) : 117-123

1960. *Ptilomera (Proptilomera) himalayensis* : Matsuda, *Kans. Univ. Sci. Bull.*, **41**(2) : 267.

1982. *Ptilomera (Proptilomera) himalayensis* : Andersen, *The Semiaquatic Bugs*, Entomono., **3** : 183.

Diagnosis : Apterous forms may attain a length between 10.5-12.5 mm, while macropterous forms attain a length of about 14.5 mm. Other diagnostic characters as in key.

Distribution : India : Sikkim (District - West Sikkim); West Bengal.

Remarks : No material was available from Sikkim for present study but Hungerford and Matsuda (1965) had studied the specimens collected from Gopaldhara, Rungbong, West Sikkim. Hence, the species has been included in the paper.

13. ***Ptilomera (Ptilomera) laticaudata*** (Hardwicke)

1825. *Gerris laticaudata* Hardwicke, *Trans. Linn. Soc.*, **14** : 134.

1902. *Ptlomera laticaudata* : Distant, *Fauna Brit. India, Rhynchota*, **2** : 185.

1965. *Ptilomera (Ptilomera) laticaudata* : Hungerford & Matsuda, *Kans. Univ. Sci. Bull.*, **45**(5) : 416.

Diagnosis : Both apterous and macropterous adults may attain a length between 13.0 - 15.0 mm. Other diagnostic characters as in key.

Distribution : India : Sikkim (Distinct West Sikkim); Meghalaya; Tamil Nadu; West Bengal. *Elsewhere* : Burma, Malay Peninsula, Sri Lanka, Thailand.

Remarks : No specimen was available for present study. Hungerford and Matsuda (1965) recorded this species from Gopaldhara, Rungbond, West Sikkim.

Subfamily HALOBATINAE

Genus 8. ***Metrocoris*** Mayr 1865

1865. *Metrocoris* Mayr, *Verh. zool.-bot. Ges. Wien*, **15** : 445.

Key to the species of the genus *Metrocoris*

1. Male front femur distinctly thick and broader than that of female, and provided with a prominent tooth at the distal end; posterior margin of 7th abdominal segment of female always prominently convex ..... *stali*

Male front femur not thicker and broader than that of female, and may be provided with a notch at the middle or a small tooth at the distal end; posterior margin of 7th abdominal segment of female otherwise 2

2. Male front femur with a small notch at the middle on underside; posterior margin of 7th abdominal segment of female slighly convex ..... *compar*

Male front femur with a small vestigial tooth at the distal end on underside; posterior margin of 7th abdominal segment of female slightly reflexed, nearly straight .....*tenuicornis*

14. ***Metrocoris stali*** (Dohrn)

1860. *Halobates stali* Dohrn, *Stettin ent. Ztg.*, **21** : 408.

1865. *Metrocoris brevis* : Mayr, *Verh. zool. -bot. Ges. Wien*, **15** : 445.

1902. *Metrocoris stali* : Distant, *Fauna Brit. India, Rhynchota*, **2** : 190.

1926. *Metrocoris stali* : Esaki, *Ann. Mus. Nat. Hung.*, **23** : 123

1947. *Metrocoris stali* : Hafiz and Pradhan, *Rec. Indian Mus.*, **45** : 373.

1965. *Metrocoris stali* : Den-Boer, *Zool. Verh.*, **74** : 8

1989. *Metrocoris stali* : Thirumalai, *Rec. zool. Surv. India, Occ. Paper*, **118** : 46.

1992. *Metrocoris stali* : Bal and Basu, *Proc. zool. Soc. Calcutta*, **45** (Suppl. A) : 326.

Material examined : 2 F exs., Gangtok, 6150 ft., East Sikkim Dist., 10.9.1909. Museum collector.

Diagnosis : Adults attain a length of about 7.0 mm; body short and broad; head with a large central and three smaller anterior black spots; male 8th tergite semicircular in outline. Other diagnostic characters as in key.

Distribution : India : Sikkim (District East Sikkim); Bihar; Gujarat; Maharashtra; Punjab; Tamil Nadu; Uttar Pradesh; West Bengal. *Elsewhere* : Nepal, Sri Lanka.

15. ***Metrocoris compar*** (Buch. White)

1883. *Halobatodes compar* Buchanan White, *Rep. Sci. Res. Challenger, Zool.*, **7** : 68.

1893. *Metrocoris compar* : Dahl, *Erg. Plankt. Exp.*, **2**(G) : 8-9.

