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TAXONOMIC STUDY ON THE LARGE INDIAN CIVET, *VIVERRA ZIBETHA* (LINNAEUS) FROM THE INDO-BURMESE SUBREGION (MAMMALIA VIVERRIDAE)

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INTRODUCTION

The colour, texture, pattern and length of dorsal fur of the body are some of the characters on which a number of subspecies of the Large Indian Civet, *Viverra zibetha* (Linnaeus) are differentiated (Pocock, 1939). While cataloguing the collections of Viverridae present in the Zoological Survey of India, the authors had an opportunity of examining a good series of skins of *V. zibetha* from the Indo-Burmese sub-region, and faced difficulty in the subspecific identification on the basis of the characters provided by Wroughton (1915, 1918), Thomas (1927) and Pocock (1933, 1939). Hence, it was felt necessary to study this species afresh, based on the material present in the Zoological Survey of India, the Bombay Natural History Society and the data available in the extant literature. The results of this study are presented in this paper.

MATERIAL AND METHOD

All measurements are in millimetres. The external measurements were taken by the collector of specimens. However, the cranial measurements have been taken by the authors according to Pocock (1939). The colour names in the text, with initial capital letters, are according to Ridgway's (1912) nomenclature.

Material examined : NEPAL : 1 ♀ Gorkha, Satthar, 11 Jan 1923 ; 1 ♂, Gorkha, Bokarlang, 24 Nov. 1923 ; 1 ♂ no locality, 2 Apr 1921. INDIA : Sikkim : 1 ♀, Gangtok, alt. 1829m, 21 Sep 1925 ; ORISSA : Puri district : 1 ♂, Satpara, 9 Dec 1986 ; WEST BENGAL : Darjiling district : 3 ♂, 2 ♀, Narbong, alt. 609 m, 9-13 Mar 1915 ; 1 ♂, Sivok, alt. 152 m, 22 Mar 1915 ; 1 ♀, Sungma, alt. 1372m, 18 May 1918 ; Jalpaiguri district : 1 ♂, 1 ♀, 1 unsexed, Hansimara, 22 Feb 1913, 17 Jan 1915, 16 Jul 1915 ; 1 ♂, 1 ♀, Bharnabari, alt. 183 m, 16 Jul 1915, 23 Feb 1916 ; Maldah district : 1 ♂ (damaged skin), no locality 1870 ; Calcutta district : 2 ♂, 1 ♀, no locality, 31 May 1870, 28 Feb 1871, undated ; 1 ♀, Jadavpur, 30 Jan 1920 ; 1 ♀, Ballygunge, 24 Mar 1922 ; South 24 Parganas district : 1 ♂, Sonarpur, 9 Feb 1920. ASSAM : Sibsagar district : 1 ♀, 1 unsexed, Golaghat, 15 and 20 Jan 1920 ; MEGHALAYA : Garo Hills district : 1 unsexed, Tura, 12 Mar 1920 ; Khasi Hills district :

Table 1.—Length (in mm) of hairs on crest and flank in three populations of
Viverra zibetha Linnaeus

Name of subspecies and distribution	Length of crest-hairs		Length of flank-hairs	
	Winter	Summer	Winter	Summer
<i>V. z. zibetha</i> Nepal, Sikkim and Northern West Bengal	52—69 (13) 63 ± 5	37—56 (3) 48 ± 8	35—42 (13) 37 ± 2	23—34 (4) 30 ± 4
<i>V. z. picta</i> (NE India and S. West Bengal)	41—70 (21) 57.5 ± 8.5	30—45 (9) 37 ± 4	23—42 (21) 32 ± 5	10—28 (9) 21 ± 5
<i>V. z. pruinosa</i> (Tenasserim, S. Burma)	48—50 (2) 49 ± 1	—	30—33 (2) 31 ± 1	—

Mohinbasti c 14 km E of Nongpoh, 28 May 1949 ; Jaintia Hills district : 1 ♂, Khonsong, 21 Jul 1920. TRIPURA West Tripura district : 1 ♂, Charilam, 21 Nov 1969 ; 1 ♀, Ampri, 17 Jan 1971. South Tripura district : 1 ♂, Abhoya, 9 Dec 1969 ; Mizoram : 1 unsexed, Lushai Hills, 27 Nov 1927. BURMA : 1 unsexed. Henjada, no date ; 1 ♂, Hkamti, Upper Chindwin, 2 Aug 1914 ; 1 unsexed, Bhamo, Feb 1914 ; 1 unsexed, Ngapun, near Kindat, Dec 1913 ; 1 ♂, 1 ♀, Pyaunggaung, N. Shan States, 2 and 12 May 1913 ; 1 ♂, Monghai, north of Sandoway, Apr 1923 ; 1 unsexed, Tavoy, 14 Feb 1925 ; 1 unsexed, Little Tenasserim, 4 Feb 1915 ; 1 ♀, Tenasserim town, 12 Mar 1914.

OBSERVATIONS

Nature of fur : Dorsal hairs relatively thicker and coarser than ventral hairs; length of dorsal hairs highly variable, generally longer in winter specimens than in summer ones (Table 1) ; seasonal variation less evident in specimens from Nepal, Sikkim and West Bengal (Darjiling district). In winter specimens, hairs of crest from Tenasserim (S. Burma) relatively smaller than those from Nepal, Sikkim and northern West Bengal but fall within the range of length of crest-hairs from southern West Bengal, north-eastern India and northern Burma, thus forming a cline.

Colour : Colour highly variable ; dorsum ranges from pale grey, Smoke Grey, dark grey, Raw Umber, Tawny Olive to Mars Brown, and grizzled with white, buff or yellow, particularly on the sides. Hairs on chest and belly ranging from Mars Brown to Raw Umber on base and white at tip. Lower half of limbs Seal Brown. It was noted that the colour varies irrespective of locality or season.

Body markings : Body markings indistinct and cloudy, except on the upper half of limbs where small stripes may be present. Pattern on the head and shoulders distinct in majority of specimens (Table 2). In six out of 15 specimens from the distributional range of the nominate subspecies, pattern on shoulders feebly developed. Whitish patch on either side of the front of muzzle, and greyish patch behind it, show various degrees of development, irrespective of locality and/or season. A black spinal stripe runs from behind the shoulders to root of the tail, which in majority of specimens flanked on either side by a narrow but distinct white stripe from posterior half of the back. However, no seasonal or geographic distinctness could be noticed in this character.

Pattern on flanks highly variable, distinct in 50-67% of the summer-specimens and 0-40% of the winter ones of the different localities (Table 2).

Tail encircled with white and black rings, the latter much broader than the former ; white rings vary from 5 to 9, usually 6 in number ; first one being

Table 2—Colour-pattern on head and shoulders, and flanks in three populations *Viverra zibetba* Linnaeus

Name of Subspecies	Pattern on head and shoulders				Pattern on flanks			
	Distinct	Winter Poorly developed	Distinct	Summer Poorly developed	Distinct	Winter Poorly developed	Distinct	Winter Poorly developed
<i>V. z. zibetha</i>	6	5	3	1	2	9	2	2
<i>V. z. picta</i>	17	—	4	1	5	12	4	2
<i>V. z. pruinosa</i>	2	—	—	—	—	2	—	—

incomplete dorsally in all the specimens ; second, third, fourth and fifth being incomplete in two, one, two and one specimens respectively.

Skull-structure : Author's observations agree with the description given by Pocock (1939) for the genus *Viverra*, and found more or less similar for all three subspecies of *V. zibetha*. However, it was noted that the posterior margin of palate varies individually, straight or semi-circular, and smooth, serrated or medially indented. Similarly, structure of auditory region varies from specimen to specimen. In one specimen each from Pyaunggaung and Hkamti (N. Burma), Golaghat (Assam) and Charilam (Tripura), zygomatic arch was found to be poorly developed and narrow (zygomatic width less than 46% of greatest length of skull). In other specimens Zygomatic arch is well-developed (48%-53% of GL), irrespective of geographical distribution (Table 3).

DISCUSSION

Linnaeus (1758) described the species *Viverra zibetha* from Bengal (probably present northern West Bengal), without mentioning the exact locality. Later, Wroughton (1915) described two subspecies, namely *V. z. picta* from upper Chindwin, northern Burma, on the basis of distinct markings on the body, and *V. z. pruinosa* from Tenasserim, southern Burma, by the absence of yellow tinge in the ground colour of the body and presence of white-tipped hairs. Three years later, based on the study of additional material, Wroughton (1918) remarked that the distinctness of the pattern is not a racial character. Hence, he withdrew the name *picta*, and relegated it to the synonymy of *V. z. zibetha*. Pocock (1933) on examination of a number of skins collected during winter noticed that the pattern on shoulder is more distinct in specimens from Assam, Meghalaya and Nagaland than those from Sikkim and northern West Bengal, and he resurrected the subspecies *picta*. He also maintained *pruinosa* on the basis of the fur being short, and pattern on the body distinct in winter specimens.

The present study of material from the geographical ranges of *zibetha*, *picta* and *pruinosa* reveals that the differences in coat-colour and the pattern on shoulders and flanks in all the three populations vary from specimen to specimen (Table 2), hence appear to be of no systematic value. As regards the length of fur, it is definitely shorter in two winter specimens from southern Burma than in specimens from Nepal, Sikkim and northern West Bengal, but are well within the range of length of fur from other localities (Table 1). Moreover, the sample-size from southern Burma is too small to come to any conclusion as to the shortness of the fur. Lekagul and McNeely (1977) although maintained the subspecies *picta* and *pruinosa* on the basis of material present in Thailand, but regarded them as poorly differentiated.

Table 3.—Measurements of body and skull (in mm) in different populations of *Viverra zibetha* (Linnaeus) with range, mean and standard deviation. Sample size in parenthesis.

Name of subspecies and distribution	Head & body	Tail	Hindfoot	Greatest length	Zygomatic width
<i>V. z. zibetha</i>	635-810 (15)	310-457 (14)	103-135 (15)	133-145 (8)	64.0-70.7 (6)
(Nepal, Sikkim, N. West Bengal)	741+33	394+45	123+9	140+4	67.8+2.0
<i>V. z. picta</i>	634-865 (19)	333-490 (19)	95-140 (19)	132-145 (12)	61.0-72.8 (9)
(North eastern India and S. West Bengal)	783+63	421+41	126+11	137.2+2.8	65.2+3.0
<i>V. z. pruinosa</i>	770-795 (2)	430-435 (2)	125-130 (2)	134-156 (4)	73.0 (1)
(Tenasserim. S. Burma)	782+12	432+2	127+2	143+8	

An analysis of the various measurements of the body and skull from different subspecific zones of the Indo-Burmese subregion reveals that there is no significant difference between them in any of the body and skull measurements (Table 3). The structure of the posterior margin of palate, auditory region and the zygomatic arch though differ to a certain extent, but are of no systematic importance because they vary from specimen to specimen.

Hence, in authors' opinion, the separation of *picta* and *pruinosa* from *zibetha* is taxonomically not justified. It would be appropriate to treat *Viverra zibetha picta* and *Viverra zibetha pruinosa* as synonyms of the nominate subspecies. Since the authors could not examine the specimens of another subspecies, *V. z. ashtoni*, from southern China due to non-availability of the material, they are not in a position to comment on the status of that subspecies. However, according to Pocock (1939, footnote on page 351) the southern Chinese race has longer coat. A winter specimen has crest and flank-hairs about 90 and 50 mm long respectively.

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ON SOME SPECIES OF *XYLOSANDRUS* REITTER
(SCOLYTIDAE : COLEOPTERA) FROM THE SUB-HIMALAYAN
WEST BENGAL WITH DESCRIPTION OF A NEW SPECIES

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INTRODUCTION

The genus *Xylosandrus* was proposed by Reitter (1913) to accommodate *Xyleborus morigerus* from New Guinea. It remained valid until 1962, when Schedl considered it as a synonym of *Xyleborus* Eichhoff along with some other genera of the tribe Xyleborini. On the basis of widely separated procoxae, Browne (1963) revived its generic status. Recently, Wood (pers. comm.) further substantiated its validity indicating that the spacing of the procoxae of this genus varies from moderately narrow to very broad. In addition, certain other characters, such as antennal club with large basal corneous portion, protibiae with 4-6 socketed teeth and armed pronotum with rounded lateral margins are important for this genus. With this generic concept, as many as 15 species may be assigned to this genus from India, of which eight species including a new one are recognised from the sub-Himalayan West Bengal.

Further, a key for easy identification of species, has also been formulated for the first time. The synonym, morphological characters, range of distribution and variations, taxonomic and biological remarks pertaining to each of the species have also been provided. Mention may be made that the detailed description of each species has been incorporated due to its poor description available in the literature. The unidentified and identified material examined under some species, have been marked into two categories as 'A' and 'B' respectively.

Key to the genus *Xylosandrus* based on female only

1. Procoxae subcontiguous ; larger species, more than 4.00 mm 2
— Procoxae widely separated ; smaller species, below 4.00 mm 3
2. Postero-lateral margins of declivity distinctly carinate ; posterior portion of

- pronotum with minute punctures ; declivity abruptly sloping ; body length 4.80 mm *X. gravidus* (Blandford)
- Postero-lateral margins of declivity not carinate, rather rounded with distinct tubercles ; posterior portion of pronotum with large punctures ; declivity rather gradually sloping ; body length 4.25-4.60 mm *X. ursinus* (Hagedorn)
3. Declivital surface with obsolete strial punctures, both striae and interstriae with granules and dense fine hairs 4
- Declivital surface with distinct strial and interstitial punctures , declivital interstriae with uniseriate row of hairs 6
4. Declivital face uniformly convex and gradually sloping, entire surface with confused granules ; posterior one-third of pronotum shiny, punctate and with dense hairs, but devoid of any tuft of hairs ; body length 2.20-2.50 mm *X. crassiusculus* (Motschulsky)
- Declivital face steep and abruptly sloping ; only interstitial granules confused, but strial granules in row, rather close and large ; posterior one-third of pronotum not shiny rather granulate, and with sparse hairs along with a median tuft of yellowish hairs 5
5. Declivital face strictly convex ; declivital interstriae with single row of small hairs along with dense microhairs ; discal striae of elytra feebly impressed marked by large punctures ; smaller species, body length 2.30-2.40 mm *X. discolor* (Blandford)
- Declivital face plano-convex ; declivital interstriae with single row of long fine hairs along with dense coat of pubescence ; discal striae of elytra not impressed only marked by shallow small punctures ; larger species, body length 2.80-2.90 mm *X. beelsoni* sp. nov.
6. In profile, elytra strongly arching from base, declivital face abrupt ; body length 1.60-1.70 mm *X. morigerus* (Blandford)
- In profile, elytra feebly arching from base to apex 7
7. Strial puncture very large, distinct, each with a microhair ; body length 1.45 mm *X. mesuae* (Eggers)
- Elytral strial puncture very small, rather shallow devoid of microhair ; body length 1.88 mm *X. difficilis* (Eggers)

1. *Xylosandrus beelsoni* sp. nov.

(Fig. 1, a-f)

Material examined 4 Females, Rangirum (1846m), Darjiling Dist., coll. J. C. M. Gardner, 8.ix. 1929, ex. "*Symplocos theaeifolia*."

Description : Female : Body short and stout ; head and pronotum yellowish brown in colour, elytra slightly darker. Body length 2.80-2.90 mm, twice as long as wide.

Head globose ; frons plano-convex with a feeble median line ; surface finely reticulate with a few shallow punctures towards vertex and a few distinct carinulae converging towards epistomal margin ; vestiture of long sparse hairs. Eyes elongately

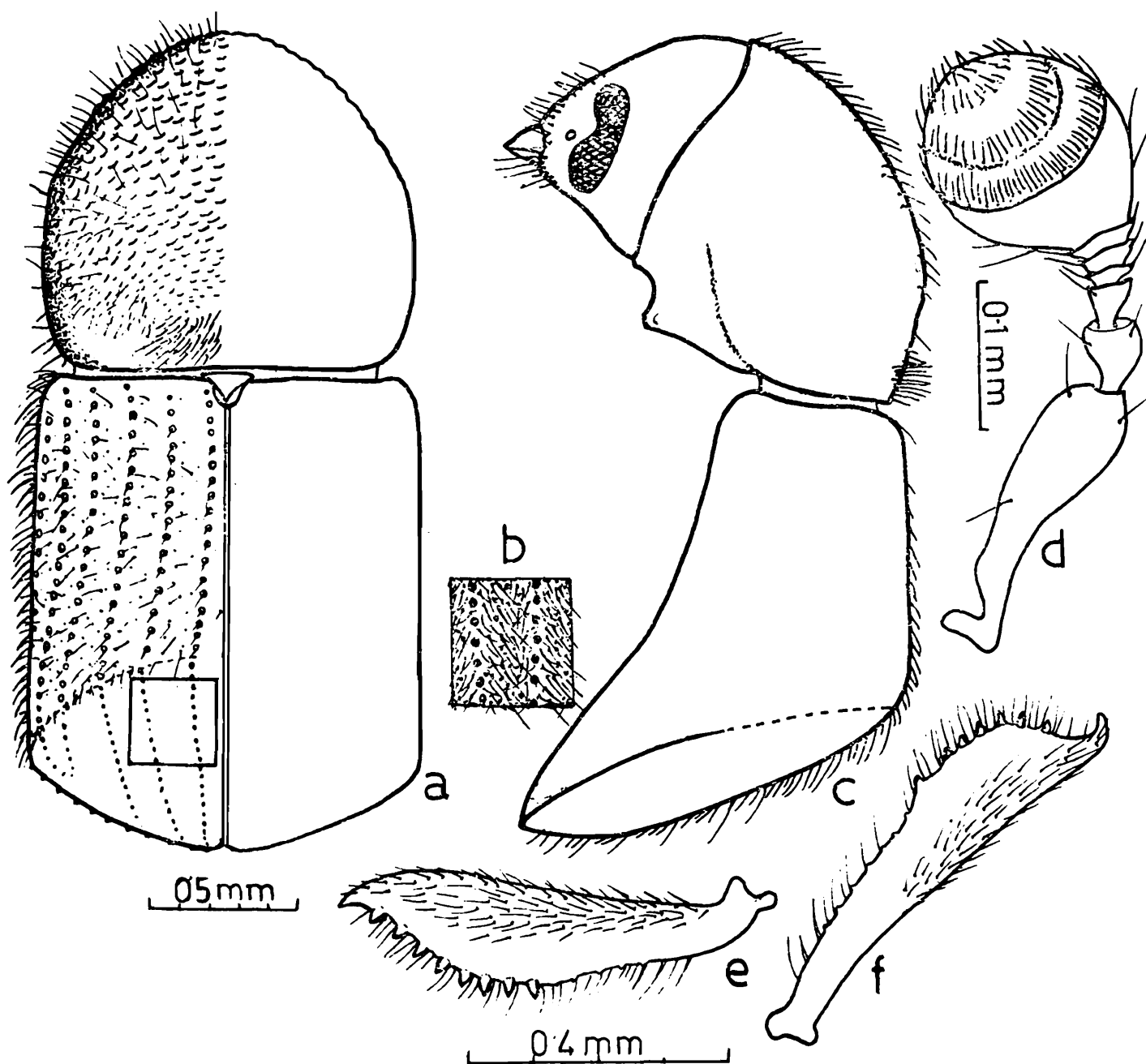


Fig. 1, a-f, *Xylosandrus beelsoni* sp. nov., Female: a, Pronotum and elytra in dorsal view ; b, enlarged portion of declivital face ; c, head, pronotum and elytra in lateral view ; d, antenna ; e, mesotibia ; f, protibia.

oval, broadly emarginate almost half of its width. Antennal scape short and stout; funicle with 5 segments; club obliquely truncate, on anterior face, basal corneous portion with revurved costate apical margin forming a complete ring to the apex, truncated face with two recurved sutures; posterior face devoid of any suture.

Pronotum subglobose, slightly wider than long, basal margin substraight, lateral sides feebly outcurved; anterior margin distinctly rounded and armed with 7-8 small asperities; summit conspicuous on basal third; entire surface with closely set small but distinct asperities in concentric rows, gradually smaller posteriorly except basal narrow strip, where only a few sparse small granules; entire surface with long erect hairs and postero-median portion with a dense patch of hairs.

Scutellum smooth, shiny and tongue-shaped.

Elytra upto truncated margin slightly wider than its own length and nearly as long as pronotum; basal margin substraight; lateral sides subparallel upto truncated margin, lower half of declivity converging posteriorly and terminating into an angular apex; discal striae feebly marked by small sparse shallow punctures, each with a microhair; interstriae flat and shiny, much wider than striae with irregular shallow, small punctures and with fine hairs. Declivital face abrupt, steep and convex; declivital margin on upper half somewhat rounded and lower half carinate; declivital face with striae 1, 2 and 3 complete, 4 and 5 forming a loop, all the striae marked by a row of closely set granules and microhairs, replacing punctures; interstriae punctures obsolete, but with irregular comparatively small granules and single row of fine long hairs along with dense coat of pubescence on entire surface. Procoxae moderately separated from each other, protibiae with 5 and both meso- and meta-tibiae with 8 teeth.

Male : Not available in material studied.

Type-locality : Rangirum (1846 m), Darjiling Dist., West Bengal, India.

Type-specimens : *Holotype* Female from a single source as under "Material" deposited in F.R.I., Dehra Dun.

Paratypes : Females from the same lot as above, deposited as follows (a) 2 Females, in F.R.I., Dehra Dun and (b) 1 Female, in Z.S.I., Calcutta.

Comparison : The species *Xylosandrus beelsoni* is close to *Xylosandrus discolor* (Blandford), but can be separated on the basis of following characters of the female : (i) Declivital face plano-convex in *X. beelsoni* (vs. declivital face strictly convex in *X. discolor*); (ii) Declivital interstriae with single row of long fine hairs along with dense coat of pubescence (vs. declivital interstriae with single row of small hairs along dense microhairs); (iii) Discal striae of elytra not impressed having small punctures (vs. elytral disc with feebly impressed striae marked by large

punctures) ; (iv) Pronotal summit conspicuous on basal third (vs. pronotal summit inconspicuous, dorsum uniformly convex) and (v) Larger species, body length 2.80-2.90 mm (vs. smaller species, body length 2.30-2.40 mm).

2. *Xylosandrus crassiusculus* (Motschulsky)

(Fig. 2, a-e)

1866. *Phloeotrogus crassiusculus* Motschulsky, *Bull. Imp. Nat. Moscou*, 39 : 403, Female, Type-locality : Mountain near Nuware Eliya, Sri Lanka.

1969. *Xyleborus crassiusculus* : Wood, *Gt. Basin Nat.*, 29 : 119.

1982. *Xylosandrus crassiusculus* : Wood, *Mem. Gt. Basin Nat.*, no. 6 : 766-768.

1986. *Xylosandrus crassiusculus* : Maiti and Saha, *Rec. zool. Surv. India, Occ. Paper*, no. 86 : 145-148.

1878 (1879). *Xyleborus semiopacus* Eichhoff, *Mem. Soc. Roy. Sci. Liege*, 8 (2) : 334.

1896. *Xyleborus semigranosus* Blandford, *Trans. ent. Soc. Lond.*, 211-212.

1908. *Dryocoetes bengalensis* Stebbing, *Indian For. Mem.*, Zool. 1 (1) : 12.

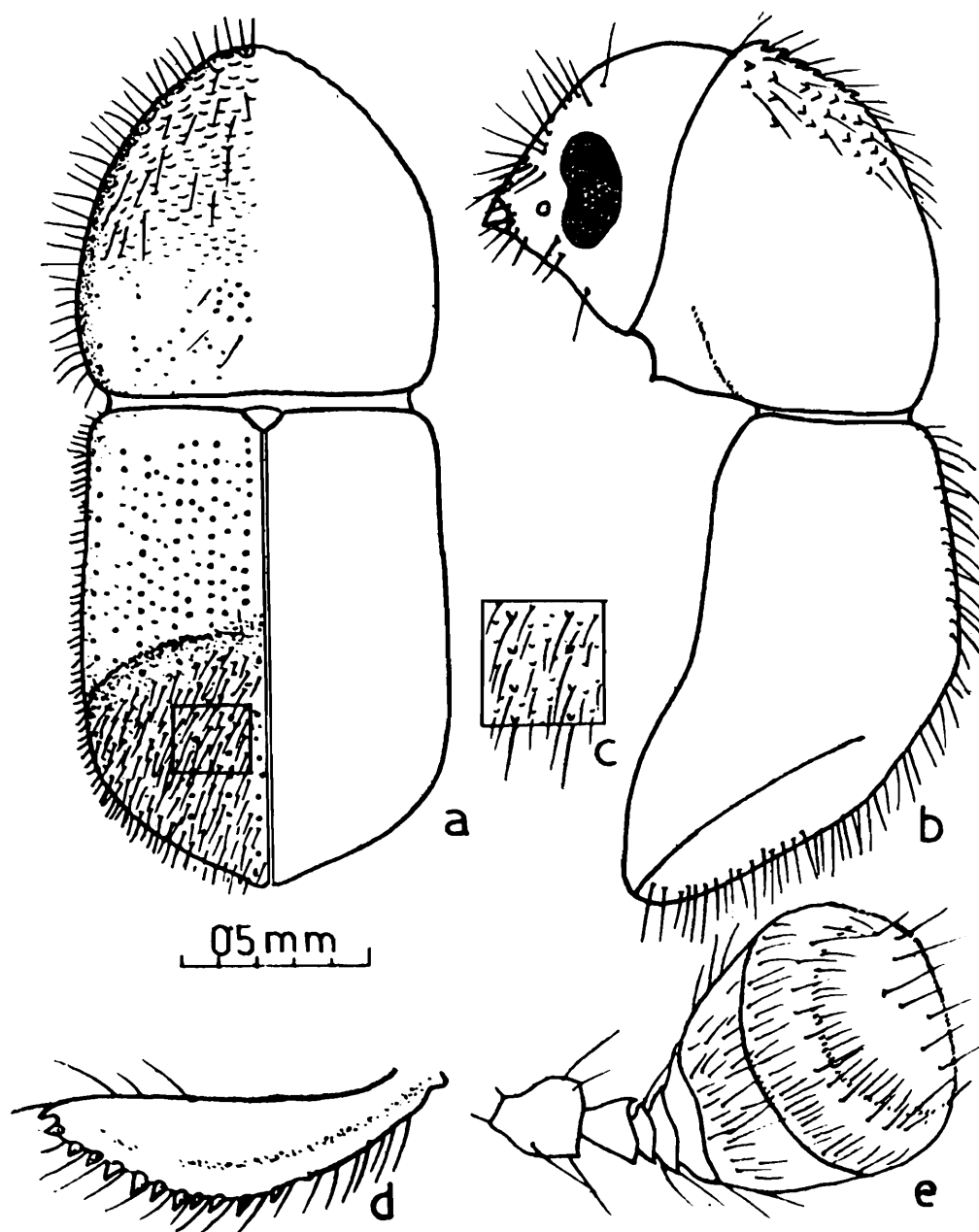


Fig. 2, a-e, *Xylosandrus crassiusculus* (Motschulsky), Female : Pronotum and elytra in dorsal view ; b, head, pronotum and elytra in lateral view ; c, enlarged portion of elytra in lateral view ; d, mesotibia ; e, antenna.

1908. *Xyleborus mascarensis* Hagedorn, *Dt. ent. Z.* p. 379.

1935. *Xyleborus okoumeensis* Schedl, *Stylops*, 4: 271-272.

1936. *Xyleborus declivigranulatus* Schedl, *J. Fed. Malay. St. Mus.* 18: 30

Material examined: (a) 125 exs. from Samsingh, Darjiling Dist., as follows:

- (i) 63 Females, coll. N. C. Chatterjee, in different dates between 16.ii. 1934 and 5.xii. 1934, ex. "*Lasiococca* sp." (ii) 2 Females, coll. Borer Project, ex. "*Amoora wallachii*"; (iii) 2 Females, coll. N. C. Chatterjee, 7 and 14.x. 1933, ex. "*Amoora wallachii*"; (iv) 4 Females, coll. Borer Project, 1933 ex. "*Acrocarpus fraxinifolius*"; (v) 2 Females, coll. C.F.C. Beeson, 17.ii. and 6.iii. 1934, ex. "*Sapium euginiaefolium*"; (vi) 1 Female, coll. Balwant Singh, ex. "*Ostodes paniculata*"; (vii) 3 Females, coll. Mohan Lal, January, 1934, ex. "Unknown wood"; (viii) 30 Females, coll. N. C. Chatterjee, 10.x. 1933, ex. "*Litsaea elongata* (Painle) and (ix) 18 Females, coll. N. C. Chatterjee, 10.x. 1933, ex. "swasanikat." (b) 1 Female, Dahura, Bagdogra, Darjiling Dist., coll. N. C. Chatterjee, 22.x. 1933, ex. "*Schima wallichii*." (c) 21 Females, Tista valley. Darjiling Dist., coll. J. C. M. Gardner, 28.ix. 1929, ex. "Misc-timber" and "*Cedrela toona*" (d) 4 exs., Sukna, Darjiling Dist., coll. C. F. C. Beeson, as follows: (i) 3 Females, 12-13.viii. 1935, ex. "*Cryptocarya wightiana*" and (ii) 1 Female, 5.ix. 1935, ex. "unknown wood" (e) 13 exs., Gazalduba, Jalpaiguri Dist., coll. N. C. Chatterjee, as follows (i) 5 Females, 16.x. 1933, ex. "malata" (*Macaranga denticulata*) (ii) 2 Females, 14.x. 1933, ex. "archaya" and (iii) 6 Females, October, 1933, ex. "unknown wood."

Description: *Female*: Body stout and broad; head and pronotum chestnut brown, elytra comparatively darker, antennae and legs paler. Body length 2.20-2.50 mm, 2.5 times as long as wide.

Head globose; frons weakly convex surface coarsely granulate and with erect hairs, a few distinct carinulae on either side of distinct median line converging towards epistomal margin; sparsely punctate towards vertex.

Pronotum nearly as long as wide, lateral sides weakly outcurved; anterior margin narrowly rounded accommodating 8-9 weak asperities; summit feebly marked at the middle; nearly anterior two-thirds with fine asperities and presence of both small and long hairs; posterior portion finely reticulate with distinct punctures and usually with sparse fine hairs, more denser towards basal margin.

Scutellum fairly large and tongue-shaped.

Elytra 1.20-1.30 times as long as pronotum, 1.20-1.30 times as long as its own width; lateral sides subparallel upto basal two-thirds thence broadly rounded posteriorly; postero-lateral margins distinctly elevated with prominent carinae and confluent with interstria 7; discal striae marked by small and shallow punctures,

each with a microhair ; interstriae at least 3 times as wide as striae with irregular 2-3 rows of shallow punctures and granulate posteriorly ; interstriae with long erect hairs. Declivital face uniformly convex and gradually sloping, feebly elevated towards sutural apex ; surface opaque and striae punctures obsolete, rather with confused granules throughout ; vestiture consisting of small fine hairs and also uniseriate row of long stout setae.

Male : Not available in the material studied.

Distribution India : West Bengal (Darjiling and Jalpaiguri Dists.) ; also widely distributed in India ; Oriental Region to Japan, Pacific Islands to Hawaii, Tropical Africa and North America.

Remarks The species was described by Motschulsky (1866) as *Phloeotrogus crassiusculus* from Sri Lanka. Since then many species described under the genera *Dryocoetes* and *Xyleborus* from different territories of the Orient have been synonymised under this species. Wood (1969) transferred the species to the genus *Xyleborus* and subsequently in 1982 to *Xylosandrus*.

It is a very common pin-hole borer infesting the cut poles, branches of small to moderate size logs and newly sown timbers of numerous plants in the circum-tropics. In India, Stebbing (1908) described a species, *Dryocoetis bengalensis* from Assam, which was considered by Beeson (1930) as *X. semigranosus* Blandford. The latter species with its wide distribution in India remained valid until 1959, when Schedl synonymised it under *X. semiopacus* Eichhoff which was subsequently put under *Xyleborus crassiusculus*. However, Beeson (op.cit.) provided biological information and dealt with numerous host along with the accounts of gallery pattern, habit and habitat of the beetles under the name *Xyleborus semigranosus* in India. A few more new hosts are also recorded from the study area as follows : *Acrocarpus fraxinifolia*, *Amoora wallachii*, *Cryptocarya wightiana*, *Lasiococca* sp., *Litsaea elongata*, *Maranga denticulata*, *Sapium euginiaefolium* and *Schima wallachii*. Maiti and Saha (1986) recorded a few more hosts of this species from the Andamans.

There is considerable variation of size of this species from 2.20 to 2.50 mm which might led the earlier workers to confusion and erecting new species or variety. For example in Malaya, the females measuring 1.9 to 2.2 mm were considered as a separate species *X. declivigranulatus* Schedl which was nothing but the smaller forms of *X. semigranosus* (Browne, 1961).

3. *Xylosandrus difficilis* (Eggers)

(Fig. 3, a-b)

1923. *Xyleborus difficilis* Eggers, *Zool. Meded.*, 7 : 174-175, Female, *Type-locality* : Java, Indonesia
1930. *Xyleborus difficilis* : Beeson, *Indian Forest Rec. (Ent.)* : 14 (10) : 56.
1961. *Xylosandrus difficilis* : Browne, *Malay. Forest Rec.*, no. 22 : 165-166.

Material examined : A. 8 exs. from different parts of Darjiling Dist. : (i) 2 Females, Lopchu, coll. *J. C. M. Gardner*, 5.xi. 1929 and 28.i. 1930, ex. "*Litsaea elongata*"; (ii) 2 Females, Samsingh, coll. *N. C. Chatterjee*, 24.x. 1933 and 4.iv. 1934, ex. "jhankarikat," (iii) 1 Female, Senchal Range, coll. *J. C. M. Gardner*, 14.ix. 1929, ex. "unknown wood"; (iv) 2 Females, Tista Valley, coll. *J. C. M. Gardner*, 17.x. 1929, ex. "unknown wood" and (v) 1 Female, Rangirum, coll. *J. C. M. Gardner*, 6.ix. 1929, ex. "*Juglans regia*." B. (i) 7 Females, Lopchu, coll. *J. C. M. Gardner*, in different dates between 12.iii. 1929 and 8.iv. 1930, ex. "*Beilschmiedia sikkimensis*" and (ii) 5 Females, Samsingh, coll. *N. C. Chatterjee*, January, March and April, 1934, ex. "*Aphanamixis polystachya*" (*det. S. L. Wood*).

Description : *Female* : Body short and stout ; head, pronotum and elytra reddish brown to blackish brown. Body length 2.10-2.25 mm, 2.1-2.2 times as long as wide.

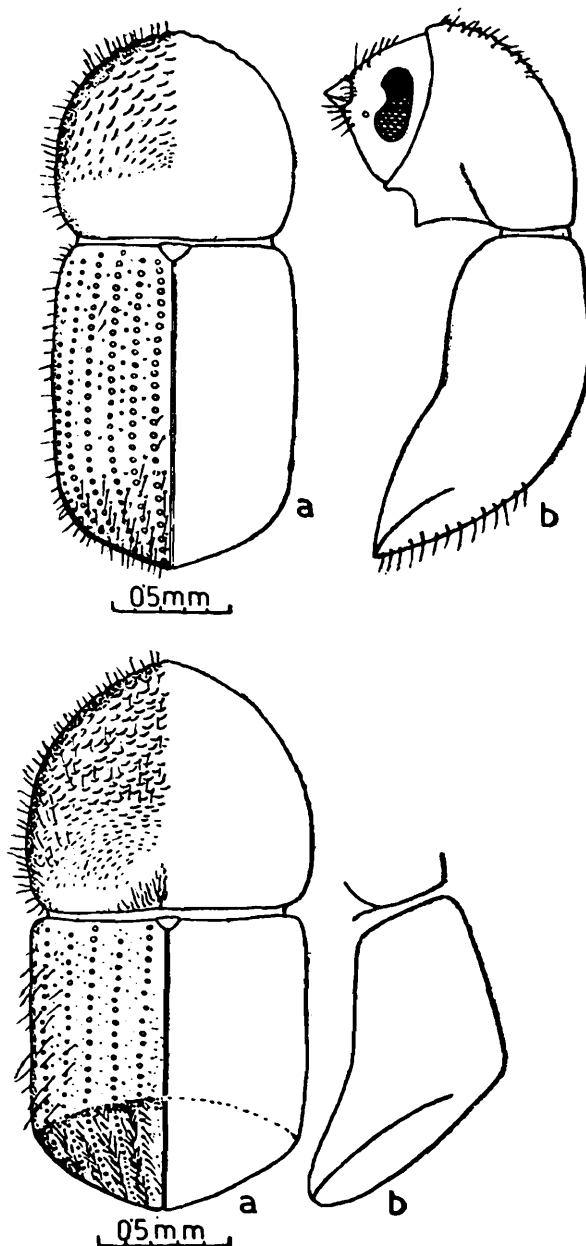


Fig. 3, a-b, *Xylosandrus difficilis* (Eggers), Female : a, Pronotum and elytra in dorsal view ; b, head, pronotum and elytra in lateral view.

Fig. 4, a-b, *Xylosandrus discolor* (Blandford), Female : a, Pronotum and elytra in dorsal view; b, elytra in lateral view.

Head globose ; frons plano-convex, with either weakly or fairly developed median line ; surface reticulate with sparse shallow punctures and long erect hairs.

Pronotum 1.1 times as wide as long ; lateral sides feebly outcurved and converging anteriorly ; anterior margin broadly rounded accommodating 7-9 fairly distinct asperities ; summit indistinct ; anterior half with closely set transverse distinct asperities and arranged some what in concentric rows, gradually becoming smaller posteriorly ; posterior half shiny with punctures and inconspicuous hairs, except on postero-median portion.

Scutellum subtriangular and comparatively large.

Elytra nearly 1.5 times as long as pronotum and 1.3 times as long as its width ; lateral sides subparallel upto basal three-fourths, thence converging posteriorly, with broadly rounded apex ; discal striae marked by shallow sparse punctures, devoid of any microhair ; interstriae flat, shiny much wider than striae, with uniseriate minute punctures and sparse erect hairs. Declivity commencing behind the middle, face steep and convex ; postero-lateral margins distinctly carinate and confluent with interstria 7 ; striae 1, 2 and 3 outcurved at the level of anterior portion of posterior half of declivity, marked by distinct close punctures ; interstriae with uniseriate sparse granules and long erect hairs. Procoxae widely separated from each other. Protibiae with 5 and both meso-and meta-tibiae with 10 teeth.

Male : Not available in the material studied.

Distribution : India : West Bengal (Darjiling Dist.) and Assam ; Indonesia, Malaysia and extends across the Pacific as far as to Fiji.

