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Dr. J. R. B. ALFRED
Director
Zoological Survey of India

RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA

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ORTHOPTERA (INSECTA) FAUNA OF ANDAMAN AND NICOBAR ISLANDS

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INTRODUCTION

The Order Orthoptera includes long and short-horned grasshoppers, crickets and grouse locusts. These insects are less known from Andaman and Nicobar Islands. Though several workers like Bhowmik (1967, 1969, 1970, 1977), Ingrisch & Shishodia (1998), Kevan & Jin (1993), Shishodia & Tandon (1975, 1977) and Shishodia et al. (1993) have recorded 70 species from these islands. In the present paper superfamilies Grylloidea, Tettigonioidea and Tetrigoidea are studied. The superfamily Acridoidea will be dealt separately in the second part. In this paper altogether 51 species belonging to 40 genera under 8 families are recorded from these islands, of which 24 species are recorded for the first time from Andaman & Nicobar Islands and are marked with single asterisk (*). The genera *Amusurgus* (Grylloidea), *Phaneroptera* and *Isopsera* (Tettigonioidea) are identified upto the generic level only, whereas *Parendacustes pendleburyi* (Grylloidea) and *Zulpha perlaria* (Tettigonioidea) are recorded for the first time not only from Andaman & Nicobar Islands but also from India. This study is made on the materials received from different Survey parties of Zoological Survey of India, Calcutta, as well as Andaman & Nicobar Regional Station, Zoological Survey of India, Port Blair. The identified materials are deposited in National Zoological Collection Calcutta and Port Blair.

Family : GRYLLOTALPIDAE

Genus *Gryllotalpa* Latreille 1802

1. *Gryllotalpa africana* Beauvois

1805. *Gryllotalpa africana* Beauvois, *Ins. Afr. Amer.*, 229.

1924. *Gryllotalpa africana* : Chopard, *Rec. Indian Mus.*, 26 : 181.

Material examined : 1♂, S. Andaman, Port Blair, Nayagon, 11.i.1991, coll. S. Kumar; 2♀, Great Nicobar, Chingan village, 26.x.1997, coll. S. K. Mandal.

Diagnosis : Anterior legs modified for digging; anterior tibia armed with 4 dactyls; female tegminal veins somewhat diverging and simply curved at base; colouration light brown.

Distribution : India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Meghalaya, Orissa, Pondicherry, Punjab, Tamil

Nadu, Tripura, Uttar Pradesh and West Bengal); Africa; Tropical Asia; Australia; Bhutan; Iran; Madagascar; Malaysia; Myanmar; Singapore and Sri Lanka.

Family : GRYLLIDAE

Genus *Teleogryllus* Chopard 1961

2. *Teleogryllus occipitalis* (Serville)

1838. *Gryllus occipitalis* Serville, *Hist. nat. Ins.*, : 339.

1980. *Teleogryllus occipitalis* : Townsend, *J. nat. Hist.*, **14**(2) : 154.

Material examined : 1 ♂, Great Nicobar, Galathea Bay, 22.i.1993, coll. K. Chandra; 1 ♂, S. Andaman, Chiriatapu, 3.xi.1997, coll. S. K. Mandal; 1 ♂, N. Andaman, Mayabunder, Ninbubera, 8.xi.1997, coll. S. K. Mandal.

Diagnosis : Head chestnut dark-brown, without any markings; pronotum dark-brown; tegmina light-brown; mirror divided by a curved vein in the middle, 4 oblique veins, apical field with 6-7 veins; diagonal vein united with the chords by 3 veins in the middle; tegmina reach upto the last abdominal segment; genitalia of *testaceus* type.

Distribution : India (Andaman Islands, Arunachal Pradesh, Assam, Bihar, Delhi, Himachal Pradesh, Karnataka, Madhya Pradesh, Manipur, Meghalaya, Orissa, Sikkim, Tamil Nadu, Uttar Pradesh and West Bengal); Bangladesh; Bhutan; Borneo; Celebes; Indonesia; Japan; Laos; Malaysia; Philippines; Sri Lanka; Taiwan; Thailand and Tibet.

Genus *Modicogryllus* Chopard, 1961

3. *Modicogryllus confirmatus* (Walker)

1859. *Acheta confirmata* Walker, *Ann. Mag. nat. Hist.*, (3)4 : 221.

1961. *Modicogryllus confirmatus* : Chopard, *Eos, Madr.*, **37** : 272.

Material examined : 1 ♀, S. Andaman, Wandoor Guest House (at light), 21.xii.1991, coll. K. Chandra; 1 ♂, 2 ♀, S. Andaman, Rutland, 25,26.ii.1995, coll. G. C. Rao; 1 ♀, N. Andaman, H. E. P. Area Kalpong 27.ii.1997, coll. K. Chandra.

Diagnosis : Head blackish with 6 longitudinal yellow lines on the occiput and a transverse yellow band between the lateral ocelli; lateral field of tegmina with widely separated veins; mirror longer than wide, divided by a curved vein, 2 oblique veins; wings caudate; ovipositor long with acute apical valves.

Distribution India (Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Delhi, Gujarat, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal); Bangladesh; Indo-china; Iran; Malaysia; Myanmar; Nepal; Pakistan; Philippines; Sri Lanka and Thailand.

Genus *Gryllus* Linnè, 17584. *Gryllus bimaculatus* De Geer

1773. *Gryllus bimaculatus* De Geer, *Mem. Ins.*, 3 : 521.

1969. *Gryllus bimaculatus* : Chopard, *Fauna of India, Grylloid.*, 2 : 35.

Material examined : 1 ♂, S. Andaman, Rutland, 25.ii.1995, coll. G. C. Rao; 1 ♀, N. Andaman, Diglipur, 6.ii.1998, coll. Raja Ram.

Diagnosis : Body and legs almost glabrous; typically black colour with a yellow spot at base of each tegmen; frontal rostrum wide; posterior femora not longer than tibia and metatarsus together.

Distribution : India (Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Bihar, Delhi, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Pondicherry, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh and West Bengal); Malaysia; Myanmar; Pakistan; Singapore; Sri Lanka; also in Africa and Mediterranean region.

Genus *Loxoblemmus* Saussure, 18775. *Loxoblemmus detectus* (Serville)

1839. *Platyblemmus detectus* Serville, *Hist. Nat. Ins. Orth.*, : 356.

1969. *Loxoblemmus detectus* : Chopard, *Fauna of India, Grylloidea* 2 : 123.

Material examined : 1 ♀, S. Andaman, Rutland, Ghasmala, 23.i.1982, coll. R. M. Sharma & M. K. D. Roy; 1 ♀, S. Andaman, Wandoor Guset House, 21.xii.1991, coll. K. Chandra.

Diagnosis : Head brown with yellow lines above; frontal rostrum not wide, feebly projecting; antennae with first segment not with process; labial palpi normal; wings caudate.

Distribution : India (Andaman Islands, Andhra Pradesh, Arunachal Pradesh, Bihar, Mizoram, Sikkim, Uttar Pradesh and West Bengal); China; Java; Johore; Kuala Lumpur; Pahang; Singapore; Sri Lanka; Sumatra and Taiwan.

Genus *Pteronemobius* J. & B. 19056. *Pteronemobius taprobanensis* (Walker)

1869. *Trigonidium taprobanensis* Walker, *Cat. Derm. Salt. Br. Mus.*, 1 : 102.

1925. *Pteronemobius taprobanensis* : Chopard, *Ann. Mag. nat. Hist.* (9)15 : 507.

Material examined : 1 ♀, L. Andaman, Hut Bay, 15.x.1991, coll. K. Chandra; 1 ♀, S. Andaman, Wandoor Guset House, 21.xii.1991, coll. K. Chandra; 3 ♀, N. Andaman, H. E. P. A. Kalpong, 20,21.vi.1994, coll. K. Chandra; 1 ♀, N. Andaman, Aerial Bay Guest House, 24.vi.1994, coll. K. Chandra.

Diagnosis : Tegmina with normal venation; lateral lobes of pronotum and lateral field of tegmina blackish, contrasting with the upper part which is testaceous; posterior femora unicoloured.

Distribution : India (Andaman Islands, Arunachal Pradesh, Assam, Bihar, Delhi, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Rajasthan, Tamil Nadu, Tripura and West Bengal); Bangladesh; China; Malacca; Malaysia; Myanmar; Perak; Sri Lanka and Vietnam.

7. *Pteronemobius indicus* (Walker)

1869. *Nemobius indicus* Walker, *Cat. Derm. Salt. Br. Mus.*, 1 : 58.

1969. *Pteronemobius indicus* : Chopard, *Fauna of India, Grylloidea*, 2 : 159.

Material examined : 1♂, 1♀, S. Andaman, Mt. Harriet National Park, 15.ii.1994, coll. Kailash Chandra.

Diagnosis : Tegmina with normal venation; lateral lobes of pronotum and lateral field of tegmina of the same colour as upper part; tegmina extending to the apex of abdomen; posterior femora unicoloured; ovipositor longer (5 mm.) and straight.

Distribution : India (Andaman Islands, Arunachal Pradesh, Assam, Maharashtra, Meghalaya, Tamil Nadu and West Bengal); Malaysia; Myanmar; Pehang and Sri Lanka.

8. *Pteronemobius concolor* (Walker)

1871. *Eneoptera concolor* Walker, *Cat. Derm. Salt. Br. Mus.*, 5 Suppl. : 10.

1931. *Pteronemobius concolor* : Chopard, *Bull. Raffles Mus.*, No. 6 : 134.

Material examined : 1♂, N. Andaman, North Reef, 24.iii.1993, coll. G. C. Rao; 1♀, S. Andaman, Chiriatapu, 3.xi.1997, coll. S. K. Mandal.

Diagnosis : Tegmina with normal venation; lateral lobes of pronotum and lateral field of tegmina of the same colour as the upper part; colour of the tegmina and pronotum more or less same; tegmina and wings extending to the apex of abdomen; posterior femora unicoloured; posterior tibiae with 4 spines on each margin; ovipositor short and gently curved.

Distribution : India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Delhi, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Orissa, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal); Afghanistan; Malaysia; Myanmar; Perak; Sri Lanka and Turkistan.

Family : OECANTHIDAE

Genus *Oecanthus* Serville, 1831

9. *Oecanthus indicus* Saussure

1878. *Oecanthus indicus* Saussure, *Mem. Soc. Phys. Hist. nat. Geneve*, 25 : 454.

1969. *Oecanthus indicus* : Chopard, *Fauna of India, Grylloidea*, **2** : 267.

Material examined : 1 ♀, S. Andaman, Rutland, 27.ii.1995, coll. G. C. Rao; 1 ♀, N. Andaman, Agriculture farm Neil island, 24.i.1998, coll. Raja Ram.

Diagnosis : First two antennal joints without black markings; size small (14mm.); anterior tibiae strongly dilated at base; posterior tibiae serrulated and armed with certain number of spines; ovipositor short (4.5 mm.).

Distribution : India (Andaman Islands, Arunachal Pradesh, Assam, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Tamil Nadu, Tripura and West Bengal); Ambon; China; Japan; Malaysia; Malaya Archipelago; Philippines; Sri Lanka and Sumba.

Family : TRIGONIDIIDAE

Genus *Trigonidium* Rambur, 1839

10. *Trigonidium cicindeloides* Rambur

1839. *Trigonidium cicindeloides* Rambur, *Fauna Andal.*, **2** : 39.

1969. *Trigonidium cicindeloides* : Chopard, *Fauna of India, Grylloidea* **2** : 304.

Material examined : 5 ♂, 3 ♀, N. Andaman, Aerial Bay, 6.xi.1997, coll. S. K. Mandal.

Diagnosis : Tegmina convex, same venation in both sexes, false veins between the principal veins; wings short; anterior tibiae unperforated.

Distribution : India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Bihar, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Lakshadweep, Maharashtra, Manipur, Mizoram, Meghalaya, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal); Africa; Bhutan; Madagascar; Malaysia; Mauritius Island; Mediterranean region; Myanmar; Nepal; Sri Lanka; S. Europe to S. Asia and all over Africa.

11. **Trigonidium humbertianum* (Saussure)

1878. *Homoseoxiphus humbertianus* Saussure, *Mem. Soc. Geneva*, **25** : 468.

1925. *Trigonidium humbertianum* : Chopard, *Ann. Mag. nat. Hist.* (9) **15** : 525.

Material examined : 1 ♀, 1 ♂, N. Andaman, Aerial Bay, 6.xi.1997, coll. S. K. Mandal.

Diagnosis : This species is similar to the preceding species, except in shape of tegmina which are not so convex and are more longer, long wings and the perforated anterior tibiae.

Distribution : India (Arunachal Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal). Widely distributed in Oriental region.

Genus *Metioche* Stål, 187712. *Metioche* sp.

1877. *Metioche* Stål, *Oefv. Vet.-Akad. Forh.*, **34**(1) : 46.

Material examined : 1 ♂, 1 ♀, S. Andaman, Port Blair, Sippy Ghat, 20.i.1998, coll. Raja Ram.

Diagnosis : Tegmina without or very feebly pubescence; venation similar in both sexes, transverse veinlets numerous; second segment of tarsi somewhat flattened.

Distribution : The genus is distributed in Indo-Australian region and Philippine Islands.

Genus *Amusurgus* Brunner, 189313. **Amusurgus* sp.

1893. *Amusurgus* Brunner, *Ann. Mus. nat. Geneva*, **33** : 212.

Material examined : 1 ♀, S. Andaman, Mt. Harriet National Park, 11.v.1995, coll. K. Chandra.

Diagnosis : Tegmina covered with fine pubescence; veins more or less anastomosed, specially in male; vertex convex; eyes vertically lengthened.

Distribution : The genus is distributed in India, N. Australia, Malaysia, Malaya Archipelago, New Guinea, Myanmar and Sri Lanka.

Genus *Homoeoxipha* Saussure, 187414. *Homoeoxipha lycoides* (Walker)

1869. *Phyllopalpus lycoides* Walker, *Cat. Derm. Salt. Br. Mus.*, **1** : 71.

1925. *Homoeoxipha lycoides* : Chopard, *Ann. Mag. nat. Hist.* (9) **15** : 532.

Material examined : 1 ♂, N. Andaman, H. E. P. A. Kalpong, 27.ii.1997, coll. K. Chandra; 1 ♀, Great Nicobar, Campbell Bay, 16 miles, 27.x.1997, coll. S. K. Mandal; 3 ♂, 2 ♀, N. Andaman, Aerial Bay, 6.xi.1997, coll. S. K. Mandal.

Diagnosis : Pronotum narrowing and rounded in front; tegmina presenting false veins between principal veins; tegmina long and narrow; wings long; posterior tibiae non-serrulated, armed with 3 spines on each margin; second joint of tarsi depressed.

Distribution : India (Andaman Islands, Arunachal Pradesh, Assam, Bihar, Karnataka, Meghalaya, Tamil Nadu, Uttar Pradesh and West Bengal); Australia; Bangladesh; China; Malaysia; Myanmar; Queensland; Singapore; Sri Lanka and Taiwan.

Genus *Anaxipha* Saussure, 187415. *Anaxipha longipennis* (Serville)

1839. *Trigonidium longipenne* Serville, *Ins. Orth.*, : 351.

1924. *Anaxipha longipennis* : Chopard, *Rec. Indian Mus.*, 26 : 188.

Material examined : 1 ♂, Great Nicobar Biosphere Reserve, 16 kms. E.-W. Road, 14.xi.1993, coll. K. Chandra.

Diagnosis : General shape narrow, colouration of head and pronotum uniformly yellow, without rufous spots; legs without reddish spots; posterior femora without brown bands; mirror of male very narrow; wings very long.

Distribution : India (Andaman & Nicobar Islands, Assam, Karnataka, Manipur, Meghalaya, Orissa, Tamil Nadu and West Bengal); E. Africa; Tropical Asia; Madagascar; Malaysia; Mauritius; Myanmar; Philippines; Queensland; Seychelles and Sri Lanka.

Family : ENEOPTERIDAE

Genus *Euscyrtus* Guérin, 184416. *Euscyrtus hemelytrus* (Haan)

1842. *Gryllus (Eneoptera) hemelytra* Haan, *Temminck Verhandle. Orth.*, : 231.

1931. *Euscyrtus hemelytrus* : Chopard, *Bull. Raffles Mus.*, No. 6 : 145.

Material examined : 1 ♀, S. Andaman, Beech Dera, Port Blair, 25.x.1997, coll. M. S. Shishodia.

Diagnosis : Body long and narrow; small in size (13.0 mm.); head short; frontal rostrum short, wide, flattened above, anterior ocellus located almost at apex; pronotum flattened above; ovipositor sinuated in the shape of 'S'

Distribution : India (Andaman & Nicobar Islands, Assam, Orissa, Uttar Pradesh and West Bengal); N. Australia; Tropical Asia; China; Japan; Java; Korea; Malaysia; Moluccas; Myanmar; Sri Lanka and Taiwan.

Genus *Madasumma* Walker, 186917. *Madasumma* sp.

1869. *Madasumma* Walker, *Cat. Derm. Salt. Brit. Mus.*, 1 : 64.

1969. *Madasumma* : Chopard, *Fauna of India, Orthopt.*, 2 Grylloidea : 341.

Material examined : 1 ♀, S. Andaman, Alexander Sword, 15.vi.1982, coll. R. M. Sharma.