1902. *Metrocoris compar* : Distant, *Fauna Brit. India, Rhynchota*, **2** : 189.

1965. *Metrocoris compar* : Den-Boer, *Zool. Verh.*, **74** : 16.

Material examined : 7M, 3F macropterous exs., Tumin, 1800 metres, East Sikkim Dist., 23.9.1988, V.C.Agrawal coll.

Diagnosis : Adult insects may be 4.5 6.0 mm. in body length. Other diagnostic characters as in key.

Distribution : India : Sikkim (District East Sikkim); Assam; Meghalaya; Uttar Pradesh. *Elsewhere* : Borneo, Burma, China, java, Malaya, Sumatra.

16. ***Metrocoris tenuicornis*** Esaki *

1926. *Metrocoris tenuicornis* Esaki, *Ann. Mus. Nat. Hung.*, **23** : 125.

1934. *Metrocoris tenuicornis* : Lundblad, *Arch. Hydrobiol. Suppl.*, **12** : 371.

1965. *Metrocoris tenuicornis* : Den Boer, *Zool. Verh.* **74** : *28.*

1969. *Metrocoris tenuicornis* : Cheng & Fernando, *Oriental Ins.*, **3**(2) : 126.

1974. *Metrocoris tenuicornis* : Fernando & Cheng, *Edn. Mus. J.*, **9** : 30.

Material examined : 2M, 2F exs., Pakyong, East Sikkim Dist., 12.XI.1993, S.K.Saha and S.K. Chatterjee coll

Diagnosis : Adult insects may be 4.5–6.0 mm in body length. Other diagnostic characters as in key.

Distribution : India : Sikkim (District East Sikkim); Assam; Meghalaya; Uttar Pradesh. *Elsewhere* : Borneo, Burma, China, Java, Malaya, Sumatra.

Subfamily EOTRECHINAE

Genus 9. *Chimarrhometra* Bianchi 1896

1896. *Chimarrhometra* Bianchi, *Annu. Mus. St. Petersb.*, **1** : 71.

17. *Chimarrhometra orientalis* (Distant) *

1879. *Halobates orientalis* Distant, *Trans, ent. Soc.*, : 176.

1896. *Chimarrhometra orientalis* : Bianchi, *Annu. Mus. St. Petersb.*, **1** : 71.

1902. *Chimarrhometra orientalis* : Distant, *Fauna Brit. India, Rhynchota*, **2** : 190.

1910. *Gerris monticola* : Distant, *Fauna Brit. India, Rhynchota*, **5** : 142.

1919. *Chimarrhometra orientalis* : Paiva, *Rec. Indian Mus.*, **16** : 364.

1982. *Chimarrhometra orientalis* : Andersen, *Semiaquatic bugs. Entomono.*, **3** : 183.

Material examined : 2 M, 3 F, apterous exs., Tumin, 1800 meters, East Sikkim Dist., 23.9.1988, V. C. Agrawal coll.

Diagnosis : Adult insects may attain a length of about 8.0 mm; head with semiglobular large eyes; antennae with first segment curved, robust and about the length of head and pronotum together, other segments slender, second and third segments subequal while fourth segment a little shorter than the third segment; pronotum truncate anteriorly with mid-longitudinal pale line and mesonotum with paired oblique depression near the anterior margin; basal joint of anterior tarsi nearly twice as long as the second joint; anterior femora much incrassate and thicker than the middle femora; parameres of male genitalia greatly developed.

Distribution : India : Sikkim (District East Sikkim); Himachal Pradesh; Punjab; Uttar Pradesh; West Bengal.

Genus 10. *Eotrechus* Kirkaldy 1902

1902. *Eotrechus* Kirkaldy, *Entomologist*, **35** : 137.

Key to the species of the genus *Eotrechus*

1. Legs relatively shorter; genital segments concealed in female as seen laterally; in male genital segments pygophore with a pair of prominent lateral projections, each projection directed obliquely upwards, platelike and with an external blunt process and an internal fingerlike process..... ..... *brevipes*

— Leges relatively longer; genital segments not concealaed but exposed in female as seen laterally; in male genital segments pygophore without any basal notch on lower margin, distal part slender..... *terrestris*

18. *Eotrechus brevipes* Andersen

1982. *Eotrechus breipes* Andersen, *Steenstrupia*, **9**(1) : 19

Diagnosis : Adult insects may be upto 7.3 mm for wingless and 8.9 mm for winged forms in length; a yellowish brown transverse band on basal part of head and anteriorly connected lateral stripes in front of eyes; antennae with first segment longest and third shortest while second and fourth segments subequal in length; pronotum with a median and sublateral yellowish brown stripes; anterior femur in male greatly incrassate with a distinct patch of dark spinules basally but in female anterior femur more slender and without a patch of spinules on ventral margin. Other diagnostic characters as in key.