Remarks : This species is closely related to *X. mesuae* and was originally described under *Xyleborus* from Java. Subsequently, it was recorded from the intervening areas of eastern India (Assam) to Fiji in the Pacific. Recently, it has been transferred to the genus *Xylosandrus* by Browne (1961). However, the species is recorded here for the first time from the hilly tracts of north Bengal, thus extending its distribution further east of Assam. In Assam, it was recorded from a single host, *Gmelina arborea* (Beeson, 1930). Four hosts, namely *Aphanamixis polystachya*, *Beilschmiedia sikkimensis*, *Juglans regia* and *Litsaea elongata* are the additional hosts of the species from the sub-Himalayan West Bengal. In Malaya, the species is found infesting predominantly the stout twigs, poles and branches of smaller diameters (Browne, 1961). The species is never considered as economically important one, since the damage caused to the wood is generally superficial in nature. The colour varying from reddish brown to complete black is a common feature of the species.

4. *Xylosandrus discolor* (Blandford)

(Fig. 4, a-b)

1898. *Xyleborus discolor* Blandford, *Trans. ent. Soc. Lond.*, p. 429, Female, *Type-locality* : Sri Lanka.
 1930. *Xyleborus discolor* : Beeson, *Indian Forest Rec. (Ent.)*, 14 (10) : 56.
 1961. *Xylosandrus discolor* : Browne, *Malay. Forest. Rec.*, no. 22, p. 169.
 1986. *Xylosandrus discolor* : Maiti and Saha, *Rec. zool. Surv. India, Occ. Paper*, no. 86 : 148-151.
 1939. *Xyleborus posticestriatus* Eggers, *Arb. morph. taxon Ent.*, 6 : 119, Male.

Material examined 1 Female from Samsingh, coll. C.F.C. Beeson, 7.x. 1933, ex. "areri kanda."

Description : Female : Body short and stout ; head and pronotum pale brown ; elytra blackish brown ; antennae and legs pale brown. Body length 1.90-2.00 mm, twice as long as wide.

Head globose ; frons plano-convex with a feeble median line ; surface reticulate with a few shallow punctures towards vertex and a few fine carinulae converging towards epistomal margin ; vestiture of erect hairs.

Pronotum subglobose ; 1.1 times as wide as long ; anterior margin distinctly rounded and armed with 7-8 adpest asperities ; summit indistinct, entire surface with closely set small but distinct asperities in concentric rows, gradually becoming granulate posteriorly and with small erect hairs throughout ; postero-median portion with a dense patch of pubescence.

Scutellum smooth, shiny and tongue-shaped.

Elytra almost as long as pronotum and its own width ; lateral sides subparallel upto basal fifth, whence strongly converging posteriorly into an angular apex ; discal striae feebly impressed with shallow linear punctures, each with a microhair ; interstriae much wider than striae, with irregular shallow small punctures and sparse hairs. Declivital face abrupt, steep and convex, and declivital margin on upper half somewhat rounded and lower half carinate ; striae 1, 2 and 3 complete, 4 and 5 forming loop, all the striae marked by single row of closely set granules and microhairs, replacing punctures ; interstrial punctures also obsolete, but with irregular comparatively small granules and a single row of small hairs along with microhairs on entire surface. Procoxae moderately separated from each other, protibiae with 4 and both meso-and meta-tibiae with 8 teeth.

Male : Not available from the collection for study.

Distribution India : West Bengal (Darjiling Dist.), Andaman Isl., Assam, Tamil Nadu and Uttar Pradesh ; Burma, Indonesia, Malaysia, Sri Lanka, Sumba Isl. and Taiwan.

Remarks : This species has the unique character such as declivital striae marked by uniseriate close granules replacing punctures like those of *Xylosandrus beelsoni* sp. nov. and *X. crassiusculus* (Motschulsky). It is a fairly common shoot-and twig-borer of many a green plants in India, Sri Lanka, Burma, Malaya and Indonesia. In the present study, the species is collected only in a single occasion from an unidentified host in the study area. The biological features, such as developmental period, emergence of adults, gallery pattern, nest and brood size, etc. have been studied by different authors in different countries, namely, Beeson (1941) in India, Browne (1961) in Malaya and Kalshoven (1958 and 1959) in Indonesia.

5. *Xylosandrus gravidus* (Blandford)

(Fig. 5, a-c)

1898. *Xyleborus gravidus* Blandford, *Trans. ent. Soc. Lond.*, p. 427, Female, *Type-locality* : Chittagoun hills tracts, Bangladesh.
1914. *Xyleborus gravidus* : Stebbing, *Indian Forest Insects (Coleopt.)* p. 586.
1977. *Xyleborus gravidus* : Kumar and Chandra, *Oriental Ins.*, 11 (1) : 34.

Material examined : (i) 1 Female, Pashok, coll. *Ind. Mus.*, May, 1915; (ii) 6 Females, Samsingh, coll. *N.C. Chatterjee*, in different dates between 19.iii. and 14.iv. 1934, ex. "swasnikat" and (iii) 6 Females, Samsingh, coll. *Balwant Singh*, Nov. 1933, ex. "unknow wood" (*det.* C.F.C. Beeson as *Xyleborus gravidus* Blandford).

Description : *Female* : Body short and stout : head, posterior half of pronotum, antennae, legs yellowish brown and anterior slop of pronotum, elytra deep reddish brown and sometimes entire body reddish brown in colour. Body length 4.80 mm, 1.7 times as long as wide.

Head globose ; frons convex, medially slightly elevated with indistinct or obsolete median line, surface shiny with irregular punctures and long erect hairs.

Pronotum 1.1-1.2 times as wide as long ; basal margin substraight with median broad emargination ; lateral sides feebly outcurved, anterior margin produced to accommodate at least 6 pointed asperities, middle two very distinct, transverse summit nearly at middle ; anterior declivous portion with transverse asperities becoming smaller posteriorly ; posterior half shining with distinct sparse minute punctures ; vestiture of long hairs only on anteriorly and laterally, postero-median portion with a dense patch of recumbent hairs.

Scutellum small, distinctly broader than long.

Elytra 1.3 times as long as pronotum and nearly as long as its width ; basal margin feebly outcurved at the level of interstriae 2 and 3 ; lateral sides subparallel whence strongly converging posteriorly and terminating into an angular apex ; discal striae marked by sparse shallow and small punctures, without distinct micro-hair ; interstriae much wider than striae, surface flat and shiny with irregular rows

of minute punctures and a few sparse small hairs. Declivital face steep and flatly convex with oblique surface, declivital margins on upper half rounded and strongly carinate on lower half; striae impressed, with large close punctures, each with a microhair; all interstriae with 2-3 irregular rows of granules; surface with vestiture of short recumbent as well as uniseriate row of sparse long erect hairs. Pro-coxae subcontiguous; protibiae with 6 and both meso-and meta-tibiae with 11 teeth.

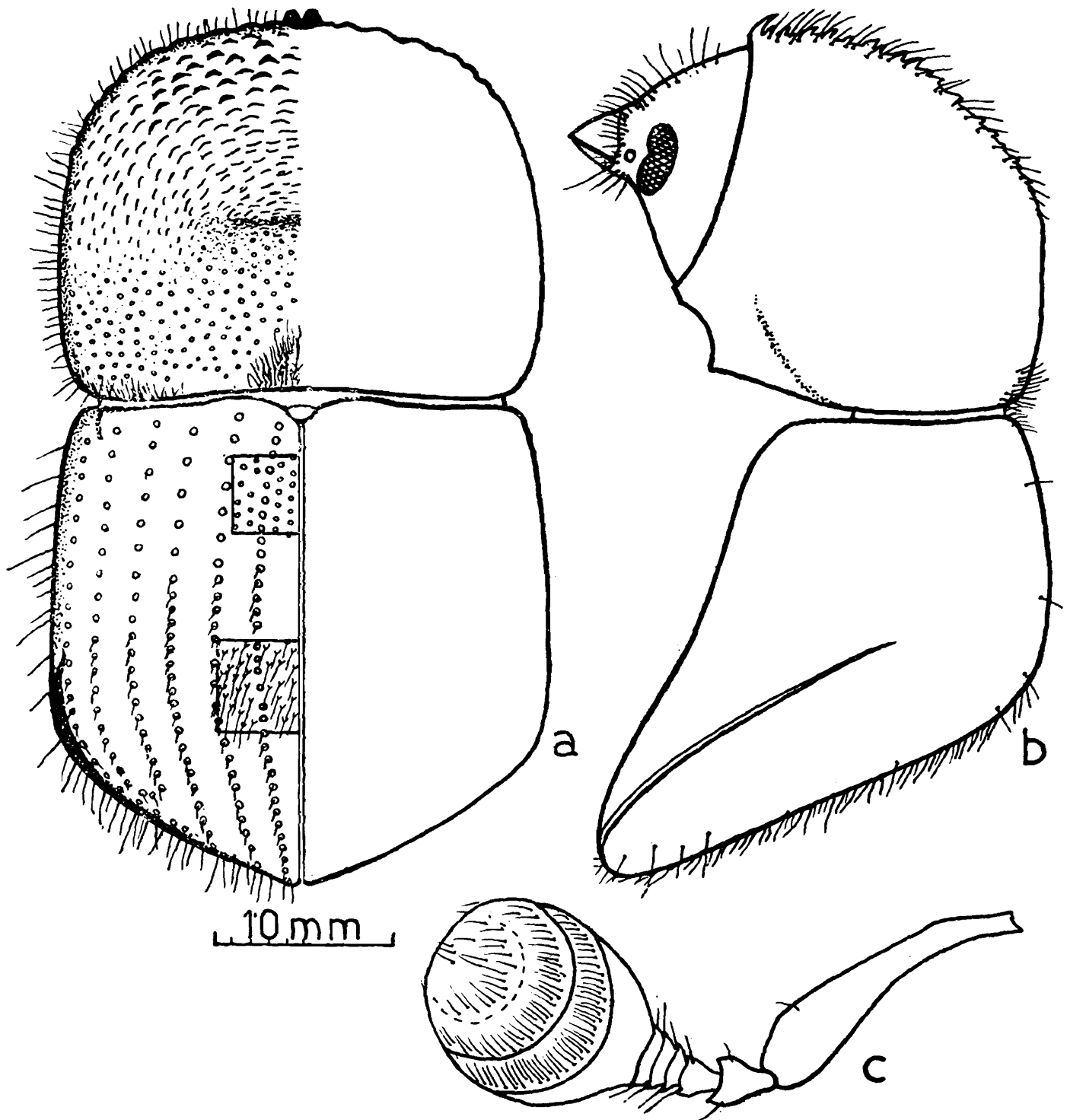


Fig. 5. a-c. *Xylosandrus gravidus* (Blandford) Female: a, Pronotum and elytra in dorsal view; head, pronotum and elytra in lateral view; c, antenna.

Male : Male not available in the material under study.

Distribution India : West Bengal (Darjiling Dist.) and Assam ; Bangladesh, Burma, Laos, Malaysia, North Vietnam, Thailand and Sri Lanka.

Remarks : This is a fairly widely distributed species in south east Asia. The examination of identified material exhibits some uniform deep brown colour throughout. But, the head, posterior half of pronotum, antennae and legs of some beetles from Samsingh are yellowish brown and anterior slop of pronotum and elytra of same individual are deep reddish brown in colour.

In all essential morphological characters, the species certainly belongs to the genus *Xylosandrus*, but almost contiguous procoxae serves as an unique character of the species.

The species has been recorded from a number of hosts (Beeson, 1930). In the study area has been collected from some unidentified host plants. This species is of possible economic importance, though it attacks on young trees (Beaver and Browne, 1975).

6. *Xylosandrus mesuae* (Eggers)

(Fig. 6, a-c)

1930. *Xyleborus mesuae* Eggers, *Indian Forest Rec. (Ent')* 14 (9) : 6, Female, *Type-locality* : Kalimpong, West Bengal.

1930. *Xyleborus mesuae* : Beeson, *Indian Forest Rec. (Ent')*, 14 (10) : 69-70.

1963. *Xylosandrus mesuae* : Browne, *Ent. Ber.*, 23 : 55.

Material examined : Four Females (Holotype and 3 paratypes) from Kalimpong, Darjiling Dist. 1910, ex. "*Mesua ferrea*."

Description : *Female* Body short and stout ; colour yellowish brown, elytra comparatively darker. Body length 1.46 mm (original-1.1 mm), 2.3 times as long as wide.

Head largely concealed under pronotum ; frons plano-convex with scattered punctures ; epistomal margin with a very few short hairs.

Pronotum just wider than long, lateral sides subparallel upto half then converging anteriorly, anterior margin narrowly rounded armed by 9-10 closely set of asperities ; summit indistinct ; anterior half with fine transverse asperities and few recumbent hairs ; posterior half shiny, punctures and hairs indistinct.

Scutellum small, broader than long.

Elytra 1.47 times as long as pronotum, 1.33 times as long as its width ; lateral sides subparallel upto three-fourths, thence broadly rounded posteriorly ; postero-lateral margins forming distinct carina, which extending upto interstriae 7 ; discal

striae marked by distinct punctures ; interstriae flat, shiny with sparse indistinct punctures. Declivital face abruptly sloping, face flatly convex ; striae distinctly impressed with close and large punctures, each with a microhair ; interstriae feeble elevated with uniseriate row of fine granules and recumbent hairs. Procoxae well separated ; protibiae with 5-6 and both meso-and meta-tibiae with 8 teeth.

Male : Not available in the material studied.

Distribution : India : West Bengal (Darjiling Dist.) and Uttar Pradesh (Siwalik).

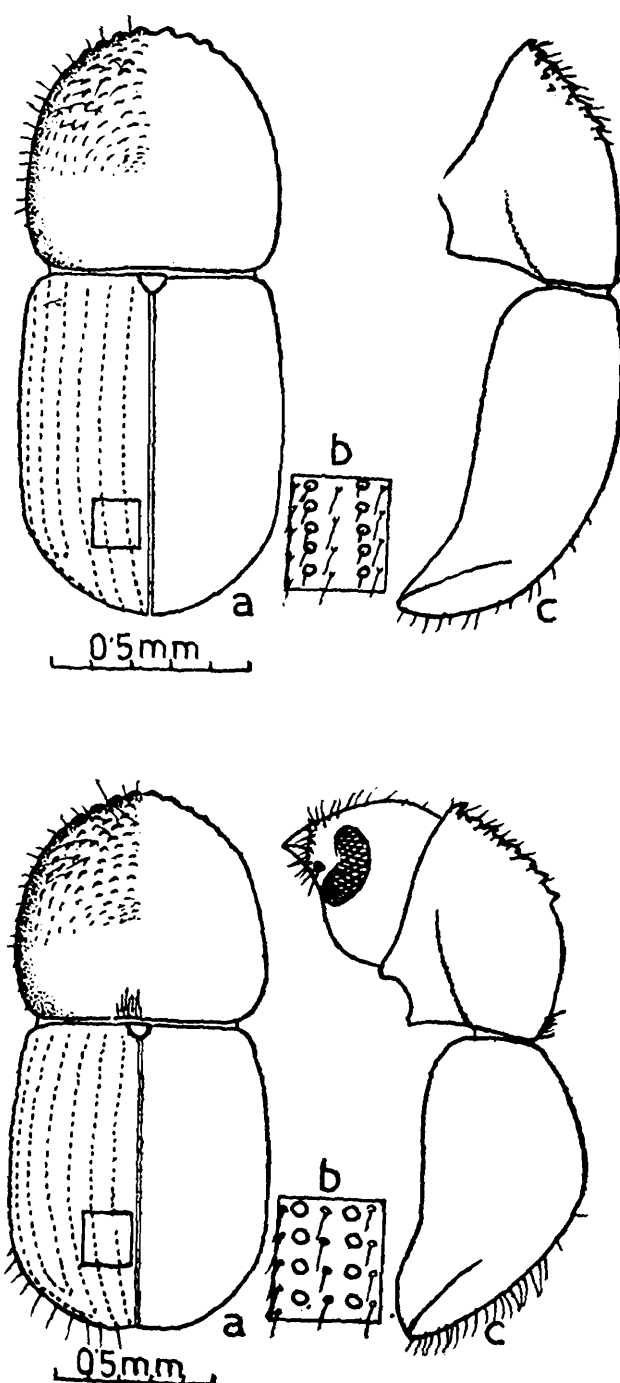


Fig. 6. a-c. *Xylosandrus mesuae* (Eggers), Female : a, Pronotum and elytra in dorsal view ; b, enlarged portion of elytral declivity ; c, pronotum and elytra in lateral view.

Fig. 7. *Xylosandrus morigenus* (Blandford), Female : a, head and pronotum in dorsal view ; b, enlarged portion of elytra declivity ; c, pronotum and elytra in lateral view.

Remarks : The species is so far known only from the hilly tract of Darjiling Dist., West Bengal. According to Beeson (1930), its record from Siwaliks (Phandowala) in U.P., is probably an error in labelling. It is reported as a twig borer of dying *Mesua ferrea* in association with *Xyleborus mucronatulus* Eggers in Kalimpong.

7. *Xylosandrus morigerus* (Blandford)

(Fig. 7, a-c)

1894. *Xyleborus morigerus* Blandford, *Insect life*, 6 : 264--265, Female and Male, *Type-locality* : New Guinea.
 1930. *Xyleborus morigerus* : Beeson, *Indian Forest Rec.*, 14 (10) : 73.
 1913. *Xylosandrus morigerus* : Reiter, *Wien. ent. Ztg.*, 32 (2) : 83. 1908. *Xyleborus coffeae* Wurth, *Salatiga Cultuurgids* 10 : 63-78.
 1923. *Xyleborus luzonicus* Eggers, *Zool. Meded.*, 7 : 174.

Material examined : (a) 5 Females, Tista Valley, Darjiling, coll. J. C. M. Gardner, 29.ix., 7.x. and 27.xi. 1929, ex. "unknown wood"; (b) 13 Females, Sam-singh, as follows : (i) 2 Females, coll. C. F. C. Beeson, 4.x. 1933, ex. "amboke" (*Eugenia formosa*) ; (ii) 8 Females, coll. C. F. C. Beeson, 7.x. 1933, ex. "arerikanda" ; (iii) 2 Females, coll. N. C. Chatterjee, 26.x. 1933, ex. "Bamni pal" and (iv) 1 Female, coll. Mohan Lal, January, 1934 ex. "unknown wood."

Description : *Female* : Body short and stout, colour yellowish brown to complete black, antennae and legs rather paler. Body length 1.60-1.70 mm, nearly twice as long as wide.

Head globose, frons convex with a distinct median line ; surface finely reticulate with sparse fine granules and long erect hairs.

Pronotum 1.1 times as wide as long basal margin substraight, lateral sides feebly outcurved with narrowly rounded anterior margin accommodating 5-6 transverse asperities ; summit indistinct ; anterior half with weak transverse asperities in concentric rows and bent hairs ; posterior half without any puncture or granules ; a few hairs laterally and at postero-median portion.

Scutellum comparatively large and tongue shaped.

Elytra 1.3 times as long as pronotum and 1.1 times as long as its width, slightly wider than pronotum ; lateral sides subparallel upto four-fifth with broadly rounded apex ; postero-lateral margin elevated forming distinct carinae extending to interstria 7 ; in profile, disc strongly convex, arching from base ; surface smooth and shiny with indistinct striae marked by minute punctures, devoid of any microhair ; interstriae flat with inconspicuous punctures and hairs. Declivital face abrupt, steep and convex ; striae punctures rather close and distinct than on disc ; interstriae with

uniseriate punctures and erect hairs, each puncture sometimes bearing minute granules. Procoxae widely separated, protibiae with 4 teeth and both meso- and metatibiae with 6 teeth.

Male : Not available in the present material.

Distribution : India : West Bengal (Darjiling Dist.) ; Indomalayan Region, imported to East Africa, Colombia and some of the polynesian islands (New Braitania, Samoa, Fiji, Hawaii), and Europe and America.

Remarks : The species is recorded here for the first time from the interior of the mainland of India, occurring in the hilly tracts of north Bengal. Prior to this, it was known only from some insular territories of the Indo-Malayan region and subsequently imported to many countries of the world. In north Bengal, it has been collected from a few localities infesting *Eugenia formosa* in addition to some unknown wood. The species was originally described from a orchid, *Dendrobium phalaenopsis* in New Guinea. The development of brood takes exceedingly short period of more than a week in Sri Lanka (Beeson, 1930). The species can easily be separated from all other members of the genus by its smaller body from and elytra arching from the base towards declivital summit.

8. *Xylosandrus ursinus* (Hagedorn)

(Fig. 8, a-b)

1908. *Xyleborus ursinus* Hagedorn, *Dt. ent. Z.*, p. 381, Female *Type-locality* : Ri-Rambe, Sumatra, Indonesia.
 1927. *Xyleborus ursinus* : Eggers, *Treubia*, 9 : 406
 1966. *Xyleborus ursinus* : Schedl, *Entom. Abh. Mus. Tierk. Dresden*, 35 : 75.
 1986. *Xylosandrus ursinus* : Maiti and Saha, *Rec. zool. Surv. India, Occ. Paper No. 86* : 151-153.

Material examined : A. (i) 35 Females, Samsingh, different dates in between 17.x. 1933 and 31.i. 1934, ex. "*Sterculia colorata*" or "*Sapium eugeniaefolium*" and (ii) 3 Females Samsingh, coll. N.C. Chatterjee, 4.iii. 1934, ex. "*Castanopsis* sp.", B. 62 exs. from Samsingh, as follows : (i) 15 Females, coll. Mohan Lal, January, 1934, "unknown wood" ; (ii) 27 Females, coll. Balwant Singh, February, 1934, ex. "unknown wood" ; (iii) 1 Female, coll. Mohan Lal, December, 1934 ; (iv) 19 Females, coll. C. F. C. Beeson, 2.x. 1933, ex. "barkula"—(*Casearia glomerata*) (det. S.L. Wood).

Description : *Female* : Body broad and stout ; head blackish brown, pronotum and elytra pitchy black, antennae and legs light brown ; body densely hairy. Body length 4.25-4.40 mm, 1.8 times as long as its width.

Head globose ; frons plano-convex, surface finely reticulate with moderately close, deep scattered punctures and a few long hairs.

Pronotum globose, 1.23-1.28 times as wide as long, lateral sides moderately outcurved with broadly rounded anterior margin accommodating 5 median asperities, middle one largest; summit little behind the middle; distinct asperities on anterior declivous two-thirds, gradually larger anteriorly; posterior half with large, deep, close punctures; entire pronotum with dense long hairs.

Scutellum smooth, large and subrounded.

Elytra 1.4 times as long as and nearly as wide as pronotum and nearly as long as its width; lateral sides very weakly outcurved with broadly rounded apex, postero-lateral margins without any distinct carina rather with some close either small or large distinct granules; striae with close small shallow punctures, each with a microhair; interstriae flat, much wider than striae with irregular setiferous punctures. Declivity commencing a little before the middle, face weakly convex and gradually sloping posteriorly; striae fairly impressed marked by shallow, comparatively large punctures, each with a microhair; interstriae flat with irregular punctures, sparse granules and long erect dense hair. Procoxae subcontiguous; protibiae with 6 and both meso-and meta-tibiae with 9 teeth.

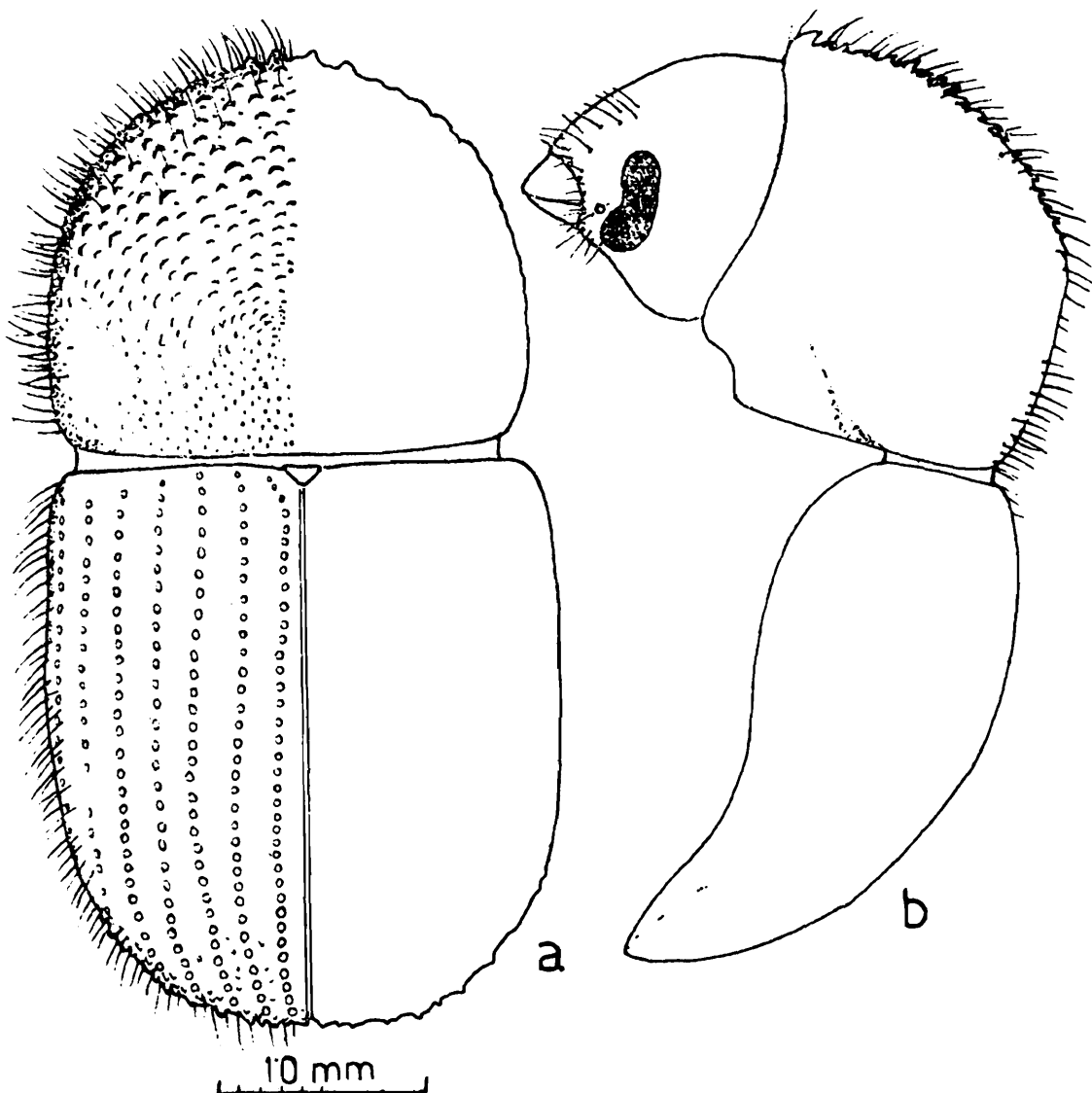


Fig. 8, a-b, *Xylosandrus ursinus* (Eggers), Female: a, Pronotum and elytra in dorsal view; b, head, pronotum and elytra in lateral view.

Male : Male not available in the material studied.

Distribution : India : West Bengal (Darjiling Dist.), and Nicobar Isl. ; Indonesia and Philippines.

Remarks : The stout and strong body from with profuse pilosity is an aid to the identity of the species. The tubercles on the postero-lateral margins of elytra vary considerably in the individual of different collection. However, the species was so far known from the different insular territories of the Orient including Great Nicobar Island. It is recorded here for the first time from the interior of Indian mainland occurring in the sub-Himalayan West Bengal. Recently, Maiti and Saha (1986) reported the species from felled logs of some four host-plants in the Great Nicobar. The new host records from the study area, are as follows : *Casearia glomerata*, *Castanopsis* sp., *Sterculia colorata* or *Sapium eugeniaefolium*.

SUMMARY

The paper deals with the taxonomic account of seven species of Scolytid beetles belonging to the genus *Xylosandrus* from the sub-Himalayan West Bengal, based on the material present in the Forest Research Institute, Dehra Dun. Of these species, *X. beelsoni* has been described as new to science and three species, namely, *X. difficilis* (Eggers), *X. morigerus* (Blandford) and *X. ursinus* (Hagedorn) are recorded for the first time from the area. A key for the identity of the species have been prepared for the first time. Each species has been dealt with synonymies, diagnostic character, range of distribution and variations, taxonomic and biological remarks etc.

ACKNOWLEDGEMENTS

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TWO KNOWN SPECIES OF DORYLAIMIDA (NEMATODA) FROM SEWAGE SYSTEM OF CALCUTTA, WEST BENGAL, INDIA.

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INTRODUCTION

Nematodes occur in a wide range of habitats which is perhaps unsurpassed by any other metazoan group. However, reports by Cobb, 1918 ; Chang and Kabler, 1962 ; and Zullini, 1976, conclude that nematodes of sewage and waste water plants predominantly belong to the order Rhabditida and in lesser numbers to Order Dorylaimida which are mostly predators.

According to Calaway (1963), the occurrence of these nematodes in the polluted areas is for maintaining the filter-beds porous by feeding on biological films. they further influence the decomposition process as a result of metabolism.

Keeping in view the functional role of nematodes in the sewage activated system, the present study was undertaken in the Central sewage canal of Calcutta near Rajabazar area, Calcutta, West Bengal, during May and December, 1987. These soil samples overlying with stagnant and dark water yielded two known nematode species belonging to the genera *Mesodorylaimus* Andrassy, 1959 and *Laevides* Heyns, 1968, under the families Dorylaimidae and Nygolaimidae, respectively. It appears that these two species are being reported from this extreme degraded ecosystem for the first time from India. The occurrence of these nematode species in these ecologically disturbed area permits to conclude about their high range of tolerance.

***Mesodorylaimus pizai* Lordello, 1965**

(Fig. 1)

Dimensions :

Females (6) : L=1.15-1.27 mm ; a=32-35.5 ; b=4.4-4.9 ; c=30-40 ; c'=1.6-1.8 ; V=52.5-55.6.

Males (2) : L=1.07-1.15 mm ; a=33.5-38 ; b=3.9-4.6 ; c=60-76 ; c'=0.8-0.85.

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Description :

Female : Body ventrally arcuate in the posterior half of its length. Cuticle finely striated, about $1.5\text{-}2.0\ \mu\text{m}$ on mid-body and $2.5\text{-}3\ \mu\text{m}$ on tail. Lip region $10\text{-}10.5\ \mu\text{m}$ wide, set off, rounded. Amphids cup-shaped, $5\ \mu\text{m}$ or about half of the corresponding body-width.

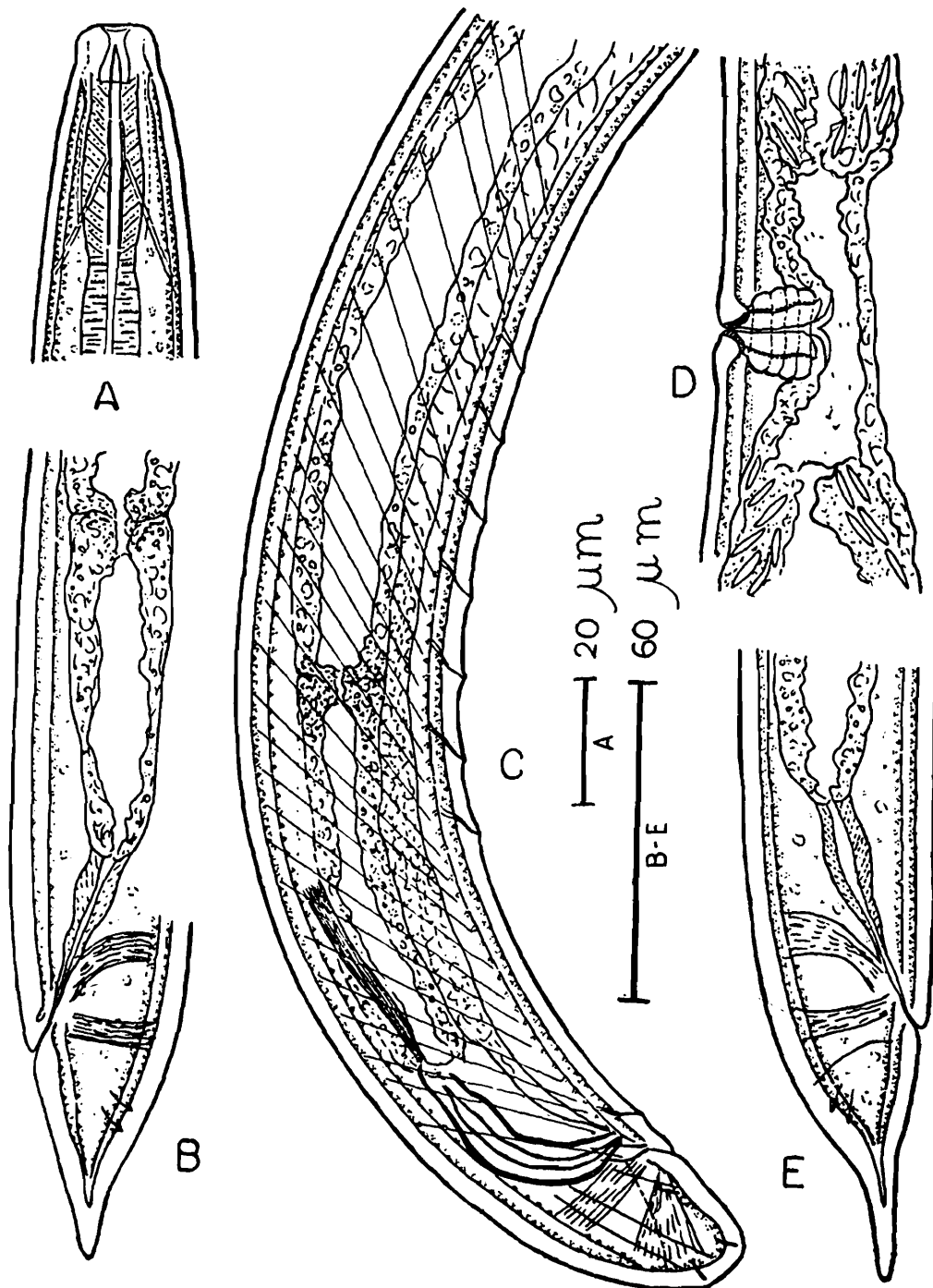


Fig. 1. *Mesodorylaimus pizai* Lordello, 1965

- A. Anterior end B. & E. Posterior ends of female
C. Posterior region of male D. Vulvar region showing sperm

Odontostyle 10.5-12.0 μm or 1-1.2 head-width long, about as wide as cuticle of the corresponding body ; aperture occupying more than 1/3rd of odontostyle length. The fixed guiding ring not sclerotised, about 7.5 μm from anterior extremity. Odontophore 18-20 μm or about 1.7-1.8 times the odontostyle length. The basal expanded part of oesophagus occupies about 40% of the total oesophageal length. Cardia conoid. Prerectum 47-60 μm or 2.4-3.3 anal body-widths long. Rectum 30-32 μm or 1.4-1.8 anal body-widths long.

Vulva a transverse slit, vagina 14-18 μm long or 40-50% of corresponding body-width, strongly cuticularised distally. Reproductive system amphidelphic ; ovaries reflexed, spermatheca filled with spindle shaped-sperms.

Tail 30-40 μm or 1.7-2.1 anal body-widths long, first convex conoid then gradually tapering to the rounded tip.

Male : Similar to female in general shape and morphology except the reproductive system and tail shape. Spicules 36-42 μm or 1.8-2.2 anal body-widths long. In addition to the precloacal supplements, 7 ventromedian supplements present, spaced nearly at regular intervals, 8-10 μm apart from each other ; the first supplement 120-128 μm and the last at 50-54 μm from cloacal opening. Prerectum starts at the level of 5th-6th ventromedian supplements, 80-85 μm or about 7 anal-body widths long. Tail bluntly rounded, 15-18 μm or 0.79-0.85 anal body-width long, with two caudal pores on each side.

Habitat and locality : Soil from the sewage canal of Calcutta at Rajabazar area, Calcutta, West Bengal.

Remarks : The present population differs from the type population of *M. pizai* Lordello, 1965 in having shorter tail in female and male with lesser number of supplements ($c=17-18$; $c'=2.0-2.5$ and supplements 11-12 after Lordello, 1965). We consider these differences as variations. The species is being reported for the first time from India.

***Laevides timmi* (Heyns, 1968) Ahmad & Jairajpuri, 1982**
(Figs. 2)

Dimension :

Female L=2.25 mm ; a=39 ; b=4 ; c=70.4 ; V=50 ; $G_1=13$; $G_2=10.5$.

Male L=2.235 mm ; a=37.2 ; b=4.2 ; c=74.5 ; T=50.7.

Description :

Female : Body ventrally curved in posterior half upon fixation. Cuticle 2 μm thick at mid body and 4 μm thick on tail with finely striated subcuticle. Lip region slightly marked by a depression ; lips with usual number of papillae. Amphid

apertures slit-like, occupying more than half of corresponding body-width. Tooth moderately slender, dorylaimoid type, $12\ \mu\text{m}$ or about $3/4$ th of head-width, with a distinct dorsal aperture. The basal expanded part of oesophagus enveloped by a sheath, occupying about 48% of the total oesophageal length; nerve ring surrounding the anterior part. Cardia hemi-spherical. Cardiac glands well developed, ovoid, $5\text{--}6\ \mu\text{m} \times 10\text{--}11\ \mu\text{m}$. Hemizonids indistinct.