Diagnosis : Colour brownish; disc of pronotum weakly convex; anterior tibiae with a weak basal swelling; posterior tibiae with short, subequal external apical spurs; posterior metatarsi short; second segment of tarsi depressed.

Distribution : The genus is distributed in S. Asia, including India and Philippine Islands. It has also been reported from Australia and Madagascar.

Remarks : In absence of male the specimen could not be identified upto the specific level.

Family : PHALANGOPSIDAE

Genus *Parendacustes* Chopard, 1924

18. **Parendacustes pendleburyi* Chopard

1969. *Parendacustes pendleburyi* Chopard. *Fauna of India*, Orthopt., 2 Grylloidea : 250.

Material examined 1 ♂, Great Nicobar Biosphere Reserve, 4-16 kms. E.-W. Road, 15.xi.1993, coll. K. Chandra.

Diagnosis : 5th joint of maxillary palpi very long, dilated at apex; tegmina almost reaching upto the apex of abdomen; mirror more or less as broad as long, anterior angle acute, divided by a curved vein behind the middle; 4 oblique veins; subgenital plate without truncate margin; hind tibiae with 3 spines on each margin.

Measurements (in mm.) Body length 11.0; Pronotum 3.0; tegmen 6.0; posterior femur 14.0; post. tibia 14.0.

Distribution : Previously recorded from Malaysia. It is recorded here for the first time from Andaman & Nicobar Islands of India.

Superfamily : TETTIGONIOIDEA

Family : TETTIGONIIDAE

Subfamily : PHANEROPTERINAE

Genus *Phaneroptera* Serville

19. **Phaneroptera* sp.

1831. *Phaneroptera* Serville, *Ann. Sci. nat.*, 22 : 158.

1956. *Phaneroptera* : Ragge, *Proc. zool. Soc. Lond.*, 127 : 211.

Material examined : 1 ♂, N. Andaman, Kalpong, H. E. P. Area, 20.vi.1994, coll. K. Chandra.

Diagnosis : Fastigium of vertex sulcated dorsally; fore coxae with well developed spine; fore tibiae with oval tympanum, opening on both sides; middle tibiae swollen in basal half; hind tibiae with 3 apical spines on both sides; abdominal tergite without median carina; male cerci with black point.

Distribution : The genus is distributed in Africa, Australia, Celebes, China, Europe, India, Indo-china, Malaysia, Myanmar, Solomon Islands, Sumatra, Thailand etc.

Genus *Isopsera* Brunner, 187820. **Isopsera* sp.

1878. *Isopsera* Brunner, *Mon. Phaneropt.*, : 218.

1923. *Isopsera* : Karny, *Journ. Malayan Br. R. As. Soc.*, 1 : 156.

Material examined : 1♂, S. Andaman, Mt. Harriet National Park, 11.v.1995, coll. K. Chandra.

Diagnosis : Head rounded and short; antennae longer than the body, inserted between the eyes; scrobes weakly margined; eyes small and rounded; prosternum lacks spines; hind tibiae with an apical spine on each side; wings fully developed and tegmina leaf-like.

Distribution : The genus is distributed in Asia.

Genus *Ducetia* Stål, 187421. *Ducetia japonica* (Thunberg)

1815. *Locusta japonica* Thunberg, *Mem. Acad. Sci. St.-Petersb.*, 5 : 282.

1961. *Ducetia japonica* : Ragge, *Bull. Br. Mus. nat. Hist. (Ent.)*, 10(5) : 187.

Material examined : 1♂, N. Andaman, Belapur, 6.ii.1972, coll. B. Dutta; 2♂, N. Andaman, Kalpong, H. E. P. Area, 20.vi.1996, coll. K. Chandra.

Diagnosis : Radius of tegmina with 4-6 closely parallel branches; hind wings well developed; cerci with interno-ventral ridge at apex; subgenital plate deeply bifurcate with continuous lobes.

Distribution : India (Andaman Islands, Arunachal Pradesh, Assam, Bihar, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu and West Bengal). Whole Asia, Indonesia, extending eastwards to Solomon Islands and Southwards to Northern Australia (Ragge, 1961).

Genus *Elimaea* Stål, 1874Subgenus *Orthelimaea* Karny, 192622. *Elimaea (Orthelimaea) securigera* Brunner

1878. *Elimaea securigera* Brunner, *Monogr. Phaneropt.*, : 93.

1990. *Elimaea (Orthelimaea) securigera* : Ingrisch, *Spixiana*, 13(2) : 157.

Material examined : 2♂, Delanipur, Port Blair, 15.ix.1981 and 26.ix.1982, coll. R. M. Sharma.

Diagnosis : Antennae without white rings; pronotum with a fine yellowish carinula; anterior femur straight, front coxae with spines; tegmina broad; radial sector with 3-4 branches; subgenital plate notched in the middle.

Distribution : India (Andaman & Nicobar Islands, Assam, Himachal Pradesh, Karnataka,

Manipur, Meghalaya, Nagaland (in press), Sikkim, Tripura and West Bengal); Australia; Indonesia; Nepal and Sri Lanka. This species is also studied from Andhra Pradesh, Kerala, Madhya Pradesh, Orissa and Rajasthan.

Genus *Holochlora* Stål, 1873

23. **Holochlora nigrotympana* Ingrisch

1990. *Holochlora nigrotympana* Ingrisch, *Senckenbergiana biol.*, **70**(1/3) : 105.

Material examined : 1♂, Great Nicobar Biosphere Reserve, 6 kms. S.-W. Road, 15.xi.1993, coll. K. Chandra.

Diagnosis : Antennae long, yellowish; eyes big, oval, laterally projected; fastigium of vertex narrow than the two antennal segments, dorsally grooved; pronotum, in profile, entirely convex, front margin straight, hind margin convex; terminal tergite concave on anterior and posterior margin.

Distribution : India (Mizoram); Bhutan and Central Thailand.

24. *Holochlora indica* Kirby

1906. *Holochlora indica* Kirby, *Syn. Cat. Orth.*, **2** : 430.

1993. *Holochlora indica* : Barman, *Insecta* : Orthoptera : Tettigoniidae. *State Fauna Series 3 : Fauna of West Bengal*, part 4 : 358.

Material examined : 1♂, S. Andaman, Haddo, Port Blair, 20.x.1997, coll. H. L. Das.

Diagnosis : Fastigium conically produced with rounded apex; anterior margin of pronotum concave, posterior margin convex; radius sector 2 arises from middle of tegmina and bifurcated at basal third; subgenital plate forms a circle at the region of bifurcation; style foot-shaped and the cercus gradually narrowed and curved at apex.

Distribution : India (Andaman Islands, Karnataka, Meghalaya, Orissa, Tamil Nadu and West Bengal); Java and Sri Lanka.

25. *Holochlora traba* Ingrisch & Shishodia

1998. *Holochlora traba* Ingrisch & Shishodia, *Mitt. schweiz. Ent. Ges.*, **71** : 362-363.

Material examined : 1♂, M. Andaman, Rangat, 9.i.1992, coll. A. Mishra. (Holotype)

Diagnosis : Very close to *Holochloa ensis* (De Haan), but differs from it by the lobes of 10th abdominal tergite which is curved ventrally near apex, by the subgenital plate having the narrow apical area longer and divided for a shorter distance. This species also differs from *H. geniculata* Brunner, by the cerci which are only curved at apex and have the apex unispinose. It also differs from *H. nigrospinulosa* Brunner, by the uniform colouration, posterior femora without markings, smaller size and having 6-7 spinules on ventral margins of posterior femora.

Distribution : India (Andaman Islands).

Genus *Zulpha* Walker, 1870

26. **Zulpha perlaria* (Westwood)

1848. *Phaneroptera perlaria* Westwood, *The Cabinet of Oriental Entomology* : 33.

1878. *Eurypalpa perlaria* : Brunner, *Monogr. Phaneropt.*, : 142.

1906. *Zulpha perlaria* : Kirby, *Syn. Cat. Orth.*, 2 : 408.

Material examined : 1 ♂, N. Andaman, Kalpong, H. E. P. Area, 27.ii.1997, coll. K. Chandra.

Diagnosis : Head small; fore tibiae with foramina on both sides; all the femora flattened, pubescent and provided spines on both margins ventrally; tegmina obliquely truncate at apex, provided with pinkish spots irregularly; hind wings longer than tegmina, smoky except at apical point towards costal area and with numerous pinkish spots with whitish centre; cerci curved before apex with small tooth at apex; subgenital plate long, apical part truncate, styli small.

Measurements (in mm.) : Body length 29.0; pronotum 6.0; tegmen 41.0; hind femur 14.0 and hind tibia 12.0.

Distribution : Borneo; Java; Prince of Wales Island and Sumatra.

Remarks : This species is recorded here for the first time not only from Andaman Islands but also from India.

Genus *Trigonocorypha* Stål, 1873

27. **Trigonocorypha crenulata* Thunberg

1815. *Locusta crenulata* Thunberg, *Mem. Acad. Sci. St.-Petersb.*, 5 : 280.

1873. *Trigonocorypha crenulata* : Stål, *Rec. Orth.*, 2 : 44.

1900. *Trigonocorypha crenulata* : Bolivar, *Annl. Soc. ent. Fr.*, 68 : 767.

Material examined : 1 ♀, S. Andaman, Nayagaon, Port Blair, 16.xii.1990, coll. S. Kumar; 1 ♀, S. Andaman, Middle Point, Port Blair, 24.xi.1992, coll. D. D. Prakasham; 1 ♀, S. Andaman, Middle Point, Port Blair, 13.x.1993, coll. P. Boominatham.

Diagnosis : Body colour green; fastigium of vertex triangular, medially sulcated; pronotum disc flat, lateral margin crenulated, anterior margin concave, posterior margin obtusely rounded; anterior tibiae perforated on both sides; hind wings a little longer than tegmina; ovipositor short and curved upwards.

Distribution : India (Orissa and Tamil Nadu); Java and Sri Lanka. It is also studied from Rajasthan and West Bengal.

Subfamily CONOCEPHALINAE

Genus *Conocephalus* Thunberg, 181528. **Conocephalus maculatus* (Le Guillou)

1815. *Xiphidion maculatum* Le Guillou. *Revue Zool.*, 4 : 294.

1980. *Conocephalus maculatus* : Pitkin. *Bull. Br. Mus. nat. Hist. (Ent.)*, 41(5) : 344.

Material examined : 1♂, Little Andaman, Ramkrishanpuram, 19.i.1988, coll. A. N. T. Joseph.

Diagnosis : Prosternum bispinose; hind femora unarmed ventrally; tegmina with large dark-brown spots; stridulatory area of left fore wing small; male cerci with one internal spine.

Distribution : India (Himachal Pradesh, Mizoram, Sikkim and Tripura); Australia; Ethiopian Region; Hong Kong; Indonesia; Java; Malaysia; Melagasian Region; Nepal; New Guinea; Philippines etc. It is also studied from Arunachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Tamil Nadu and West Bengal in India.

29. *Conocephalus longipennis* (De Haan)

1842. *Locusta (Xiphidium) longipennis* De Haan, In : Temminck, C. J. *Verh. Natuurl. Gesch. Ned. Overs. Bezitt.*, 2 : 189.

1980. *Conocephalus longipennis* : Pitkin. *Bull. Br. Mus. nat. Hist. (Ent.)*, 41(5) : 349.

Material examined : 1♂, M. Andaman, Rangat, 1.ii.1972, coll. Mukherjee & Dutta.

Diagnosis : Fastigium of vertex very narrow; prosternum bispinose; fore wings unicolorous; cross veins of costal and precostal areas of tegmina regular; subgenital plate of male with median notch at apex; male cerci with one internal spine with a globular apex.

Distribution : India (Andaman & Nicobar). Widely distributed in the Oriental and Austo-Oriental Region.

Genus *Euconocephalus* Karny, 190730. *Euconocephalus pallidus* (Redtenbacher)

1891. *Conocephalus pallidus* Redtenbacher, *Verh. zool.-bot. Ges. Wien.*, 41 : 414.

1922. *Euconocephalus pallidus* : Hebard, *Proc. Acad. nat. Sci. Philad.*, 74 : 239.

Material examined : 2♂, S. Andaman, Delanipur, Port Blair, 17.ii. and 2.xii.1981, coll. R. M. Sharma and V. Arumugam respectively.

Diagnosis : Body colour green; vertex obtusely produced in front; pronotum obtusely rounded at posterior margin; radius sector 2 arises from middle of tegmina; male subgenital plate with 2 style-like projections; style bifurcated at apex.

Distribution : India (Andaman Islands, Himachal Pradesh, Meghalaya, Uttar Pradesh and West Bengal); Bangladesh; Borneo; Java; Myanmar; Penang (Malaysia); Philippines; Singapore; Sri Lanka and Tonkin. It is also studied from Kerala and Tamil Nadu.

31. *Euconocephalus incertus* (Walker)

1869. *Conocephalus incertus* Walker, *Cat. Derm. Salt. Brit. Mus.*, 2 : 320.

1912. *Euconocephalus incertus* : Karny, *Genera Ins.*, 2(139) : 35.

Material examined : 1♂, N. Andaman, Agriculture farm, Neil Island, 24.i.1998, coll. Raja Ram.

Diagnosis : Colour brown to light green; tegmina with faint narrow black line on anterior margin; male genitalia more or less as in *E. pallidus* (Redtb.).

Distribution India (Andaman & Nicobar Islands, Meghalaya, Orissa, Pondicherry and West Bengal); Java and Sri Lanka. It is also studied from Kerala and Tamil Nadu.

Genus *Hexacentrus* Serville, 1831

32. **Hexacentrus unicolor* Serville

1831. *Hexacentrus unicolor* Serville, *Ann. Sci. Nat.*, 22 : 146.

1912. *Hexacentrus unicolor* : Karny, *Genera Ins.*, 2(131) : 16.

Material examined : 1♂, Great Nicobar, Campbell Bay, Köpenhut, 24.x.1997, coll. S. K. Mandal.

Diagnosis : Hind femora with ventral margin armed with 4-5 spines and middle tibiae with 6 pairs of spines; vertex similar to *E. annulicornis* (Stål); tegmina, near the middle, strongly spread.

Distribution : India (Manipur, Mizoram and Nagaland - all in press); Borneo; Celebes; Cochinchina; China; Japan; Java; Moluccas; Myanmar; Philippines; Singapore; Sumatra and Taiwan.

Genus *Phisis* Stål, 1874

33. *Phisis pectinata* (Guérin)

1830. *Listroscelis pectinata* Guérin, *Voy. Coquille Zool.*, II, Part II : 153.

1922. *Phisis pectinata* : Hebard, *Proc. Acad. nat. Sci. Philad.*, 74 : 266.

Material examined : 1♂, S. Andaman, Shola Bay, 28.v.1982, coll. R. M. Sharma; 1♂, S. Andaman, Port Blair, Ferrargunj Guest House, 31.v.1982, coll. R. M. Sharma & B. Mitra; 1♂, Great Nicobar, South Bay, 18.vii.1984, coll. B. Mitra.

Diagnosis : Anterior coxae with a short spine; anterior femora armed ventrally with 4 internal and 5 external spines; anterior tibiae armed with 6-7 pairs of long, curved spines ventrally and a pair of small distal spines; middle femora armed with 3 external spines ventrally and internal

margin with two short proximal spines and a series of serrulations; middle tibiae armed ventrally with 6-7 pairs of spines and with a mesodorsal spine; hind femora ventrally armed with 11-12 external and 2 internal short spines; subgenital plate narrow.

Distribution India (Andaman Islands); Borneo; Moluccas; New Guinea; Samoa Island and Sri Lanka.

Subfamily : MECOPODINAE

Genus *Mecopoda* Serville, 1831

34. *Mecopoda elongata* (Linnaeus)

1758. *Gryllus (Tettigonia) elongatus* Linnaeus, *Syst. Nat.* (10th ed.) : 429.

1906. *Mecopoda elongata* : Kirby, *Syn. Cat. Orthopt.*, 2 : 364.

Material examined : 1 ♀, S. Andaman, Middle Point, Port Blair, 24.ix.1982, coll. V. Arumugam; 1 ♂, Great Nicobar Biosphere Reserve, 25 kms. on E.-W. Road, 27.iii.1985, coll. M. K. D. Roy; 1 ♂, N. Andaman, Mayabunder, 15.viii.1991, coll. K. Chandra; 1 ♂, S. Andaman, Nayagaon, Port Blair, 14.x.1992, coll. S. Kumar; 1 ♂, Great Nicobar Biosphere Reserve, 27 kms. E.-W. Road, 16.xi.1993, coll. K. Chandra.

Diagnosis : Size very large; colour brown to dry leaf-colour; antennae strongly margined; prosternum with a pair of long spines; pronotum wide at posterior margin; lateral lobes dark-brown at least on upper margin; tegmina with 4-6 white spots in the middle; wings fully developed; male subgenital plate bifurcated, apex pointed.

Distribution : India (Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Maharashtra, Meghalaya, Orissa, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal); Australia; China; Indonesia (Aru Island, Buru Island, Celebes, Moluccas Island); Japan; Malacca; Malaya Islands; New Guinea; Philippines; Sunda Islands; Taiwan and Tonkin.