Distribution : Indian : Sikkim; West Bengal. *Elsewhere* : China.

Remarks : No material was available for present study. Diagnostic characters and other informations have been incorporated in this paper from Andersen (1982b).

19. *Eotrechus terrestris* Andersen

1982. *Eotrechus terrestris* Andersen, *Steenstrupia*, **9** (1) : 15

Diagnosis : Adult insects may be upto 7.2 mm in wingless and 8.6 mm in winged forms in body length; antennae with first segment longest, third segment shortest while second and fourth segments are subequal in length; in male front femur moderately incrassate in basal part and its ventral pubescence simple, in female front femur more slender and without stout hairs on ventral margin. Other diagnostic characters as in key.

Distribution : India : Sikkim (Districts East Sikkim, West Sikkim); West Bengal.

Remarks : No material was available for present study. diagnostic characters and other informations have been incorporated in this paper from Andersen (1982b).

Subfamily GERRINAE

Genus 11. *Neogerris* Matsumura 1913

1913. *Neogerris* Matsumura, *Thousand Insects of Japan, Additamenta,* **1** : 100.

20. *Neogerris parvula* (Stål) *

1859. *Gerris Parvula* Stål, *K. Svenska Eug. zool.,* **4** : 265.

1899. *Gerris tristan :* Kirkaldy, *Rev. d' Ent.,* **18** : 88

1934. *Limnogonus parvulus :* Lundblad, *Arch. Hydrobiol. Suppl.,* **12** : 384

1989. *Neogerris parvula :* Thirumalai, *Rec. zool. Surv. India, Occ. Paper,* **118** : 42.

Material examined : 2 M exs. macropterous, Jorethang, South Sikkim Dist., 10.xi.1994, G. C. Sen and party coll.; 5 M, 3 F exs. (all macropterous); Dentam, West Sikkim Dist., 18.x.1995, S.C. Mitra and party coll.; 2 M, 1 F exs. (all macropterous), Lopthing Leg, West Sikkim Dist., 7.xii.1995, B.N. Roy coll.

Diagnosis : Adult insects may be 6.0 6.5 mm in body length; antennal first segment longest and as long as or little longer than the second and third segments together; midlongitudinal carination on pronotum indistinct; anterior lobe of pronotum with a large roundish yellow spot; posterior lobe of pronotum convexly curved; in male pygophore hind margin straight while in female the hind margin of 7th ventral abdominal segment bisinuate.

Distribution : India : Sikkim (Districts South Sikkim, West Sikkim); Assam; Bihar; Himachal Pradesh; Kerala; Meghalaya; Orissa; Tamil Nadu; Uttar Pradesh; West Bengal. *Elsewhere* : Bangladesh, Burma, China, Iran, Java, Malay Peninsula, Muscat, New Guinea, Oman, Pakistan, Philippines, Solomon Islands, Sri Lanka, Taiwan, Thailand, Timor, Vietnam.

Genus 12. *Limnogonus* Stål 1868

1868. *Limnogomus* Stål, *K. Svenska Vet. - Akad. Handl.,* **7** : 132.

21. *Limnogonus (Limnogonus) nitidus* (Mayr)*

1865. *Hydrometra nitida* Mayr. *Verh. zool. bot. Ges. Wien.,* **15** : 443

1902. *Gerris nitida :* Distant, *Fauna Brit. India, Rhynchota,* **2** : 178

1934. *Limnogonus nitidus :* Lundblad, *Arch. Hydrobiol. Suppl.,* **12** : 387

1939. *Limnogonus nitidus* : Hafiz and Ribeiro, *Rec. Indian Mus.,* **41** : 427

1960. *Limnogonus (Limnogonus) nitidus :* Matsuda, *Kans. Univ. Sci. Bull.,* **41** : 198

1989. *Limnogonus (Limnogonus) nitidus :* Thirumalai, *Rec. zool. Surv. India. Occ. Paper,* **118** : 42

Material examined : 1 M (macropterons) ex., Gangtok, East Sikkim Dist., 10.x.1988, V. C. Agrawal coll.; 1F (macropterous) ex, Singtam, East Sikkim Dist., 30.i.1993, B. N. Das and party coll.; 2 M, 2 F (all macroterous) exs., Power Rest House Compound, Jorethang, South Sikkim Dist., 10.xi.1994, G. C. Sen and party coll.; 11 M, 9 F (all macropterous) exs., Dentam, West Sikkim Dist., 18.x.1995, S.C. Mitra and party coll.