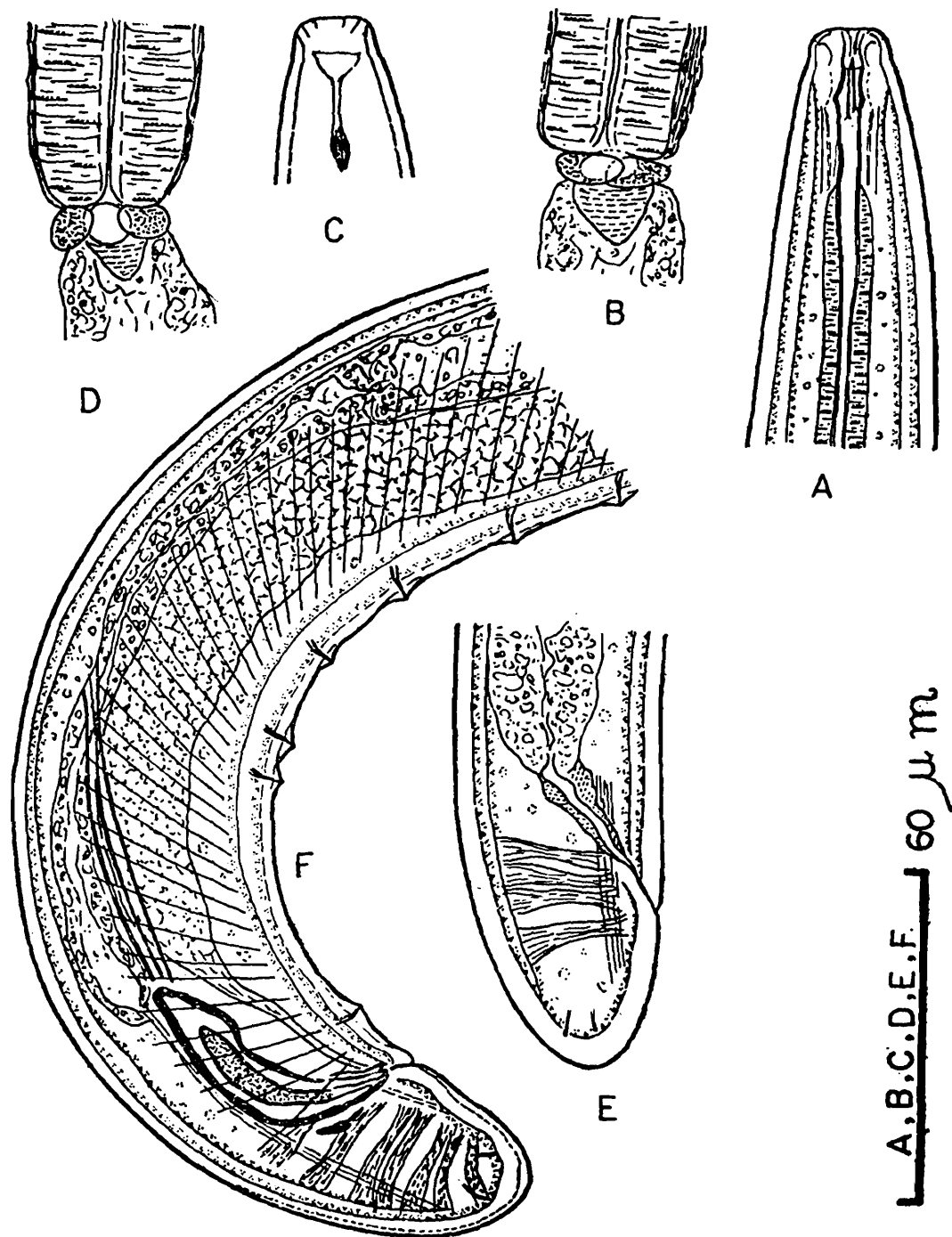


Fig. 2. *Levides tlmmi* (Heyns, 1968) Ahmad & Jairajpuri, 1982

- | | | |
|-----------------------|---------------------------------------|------------|
| A. Anterior end | B. & D. Oesophago-intestinal junction | C. Amphids |
| E. Tail end of female | F. Posterior region of male | |

Reproductive system amphidelphic. Ovaries reflexed, with oocytes arranged in a single row except in growth region. Pre-rectum 108 μm or about 3 anal body-widths long. Tail short, bluntly rounded, 32 μm or 0.95 anal body-width long, with two caudal pores on each side.

Male : Similar to female in general shape and morphology except the reproductive system and tail shape. Spicules 60 μm or about 1.6 anal body-width long along the median line. Lateral guiding pieces 10 μm with concave proximal end. Gubernaculum 9 μm long. Supplements consist of an adanal pair and six ventro-medians which are irregularly spaced. Pre-rectum 138 μm or about 3.7 anal body-widths long. Tail bluntly rounded, 30 μm or less than one anal body-width long, with two caudal pores on each side.

Habitat and locality : Soil from the sewage canal of Calcutta near Rajabazar, Calcutta, West Bengal.

Remarks : The females of the present population agree with the original description provided by Heyns (1968). Ahmad and Jairajpuri (1982) reported the males of *L. timmi* for the first time from Gulaba Army Camp, Manali, District Kulu, Himachal Pradesh. The present male fits well with the description of male provided by these authors. The female is being reported for the first time from India.

SUMMARY

During the survey of soil inhabiting nematodes from a branch of circular sewage canal near Rajabazar area of Calcutta, two nematode species of the genera *Mesodorylaimus* Andrassy, 1959 and *Laevides* Heyns, 1968 (one each) are being reported. The former has been identified as *M. pizai* Lordello, 1965 while the latter as *L. timmi* (Heyns, 1968) Ahmad & Jairajpuri, 1982.

ACKNOWLEDGEMENTS

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ON THE BIOLOGY AND THE NYMPHAL TAXONOMY OF *PHLAEOPA INFUMATA* BRUNNER (ACRIDIDAE) UNDER LABORATORY CONDITION

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Zoological Survey of India
Calcutta

INTRODUCTION

The biology of different orthopteran pests have been studied in India and abroad by workers like Lefroy (1909); Coleman and Kannan (1911); Roonwal (1945, '46, '47 and '76); Albreeht (1955), Jago (1963); Gupta and Kushwaha (1965, 68) and Parihar (1974).

Kushwaha and Bharadwaj (1977) has recognised *Phlaeoba infumata* as the pest of crops and vegetables. But so far the biology of this grasshopper species has not been attempted. The aim of the present paper is to give in some detail of its biology and to provide the identifying characters of the nymphs for easy recognition in the field and laboratory.

MATERIALS AND METHODS

Gravid females have been collected directly from the fields and kept in wooden cages (25 cm. x 15 cm.), two sides of which are fitted with zinc wire net for ventilation, other two sides with glass and top with sliding glass for smooth operation.

The floor of the wooden cages were provided with some false floor for insertion of glass tubes measuring (8 cm. height and 3 cm. in diameter) containing sterilised moist loamy soil (50% sand and 50% clay) for facilitating deposition of eggs. For observing the development and duration of hoppers, the nymphs were reared in isolated condition in separate cylindrical zinc wire net cages measuring 14 cm. height and 6 cm. in diameter, the top of which are covered with muslin cloth secured by rubber band. The appearance of fresh exuvae confirms the presence of newly moulted nymphs. The rearing cages were placed in B. O. D. incubator under controlled temperature $33^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 70% to 85% relative humidity. During day time the cages were exposed to sunlight for 5 to 6 hours. Every day in the morning at 10.30 hours fresh *Cyperus rotundus* (grass) was placed in the rearing cages as food.

RESULTS

1) *Deposition of eggs and the formation of egg pods :*

The tip of the abdomen of *Phlaeoba infumata* during oviposition reaches up to the desired depth of 2.4 to 6.0 cm. and then secretes a kind of silvery-white secretion through the tip of the abdomen. After that the eggs, (light yellow in colour) were laid with a foamy substances. The female secretes some extra substances after completion of egg laying then withdraw its abdomen and sealed the hole with a plug made up of a soil and forthy material. The time taken for drilling operation till the abdomen removed ranges from 20 to 45 minutes. This species lays 1 to 3 egg pods in her life time. The interval between the deposition of one egg pod to other was recorded from 3 to 7 days. Each egg-pod contains 8 to 25 eggs. (Table 1).

The freshly laid eggs of *Phlaeoba infumata* is bright yellow in colour but after two hours, it becomes deep brown. It is cylindrical and blunt at both the sides. Each egg measures 5.5 to 5.9 mm. in length and 1.5 to 1.65 mm. in breadth.

2) *Hatching of eggs from the pods.*

From table 2 it is evident that the incubation period of egg of *Phlaeoba infumata* is from 17 to 23 days (Mean 20.26 days). The hatching starts from 20.26 the tip of the egg-pod ; a rupture appears at the upper end of the egg pod and through this orifice the "Vermiform larvae" comes out with head directed upwards. The larvae is enclosed within a thick transparent membrane, a separate "sleeves" for the legs, the distal part of the antennae and the cerci. The cuticle of vermiform larvae is ruptured after reaching the soil surface along the dorsum of the head then thorax and lastly the membrane from the hind legs. This shedding of skin is known as intermediate moult, hatching took place within 12 to 35 minutes or may extend upto 10 hours. The percentage of male and female were 53.62% and 46.38% respectively. it was calculated from 276 examples of laboratory reared specimens hatched from 15 egg pods ;

3) *Developmental stages and their duration :*

The nymphs of *Phlaeoba infumata* were found to pass through 5 moults to become adult male and 6 moults for adult female. It is evident from the table that the duration of the nymphal stages ranges from 32 to 44 days in male and 38 to 45 days in female.

Table 3. Duration of nymphal life (days) of *Phlaeoba infumata*. Isolated hoppers reared for development in the laboratory in B. O. D. incubator at $33 \pm 2^{\circ}\text{C}$ (Number of observations-30)

No. of instars	1	2	3	4	5	6	Mean total days
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Male :

Mean (days)	6.5	7.0	7.6	7.0	9.4	—	36.2
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Ranges

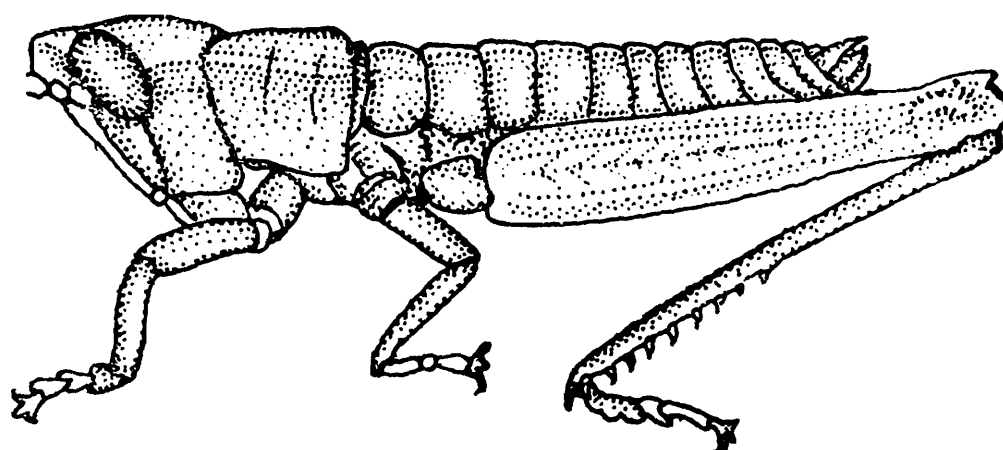
(days)	5-8	5-8	6-9	7-9	8-12	—	32-44
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Female :

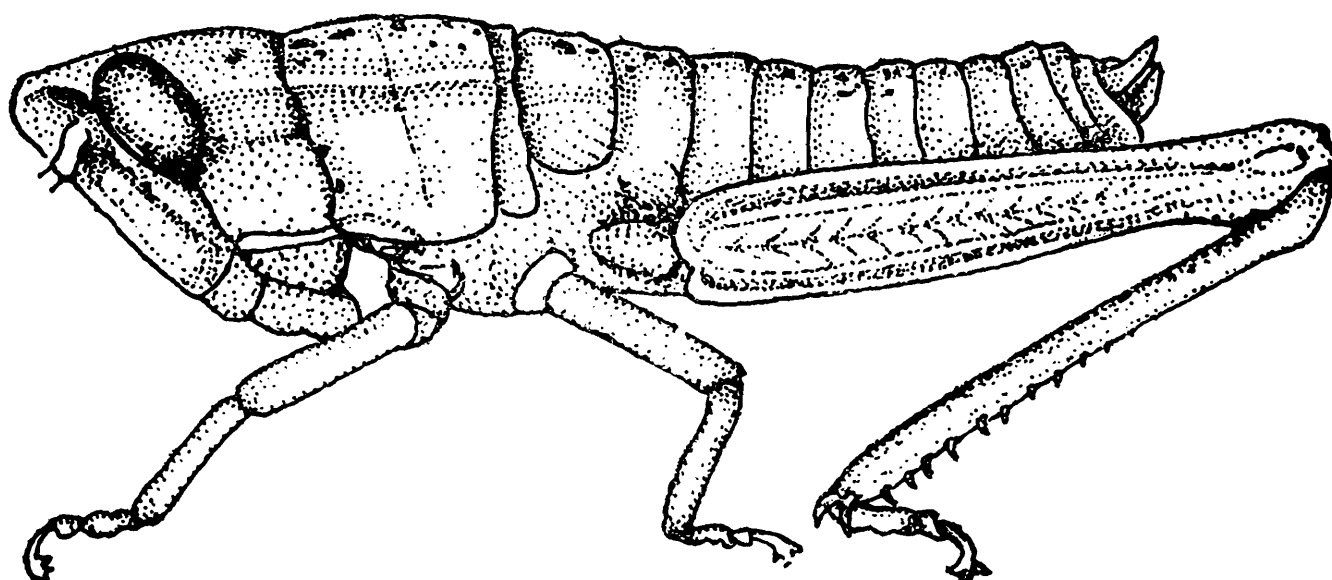
Mean (days)	6.0	6.5	7.3	8.4	8.6	10.5	41.5
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Ranges

(days)	5-8	5-8	6-9	7-11	7-10	10-14	38-45
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1



2

Fig. 1. First instar nymph of *Phlaeoba infumata* (male)Fig. 2. Second instar nymph of *Phlaeoba infumata* (Female)

4) *Morphology of different instars of Phlaeoba infumata :*

First-instar (Fig. 1)

Colour : Freshly emerged nymph of first instar was whitish yellow in colour but within 2 hours it changed to light brown colour with deep brown spots. *Head :* Relatively robust in comparison to the posterior part of the body and length measures 1.55 mm. *Antennae :* Ensiform, segments 12 ; comprises of scape, pedicel, and a flagellum of 10 annuli, measures from 2.3 to 2.7 mm. in length (Fig. 2) *Pronotum :* Posterior margin deeply incurved or concave and measures 1.06 mm. in length along the median carina. *Wing pads* Rudiments of hind margin of mesonotum or fore wing pad and metanotum or hind wing pad were directed vertically downward, blunt rounded at apex and without clear indication of trachiation. Fore wing pad measures from 1.8 to 2.0 mm. in length. *Hind femur :* Lower basal lobe longer than upper one and measures from 3.0 to 3.3 mm. in length and 0.7 to 0.8 mm. in breadth. *External genitalia Male :* (Fig. 10) Subgenital plate small deeply emarginate at apex, *Female :* (Fig. 11) : Sternite 8th (Fig. 1) bears a pair of small and truncate valve which later develops into anterior ovipositor valves, sternite 9th of abdomen bears another pair of small, triangular valves, which later develops into posterior ovipositor valves. (Fig. 1)

Second instar (Fig. 2)

Colour : General body colour same as first instar *Head, :* Less robust in comparison to the posterior part of the body and measures from 1.9 to 2.2 mm. in length ; *Antennae* (Fig. 22) : Segments 11 to 12 in number and comprises scape, pedicel, and a flagellum, measures 3.18 (3.10 to 3.2) mm. in length. *Pronotum :* Shape same as in 1st instar, posterior margin slightly incurve or concave and measures from 1.5 to 1.67 mm. in length. *Wing pads :* Presence of steaky pattern of trachiation, hind margin of mesonotum or fore wing pad or metanotum or hind wing pad same as in 1st instar. *Hind femur :* Lower basal lobe slightly longer than upper basal lobe and measures from 4.0 to 4.1 mm. in length. *External genitalia Male* (Fig. 12) : Subgenital plate narrowed with less emarginate at apex, *Female* (Fig. 13) : Anterior ovipositor valves or lower valves clearly developed posterior ovipositor or upper valves slightly angular and elongate in shape, inner margin deeply separated.

Third instar (Figs. 3, 4)

Colour General body colour more or less like second instar except the colour becomes more bright. *Head :* Now proportionate to the abdomen and measures from 2.4 to 2.6 mm. in length. *Antennae* (Figs. 23, 24) : Number of segments 16, occasionally 15 segments at the right side and 16 at left, and measures from 3.4 to 3.6 mm. in length. *Pronotum :* Posterior margin slightly concave or incurved

and measures from 2.0 to 2.2 mm. in length. *Wing pads*: Lower posterior angles of mesonotum or fore wing pad and metanotum or hind wing pad begins to project and more or less triangular in shape. *Male*: Fore wing pad reaches at least one third length along the costal border of hind wing pad. *Female*: Fore wing pad extend at least one fourth of length along the costal margin of hind wing pad. *Hind femur* Upper and lower basal lobe equal and measures from 5.9 to 6.5 mm. in length.

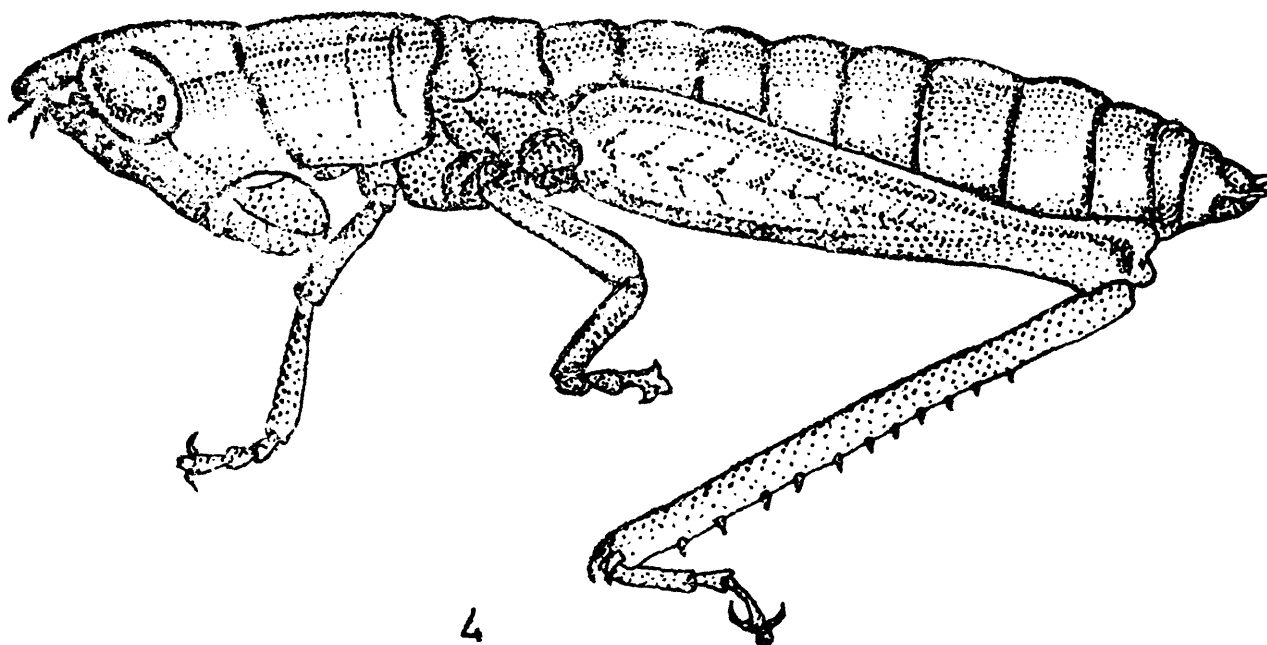
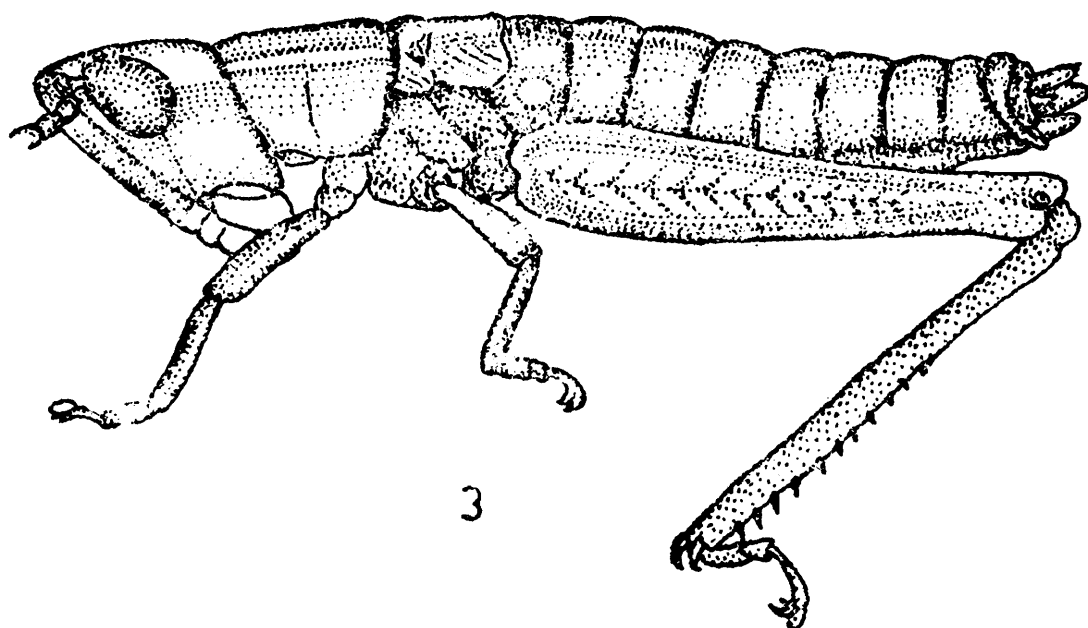


Fig. 3. Third instar nymph of *Phlaeoba infumata* (male)

Fig. 4. Third instar nymph of *Phlaeoba infumata* (female)

External genitalia : Male (Fig. 14) : Apex of subgenital plate out curved and reaches up to the end of paraprocts. *Female* (Fig. 15) : Anterior ovipositor valves reaches at the base of posterior ovipositor valves, posterior ovipositor valves or lower valves reaches upto one third length of the paraprocts, inner margin of posterior ovipositor valves slowly divergent from each other, inner valves also developed in between the posterior ovipositor valves.

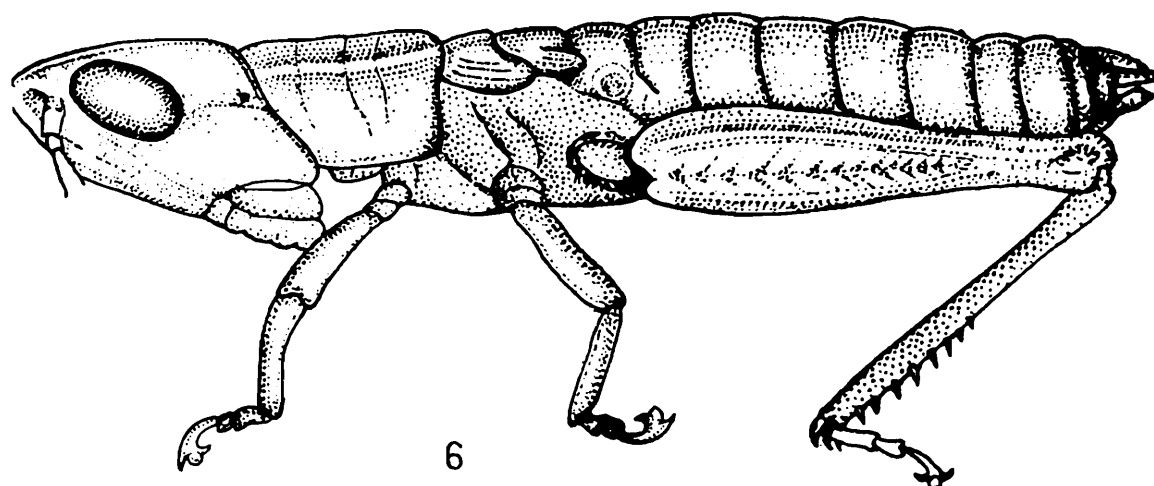
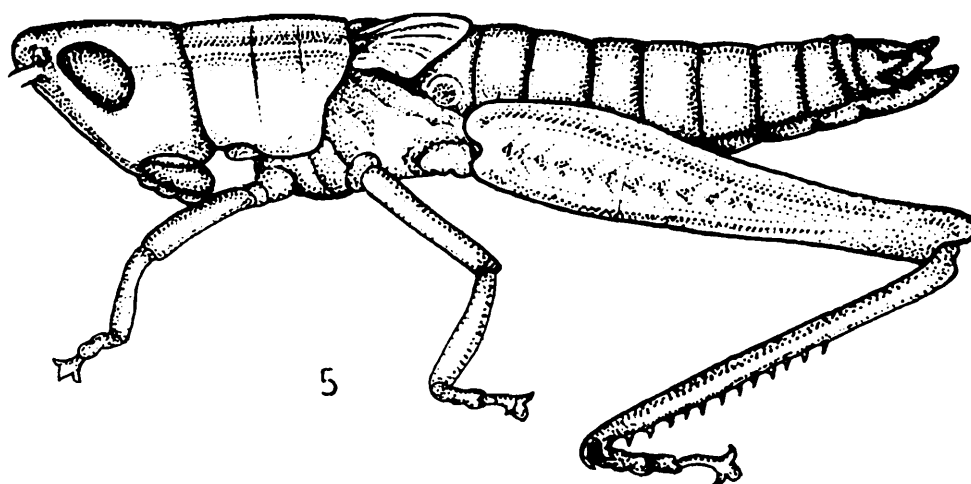


Fig. 5. Fourth instar nymph of *Phaleoba infumata* (male)

Fig. 6. Fourth instar nymph of *Phlaeoba infumata* (female)

Fourth Instar (Figs. 5,6)

Colour General body colour straw yellow to deep brown, numerous deep brown dots scattered all over the body and legs. *Head* : Male Measures from 2.8 to 2.9 mm. in length. *Female* : Measures from 2.8 to 3.0 mm. in length. *Antennae* (Figs. 25, 26) : In both the sexes the number of segments were 18 measures from 4.5 to 4.8 mm. in length. *Pronotum* : Posterior margin of pronotum transverse ; Male : Measures from 2.8 to 2.9 mm. in length ; *Female* : Measures 3.8 to 3.0

mm. in length. *Wing pads* : Male : Wing pads reversed in direction, outer surface becomes the inner and develops numerous unbranched veins ; hind wing pad not touching the margin of first abdominal tergite ; *Female* : Lower posterior angle of meso and metanotum formed the definite lobe for future tegmina and wings, trachiation more distinct, fore wing pad backwardly directed about one third of length along the costal margin of hind wing pad. *Hind femur* : Upper basal lobe slightly longer than lower basal lobe. Measures 8.1 to 8.5 mm. in length. *External genitalia-Male* (Fig. 16) : Apex of subgenital plate acutely conical and extends beyond the paraproct. *Female* (Fig. 17) : Anterior ovipositor valves or lower valves crossed the base of the posterior ovipositor valves, inner margin of posterior ovipositor valves not touching along each other, inner valves more prominently developed.

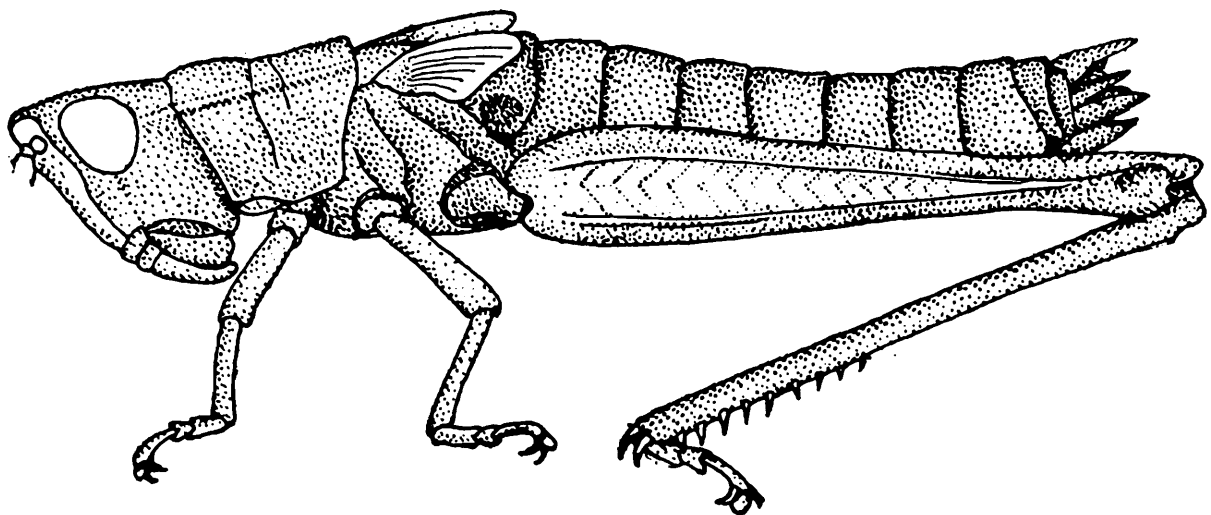
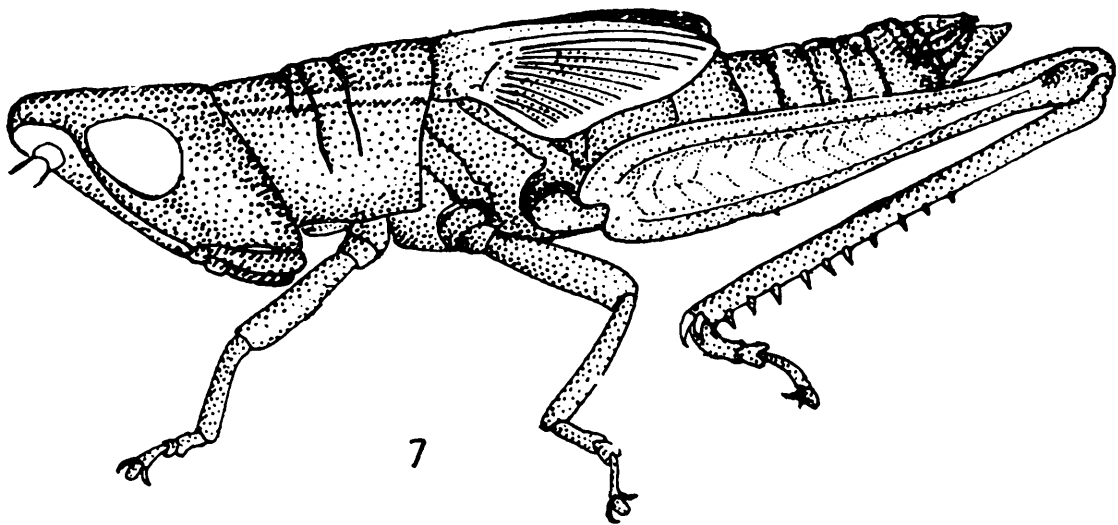


Fig. 7. Fifth instar nymph of *Phlaeoba infumata* (male)

Fig. 8. Fifth instar nymph of *Phlaeoba infumata* (female)

Fifth instar (Figs. 7, 8)

Colour : No remarkable changes in colour pattern than the previous instars. *Head* : In both sexes measures from 3.2 to 3.5 mm. in length. *Antennae* (Figs. 27, 28) : Number of segments 20 and measures from 6.0 to 7.2 mm. in length in both the sexes. *Pronotum* : Posterior margin of pronotum convex or out curved and measures from 3.4 to 3.9 mm. in length in case of both the sexes. *Wing pads* : *Male* : Wing pads, triangular in shape and pointing upwards, hind wing pad not touching the abdominal tergite 3, *Female* : Wing pads reversed as in the fourth instar of female hopper, hind wing pad extends just above the 1st abdominal tergite. *Hind femur* : Upper basal lobe longer than lower basal lobe and measures from 10.5 to 12 mm. in length. *External genitalia* : *Male* (Fig. 18) : Apex of subgenital plate more acutely conical and extends more beyond the paraproct. *Female* (Fig. 19) : A triangular projection appeared in between the base of anterior ovipositor valves. Anterior ovipositor valves covers more than half of the posterior ovipositor valves. Posterior ovipositor valves extends upto the end of paraproct, inner valves overlapped.

Sixth instar (female) (Fig. 9)

Colour : General body colour of fresh hopper is straw yellow, wing pads light green just after moulting but after half an hour the colour of the wing pads changes to brown. *Head* : Measures from 3.9 to 4.0 mm. in length. *Antennae* (Fig. 29) : Number of segments 20 to 23, measures from 7.3 to 8.0 mm. in length. *Pronotum* : Posterior margin convex and obtusely pointed at the posterior margin and measures from 6.1 to 6.2 mm. in length. *Hind femur* : Upper basal lobe more longer than the lower basal lobe and measures from 13.0 to 14 mm. in length.

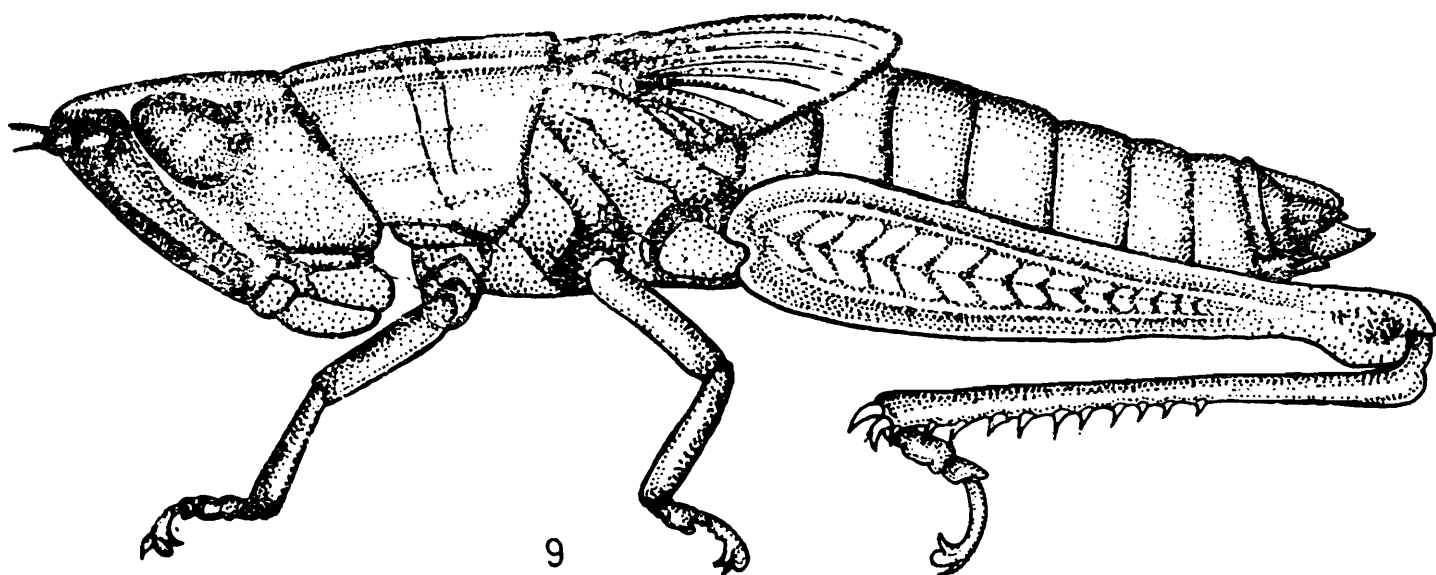


Fig. 9. Sixth instar nymph of *Phaleoba infumata* (female)

Wing pads : Hind wing pads touching the posterior margin to tergite 3. *External genitalia* (Fig. 20) : The triangular projection on eighth sternum more prominent ; anterior ovipositor valves extends three fourth length of posterior ovipositor valves and posterior ovipositor valves extended beyond the paraproct.

5) Key to the identification of different instars of *Phlaeoba infumata*.