Subfamily : MECONEMATINAE

Genus *Xiphidiopsis* Redtenbacher, 1891

35. *Xiphidiopsis straminula* (Walker)

1871. *Locusta straminula* Walker, *Cat. Derm. Salt. Brit. Mus.*, 5 suppl. : 36.

1966. *Xiphidiopsis straminula* : Beier, *Orthopt. Catalog.*, part 9 : 267.

Material examined : 1 ♀, S. Andaman, Mt. Harriet National Park, 16.xii.1994, coll. K. Chandra.

Diagnosis : Lateral lobes of pronotum distinctly longer than deep, without a humeral sinus; thoracic foramen fully exposed; anterior tibiae with long, movable spines.

Distribution : India (Andaman & Nicobar Islands, Karnataka, Maharashtra - Bombay, Tamil Nadu and West Bengal); Java and Sri Lanka.

Genus *Alloteratura* Hebard, 192236. *Alloteratura andamanensis* Kevan

1993. *Alloteratura andamanensis* Kevan, *Trop. Zool.*, 6 : 266.

Material examined : Holotype ♂, Little Andaman, Ramkrishnapur, 20.i.1988, coll. M. S. Shishodia.

Diagnosis : Head short; fastigium triangular, without median longitudinal sulcus; eyes large widely separated; maxillary palpi with terminal segment widened distally; pronotal disc about twice as long as wide; thoracic foramen fully exposed; tegmina slightly extend beyond the apex of hind femora; hind wings extended slightly beyond the apex of tegmina; last abdominal tergum truncated posteriorly; cerci somewhat expanded basally, flattened distally and bent inwards; subgenital plate rectangular, with raised lateral margin and bearing a pair of distal styli.

Distribution : This species is known from Little Andaman only.

Subfamily : PSEUDOPHYLLINAE

Genus *Phyllomimus* Stål, 187337. **Phyllomimus deterrentus* (Walker)

1869. *Pseudophyllus deterrentus* Walker, *Cat. Derm. Salt. Brit. Mus.*, 2 : 406.

1962. *Phyllomimus deterrentus* : Beier, *Das Tierreich*, 73 : 91.

Material examined : 1 ♀, N. Andaman, Mayabunder, 3.ii.1998, coll. Raja Ram.

Diagnosis : Olive green in colour; antennae yellowish; tegminal venation irregular, usually with a black spot between median and ulnar veins of tegmina; pronotum with scattered granules, hind margin rounded; ventral margin of lateral lobes bluntly angular; tegmina nearly parallel side, apex broadly rounded, RS arise behind the middle; wings a little shorter than tegmina; hind femora apically and hind tibiae basally light pink; subgenital plate short, triangular, emarginate at apex.

Distribution : Hinter-Indian; Indonesia (Celebes, Moluccas); South China; Java and Philippines.

Suborder : CAELIFERA

Super fam. : TETRIGOIDEA

Family : TETRIGIDAE

Genus *Thoradonta* Hancock, 190838. **Thoradonta apiculata* Hancock

1915. *Thoradonta apiculata* Hancock, *Rec. Indian Mus.*, 11 : 81.

Material examined : 1 ♂, 3 ♀, N. Andaman, Kalpong, H. E. P. Area, 19,20.vi.1994, coll. K. Chandra.

Diagnosis Vertex wider than an eye, slightly narrower in front; paired ocelli placed below the middle of eyes; antennae inserted on the inferior margin of eyes; pronotum extended beyond the apex of hind femora; dorsum rugose, granulate, a little depressed on either side in front and behind the shoulders; posterior angles of lateral lobes of pronotum produced into a small spine with a wide base, margin not sinuated in front, spine directed posteriorly; wings extended upto the apex of pronotum.

Distribution : India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Orissa, Tamil Nadu and West Bengal); China and Myanmar.

39. **Thoradonta nodulosa* (Stål)

1860. *Tetrix nodulosa* Stål, *Eugenies Resa Orth.* : 346.

1915. *Thoradonta nodulosa* : Hancock, *Rec. Indian Mus.*, 11 : 82.

Material examined : 3♂, Great Nicobar, Galathea Bay, 23.iii.1966, coll. Daniel & Bhowmik; 1♂, 1♀, Great Nicobar, Galathea Bay, 5.iv.1966, coll. Daniel & Bhowmik; 1♂, S. Andaman, Ferrargunj, 17.i.1972, coll. K. S. Pradhan.

Diagnosis : Vertex more or less equal to an eye; pronotum a little extended beyond the apices of hind femora; dorsum rugose, depressed in front and behind the shoulders; the upper lobe of posterior angles of lateral lobes of pronotum produced into a sharp spine which is directed posteriorly, lower lobe obliquely produced with pointed apex; posterior femora stouter, with a series of nodules on the upper and lower marginal areas.

Distribution : India (Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Manipur, Meghalaya, Sikkim, Tamil Nadu, Tripura and West Bengal); China; Hainan; Java; Malaysia; Myanmar; Singapore; Sri Lanka and Sumatra.

Genus *Eucriotettix* Hebard, 1929.

40. **Eucriotettix grandis* (Hancock)

1912. *Criotettix grandis* Hancock, *Mem. Dep. Agric. India, Ent. Ser.*, 4 : 134.

1929. *Eucriotettix grandis* : Hebard, *Revue suisse Zool.*, 36 : 573.

Material examined 1♂, S. Andaman, Shadipur, Port Blair, 30.vii.1992. coll. K. Chandra.

Diagnosis : Size large; vertex narrower than an eye; frontal costa distinctly bifurcate behind the paired ocelli; paired ocelli placed between the eyes; antennae located on the inferior margin of eyes; pronotum extended beyond the apices of posterior femora; dorsum granulate; posterior angles of lateral lobes of pronotum laminated, anterior margin with triangular sharp spine, directed subobliquely or posteriorly, posterior margin subtruncate; wings extended upto the apex of pronotum.

Distribution : India (Arunachal Pradesh, Assam, Meghalaya, Sikkim and West Bengal); China and Myanmar. It is also being recorded from Mizoram and Tripura (in press).

41. **Eucriotettix maculatus* (Kirby)

1914. *Criotettix maculatus* Kirby, *Faun. Brit. India. Orth.*, : 32.

1929. *Eucriotettix maculatus* : Hebard, *Revue Suisse Zool.*, **36** : 573; 575.

Material examined : 2♂, Little Andaman, Hutbay, Water fall, 10.iii.1991, coll. S. Kumar.

Diagnosis : Vertex narrower than an eye; lateral lobe of pronotum produced into a sharp spine; spine slender at base and curved forwards; pronotum and wings extended beyond the apex of hind femora.

Distribution : India (Karnataka, Tamil Nadu) and Myanmar.

42. **Eucriotettix spinilobus* (Hancock)

1904. *Criotettix spinilobus* Hancock, *Spolia zeylan.*, **2** : 108.

1929. *Eucriotettix spinilobus* : Hebard, *Revue suisse Zool.*, **36** : 573, 575.

Material examined : 16♂, 10♀, Great Nicobar, Casuarina Bay, 5,6.iv.1966, coll. Daniel & Bhowmik; 2♂, N. Andaman, North Reef, 26.iii.1993, coll. G. C. Rao.

Diagnosis : Vertex subequal in width to one of the eyes; posterior angles of lateral lobes of pronotum of each side with strong, sharp spine which is curved forward and thick at base.

Distribution : India (Karnataka, Kerala and Tamil Nadu); Penang and Sri Lanka.

Genus *Loxilobus* Hancock, 1904

43. **Loxilobus brunneri* Günther

1938. *Loxilobus brunneri* Günther, *Stettin. ent. Ztg.*, **99** : 214.

Material examined : 1♂, 4♀, Great Nicobar Biosphere Reserve 16 kms. E.-W. Road, 13.xi.1993, coll. K. Chandra.

Diagnosis : Inter ocular distance a little narrower or equal than an eye; eyes raised above the vertex; frontal costa raised between antennae; antennae inserted below the lower margin of eyes; pronotum transverse at anterior margin, hind process reaching or not beyond the apex of hind femora; dorsum granulate and rugulose; middle carina interrupted; lateral lobes of pronotum laminate and notched in the middle; prozonal carinae well-marked; 1st and 3rd tarsal segments more or less equal.

Distribution : India (Tripura); China and Myanmar.

Genus *Hyboella* Hancock, 1915

44. **Hyboella dilatata* (De Haan)

1842. *Acridium Tetrix dilatatum* De Haan, *Temminck, Verhandel. Orth.* : 167, 169.

1915. *Hyboella dilatata* : Hancock, *Rec. Indian. Mus.*, **11** : 107.

Material examined : 3 ♀, Great Nicobar, Campbell Bay, 5.10.iii.1966, coll. Daniel & Bhowmik.

Diagnosis : Stature stout; vertex slightly wider than an eye; triangular fossulae present on either side of each eye; median carinula distinct on the middle of the vertex and runs upto the frontal costa in front, obliterated behind the middle; frontal costa narrow between the lateral ocelli, wide at anterior ocellus region; antennae located at the lower margin of eyes; pronotum angulate in front, extended upto the apex of hind knees; dorsum granulose; median carina raised in front and between the shoulders, low behind, apex slightly notched in the middle; angles of lateral lobes of pronotum expanded and quadrate at apex.

Measurements (in mm.) : Body length 13.5; pronotum 11.0; hind femur 8.0; hind tibia width 3.0.

Distribution : India (Arunachal Pradesh, Assam); China; Java; Key Islands; Malaysia; Myanmar; Sumatra; Thailand and Tibet.

Genus *Euparatettix* Hancock, 1904

45. **Euparatettix variabilis* (Bolivar)

1887. *Paratettix personatus* Bolivar, *Annls. Soc. ent. Belg.*, **31** : 276.

1992. *Euparatettix variabilis*; Blackith, *Cat. S. E. Tetrigidae*, : 66.

Material examined : 1 ♀, S. Andaman, Aberdeen, Port Blair, 30.viii.1928, coll. R. B. S. Sewell; 1 ♂, S. Andaman, Denni Point, 3.ix.1928, coll. R. B. S. Sewell.

Diagnosis : Head a little exserted above the level of pronotum; vertex subequal than an eye, a little narrowed forwards; frontal costa bifurcate behind the paired ocelli; narrowly sulcate; paired ocelli placed between the middle of eyes; antennae filiform, located on the lower margin of eyes; eyes raised above the level of vertex and pronotum; pronotum truncate in front, subulate posteriorly and extended beyond the apex of hind femora; dorsum granulose; median carina indistinctly sinuate on hind process of pronotum; lateral carinae very finely serrulate on hind process of pronotum; wings extended beyond the apex of pronotum; hind tibiae dense black with white annulations just behind the knee.

Distribution : India (Throughout); Bangladesh; Bhutan; Borneo; Java; Myanmar; New Britain; New Guinea; Pakistan; Papua; Philippines; Solomon Islands; Sri Lanka; Sumatra and Taiwan.

Genus *Pseudoparatettix* Günther, 1937

46. **Pseudoparatettix histricus* (Stål)

1861. *Tetrix histricus* Stål, *Freq. Eugenes Resa. Orth.*, : 347.

1992. *Pseudoparatettix histricus* : Blackith, *Cat. S. E. Asian Tetrigidae* : 149.

Material examined : 1 ♀, S. Andaman, Port Blair, 15.ii.-15.iii.1915, coll. S. W. Kemp; 1 ♂,

Aberdeen, 30.viii.1928, coll. R. B. S. Sewell; 1 ♀, Aberdeen, 3.ii.1930, coll. R. B. S. Sewell; 1 ♂, Nancowry, Katchal Island, 12.ii.1993, coll. D. V. Rao; 1 ♀, Great Nicobar Biosphere Reserve, 16 kms. E.-W. Road, 12.xi.1993, coll. K. Chandra; 5 ♂, 3 ♀, S. Andaman, Mount Harriet, 16.xii.1994, coll. K. Chandra.

Diagnosis : Size large and body robust; head a little raised above the pronotum; pronotum moderately dilated between shoulders, extended beyond the apex of hind femora; median carina of pronotum arcuate forward, often little undulate before shoulders, low on shoulders and straight behind; hind tibiae unicoloured or obscurely marked; wings extended beyond the pronotal apex.

Distribution : India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Tamil Nadu, Tripura and West Bengal); E. Afghanistan; E. Africa; Australia; Borneo; Caledonia; Celebes; S. China; Holland; Indonesia; Iran; Malaysia; New Ireland; Pakistan; Philippines; Queensland; Saudi Arabia; Solomon Islands; Sri Lanka; Sumatra and Taiwan.

Genus *Paratettix* Bolivar, 1887

47. **Paratettix tricarinatus* Bolivar

1887. *Paratettix tricarinatus* Bolivar, *Annls. Soc. ent. Belg.*, 31 : 282.

1987. *Paratettix tricarinatus* : Shishodia, Tetrigidae : Orthoptera : Insecta : *State Fauna Series 1 : Fauna of Orissa*, Part 1 : 95.

Material examined : 1 ♂, 1 ♀, S. Andaman, Port Blair, 15.ii.-15.iii.1915, coll. S. W. Kemp; 1 ♂, Aberdeen, 30.vii.1928, coll. R. B. S. Sewell; 1 ♂, Denni Point, 3.ix.1928, coll. R. B. S. Sewell; 1 ♀, Great Nicobar, 19 kms. E.-W. Road, 25.i.1993, coll. K. Chandra.

Diagnosis : Head not exserted; vertex narrower than an eye; front margin of vertex truncate, middle carinula distinct and reach upto the end of fossulae; pronotum extended beyond the apices of posterior femora and the hind wings surpass the pronotal apex; apex of tegmina not narrowed.

Distribution : India (Meghalaya, Orissa, Tripura and West Bengal); Celebes; Malaysia; Mindanao; Papua; Philippines; Sumatra and Taiwan.

Genus *Coptotettix* Bolivar, 1887

48. **Coptotettix conspersus* Hancock

1915. *Coptotettix conspersus* Hancock, *Rec. Indian Mus.*, 11 : 119.

Material examined : 1 ♀, N. Andaman, Mayabunder, 10.v.1971, coll. B. K. Tikadar; 1 ♀, N. Andaman, 2 kms. south from Tugapur, Mayabunder, 12.v.1971, coll. B. K. Tikadar; 1 ♂, 1 ♀, S. Andaman, Chiriatapu Guest House, 22.x.1972. coll. P. T. Cherian; 1 ♂, 1 ♀, S. Andaman, Shadipur, Port Blair, 30.vii and 13.x.1992 coll. K. Chandra; 1 ♂, 1 ♀, Yatriniwas, Port Blair, 2.ix.1993, coll. K. Chandra; 2 ♂, 2 ♀, N. Andaman, Kalighat Guest House compound, 17.vi.1994, coll. K. Chandra; 2 ♂, 9 ♀, N. Andaman, Kalpong H. E. P. Area, 19,20,21.vi.1994, coll. K. Chandra; 2 ♂, 3 ♀, N. Andaman, Aerial Bay Guest House, 24,26.vi.1994, coll. K. Chandra; 1 ♂, S. Andaman, Wandoor, 2.xi.1997, coll. S. K. Mandal.

Diagnosis Head not exserted above the surface of pronotum; vertex more narrowed towards front; pronotum extended beyond the hind femoral apices, finely granulose with scattered wrinkles on hind process of pronotum; lateral lobes of pronotum narrow, roundly truncate; ovipositor robust.

Distribution : India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Orissa, Tripura, Uttar Pradesh and West Bengal) and Sri Lanka.

Genus *Hedotettix* Bolivar, 1887

49. **Hedotettix attenuatus* Hancock

1904. *Hedotettix attenuatus* Hancock, *Spolia zeylan.*, 2 : 108, 149.

Material examined : 1♂, Great Nicobar, Casuarina Bay, 21.iii.1966, coll. Daniel & Bhowmik; 4♂, Great Nicobar, Galathea Bay, 23.iii.1966, coll. Daniel & Bhowmik; 1♂, 1♀, Car Nicobar, Arong, 27.xii.1972, coll. K. S. Pradhan; 1♀, Great Nicobar Biosphere reserve, 19 kms. E.-W. Road, 25.i.1993, coll. K. Chandra.

Diagnosis : Body slender; head not exserted above the surface of pronotum; vertex narrower than an eye; frontal costa bifurcated behind the paired ocelli, not suddenly divergent between antennae; frontal sulcus gently wide rather narrow; pronotum subtruncate anteriorly, extended upto or beyond the apex of hind femora, apex narrowly rounded; dorsum smooth; hind wings extended upto or beyond the apex of pronotum.

Distribution : India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Orissa, Sikkim, Tripura and West Bengal) and Sri Lanka.

Remarks : Both macro and microforms are studied.

50. *Hedotettix gracilis* (De Haan)

1842. *Acridium (Tetrix) gracilie* De Haan, *Temminck, Verhandel.*, Orth., : 167.

1887. *Hedotettix gracilis* : Bolivar, *Annls. Soc. ent. Belg.*, 31 : 284.