Diagnosis : Body length of adult insects may be 6.0 8.0 mm; first antennal segment slightly longer than the fourth segment or they are subequal in length while second and third segments shortest and subequal in length; anterior part of pronotum with a pair of linear, small yellowish patches; posterior margin of dorsal vesicle plate is remarkably angular; 7th abdominal segment provided with fairly prominent connexival spines in both the sexes.

Distribution : India : Sikkim (Districts East Sikkim, West Sikkim, South Sikkim) Assam; Bihar; Himachal Pradesh; Kerala; Meghalaya; Tamil Nadu; Uttar Pradesh; West Bengal. *Elsewhere* : Borneo, Burma, Celebes, Combodia, China, Java, Maldive, Malaya, Nepal, Sri Lanka, Sumatra, Thailand, Vietnam.

Genus 13. *Gerris* Fabricius 1794

1794. *Gerris* Fabricius, *Ent. Syst.*, **4** : 187.

Key to the species of the genus *Gerris*

1. Anterior lobe of pronotum indistinct; midlongitudinal carina distinct and present throughout the anterior and posterior lobes on pronotum; anterior margin of pronotum without any prominences ..... *lepcha*

   Anterior lobe of pronotum distinct; midlongitudinal carinaon pronotum otherwise; anterior amrgin of pronotum with a pair of prominences 2

2. Antennal first segment nearly as long as remaining three segments together; a black distinct carina on the posterior lobe of pronotum; posterior femur longer than body length ..... *spinolae*

   Antennal first segment nearly half in length than the remaining three segments together; a distinct pale coloured carina on the posterior lobe of pronotum; posterior femur half in length than the body length ..... *gracilicornis*

22. *Gerris lepcha* Distant

1910. *Gerris lepcha* Distant, *Ann. Mag. nat. Hist.*, (8)**5** : 140

1910. *Gerris lepcha* : Distant, *Fauna Brit. India, Rhynchota*, **5** : 142.

Material examined : 2F exs. (macropterious), Shamaang, about 3000 ft., South Sikkim Dist., 7.9.1909, Museum Collector.

Diagnosis : Body length of adult insects varies from 11.5-14.0; antenna with first segment longest, second segment shortest while third and fourth almost subequal or often fourth slightly longer than third; hemelytra longer than the posterior femora. Other diagnostic characters as in key.

Distribution : India : Sikkim (District South Sikkim); West Bengal.

23. *Gerris spinolae* Lethierry and Severin *

1896. *Gerris spinolae* Lethierry and Severin, *Cat. Gen. Hem.*, **3** : 63.

1902. *Gerris spinolae* : Distant, *Fauna Brit. India, Rhynchota*, **2** : 180.

1918. *Gerris spinolae* : Paiva, *Rec. Indian Mus.*, **14** : 24.

1992. *Gerris spinolae* : Bal and Basu, *Proc. zool. Soc. Calcutta*, **45** (Suppl. A) : 326.

Material examined : 1 F ex. (macropterous), Dentam, West Sikkim, 18.10.1995, S. C. Mitra and party coll.

Diagnosis : Body length may vary from 11.0-12.5 mm. in adults; antennal third segment much shorter than second segment and a little shorter than fourth segment. Other diagnostic characters as in key.

Distribution : India : Sikkim (District - West Sikkim); Uttar Pradesh; West Bengal. *Elsewhere* : Myanmar.

24. *Gerris gracilicornis* (Horvath)

1879. *Limnotrechus gracilicornis* Horvath, *Annu. Soc. ent. Belg.*, **22** : 109.

1902. *Gerris gracilicornis* : Distant, *Fauna Brit. India, Rhynchota*, **2** : 178.

1934. *Gerris gracilicornis* : Lundblad, *Arch. Hydrobiol. Suppl.*, **12** : 370.

Material examined : 2 M exs. (macrop-terous); Rabangla, 2010 meters, South Sikkim Dist., 6.10.1988, V. C. Agrawal coll.; 1 M, 1 F exs. (all macropterous), Jeema, North Sikkim Dist., 27.7.1989, Srikumar Chottopadhyay coll.

Diagnosis : Adult insect may attain a length of about 14.0-15.0 mm; a small brownish yellow spot in front of each eye. Other diagnostic characters as in key.