1. Anterior ovipositor valves absent on eighth abdominal sternite ; subgenital plate present on ninth abdominal sternite Male (2)
 — Anterior valves of ovipositor and subgenital plate present on eighth abdominal sternite Female (6)
2. Upper and lower basal lobe of hind femur equal or lower basal lobe slightly longer than upper basal lobe ; length of subgenital plate shorter than breadth (3)
 — Upper basal lobe distinctly longer than lower basal lobe ; length of subgenital plate longer or equal (4)
3. Head width 2.4 to 2.5 mm. in length ; subgenital plate covers only base of the paraproct and tip of subgenital plate deeply emarginate... 1st instar ♂
 — Head width 3.0 to 3.1 mm. in length ; subgenital plate covers half of the paraprocts and tip less emarginate... 2nd instar ♂
4. Wing pads more or less triangular in shape ; apex of subgenital plate transverse not elevated in the middle and covered three fourth of the paraproct 3rd instar ♂
 — Wing pads clearly triangular in shape, apex of subgenital plate acutely conical, elongated, elevated in the middle, and extends beyond the paraproct (5)
5. Posterior margin of pronotum transverse hind wing pad reaches just above the hind margin of first tergite ; 4th instar ♂
 — Posterior margin of pronotum outcurved hind wing pad reaches before the posterior margin of 3rd tergite ; 5th instar ♂
6. Wing rudimentary, downwardly directed and blunt ; posterior margin of subgenital plate incurved (7)
 — Wing rudimentary obliquely backwardly directed and less blunt, posterior margin of subgenital plate transverse (8)
7. Antennae 10 segmented ; anterior ovipositor valves not clearly developed ;
 1st instar ♀
 — Antennae more than 12 segment anterior ovipositor valves more clearly

developed ; posterior valve elongated 2nd instar ♀

8. Antennae 16 segmented ; anterior ovipositor valve touching the ninth sternum groove and apex more or less attenuated but not sclerotised ; posterior valves cover half of the paraproct 3rd instar ♀

— Antennae more than 16 segments ; anterior ovipositor valves extended beyond the base of the posterior valves, apex more attenuated and sclerotised ; posterior valves cover more than half of the paraprocts ... (9)

9. Posterior margin of subgenital plate not indented ; inner line of posterior valves not touching along each other posteriorly 4th instar ♀

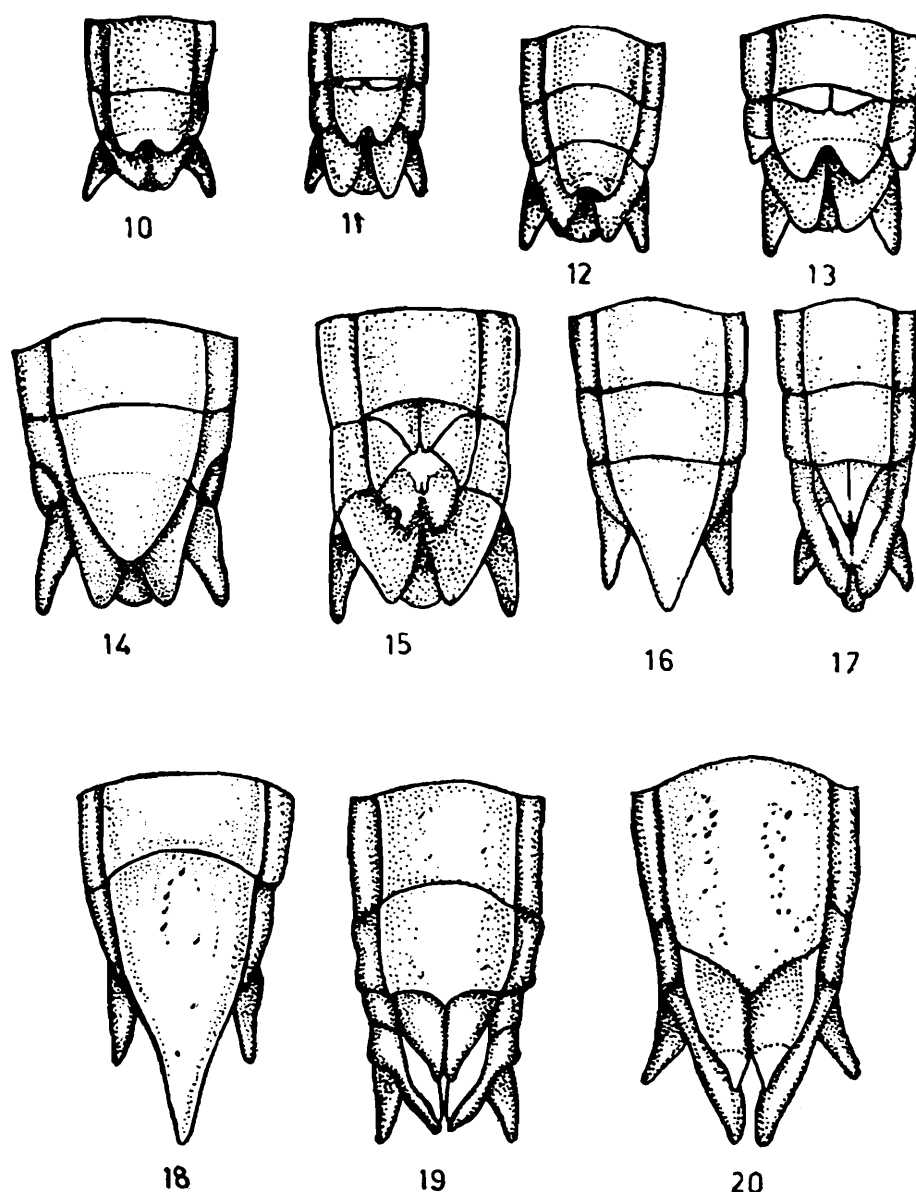
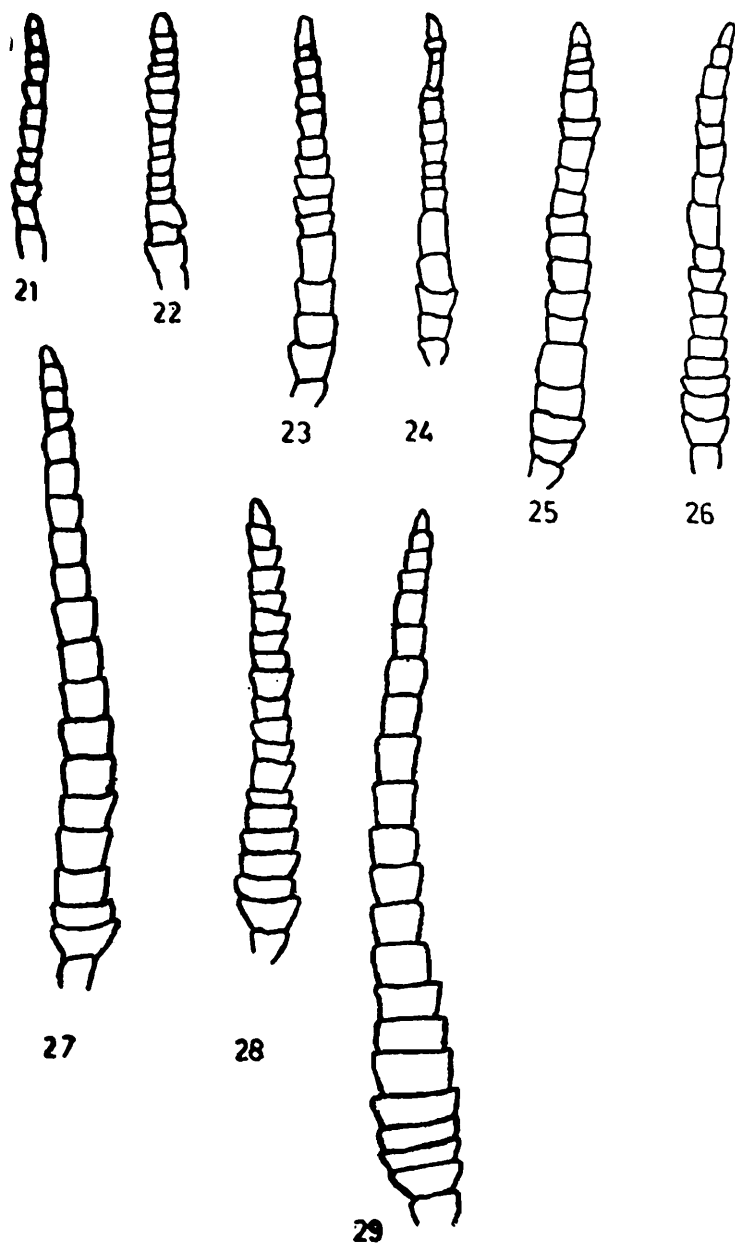


Fig. 10.-20. Genitalia of different instars of *Phaleoba infumata* figs. 10-11, first instar male and female ; figs. 12-13, second instar male and female ; figs. 14-15, third instar male and female ; figs. 16-17, fourth instar male and female ; figs. 18-19, fifth instar male and female ; fig. 20, sixth instar female.

- posterior margin of subgenital plate indented ; inner line of posterior valves touching along their posterior inner margin ... (10)
10. Antennae 19-20 segmented, tip of the anterior valves covered half of the posterior ovipositor valves, posterior valves extend up to the end of paraproct ... 5th instar ♀
- Antennae 21-22 segmented, tip of the anterior valves extend three-fourth of the posterior valves, both anterior and posterior valves cover the paraproct, ... 6th instar ♀



Figs. 21.-29. Antennae of different instars of *Phlaeoba infumata* figs. 21, first instar male ; fig. 22, second instar female ; figs. 25-26, third instar male and female ; figs. 27-28, fourth instar male and female ; figs. 29-30, fifth instar male and female ; Figs. 31, sixth instar female.

6. Adult Biology

Adult : Fledging or fresh adult of *Phlaeoba infumata* is straw or yellow in colour, very less active and do not take any food for 5 hours. It acquires the colour pattern of adult species nearly after 7 to 8 hours.

Copulation : The male of this species generally took 5 to 10 days for first copulation and the female took about 6 to 9 days. The mating lasts for about 20 to 50 minutes extending up to 3 hours in some cases. The number of copulation of a pair was observed 3 to 6 times.

Interval between pairing and oviposition

In female time from pairing to oviposition was from 8 to 15 days.

Longevity of adult

The average longevity of an adult male is from 19 to 32 days and an adult female 24 to 38 days.

DISCUSSION

So far no detail account on the life history and the nymphal taxonomy of *Phlaeoba infumata* have been recorded.

The period of incubation of eggs varies in different species, as Descamps (1965) recorded about 22-24 days in *Gastrimargus africanus* at variable temperature, whereas Parihar (1974) recorded the incubation period in case of *poekilocerus pictus* was 45-49 days at variable temperature. In the present study the time taken for incubation was 17-23 days at 33°C.

The duration of hopper stages in the present study was 36.2 days and 41.5 days respectively in male and female at 33°C. Khan and Aziz (1974) recorded in *Oedaleus abruptus* 53.5 days in case of male and 71 days in case of female at 30°C constant temperature, while in case of *Spathosternum pr. prasiniferum* Iq'bal and Aziz (1974) found that the duration of hopper stages were 37.58 days 44.25 days respectively for male and female.

It can be concluded from the present observation that throughout its development *Phlaeoba infumata* prefers a constant temperature of 33°C and single type of food plant under laboratory conditions. External genitalia starts to develop from 1st instar in both male and female. The duration of nymphal life was maximum for 6th instar female which lasts for about 10.5 days (Table 3). Moreover, the different instars of the species can easily be identified with the help of the given key.

ACKNOWLEDGEMENTS

We offer our grateful thanks to Prof. M. S. Jairajpuri, Director, Zoological Survey of India for providing laboratory facilities. Thanks are also due to Dr. S. K. Bhattacharya, Scientist 'SF' of the same organisation for helpful suggestions.

SUMMARY

The present paper deals with the biology and the taxonomy of nymphs of *Phlaeoba infumata*—a minor grasshopper pest of crops and vegetables of West Bengal. A detail study on all the instars have been made. The identifying characters and figures of the nymphs for easy recognition in the field have been provided. This species throughout its development period prefers a constant temperature of 33°C—2°C and single type of food plant under laboratory conditions.

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TABLE 1

Showing the records of egg-laying of *Phlaeoba infumata*

Sl. No.	Date of final moult	Date of first copulation	First oviposition date & time		Time taken (min)	Preoviposition (Days)	Time taken between first copulation and oviposition	Second oviposition date & time		Time taken (min)	No. of egg post laid in life time	Time between 1st & 2nd oviposition
			St.	end				Start	Complete			
1.	26.4.82	3.5.82 (7 days)	15.5.82 (12.15 p.m.)	15.5.82 (12.35 p.m.)	20	19	12	20.5.82 (14.30 p.m.)	20.5.82 (13.00 p.m.)	30	2	5
2.	24.2.83	3.3.83 (7 days)	14.3.83 (12.50 p.m.)	14.3.83 (13.25 p.m.)	35	18	11	19.3.83	19.3.83	30	3	5
3.	26.3.83	1.4.83 (6 days)	14.4.83 (15.10 p.m.)	14.4.83 (16.00 p.m.)	50	20	13	20.4.83	20.4.83	35	3	6
4.	24.6.83	2.6.83 (8 days)	10.6.83 (13.55 p.m.)	10.6.83 (14.20 p.m.)	25	16	8	—	—	—	1	—
5.	6.7.83	13.7.83 (7 days)	26.7.83 (15.45 p.m.)	26.7.83 (16.15 p.m.)	30	20	13	30.7.83 (16.05 p.m.)	30.7.83 (16.45 p.m.)	40	3	4
6.	20.3.83	29.3.84 (9 days)	10.4.84 (12.35 p.m.)	10.4.84 (13.10 p.m.)	35	21	12	17.4.84 (13.12 p.m.)	17.4.84 (13.32 p.m.)	20	2	7
7.	26.7.84	3.8.84 (8 days)	13.8.84 (15.10 p.m.)	13.8.84 (15.55 p.m.)	45	10	10	19.8.84 (13.00 p.m.)	19.8.84 (13.25 p.m.)	25	3	6
8.	4.7.85	12.7.85 (8 days)	29.7.85 (14.50 p.m.)	29.7.85 (15.40 p.m.)	50	20	15	1.8.85 (16.00 p.m.)	1.8.85 (16.35 p.m.)	35	3	3

TABLE 2Showing records of hatching of eggs of **Phlaeoba infumata** from 15 egg-pods

Sl. No. of egg pod	Date of laying of egg pod	incubation period	Date of hatching	No. of eggs in the pod	No. of egg hatching in the egg pod	Sex Ratio	
						Male	Female
1	15.05.82	19	03.06.82	8	8	5 (62.50)	3 (37.50)
2	20.05.82	21	11.06.82	22	20	12 (60.00)	8 (40.00)
3	14.03.83	22	06.04.83	23	21	13 (61.90)	8 (38.10)
4	19.03.83	20	09.04.83	13	11	6 (54.55)	5 (45.45)
5	14.04.83	21	05.05.83	17	16	8 (50.00)	8 (50.00)
6	20.04.83	21	09.05.83	14	14	5 (35.71)	9 (64.29)
7	28.04.83	23	21.05.83	25	25	13 (52.00)	12 (48.00)
8	10.06.83	18	28.06.83	18	18	8 (44.44)	10 (55.56)
9	10.04.84	19	29.04.84	25	24	14 (58.33)	10 (41.67)
10	17.04.84	21	08.05.84	25	25	11 (44.00)	14 (56.00)
11	25.04.84	23	18.05.84	16	14	7 (64.29)	5 (35.71)
12	13.08.84	19	02.09.84	20	17	10 (58.82)	7 (41.18)
13	19.08.84	18	07.09.84	18	18	9 (50.00)	9 (50.00)
14	29.07.85	19	17.08.85	25	25	14 (56.00)	11 (44.00)
15	01.07.85	20	21.08.85	21	20	11 (55.00)	9 (45.00)
Mean		20.26		19.33	18.4	53.62	46.38

**A NEW SPECIES OF *TURANOSONIA* ROHDENDORF
(DIPTERA : TACHINIDAE)
FROM DARJEELING DIST , WEST BENGAL**

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INTRODUCTION

During the course of studies of some Tachinid collections made recently and also in the past by different Z.S.I. groups, a few specimens were found to be new and this new species is being described. Two species of this genus have been reported so far from India.

***Turanogonia kalimpongensis* sp. nov.**

(Fig. 1. A. B.)

Female Head : Pale reddish yellow, frons and facial region very wide, occiput whitish ; parafrontal golden yellow ; parafacial and gena with golden white pollinosity ; interfrontal area yellowish dark ; 3rd segment greyish, arista dark grey, palpus yellow ; vertex wider than eye width, epistome not projected forward, same as vibrissal angle, gena about 1/4 of eye height ; ocellar bristle reclinate. Antennae normal, 2nd segment about 1/4 as long as wide. Arista naked, slightly shorter than 3rd antennal segment. Proboscis of normal length, labella normal ; palpi slightly elavate. Eyes bare.

Thorax : Yellowish brown in ground color, tergum thinly and pleura with dense golden yellow pollinosity, sternopleura with 4 hairs, dorsocentral hair 3+4, (3 pairs of scutellar bristles) ; apical and subapical scutellar bristles slightly longer than scutellum, apical scutellar bristle as long as subapical, scutellum yellowish in color.

Wing : Hyaline, basicosta yellow, lower calypter pale yellowish white. Vein R 4+5 setulose at base.

Legs : Legs yellowish dark, tarsus black, pulvillus yellowish white, claw and pulvillus moderately long ; tibiae with anterodorsal, posterodorsal and ventral setae.

Abdomen : Yellowish grey in ground color, sternal plate not clearly visible, 4th and 5th terga with a row of marginal bristles.

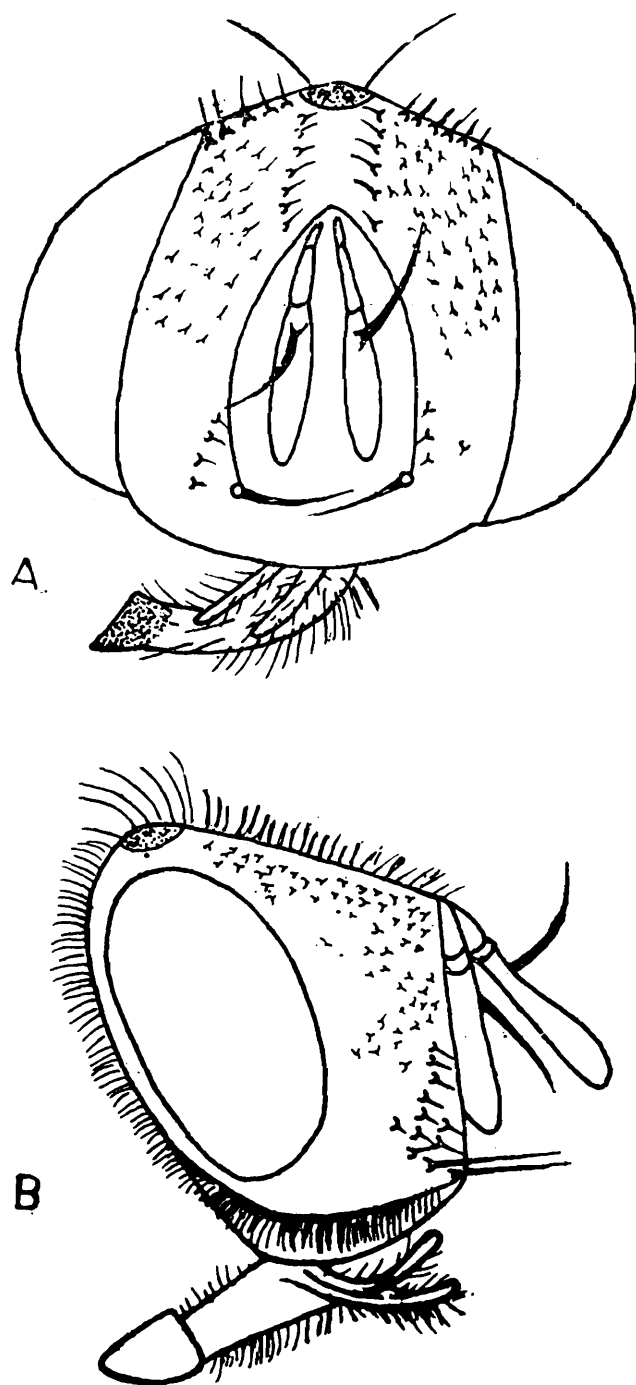


Fig. 1. *Turanogonia kalimpongensis* sp. nov.

A. Head front view

B. Head lateral view

Male : Unknown

Distribution : Darjiling dist., West Bengal.

Holotype : 1 ♀ : Z.S.I. Regd. No. 6975/H6, Kalimpong, Darjiling dist., 20.ix.80, B, C. Das.

Paratypes : 2 ♀ ♀, Z.S.I. Regd. No. 6976/H6 & 6977/H6, Kurseong, Darjiling dist., 22.vi.10 & 24.vi.10. N.A.

Remarks : This species comes close to *T. klapperichi* Mesnil but differs by Abdomen dark orange yellow, antennal segment 2 about 1/3 of segment 3, abdominal side yellowish, dorsum of thorax with golden yellow tinge, all segments of tarsi dark black.

SUMMARY

A new species *Turanogonia Kalimpongensis* sp. nov. is described here from Darjeeling dist., West Bengal.

ACKNOWLEDGEMENT

The author is very much grateful to the Director. Zoological Survey of India for providing encouragement and laboratory facilities.

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DESCRIPTION OF A NEW SPECIES OF SPIDER (CLUBIONIDAE : TRACHELAS) FROM INDIA

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INTRODUCTION

The family Clubionidae is known from India through the work of Cambridge (1885), Pocock (1900), Simon (1906), Gravely (1921, 1931), Reimoser (1934), Tikader (1962, 1975, 1976, 1977, 1981), Tikader & Biswas (1981), Biswas (1984) and through these 85 species under 15 genera were represented from India. While examining some specimens collected from Dist. Darjiling, the author came across a new species of *Trachelas* which is described in this paper. This, in fact, is the fourth species of this genus known from the Indian Sub-continent.

The type specimens are deposited in the National Zoological collection of the Zoological Survey of India, Calcutta.

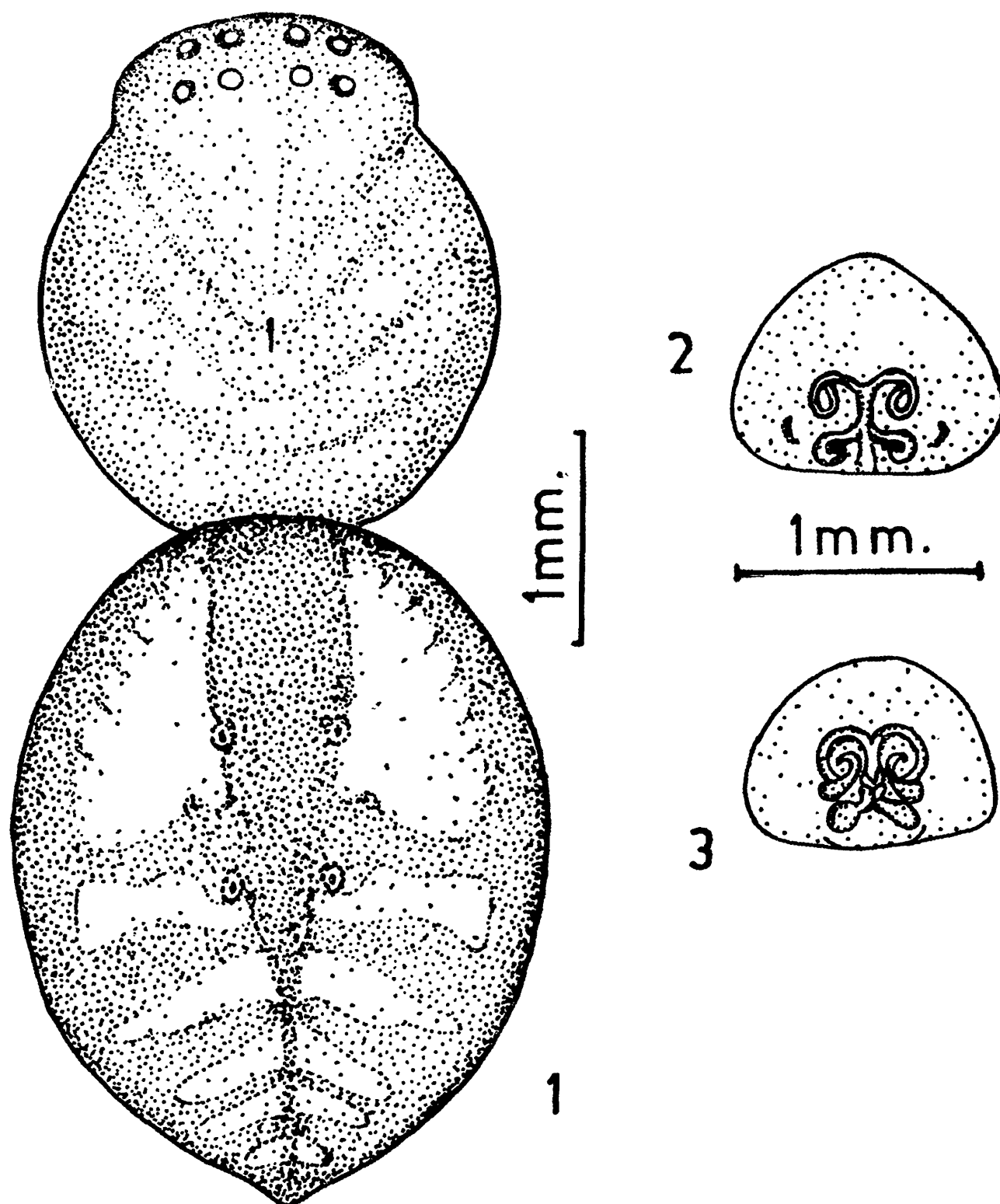
***Trachelas himalayensis* Sp. nov.**

(Figs. 1-3)

General : Cephalothorax dark brown and legs orange ; abdomen light green. Total length 5.80 mm. Carapace 2.50 mm. long, 2.20 mm. wide ; abdomen 3.30 mm. long, 2.50 mm. wide.

Cephalothorax : Longer than wide, narrower both anteriorly and posteriorly, covered with short erect setae, provided with prominent fovea situated just below the median half of carapace. Eyes in two transverse rows (anterior and posterior), moderately large, uniform in size. Anterior row of eyes slightly recurved ; medians slightly closer to laterals than to each other ; posterior row of eyes longer than anterior row, strongly recurved, with medians slightly closer to laterals than to each other ; laterals remote from medians. Ocular quadrangle longer than wide, narrow anteriorly and wide posteriorly. Chelicerae strong and stout, more or less parallel, dark reddish in colour ; inner and outer margins provided with two and three teeth respectively on each side. Maxillae longer than wide, deep brown in colour, broad and rounded anteriorly and convex at its outer surface, slightly scopulated anteriorly. Labium longer than wide, redish in colour, covered with fine pubescence, with a constriction posteriorly, slightly scopulated anteriorly. Sternum distinctly margined, heart-shaped, blackish red in colour, covered with black hair. Legs long and slender ; leg formula 1423 ; first pair of legs larger than the others, blackish

red in colour (other legs paler) ; tibiae and metatarsi of all legs provided with number of long spine-like hair ; tarsi furnished with dark claw tufts.



Figs. 1. Dorsal view of female, legs omitted.

2. Epigyne.

3. Spermathecae.

Abdomen : Oval in shape, covered with fine pubescence ; dorsum provided with two pairs of sigilla arranged on either side of mid-dorsal line. Epigyne with rounded copulatory openings. Venter pale in colour ; with blackish longitudinal band extending from epigastric furrow to spinnerets.

Type specimens : Holotype 1 ♀ and Paratype 2 ♀ in spirit. Regd. Nos. 5173-74/18.

Type locality : Types ; Batasia loop, Darjiling, Eastern Himalayas, West Bengal, India, coll. Bijan Biswas, 24.IV.1974.

Distribution : India : Palni Hills, Tamil Nadu, Darjiling, West Bengal, Western Himalayas.

Remarks : This species resembles *Trachelas fronto* Simon but differs from it on the following points : 1. Inner and outer margin of chelicerae provided with two equal size teeth in *T. fronto* but in *T. himalayensis* with two and three teeth on the inner and outer margins respectively of chelicerae. 2. Dorsum with five blackish transverse bands in *T. himalayensis* but in *T. fronto* without such bands. 3. Epigyne and spermatheae structurally different.

SUMMARY

A new species under the genus *Trachelas* Koch is described and illustrated. This is the fourth species under this genus known from the Indian Sub-continent.

ACKNOWLEDGEMENT

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RECORDS OF SARCOPHAGID FLIES (DIPTERA SARCOPHAGIDAE) FROM MADHYA PRADESH, INDIA

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INTRODUCTION

So far the literature is concerned not a single species has been reported from Madhya Pradesh. The author collected these flies from different parts of Madhya Pradesh in 1990 and a total of eleven species are recorded for the first time from this state of India. Distributional records of the species are included which were not mentioned by the author in earlier papers (1989, 1990).

SYSTEMATIC ACCOUNTS

Subfamily : SARCOPHAGINAE

Tribe : SARCOPHAGINI

Subtribe : PARASARCOPHAGINA

1. *Parasarcophaga (Liopygia) ruficornis* (Fabricius)

Material examined : 1♂, Jabalpur R. D. University Campus, 418 m., 19.x.1990 ; 2♂♂, Indore Nehru Park, 520 m., 15.x.1990.

2. *Parasarcophaga (Liosarcophaga) brevicornis* (Ho)

Material examined : 2♂♂, Jabalpur Rly. Station area, 410 m., 21.x.1990 ; 1♂, Bilaspur Rly. Station area, 395 m., 23.x.1990.

3. *Parasarcophaga (Liosarcophaga) dux* (Thomson)

Material examined 1♂, Indore Zoo. Garden, 520 m., 16.x.1990 ; 2♂♂, Khajuraho, 480 m., 20.x.1990.

4. *Parasarcophaga (Parasarcophaga) albiceps* (Meigen)

Material examined : 4♂♂, Indore Nehru Park, 520 m., 15.x.1990 ; 10♂♂, Indore Zoo. Garden, 520 m., 16.x.1990 ; 3♂♂, Bhopal Kamala Park, 495 m., 17.x.1990 ; 9♂♂, Pachmarhi, 1,067 m., 18.x.1990 ; 7♂♂, Bheraghat, 450 m.,

19.x.1990 ; 3♂♂, Jabalpur R. D. University Campus, 410 m., 19.x.1990 ; 10♂♂, Khajuraho, 480 m., 20.x.1990 ; 2♂♂, Jabalpur Rly. Station area, 480 m., 21.x.1990 ; 6♂♂, Jabalpur G. C. Road, 480 m., 21.x.1990 ; 1♂, Bilaspur Rly. Station area, 395 m., 23.x.1990.

5. *Parasarcophaga (Parasarcophaga) hirtipes* (Wiedemann)

Material examined : 1♂, Jabalpur R. D. University Campus, 410 m., 19.x.1990.

6. *Parasarcophaga (Parasarcophaga) sericea* (Walker)

Material examined : 1♂, Indore Nehru Park, 520 m., 15.x.1990 ; 2♂♂, Indore Zoo. Garden, 520 m., 16.x.1990 ; 1♂, Bhopal Kamala Park, 495 m., 17.x.1990 ; 2♂♂, Pachmarhi, 1,067 m., 18.x.1990 ; 3♂♂, Bheraghat, 450 m., 19.x.1990 ; 3♂♂, Jabalpur, R. D. University Campus, 410 m., 19.x.1990, 3♂♂, Khajuraho, 480 m., 20.x.1990 ; 1♂, Jabalpur Rly. Station area, 480 m., 21.x.1990 ; 3♂♂, Jabalpur G. C. Road, 480 m., 21.x.1990 ; 4♂♂, Bilaspur Rly. Station area, 395 m., 23.x.1990.

7. *Parasarcophaga (Parasarcophaga) misera* (Walker)

Material examined : 4♂♂, Indore Nehru Park, 520 m., 15.x.1990 ; 2♂♂, Indore Zoo. Garden, 520 m., 16.x.1990 ; 2♂♂, Bhopal Kamala Park, 495 m., 17.x.1990 ; 2♂♂, Pachmarhi, 1,067 m., 18.x.1990 ; 6♂♂, Bheraghat, 450 m., 19.x.1990, 3♂♂, Jabalpur R. D. University Campus, 410 m., 19.x.1990 ; 2♂♂, Khajuraho, 480 m., 20.x.1990 ; 4♂♂, Jabalpur Rly. Station area, 480 m., 21.x.1990 ; 2♂♂, Jabalpur G. C. Road, 480 m., 21.x.1990 ; 3♂♂, Bilaspur Rly. Station area, 395 m., 23.x.1990.

8. *Sarcosolomonina (Parkerimyia) nathani* Lopes and Kano

Material examined : 1♂, Indore Nehru Park, 520 m., 15.x.1990 ; 2♂♂, Khajuraho, 480 m., 20.x.1990.

Distribution : Madhya Pradesh ; Indore Nehru Park, Khajuraho ; Orissa ; Balangir, Balugaon ; Tamil Nadu ; Guadalupe, Singora ; Uttar Pradesh ; Rishikesh ; West Bengal ; Chandrapur forest.

Subtribe : HARPAGOPHALLINA

9. *Iranihindia futilis* (Senior-White)

Material examined : 1♂, Khajuraho, 480 m., 20.x.1990 ; 2♂♂, Jabalpur Rly. Station area, 480 m., 21.x.1990 ; 5♂♂, Bilaspur Rly. Station area, 395 m., 23.x.1990.

10. *Iranihindia martellatoides* (Baranov)

Material examined : 1♂, Bhopal Kamala Park, 495 m., 17.x.1990 ; 2♂♂,

Jabalpur R. D. University Campus, 410 m., 19.x.1990 ; 1♂, Khajuraho, 480 m., 20.x.1990 ; 1♂, Jabalpur Rly. Station area, 480 m., 21.x.1990 ; 2♂♂, Bilaspur Rly. Station area, 395 m., 23.x.1990.

Subtribe : SENIORWHITEINA

11. *Seniorwhitea reciproca* (Walker)

Material examined : 1♂, Bhopal Kamala Park, 495 m., 17.x.1990 ; 3♂♂, Pachmarhi, 1,067 m., 18.x.1990 ; 1♂, Bheraghat, 450 m., 19.x.1990 ; 1♂, Jabalpur Rly. Station area, 480 m., 21.x.1990.

SUMMARY

Parasarcophaga (*Liopygia*) *ruficornis* (Fabricius), *Parasarcophaga* (*Liosarcophaga*) *brevicornis* (Ho), *Parasarcophaga* (*Liosarcophaga*) *dux* (Thomson), *Parasarcophaga* (*Parasarcophaga*) *albiceps* (Meigen), *Parasarcophaga* (*Parasarcophaga*) *hirtipes* (Wiedemann), *Parasarcophaga* (*Parasarcophaga*) *sericea* (Walker), *Parasarcophaga* (*Parasarcophaga*) *misera* (Walker), *Sarcosolomonina* (*Parkerimyia*) *nathani* Lopes and Kano, *Iranihindia futilis* (Senior-White), *Iranihindia martellatoides* (Baranov) and *Seniorwhitea reciproca* (Walker) are recorded for the first time from Madhya Pradesh.

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The author is thankful to the Principal and Head of the Deptt. of Zoology, Presidency College, Calcutta, for laboratory facilities. Thanks are also due to the Director, Zoological Survey of India, Calcutta, for permission to work on this group under Collaborative Research Project and Contractual Services in Z.S.I., Calcutta. Financial help to the author by the Govt. of India is also duly acknowledged.

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NOTES ON DERMAPTERA (INSECTA) OF NAMDAPHA (ARUNACHAL PRADESH, INDIA) A PROPOSED BIOSPHERE RESERVE

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INTRODUCTION

Srivastava (1985) recorded 14 species belonging to 12 genera from the area. In the present study altogether 26 species belonging to 20 genera are dealt with of which 16 are reported for the first time from the area. It also includes a new species viz., *Gonolabidura biswasi*. Besides, *Protolabidura* Steinmann is treated as synonym of *Gonolabidura* Zacher and *Allodahlia ochroptera* Brindle under *Allodahlia coriacea* (Bormans).

A check-list of species is provided which includes altogether 31 species (including 1 species identified up to generic level) belong to 24 genera. Besides a key for their discrimination is also provided.

The material on which the present paper is based was collected by S. Biswas and party.

ZOOGEOGRAPHICAL REMARKS

The area is situated on the western most part of the Indo-Chinese Sub Region of the Oriental Region. An analysis of the Dermaptera fauna reveals that out of 31 species, 17 are derivatives of Indo-Chinese and Indo-Malayan elements and are confined to north eastern portion of India, Bhutan and Nepal. And 7 other species are restricted at present to mountains of north eastern India, may perhaps have a wider distribution in the Oriental Region when further explorations are taken up. In addition 5 species are distributed throughout the Himalays from north west to north east. *Labidura riparia* (Pallas) and *Labia curvicauda* (Motschulsky) are world wide in distribution.

It may be inferred from the above that the Dermaptera fauna of the area has the preponderance of Indo-Chinese and Indo-Malayan elements. Besides, a large number of species are restricted to mountains of north-eastern portion of India and a few are spread all along the Himalayas in India, Bhutan and Nepal.

KEY TO THE SPECIES KNOWN FROM NAMDAPHA

- 1(8). Neck blattoid type i.e., anterior and posterior cervical sclerites anterior to prosternum separated from each other but hind margin of posterior sclerite may be separate or fused with the apical margin of prosternum ; male genitalia with two functional distal lobes (fig. 1) (PYGIDICRANIDAE)
- 2(3). Antennal segments 4-5 transverse, 25-segmented or more (PYGIDICRANIDAE)
Cranopygia sp.
- 3(2). Antennal segments 4-6 longer than broad, 20 segmented or less
- 4(7). Body convex, covered with thick characteristic setae (fig. 3) ; pygidium with hind margin projecting ; forceps cylindrical (ECHINOSOMATINAE)
- 5(6). Male genitalia with virga S-shaped (fig. 5) ; female pygidium truncate apically (fig. 6) *Echinosoma convolutum* Hincks
- 6(5). Male genitalia with virga apically almost straight or gently curved (fig. 8) ; female pygidium obtuse or convex posteriorly (figs. 9-10) *Echinosoma dentiferum* Borelli
- 7(4). Body weakly depressed, glabrous and smooth ; pygidium vertical with hind margin not projecting ; forceps trigonal in basal one third, afterwards depressed (PROLABISCINAE)
Parapsalis infernalis (Burr)
- 8(1). Neck forficuloid type i.e., (fig. 2) anterior and posterior cervical sclerites fused and the hind margin of the latter joined with anterior margin of prosternum ; male genitalia with one or two functional distal lobes
- 9(28). Male genitalia with paired distal lobes (figs. 14, 16, 26, 29)

- 10(27). Pygidium in both sexes vertical, with its hind margin not free (fig. 19)
- 11(18). Male genitalia, if virga present, at base not wider and without sinous inner tube ; otherwise denticulated pads present on distal lobes (fig. 20)
(ANISOLABIDIDAE)
- 12(17). Male parameres internally without any tooth (fig. 14, 16, 26)
- 13(16). Male parameres three to four times longer than broad, broader at base with outer margin not convex, narrowed apically (figs. 14, 16, 26)
- 14(15). Male parameres with tip obtuse (fig. 14) *Anisolabis deplanata* Srivastava
- 15(14). Male parameres with tip acuminate (fig. 16) *Apolabis aborensis* (Burr)
- 16(13). Male parameres slightly longer than broad, flattened, broad at base somewhat semicircular with external margin convex, tip obtuse (fig. 18)
Paralabis montshadskii Bey-Bienko
- 17(12). Male parameres internally at base armed with a sharp tooth (fig. 20)
Aborolabis pervicina (Burr)
- 18(11). Male genitalia with virga distinct, dilated at base with a distinct inner sinous tube (fig. 29)
(LABIDURIDAE)
- 19(20). Mesosternum strongly narrowed posteriorly (fig. 22) (ALLOSTETHINAE)
Gonolabidura biswasi sp. n.
- 20(19). Mesosternum not narrowed posteriorly
- 21(22). Elytra with a sharp ridge along the costal margin ; legs relatively short
(NALINAE)
Nala nepalensis (Burr)
- 22(21). Elytra without any sharp ridge along the costal margin ; legs longer
(LABIDURINAE)

- 23(24). Sides of abdominal segments in males without spine (fig. 30) and parameres with a short epimerite apically
Labidura riparia (Pallas)
- 24(23). Sides of abdominal segments in normal males with spines (figs. 31, 34); parameres with a long epimerite apically
- 25(26). Sides of abdominal segments 3-5 with a single hooked spine (fig. 31)
Forcipula aborensis Brindle
- 26(25). Sides of abdominal segments 3-5 with a pair of spines, of which dorsal one larger (fig. 34)
Forcipula clavata Liu
- 27(10). Pygidium in both sexes forming a flat process with hind margin free (fig. 36)
(APACHYIDAE)
Apachyus feae Bormans
- 28(9). Male genitalia with a single median distal lobe (figs. 35, 66, 75, 77)
- 29(36). Second tarsal segment simple i.e., compressed (neither lobed or projecting below 3rd tarsal segment) (fig. 37)
(SPONGIPHORIDAE)
- 30(31). Hind tarsi long and slender, 1st segment five times longer than its width (fig. 37)
(IRDEXINAE)
Irdex nitidipenis (Bormann)
- 31(30). Hind tarsi comparatively shorter and thick, 1st segment three to four times longer than its width
(LABIINAE)
- 32(33). Head convex ; forceps glabrous or with sparse pubescence (fig. 39)
Labia curvicauda (Mostchulsky)
- 33(32). Head flattened ; forceps with thick pubescence (fig. 40)
- 34(35). Pygidium in males short and transverse with hind margin truncate (fig. 40)
Chaetospania kurseongae Hebard
- 35(34). Pygidium in males projecting, slightly longer than broad, on sides straight or convex in middle and converging apically, emarginate posteriorly with

posterolateral angles produced into sharp points, often with a minute point in middle also (fig. 42)

Chaetospania feae Bormans

36(29). Second tarsal segment produced below the third (fig. 50) or lobed (figs. 59, 61)

37(46). Second tarsal segment produced below the third segment as narrow lobe (fig. 50)
(CHELISOCHIDAE)

38(45). Male genitalia with parameres four to five times longer than broad, feebly dilated in middle

39(42). Tibiae sulcate above in distal half

40(41). Build slender ; colour generally lighter ; antennal segments slender, 3rd almost equal to 4th but slightly shorter than 5th (fig. 44) *Proreus weisi* (Burr)

41(40). Build stout ; colour generally dark ; antennal segments thick, 3rd longer than 4th and 5th
Chelisoches brevipennis Borelli

42(39). Tibiae smooth above (not sulcate) in distal half (generally with metallic sheen)

43(44). General colour uniform dark brown ; in males forceps slender, in females pygidium about twice as long as broad, lanceolats with hind margin truncate or pointed (fig. 49)
Adiathetus glaucopterus (Bormans)

44(43). General colour dark brown with head, antennae, tibiae and tarsi of middle and hind legs and ultimate tergite black ; in male forceps stouter (fig. 51) ; in females (fig. 52) pygidium slightly longer than broad, scarcely narrowed posteriorly with sides convex in middle and hind margin concave
Adiathetus metallicus Srivastava

45(38). Male genitalia with parameres twice as long as broad, greatly dilated extrnally in middle (fig. 54)
Hamaxas feae (Bormans)

46(37). Second tarsal segment dilated, forming a rounded lobe (fig. 59)
(FORFICULIDAE)

- 47(50). Antennal segments long and slender, 4th longer than the 3rd or almost equal, both of similar build i.e., slender (fig. 56) (OPISTHOCOSMIINAE)
- 48(49). Basal segment thick (fig. 56); hind tarsi with 1st segment about as long as third; forceps in males with a compressed vertical tooth in basal one third (fig. 57 & 58) *Timmomenus nevillei* (Burr)
- 49(48). Basal antennal segment slender; hind tarsi (fig. 59) with 1st segment about twice as long as the 3rd; forceps in males with a faint crest above internally near base or branches simply depressed (fig. 60) *Eparchus simplex* (Bormans)
- 50(47). Antennal segments shorter and wider, occasionally apical ones long and slender, 4th shorter or equal to 3rd but former always wider
- 51(56). Mesosternum broader than long (ALLODAHLINAE)
- 52(55). Pronotum quadrate; elytra punctulated or rugose, pygidium in males provided with a small or well developed tooth in middle posteriorly; forceps internally armed with a pair of teeth
- 53(54). General body colour reddish, black on certain body parts; elytra finely punctulate, reddish with internal and posterior margin black; forceps in males, stout, internal teeth well developed; pygidium with a median posterior spine well developed (fig. 62-65) *Allodahlia ahrimanes* (Burr)
- 54(53). General body colour blackish brown; elytra with deep punctures; forceps in males slender with internal teeth not so well marked; pygidium with a small median tooth (fig. 67-69) *Allodahlia coriacea* (Bormans)
- 55(52). Pronotum semicircular; elytra scabrous i.e., covered with dense mass of tubercles; pygidium in males provided with a tooth on posterolateral angles; forceps internally armed with a single tooth in apical one third (fig. 70). *Allodahlia scabriuscula* (Serville)
- 56(51). Mesosternum about as long as broad
- 57(58). Pronotum about as long as broad (fig. 72); legs yellow, femora with a black

band in apical one third

(EUDHORNIINAE)

Pterygida pulchripes (Bormans)

58(57). Pronotum transverse ; leg uniformly coloured

59(60). Males with pygidium longer than broad with hind margin convex ; forceps dilated in basal one half or little less, afterwards branches almost straight with apices gently curved (fig. 74).