Material examined : 1♀, Great Nicobar, Campbell Bay, 3.iii.1966, coll. Daniel & Bhowmik; 5♂, 2♀, Great Nicobar, Galathea Bay, 21.iii.1966, coll. Daniel & Bhowmik; 2♀, Great Nicobar, Shivadul Bay, 15.iv.1966, coll. Daniel & Bhowmik; 1♂, Great Nicobar, Phulabaur, 17.iv.1966, coll. Daniel & Bhowmik; 1♀, M. Andaman, Rangat, 1.ii.1972, coll. B. K. Dutta; 1♂, S. Andaman, Marina Hill, Port Blair, 15.xii.1972, coll. K. S. Pradhan; 1♀, S. Andaman, Humfreygunj, 17.xii.1972, coll. K. S. Pradhan; 1♂, Car Nicobar, Arong, 27.xii.1972, coll. K. S. Pradhan; 1♀, Little Andaman, Netajinagar, 17.i.1988, coll. A. N. T. Joseph; 1♀, L. Andaman, 3 kms. away from Hut Bay, 22.i.1988, coll. A. N. T. Joseph; 1♂, 1♀, L. Andaman, Ramkrishnapuram, 29.i.1988, coll. A. N. T. Joseph; 2♀, S. Andaman, Rutland, 3,4.ii.1988, coll. A. N. T. Joseph; 1♂, Great Nicobar, Campbell Bay, 20.i.1993, coll. K. Chandra; 2♂, 1♀, Great Nicobar, Galathea National Park, 22.i.1993, coll. K. Chandra; 1♀, Nancowry, Katchal Island, 13.ii.1993, coll. D. V. Rao; 4♂, 4♀, Great Nicobar Biosphere Reserve, 41 kms. E.-N. Road, 18.xi.1993, coll. K. Chandra; 1♂, N. Andaman, Aerial Bay, Guest House campus, 24.vi.1994, coll. K. Chandra.

Diagnosis : Vertex very little or not at all raised above the surface of pronotum; antennae inserted below the middle of eyes; frontal costa widely sulcated, the rami widened between the antennae; pronotum angulate anteriorly, extended upto or beyond the apex of hind femora; wings upto or a little surpass pronotal apex.

Distribution : India (Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Sikkim, Tripura and West Bengal); Bangladesh; Celebes; China; Java; Myanmar; Pakistan; Sri Lanka; Sumatra; Taiwan; Thailand and Vietnam.

Remarks : This species is found in both micro and macroforms.

Genus *Ergatettix* Kirby, 1914

51. **Ergatettix dorsiferus* (Walker)

1871. *Tettix dorsifera* Walker, *Cat. Derm. Salt. Brit. Mus.*, 5 : 825.

1992. *Ergatettix dorsiferus* : Blackith, *Cat. S. E. Asian Tetrigidae* : 52.

Material examined : 1♂, S. Andaman, Port Blair, 15.ii.-15.iii.1915. coll. S. W. Kemp; 2♂, 2♀, S. Andaman, Port Blair, 18.iii.1969, coll. T. D. Soota; 1♂, Car Nicobar, Arong, 27.xii.1972, coll. K. S. Pradhan; 1♀, Nancowry, Ketchal Island, 12.ii.1993, coll. D. V. Rao; 1♂, 1♀, Great Nicobar Biosphere Reserve, 10 kms. E.-W. Road (at light), 10,11.xi.1993, coll. K. Chandra; 3♂, 2♀, Great Nicobar Biosphere Reserve, 12,13,14,15,16.xi.1993, coll. K. Chandra.

Diagnosis : Head distinctly exserted above the surface of pronotum; vertex much narrower than an eye; frontal costa arcuate between antennae; paired ocelli located between the lower-third of eyes; antennae inserted below the eyes; pronotum truncate anteriorly, extended beyond the apex of hind femora; median carina indistinctly undulate; lateral carinae without dilated lobes on hind process of pronotum; middle femora less flattened, margins a little lobate; hind femora with less protuberant tubercles on external surface.

Distribution : India (Arunachal Pradesh, Assam, Bihar, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal); Afghanistan; Bangladesh; Central Asia; S. China; Greater Sunda Island; Indonesia (Sumba); Iran; Java; Myanmar; Nepal; Sri Lanka; Sumatra and Taiwan.

SUMMARY

Altogether 51 species of Orthoptera belonging to 40 genera under 8 families are recorded from Andaman & Nicobar Islands. These include 18 species (15 genera, 6 families) of Grylloidea, 19 species (15 genera, 1 family) of Tettigonioidea and 14 species (10 genera, 1 family) of Tetrigoidea from these Islands. Five species (3 species of Grylloidea and 2 species of Tettigonioidea) are identified upto generic level only and two species (1 species of Grylloidea and 1 species of Tettigonioidea) are recorded for the first time not only from A. & N. Islands but also from India.

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STUDIES ON THE ODONOTA FAUNA OF ANDAMAN AND NICOBAR ISLANDS

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INTRODUCTION

The archipelago of Andaman and Nicobar Islands is well known for its unique bio-genetic resources. These oceanic islands provide an ample scope of study of its Zoogeography. These islands are peaks of a submerged mountain hill range starting from Arakan Yoma in Myanmar in the north to Sumatra in Indonesia in the south, between latitudes 6°45' and 13°41' N and longitudes 92°12' and 93°57' E. The island group comprises of more than 500 islands, islets and rocks with a total coastline of about 1962 Km. The area of these islands covers 8,249 Km².

The climate of these islands is tropical with hot-humid conditions. The islands receive rainfall from both the south-west and north-east monsoons. The maximum precipitations is between april to December, the driest period being between January to March. The temperature ranges from 22°C to 33°C and relative humidity usually ranging between 80% to 90% throughout the year. Despite the heavy rainfall, the islands possess very few freshwater stream, which are mostly present in Andaman and Great Nicobar Islands.

These islands are occupied by about 86% of the forest area, which support luxuriant growth of evergreen, semievergreen, moist deciduous, littoral and mangrove forests from water's edge to the hill-tops, depending on the topography and nature of soil. The vegetation is mainly composed of the Indo-Myanmar type in Andamans, while the Malayan elements are present in Nicobar group of Islands.

The first report on Odonata fauna of Andaman and Nicobar Islands was published by Selys (1853), who described new species of damselfly, *Libellago lineata blanda* from Great Nicobar Island. Subsequently, two more species, viz. *Copera vittata serapica* (Selys) and *Epophthalmia vittata* (Burmeister) were also reported by Selys in 1863 and 1871 respectively. Fraser (1924) reported 9 species on the material of Dr. N. Annandale, who collected 17 specimens of odonates from these islands during the months of November and December, 1923. Later on all these species were included in the "Fauna of British India" by Fraser (1933, 1934, 1936).

After a long gap, Chhotani *et al.* (1983) studied the material of Odonata present in the Z.S.I. HQ, Calcutta, collected by the various survey parties from Andaman and Nicobar Islands and

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added 21 species/subspecies including the description of two species i.e. *Gomphidia ganeshi* and *Oligoaeschna andamani*, which raised the total number of species and subspecies to 34 under 24 genera. Lahiri and Mitra (1993) added eight species new to the odonate fauna of these islands. Mitra (1995) worked on the old collection of Great Nicobar Island and added 8 species to the fauna of the Island. Since 1991, several surveys to different parts of Andaman and Nicobar Islands were undertaken by the authors and staff of Andaman and Nicobar Regional Station, Port Blair, Which resulted into the addition of eight species, of which seven species, viz. *Pseudagrion microcephalum* (Rambur), *Gomphidia T-nigrum* Selys, *Gynacantha bayadera* Selys, *Cratilla lineata calverti* Foerster, *Lyriothemis cleis* Brauer, *Indothemis carnatica* (Fabricius) and *Zyxomma petiolatum* Rambur are new records to the Andaman and Nicobar Islands; while one species, i.e. *Cratilla metallica* (Brauer) is new addition to the odonate fauna of India. A running key for the identification of known species of Andaman and Nicobar is provided. The paper also furnishes an uptodate list of Odonata fauna of these islands. The distribution of each species spread over group of Islands is also appended as Table I.

LIST OF ODONATA FROM ANDAMAN AND NICOBAR ISLANDS

Order : ODONATA
 Suborder : ZYGOPTERA
 Superfamily : COENAGRIONOIDEA
 Family : COENAGRIONIDAE

1. *Ceriagrion cerinorubellum* (Brauer)
2. *Ceriagrion olivaceum* Laidlaw
- **3. *Pseudagrion microcephalum* (Rambur)
4. *Pseudagrion andamanicum* Fraser
5. *Pseudagrion pruinosum* (Burmeister)
6. *Pseudagrion williamsoni* Fraser
7. *Aciagrion pallidum* Selys
8. *Ischnura senegalensis* (Rambur)
9. *Agriocnemis femina oryzae* (Lieftinck)
10. *Agriocnemis pygmaea* (Rambur)
11. *Argiocnemis rubescens rubeola* Selys

* Species recorded for the first time from India.

** Species recorded for the first time from Andaman and Nicobar Islands.

Family PLATYCNEMIDIDAE

12. *Copera marginipes* (Rambur)

13. *Copera vittata serapica* (Selys)

Family : PLATYSTICTIDAE

14. *Drepanosticta annandalei* Fraser

Family : PROTONEURIDAE

15. *Prodasineura verticalis andamanensis* (Fraser)

Superfamily : LESTOIDEA

Family : LESTIDAE

16. *Lestes malabarica* Fraser

17. *Lestes praemorsa praemorsa* Selys

Superfamily : CALOPTERYGOIDEA

Family : CALOPTERYGIDAE

18. *Vestalis gracilis gracilis* (Rambur)

Family : CHLOROCYPHIDAE

19. *Libellago lineata andamanensis* (Fraser)

20. *Libellago lineata blanda* (Selys)

21. *Libellago aurantiaca* (Selys)

Suborder : ANISOPTERA

Superfamily : AESHNOIDEA

Family : GOMPHIDAE

**22. *Gomphidia T-nigrum* Selys

23. *Gomphidia ganeshi* Chhotani, Lahiri and Mitra

Family : AESHNIDAE

24. *Anaciaeschna jaspidea* (Burmeister)

25. *Oligoaeschna andamani* Chhotani, Lahiri and Mitra

26. *Anax guttatus* (Burmeister)

27. *Gynacantha dravida* Lieftinck

28. *Gynacantha subinterrupta* Rambur

**29. *Gynacantha bayadera* Selys

Superfamily LIBELLULOIDEA

Family CORDULIIDAE

30. *Epophthalmia vittata vittata* Burmeister

Family LIBELLULIDAE

31. *Agrionoptera insignis* (Rambur)

*32. *Cratilla metallica* (Brauer)

**33. *Cratilla lineata culverti* Foerster

34. *Lathrecista asiatica asiatica* (Fabricius)

35. *Nesoxenia lineata* (Selys)

**36. *Lyriothemis cleis* Brauer

37. *Orthetrum chrysis* (Selys)

38. *Orthetrum pruinorum neglectum* (Rambur)

39. *Orthetrum sabina sabina* (Drury)

40. *Potamarcha congener* (Rambur)

41. *Acisoma panorpoides panorpoides* Rambur

42. *Brachythemis contaminata* (Fabricius)

43. *Crocothemis servilia servilia* (Drury)

44. *Diplacodes trivialis* (Rambur)

**45. *Indothemis carnatica* (Fabricius)

46. *Neurothemis fulvia* (Drury)

47. *Neurothemis fluctuans* (Fabricius)

48. *Neurothemis intermedia intermedia* (Rambur)

49. *Trithemis aurora* (Burmeister)

50. *Trithemis festiva* (Rambur)

51. *Trithemis pallidinervis* (Kirby)

52. *Rhyothemis phyllis phyllis* (Sulzer)

53. *Rhyothemis variegata variegata* (Linnaeus)

54. *Camacinia gigantea* (Brauer)

55. *Pantala flavescens* (Fabricius)

56. *Tramea virginia* (Rambur)

57. *Tholymis tillarga* (Fabricius)

**58. *Zyxomma petiolatum* Rambur

SYSTEMATIC ACCOUNT

Key to the suborders of order ODONATA

1. Eyes are well separated; fore and hind wings are more or less of the same shape and breadth. ZYGOPTERA
- Eyes usually confluent or slightly separated; fore and hind wings variable in shape; hind wing usually broader at the base than the forewing. ANISOPTERA

Suborder : ZYGOPTERA

Key to the families of the suborder ZYGOPTERA

1. Only 2 antenodal nervures. 3
- More than 2 antenodal nervures. 2
2. Epistome tumid and projecting markedly like a nose in front of face; abdomen shorter than the wings. CHLOROCYPHIDAE
- Epistome normal, face depressed, abdomen always larger than the wings. CALOPTRYGIDAE
3. The nervure 1A absent and Cuii markedly reduced. PLATYSTICTIDAE
- The nervure 1A present, Cuii of normal length or reduced. 4
4. No intercalated sectors at apical end of wing. 5
- A variable number of intercalated sectors at apical end of wing. LESTIDAE
5. Discoidal cell in hind wing with costal margin less than fourth. COENAGRIONIDAE
- Discoidal cell in the hind wing with costal margin more than three fourth as long as the inner margin. 6
6. Discoidal cell with costal margin one fifth shorter than the inner margin. PLATYCNEMIDIDAE
- Discoidal cell with costal margin subequal to the inner margin. PROTONEURIDAE

Key to the genera of family COENAGRIONIDAE

1. Arc situated distal to the level of distal antenodal nervure. AGRIOCNEMIS Selys
- Arc situated at the level of distal antenodal nervure. 2
2. Anal bridge arising from hind border of the wing at the point where Ac meets it. 3
- Anal bridge arising from hind border of the wing slightly proximal to the point where Ac meets it. ISCHNURA Charpentier

3. A proximal ridge on the frons; no postocular coloured spots on head; head and thorax of a uniform colour, without any dark markings. CERIAGRION Selys
 - No ridge on frons; postocular coloured spots always present; head and thorax not of uniform colour and usually with black or dark markings. 4
4. Pterostigma in forewing larger than that in the hind; abdomen usually very long and slender; female with an apical ventral spine on segment eight. ACIAGRION Selys
 - Pterostigma of same size in both the wings; abdomen not unduly long and slender; female without a ventral spine on apical border of segment eight. PSEUDAGRION Selys

Family : COENAGRIONIDAE

Genus *Ceriagrion* Selys

Keys to the species of *Ceriagrion* Selys

1. Abdomen uniform dull olivaceous. *olivaceum* Laidlaw
 - Abdomen bright red at base and anal ends, black on dorsum in between.
..... *cerinorubellum* (Brauer)

1. *Ceriagrion cerinorubellum* (Brauer)

1865. *Pyrrhosoma cerinorubellum* Brauer, *Vérh. zool.-bot. Ges. Wien.*, 15 : 511.

1876. *Ceriagrion cerinorubellum*, Selys, *Bull. Acad. Belg.* (2), 42 : 526.

1933. *Ceriagrion cerinorubellum*, Fraser, *Fauna Brit. India, Odon.*, 1 : 326-328.

1983. *Ceriagrion cerinorubellum*, Chhotani *et. al.*, *Rec. zool. Surv. India*, 80 : 476.

Material studied : 1 ♂, North Andaman, 11.3.93, G. C. Rao.

Distribution in A. & N. North Andaman, South Andaman, Little Andaman and Viper Island.

Elsewhere : Throughout India, Sri Lanka, Myanmar and Malaysia.

Remarks This is one of the common species in Indian subcontinent but rare in Andamans.

2. *Ceriagrion olivaceum* Laidlaw

1914. *Ceriagrion olivaceum* Laidlaw, *Rec. Indian Mus.*, 8 : 345-346.

1933. *Ceriagrion olivaceum*, Fraser, *Fauna Brit. India, Odon.*, 1 : 324-326.

Distribution in A. & N. South Andaman and Car Nicobar Island.

Elsewhere : India (Arunachal Pradesh, Assam, Kerala, Manipur, Maharashtra, Orissa, Uttar Pradesh and West Bengal).

Remark : This species is included here on the basis of literature review.

Genus : *Pseudagrion* Selys

Key to the species of *Pseudagrion* Selys

1. Thorax black, densely pruinosed, especially on dorsum. *pruinsum* (Burm.)
- Thorax azure blue or green on dorsum. 2
2. Superior anal appendages expanded on the inner side and bearing 1 to 3 small spines near base. 3
- Superior anal appendages without any spine at base. *williamsoni* Fraser
3. Dorsal marking on segment 2 goblet-shaped. *microcephalum* (Rambur)
- Dorsal marking on segment 2 narrow rectangular. *andamanicum* Fraser

****3. *Pseudagrion microcephalum* (Rambur)**

1842. *Agrion microcephalum* Rambur, *Hist. nat: Ins. Nevropteres*, : 259.

1876. *Pseudagrion microcephalum*, Selys, *Bull. Acad. Belg.*, (2)42 : 504.

1933. *Pseudagrion microcephalum*, Fraser, *Fauna Brit. India. Odon.*, 1 : 278-280.

Material studied : 1♂, Nicobar, Trinket Island, 17.2.93, D. V. Rao.

Distribution in A. & N. : Middle Nicobar (Trinket Island).

Elsewhere : Throughout plains of India.

Remarks : This species is recorded for the first time from Andaman & Nicobar Islands. The specimen examined is very tender and its anal appendages compressed. The abdominal marking on segment 2 and presence of three small spines on the superior appendages confirm the species identity.

4. *Pseudagrion andamanicum* Fraser

1924. *Pseudagrion andamanicum* Fraser, *Rec. Indian Mus.*, 26 : 411-412.

1933. *Pseudagrion andamanicum*, Fraser, *Fauna Brit. India, Odon.*, 1 : 281-282.