Distribution : India : Sikkim (Districts - North Sikkim, South Sikkim); Assam; West Bengal. *Elsewhere* : China, Formosa, Japan.

SUMMARY

The present work has dealt with water-bugs belonging to seven families of the Order Hemiptera, *viz.* Gelastocoridae, Nepidae, Corixidae, Notonectidae, Hebridae, Veliidae and Gerridae, from Sikkim. A total number of 24 species under 13 genera of the above mentioned families have been included in the study, out of which 12 species with asteric marks in the text, are being considered for newly recorded from the State of Sikkim. Taxonomic keys for families, subfamilies, genera and species of water-bugs of Sikkim have been constructed in the present work. Distribution of each species is also shown in different districts of Sikkim in tabulation form as well as in the map.

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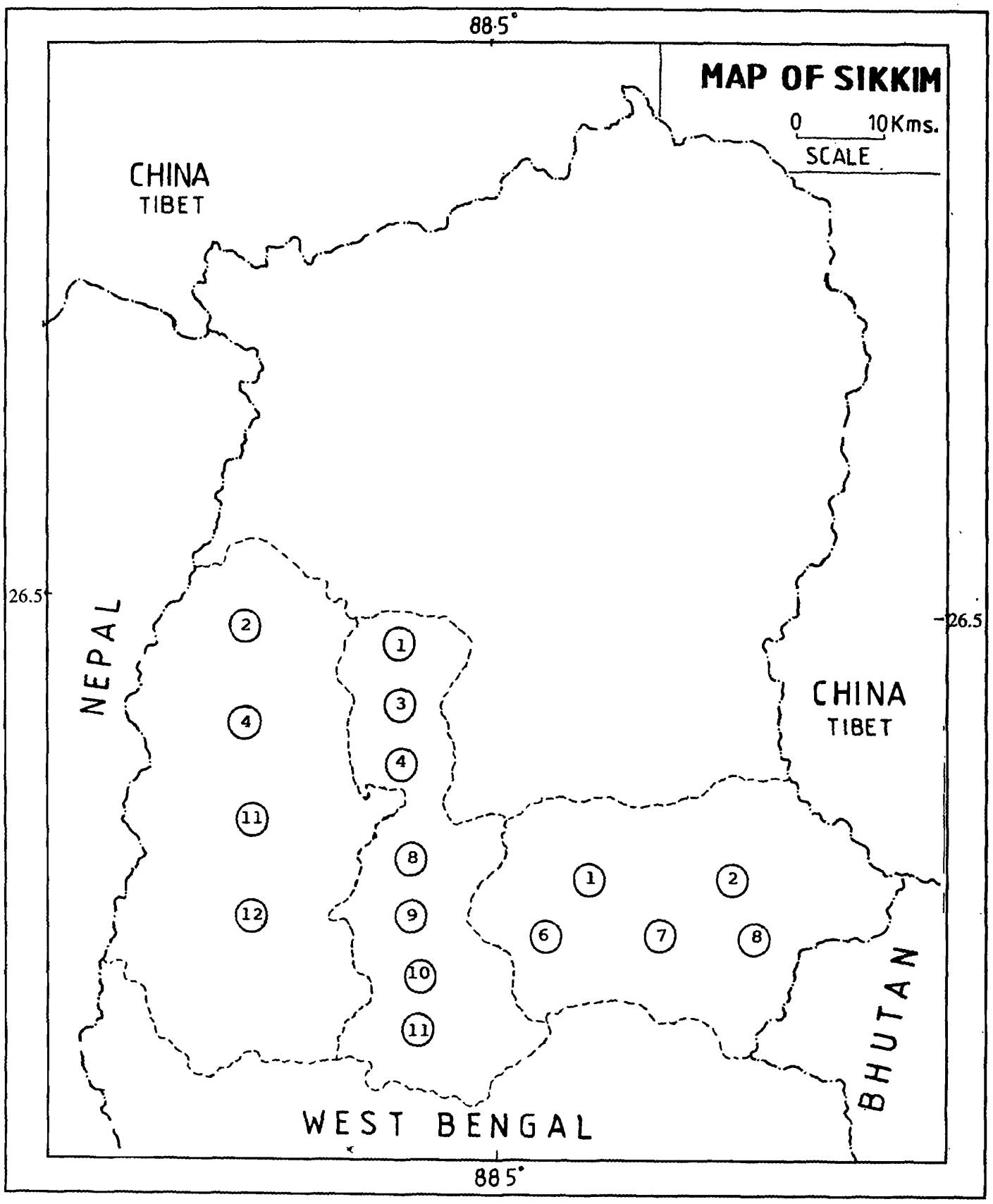
DISTRICTWISE DISTRIBUTION OF WATER-BUGS IN SIKKIM
(Fauna of Sikkim : Insecta : Hemiptera : Water-bugs)



MAP – I. Numbers in different districts of the map correspond with the serial numbers of species in the text.