(FORFICULINAE)

Forficula beelzebub (Burr)

60(59). Males with pygidium rounded or obtuse ; forceps dilated near the base, (in f. microlabia) stout and strongly bowed (fig. 76), (in f. macrolabia) slender and straight, slightly curved near apex.

Forficula planicollis Kirby

CHECK-LIST OF SPECIES FROM NAMDAPHA

- * Species represented in the material studied.
- * * Species dealt with in the present paper and reported for the first time from the area.

PYGIDICRANIDAE

PYGIDICRANINAE

Cranopygia sp.

ECHINOSOMATINAE

Echinosoma convolutum Hincks, 1959

* *Echinosoma dentiferum* Borelli, 1912

PROLABISCINAE

* * *Parapsalis infernalis* (Burr, 1913)

ANISOLBIDIDAE

CARCINOPHORINAE

Anisolabis deplanata Srivastava, 1985

Apolabis aborensis (Burr, 1913)

* * *Paralabis montshadskii* Bey-Bienko, 1959

* *Aborolabis pervicina* (Burr, 1913)

LABIDURIDAE

ALLOSTETHINAE

* * *Gonolabidura biswasi* sp. n.

NALINAE

* *Nala nepalensis* (Burr, 1907)

LABIDURINAE

* *Labidura riparia* (Pallas, 1773)

* * *Forcipula aborensis* Brindle, 1966

* * *Forcipula clavata* Liu, 1946

APACHYIDAE

* * *Apachyus feae* Bormans, 1894

SPONGIPHORIDAE

IRDEXINAE

* *Irdex nitidipennis* (Bormans, 1894)

LABIINAE

* *Labia curvicauda* (Motschulsky, 1863)

* * *Chaetospania kurseongae* Hebard, 1923

* * *Chaetospania feae* Bormans, 1894

CHELISOCHIDAE

CHELISOCHINAE

Proreus weisi (Burr, 1904)

- * *Chelisoches brevipennis* Borelli, 1923
- * *Adiathetus glaucopterus* (Bormans, 1894)
- * *Adiathetus metallicus* Srivastava, 1985
- * * *Hamaxas feae* (Bormans, 1894)

FORFICULIDAE
OPISTHOCOSMIINAE

- * * *Timmomenus nevilli* (Burr, 1905)
- * * *Eparchus simplex* (Bormans, 1894)

ALLODAHLINAE

- * * *Allodahlia ahrimanes* (Burr, 1900)
- * * *Allodahlia coriacea* (Bormans, 1894)
- (= *Allodahlia ochroptera* Brindle, 1972—Syn. n.)
- * *Allodahlia scabriuscula* (Serville, 1839)

EUDOHRNIINAE

- * * *Pterygida pulchripes* (Bormans, 1894)

FORFICULINAE

- * * *Forficula beelzebub* (Burr, 1900)
- * * *Forficula planicollis* Kirby, 1891

Superfamily : PYGIDICRANOIDEA
Family : PYGIDICRANIDAE
Subfamily : ECHINOSOMATINAE

Echinosoma dentiferum Borelli Figs. 7-10

1912. *Echinosoma dentiferum* Borelli, *Bull. Mus. Hist. nat. Paris*, 18 : 223 (♂ ; Bhutan).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Miao, 1 ♂, 7. XII. 1982 ; Gandhigram, ca 135 km from Miao, 1 ♀, 30.1.1987.

Distribution : India (North East India), Bhutan, Burma and Vietnam.

Subfamily : PROLABISCINAE

Parapsalis infernalis (Burr) Figs. 11-13

1913. *Chaetospania infernalis* Burr, *Ent. Mitt. Berlin*, 12 : 67, fig. 3 (♂ ; Dorsal view).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Ghandhigram, ca 135 km from Miao, 1 ♀, 24. XII. 1984.

Distribution : India (North East India), Bhutan, South China, Taiwan and Borneo.

Superfamily : ANISOLABOIDEA

Family : ANISOLABIDIDAE

Subfamily : CARCINOPHORINAE

Paralabis montshadskii Bey-Bienko Figs. 17-18

1959. *Anisolabis (Paralabis) montshadskii* Bey-Bienko, *Ent. Obzor*, 38 : 600, fig. 16 (♂, ♀ ; China : Yunnan).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Miao, 1 ♂ (genitalia mounted between two coverslips and pinned with the specimen), 1.XII.1982.

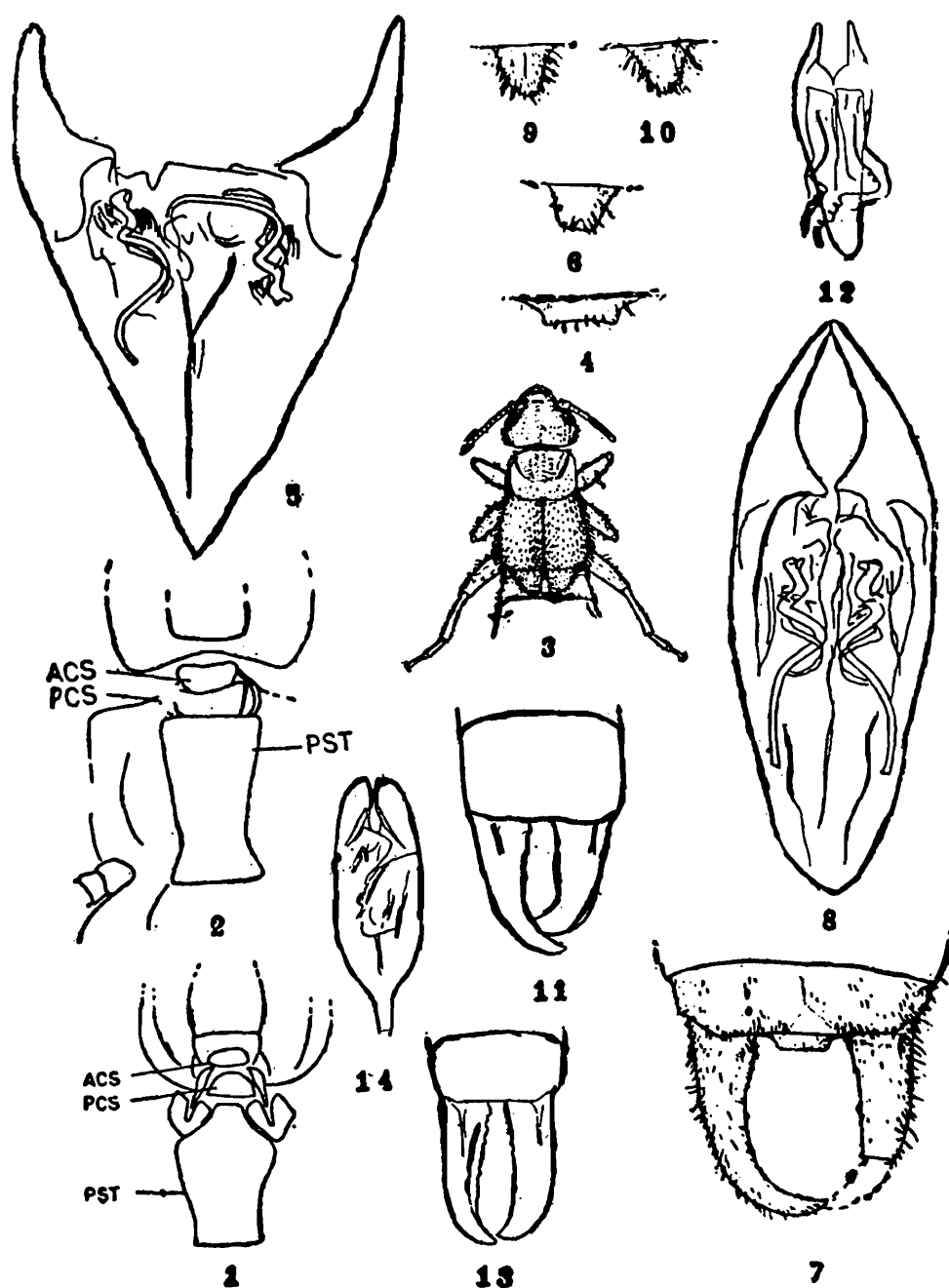
Distribution : India (Arunachal Pradesh) and China (Yunnan).

Aborolabis pervicina (Burr) Figs. 19-20

1913. *Anisolabis pervicina*, *Rec. Indian Mus.*, 8 (2) : 137 (♂, ♀ ; India, Assam).

Material examined : INDIA : Arunachal Pradesh : Tirap Dist., Miao, 1 ♂, 20 ♀, 5.I.1983 ; Gibbons land, 16 km E of Miao, 5 ♂, 5 ♀ and 4 nymphs ; Miao, 4 ♂, 3 ♀ and 3 nymphs, 5.XII.1982, 2 ♀, 21.XII.1982, 1 ♀, 25.XII.1982 ; Gandhigram ca 135 km from Miao, 2 ♀, 30.XI.1982, 1 ♂, 1 ♀, 24.XII.1986 ; 1 ♂, 2 ♀, 26.27.XII.1986, 1 ♂, 20.I.1987, 1 ♂, 1 ♀, 23.I.1987, 1 ♂, 1 ♀, 1 nymph, 25.I.1987, 1 ♂, 1 ♀, 28.I.1987 ; 77 mile camp, Miao-Vijainagar Road, 1 ♀, 4.I.1985, 1 ♀, 1 nymph, 7.I.1985.

Distribution : All along the Himalayas in India, Nepal and Bhutan.



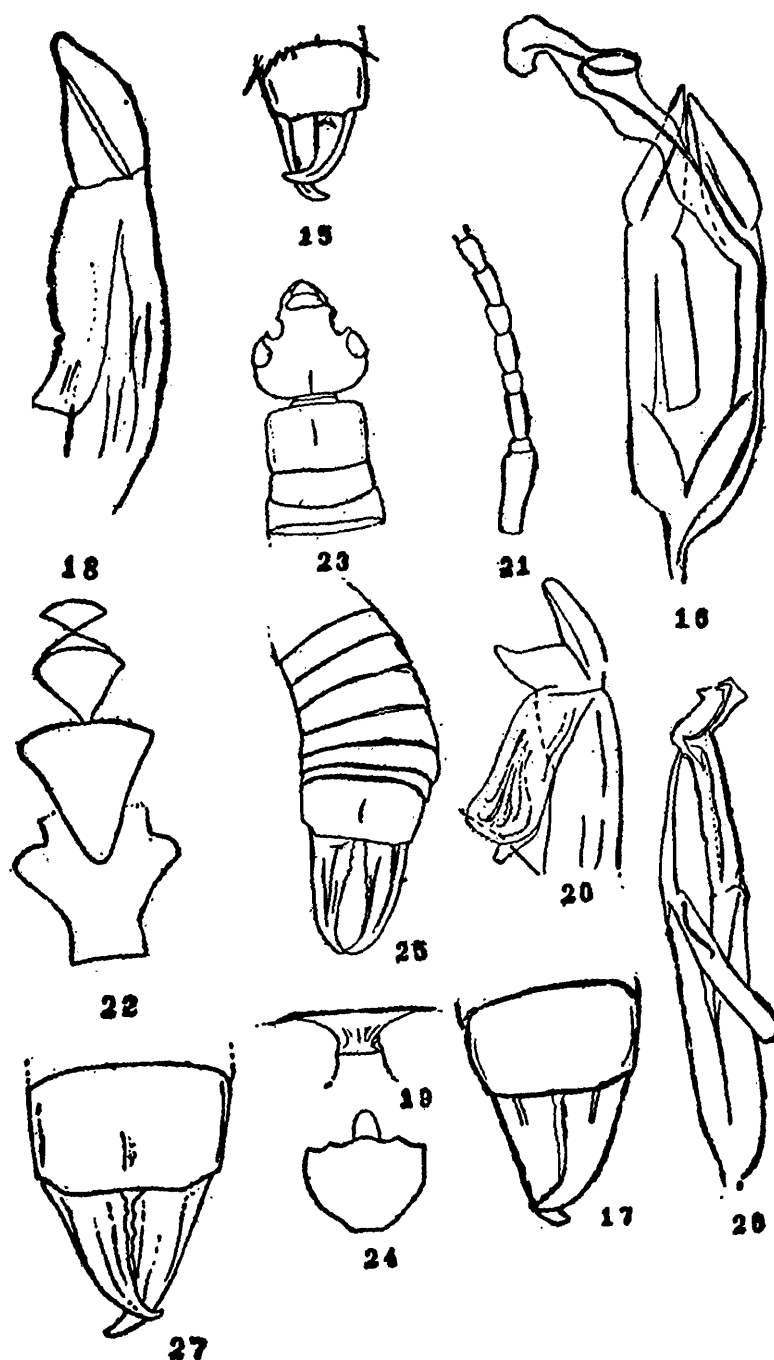
Figs. 1-14: *Parapsalis* sp., 1. Cervical sclerites and prosternum; *Euborellia* sp., 2. Cervical sclerites and prosternum; *Echinotoma convolutum* Hincks, ♂, 3. Anterior portion of body, 4. Pygidium; 5. Genitalia, ♀, 6. Pygidium; *Echinotoma dentiferum* Borelli, ♂, 7. Ultimate tergite, pygidium and forceps; 8. Genitalia, ♀, 9 and 10. Pygidium; *Parapsalis infernalis* (Burr), ♂, 11. Ultimate tergite and forceps, 12. Genitalia, ♀, 13. Ultimate tergite and forceps; *Anisolabis deplanata* Srivastava, ♂, 14. Genitalia.

Abbreviations : ACS—Anterior cervical sclerite ; PCS Posterior cervical sclerite ; PST—Prosternum.

Family : LABIDURIDAE
Subfamily : ALLOSTETHINAE

Genus *Gonolabidura* Zacher

1910. *Gonolabidura* Zacher, *Ent. Rdsch.*, 27 : 28 (Type-species : *Anisolabis piligera* Bormans, 1900).
1985. *Protolabidura* Steinmann, *Int. Qrt. Ent.*, Izmir, 1 : 21 (Type-species : *Gonolabidura boschmai* Boeseman, 1954)—Syn. n.



Figs. 15-27 : *Apolabis aborensis* (Burr), ♂, 15. Ultimate tergite and forceps, 16. Genitalia ; *Paralabis montshadskii* Bey-Bienko, ♂, 17. Ultimate tergite and forceps 18. A portion of genitalia ; *Aborolabis pervicina* (Burr), ♀, 19. Pygidium, 20. A portion of genitalia ; *Gonolabidura biswasi* sp.n., Holotype ♂, 21. A few basal antennal segments, 22. Sternal plates, 23. Anterior portion of body, 24. Penultimate sternite, 25. Hind portion of body, 26. Genitalia ♀, 27. Ultimate tergite and forceps.

Gonolabidura biswasi sp. n. Figs. 21—27

♂ : General colour shining black, mouth parts, knee joints and tarsi brownish. Head slightly longer than broad, smooth, impunctate, frons convex, sutures fine, hind margin emarginate. Eyes small, about half as long as the post-ocular length. Antennae partly damaged, only 9 basal segments on the right side remaining, 1st stout, narrowed basally, slightly shorter than the distance between antennal bases; 2nd short; 3rd segment thrice as long as broad; 4th about as long as broad; 5th longer than broad and slightly shorter than 3rd; 6th onwards segments gradually increasing in length and comparatively less stout. Pronotum transverse, smooth, anterior margin lightly convex, sides and hind margin straight, former gently reflexed, prozona weakly raised and not well differentiated from flat metazona, median sulcus faint. Meso and metanotum transverse, former with hind margin straight and latter with hind margin broadly concave. Sternal plates typical, mesosternum prolonged posteriorly into a narrow process. Legs stout, hind tarsi with 1st and 3rd segments equal and 2nd short. Abdomen narrowed at base, enlarged in middle, long and short pubescence present on sides, tergites weakly convex, obscurely punctulate, sides of segments convex, rugosely striate. Penultimate sternite clad with long pubescence, roughly triangular, hind margin posteriorly in middle truncate, manubrium about $\frac{1}{3}$ as long as the sternite. Ultimate tergite transverse, gently narrowed posteriorly, hind margin in middle straight, laterally oblique and concave, disc weakly depressed, median sulcus faint. Forceps subcontiguous and broader at base, tapering apically, almost straight, gently incurved in apical $\frac{1}{3}$, tip hooked and pointed, trigonal in basal $\frac{1}{3}$, afterwards depressed, internal margin dentate. Genitalia as seen in fig. 26.

♀ : Agrees with male in most characters except that ultimate tergite less transverse, penultimate sternite obtusely rounded posteriorly and forceps simple and straight.

Measurements (in mm) :

	Holotype.	Paratype
	♂	♀
Length of head	3.0	3.8
Width of head	2.8	3.4
Length of pronotum	2.0	2.4
Width of pronotum	2.7	3.5
Length of body (without forceps)	15.4	18.5
Length of forceps	4.0	4.7

Material examined: INDIA : Arunachal Pradesh, Tirap Dist., Gandhigram, ca 135 km from Miao, Holotype ♂ (genitalia mounted between two coverslips and

pinned with the specimen), Paratype 1 ♀, 22.1.1987, S. Biswas coll., deposited in the Zoological Survey of India, Calcutta.

Remarks : With Brindle's (1965) key to species of *Gonolabidura* Zacher, the described species comes close to *G. boschmai* Boeseman 1954 in having body colouration dark black with unicolorous legs but differs by its larger body size, triangular penultimate sternite with posterior margin in middle truncate and branches of forceps internally dentate.

It may be mentioned here that Steinmann (1985) erected genus *Protolabidura* with *Gonolabidura boschmai* Boeseman, as the type-species, after reexamination of its Holotype ♂ and genitalia which represent the immature stage. Besides on comparison with the ♂ genitalia of immature stages of other Anisolabid species it may be inferred that 'Holotype' ♂ of *G. boschmai* is a ♂ nymph. As a result is very difficult to place it accurately up to specific level. As such it is proposed to synonymise *Protolabidura* Steinmann, 1985 under *Gonolabidura* Zacher, 1910.

The genus *Gonolabidura* was hitherto known in India, by the species restricted to South India and the present record of the genus on the basis of an undescribed species from NE India is of interest.

Subfamily : NALINAE

Nala nepalensis (Burr) Figs. 28-29

1907. *Labidura nepalensis* Burr, *Rec. Indian Mus.*, 1 : 208 (♂. ♀ ; Nepal : Soondrijal and Pharping).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., 77 mile camp on Miao-Vijaynagar Road, 2 ♂, 7 ♀, 1 nymph, 12.1.1985.

Distribution : In the mountain and sub-mountain regions of India, Nepal, Malaya, Indo-China and Afghanistan.

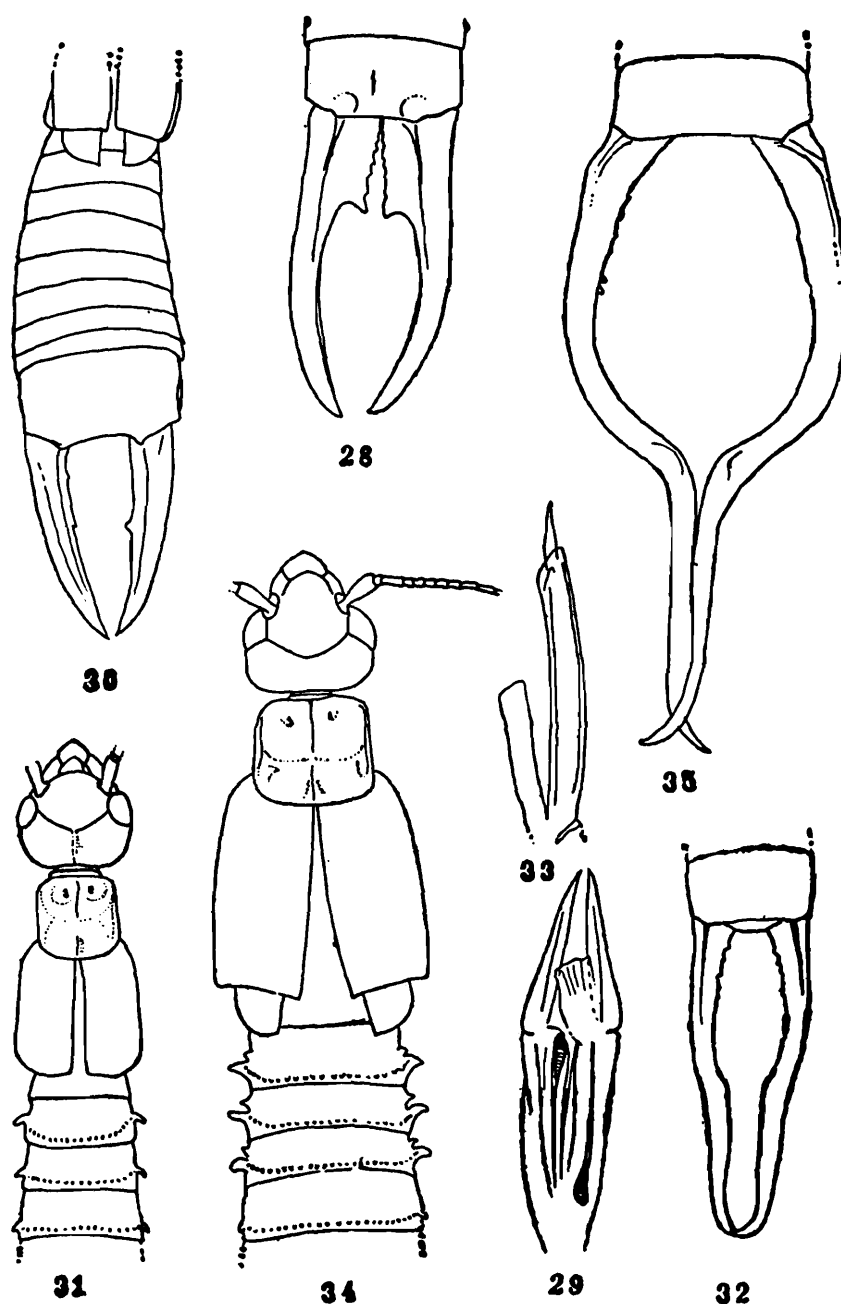
Subfamily : LABIDURINAE

Labidura riparia (Pallas) Fig. 30

1773. *Forficula riparia* Pallas, *Reise Russ. Reichs*, 2 : 727 (Shores of Irtysh River Western Siberi).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Deban, 1 ♀, 14.XII.1982 ; Gandhigram, ca 135 km from Miao, 1 ♂ 20.1.1987.

Distribution : World wide.



Figs. 28-35: *Nala nepalensis* (Burr), ♂, 28. Ultimate tergite and forceps, 29. Genitalia; *Labidura riparia* (Pallas), ♂, 30. A portion of elytra, wings, abdomen, ultimate tergite and forceps; *Forcipula aborensis* Brindle, ♂, 31. Anterior portion of body, 32. Ultimate tergite and forceps, 33. Paramere and distal lobe; *Forcipula clavata* Liu, ♂, 34. Anterior portion of body, 35. Ultimate tergite and forceps.

Forcipula aborensis Brindle Figs. 31-33

1966. *Forcipula aborensis* Brindle, *Ann. Mag. nat. Hist.*, (13) 9: 262 (♂ ; India : Arunachal Pradesh, Near Dosing, 1400 ft., Shimang River).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Gibbons land, 16 km E of Miao, 1 ♂ (genitalia mounted between two coverslips and pinned with the specimens), 1 nymph, 19.XII.1989.

Distribution : N.E. Himalayas in India (Arunachal Pradesh, Siang Dist. and Assam).

Remarks Previous records of the species are based on the material collected during 1911 and 1912 recorded by Burr (1913) as *Forcipula pugnax*, from which the 'Holotype' of the species was designated. Therefore, the present record of the species after a lapse of about eight decades is of interest.

Forcipula clavata Liu Figs. 34-35

1946. *Forcipula clavata* Liu, *J. W. China Border Rec. Soc.*, 16 : 22, pl. 2, fig. 8 (♂, ♀ ; China : Pan-Chi, Pen-Chi in Chunking).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Vijaynagar, 6 ♂, 4 ♀ and 2 nymphs, 14.1.1987 ; 77 mile camp, Miao-Vijainagar Road, 1 ♂, 27.1.1987.

Distribution : India (Arunachal Pradesh) and China (Chunking).

Remarks : Srivastava (1986) has made an attempt to clarify the status of this species on a large series collected from different localities in Arunachal Pradesh, India.

Superfamily : APACHYOIDEA

Family : APACHYIDAE

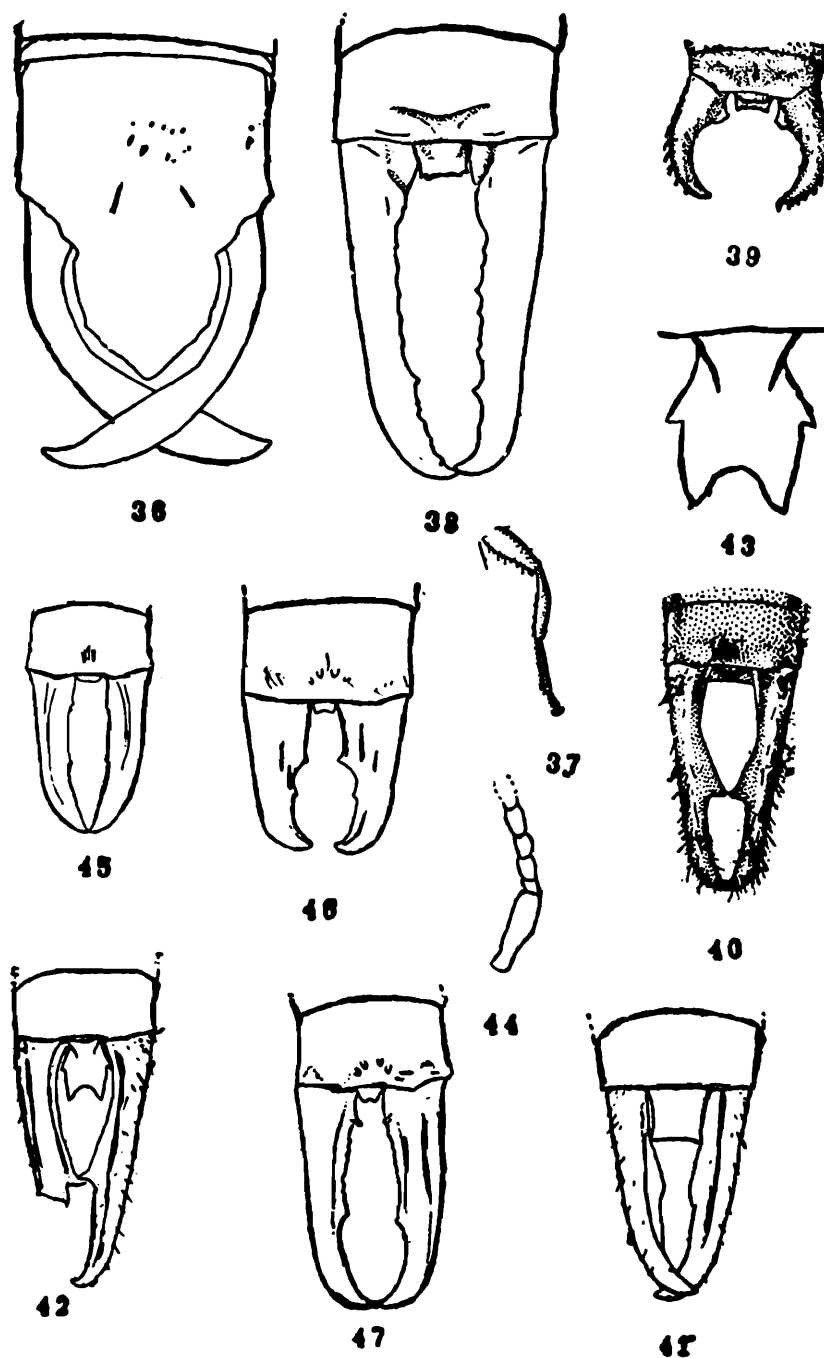
Apachyus feae Bormans Fig. 36

1894. *Apachyus feae* Bormans, *Annali Mus. civ. Stor. nat. Giacoma Doria*, (2) 14 : 372 (1 ♂, 1 ♀, 1 nymph ♂, Burma ; Carin Cheba).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Gandhigram, ca 135 km of Miao, 22 nymphs, 30.I.1987.

Distribution : India (NE Region), Bhutan, Burma, Vietman and China (Yunnan).

Remarks : Only nymphs of both sexes at various stages of development are present.



Figs. 36-47: *Apachyus feae* Bormans, ♂, 36. Ultimate tergite, anal process and forceps; *Irdex nitidipennis* (Bormans), ♂, 37. Hind leg, 38. Ultimate tergite, pygidium and forceps; *Labia curvicauda* (Motschulsky), ♂, 39. Ultimate tergite and forceps; *Chaetospania kurseongae* Hebard, ♂, 40. Ultimate tergite and forceps, ♀, 41. Ultimate tergite and forceps; *Chaetospania feae* Bormans, ♂, 42. Ultimate tergite, pygidium and forceps, 43. Pygidium, enlarged; *Proreus weisi* (Burr), ♂, 44. A few basal antennal segments, 45. Ultimate tergite and forceps: *Chelisochis brevipennis* Borelli, ♂, 46 and 47. Ultimate tergite and forceps.

Superfamily : FORFICULOIDEA

Family : SPONGIPHORIDAE

Subfamily : IRDEXINAE

***Irdex nitidipennis* (Bormans) Figs. 37-38**

1894. *Spongophora nitidipennis* Bormans, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 14 : 382 (1 ♂ ; Burma).

Material examined INDIA : Arunachal Pradesh, Tirap Dist., Gibbon's land, 16 km E of Miao, 1 ♀, 20.XII.1982, 1 ♂, 1 nymph, 22.XII.1981 ; Gandhigram, ca 135 km from Miao, 1 ♀, 23.1.1987, 1 ♀ 23.1.1987 ; 1 ♂, 28.1.1987, 13 ♂, 5 ♀, 2 nymphs, 30.1.1987.

Distribution : India, Bhutan, Burma, China, Sumatra and Hainan Island.

Remarks : The interpretation of the species in this work is after Srivastava (1985a).

Subfamily : LABIINAE

***Labia curvicauda* (Motschulsky) Fig. 39**

1863. *Forgicesila rcurvicauda* Motschulsky, *Bull. Soc. Imp. Nat. Moscou*, 34 (2) : 2, pl. 1, fig. 1 (♂, ♀ ; Nura Illia Mountains, Sri Lanka).

Material examined INDIA : Arunachal Pradesh, Tirap Dist., Gibbons land, 16 km E of Miao, 5 ♂, 1 ♀, 20.XII.1982.

Distribution Almost world wide.

***Chaetospania kurseongae* Hebard Figs. 40-41**

1923. *Chaetospania kurseongae* Habard, *Mem. Dep. Agric. India, ent. Ser.*, 7: 215, figs. 10-11 (♂, ♀ ; India : Kurseong).

Material examined. INDIA : Arunachal Pradesh, Tirap Dist., Deban, 27 km E of Miao, 1 ♀, 10.XII.1982.

Distribution : In India this species is reported from West Bengal (Kurseong) and the present record from Arunachal Pradesh, though not unexpected, is new to the area.

Remarks : Generally it is difficult to determine isolated females but on the basis of shape of pygidium and forceps the above specimen may be referred to this species with some certainty.

Chaetospania feae Bormans Figs. 42-43

1894. *Chaetospania feae* Bormans, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 14 : 390 (♂, ♀ ; Burma).

Material examined : INDIA : Arunachal Pradesh : Tirap Dist., Deban, 27 km E of Miao, 1 ♂, 10.XII.1982.

Distribution : Widely distributed throughout the Oriental Region.

Family : CHELISOCHIDAE
Subfamily : CHELISOCHINAE

Chelisothes brevipennis Borelli Fig. 46-47

1923. *Chelisothes brevipennis* Borelli, *Boll. Musei zool. Anat. Comp. R. Univ. Torino*, 8 (13) : 12 (♂, ♀ ; Philippine Isls, N, Palawan, Binalaun).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., 77 mile camp, Miao-Vijainagar Road, 1 ♂, 4.1.1985, 2 ♂, 2 ♀, 11.1.1985.

Distribution : India (NE Region) and Philippine Isls.

Adiathetus glaucopterus (Bormans) Figs. 48-49

1888. *Chelisothes glaucopterus* Bormans, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 6 : 441 (1 ♂, and 1 nymph ; Burma).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Gandhigram ca 135 km from Miao, 1 ♀, 23.1.87.

Remarks : India (North Eastern Hills), China (Yunnan), Burma and Vietnam.

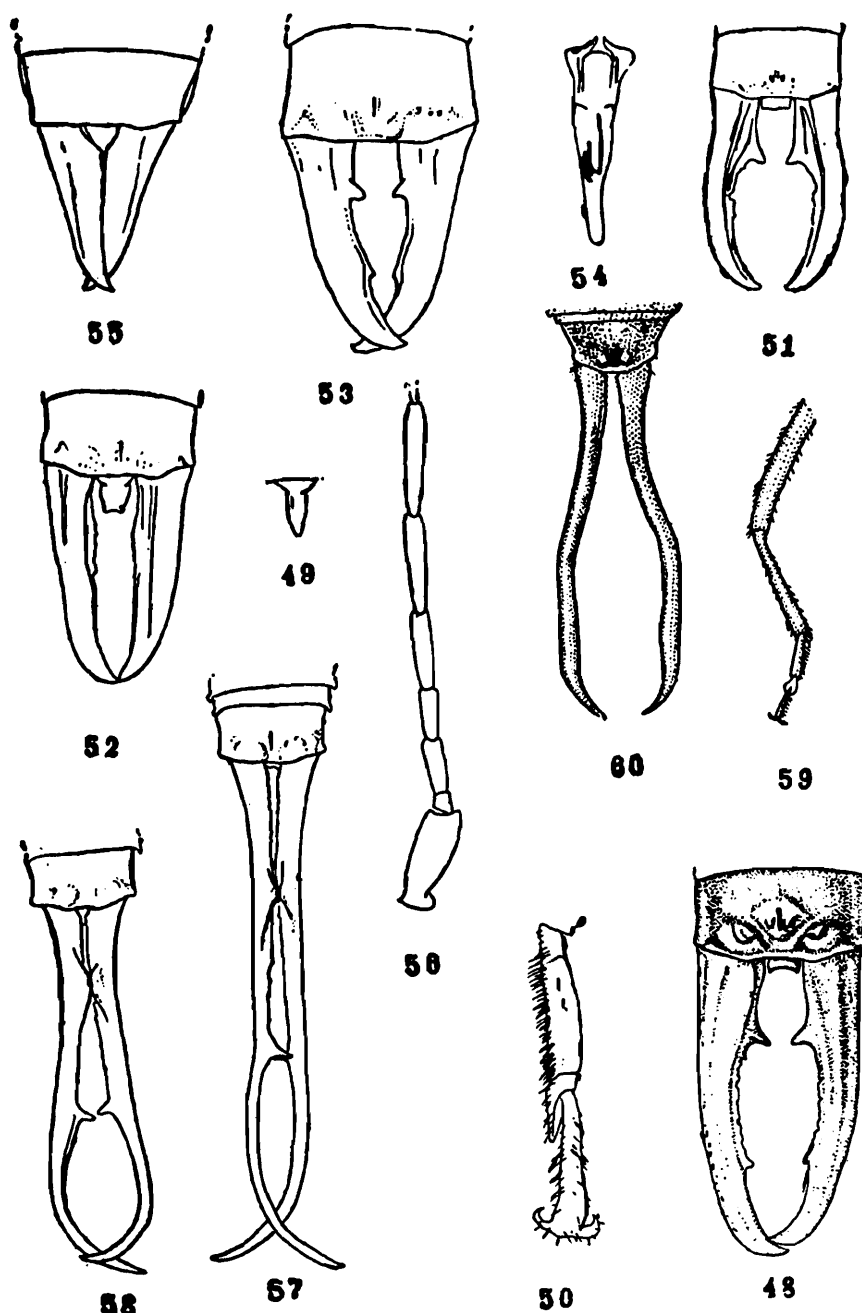
Adiathetus metallicus Srivastava Figs. 50-52

1985. *Adiathetus metallicus* Srivastava, *Rec. Indian Mus.*, 82 (1-4) : 48, figs. 14-19 (♂, ♀ ; India : Arunachal Pradesh, Tirap Dist., Hornbill).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., 77 miles camp on Miao Vijaynagar Road, 1 ♀, 11.1.1985 ; Gandhigram ca 135 km from Miao, 8 ♂, 5 ♀, 30.1.1987 ; Deban, 30 km E of Miao, 1 ♀, 12.XII.1982.