1983. *Pseudagrion andamanicum*, Chhotani *et. al.* *Rec. zool. Surv. India*, 80 : 477.

1987. *Pseudagrion andamanicum*, Prasad, *et. al.*, *Bull. zool. surv. India*, 8(1-3) : 314.

Material studied : 1♂, Little Andaman, 12.3.91, S. Kumar.

Distribution in A. & N. : South Andaman, Little Andaman and Great Nicobar.

Elsewhere India (Orissa).

Remarks This specimen differs from Fraser's description mainly on length of abdomen and wings, which are 31mm. and 22mm. respectively. It is recorded for the first time from Little Andaman.

5. *Pseudagrion pruinsum* (Burmeister)

1839. *Agrion pruinsum* Burm.. *Handb. Ent.*, 2 : 821.

1933. *Pseudagrion pruinsum*. Fraser. *Fauna Brit. India. Odon.*, 1 : 305-306.

1995. *Pseudagrion pruinsum*. Mitra. *Opusc. zool. flumin.*, 129 : 2.

Material studied : 1♂, Great Nicobar, Galathea National Park, 17.11.93, K. Chandra.

Distribution in A. & N. : Great Nicobar.

Elsewhere : Extending from Myanmar to Indo-China & Java.

Remarks : This species was first recorded by Mitra (1995) from Great Nicobar as subspecies of *P. pruinsum*. The present identification confirms the presence of the same species.

6. *Pseudagrion williamsoni* Fraser

1922. *Pseudagrion williamsoni* Fraser. *Mem. Dep. Agric. India (Ent.)*, 7 (7) : 46-47.

1933. *Pseudagrion williamsoni*, Fraser. *Fauna Brit. India, Odon.*, 1 : 300-302.

1995. *Pseudagrion williamsoni*, Mitra. *Opusc. zool. flumin.*, 129 : 3.

Distribution in A. & N. : Great Nicobar.

Elsewhere : Lower Myanmar.

Remark : This species is included here on the basis of literature review.

Genus *Aciagrion* Selys

7. *Aciagrion pallidum* Selys

1891. *Aciagrion pallidum* Selys, *Ann. Mus. Civ. Genova*, (2), 10 (30) : 512-513.

1933. *Aciagrion pallidum*, Fraser. *Fauna Brit. India, Odon.*, 1 : 344-345.

1993. *Aciagrion pallidum*. Lahiri & Mitra, *J. Andaman Sci. Assoc.*, 9(1&2) : 97.

Distribution in A. & N. : Middle Andaman.

Elsewhere : India (Bihar, Eastern and Western Himalaya, Orissa, Maharashtra, Uttar Pradesh and Western Ghats), Nepal and Myanmar.

Remarks : This species is included here on the basis of literature review. This is not a common species in Andaman.

Genus *Ischnura* Charpentier

8. *Ischnura senegalensis* (Rambur)

1842. *Agrion senegalensis* Rambur, *Hist. nat. Ins. Neuropteres*, : 276.

1933. *Ischnura senegalensis*, Fraser, *Fauna Brit. India, Odon.*, 1 : 348-351.

1983. *Ischnura senegalensis*, Chhotani *et. al.*, *Rec. zool. Surv. India*, 80 : 479.

Material studied : 1 ♂, South Andaman, Port Blair, Gandhi Park, 21.1.98 and 1 ♂, Mayabunder, North Andaman, 4.2.98, Raja Ram.

Distribution in A. & N. : North Andaman, Middle Andaman, South Andaman and South Nicobar Islands.

Elsewhere : Throughout India, Africa, Myanmar, Sri Lanka, Philippines, Indonesia and Japan.

Genus *Agriocnemis* Selys

Keys to the species of Genus *Agriocnemis* Selys

1. Superior anal appendages longer than inferior. *pygmaea* (Rambur)
- Superior anal appendages shorter than inferior. *femina oryzae* (Lieftinck)

9. *Agriocnemis femina oryzae* (Lieftinck)

1888. *Ischnura femina* Brauer, *Verh. zool.-bot. Ges. Wien.*, 18 : 554.

1962. *Agriocnemis femina oryzae* Lieftinck, *Insects of Micronesia*, 5(1) : 44.

1983. *Agriocnemis femina oryzae*, Chhotani *et. al.*, *Rec. zool. Surv. India*, 80 : 479.

Material studied : 1 ♂, Great Nicobar, Galathea National Park, 23.1.93; 3 ♂♂, 10 Km. E. W. Road, 10.11.93; 2 ♂♂, same locality, 11.11.93; 1 ♂, 41 Km. N. S. Road, 17.11.93, K. Chandra; 1 ♀, South Andaman, B. S. I. Garden, 30.10.93; K. Chandra; 2 ♂♂ & 2 ♀♀, Port Blair, 31.11.96 and 2 ♂♂ & 3 ♀♀, Pahadgaon, 20.1.98, Raja Ram.

Distribution in A. & N. : Middle Andaman, South Andaman and Great Nicobar.

Elsewhere : India (Assam and West Bengal), Ryukyu Island, Borodino Island, China and Taiwan.

Remarks : This is one of the commonest species in Andaman and Nicobar Island and for the first time recorded from Great Nicobar Island.

10. *Agriocnemis pygmaea* (Rambur)

1842. *Agrion pygmaeum* Rambur, *Hist. nat. Ins. Neuropteres*, : 278.

1933. *Agriocnemis pygmaea*, Fraser, *Fauna Brit. India, Odon.*, 1 : 398-401.

Distribution in A. & N. : Nicobar (Great Nicobar Island).

Elsewhere : Throughout India, Nepal, Myanmar, Sri Lanka, Singapore, Philippines, Seychelles, Taiwan, Sunda Islands, China, Papua and Australia.

Remark : This species is included here on the basis of literature review.

Genus *Argiocnemis* Selys11. *Argiocnemis rubescens rubeola* Selys

1877. *Argiocnemis rubescens* Selys, *Bull. Acad. Belg.* (2) 43 : 136.

1933. *Argiocnemis rubescens*, Fraser, *Fauna Brit. India, Odon.*, 1 : 406-408.

1995. *Argiocnemis rubescens rubeola* Prasad & Varshney, *Oriental Ins.*, 29 : 391.

Distribution in A. & N. : South Andaman.

Elsewhere India (Eastern); Myanmar; Thailand; Malaysia; Indonesia, Australia and Madagascar.

Remark : This species is included here on the basis of literature review.

Family : PLATYCNEMIDIDAE

Genus *Copera* KirbyKey to the species of genus *Copera* Kirby

1. Superior anal appendages only one-fourth the length of inferior. *marginipes* (Rambur)
- Superior anal appendages at least half the length of inferior. *vittata serapica* (Selys)

12. *Copera marginipes* (Rambur)

1842. *Platycnemis marginipes* Rambur, *Hist. nat. Ins. Neuropteres*, : 240.

1890. *Copera marginipes*, Kirby, *Cat. Odon.*, : 129.

1933. *Copera marginipes*, Fraser, *Fauna Brit. India, Odon.*, 1 : 192-197.

1983. *Copera marginipes*, Chhotani *et. al.*, *Rec. zool. Surv. India*, 80 : 476.

Material studied : 3♂♂, South Andaman, Port Blair, Haddo, 31.10.96; 4♂♂ & 2♀♀, locality same, 1.11.96; 1♂, Port Blair, Delanipur, 15.11.96; 7♂♂ & 1♀, B. S. I. Garden, 20.1.98 and 6♂♂ & 1♀, Nalah near Satellite Station, Port Blair, 22.1.98, Raja Ram.

Distribution in A. & N. : South Andaman and Little Andaman.

Elsewhere : Widely distributed in India, Nepal, China, Sri Lanka, Myanmar, Thailand, Malaysia, Indo-China and Taiwan.

Remarks : This is one of the commonest species all over India and sparingly in South-east Asia.

13. *Copera vittata serapica* (Selys)

1863. *Psilocnemis vittata* Selys, *Bull. Acad. Belg.*, (2) 16 : 170.

1890. *Copera vittata* Kirby, *Cat. Odon.*, : 129.

1933. *Copera vittata*, Fraser, *Fauna Brit. India, Odon.*, 1 : 198-201.

Distribution in A. & N. : Nicobar Island.

Elsewhere : South India (Malabar, Coorg, Nilgiris, Anaimalais), Bengal, Assam and Myanmar.

Remarks : This species is included here on the basis of literature review.

Family : PLATYSTICTIDAE

Genus *Drepanosticta* Laidlaw

14. *Drepanosticta annandalei* Fraser

1924. *Drepanosticta annandalei* Fraser, *Rec. Indian Mus.*, 26 : 412-413.

1933. *Drepanosticta annandalei* Fraser, *Fauna Brit. India, Odon.*, 1 : 148-150.

1983. *Drepanosticta annandalei* Chhotani *et al.*, *Rec. zool. Surv. India*, 80 : 474.

Distribution in A. & N. : South Andaman.

Remark : This species is included here on the basis of literature review.

Family : PROTONEURIDAE

Genus : *Prodasineura* Cowley

15. *Prodasineura* Cowley

1924. *Caconeura verticalis* Fraser, *Rec. Indian Mus.* 26 : 412, 503 & 504.

1933. *Caconeura verticalis andamanensis* Fraser, *Fauna Brit. India, Odon.*, 1 : 218.

1983. *Prodasineura verticalis andamanensis*, Chhotani *et al.*, *Rec. zool. Surv. India*, 80 : 474.

Material examined : 5♂♂, South Andaman, Port Blair, Haddo, 31.10.96 and same locality, 2♂♂, 1.11.96, Raja Ram; 3♂♂, North Andaman, Kalpong H.E.P.A., 26.11.97, 28.11.97 & 1.11.97 respectively, K. Chandra & P.; 1♂, South Andaman, Gandhi Park, 21.1.98 and 2♂♂, Port Blair, Near Satellite Station., 22.1.98, Raja Ram.

Distribution in A. & N. South Andaman and Little Andaman.

Remarks This subspecies is endemic to Andamans.

Family LESTIDAE

Genus *Lestes* Leach

Key to the species of genus *Lestes* Leach

1. Thorax with narrow antehumeral stripes expanded outwardly at the upper ends.
..... *malabarica* Fraser
- Thorax with antehumeral stripes deeply scalloped or crenulate on the outer sides.
..... *praemorsus praemorsus* Selys

16. *Lestes malabarica* Fraser

1929. *Lestes malabarica* Fraser, *J. Bombay nat. Hist. Soc.*, 33 : 847-848.

1934. *Lestes malabarica* Fraser, *Fauna Brit. India. Odon.*, 2 : 40-43.

1983. *Lastes malabarica* Chhotani *et. al.*, *Rec. zool. Surv.*, 80 : 473.

Distribution in A. & N. : South Andaman.

Elsewhere India (Kerala and Chandigarh).

Remark : This species is included here on the basis of literature review.

17. *Lestes praemorsus praemorsus* Selys

1862. *Lestes praemorsa* Selys. *Bull. Acad. Belg.*, 2(13) : 320.

1924. *Lestes praemorsa andamanensis*, Fraser, *Rec. Indian Mus.*, 26 : 410.

1995. *Lestes praemorsus praemorsus*, Prasad & Varshney, *Oriental Ins.*, 29 : 395.

Distribution in A. & N. : South Andaman.

Elsewhere : India (West Bengal and Western Himalaya).

Remark : This species is included here on the basis of literature review.

Superfamily : CALOPTERYGOIDEA

Family : CALOPTERYGIDAE

Genus *Vestalis* Selys

18. *Vestalis gracilis gracilis* (Rambur)

1842. *Calopteryx gracilis* Rambur, *Hist. nat. Ins. Nevropteres.* : 224.

1853. *Vestalis gracilis*, Selys, *Syn. Cal.*, : 26.

1929. *Vestalis gracilis gracilis*, Fraser, *J. Bombay nat. Hist. Soc.*, 33 : 581-582.

1934. *Vestalis gracilis gracilis*, Fraser, *Fauna Brit. India, Odon.*, 2 : 126-128.

1983. *Vestalis gracilis gracilis*, Chhotani *et al.*, *Rec. zool. Surv. India*, 80 : 473.

Material studied : 2♂♂, Middle Andaman, Parna, 24.2.83, R. M. Sharma; 2♂♂ & 1♀, South Andaman, Mount Harriet National Park, 14.12.94, K. Chandra; 2♂♂ & 1♀, North Andaman, Kalpong H. E. P. A., 21.6.94, 1♂, 1♂ & 1♀, (27.2.97) and 2♂♂ (1.3.97) same locality, K. Chandra; 1♂, Mount Harriet National Park, 31.1.98, Raja Ram.

Distribution in A. & N. : North Andaman, Middle Andaman and South Andaman.

Elsewhere : India, Nepal, Myanmar, Thailand, Vietnam and Malaysia.

Remark : This species is recorded for the first time from North and Middle Andaman.

Family : CHLOROCYPHIDAE

Genus *Libellago* Selys

Key to the species of genus *Libellago* Selys

1. Abdomen marked with bright orange. *aurantica* (Selys)
- Abdomen marked with bright citron yellow or greenish. 2
2. Humeral stripe present at its middle, posterior lobe with a large dorsal spot. thoracic markings orange. *lineata blanda* (Selys)
- Humeral stripe absent, posterior lobe of prothorax unmarked thoracic markings citron-yellow or green. *lineata andamanensis* (Fraser)

19. *Libellago lineata andamanensis* (Fraser)

1924. *Micromerus andamanensis* Fraser, *Rec. Indian Mus.*, 26 : 410.

1934. *Libellago andamanensis* Fraser, *Fauna Brit. India, Odon.*, 2 : 66.

1983. *Libellago lineata andamanensis* Chhotani *et al.*, *Rec. zool. Surv. India*, 80 : 471.

Material studied : 2♂♂, Little Andaman, Gandhighat & 1♂, Cowrighat, 15.12.85, B. Mitra & P; 1♂, (26.2.97), 1♂, (27.2.97), 8♂♂ (28.2.97) and 3♂♂ (1.3.97), North Andaman, Kalpong H. E. P. A., K. Chandra & P.

Distribution in A. & N. : North Andaman, South Andaman and Little Andaman.

Remarks : The species is endemic to Andaman Islands, which is allied to *Libellago lineata indica* (Fraser) but differs in larger black markings on abdominal segments.

20. *Libellago lineata blanda* (Selys)

1853. *Micromerus blandus* Selys, *Syn. Cal.*, : 64.

1934. *Libellago lineata blanda*, Fraser, *Fauna Brit. India, Odon.*, 2 : 65.

Distribution : Confined to the Nicobars.

Remark : This species is included here on the basis of literature review.

21. *Libellago aurantiaca* (Selys)

1859. *Micromerus aurantiacus* Selys, *Bull. Acad. Belg.*, (2) 7 : 448.

1995. *Libellago aurantiaca*, Mitra, *Opusc. zool. flumin.*, 129 3.

Distribution in A. & N. : Great Nicobar.

Elsewhere Myanmar, Malaysia, Lower Siam, Borneo and Singapore.

Remark : This species is included here on the basis of literature review.

Suborder . ANISOPTERA

Key to the families of suborder ANISOPTERA

1. Costal and subcostal antenodal cross veins coinciding; Primary antenodal not distinguishable. 2
- Costal and subcostal antenodal cross veins not coinciding. 3
2. Tibia of male with a long membranous keel on the flexor surface; base of hind wing of male strongly angulated. CORDULIIDAE
- Tibia of male without a membranous keel on flexor surface; base of hind wing in both sexes always rounded. LIBELLULIDAE
3. Eyes separated on vertex; discoidal cell of hind wing more transversely elongated than fore wing. GOMPHIDAE
- Eyes confluent on vertex; discoidal cell of hind wing transversely as long as that of fore-wing. AESHNIDAE

Family GOMPHIDAE

Genus *Gomphidia* SelysKey to the species of genus *Gomphidia* Selys

1. Face yellow with 'T' shaped black mark on surface of frons. *T-nigrum* Selys

- Face black without ‘T’, shaped mark on frons. *ganeshi* Chhotani *et. al.*

****22. *Gomphidia T-nigrum* Selys**

1854. *Gomphidia T-nigrum* Selys, *Bull. Acad. Belg.*, 21 : 86.

1934. *Gomphidia T-nigrum*, Fraser, *Fauna Brit. India, Odon.*, 2 : 383-384.

Material studied : 1 ♀, Little Andaman, Krishna Nala, 12.3.91, S. Kumar and 1 ♀, North Andaman, Kalpong H. E. P. A., 27.2.97, K. Chandra & P.

Distribution in A. & N. : North Andaman & Little Andaman.

Elsewhere : Type in the Selys collection from Uttar Pradesh but locality unknown (Fraser). Fraser also observed this species on the Katray Lake, Poona Deccan.

Remark : This species is being recorded for the first time from Andaman and Nicobar Islands.

23. *Gomphidia ganeshi* Chhotani, Lahiri & Mitra

1983. *Gomphidia ganeshi* Chhotani, Lahiri & Mitra *Rec. zool. Surv. India*, 80 : 480.

Distribution : South Andaman.

Remark : This species is included here on the basis of literature review.