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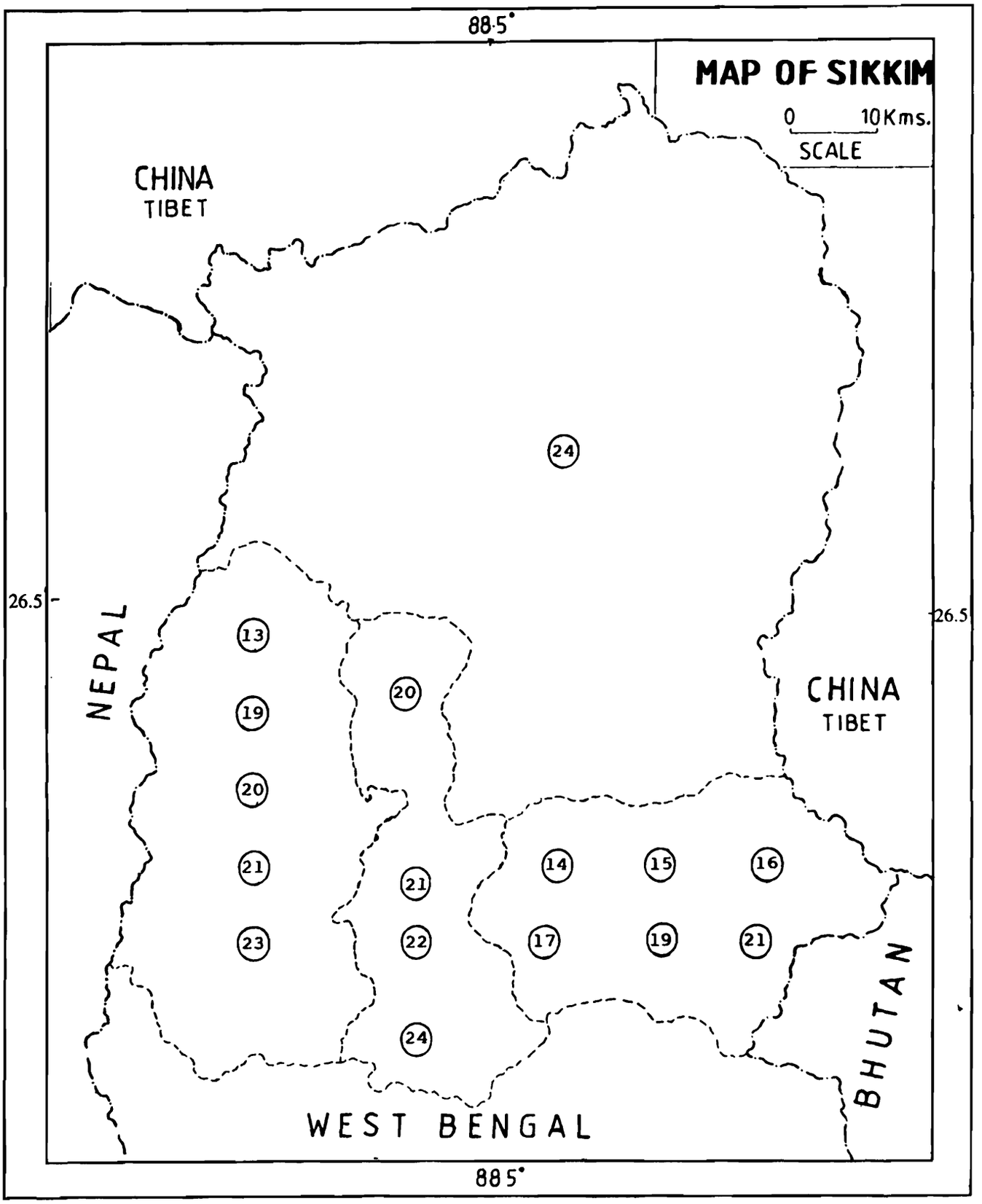

MAP – II. Numbers in different districts of the map correspond with the serial numbers of species in the text.