Distribution : So far it is known from India, Arunachal Pradesh, Tirap Dist.

Remarks : The above material agrees with the 'Type' series of the species.



Figs. 48-60: *Adiathetus glaucopterus* (Bormans), ♂, 48. Ultimate tergite and forceps, ♀ 49. Pygidium; *Adiathetus metallicus* Srivastava, ♂, 50. Hind tarsi; 51. Ultimate tergite and forceps, ♀, 52. Ultimate tergite and forceps; *Hamaxas feae* (Bormans), ♂, 53. Ultimate tergite and forceps, 54. Genitalia, ♀, 55. Ultimate tergite and forceps; *Timmomenus nevillei* (Burr), ♂, 56. A few basal antennal segments; 57. and 58. Ultimate tergite and forceps; *Eparchus simplex* (Bormans), ♂, 59. Hind legs; 60. Ultimate tergite and forceps.

Hamaxas feae (Bormans) Figs. 53-55

1894. *Chelisoches feae* Bormans, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 14 : 393 (♂, ♀ ; Burma).

Material examined INDIA : Arunachal Pradesh, Tirap Dist., Deban, 27 km E of Miao, 1 ♂, 10.12.1982 ; Miao, 1 ♀ ; Gandhigram ca 135 km from Miao, 2 ♀, 30.XII.1984, 1 ♀, 24.1.1987.

Distribution India (North Eastern Himalayas) and other parts of Oriental Region.

Family : FORFICULIDAE
Subfamily : OPISTHOCOSMIINAE

Timmomenus nevillei (Burr) Figs. 56-58

1904. *Opisthocosmia nevillei* Burr, *Trans. R. ent. Soc. Lond*, 1904 : 305, 309 (♂, Bhutan Maria Basti).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Lower Jheel Camp, 4 ♂, 3.II.1987 ; Gandhigram ca 135 km from Miao, 1 ♂, 27.1.1987.

Distribution : India (Sikkim) and Bhutan (Maria Basti),

Remarks The present material agrees with detailed description of Burr (1910) and the following additional information would be useful in the determination of the species.

Head convex, sutures obsolete. Eyes about 1/2 as long as the post-ocular length. Antennae with 14 (in one specimen) segments ; basal segment thick, slightly longer than the distance between antennal bases. Lateral tubercles on 3rd and 4th abdominal tergites well developed, sides of abdominal segments 5th to 6th convex, with an oblique fold or tubercle, well developed or poorly marked. Pygidium obtuse, in middle above with a faint concavity. Forceps may be slender, less curved in apical half or sometimes stouter and more curved in apical half.

T. nevillei comes very close to *Timmomenus lugens* (Bormans) but differs by the presence of greenish sheen on the body, slender build and in ♂, forceps with a vertical, triangular tooth in basal half which is more compressed and hardly incurved or acute at tip.

Eparchus simplex Bormans Figs. 59-60

1894. *Opisthocosmia simplex* Bormans, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 14 : 396 (♂, ♀ ; Burma).
 1981. *Eparchus simplex* ; Srivastava, *Annali, Mus. civ. Stor. nat. Giacomo Doria*, 83 : 302, figs. 42-50.

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Gibbons Land, 16 km E of Miao, 1 ♂, 25.XII.1982 ; Lower Jheel camp, 1 ♂, 3.II.1987 ; 77 mile base camp 1 ♀, 31.1.1987.

Distribution : India (NE Himalayas), Bhutan, and South China.

Remarks : Present interpretation of the species is after Srivastava (1981).

Subfamily : ALLODAHLINAE

Allodahlia ahrimanes (Burr) Figs. 61-66

1990. *Anechura ahrimanes* Burr, *Ann. Mag. nat. Hist.*, (7) 6 : 79, pl. Fig. 5 (♂ ; Sikkim).
 1910. *Allodahlia ahrimanes* ; Burr, *Fauna British India, Dermaptera* : 154, pl. 10, Fig. 98.

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Gandhigram ca 135 km from Miao, 5 ♂, 20.1.1987, 1 ♂, 27.1.1987, 2 ♀, 30.1.1987, 77 mile base camp, 1 ♂, 31.1.1987.

Distribution : India Sikkim ; West Bengal (Darjeeling dist., Kurseong) ; Burma (N.E. Kambaiti).

Remarks : In the above material some variation in the colour of elytra, wings and the shape of pygidium are noted.

The elytra are reddish brown in middle, posterior and lateral margins with a black band and wings with a rounded yellow spot. Forceps in normal ♂ are undulate at base above a vertical pointed tooth and internally at about middle a sharp tooth present, followed by somewhat similar tooth in the middle of posterior half. In some specimens forceps are almost horizontal and internal teeth are not well marked. Besides, other specimens represent the intermediate stages of development of forceps and its inner armatur.

Pygidium, in normal ♂, is about twice as long as the length of ultimate tergite with tip acuminate, at base declivous, afterwards horizontal or a little raised upwards. It is either poorly developed or represents intermediate stages in other specimens.

***Allodahlia coriacea* (Bormans) Figs. 67-69**

1894. *Anechura coriacea* Bormans, *Annali Mus. civ. Stor. nat. Giacomo Doria*, (2) 14 : 403 (♂; Burma, Carin Cheba).
1959. *Allodahlia coriacea signata* Bey-Bienko, *Ent. Obzor.*, 38 : 620 (♂, ♀; China, Yunnan).
1972. *Allodahlia ochroptera* Brindle, *Entomologist's mon. mag.*, 108 : 27 (Holotype ♂, Teinzo, Burma, Allotype ♀, Bhamo, Burma, Brit. Mus. (Nat. Hist.); Paratype 1♂ with same data as the Allotype, Manchester Museum—All determined by Bormans as *Anechura ancylura* Dohrn; other specimens : 1♂, Sikkim (Manchester Mus.); 1♂, 1♀, Hinterindien (Vienna Mus.); 1♂, Ind. Orientale (Vienna Mus.) and 1♀, (Pedong) W. Bengal (Brit. Mus. Nat. Hist.).—Syn. nov.

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Lower Jheel camp, 2♀, 3.II.1987, 1♂, 5.II.1987; Gandhinagar ca 135 km from Miao, 1♂, 27.I.1987; 77 mile camp, Miao-Vijaynagar Road, 1♂, 31.I.1987.

Distribution : In the mountains of India, Bhutan, Burma, China (Yunnan), Borneo and Sumatra.

Remarks : These specimens are compared with the 'Type' ♂ of the species and agree well with it and differ slightly in ♂ by the degree of development and the position of internal teeth of forceps and the shape of pygidium which may be considered as individual variation.

In the 'Type' ♂, the pygidium is transverse, more or less triangular posteriorly, posterolateral angles and in middle provided with a minute point, at base above convex on either side of a median groove. The above recorded males possess transverse pygidium with three minute points posteriorly but the posterior margin appears wavy due to certain linear grooves. The forceps are internally armed with two sharp teeth beyond middle.

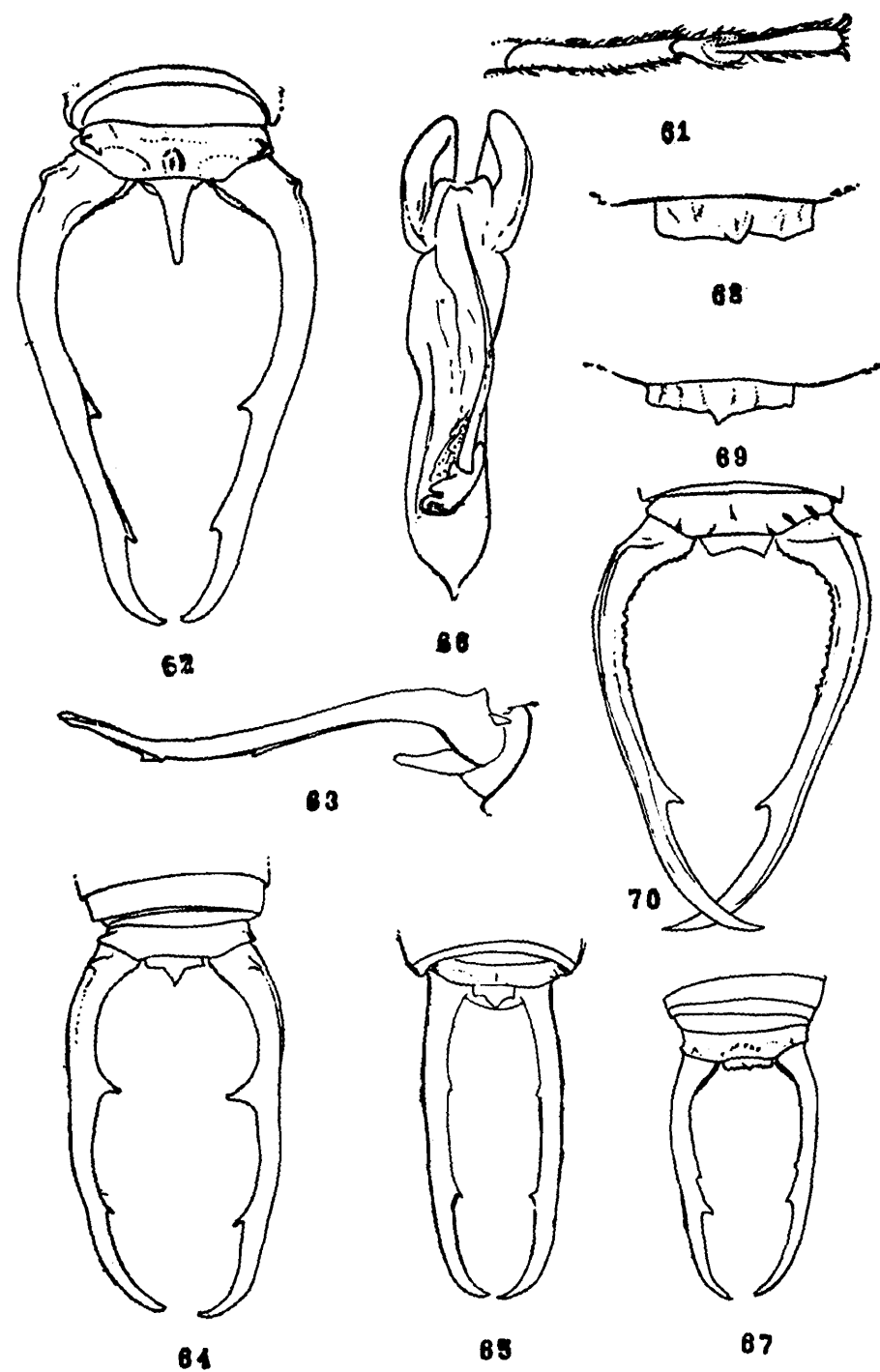
In the light of above variation, the *Allodahlia ochroptera* Brindle (1972) is considered as synonym of this species. Besides, it may be mentioned that the specimens with yellow wings are reported earlier for *A. coriacea* (Bormans).

***Allodahlia scabriuscula* (Serville) Fig. 70**

1839. *Forficula scabriuscula* Serville, *Histoire des Insectes Orthopteres* : 38 (♀, Holotype,) 'Amerique meridionale' (locality erroneous).

Material examined : INDIA : Arunachal Pradesh, Tirap Dist., Lower Jheel camp, 1♀, 30.XI.1987; Gandhigram ca 135 km from Miao, 2♂, 30.I.1987, 1♂, 3.II.1987; 1♂, 5.II.1987; 2♂, 2♀, 8.II.1987.

Distribution India, Bhutan, Burma, Vietnam, Java, Sumatra, Borneo, South China and Philippine Islands.



Figs. 61-70 : *Allodahlia ahrimanes* (Burr), ♂, 61. Hind tarsi, 62. Ultimate tergite and forceps, 63. Ultimate tergite and forceps, in profile, 64-65. Ultimate tergite and forceps, 66. Genitalia ; *Allodahlia coriacea* (Bormans), Holotype ♂, 67. Hind portion of body, 68. Pygidium, enlarged ; 69. Pygidium, enlarged (from other ♂,) ; *Allodahlia scabriuscula* (Serville), ♂, 70. Ultimate tergite and forceps (Figs. 62 and 63 ; 67 and 68 from same specimens).

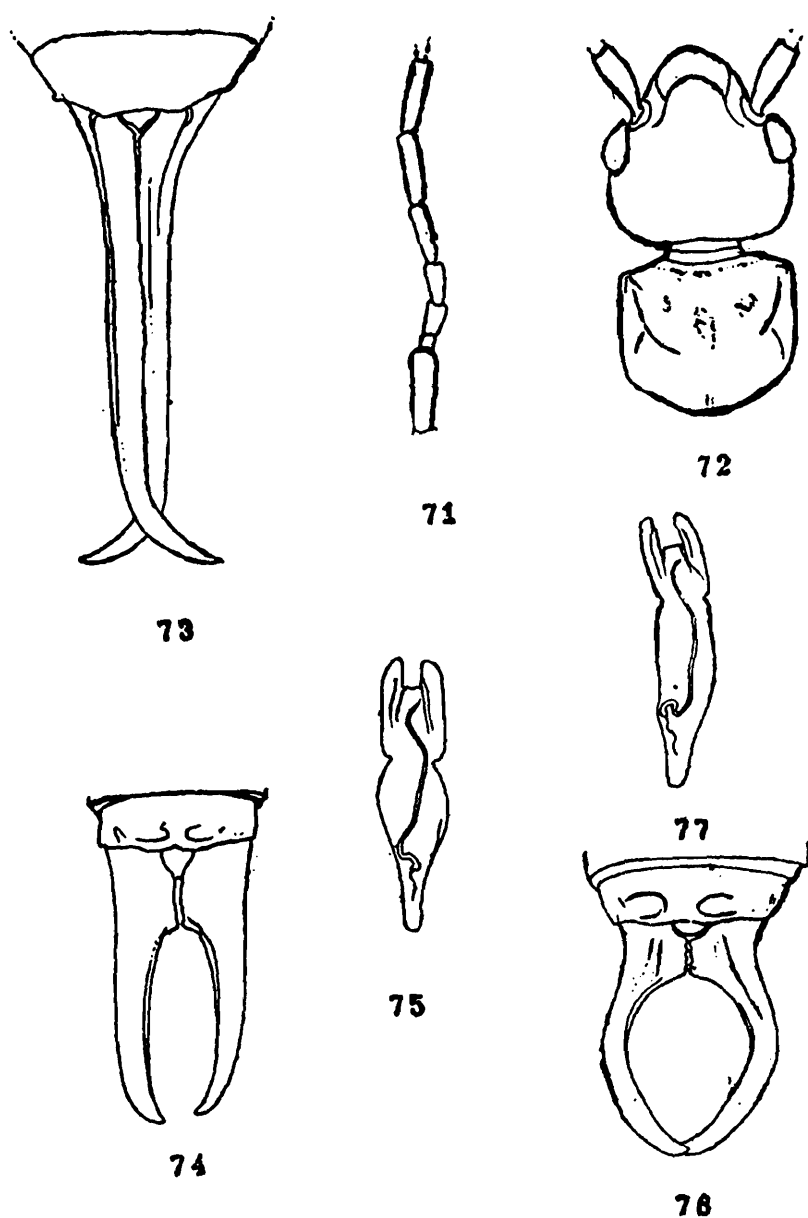
EUDOHRNIINAE

***Pterygida pulchripes* (Bormans) Figs. 71-73**

1894. *Forficula pulchripes* Bormans, *Annali Mus. civ. Stor. nat. Giacomo Dorta*, (2) 14: 408 (♀, Burma).

1982. *Kosmetor pulchripes*; Srivastava, *Annali Mus. civ. Stor. nat. Giacomo Doria*, 85: 103, fig. 12.

Material examined. : INDIA : Arunachal Pradesh, Tirap Dist., Lower Jheel camp, 5 ♀, 3.11.1987.



Figs. 71-77 : *Pterygida pulchripes* (Bormans), ♀, 71. A few basal antennal segments, 72. Head and pronotum, 73. Ultimate tergite and forceps; *Forficula beelzebub* (Burr), ♂, 74. Ultimate tergite and forceps; 75. Genitalia, *Forficula planicollis* Kirby, ♂, 76. Ultimate tergite and forceps. 77. Genitalia

Distribution : Hitherto known by Type ♂ from Burma.

Remarks : The present material agrees well with Type ♀ of the species in morphological details and general body colouration. The only difference noted in the material is that legs are yellow with femora dark brown in apical one third.

FORFICULINAE

Forficula beelzebub (Burr) Fig. 74-75

1900. *Chelisoche beelzebub* Burr, *Ann. Soc. ent. Belge.*, **44** : 51 (1 ♂ ; India, Kurseong).

1904. *Forficula beelzebub* ; Burr, *Trans. R. en Soc. Lond.*, **1904** : 322.

Material examined. INDIA : Arunachal Pradesh, Tirap Dist., Gandhigram, ca 135 km from Miao, 1 ♂ , 27.XII.1987, 1 ♂ , 20.I.1987.

Distribution : India (Himalayan and Sub Himalayam Region), Nepal, Bhutan and also recorded from Africa.

Forficula planicollis Kirby Figs. 76-77

1891. *Forficula planicollis* Kirby, *J. Linn. Soc. (zool)*, **23** : 225 (♀ ; North India).

Material examined. INDIA : Arunachal Pradesh, Tirap dist., Gandhigram, ca 135 km from Miao, 1 ♀ , 2 nymphs, 30.I.1987.

Distribution : Mountain region of India (U.P., W.B and Sikkim), Nepal, Bhutan, Burma and China (South China).

SUMMARY

The paper deals with 26 species belonging to 20 genera, including a new species viz., *Gonolabidura biswasi*, besides proposing the synonymy of the genus *Protolabidura* Steinmann under *Gonolabidura* Zacher and *Allodahlia ochroptera* Brindle under *Allodahlia coriacea* (Bormans). A complete check-list of the species known from Namdapha, Tirap dist., Arunachal Pradesh listing 31 species under 24 genera, besides a key for their identification is provided. Zoogeographical notes are also given.

ACKNOWLEDGEMENTS

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ASILIDAE (DIPTERA) FROM RAJASTHAN, INDIA

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INTRODUCTION

From 8th September to 7th October 1986 we had surveyed robberflies of Rajasthan in collaboration with the Desert Regional Station, Zoological Survey of India, Jodhpur. The present paper deals with collections made during this survey, and two specimens of *Philodicus sharmai* n. sp. from Gujarat present in the Desert Regional Station. The arrangement of genera followed is based on 'A Review of the Asilidae (Diptera) from the Oriental Region' by Joseph and Parui (1983).

Leptogaster Meigen

1803. *Leptogaster* Meigen, *Magazin Insektenkde*, 2 : 269.

1. **Leptogaster cheriani** Bromley

1938. *Leptogaster cheriani* Bromley, *Indian J. Agri. Sci.* 8 : 863.

1983. *Leptogaster cheriani* : Joseph & Parui, *Oriental Ins.* 17 : 280.

Material : 3 ♂, 2 ♀, Rajasthan : Alwar District Sariska, 4.x.1986, Coll. A.N.T Joseph.

Remarks : So far the species has been recorded only from Tamil Nadu. It is the first report from Rajasthan.

Laxenecera Macquart

1838. *Laxenecera* Macquart, *Dipt. Exot.* 1 (2) : 77.

2. *Laxenecera albibarbis* Macquart

1838. *Laxenecera albibarbis* Macquart, *Dipt. Exot.* 1 (2) : 194.

1983. *Laxenecera albibarbis* : Joseph & Parui, *Oriental Ins.* 17 : 297.

Material : 1 ♂, 3 ♀, Rajasthan Sirohi District : Abu Road, 375m, 18.ix.1986 ; 1 ♂, 1 ♀, Ranathambore, 25.ix.1986 ; 1 ♂, 10 ♀, Swai Madhopur District : Choru, 26.ix.1986, all Coll. A.N.T. Joseph.

Remarks : It has been recorded from Andaman Islands, Bihar, Gujarat, Himachal Pradesh, Maharashtra, Uttar Pradesh and West Bengal. It is recorded for the first time from Rajasthan.

3. *Laxenecera flavibarbis* Macquart

1838. *Laxenecera flavibarbis* Macquart, *Dipt. Exot.* 1 (2) : 193.

1983. *Laxenecera flavibarbis* : Joseph & Parui, *Oriental Ins.* 17 : 297.

Material : 1 ♀, Rajasthan : Tonk District : Indergarh, 28.viii.1986 ; 2 ♂, 5 ♀, Jodhpur District : Balsamandh, 14.ix.1986 ; 2 ♂, 2 ♀, Sirohi District : Kiarali, 19.ix.1986 ; 2 ♂, 1 ♀, Swai Madhopur District : Ranathambore, 25.ix.1986 ; 2 ♂, 2 ♀, Swai Madhopur Choru, 26.ix.1986 ; 1 ♂, 3 ♀, Alwar District : Sariska, 4.x.1986, all Coll. A.N.T. Joseph.

Remarks : This species has been recorded from Bihar, Goa, Gujarat, Maharashtra, Tamil Nadu and West Bengal. It is the first report from Rajasthan.

Nusa Walker

1851. *Nusa Walker*, *Insecta Saundersiana*, 1 : 105.

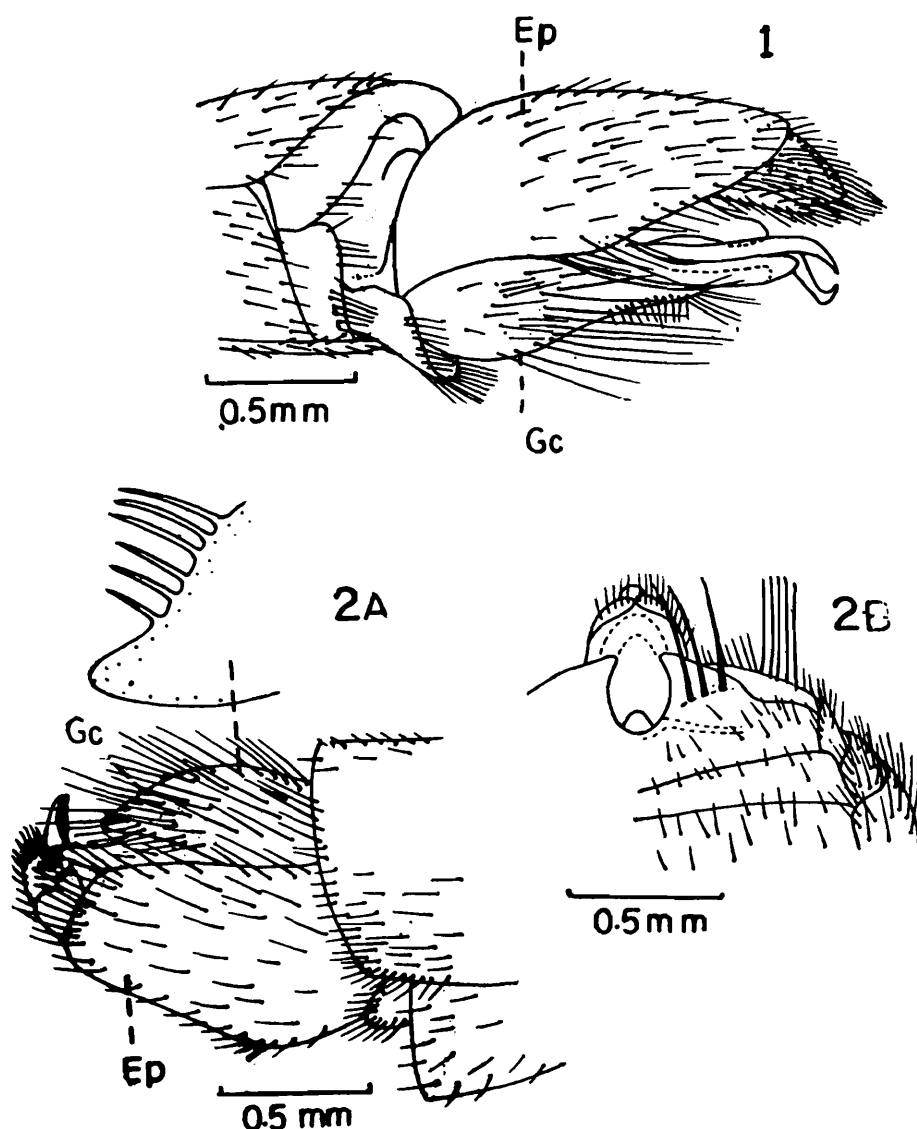
4. *Nusa rajasthanensis* n sp. (Fig. 1)

A small species with black head and thorax, black and yellowish-brown abdomen and legs, and pale yellow wings. Male : Length 9 mm, wing 5 mm.

Male : *Head* slightly broader than thorax, black with scarce greyish-yellow or grey tomentum ; *mystax* pale yellow, *fronto-orbital setae* white, *ocellar bristles* pale yellow, *postocular bristles* pale yellow, *postgena* with dense white setae. *Antenna* with *scape* yellowish-brown, *pedicel* black, *first flagellomere* black with its base yellowish-brown, *scape* subequal to *pedicel*, *first flagellomere* elongate. *Palpus* and *proboscis* black with white setae.

Thorax black, grey tomentum on pleura ; pronotum with a transverse row of 4 white bristles amidst white setae ; scutum without stripe ; chaetotaxy : 1 notopleural, 6-7 bristles posterolaterally ; vestiture golden yellow and bristles pale yellow ; scutellum without bristles, disc with vestiture like that of scutum ; katatergite with long, white, bristly setae. Haltere yellowish-brown with dark brown or black on head.

Legs black and yellowish-brown, fore coxa black, trochanter yellowish-brown, femur black with its apex narrowly yellowish-brown, tibia yellowish-brown and dark brown, tarsus dark brown, mid leg similar except coxa being yellowish-brown, hind coxa, trochanter and femur similarly coloured like that of mid leg, tibia basally yellowish-brown and rest black, tarsus black ; vestiture and bristles pale yellow.



1. Lateral view of male genitalia of *Nasa rajasthanensis* n. sp.

2. *Nasa setosa* n. sp., A. lateral view of male genitalia ; B, ventral view of female genitalia.

Wing pale yellow, but medially and along hind border hyaline ; R_5 and M_1 united close to the border.

Abdomen black and yellowish-brown, terga 1-3 black with yellowish-brown hind border, tergum 4 yellowish-brown with lateral black marking remaining terga wholly yellowish-brown, tergum 1 laterally with a few pale yellow bristles, terga 2-5 with a pair of pale yellow bristles, vestiture golden yellow. Male genitalia (Fig. 1) yellowish-brown with white setae.

Holotype ♂, Reg. No. 7644/H6, Rajasthan : Jodhpur : Balsamandh, 14.ix.1986, Coll. A.N.T. Joseph & Party, deposited in the Zoological Survey of India, Calcutta.

Using the key to the species of *Nusa* Walker from India and adjoining countries. (Joseph & Parui 1987a), it keys to *N. albibarbis* Ricardo from which it differs in the thorax being without stripe, black and yellowish-brown legs, hind border of scutellum without bristles, abdomen predominantly yellowish-brown and the differences in the shape of epandrium and gonocoxite.

5. *Nusa setosa* n. sp. (Fig. 2)

A small, pilose, yellowish-brown or orange species marked with dark brown or black to varying extent, legs pale yellow or yellowish-brown with dark brown or black, and wings hyaline. Male : length 9 mm, wing 5-6 mm ; female : length 8-9 mm, wing 6 mm.

Male Head as broad as thorax, yellowish-brown and black with dense grey tomentum ; mystax golden yellow, fronto-orbital setae and ocellar bristles white. Antenna with scape and pedicel pale yellow, first flagellomere basally pale yellow and remainder dark brown, scape with white setae and 1 or 2 white bristles, pedicel slightly shorter than or nearly equal to scape, first flagellomere elongate. Palpus yellowish-brown, proboscis yellowish-brown and black, both with white setae.

Thorax yellowish-brown with dark brown or black to varying extent so much so in some examples mostly dark brown or black, short white or golden yellow pollinose ; pronotum with white setae ; scutum in holotype with a broad mediolongitudinal, black stripe extending from anterior border to midway between transverse suture and hind border, laterally with the black spots united, in one paratype the stripe faint and in the other absent, in both paratypes lateral black spots much smaller and faint ; chaetotaxy : 1 notopleural, 2 postalars, a few bristles postero-

laterally ; scutellum with dense pile, but in holotype comparatively less, border without bristles ; katatergite with long, white, bristly setae. Haltere pale yellow, with or without dark brown on head.

Legs pale yellow or yellowish-brown with dorsal dark brown or black marking on femur, the intensity and area of dark brown or black increases from fore to hind tibia so much so in the latter in some examples it occupies the whole of upper side, apex of hind tibia also dark brown or black : vestiture and bristles white.

Wing hyaline with the veins pale yellow basally.

Abdomen yellowish-brown or orange brown with short, white or golden yellow pilose, holotype with faint median and lateral black markings on terga and with sparse setae, tergum 2 laterally with three bristles, terga 3 and 4 and in some examples tergum 5 also with 1 or 2 bristles. Male genitalia (Fig. 2A) with gonocoxite bearing a row of bristles apically.

Females : Similar but with the following differences : comparatively darker specimens ; scutum with the mediolongitudinal stripe and lateral spots larger and distinctly marked ; haltere yellowish-brown ; abdomen mostly black with much less yellowish-brown or orange-brown. Female genitalia (Fig. 2B) figured.

Holotype ♂, Reg. No. 7645/H6, Rajasthan : Jodhpur University Campus, 13.ix.1986, Coll. A.N.T. Joseph and Party. *Paratypes* 1 ♀, Reg. No. 7646/H6, rest of data as in holotype ; 2 ♂, 2 ♀, Reg. No. 7647/H6 to 7650/H6, Jodhpur Bavad-choraya, 15.ix.1986, Coll. A.N.T. Joseph and Party, deposited in Zoological Survey of India, Calcutta.

The male genitalia of *Nusa setosa* n. sp. is distinctive and this species can be readily distinguished by the presence of an apical row of bristles on gonocoxite.

Stenopogon Loew

1847. *Stenopogon* Loew, *Linn. Ent.* 2 : 453.

6. *Stenopogon roonwali* n. sp. (Fig. 3)

A medium black species with black and pale yellow or yellowish-brown legs, and anteriorly brownish and posteriorly infuscated wing with closed first posterior

cell ; abdomen black in male and orange or yellowish-brown in female. Male : length 18-21 mm, wing 12-13 mm ; female 18-22 mm, wing 12-14 mm.

Males : Head narrower than thorax, black with dense greyish-white tomentum ; mystax white, fronto-orbital bristles and ocellar bristles and medially with white setae. Antenna black or scape and pedicel yellowish-brown and remainder black, scape and pedicel with white bristles, scape slightly longer than half to much longer than half of pedicel, first flagellomere longer than the combined length of scape and pedicel, style about half to less than half the length of first flagellomere. Palpus and proboscis black, both with white setae.

Thorax black, with or without grey tomentum ; pronotum with white or pale yellow, dense bristles and a few setae ; scutum with the humeri sometimes brown, usually with a faintly black mediolongitudinal stripe present extending from anterior border to beyond the transverse suture, the stripe faintly divided by a narrow grey stripe, in most of the cases the stripes black and indistinct to varying extent ; chaetotaxy ; a number of white bristles present laterally and posteriorly, of which postalars (7 or more) and dorsocentrals distinct ; vestiture and bristles white ; scutellum with a row of white bristles apically and sparse white setae laterally. Haltere pale yellow, yellowish-brown or yellowish-orange.

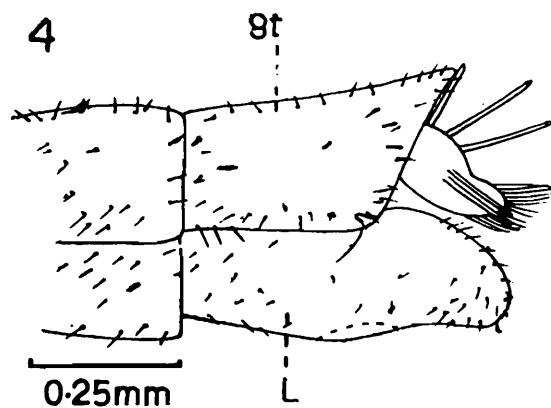
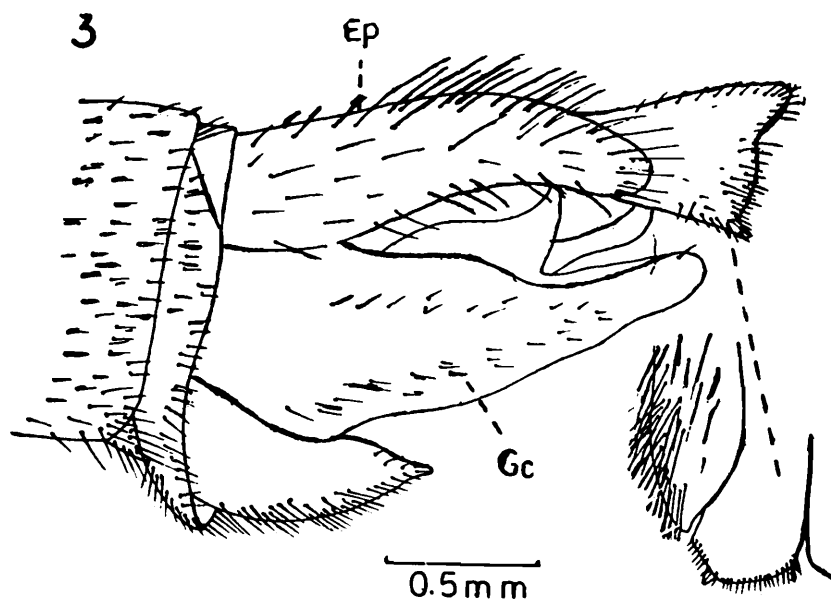
Legs black and pale yellow or yellowish-brown, coxa and trochanter black, fore femur black basally for half or more and remainder pale yellow or yellowish-brown, mid femur similar but black more extensive and occupies two-thirds or more, hind femur wholly black, fore tibia and tarsus pale yellow or yellowish-brown, mid tibia and tarsus similar but tibia apically black, hind tibia wholly black or basally pale yellow upto one-fourth and the remainder black, tarsus pale yellow with basitarsus sometimes black ; fore femur with antero-ventral and posteroventral rows of bristles but in one paratype the latter row absent, mid femur with antero-dorsal, anteroventral, ventral (weak) and posteroventral rows of bristles, hind femur with anterior and anteroventral rows of bristles ; vestiture and bristles white.

Wing anteriorly brownish and the remainder infuscated ; first posterior cell closed.

Abdomen black, with or without grey tomentum, tergum 1 posterolaterally with a few white bristles, tergum 2 laterally with a few, white, bristly setae, vestiture white or white and yellow. Male genitalia (Fig. 3) black with white and black setae, gonocoxite long.

Females Similar but with the following differences bristles on upper side of postcranium white or pale yellow ; scutum with humeri in most cases yellowish-orange, in a few paratypes mediolongitudinal stripe bordered by a narrow, yellowish-orange line ; ventral row of bristles on mid femur lesser in number ; abdomen orange or yellowish-brown medially and black laterally, tergum 1, tergum 2 anteriorly, tergum 6 mostly, and terga 7 and 8 completely black, in some examples orange or yellowish-brown more extensive so much so terga 2 and 7 almost wholly orange or yellowish-brown. Genitalia with tergum 9 bearing ten, blunt, spines.

Holotype ♂, Reg. No. 7651/H6, Rajasthan : Abu Road, 375m, 18.ix.1986, Coll. A.N.T. Joseph & Party. **Paratypes** 1 ♂, 3 ♀, Reg. No. 7652/H6 to 7655/H6, rest of details as in holotype ; 5 ♂, 7 ♀, Reg. No. 7656/H6 to 7667/H6, Sirohi District : Kiarali, 19.ix.1986, 1 ♀, Reg. No. 7668/H6, Ajmer : Beer Tank, 22.ix.1986, all Coll. A.N.T. Joseph & Party, deposited in Zoological Survey of India, Calcutta.



3. Lateral view of male genitalia of *Stenopogon roonwali* n. sp.
4. Lateral view of male genitalia of *Stichopogon basiti* n. sp.

It is quite similar to *Stenopogon cinchonaensis* Joseph and Parui (1981b) from which it differs in the white mystax, white bristles on the hind border of scutellum and in the shape of gonocoxite. It is named in honour of Dr. M. L. Roonwal, ex-director, Zoological Survey of India, Calcutta, who recently passed away.

Stichopogon Loew

1847. *Stichopogon* Loew, *Linn. Ent.* 2 : 499.

7. *Stichopogon basiti* n. sp. (Fig. 4)

A tiny, densely grey or greyish-yellow tomentose species with pale yellow legs with dark brown or black markings, wings with two brown spots, and abdomen with a broken, mediolongitudinal, black or dark brown stripe; lamella of female without hair tuft.