Family : AESHNIDAE

Key to the genera of family AESHNIDAE

1. Base of hind wing without a notch; anal triangle absent. *Anax* Leach
- Base of hind wing more or less deeply notched; anal triangle always present. 2
2. The nervure IRiii not forked. *Oligoaeschna* Selys
- The nervure IRiii forked into two equal branches at or near the inner end of Pterostigma. 3
3. The nervure IRiii making an abrupt curve towards and beneath outer end of pterostigma; MA fusing with Riv + v well before posterior border of wing; Rspl. forked shortly after its origin, the posterior branch running parallel with Riv + v to posterior border of wing; superior anal appendages with apex prolonged and curled downwards abruptly. *Anaciaeschna* Selys
- The nervure Riii without an abrupt curve towards and beneath the outer end of pterostigma; MA not fusing with Riv + v, but interrupted or forked at the same level; superior anal appendages not prolonged at the apex. *Gynacantha* Rambur

Genus *Anaciaeschna* Selys24. *Anaciaeschna jaspidea* (Burmeister)

1839. *Aeschna jaspidea* Burm., *Handb. Ent.*, 2 : 840.

1836. *Anaciaeschna jaspidea*, Fraser, *Fauna Brit. India. Odon.*, 3 : 152-154.

1995. *Anaciaeschna jaspidea* Mitra, *Opusc. zool. flumin.*, 129 : 3.

Material studied 1 ♀, Great Nicobar, Galathea, 17.11.93, K. Chandra.

Distribution in A. & N. Great Nicobar.

Elsewhere Western Ghats, West Bengal extending to Pacific Island..

Genus *Oligoaeschna* Selys25. *Oligoaeschna andamani* Chhotani, Lahiri & Mitra

1983. *Oligoaeschna andamani* Chhotani, Lahiri & Mitra, *Rec. zool. Surv. India*, 80 : 482.

Distribution South Andamans only.

Remarks This species is included here on the basis of literature review.

Genus *Anax* Leach26. *Anax guttatus* (Burmeister)

1839. *Aeschna guttata*, Burmeister, *Handb. Ent.*, 2 : 840.

1842. *Anax guttatus*, Rambur, *Hist. nat. Ins. Nevropteres*, : 188.

1936. *Anax guttatus*, Fraser, *Fauna Brit. India, Odon.*, 3 : 140-142.

Material studied : 1 ♀, South Andaman, Port Blair, Delanipur, 1.11.80, V. Arumugam.

Distribution in A. & N. : South Andaman and Great Nicobar.

Elsewhere Widely distributed in India (Andhra Pradesh, Bihar, Eastern Himalaya, Himachal Pradesh, Karnataka, Kerala, Punjab, Tamil Nadu and Uttar Pradesh), Indonesia, Malaysia, Micronesia, Myanmar, Nepal, North Australia, Island, Taiwan & Sri Lanka.

Genus : *Gynacantha* RamburKey to the species of *Gynacantha*

1. Upper surface of frons marked with thick black marking 'T' 2
- Upper surface of frons unmarked or with only a blackish bordering. *bayadera* Selys
2. Inferior anal appendages less than one-third the length of superior. *subinterrupta* Ramb

– Inferior anal appendages more than one-third the length of superior. *dravida* Lieftinck

27. *Gynacantha dravida* Lieftinck

1882. *Gynacantha hyalina* Selys, *An. Soc. espo. Hist. nat.*, 11 : 19.

1936. *Gynacantha hyalina*, Fraser, *Fauna Brit. India, Odon.*, 3 : 97-100.

1960. *Gynacantha dravida* Lieftinck, *Mem. Soc. Ent. Ital.*, 38 : 229-251.

Material studied : 1♂, Little Andaman, 10.9.90, Venkat Raman and 1♀, Great Nicobar, South Bay G. H., B. Mitra.

Distribution in A. & N. : Little Andaman and Great Nicobar.

Elsewhere : India (Bihar, West Bengal, Assam, Meghalaya, Malabar, Wynaad, Coorg and Coimbatore), Myanmar, Thailand, Indonesia, China and Japan.

28. *Gynacantha subinterrupta* Rambur

1842. *Gynacantha subinterrupta* Rambur, *Hist. nat. Ins. Nevropteres*, : 212.

1936. *Gynacantha subinterrupta*, Fraser, *Fauna Brit. India, Odon.*, 3 : 100-101

1995. *Gynacantha subinterrupta*, Mitra, *Opusc. zool. flumin.*, 129 : 3.

Distribution in A. & N. : Great Nicobar.

Elsewhere : Mizoram.

Remark : This species is included here on the basis of literature review.

**29. *Gynacantha bayadera* Selys

1891. *Gynacantha bayadera* Selys, *Ann. Mus. Civ. Genova*, 10(30) : 47.

1936. *Gynacantha bayadera*, Fraser, *Fauna Brit. India, Odon.*, 3 : 103-104.

Material studied : 1♀, South Andaman, Port Blair, Middle Point, 9.7.93, K. Chandra, 1♂, Champin Island, Nancowry, 10.2.93, D. V. Rao & P.

Distribution in A. & N. : South Andaman and Middle Nicobar.

Elsewhere : India (Meghalaya, Sikkim, West Bengal), Myanmar, Thailand, Indonesia, New Guinea and Philippines.

Remark : This species is being recorded for the first time from Andaman & Nicobar Islands.

Superfamily : LIBELLULOIDEA

Family : CORDULIIDAE

Genus *Epophthalmia* Burmeister

30. *Epophthalmia vittata vittata* Burmeister

1839. *Epophthalmia vittata vittata* Burmeister, *Handb. Ent.*, 2 : 845.

1936. *Epophthalmia vittata vittata*, Fraser, *Fauna Brit. India, Odon.*, 3 : 194-196.

Distribution in A. & N. : South Andaman.

Elsewhere : Peninsular India, Uttar Pradesh and West Bengal.

Remark : This species is included on the basis of literature review.

Family : LIBELLULIDAE

Key to the genera of family LIBELLULIDAE

1. Borders of anal loop running on to meet posterior border of wing, apex of loop open. 2
 - Borders of anal loop converging and meeting before posterior border of wing, apex of loop closed. 3
2. Abdomen broad at base, then tapering gradually to the end; male with an opalescent white spot in centre of hind wing. *Tholymis* Hagen
 - Abdomen very tumid at base, then abruptly narrowed and very slim and cylindrical to the end; wing broadly tipped with dark brown and without opalescent white spot in centre of hind wing. *Zyxomma* Rambur
3. Distal antenodal nervures in fore-wing complete. 4
 - Distal antenodal nervures in fore-wing incomplete. 10
4. Lobe of prothorax large and fringed with long hairs. 5
 - Lobe of prothorax small and usually naked. 6
5. Only 6 antenodal nervures in fore-wing; abdominal segment 1 to 6 dilated 7 to 10 slim and cylindrical. *Acisoma* Rambur
 - Never less than 12 antenodal nervures in fore-wing, shape of abdomen variable but not like last. *Orthetrum* Newman
6. Sectors of arc in fore-wing arising from a common and rather long stalk frons metallic above. 7
 - Sectors of arc in fore-wing separated at their origin; frons nonmetallic. *Camacinia* Kirby

7. Base of the discoidal cell in hind wing widely distal to level of arc. 8
 - Base of discoidal cell in hind wing situated at the level of arc. 9
8. Supplementary nervures present in bridge; anal loop small of not more than 6 cells; segment 8 in female with lateral border undilated. *Nesoxenia* Kirby
 - Supplementary nervures absent in bridge; anal loop longer and larger of more than 6 cells, segment 8 in female with lateral border dilated. *Agrionoptera* Brauer
9. Only 1 Cubital nervure in all wings anal loop very long and overlapping distal end of discoidal cell. *Cratilla* Kirby
 - More than 1 Cubital nervure in hind wing; anal loop variable, long or short. *Lyriothemis* Brauer
10. Lobe of prothorax large and fringed with long hair. *Diplacodes* Kirby
 - Lobe of prothorax small, usually naked 11
11. Sectors of arc in fore-wing separated and diverging at origin. *Rhyothemis* Hagen
 - Sectors of arc in fore-wing arising from a common and rather long stalk. 12
12. Discoidal field with borders converging strongly at wing margin. 13
 - Discoidal field with borders parallel or widely divergent at wing-margin. 14
13. Discoidal cell in fore-wing very narrow, its costal side only about one-fourth to one-third the length of basal, a conspicuous supplementary nervure IRii present between Rii and Riii. *Pantala* Hagen
 - Discoidal cell in fore-wing broader, its costal side about one half the length of basal; no supplementary nervure IRii present between Rii and Riii. *Trithemis* Brauer
14. Discoidal field in fore-wing adjacent to discoidal cell only 2 cells wide. *Indothemis* Ris
 - Discoidal field in fore-wing adjacent to discoidal cell 3 or more cells wide. 15
15. Genital hamules very long projecting and conspicuous in profile; hind wing very broad at base and rather tapered at apex; cells in hind wing becoming arranged into straight rows of closely packed narrow cells; pterostigma very short and usually unequal in fore and hind wings. ... *Tramea* Hagen
 - Genital hamules small and conspicuous in profile; hind wing not markedly wide at base and apex not markedly tapered; cell at the base of hind wing not closely packed in straight rows; pterostigma variable and usually of equal in fore-anal hind wing. 16
16. Wings coloured amber-yellow at base or more broadly dark reddish-brown and often with a development of close secondary reticulation, especially proximal to node; more than one cubital nervure in all wings. *Neurothemis* Brauer

- Wings usually uncoloured or with but a small basal yellow marking in hind wing; no secondary reticulation in the wing; only 1 cubital nervure in all wings. 17
- 17. Red or ochreous species with basal or medial yellow markings to wing. 18
- Variable coloured and darker species, never or only partly red or ochreous. 19
- 18. Wings with small basal yellow marking, face and frons red. *Crocothemis* Brauer
- Wings with broad reddish-yellow medial fascia, face and abdomen never red.
..... *Brachythemis* Brauer
- 19. Arc situated between the second and third antenodal nervures, only 1 row of cells between IRii and Rspl. *Lathrecista* Kirby
- Arc situated between the first and second antenodal nervures; 2 rows of cell between IRiii and Rspl.. *Potamarcha* Karadsch

Family LIBELLULIDAE

Genus *Agrionoptera* Brauer

31. *Agrionoptera insignis* (Rambur)

1842. *Libellula insignis* Rambur, *Hist. nat Ins. Nevropteres*, : 123.

1865. *Agrionoptera nicobarica* Brauer, *Verh. zool. bit. Ges. Wien.*, 15 : 978.

1936. *Agrionoptera insignis insignis*, Fraser, *Fauna Brit. India, Odon.*, 3 : 274-276.

1995. *Agrionoptera insignis*, Prasad & Varshney, *Oriental Ins.*, 29 : 408.

Material studied : 1 ♂, Great Nicobar, Indira Point, 23.1.93; 2 ♂♂, 8 Km. E. W. Road, 26.1.93; 1 ♂ & 1 ♀, 13 Km. E. W. Road, 14.11.93; 1 ♂, 27 Km. E. W. Road, 16.11.93., K. Chandra; 1 ♂, Nancowry, Champion Island, 10.2.93, D. V. Rao.

Distribution in A. & N. : Middle and South Nicobar.

Elsewhere : Myanmar, Indonesia, Malaysia and Borneo.

Remarks : The antenodal nervures in the fore-wings vary from 15-17 and in the hind wing from 13-15. The post nodal in the fore and the hind wings vary from 13-14 and 12-15 respectively. Cubital nervures were observed single only in the all wings except in a female specimen of which fore wing bears 2 nervures. Anal loop also vary from 8-12 cells, while a single female specimen under study consist of 13 cells.

Genus *Cratilla* Kirby

Key to the species of the genus *Cratilla* Kirby

1. Wings tipped broadly with deep black; thorax dark metallic green. *metallica* (Brauer)

– Wings not tipped with black; thorax non-metallic. *lineata* (Brauer)

***32. *Cratilla metallica* (Brauer)**

1878. *Orthetrum lineata* Brauer, *Sitzungsber Acad. Wien.*, 79 : 9.

1936. *Cratilla metallica* Fraser, *Fauna Brit. India.*, 3 : 285-286.

Material studied : 1♂, North Andaman, Kalpong, H. E. P. A. 21.6.94, K. Chandra.

Distribution in A. & N. : North Andaman.

Elsewhere : Malacca and New Guinea.

Remarks : Nodal index $\left[\frac{11-16/17-10}{12-12/13-12} \right]$. This is the first record of the species from India.

****33. *Cratilla lineata calverti* Foerster**

1878. *Orthetrum lineata* Brauer, *Sitzungsber Acad. Wien.*, 77 : 9.

1903. *Cratilla lineata calverti* Foerster, *Odonaten aus-New Guinea*, III Ann. Mus. Hungarica, 1 : 509-554.

1936. *Cratilla lineata*, Fraser, *Fauna Brit. India, Odon.*, 3 : 286-288.

Material studied : 1♂, Middle Andaman, C. F. O., 26.2.83, R. M. Sharma.

Distribution in A. & N. : Middle Andaman.

Elsewhere : India (Maharashtra, Orissa, Uttar Pradesh & Western and Eastern Ghats), Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Sri Lanka and Sundaic Archipelago to Borneo.

Remarks : There is no supplementary nervures to the bridge. This species is being recorded for the first time from A. & N. Islands.

Genus *Lathrecista* Kirby

34. *Lathrecista asiatica asiatica* (Fabricius)

1798. *Libellula asiatica* Fabricius, *Ent. Syst., Supply.*, : 283.

1909. *Lathrecista asiatica asiatica*, Ris, *Cat. Coll. Selys*, 9 : 129.

1983. *Lathrecista asiatica asiatica*, Chhotani *et al.*, *Rec. zool. Surv. India*, 80 : 486.

Material studied : 1♂, South Andaman, Port Blair, Dairy farm, 7.11.81; 2♂♂, Caddle Gunj, 14.4.82; 1♂, Kalatang, 28.5.82, R. M. Sharma & Party; 1♂, Long Island, 28.8.86; 2♂♂, Kalatang, 24.9.87, H. S. Mehta & Party; 3♂♂, Little Andaman, 12.3.91, S. Kumar; 2♂♂, South Andaman Chidiatapu, 2.7.91, B. Mitra; 1♂, Port Blair, 26.7.91; 1♂, North Andaman, West Saddle Park, 18.6.94; 1♂, Lamya Bay, 25.6.94; 1♂, Shyam Nagar, 26.6.94 & 1♂, Mount Harriet National Park, 11.5.94, K. Chandra.

Distribution in A. & N. South Andaman, North Andaman, Little Andaman and South Nicobar.

Elsewhere : West Bengal, Western Ghats.

Remarks Single male specimen from North Andaman, Kalighat & South Andaman. Each specimen differs in respect of subtrigone of right fore-wing 5 and 4 cells respectively.

Genus *Nesoxenia* Kirby

35. *Nesoxenia lineata* (Selys)

1879. *Agrionoptera lineata* Selys, *Ann. Mus. Civ. Genova*, 14 : 302.

1936. *Nesoxenia lineata*, Fraser, *Fauna Brit. India, Odon.*, 3 : 279.

1983. *Nesoxenia lineata*, Chhotani *et al. Rec. zool. Surv. India*, 80 : 486.

Material studied : 1 ♀, North Andaman, Kalatang, 28.4.82, S. Sharma.

Distribution in A. & N. North and South Andaman.

Elsewhere : India (West Bengal), Malaysia, Sumatra, Borneo and Philippines.

Remarks : Abdominal segments from 5th onwards are missing but its venational characters are sufficient to make the identity of the species. Specimens differs from Fraser's description in the following respect : Nodal index is higher $\left[\frac{13-13/12-15}{14-12/10-14} \right]$ and supplementary nervures to the bridge in the left hind wings are 2 in numbers while single in the other.

Genus *Lyriothemis* Brauer

**36. *Lyriothemis cleis* Brauer

1868. *Lyriothemis cleis* Brauer, *Verh. zool.-bot. Ges. Wein.*, 18 : 181.

1936. *Lyriothemis cleis*, Fraser, *Fauna Brit. India, Odon.*, 3 : 267-269.

Material studied 1 ♂, North Andaman, Western Saddle Peak National Park, 18.6.94, K. Chandra.

Distribution in A. & N. : North Andaman.

Elsewhere India (Assam); Extends from Lower Myanmar to Borneo, Philippines and Celebes.

Remarks Specimen differs from Fraser's description as follows : The cubital space in the right hind wing traversed twice while in the other only once; the discoidal cell is traversed twice in all the wings and nodal index $\left[\frac{10-15/16-10}{10-14/12-10} \right]$ This species is recorded for the first time from Andaman & Nicobar Islands.

Genus *Orthetrum* NewmanKey to the species of the genus *Orthetrum* Newman

1. Males violaceous red. *pruinorum neglectum* (Rambur)
- Males may be bright red or brown marked with yellow. 2
2. Abdomen enormously swollen at base and then abruptly slimmed and compressed to the end.
..... *sabina sabina* (Drury)
- Abdomen not swollen, more or less of even breadth. *chrysis* (Selys)

37. *Orthetrum chrysis* (Selys)

1891. *Libellula testacea* race *chrysis* Selys, *Ann. Mus. Civ. Genova*, 30 : 462.

1936. *Orthetrum chrysis*, Fraser, *Fauna Brit. India, Odon.*, 3 : 310.