Females: *Head* broader than thorax, densely greyish-white or greyish-yellow tomentose; mystax white, fronto-orbital plate with white bristles and setae, ocellar setae white, postcranium with white setae, postocular bristles white and confined to above, postgena with white setae. Antennal scape and pedicel pale yellow, remainder black, pedicel bearing a few white bristles, scape very short, about one-fourth the length of pedicel, first flagellomere long, longer than one and-a-half times the combined length of scape and pedicel. Palpus and proboscis black with sparse, white setae.

Thorax black, greyish-yellow and grey tomentose; pronotum with a median transverse row of white, bristly hairs; scutum without mediolongitudinal stripe and lateral spots in holotype but with a faint, black mediolongitudinal stripe extending from anterior border to transverse suture in paratype; chaetotaxy: 1 notopleural, 1 postalar, 1 supra-alar, 1 dorsocentral; vestiture and bristles white; scutellar disc

bare, hind border with a few, long, white setae and 8 white bristles; katatergite with a row of elongate bristly setae. Haltere yellowish-brown or pale yellow.

Legs pale yellow with dark brown or black marking, fore and mid femora pale yellow or pale yellow with dark infuscation medially for about one-third length, hind tibia basally pale yellow and distally black or dark brown for about half or lesser than that, tarsal segments yellowish-brown with apical 1 or 2 segments black, vestiture and bristles white.

Wing lightly infuscated with two brown spots : one at the origin of R_4 , and the other at the junction between discal, 2nd posterior and 3rd posterior cells.

Abdomen black or dark brown with grey and greyish-yellow tomentum, medially with a broken, black or dark brown stripe from terga 1 to 6, tergum 7 with the stripe faint, and succeeding tergum without it, tergum 7 mostly and tergum 8 wholly tomentose, hind border of terga with a narrow grey or yellowish-brown border, tergum 1 posterolaterally with a few, long, white setae. Female genitalia (Fig. 4) with tergum 8 bearing a circlet of ten spines ; lamella without hair tuft.

Holotype ♀, Reg. No. 7669/H6, Rajasthan : Jaipur, 3.x.1986, Coll. A.N.T. Joseph and Party. *Paratype* ♀, Reg. No. 7670/H6, rest of details as in holotype, deposited in Zoological Survey of India, Calcutta.

Of all the known regional species of *Stichopogon*, *S. basiti* n. sp. is closer to *S. ramakrishnai* Joseph and Parui (1988) from which it can be separated by the presence of marginal row of white bristles on scutellum, wing with only two brown spots, and in the difference in the shape of lamella. It is named in honour of Mr. Abdul Basit, our colleague in Jodhpur, who has taken some excellent photographs of insects.

8. *Stichopogon biharilali* n. sp. (Fig. 5)

A tiny black species with greyish-white tomentum, black and pale yellow or yellowish-orange legs, and faintly infuscated wings ; in female lamella with closely matted setae in a spindle-like tuft. Female : length 4.0-5.0 mm, wing 3.0-3.5 mm ; male : length 3.0 mm, wing 2.5 mm.

Females *Head* broader than thorax, black, grey tomentose, specimens with dense grey tomentum with a mediolongitudinal black line extending from ocellar triangle to occipital foramen ; mystax white except in one paratype it being pale yellow, fronto-orbital setae and ocellar bristles white, postcranium with white setae, postocular bristles white and confined to above, postgena with white setae. Antennal scape and pedicel pale yellow to yellowish-brown with sparse white setae, remainder black, scape less than half to slightly more than half of pedicel, first flagellomere long, about one and-a-half times the length of scape and pedicel combined. Palpus and proboscis black, latter with sparse white setae.

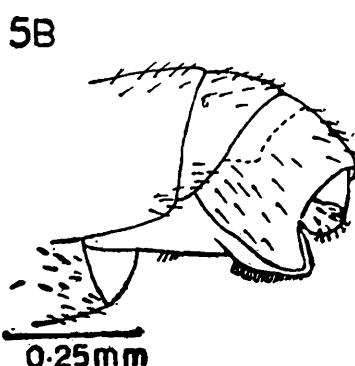
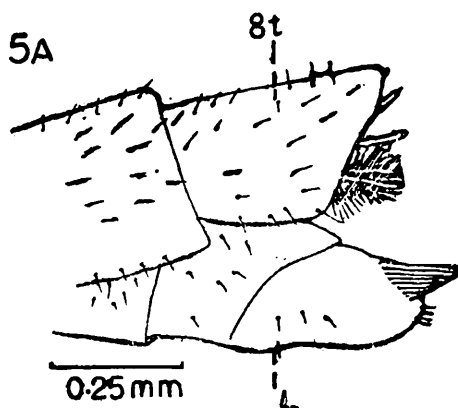
Thorax black with grey and greyish-yellow pollinose ; pronotum with sparse

white setae ; scutum with a narrow mediolongitudinal stripe extending from anterior border to transverse suture, the length and breadth of which quite variable, laterally with or without 2 black spots ; chaetotaxy : 1 notopleural, 1 postalar, 1 supra-alar ; vestiture sparse, white, bristles white or pale yellow ; scutellar disc bare, border with a few elongate setae, 2 or 4 of which may form bristly setae ; katatergite with a few, elongate, white bristly setae. Haltere pale yellow in most of the cases, but in one example yellowish-brown and in the other white.

Legs black and yellowish-orange or pale yellow, coxa, trochanter and femur black, tibia yellow with black apex, the black colouration increases from fore to hind tibiae so much so in the latter one-third or more black, vestiture and bristles white.

Wing faintly infuscated.

Abdomen black, greyish-white pollinose, in typical case as in holotype tergum 1 greyish-white pollinose with a median black mark, terga 2-6 black, on anterior border with a medially incomplete greyish-white stripe and laterally greyish-white,



5. *Stichopogon biharilali* n. sp., A, lateral view of female genitalia ; B, lateral view of male genitalia.

tergum 7 similar but hind border also greyish-white so much so the black area much reduced, tergum 8 completely greyish-white, the extent of black and greyish-white areas quite variable from specimen to specimen. Female genitalia (Fig. 5A) figured, tergum 8 with a circlet of ten spines, lamella with closely matted setae in spindle-like tuft.

Male Similar except the border of scutellum with 6 bristly hairs ; abdomen with much less greyish-white pollinose so much so terga 4-6 almost wholly black, tergum 7 with greyish-white restricted to hind border, terga 8 and 9 almost wholly greyish-white. Male genitalia (Fig. 5B) illustrated.

Holotype ♀, Reg. No. 7671/H6, Rajasthan : Alwar District : Prathapgarh, 1.x.1986, Coll. A.N.T Joseph & Party. *Paratypes* 3 ♀, Reg. No. 7672/H6 to 7674/H6, rest of details as in holotype ; 2 ♀ 1 ♂, Reg. No. 7675/H6 to 7677/H6, Ajmer : Beer Tank, 20.ix.1986, Coll. A.N.T Joseph, deposited in Zoological Survey of India, Calcutta.

Female of *Stichopogon biharilali* n. sp. is similar to *S. meridionalis* Oldroyd (1948) in the spindle-shaped tuft of setae on lamella, otherwise a quite distinct species with black fore and mid femora and in the shape of lamella. It is named in honour of our colleague Mr Biharilal, who had helped us in several ways to make our Rajasthan collection trip successful.

9. *Stichopogon inaequalis* Loew

1847. *Stichopogon inaequalis* Loew, *Linn. Ent.* 2 : 505.

1983. *Stichopogon inaequalis* : Joseph & Parui, *Oriental Ins.* 17 : 325.

Material : 1 ♂, 1 ♀, Rajasthan : Ajmer District : Gogal, 23.ix.1986 ; 4 ♂, 18 ♀, Swai Madhopur District : Pali : Chambal River bed, 27.ix.1986, all Coll. A.N.T. Joseph.

Remarks : From India it is reported from Andaman Islands, Andhra Pradesh, Bihar, Maharashtra and Tamil Nadu. Here it is recorded for the first time from Rajasthan. Outside India it is known to occur in Sri Lanka.

10. *Stichopogon indicus* Joseph & Parui

1984. *Stichopogon indicus* Joseph & Parui, *Bull. zool. Surv. India* 6 (1-3) : 249.

Material : 1 ♂, 2 ♀, Swai Madhopur District : Pali : Chambal River bed, 27.ix.1986, Coll. A.N.T Joseph.

Remarks : The species was described from Maharashtra, and subsequently recorded from Andhra Pradesh. It is the first report from Rajasthan.

11. *Stichopogon meridionalis* Oldroyd

1948. *Stichopogon meridionalis* Oldroyd, *Ent. Month. Mag.* **84** : 261.

1983. *Stichopogon meridionalis* : Joseph & Parui, *Oriental Ins.* **17** : 325.

Material : 1 ♂, 1 ♀, Rajasthan : Jodhpur District : Akhir Sagar, 12.ix.1986 ; 2 ♂, Ajmer District Gogal, 23.ix.1986 ; 3 ♂, 1 ♀, Swai Madhopur District : Pali : Chambal River bed, 27.ix.1986, all Coll. A.N.T Joseph.

Remarks : In India this species has been recorded from Andhra Pradesh, Gujarat, Karnataka, Kerala, Tamil Nadu and West Bengal. It is recorded here for the first time from Rajasthan. It has also been recorded from Sri Lanka.

12. *Stichopogon tomentosus* Oldroyd

1948. *Stichopogon tomentosus* Oldroyd, *Ent. Month. Mag.* **84** : 263.

1983. *Stichopogon tomentosus* : Joseph & Parui, *Oriental Ins.* **17** : 326.

Material : 2 ♀, Alwar, 2.x.1986 ; 1 ♀, Jaipur, 3.x.1986, all Coll. A.N.T. Joseph.

Remarks : Distributed in Andaman Islands, Bihar, Karnataka and West Bengal. Here it is recorded for the first time from Rajasthan.

Cophinopoda Hull

1958. *Cophinopoda* Hull, *Proc. Ent. Soc. Washington* **60** : 251.

13. *Cophinopoda chinensis* (Fabricius)

1794. *Asilus chinensis* Fabricius, *Ent. Syst.* **4** : 383 (for detailed synonyms refer Joseph & Parui, 1983).

1983. *Cophinopoda chinensis* : Joseph & Parui, *Oriental Ins.* **17** : 326.

Material : 2 ♂, 1 ♀, Rajasthan : Jodhpur District : Balsamandh, 14.ix.1986 ; 8 ♂, 9 ♀, Sirohi District : Kiarali, 19.ix.1986, all Coll. A.N.T Joseph.

Remarks : It is reported from Andaman Islands, Andhra Pradesh, Assam, Bihar, Orissa, Sikkim, Tamil Nadu, Uttar Pradesh and West Bengal. It is recorded for the first time from Rajasthan.

Michotamia Macquart

1838. *Michotamia* Macquart, *Dipt. exot.* 1 (2) : 72.

14. Michotamia aurata (Fabricius)

1794. *Asilus aurata* Fabricius, *Ent. Syst.* 4 : 387.

1975. *Michotamia aurata* (Fabricius) : Oldroyd, *A Catalog of Diptera of the Oriental Region* 2 : 130 ;
1983. Joseph & Parui, *Oriental Ins.* 17 : 327.

Material : 1 ♂, Rajasthan : Jodhpur District : Mandore Garden, 11.ix.1986 ; 1 ♂, Sirohi District : Mount Abu, 840m, 17.ix.1986 ; 2 ♂, Ajmer District : Beer Tank, 22.ix.1986 ; 3 ♂, 1 ♀, Tonk District : Indergarh, 28.ix.1986 ; 3 ♀, Alwar District : Alwar, 2.x.1986, all Coll. A.N.T. Joseph.

Remarks : This species has been reported from Andhra Pradesh, Bihar, Karnataka, Kerala, Madhya Pradesh, Orissa, Pondicherry, and West Bengal. It is the first record from Rajasthan.

Ommatius Wiedemann

1821. *Ommatius* Wiedemann, *Dipt. exot.* 1 : 213.

15. Ommatius ponti Joseph & Parui

1984. *Ommatius ponti* Joseph & Parui, *Oriental Ins.* 18 : 58.

Material : 1 ♂, Rajasthan : Sirohi District : Kiarali, 19.ix.1986, Coll. A.N.T. Joseph.

Remarks : It was described from Pakistan. From India this species has been recorded from Uttar Pradesh (Joseph & Parui, 1987b). It is reported for the first time from Rajasthan.

16. Ommatius pseudokempi Joseph & Parui

1987. *Ommatius pseudokempi* Joseph & Parui, *Bull. zool. Surv. India* 8 (1-3) : 210-211.

Material : 1 ♂, 1 ♀, Rajasthan : Sirohi District Kiarali, 19.ix.1986, Coll. A.N.T Joseph.

Remarks : The species was described from Orissa and subsequently reported from South India. This is the first report from Rajasthan.

17. *Ommatius singhi* n. sp. (Fig. 6)

A very small black species with black and yellowish-brown legs, and distally infuscated wings. Male : length 4.0-5.6 mm, wing 4.0 mm ; female : 6.00 mm, wing 5.00 mm.

Males : *Head* black, grey tomentose ; mystax white with 2-3 to the whole of upper half with black bristles, fronto-orbital setae black and white or wholly black, ocellar bristles white or black, postocular bristles black above and white below, postcranium bare above and with a few white setae below. Antenna black, scape and pedicel with black bristles, scape subequal to pedicel, first flagellomere and pedicel nearly equal in length. Palpus and proboscis black with white setae.

Thorax black with grey tomentum ; pronotum with white setae and with or without 1 or 2 pairs of pale yellow bristly setae in a transverse row ; scutum with the mediolongitudinal stripe black, faintly marked, and extending from anterior border to beyond transverse suture ; chaetotaxy : 1 notopleural, 1 postalar, 2 supra-alars, 1 or 2 dorso-centrals ; vestiture white, bristles white with one or more pairs black ; scutellum with a pair of white or black bristles on border, disc with a few white setae ; katatergite with a few, long, bristly white setae, meron also with a pair of similar setae. Haltere pale yellow or white.

Legs black and yellowish-brown, coxa, trochanter and femur black, tibia yellowish-brown with black apex or wholly yellowish-brown, remainder of tarsus black, hind femur with anteroventral and postero-ventral row of weak bristles, vestiture predominantly white with some black setae, bristles white and black.

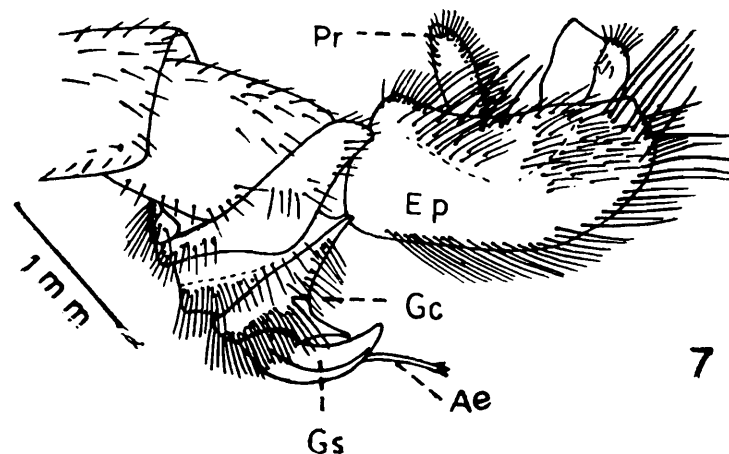
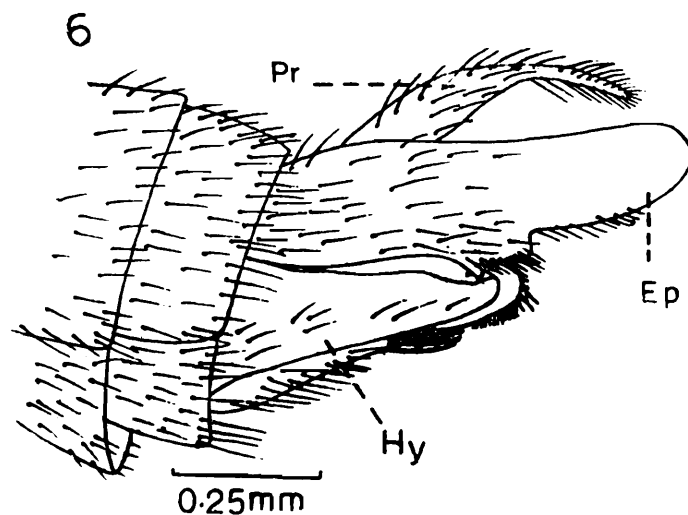
Wing more than half infuscated distally, the remainder hyaline.

Abdomen club-shaped, black, tergum 1 posterolaterally with a few, white bristles and setae, tergum 2 laterally with a few, long, white setae, vestiture white. Male genitalia (Fig. 6) black with black setae and bristles, epandrium ventrally with a nearly rectangular projection.

Female : Similar to the males. Female genitalia black with black and white setae, sternum 8 depressed medially, shallowly concave apically, and with a pair of long bristles laterally, proctiger narrow at apex.

Holotype ♂, Reg. No. 7678/H6, Rajasthan : Jodhpur : Mandore Garden, 11.ix.1986, Coll. A.N.T. Joseph. **Paratypes** 2 ♂, Reg. No. 7679/H6 and 7680/H6, rest of data as in holotype ; 1 ♀, Reg. No. 7681/H6, Jodhpur : Balsamandh, 14.ix.1986, Coll. A.N.T. Joseph and Party, deposited in Zoological Survey of India, Calcutta.

It is typical of the genus *Ommatius* with black colouration and club-shaped abdomen, which can be separated from all the other known Indian species by the distinctive male genitalia. It is named in honour of Sri R. K. Singh, our colleague at Jabalpur, who collected some interesting robberflies for us.



6. Lateral view of male genitalia of *Ommatius singhi* n. sp.

7. Lateral view of male genitalia of *Astochia rami* n. sp.

Astochia Becker

1913. *Astochia* Becker, *Ann. Mus. Zool. Acad. St. Petersbourg* 17 : 538.

18. *Astochia pseudoguptai* Joseph & Parui

1987. *Astochia pseudoguptai* Joseph & Parui, *Bull. zool. Surv. India* 8 (1-3) : 100.

Material 1 ♂, Rajasthan : Jodhpur District : Mandore Garden, 11.ix.1986 ; 1 ♂, Jodhpur District : Mogra pumping station, 13.ix.1986 ; 6 ♂, 2 ♀, Jodhpur District : Balsamandh, 14.ix.1986 ; 1 ♂, Ajmer District : Saradhana, 21.ix.1986 ; 1 ♂, 1 ♀, Ajmer District : Beer Tank, 22.ix.1986, all Coll. A.N.T. Joseph.

Remarks : The species was described from Sikkim, and subsequently recorded from Karnataka. It is the first report from Rajasthan.

19. *Astochia rami* n. sp. (Fig. 7)

A medium, black species with sparse grey tomentum, black and yellowish-brown or pale yellow legs, and distally infuscated wing. Male : length 13-16 mm, wing 9-10 mm ; female : length 16-18 mm, wing 11-13 mm.

Males : *Head* slightly broader than thorax, black with or without grey tomentum ; mystax white, fronto-orbital setae wholly white or black and white, ocellar bristles wholly black or rarely black and white, postocular bristles pale yellow or white, a few, and confined to above, postgena with white setae. Antenna black with first flagellomere to varying extent yellowish-brown or dark brown, scape and pedicel with black and white setae and bristles, pedicel more than two-thirds to slightly shorter than scape, first flagellomere shorter to longer than the combined length of scape and pedicel. Palpus and proboscis black with white setae.

Thorax black with sparse grey tomentum ; pronotum with white or white and pale yellow setae, medially with 2 or 4 weak bristles in a transverse row ; scutum without stripe or spots ; chaetotaxy : 1 notopleural, 2-3 postalars, 2 supra-alars, 1 intra-alar ; scutellar disc with long setae, border with 2 bristles ; katatergite with elongate, white, bristly setae, vestiture and bristles black and white. Haltere pale yellow with its head yellowish-brown, orange brown or dark brown.

Legs black, except tibia being mainly yellowish-brown or pale yellow with apically black to varying extent, fore and mid tibiae with black apex, hind tibia distally black for about half or more ; vestiture white and black, bristles black.

Wing distally infuscated, but lighter or hyaline medially and posterobasally.

Abdomen black with transverse band of light grey on hind border of terga, tergum 1 with a few white bristles laterally, vestiture white. Male genitalia (Fig. 7) black with black and white setae.

Females : Similar but with the following differences : scutellar border with 2 or 4 bristles ; tergum 1 of abdomen with white or white and black bristles. Genitalia black, elongate, tergum 8 long and two and-a-half to thrice the length of tergum 9, proctiger about two-thirds the length to slightly shorter than tergum 9.

Holotype ♂, Reg. No. 7682/H6, Rajasthan : Jodhpur : Balsamandh, 14.ix.1986, Coll. A.N.T. Joseph & Party. *Paratypes* 6♂, 2♀, Reg. No. 7683/H6 to 7690/H6, rest of details as in holotype ; 2♀, Reg. No. 7691/H6 and 7692/H6 ; Jodhpur : Bavadchoraya, 15.ix.1986, Coll. A.N.T. Joseph and Party ; 1♀, Reg. No. 7693/H6, 16.ix.1986, rest of details as in preceding ; 1♂, 1♀, Reg. No. 7694/H6 and 7695/H6, Sirohi District Kiarali, 19.ix.1986, Coll. A.N.T. Joseph and Party ; 4♀, 2♂, Reg. No. 7696/H6 to 7701/H6 ; Ajmer : Beer Tank, 22.ix.1986, all Coll. A.N.T. Joseph and Party, deposited in Zoological Survey of India, Calcutta.

Male genitalia of *Astochia rami* n. sp., *A. guptai* Joseph & Parui (1981a) and *A. pseudoguptai* Joseph & Parui (1987c) are quite similar. Of these, *A. rami* n. sp. is closer to *A. pseudoguptai* Joseph & Parui from which it can be recognised by the black femur and predominantly black and comparatively thinner abdomen. It is named in honour of Mr Girdari Ram, our colleague from Jodhpur, who accompanied us in our collection trip of asilids in Rajasthan.

Philodicus Loew

1848. *Philodicus* Loew, *Linn. Ent.* 3 : 391.

20 Philodicus femoralis Ricardo

1921. *Philodicens femoralis* Ricardo, *Ann. Mag. nat. Hist.* (9) 8 : 190.

1983. *Philodicus femoralis* : Joseph & Parui, *Oriental Ins.* 17 : 361.

Material : 10♂, 9♀, Rajasthan : Ajmer District : Saradhana, 21.ix.1986 ; 2♂, 4♀, Ajmer : Beer Tank, 22.ix.1986 ; 5♂, 2♀, Ajmer District : Gogal, 23.ix.1986 ; 2♂, 1♀, Swai Madhopur District : Choru, 26.ix.1986 ; 3♂, 2♀, Tonk District : Indergarh, 28.ix.1986 ; 1♂, Swai Madhopur, 29.ix.1986 ; 3♀, 2♂, Alwar District :

Pratapgarh, 1.x.1986 ; 4 ♂ , 4 ♀ , Jaipur, 3.x.1986, all Coll. A.N.T. Joseph.

Remarks : The species has been recorded from Arunachal Pradesh, Bihar, Goa, Kerala, Maghalaya and West Bengal. It is the first report from Rajasthan.

21. *Philodicus javanus* (Wiedemann)

1819. *Asilus javanus* Wiedemann, *Zool. Mag.* (Wied.) 1 (3) : 4. (for detailed synonyms refer to Joseph & Parui 1983 : 362).

1983. *Philodicus javanus* : Joseph & Parui, *Oriental Ins.* 17 : 362.

Material : 2 ♂ , Rajasthan : Sirohi District : Mount Abu, 840 m, 17.ix.1986, Coll. A.N.T. Joseph,

Remarks : In India it has been recorded from Assam, Arunachal Pradesh, Bihar, Himachal Pradesh, Karnataka, Tamil Nadu, Uttar Pradesh, and West Bengal. This is the first report from Rajasthan.

22. *Philodicus pruthii* Bromley

1935. *Philodicus pruthii* Bromley, *Rec. Indian Mus.* 37 : 224.

1983. *Philodicus pruthii* : Joseph & Parui, *Oriental Ins.* 17 : 362.

Material : 1 ♂ , Rajasthan : Alwar District : Pratapgarh, 19.ix.1986 ; 2 ♂ , Ajmer District : Beer Tank, 22.ix.1986 ; 1 ♀ , Swai Madhopur District Choru, 26.ix.1986, all Coll. A.N.T. Joseph.

Remarks : So far it is known to occur in Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. This is the first record from Rajasthan.

23. *Philodicus raoi* Joseph & Parui

(in press a.) *Philodicus raoi* Joseph & Parui, *Rec. zool. Surv. India*.

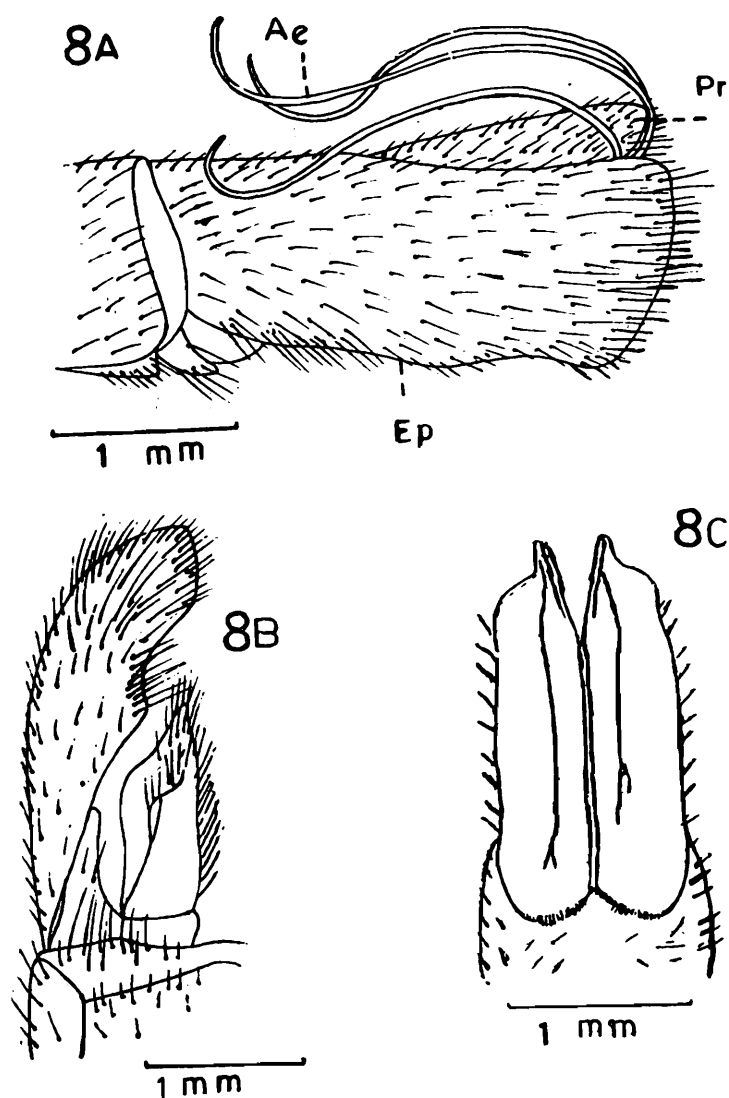
Material : 4 ♂ , 1 ♀ , Rajasthan : Jodhpur District : Bavad Choraya, 15.ix.1986 ; 4 ♂ , 2 ♀ , Swai Madhopur, 29.ix.1986, all Coll. A.N.T. Joseph.

Remarks : The species was described from Rajasthan. It is the second record of the species and from the same state.

24. *Philodicus sharmai* n. sp. (Fig. 8)

A large black species with dense grey or-greyish-yellow tomentum, black legs and light brown wings with yellowish-brown veins. Male : length 26-28 mm, wing 19 mm ; female : length 28-29 mm, wing 19 mm.

Males : *Head* narrower than thorax, black, greyish-yellow tomentose ; *mystax* white, fronto-orbital plate with white and one or more black setae, ocellar bristles black, postocular bristles white or pale yellow with one or more of them being black, postcranium with white setae, postgena with dense white setae. Antenna wholly black or scape black and remainder dark brown or yellowish-brown, scape and pedicel with black bristles, scape about one-third longer than pedicel, first flagellomere nearly equal in length to scape. Palpus and proboscis black with white setae.



8. *Philodicus sharmai* n. sp., A, lateral view of male genitalia ; B, ventral view of male genitalia : C, ventral view of female eighth sternum.

Thorax black with dense greyish-yellow or grey tomentum ; pronotum with a transverse row of white or pale yellow bristles, and with dense white setae, scutum with a mediolongitudinal stripe extending from anterior border to midway between transverse suture and hind border, the stripes divided by a greyish-yellow stripe, posterior to the longitudinal stripe with three, longitudinal, grey marks, lateral three black spots faintly marked or distinct ; chaetotaxy : 1 notopleural, 2 postalars, 2 supra-alars, 1 intra-alar, 1-5 dorsocentrals : vestiture black with some white setae laterally, bristles black ; scutellar disc with white setae, border with 2, and in one paratype 3, black bristles ; katatergite and meron with white or pale yellow, long, bristly setae. Haltere pale yellow or stalk pale yellow with orange or dark brown head.

Legs black, hind femur with an anteroventral row of black bristles, vestiture white, bristles black, fore tibia and tarsus anteriorly with mat of golden yellow setae, in hind tibia and tarsus similar setae present posteriorly.

Wing light brown with cells along hind border still lighter coloured, veins yellowish-brown.

Abdomen black, grey tomentose to varying extent, in typical case as in holotype tergum 1 completely grey, terga 2-6 anteromedially black, and laterally and posteriorly grey tomentose, terga 7 and 8 medially black and laterally grey tomentose, terga posterolaterally with a few white or pale yellow bristles which decrease in number and size in succeeding terga, tergum 2 mediolaterally with 2 additional bristles, vestiture predominantly white. Genitalia (Fig. 8A, B) black.

Females : Similar but with the following differences : chaetotaxy : 2 paratypes with 1 supernumerary seta outer to the posterior postalar ; bristles on abdomen confined to terga 1 and 2, tergum 1 similar to that of male, tergum 2 with 2-4 mediolateral bristles (which in one paratype black) but without posterolateral bristles. Genitalia (Fig. 8C) black, tergum 9 with 8 or 10 spines.

Holotype ♂ Reg. No. 7702/H6, Rajasthan : Sirohi District : Kiarali, 19.ix.1986, Coll. A.N.T Joseph & Party. *Paratypes* 2♂, Reg. No. 7703/H6 and 7704/H6, Gujarat : 3.5 Km West of Deesa, 15.x.1964, Coll. V.C. Agrawal ; 4♀, Reg. No. 7705/H6 to 7708/H6, rest of details as in holotype, deposited in Zoological Survey of India, Calcutta.

It is generally similar to *Philodicus chinensis* Schiner (1868) and *P. indicus* Joseph & Parui (in press b) from both of these it can be recognised by the larger size together with the shape of female genitalia. The new species is affectionately dedicated in honour of our long time friend and colleague, Dr. R. C. Sharma, Scientist 'SE', without whose generous help it could not have been possible to undertake the Rajasthan Survey of Asilidae successfully.

Promachus Loew

1848. *Promachus* Loew, *Linn. Ent.* 3 : 390.

25. *Promachus duvaucelii* (Macquart)

1838. *Trupanea duvaucelii* Macquart, *Dipt. Exot.* 1 (2) : 97.

1975. *Promachus duvaucelii* (Macquart) : Oldroyd, *A Catalog of Diptera of the Oriental Region* 2 : 152;
1983. Joseph & Parui, *Oriental Ins.* 17 : 366.

Material : 4 ♀, Rajasthan : Jodhpur District Mandore Garden, 11.ix.1986 ; 13 ♂, 5 ♀, Jodhpur District : Bhim Dadak, 12.ix.1986 ; 1 ♂, 1 ♀, Jodhpur District : Balsamandh, 14.ix.1986 ; 4 ♂, 15 ♀, Sirohi District : Abu Road, 375m, 18.ix.1986 ; 6 ♂, 16 ♀, Sirohi District : Kiarali, 19.ix.1986 ; 8 ♂, 4 ♀, Swai Madhopur District : Ranathambore, 25.ix.1986 ; 1 ♂, Swai Madhopur District : Choru, 26.ix.1986 ; 1 ♂, 5 ♀, Swai Madhopur District : Pali, 27.ix.1986 ; 7 ♂, 2 ♀, Tonk District : Indergarh, 28 ix.1986 ; 5 ♂, 4 ♀, Swai Madhopur, 29.ix.1986 ; 2 ♂, 2 ♀, Alwar District : Pratapgarh, 1.x.1986 ; 2 ♂, 1 ♀, Alwar District : Sariska, 4.x 1986, all Coll. A.N.T Joseph.

Remarks : It has been recorded from Andhra Pradesh, Delhi, Gujarat, Madhya Pradesh, Maharashtra, Punjab, Uttar Pradesh and West Bengal. It is the first time record from Rajasthan.

SUMMARY

This paper reports 25 species of robberflies under 11 genera, of which 8 are new species, viz., *Nusa rajasthanensis*, *N. setosa*, *Stenopogon roonwali*, *Stichopogon basiti*, *S. biharilali*, *Ommatius singhi*, *Astochia rami* and *Philodicus sharmai* ; 16 are new records ; and the remaining 1, *Philodicus raoi* Joseph and Parui, being reported earlier.

ACKNOWLEDGEMENTS

We are grateful to Prof. M. S. Jairajpuri, Director, Zoological Survey of India, Calcutta, for encouragements. Our sincere thanks are also due to Dr R. C. Sharma, Scientist 'SE', Desert Regional Station, Zoological Survey of India, Jodhpur, without whose help it could not have been possible to survey Rajasthan so successfully. We are indebted to Prof. A. G. Scarbrough, Department of Biological Sciences, Towson State University, Baltimore, U.S.A., for critically reading the manuscript and for offering valuable suggestions.

Abbreviations used in text-figures

Ae, aedeagus ; Ep, epandrium ; Gc, gonocoxite ; Gs, gonostylus ; Hy, hypandrium ; L, lamella ; Pr, proctiger ; 8 t, eighth tergum.

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STUDIES ON SOME MATERIAL OF DERMAPTERA FROM HIMACHAL PRADESH, INDIA

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INTRODUCTION

The present study is based on the Dermaptera from Himachal Pradesh collected during 1969 and 1976 by various survey parties of the Department. Altogether, 19 species under 12 genera are represented. Of these 9 species are reported for the first time from the area.

During the course of present study it was observed that at high altitudes the genus *Anechura* Scudder, is represented by a large number of specimens which confirms the phenomenon of congregation.

A check-list of various species recorded from Himachal Pradesh is provided.

CHECK LIST OF DERMAPTERA FROM HIMACHAL PRADESH

**Species reported for the first time from the area.

*Species represented in the material studied.

Superfamily : PYGIDICRANOIDEA

Family : PYGIDICRANIDAE

Subfamily : DIPLATYINAE

Haplodiplatys glenis (Kapoor, 1968)

•*Haplodiplatys rufescens* (Kirby, 1896)

Haplodiplatys simlaensis (Kapoor, 1968)

Haplodiplatys chinensis (Hincks, 1955)

Haplodiplatys srivastavai (Kapoor, 1974)

Superfamily : ANISOLABIOIDEA

Family : ANISOLABIDIDAE

Subfamily : CARCINOPHORINAE

***Aborolabis pervicina* (Burr, 1913)

**Euborellia annulipes* (Lucas, 1847)

***Euborellia compressa* (Borelli, 1907)

***Euborellia rajasthanensis* Srivastava, 1977

Subfamily : PARISOLABIDINAE

Parisolabis elegans (Hebard, 1917)

Subfamily ISOLABOIDINAE

**Isolaboides burri* (Borelli, 1909)

I. jonathani (Kapoor and Katiyar, 1971)

I. santokhi (Kapoor and Katiyar, 1971)

Family : LABIDURIDAE

Subfamily : NALINAE

***Nala lividipes* (Dufour, 1829)

***Nala nepalensis* (Burr, 1907)

Subfamily : LABIDURINAE

**Labidura riparia* (Pallas, 1773)

Forcipula indica Brindle, 1966

***F. quadrispinosa* (Dohrn, 1863)

**F. trispinosa* (Dohrn, 1863)

Superfamily : FORFICULOIDEA

Family : CHELISOCHIDAE

Hamaxas singhi Kapoor, 1966

**Family : FORFICULIDAE
Subfamily : ANECHURINAE**

- **Anechura stoliczkae* Burr, 1911
**Anechura zubovskii* Semenov, 1901
Anechura nayyari Kapoor, 1966**

Subfamily : FORFICULINAE

- ***Elaunon bipartitus* (Kirby, 1891)
Forficula aceris Burr, 1905
***Forficula planicollis* Kirby, 1891
**Forficula schlagintweiti* (Burr, 1904)
Forficula asketi Purohit, Julka & Lal, 1985
**Forficula davidi* Burr, 1905
Forficula beelzebub (Burr, 1900)**

Subfamily : EUDOHRNIINAE

- ***Eudohrnia metallica* (Dohrn, 1865)**

Subfamily : ALLODAHLIINAE

- **Allodahlia macropyga* (West wood, 1839)**

**SYSTEMATIC ACCOUNT
PYGIDICRANOIDEA
PYGIDICRANIDAE
DIPLATYINAE**

Haplodiplatys refescens (Kirby)

- 1896. *Cylindrogaster rufescence* Kirby, *J. Linn. Soc.*, 25 : 524, pl. 20, fig. 2 (♂, North India).
1904. *Diplatys rufescence* (Kirby), Kirby, *Syn. cat. Orth.* 1 : 2**

***Material examined* : INDIA : Himachal Pradesh : Sirmour dist., Naina Ticker on Shimla-Nahan Road, 1 ♂, 4.8.72 (H. P. Agrawal), Genitalia mounted between two coverslips and pinned with the specimen.**

***Distribution* : INDIA : N. W. Himalayas and West Bengal (Kurseong).**

Remarks : The material studied represents microlabic form of forceps.

ANISOLABIOIDEA
ANISOLABIOIDAE
CARCINOPHORINAE

Aborolabis pervicina (Burr)

1913. *Anisolabis pervicina* Burr, *Rec. Indian Mus.*, 8 (2) : 137 (♂, ♀, India, Assam and Maria Basti, Bhutan)
1915. *Paralabis pervicina* : Burr, *J. R. Micr. Soc.* : 540, pl. 12, fig. 13 (♂ genitalia)
1969. *Aborolabis pervicina* : Srivastava, *Entomologists. Rec. J. var.* 81 : 247, fig. 1 (♂ genitalia)

Material examined : INDIA : Himachal Pradesh : Kangra dist., Soon Khud, 8 km. from Palampur, 1 ♂ (Genitalia mounted between two coverslips and pinned with the specimen), 1 nymph, 20.2.1976 (R. Tilak) ; Kulu dist., 2 km. West of Kulu, 2 ♂ ♂ (Genitalia of 1 ♂ mounted between two coverslips, pinned with the specimen), 6 ♂ ♂, 8 nymphs, 23.7.1973 (M. Chandra).

Remarks : This species was hitherto recorded from the mountain regions of N.E. India, Nepal and Bhutan. On the basis of present material from Himachal Pradesh, it is reported for the first time from N. W. Himalayas.

Euborellia annulipes (Lucas)

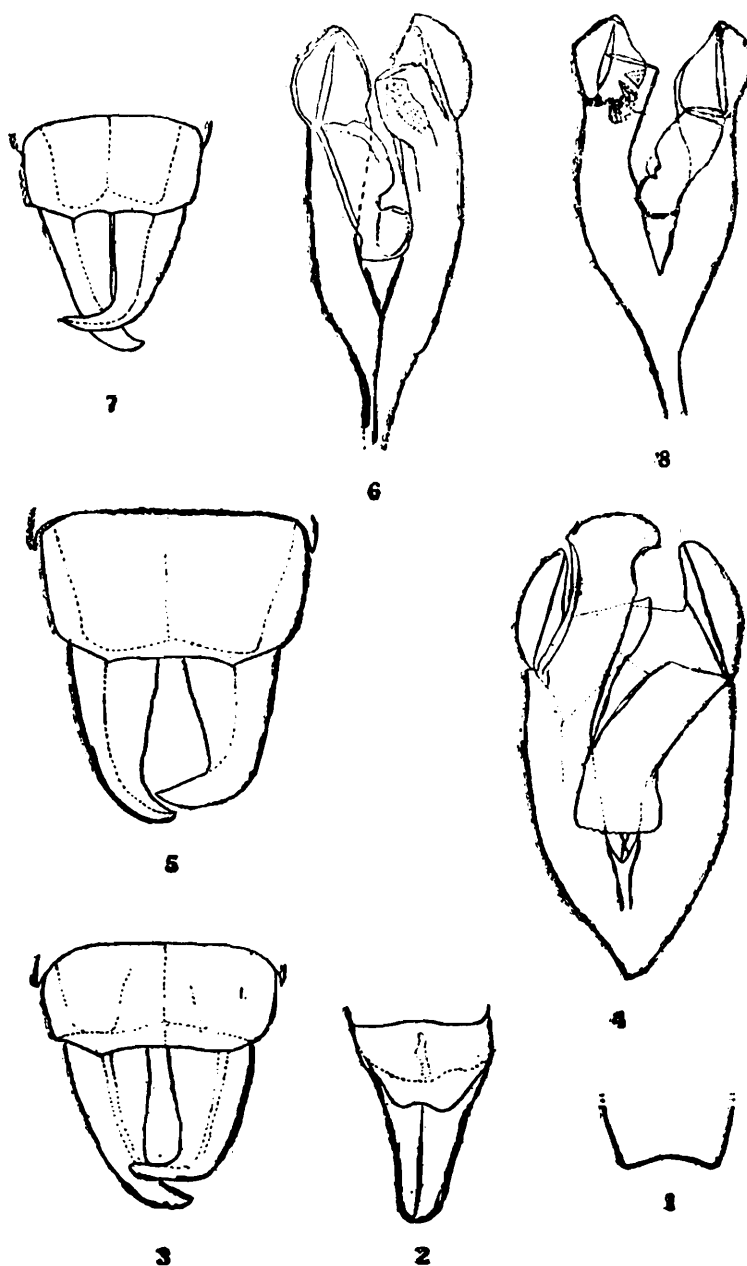
1817. *Forficesila annulipes* Lucas, *Ann. Soc. ent. Fr.*, 5 (2) : 84.

Material examined : INDIA : Himachal Pradesh Sirmour dist., Dhamla, 1 ♂, 23.8.73 (M. Chandra) ; Sultanpur, 1 ♂ (Genitalia mounted between two coverslips and pinned with the specimen), 2 ♂ ♂, 9.6.71 (A. Kumar) ; Rajgarh road, Gaura, 1 ♂, 1 ♀, 5.8.71 (H. P. Agarwal) ; Kulu dist., Gandhi Nagar, 1 ♂, 3 ♀ ♀, 3 nymphs, 25.7.78, Simla dist., Along Giri River, Kotkhair, 1 ♂, 13.7.74 (M. Chandra).

Distribution : World wide.

Euborellia rajasthanensis (Srivastava)

1977. *E. rajasthanensis* Srivastava, *Oriental Insects*, 11 (2) : 184, 186, figs. 2a-e (♂ genitalia) ; Holotype ♂, India : Rajasthan, Phalodi).



Figs. 1-8. *Haplodiplatys rufescence* (Kirby) ♂ : 1. Penultimate sternite ; 2. Ultimate tergite and forceps—*Aborolabis pervicina* (Burr) ♂ : 3. Ultimate tergite and forceps 4. Genitalia.—*Euborellia annulipes* (Lucas) ♂ : 5. Ultimate tergite and forceps ; 6. Genitalia.—*Euborellia compressa* (Borelli) ♂ : 7. Ultimate tergite and forceps ; 8. Genitalia.

Material examined : INDIA : Himachal Pradesh : Kulu dist., 2 km. W. of Kulu, 1 ♂ (genitalia mounted between two coverslips and pinned with the specimen), 23.7.73 (M. Chandra) ; Bilaspur dist., Kandhor, 1 ♂ (genitalia mounted between two coverslips and pinned with the specimen), 18.8.72 (K. K. Mahajan) ; Simla dist. Along Giri River, Kotkhai, 1 ♂ (under stones ; genitalia mounted between two coverslips and pinned with the specimens), 13.7.74 (M. Chandra).

Distribution : Hitherto this species was known from the type locality in Rajasthan and the present material constitutes its first record from the state as well as N. W. Himalayas.

Euborellia compressa (Borelli)

1907. *Anisolabis compressa* Borelli, *Boll. Musei. zool. Anat. comp. R. Univ., Torino*, (558) 22 : 3 (♂, ♀ ; Uganda) ; Burr, 1910, *Trans. R. ent. Soc. Lond.*, 1910 : 177
1915. *Euborellia compressa* Burr *J. R. micr. Soc.* : 545, pl. 12, fig. 18 (♂ genitalia).

Material examined : INDIA Himachal Pradesh : Bilaspur dist., Old Bilaspur, 2♂♂ (Genitalia of both ♂♂ mounted between two coverslips and pinned with the specimens), 1♀, 1 nymph, 3.6.73 (H. P. Agarwal) ; Naina Devi, 1♂ (Genitalia mounted between two coverslips and pinned with the specimen), 1♀, 2 nymphs, 22.4.72 (M. Chandra).

Distribution : INDIA (Himachal Pradesh and Tamil Nadu), Pakistan, Uganda, Congo and Mozambique.

Remarks : It is recorded for the first time from western Himalayas.

ISOLABOIDINAE

Isolaboides burri (Borelli)

1909. *Pseudisolabis burri* Borelli, *Boll. Musei. Zool. Anat. Comp. R. Univ., Torino*, 24 (63) : 1 (♂, ♀ ; North East Kashmir)
1910. *Pseudisolabis tenera* Burr, *Fauna. Brit. India. Dermaptera* : 104, fig. 36, pl. 4.
1958. *Isolaboides burri* : Hincks, *EOS, Madrid*, 34 (2) : 132.

Material examined : INDIA : Himachal Pradesh : Lahaul-spiti dist., Sissu, 11000 ft., 1♂ (Genitalia mounted between two coverslips and pinned with the specimen), 1♀, 28.8.71, 1♀, 30.8.71 ; Kirtnig, 2♂♂ (Genitalia of 1♂ mounted between two coverslips and pinned with the specimen), 13.9.71 ; Keylong, 10500 ft., 1♂, 1♀, 20.8.71 ; Chamba dist., Dharwaspangi, 2♂♂, 3, ♀♀ 13 nymphs, 11.9.74 (R. Tilak) ; Purthipangi, 1♂, 1♀, 31.8.74 (R. Tilak) ; Chil, 1♂, 5.11.1970 ; Kinnaur dist., Chini, 4♂♂, 3♀♀, 16 nymphs, 8.iv.1971.

Distribution : In the mountain regions of India (Kashmir and Himachal Pradesh) and Pakistan (Muree, Abbottabad and Chitral).

LABIDURIDAE

NALINAE

Nala lividipes (Dufour)

1820. *Forficula pallipes* Dufour, *Ann. gener. des. Sc. Phys. de Bruxelles*, 4 : 316, pl. 116, figs. 7, 7a & 7b (♂, ♀ Lower Catalonia, Spain).
1828. *Forficula lividipes* Dufour, *Ann. Sci. Nat.*, 13 : 340 (New name proposed).

Material examined INDIA : Himachal Pradesh Sirmour dist., Lal Khud, near Dadahu, 1♂, 3♀♀, 24.9.73 (H. P. Agrawal); Kangra dist., Nakeri Khud, 10 km from Dehra Gopipur, 1♂, 7.2.76 (R. Tilak); Bilaspur dist., Old Bilaspur, 1♂, 3.6.73; Badripur, Paouta, 1♂, 20.9.73 (H. P. Agrawal); Satluj River, 2 km downstream from Nangal, 1♂, 1♀, 9.2.76 (R. Tilak).

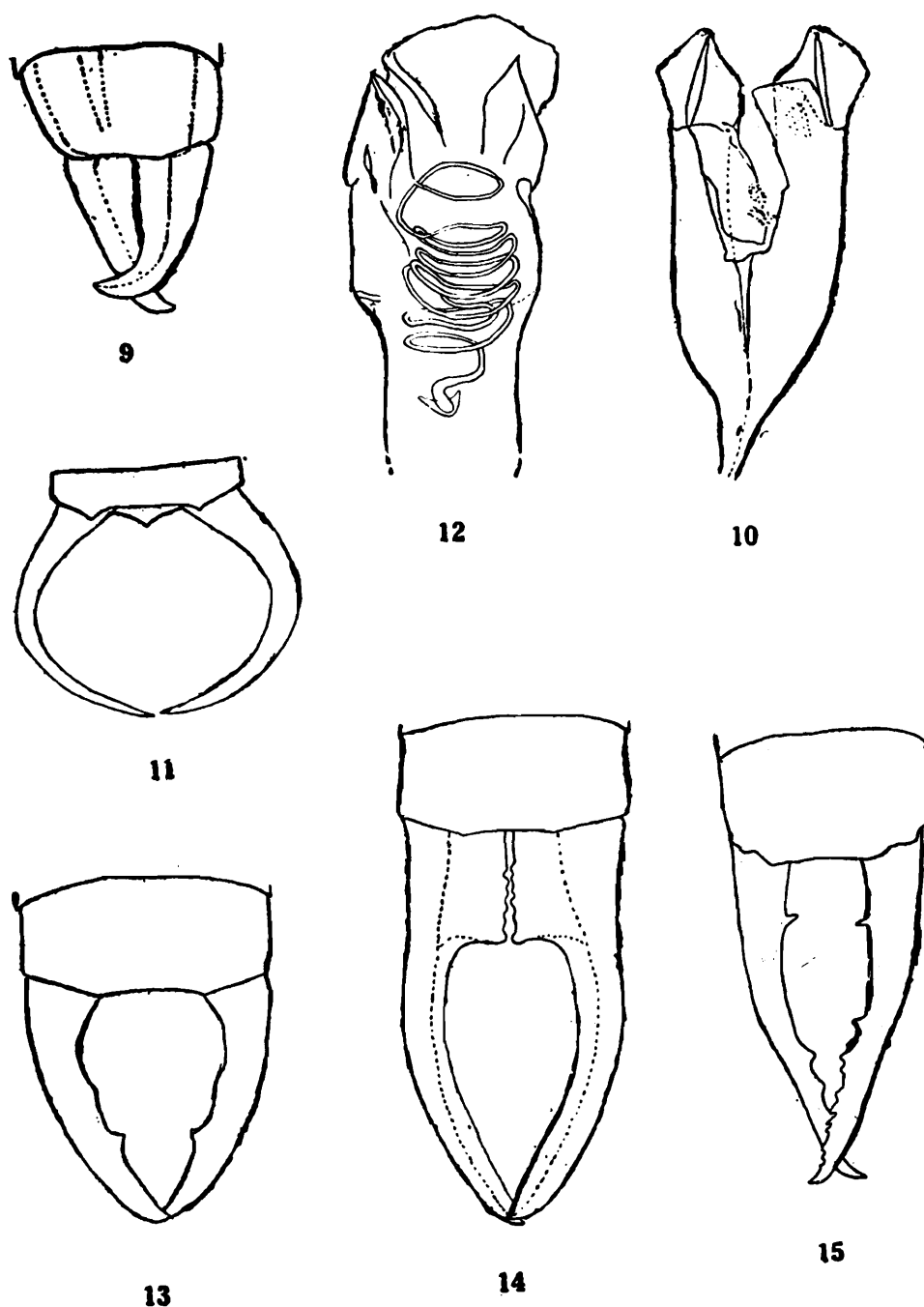
Distribution : World wide.

Remarks : The species is recorded for the first time from the State.

Nala nepalensis (Burr)

1907. *Labidura nepalensis* Burr, *Rec. Indian Mus.*; 1 : 208 (♂, ♀; Nepal, Soondrijal & Pharping)
1910. *Nala nepalensis*; Zacher, *Zool. Jb.*, 30 : 393.
1910. *Paralabidura nepalensis* Burr, *Trans. R. ent. Soc. Lond* : 185.

Material examined : INDIA : Himachal Pradesh : Kangra dist., Khauli Khud, 1 Km from Shahpur, 5♂♂ (Genitalia of 1♂ mounted between two coverslips, pinned with the specimen), 3♀♀, 26.2.76, Churan Khud, 6 km from Dharamshala, 1♂, 1♀, 24.2.76 Maul Khud, Palampur 3♂♂, 20♀♀, 1 nymph, 21.2.76 Loond Khud, 14 km from Dehra Gopipur, 1♂, 9.3.76 Ava Khud, 9 km from Palampur, 2♂♂, 5♀♀, 19.2.76 Sukni Khud, 6 km from Thural, 2♂♂, 3♀♀, 16.2.76 Soon Khud, 8 km from Palampur, 1♂, 3♀♀, 20.2.76; Bilaspur dist., Changarh Khud, 2♂♂, 1♀, 1 nymph, 11.8.72 (K. K. Mahajan); Chamba dist., Ranikhet, 1♂ (Genitalia mounted between two coverslips and pinned with the specimen), 12.6.74, 2♂♂, 14.6.74 (A. Kumar); Mandi dist., Jivni Khud, Pandoh, 1♂, 1♀, 30.5.73 (H. P. Agrawal); Kulu dist., 2 km S of Kulu, 1♂, 1♀, 22.7.73; Ramsheel, 1♂ (only posterior half present), 2♀♀, 24.7.73 (M. Chandra); Kalka dist., Parwanu, 1♂, 14.2.73 (K. A. Alvi); Arki, 50 km from Solan, 3♂♂, 2♀♀, 20.4.72 (H. P. Agrawal); Shinda dist., Kumarsan, 1700 m, 5♂♂, 3♀♀; Sarshan Nala, 1♂, 8.4.70; Manta, Tattapani, Mandi Road, 800m, 1♂, 20.9.69 (K. K. Mahajan); Rajgarh, 2♂♂, 1.3.71 (H. P. Agrawal).



Figs. 9-15. *Euborellia rajasthanensis* Srivastava, ♂ : 9. Ultimate tergite and forceps ; 10. Genitalia. — *Isolaboides burri* (Borelli) ♂ : 11. Ultimate tergite and forceps ; 12. Genitalia. — *Nala lividipes* (Dufour) — : 13. Ultimate tergite and forceps. — *Nala nepalensis* (Burr) ♂ : 14. Ultimate tergite and forceps. — *Labidura riparia* (Pallas) ♂ : 15. Ultimate tergite and forceps.

Distribution : In the mountain regions of India, Nepal, Bhutan, Malaya, Indo-China and Afghanistan.

Remarks : It is reported for the first time from the State.

LABIDURINAE

Labidura riparia (Pallas)

1773. *Forficula riparia* P. llas, *Reise Russ. Reichs*, 2 : 727 (Shores of Irtysh river, Western Siberia).

Material examined : INDIA Himachal Pradesh : Kangra dist., Khauli Khud, 1.5 km from Shahpur, 4♂♂, 1♀, 3 nymphs, 28.2.76 ; Churan Khud, 6 km. from Dharamsala, 22♂♂, 41♀♀, 36 nymphs, 24.2.7 ; Palampur, Maul Khud, 8♂♂, 7♀♀, 21.2.76, Rait village near Shahpur, 1♂, 1♀, 28.2.76 (R. Tilak) ; Kulu dist., Rest house, Kulu, 3♂♂, 2♀♀, 1 nymph (2♂♂ night collection), 22.7.73 and 1♂, 1♀, 3 nymphs (night coll.), 24.7.73 ; 2 km S of Kulu, 2♂♂, 2♀♀, 10 nymphs, 22.7.73 (M. Chandra) ; Jawalamukhi dist., P.W.D. Rest house (2 km W of Jawalamukhi), 1♂, 1♀, 25.5.73, Anb Khud, 3, ♂♂3♀♀, 9 nymphs, 26.5.73, Mandi dist., Pandoh Dam, 7♂♂, 3♀♀, 10 nymphs, 31.5.73, Samli village, 8♂♂, 12♀♀, 40 nymphs, date not given ; Sarkaghat, 2♂♂, 1♀, 1 nymph, 1.4.72 (M. Chandra), Bilaspur dist., Old Bilaspur, 11♂♂, 5♀♀, 3 6.73 (H. P. Agrawal) ; Meirikattan Shara, 2♂♂, 1♀, 7.4.72 ; Sirmour dist., 1♂, 1.7.72, Dhamla, 2♂♂, 1 nymph, 23.8.73 (M. Chandra), Naina Ticker on Simla-Nahan Road, 2♂♂, 3♀♀, 4.8.72 (H. P. Agrawal) ; Nohra, 1♂, 1♀, 2 nymphs, 1.7.72 (M. Chandra) ; Lal Khud (Near Dadahu), 1♂, 3♀♀, 24.9.73 ; Giri River at Dadahu, 2♂♂, 1♀, 23.9.73 (H. P. Agrawal) ; Kasauli dist., 3 km away from Kasauli, Auola, 11♂♂, 7♀♀, 10 nymphs, 10.12.72 (T P. Sharma) ; Simla dist., Shamsherpur, 1♂, 2 nymphs, 19.7.73, Badripur, Paouta, 6♂♂, 6♀♀, 7 nymphs, 20.9.73 (H. P. Agrawal) ; South bank of Bhalka river, 1♂, 23.4.75 (K. A. Alvi) ; Satluj river, 2 km down stream from Nangal, 5♂♂, 2♀♀, 9.2.76 (R. Tilak) ; Yamuna river bank, 1♂, 1♀, 10.4.74 (A. Kumar) ; Hamirpur, 3 km from Sujampur Tira, 5♂♂, 5♀♀, 12.2.76 (R. Tilak) ; Ashni Khud, 4♂♂ (3 damaged), 3 ♀ (1 damaged), 4 nymphs, 19.6.70 (M. Chandra).

Distribution : World wide.

Forcipula trispinosa (Dohrn)

1863. *Labidura trispinosa* Dohrn, *Stettin. ent. Zeit*, 24 : 310 (♂, India Orientali).
 1900. *Forcipulo trispinosa* : Bormans, *Das Tierreich*, 2 : 30.
 1891. *Labidura pugnax* Kirby, *J. Linn. Soc. (Zool)*, 25 : 510, pl. 12, fig. 1 (♂, ♀ ; North India).
 1910. *Forcipula trispinosa* var. *Minor* Burr, *Fauna Brit. India. Dermaptera* : 93, pl. 3, fig. 26a (♂, Nepal).
 1966. *Forcipula trispinosa* sub sp. *minor*, Brindle, *Ann. Mag. nat. Hist.*, 9 (13) : 268.
 1980. *Forcipula afghana* Steinmann, *Acta. zool. Acad. Sci. Hung.*, 26 (1-3) : 243 (♂ ; Afghanistan).

Material examined: INDIA : Himachal Pradesh : Kangra dist., Palampur, Maul khud, 9♂♂, 7♀♀, 21.2.76; Sukni khud (6 km from Thural), 3♂♂, 2♀♀, 16.2.76; Khaul khud, 1 km from Shahpur, 2♂♂, 2♀♀, 2 nymphs, 26.2.76, (R. Tilak); Churan khud, 6 km from Dharamsala, 1♂, 24.2.76; Rait village (near Shahpur), 1♂, 28.2.76; Ava khud, 9 km from Palampur, 3♂♂, 1♀, 19.2.76 (R. Tilak); P. W. D. Rest house, 2 km W. of Jawalamukhi, 2♂♂, 25.5.73 (H.P. Agrawal); Majhi khud, 1♂, 4.3.76 (R. Tilak); Kulu dist., Ramsheel, 1♂, 24.7.73 (M. Chandra), Solan Dist., arki, 50 km from Solan, 4♂♂, 3♀♀, 2 nymphs, 20.4.72 (H. P. Agrawal); Simla dist., 2 km N. of Pullbhal Nala (under stone), 3♂♂, 2 nymphs, 18.7.74 (M. Chandra); Sirmour dist., Giri river at Dadahu, 1♂, 8.4.74 (A. Kumar), Lal khud, near Dadahu, 1♂, 2♀♀, 24.9.73 (H. P. Agrawal); Chamba dist., Ranikhet, 3♂♂, 4♀♀, 12.6.74 (A. Kumar); Bilaspur dist., Goyal village, 2♂♂, 15.8.73 (K. K. Mahajan); Haloni, 5 km from Rajgril, 4♂♂, 6♀♀, Yamuna river bank, 2♂♂, 2♀♀, 10.4.74 (A. Kumar); Rajgarh road, Goura, 1♂, 1♀, 5.8.71 (H. P. Agrawal); Simla dist., Kumarsan, 1700m, 2♂♂, 2♀♀; Manta, Tattapani (Mandi Road), 800m, 1♂, 2 nymphs, 20.9.1969 (K. K. Mahajan); Arki, 1♂, 4.3.71 (M. Chandra).

Distribution: India, Nepal and Afghanistan.

***Forcipula quadrispinosa* (Dohrn)**

1863. *Labidura quadrispinosa* Dohrn, *Stettin. ent. Ztg.*, 24 : 311 (♂, Tranquabar, India and Ceylon).

Material examined: INDIA : Himachal Pradesh : Sirmour dist., Giri river at Dadahu, 4♂♂, 6♀♀, 8.4.74 (A. Kumar); Kangra dist., near Beas Sive Bridge (Dehra), 2♂♂, 2♀♀, 20.7.73 (M. Chandra).

Distribution: India, Sri Lanka, Nepal, Bhutan, Burma, Thailand, Java, Indo-China, Phillippine Islands, Reunion and Mauritius.

Remarks: This species is recorded for the first time from Himachal Pradesh.

FORFICULOIDEA

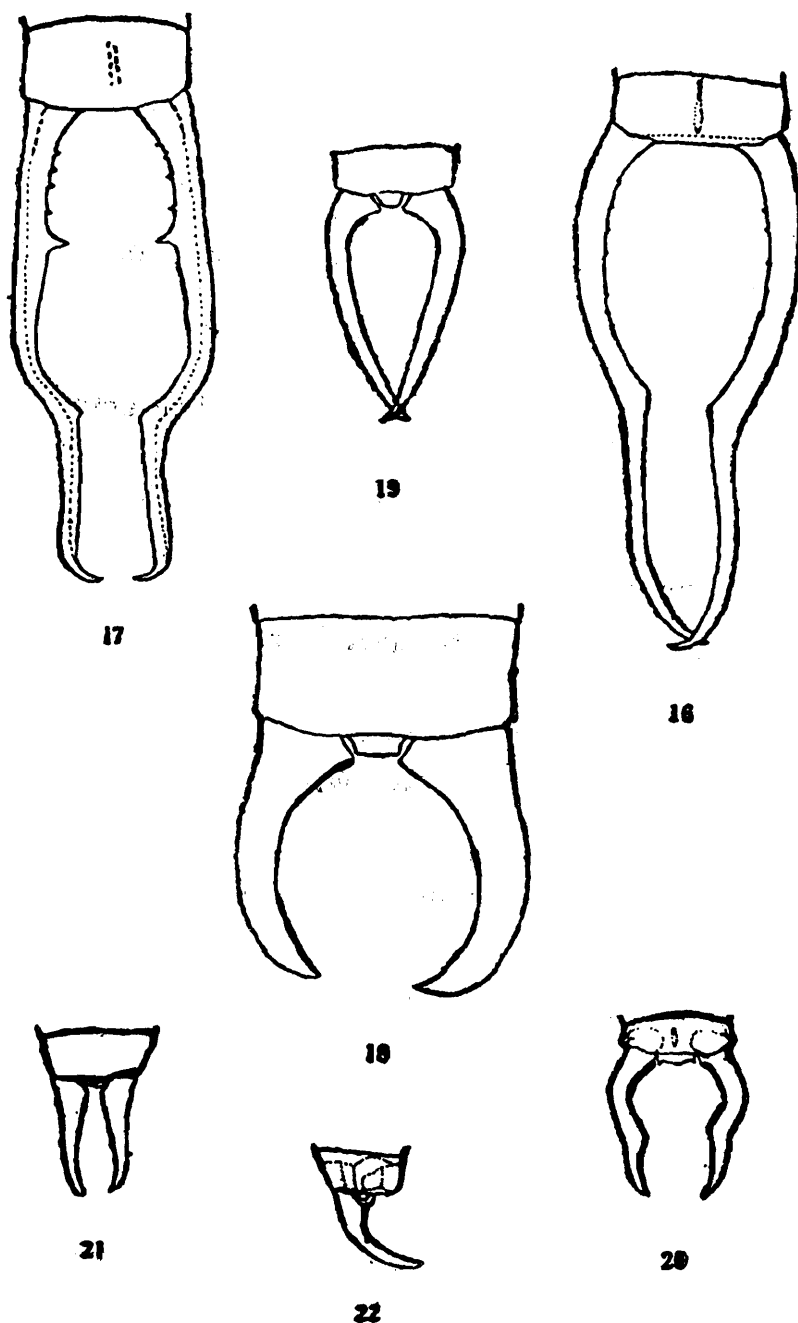
FORFICULIDAE

ANECHURINAE

***Anechura zubovskii* Semenov**

1901. *Anechura zubovskii* Semenov, *Horae. Soc. Ent. Ross.*, 35 : 188 (♂, ♀; India : Kashmir; Ladakh Valley of the river Dras, 9,000-11,000 ft).

1975. *Anechura zubovskii* : Steinmann, *Fol. Ent. Hung.*, 28 : 162.
 1966. *Anechura pirpanjalae* Kapoor, *Ann. Mag. nat. Hist.*, 13 : (9) : 391.
 1955. *Anechura bipunctata pirpanjalae* Singh, *Agra Univ. J. Res. (Sci.)*, 4 (1) : 182.



Figs. 16-22. *Forcipula quadrispinosa* (Dohrn) ♂ : 16. Ultimate tergite and forceps. — *Forcipula trispinosa* (Dohrn) ♂ : 17. Ultimate tergite and forceps. — *Anechura stoliczkae* Burr, ♂ : 18. Ultimate tergite and forceps (cyclolabic form); 19. Ultimate tergite and forceps (macrolabic form). — *Anechura zubovskii* Semenov, ♂ : 20. Ultimate tergite and forceps. — ♀ : 21. Ultimate tergite and forceps; 22. Abnormal ultimate tergite and forceps.

Material examined : INDIA : Himachal Pradesh : Lahaul-Spiti dist., Sissu, 11,000 ft., 1♂, 27.8.71, 1♀ 30.8.71, Lossar, 4100 ft, 3♂♂, 8♀♀, 7.8.71, 2♂♂, 2♀♀, 8.8.71, 3♂♂, 1♀, 11.8.71 ; Jespa, 11,000 ft, 2♀♀, 25.8.71 (K. K. Mahajan) ; Samolha village, 4♂♂, 2♀♀, 1 nymph, 22.8.75 (M. Chandra) Khoksar, 10,512 ft, 1♂, 2♀♀, 26.7.70, 2♀♀, 6.7.71, 3♀♀, 24.7.1971 ; Keylong, 10,500 ft, 3♂♂, 6♀♀, 20.8.71, 1♂, 1♀, 31.8.70 ; Kinnaur dist., Around P.W.D. Rest House, Sangla and Kaurik village, 5♂♂, 6♀♀, 20.8.71 (K. K. Mahajan) ; Chamba dist., Tindipangi, 1♀, 22.8.74, 1♂, 2♀♀, 23.8.74 ; Purthipangi, 2♀♀, 28.8.74 ; Dharwaspangi, 1♀, 12.9.74 (R. Tilak) ; Narkanda, 2,700m, 1♀, 2 nymphs, 15.9.69 ; Kolhapuri, 2♂♂, 19.4.70 (K. K. Mahajan).

Distribution : India (Kashmir, Himachal Pradesh and Sikkim) and China (S. W.) Tibet).

Remarks : In one female, collected from Khoksar ultimate tergite and forceps were observed to be abnormal (fig. 22).

***Anechura stoliczkae* Burr**

1911. *Anechura stoliczkae* Burr, *J. Asiat Soc. Bengal*, (N. S.), 7 : 792 (♂, Northern India, Upper Sutlej dist., Bashahr).
 1955. *Anechura himalayana* Singh, *Agra Univ. J. Res. (Sci.)*, 4 (1) : 180.
 1955. *Himanechura lahaulensis* Singh, *Agra. Univ. J. Res. (Sci.)*, 4 (1) : 184 (Nymphs).

Material examined : INDIA: Himachal Pradesh : Kinnaur dist., Sangla Hill, 6♂♂, 6♀♀, 27.6.75 (A. Kumar) ; Kalpa, 1♂, 2 nymphs, 15.4.70 ; Mandi dist., 1♂, 28.7.1970 (K. K. Mahajan).

Distribution : All along the Himalayas in India, Nepal and Bhutan.

Remarks : The macro-and cyclolabic forms of forceps in males with various intermediate stages are represented in the material.

Subfamily : ALLODAHLIINAE

***Allodahlia macropyga* (Westwood)**

1839. *Forficula macropyga* Westwood in Royle, *Ills. Himalayas*, 2 : iii. (♂, ♀; by inference Himalayan Mts.).

Material examined : INDIA : Himachal Pradesh : Simla dist., 3 km north of P.W.D. Rest House, Baghi, 2686 m, 5♂♂, 3♀♀, 6.10.74 ; 2 km S.F. of P.W.D. Rest House, Baghi, 2686 m, 1♂, 2♀♀, 7.10.74 ; 3 km N. F. of P.W.D. Rest House, Thanedhar, Dabbi, ca 1850 m, 1♀, 2.10.74 (L. K. Ghosh).

FORFICULINAE

Forficula schlagintweiti (Burr)

1904. *Anechura schlagintweiti* Burr *Trans. R. ent. Soc. Lond.* : 313 (♂, ♀ ; Tibet, Lahaol, Dohrn coll. ; India : Darjeeling).
1910. *Forficula schlagintweiti* : Burr, *Fauna Brit. India, Dermeptera* : 166, fig. 54, pl. 6.
1923. *Anechura stoliczkae* : Hebard, *Mem. Dept. Agric. India, Ent. Ser.*, 7 : 224 ("Brachylabic condition").

Material examined : INDIA : Himachal Pradesh : Kulu dist., P.W.D. Rest House Kothi (Kulu), 1♂, 29.7.73, 2 km S. of Kothi, Kulu, 3♀♀, 30.7.73, Bella, 3 km from Kothi, Kulu, 4♀♀, 31.7.75, Rest House, Manali 7000 ft, 1♀ (night coll.) 27.7.73 (M. Chandra) ; Lahaul-Spiti dist., Sissu, 11000 ft, 1♀, 30.8.71 (K. K. Mahajan) ; Chamba dist., Purthipangi, 1♀, 28.8.74 (R. Tilak) ; Sirmour dist., Sarpat, 1♂, 1♀, 28.8.73 (K. K. Mahajan).

Distribution : Along the Himalayas in India, Nepal Bhutan and Pakistan.

Forficula planicollis Kirby

1891. *Forficula planicollis* Kirby, *J. Linn. Soc.* : 525 (♀, North India).

Material examined : INDIA : Himachal Pradesh : Simla dist., 2 km S.E. of P.W.D. Rest House, Baghi, 2686 m, 1♂, 7.10.74 (L. K. Ghosh).

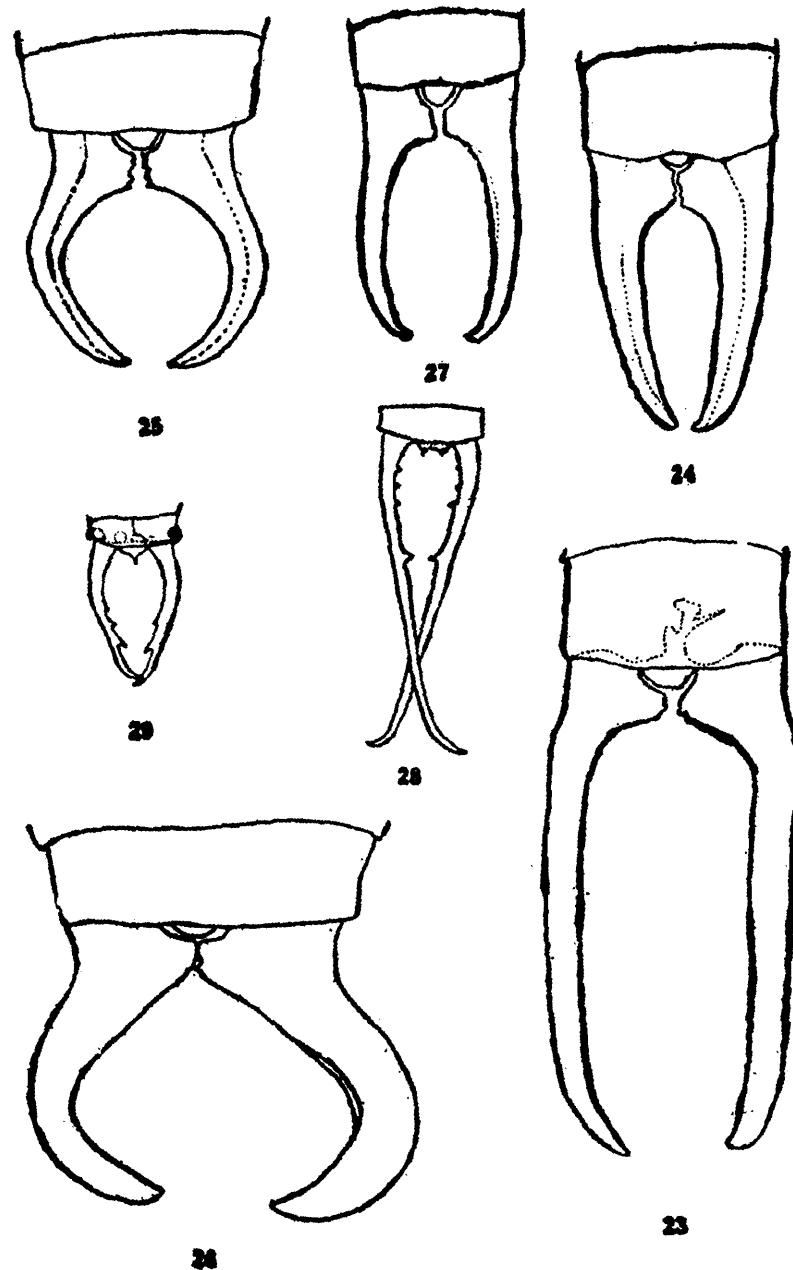
Remarks : The occurrence of this species in Simla dist. constitutes its first record for the fauna of this State.

Forficula davidi Burr

1905. *Forficula davidi* Burr, *Ent. mon. Mag. (Ser. 2)*, 16 : 86, (♂, China : Mou-Pin, Szechwan).

Material examined : INDIA : Himachal Pradesh, Sirmour dist., Habban, 2334 m., 2♂♂ 24.5.80 (Julka & Purohit).

Remarks : This material is a part of the material studied by Purohit, Julka & Lal, 1985.



Figs. 23-29. — *Elaunon bipartitus* (Kirby) ♂ : 23. Ultimate tergite and forceps (macrolabic) ; 24. Ultimate tergite and forceps (cyclolabic). — *Forficula planicollis* Kirby, ♂ : 25. Ultimate tergite and forceps. — *F. schlagintweiti* (Burr) ♂ : 26. Ultimate tergite and forceps. — *F. davidi* Burr, ♂ : 27. Ultimate tergite and forceps. — *Eudohrnia metallica* (Dohrn) ♂ : 28. Ultimate tergite and forceps.—*Allodahlia macropyga* (Westwood) ♂ : 29. Ultimate tergite and forceps.

Elaunon bipartitus (Kirby)

1891. *Sphingolabis bipartita* Kirby, *J. Linn. Soc. Z.*, 23 : 526 (♂, ♀ ; India).

Material examined : INDIA Himachal Pradesh Kulu dist., Ramsheel, 1 ♂, 1 ♀, 24.7.73 ; P.W.D. Rest House (Kulu), 1 ♀, 23.7.73 and 1 ♂, 24.7.73 2 ♂ ♂, 1 ♀, 22.7.73 (Night coll. ; Gandhi Nagar, 1 ♂, 1 ♀, 25.7.73 ; Shimla dist., Jatoo, 2 ♂ ♂, 1 ♀, 29.7.72 genitalia of both males mounted between two coverslips and pinned with the specimen (M. Chandra) ; Solan dist., 2 ♂ ♂ (at light), 14.7.1968 (O. B. Chhotani).

Remarks : Both macro and cyclolabic forms of forceps in males are present in the material studied.

EUDOHRNIINAE**Eudohnia metallica (Dohrn)**

1865. *Forficula metallica* Dohrn, *Stettin. ent. Ztg.*, 26 : 90 (♂, ♀ ; India : Assam).

Material examined : INDIA : Himachal Pradesh : Rajgarh, 1 ♂, 3.9.70 (M. Chandra).

Remarks : This species is reported for the first time from this State.

SUMMARY

The paper deals with 19 species of Dermaptera belonging to 12 genera from various localities of Himachal Pradesh, India. Of these, 9 species are reported for the first time from the area.

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