1983. *Orthetrum chrysis*, Chhotani *et al. Rec. zool. Surv. India*, 80 : 487.

Material studied : 1♂, North Andaman, C. F. O. Nalah, 1.3.83, R. M. Sharma; 1♂, South Andaman, Wright Mayo, Kalatang forest, 28.2.75, G. K. Srivastava & Party; 2♂♂, North Andaman, Kalpong H. P. E. A., 3.3.97, K. Chandra and 2♂♂, South Andaman, B. S. I. Garden, 20.1.98., Raja Ram.

Distribution in A. & N. : North and South Andaman.

Elsewhere : India (Himachal Pradesh, Orissa and Western Ghats), Sri Lanka, Celebes, Borneo, Java, Kings Islands and lower Myanmar.

38. *Orthetrum pruinorum neglectum* (Rambur)

1842. *Libellula neglecta* Rambur, *Hist. nat. Ins. Neuropteres*, : 86.

1896. *Orthetrum neglectum*, Kirby, *Syn. Cat. Neur. Odon.*, : 182.

1909. *Orthetrum pruinorum neglectum*, Ris, *Cat. Coll.* 9 : 181.

1936. *Orthetrum pruinorum neglectum*, Fraser, *Fauna Brit. India, Odon.*, 3 : 311-313.

Material studied : 1♂, Great Nicobar, 41 Km. Galathea, 17.11.93, K. Chandra.

Distribution in A. & N. : South Nicobar.

Elsewhere : Virtually cosmopolitan in India, Nepal, Tibet, China, Sri Lanka, Myanmar, Malaysia, Indo-China and Taiwan.

39. *Orthetrum sabina sabina* (Drury)

1770. *Libellula sabina* Drury, *Ill. Exot. Ins.*, 1 : 114.

1889. *Orthetrum sabina*, Kirby, *Trans. zool. Soc. Lond.*, 12 : 302.
 1936. *Orthetrum sabina*, Fraser, *Fauna Brit. India, Odon.*, 3 : 300-302.
 1942. *Orthetrum sabina sabina*, Lieftinck, *Treubia*, 18 : 475.
 1983. *Orthetrum sabina sabina*, Chhotani *et al.*, *Rec. zool. Surv. India*, 80 : 488.
 1995. *Orthetrum sabina sabina*, Mitra, *Opusc. zool. flumin.*, 129 : 4.

Material examined 1 ♀, South Andaman, Carbyne's cove, 10.9.81, 1 ♂, Port Blair, 28.11.81, R. M. Sharma; 1 ♂, Port Blair, Delanipur, 8.12.82, V. Arumugam; 1 ♂, Chidiatapu, 17.4.82, 1 ♂, Carbyne's cove, 28.10.82, R. M. Sharma, 6 ♂ ♂, Great Nicobar, 40 Km. E. W. Road, 3.8.85, M. K. Debroy & B. Mitra; 1 ♀, South Andaman, B. S. I. Garden, 20.1.98; 2 ♂ ♂ & 1 ♀, Manglutan, 20.1.98; 1 ♀, Carbyne's cove, 21.1.98; 1 ♀, Mount Harriet National Park, 31.1.98; 1 ♂, North Andaman, Mayabunder, 4.2.98, 1 ♀, South Andaman, Port Blair, Diglipur, 6.2.98, Raja Ram.

Distribution in A. & N. North, Middle and South Andaman and Great Nicobar.

Elsewhere : Cosmopolitan except America.

Genus *Potamarcha* Karsch

40. *Potamarcha congener* (Rambur)

1842. *Libellula congener* Rambur, *Hist. nat. Ins. Nevropteres.* : 70.
 1971. *Potamarcha congener*, Lieftinck, *Ent. Scand. Supp.*, 1 : 202.
 1936. *Potamarcha obscura*, Fraser, *Fauna Brit. India*, 3 : 289-291.
 1983. *Potamarcha congener*, Chhotani *et al.*, *Rec. zool. Surv. India*, 80 : 487.

Material studied 1 ♂, Little Andaman, R. O. P. Nancowry, 12.3.91, S. Kumar; 1 ♂, Middle Andaman, Rangat, 1.8.91, K. Chandra and 1 ♂, South Andaman, Mount Harriet National Park, 31.1.98, Raja Ram.

Distribution in A. & N. : North, Middle, South and Little Andaman and South Nicobar.

Elsewhere : Throughout India (Madhya Pradesh, Uttar Pradesh, West Bengal, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa and Tripura). Nepal, Bangladesh, Sri Lanka, Myanmar, Thailand, Malaysia, Indo-China, Taiwan, Philippines and Australia.

Genus : *Acisoma* Rambur

41. *Acisoma panorpoides panorpoides* Rambur

1842. *Acisoma panorpoides* Rambur, *Hist. nat. Ins. Nevropteres.* : 28.
 1936. *Acisoma panorpoides panorpoides*, Fraser, *Fauna Brit. India, Odon.*, 3 : 330-331.
 1995. *Acisoma panorpoides panorpoides*, Mitra, *Opusc. zool. flumin.*, 129 : 3-4.

Distribution in A. & N. : Great Nicobar.

Elsewhere : India (Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Punjab, Uttar Pradesh and West Bengal), Nepal, China, Sri Lanka, Thailand, Malaysia, Indonesia, Japan, Taiwan and Philippines.

Remark : This species is included here on the basis of literature review.

Genus *Brachythemis* Brauer

42. *Brachythemis contaminata* (Fabricius)

1793. *Libellula contaminata* Fabricius, *Ent. Syst.*, 2 : 382.

1868. *Brachythemis contaminata*, Brauer, *Verh. zool.-bot. Ges. wien.*, 18 : 736.

1936. *Brachythemis contaminata*, Fraser, *Fauna. Brit. India, Odon.*, 3 : 365-366.

Distribution in A. & N. : Great Nicobar.

Elsewhere : Throughout India, Nepal, China, Sri Lanka, Myanmar, Thailand, Malaysia, Indonesia, Taiwan, Philippines and Iraq.

Remark : This species is included here on the basis of literature review.

Genus *Crocothemis* Brauer

43. *Crocothemis servilia servilia* (Drury)

1770. *Libellula servilia* Drury, *III. Exot. Ins.*, 1 : 112.

1868. *Crocothemis servilia*, Brauer, *Verh. zool.-bot. Ges. Wien.*, 18 : 737.

1911. *Crocothemis servilia servilia*, Ris, *Cat. Coll. Selys*, 13 : 333.

1936. *Crocothemis servilia servilia*, Fraser, *Fauna Brit. India, Odon.*, 3 : 345-347.

1983. *Crocothemis servilia servilia*, Chhotani *et al.* *Rec. zool. Surv. India*, 80 : 488.

Material examined : 1♂, South Andaman, Lahabari, 20.11.85, H. S. Mehta & Party.

Distribution in A. & N. : North, South and Little Andaman.

Elsewhere : It is a well distributed species all over south east Asia and is also known from Japan and Australia.

Genus *Diplacodes* Kirby

44. *Diplacodes trivialis* (Rambur)

1842. *Libellula trivialis* Rambur, *Hist. nat. Ins. Neuropteres*, : 115.

1891. *Diplacodes trivialis*, Karsch, *Ent. Nachr.*, 17 : 246.

1936. *Diplacodes trivialis*, Fraser, *Fauna Brit. India, Odon.*, 3 : 336-338.

1983. *Diplacodes trivialis*, Chhotani et al., *Rec. zool. Surv. India*, 80 : 488.

1995. *Diplacodes trivialis*, Mitra, *Opusc. zool. flumin.*, 129 : 4.

Material studied 1♂, South Andaman, Carbyne's Cove, 23.10.81, S. M. Sharma; 1♀, Saithankhari, 22.1.85, V. Arumugum; 4♂♂, Great Nicobar, Galathea, 22.1.93, K. Chandra; 1♀, Nancowry, 14.2.97, 3♀♀, Trinket Island, 6.2.93, 1♀, North Island, North of Reef, 11.3.93, D. V. Rao; 1♀, Campbell Bay, 2.4.93, 3♀♀, Great Nicobar, 6 Km. E. W. Road, 11.11.93; 1♂, 10 Km. E. W. Road, 11.11.93; 1♂, 14 Km. E. W. Road, 11.11.93, 2♂♂, 16 Km. E. W. Road, 12.11.93; 3♂♂, 19 Km. E. W. Road, 14.11.93 and 3♀♀, Galathea, 18.11.93, K. Chandra & P.; 1♀, North Andaman, Kalatang, 22.6.96, 1♂, Aerial Bay, 26.6.96, K. Chandra; 2♂♂ & 1♀, South Andaman, Carbyne's Cove, 21.1.98; 1♂ & 1♀, B. S. I. Garden, 20.1.98 and 1♀, North Andaman, Mayabunder, 4.2.98, Raja Ram.

Distribution in A. & N. : North, Middle, South and Little Andaman, Nancowry Island, Trinket Island and Great Nicobar.

Elsewhere : India (Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Uttar Pradesh, Karnataka, Maharashtra, West Bengal), Nepal, Myanmar, Sri Lanka, Thailand and Indonesia.

Genus *Indothemis* Ris

****45. *Indothemis caranatica* (Fabricius)**

1798. *Libellula caranatica* Fabricius, In supplementum Entomologiae Systematicae Halpnaie, Proft & Storch (8) : 284.

1842. *Libellula caesia* Rambur, *Hist. nat. Ins. Nevropteres*, : 95.

1936. *Indothemis caesia* Fraser, *Fauna Brit. India, Odon.*, 1 : 340.

1985. *Indothemis carnatica* Allen and Tobin, *Soc. Int. Odon. Rapid Comm.*, (2) 5 : 116.

Material studied : 1♂, North Andaman, Lanya Bay, 22.6.96, K. Chandra.

Distribution in A. & N. North Andaman.

Elsewhere : West Bengal and Western Ghats.

Remarks : It differs from Fraser's description as follows : Labium yellow margined with black; post clypeus and anteclypeus without any yellow spot, rather of uniform colour; antenodal lesser by one nervure; base of discoidal cell in the left hind wing also slightly distal to the arc. This species is recorded for the first time from A. & N. Islands.

Genus *Neurothemis* Brauer

Key to species of the genus *Neurothemis* Brauer

1. Wings broadly dark reddish brown with neuration very close.....2

- Wings tinted with pale or golden yellow at base; reticulation open.
..... *intermedia intermedia* (Rambur)
- 2. Wings dark reddish-brown from base to about middle of pterostigma, apex of wing also narrowly opaque brown to partly enclose a clear window in each wing at apex.
..... *fulvia* (Drury)
- Wings dark reddish-brown from base to 1 to 2 cells proximal of inner end of pterostigma; margin of dark area in hind wing curving fan wise towards base of wing, apices of wings clear.
..... *fluctuans* (Fabricius)

46. *Neurothemis fulvia* (Drury)

1773. *Libellula fulvia* Drury, *Ill, Exot. Ins.*, 2 : 84-85.

1936. *Neurothemis fulvia*, Fraser, *Fauna Brit. India, Odon.*, 3 : 353-354.

Material examined : 1 ♂, South Andaman, Manglutan, 17.2.72, G. S. Arora & P.; 1 ♀, Rutland, 9.1.76, P. K. Maity & P.; 1 ♂, Port Blair, 12.6.80, V. Arumugam; 1 ♂, Great Nicobar, 4-8 Km. E. W. Road, 26.1.93; 1 ♂, 16 Km. E. W. Road, 11.11.93 and 1 ♂, 41 Km. Galathea N. P., 18.11.93, K. Chandra & Party.

Distribution in A. & N. : North and South Andaman and South Nicobar.

Elsewhere : Throughout India (Himachal Pradesh, Uttar Pradesh, Bihar), Nepal, Myanmar, Sri Lanka, Taiwan, Thailand, Indonesia, Philippines, Micronesia, Japan and Australia.

47. *Neurothemis fluctuans* (Fabricius)

1793. *Libellula fluctuans* Fabricius, *Ent. Syst.*, 2 : 379.

1869. *Neurothemis fluctuans*, Hagen, *Stett. Ent. Zeit.*, 30 : 105.

1983. *Neurothemis fluctuans*, Chhotani *et al.*, *Rec. zool. Surv. India*, 80 : 493.

Material studied : 1 ♀, Great Nicobar, 27.3.85, M. K. Dev Roy; 1 ♂, Little Andaman, Waterfall forest, 13.9.90, K. V. Raman & P.; Great Nicobar, 27 Km. E. W. Road, 16.11.93, K. Chandra; 1 ♂, South Andaman, Rut Island, 2.6.82, R. M. Sharma; 3 ♂♂, Little Andaman, Waterfall forest, 10.3.91, S. Kumar; 1 ♂, South Andaman, Port Blair, Delanipur, Raja Ram, 1 ♂, North Andaman, Kalpong, H. E. P. A. 26.2.97; 1 ♂, 3.3.97, same locality and 1 ♂, 2.3.97 Kalighat, K. Chandra.

Distribution in A. & N. : North, South and Little Andaman and South Nicobar.

Elsewhere : It has been reported from various parts of mainland, Sri Lanka, Myanmar, Malacca and Malaysia.

48. *Neurothemis intermedia intermedia* (Rambur)

1842. *Libellula intermedia* Rambur, *Hist. nat. Ins. Nevropteres*, : 91.

1889. *Neurothemis intermedia*, Selys, *ann. Mus. Civ. Genova*, 27 : 454.
 1911. *Neurothemis intermedia intermedia*, Ris, *Cat. Coll. Selys*, 13 : 551.
 1936. *Neurothemis intermedia intermedia*, Fraser, *Fauna Brit. India Odon.*, 3 : 357-358.
 1983. *Neurothemis intermedia intermedia*, Chhotani et al., *Rec. zool. Surv. India*, 80 : 493.

Material studied : 1 ♀, Great Nicobar, 43 Km. North South Road, 2.11.89, H. S. Mehta & Party and 1 ♀, North Andaman, Kalpong H. E. P. A., 20.6.94, K. Chandra.

Distribution in A. & N. : North Andaman and Great Nicobar.

Elsewhere : India (Himachal Pradesh, Uttar Pradesh, Madhya Pradesh, Bihar, Maharashtra, Manipur, Meghalaya, Mizoram, Punjab, Sikkim, Tamil Nadu, Tripura, West Bengal), Nepal, Sri Lanka and Myanmar.

Genus *Trithemis* Brauer

Key to the species of the genus *Trithemis* Brauer

1. Legs very long; pterostigma black with its end white. *pallidinervis* (Kirby)
- Legs of normal length; pterostigma unicolourous. 2
2. Wings marked with amber-yellow at base. *aurora* (Burm.)
- Wings marked with blackish brown at base. *festiva* (Rambur)

49. *Trithemis aurora* (Burmeister)

1839. *Libellula aurora* Burmeister, *Handb. Ent.*, 2 : 859.
 1868. *Trithemis aurora*, Brauer, *Verh. zool.-bot. Ges. Wien.*, 18 : 177.
 1936. *Trithemis aurora*, Fraser, *Fauna Brit. India, Odon.*, 3 : 383-385.
 1983. *Trithemis aurora*, Chhotani et al., *Rec. zool. Surv. India*, 80 : 491.

Material studied : 1 ♂, Middle Andaman, 25.11.83, R. M. Sharma; 1 ♂, North Andaman, Kalighat, 24.9.87, H. S. Mehta; 5 ♂ ♂, 26.2.97, 6 ♂ ♂, 25.2.97 and 4 ♂ ♂, 3.3.97, North Andaman, Kalpong H. E. P. A., K. Chandra and 1 ♀, South Andaman, Port Blair, Delanipur, 6.2.98, Raja Ram.

Distribution in A. & N. : North Andaman, Middle Andaman, South Andaman & Little Andaman.

Elsewhere : Throughout India (Madhya Pradesh, Uttar Pradesh), Nepal, Tibet, Pakistan, Sri Lanka, Myanmar, Vietnam, Malaysia, Indonesia, Taiwan and Philippines.

50. *Trithemis festiva* (Rambur)

1842. *Libellula festiva* Rambur, *Hist. nat. Ins. Nevropteres*, : 92.

1868. *Trithemis festiva*, Brauer, *Verh. zool.-bot. Ges. Wien.*, 18 : 736.

1936. *Trithemis festiva*, Fraser, *Fauna Brit. India, Odon.*, 3 : 387-389.

1983. *Trithemis festiva*, Chhotani *et al.*, *Rec. zool. Surv. India*, 80 : 492.

Material studied : 1♂, Nalah near Satellite Station, Port Blair, 31.11.96, Raja Ram; 3♂♂, North Andaman, Kalpong H. E. P. A., 26.2.97, 1♂, 28.2.97 and 1♂, 3.3.97, same locality, K. Chandra.

Distribution in A. & N. : North, Little and South Andaman.

Elsewhere : India (Himachal Pradesh, Uttar Pradesh, West Bengal, Assam, Maharashtra), Nepal, Sri Lanka, Myanmar, Malaysia, Singapore, Indonesia, Philippines, Taiwan and New Guinea.

51. *Trithemis pallidinervis* Kirby)

1889. *Sympetrum pallidinervis* Kirby, *Trans. zool. Soc. Lond.*, : 327.

1936. *Trithemis pallidinervis*, Fraser, *Fauna Brit. India, Odon.*, 3 : 389-392.

1983. *Trithemis pallidinervis*, Chhotani *et al.* *Rec. zool. Surv. India*, 80 : 492.

1988. *Trithemis pallidinervis*, Prasad & Varshney, *Rec. zool. Surv. India, Occ. Pap.*, 110 : 27.

Distribution in A. & N. : South Andaman.

Elsewhere : Throughout India except in desert areas (Uttar Pradesh, Bihar, West Bengal, Andhra Pradesh, Tamil Nadu, Karnataka & Maharashtra), Nepal, Myanmar, Sri Lanka, Philippines, Taiwan, Thailand, Malaysia & Singapore.

Remarks : It is the most common species of this genus and is found near water bodies. This species is included here on the basis of literature review.

Genus : *Rhyothemis* Hagen

Key to the species of the genus *Rhyothemis* Hagen

1. Wings widely different in sexes; male with whole of wings tinted yellow, fore-wing with spots at node, discoidal cell, apex and at middle of Riii, hind wing with similar dark spots and two broad longitudinal basal bands. Female with broader, shorter wing; fore-wing hyaline from node to apex, basal half with broad black markings; hind wing with broad irregular markings to as far distal as pterostigma, apex hyaline. *variegata variegata* (Linn.)
- Wings closely similar in shape and markings in the sexes, male with species of all wings opaque, a nodal spot in fore-wing and two short, broad, basal, fasciae in hind wing; all females with black species to wings. *phyllis phyllis* (Sulzer)

52. *Rhyothemis phyllis phyllis* (Sulzer)

1776. *Libellule phyllis* Sulzer, *Abgekürzte Gesch des Ins.*, : 169.

1867. *Rhyothemis phyllis*, Hagen, *Stett. Ent. Zeit.*, 28 : 232.

1936. *Rhyothemis phyllis phyllis*. Fraser, *Fauna Brit. India, Odon.*, 3 : 421.

Material studied 1♂, Great Nicobar, 41 Km. Galathea, 18.11.93, K. Chandra.

Distribution in A. & N. South Nicobar.

Elsewhere South India (Karnataka and Tamil Nadu), Myanmar, Malaysia, Australia and Oceania.

53. *Rhyothemis variegata variegata* (Linnaeus)

1763. *Libellula variegata* Linnaeus, *Amoenitates Acad.*, 6 : 412.

1867. *Rhyothemis variegata*. Hagen, *Stett. Ent. Zeit.*, 38 : 232.

1913. *Rhyothemis variegata variegata*, Ris, *Cat. Coll. Selys*, 15 : 931.

1936. *Rhyothemis variegata variegata*, Fraser, *Fauna Brit. India, Odon.*, 3 : 423-424.

Material studied 1♀, Great Nicobar, 41 Km. Galathea, 13.11.93 and 1♀, 16 Km. E. W. Road, 15.11.93, K. Chandra.

Distribution in A. & N. : South Nicobar.

Elsewhere India (Bihar, Himachal Pradesh, Uttar Pradesh, West Bengal), Myanmar, Sri Lanka and Nepal.

Genus *Camacinia* Kirby

54. *Camacinia gigantea* (Brauer)

1867. *Neorothemis gigantea* Brauer, *Verh. zool.-bot. Ges. Wien.*, 17 : 8.

1889. *Camacinia gigantea*, Kirby *Trans. zool. soc. Lond.*, 12 : 267.

1936. *Camacinia gigantea*, Fraser, *Fauna Brit. India, Odon.*, 3 : 417-419.

1995. *Camacinia gigantea*, Mitra, *Opusc. zool. flumin.*, 129 : 4.

Material studied 1♂, Great Nicobar, 41 Km. E. W. Road, 18.11.93, K. Chandra.

Distribution Great Nicobar.

Elsewhere Assam, Northern India & West Bengal.

Genus *Pantala* Hagen

55. *Pantala flavescens* (Fabricius)

1798. *Libellula flavescens* Fabricius, *Ent. Syst. Suppl.*, : 285.

1861. *Pantala flavescens*, Hagen, *Syn. Neur. N. Amer.*, 142.

1924. *Pantala flavescens*, Fraser, *Rec. Indian Mus.*, 26 : 426.

1936. *Pantala flavescens*, Fraser, *Fauna Brit. India, Odon.*, 3 : 414-416.

Material examined : 2 ♀ ♀, 8.10.84 and 3 ♀ ♀, 8.12.84, North Andaman, Aerial Bay, G. C. Rao & Party; 2 ♂ ♂, Kalighat, 15.12.85, B. Mitra & Party; 1 ♂, locality same, 15.12.89, G. C. Rao & Party; 1 ♀, Middle Andaman, Bakultala, 22.8.91; 2 ♂ ♂, Great Nicobar, Campbel Bay, 27.1.93; 3 ♀ ♀, 16 Km. E. W. Road, 15.11.93, K. Chandra & Party and 1 ♀, North Andaman, Shyam Nagar, 26.6.94, K. Chandra & Party.

Distribution in A. & N. : North, Middle, south and Little Andaman and South Nicobar.

Elsewhere : Circumtropical & sub-tropical in distribution : Throughout India, Morocco (North West Africa), Nepal, Myanmar, Sri Lanka, Thailand, West Malaysia, Indonesia and China.

Genus *Tramea* Hagen

56. *Tramea virginia* (Rambur)

1842. *Libellula virginia* Rambur, *Hist. nat. Ins. Nevropteres*, : 33.

1890. *Tramea virginia*, Kirby, *Syn. Cat. Neur. Odon.*, : 3.

1936. *Tramea virginia*, Fraser, *Fauna Brit. India, Odon.*, 3 : 435-436.

1995. *Tramea virginia*, Mitra, *Opusc. zool. flumin.*, 129 : 4.

Material studied : 1 ♂, North Andaman, Lamya Bay, 26.6.94, K. Chandra.

Distribution in A. & N. : North, South and Little Andaman and South Nicobar.

Elsewhere : India (Bihar, Himachal Pradesh, Uttar Pradesh and West Bengal), China, Indonesia, Micronesia, Myanmar, Taiwan, Thailand and South China.

Genus *Tholymis* Hagen

57. *Tholymis tillarga* (Fabricius)

1798. *Libellula tillarga* Fabricius, *Ent. Syst. Suppl.*, : 285.

1867. *Tholymis tillarga*, Hagen, *Stett. Ent. Zeit.*, 28 : 220.

1936. *Tholymis tillarga*, Fraser, *Fauna Brit. India, Odon.*, 3 : 411-413.

1983. *Tholymis tillarga*, Chhotani, *et al.*, *Rec. zool. Surv. India*, 80 : 489.

Material studied : 1 ♀, South Andaman, Garachamara, 28.11.90, K. V. Raman & P., 1 ♀, Port Blair, Anarkali, 31.11.96, Raja Ram; 1 ♂, North Andaman, Kalighat, 2.3.97, K. Chandra; 1 ♂, Wimberligunj, 4.9.97, P. T. Rajan and 1 ♀, Prem Nagar, Port Blair, 8.10.97, D. D. Prakashan.

Distribution in A. & N. : North, Middle, South and Little Andaman.

Elsewhere : Throughout India, Myanmar, Sri Lanka, Thailand, West Malaysia, Indonesia, Micronesia, Australia and Tropical Africa.

Genus *Zyxomma* Rambur****58. *Zyxomma petiolatum* Rambur**

1842. *Zyxomma petiolatum* Rambur. *Hist. nat. Ins. Neuropteres.* 30.

1936. *Zyxomma petiolatum*, Fraser. *Fauna Brit. India, Odon.* 3 : 409-410.

Material examined : 1 ♀, South Andaman, Middle Point, Port Blair, 4.1.93. D. D. Prakashan.

Distribution in A. & N. South Andaman.

Elsewhere Throughout India, Myanmar, Sri Lanka, Thailand, Sumatra, Java, Borneo, Malaysia, Ryukus, Seychelles, Indo-China, Micronesia and Australia.

Remarks : Terminal segments from 4 are missing but its venational characters gives its clear identity; nodal index is higher $\left[\frac{7-11\frac{1}{2}/10\frac{1}{2}-7}{9-8/8-8} \right]$, discoidal cell made of 2 cells in the fore-wing and 3 cells in the hind wing.

SUMMARY

The present paper deals with 58 species and subspecies of odonate fauna belonging to 38 genera and 11 families known from Andaman and Nicobar Islands. Of these, seven species are recorded for the first time from Andaman and Nicobar Islands and one species is addition to odonate fauna of India.

ACKNOWLEDGEMENTS

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Table I
DISTRIBUTION OF SPECIES AND SUBSPECIES OF ODNANTA IN ANDAMAN AND NICOBAR ISLANDS

Sl. No.	Name of species and subspecies	A	N	D	A	M	A	N	N	I	C	O	B	A	R
		NA	MA	SA	RA	LA			NN			MN			SN
1.	<i>Ceriagrion cerinorubellum</i> (Brauer)	+	-	+	-	+			-			-			-
2.	<i>Ceriagrion olivaceum</i> Laidlaw	-	-	+	-	-			+			-			+
3.	<i>Pseudagrion microcephalum</i> (Rambur)	-	-	-	-	-			-			+			-
4.	<i>Pseudagrion andamanicum</i> Fraser	-	-	+	-	+			-			-			+
5.	<i>Pseudagrion pruinsum</i> (Burmeister)	-	-	-	-	-			-			-			+
6.	<i>Pseudagrion williamsoni</i> Fraser	-	-	-	-	-			-			-			+
7.	<i>Aciagrion pallidum</i> Selys	-	+	-	-	-			-			-			-
8.	<i>Ischnura senegalensis</i> (Rambur)	+	+	+	-	-			-			-			+
9.	<i>Agriocnemis femina oryzae</i> (Lieftinck)	-	+	+	-	-			-			-			+
10.	<i>Agriocnemis pygmaea</i> (Rambur)	-	-	-	-	-			-			-			+
11.	<i>Agriocnemis rubescens rubeola</i> Selys	-	-	+	-	-			-			-			-
12.	<i>Copera marginipes</i> (Rambur)	-	-	+	-	+			-			-			-
13.	<i>Copera vittata serapica</i> (Selys)	-	-	-	-	-			-			-			+
14.	<i>Drepanosticta annandalei</i> Fraser	-	-	+	-	-			-			-			-
15.	<i>Prodiasineura verticalis andamaensis</i> (Fraser)+	-	-	+	-	+			-			-			-
16.	<i>Lestes malabarica</i> Fraser	-	-	+	-	-			-			-			-
17.	<i>Lestes p. praemorsus</i> Selys	-	-	+	-	-			-			-			-
18.	<i>Vestalis g. gracilis</i> (Rambur)	+	+	+	-	+			-			-			-
19.	<i>Libellago lineata andamanensis</i> (Fraser)	+	-	+	-	+			-			-			-

Table I contd.

Sl. No.	Name of species and subspecies	A	N	D	A	M	A	N	N	I	C	O	B	A	R
		NA	MA	SA	RA	LA			NN			MN			SN
20.	<i>Libellago lineata blanda</i> (Selys)	-	-	-	-	-			-			-			+
21.	<i>Libellago aurantiaca</i> (Selys)	-	-	-	-	-			-			-			+
22.	<i>Gomphidia T-nigrum</i> Selys	+	-	-	-	+			-			-			-
23.	<i>Gomphidia ganeshi</i> Chhotani, Lahiri & Mitra	-	-	+	-	-			-			-			-
24.	<i>Anaciaeschna jaspidea</i> (Burmeister)	-	-	-	-	-			-			-			+
25.	<i>Oligoeschna andamani</i> Chhotani, Lahiri & Mitra	-	-	-	-	-			-			-			+
26.	<i>Anax guttatus</i> (Burmeister)	-	-	+	-	-			-			-			+
27.	<i>Gynacantha dravida</i> Lieftinck	-	-	-	-	+			-			-			+
28.	<i>Gynacantha subinterrupta</i> Rambur	-	-	-	-	-			-			-			+
29.	<i>Gynacantha bayadera</i> Selys	-	-	+	-	-			-			+			-
30.	<i>Epophthalmia v. vittata</i> Burmeister	-	-	+	-	-			-			-			-
31.	<i>Agrionoptera insignis</i> (Rambur)	-	-	-	-	-			+			-			-
32.	<i>Cratilla metallica</i> (Brauer)	+	-	-	-	-			-			-			-
33.	<i>Cratilla lineata calverti</i> Foerster	-	+	-	-	-			-			-			-
34.	<i>Lathrecista a. asiatica</i> (Fabricius)	+	+	+	-	+			-			-			+
35.	<i>Nesoxenia lineata</i> (Selys)	+	-	+	-	-			-			-			+
36.	<i>Lyriothemis cleis</i> Brauer	+	-	-	-	-			-			-			-
37.	<i>Orthetrum chrysis</i> (Selys)	+	-	+	-	-			-			-			-
38.	<i>Orthetrum pruinosum neglectum</i> (Rambur)	-	-	+	-	-			-			-			-

Table I contd.

Sl. No.	Name of species and subspecies	A	N	D	A	M	A	N	N			O	B	A	R
		NA	MA	SA	RA	LA			NN			MN			SN
39.	<i>Orthetrum s. sabina</i> (Drury)	+	+	+	-	-			-			-			+
40.	<i>Potamarcha congener</i> (Rambur)	+	+	+	-	+			-			-			+
41.	<i>Acisoma p. panorpoides</i> Rambur	-	-	-	-	-			-			-			+
42.	<i>Brachythemis contaminata</i> (Fabricius)	-	-	-	-	-			-			-			+
43.	<i>Crocothemis s. servilia</i> (Drury)	+	-	+	-	+			-			-			-
44.	<i>Diplacodes trivialis</i> (Rambur)	+	+	+	-	+			-			+			+
45.	<i>Indothemis carnatica</i> (Fabricius)	+	-	-	-	-			-			-			-
46.	<i>Neurothemis fulvia</i> (Drury)	+	-	+	-	-			-			-			+
47.	<i>Neurothemis fluctuans</i> (Fabricius)	+	-	+	-	+			-			-			+
48.	<i>Neurothemis i. intermedia</i> (Rambur)	+	-	-	-	-			-			-			+
49.	<i>Trithemis aurora</i> (Burmeister)	+	+	+	-	+			-			-			-
50.	<i>Trithemis festiva</i> (Rambur)	+	-	+	-	+			-			-			-
51.	<i>Trithemis pallidinervis</i> (Kirby)		-	+	-	-			-			-			-
52.	<i>Rhyothemis phyllis phyllis</i> (Sulzer)		-	-	-	-			-			-			+
53.	<i>Rhyothemis v. variegata</i> (Linnaeus)		-	-	-	-			-			-			+
54.	<i>Camacinia gigantea</i> (Brauer)			-	-	-			-			-			+
55.	<i>Pantala flavescens</i> (Fabricius)	+	-	+	-	+			-			-			+
56.	<i>Tramea virginia</i> (Rambur)	+		+	-	+			-			-			+
57.	<i>Tholymis tillarga</i> (Fabricius)	+	+	+	-	+			-			-			-
58.	<i>Zyxomma petiolatum</i> Rambur	-	-	+	-	-			-			-			-

NA = North Andaman, MA = Middle Andaman, SA = South Andaman, RA = Ritchi's Archipelago, LA = Little Andaman, NN = North Nicobar, MN = Middle Nicobar and SN = South Nicobar.

LENGTH-WEIGHT RELATIONSHIP OF *PARREYSIA FAVIDENS* OF FRESHWATER DRAINAGE SYSTEMS OF BURHI GANDAK, NORTH BIHAR (INDIA)

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INTRODUCTION

Parreysia favidens (Benson) belongs to family Unionidae, order Schizondonta and class Bivalvia. These freshwater bivalves are abundantly found in rivers, streams, lakes, channels and drainage systems of North Bihar especially in the river Burhi Gandak. It lives on the bottom buried in mud and sand.

Many workers have investigated on the shell growth and length weight of the bivalves, (Teissier, 1948; Patil, 1976; Ambrose, 1977 Seed and Connor, 1980; Welch and Joy, 1984; Mattice and Wright, 1986; Belanger *et al.*, 1986a; Franeis *et al.*, 1990 and Fatima, 1993).

In this work an attempt has been made to study the length weight relationship of *Parreysia favidens* of freshwater drainage systems of Burhi Gandak of North Bihar.

MATERIAL AND METHODS

One hundred species (0.21-9.7g) of *Parreysia favidens* were collected from drainage of Burhi Gandak of North Bihar by Ekman dredge (Fig. 1). Each specimen were measured. After measurement wet tissue weight was noted by weighing it on an electric balance accurate to 0.1 mg. The weighted specimens were dried in an oven at 105° upto a constant weight. Data were examined by testing the fit of pairs of variable to the allometric growth equation $y = ax^b$, where 'y' is the independent variable and 'x' the independent variable. The constant 'a' and 'b' were determined by least squares regression analysis. The value of 'b' indicates the ratio of growth rate of the two variables the value of 'b' equal to three means that the rate of growth of the two variable is the same and the relationship is known as isometric. A smaller value means that 'y' is increasing at a slower rate than the variable 'x' and the allometric relationship is termed negative allometry.

RESULTS

On the dorsal region of the shell, rings and lines appear in semi-circles keeping umbo as the central point. There is so many light and dark bands. The dark bands show the maturity of the shell and the light bands indicate growth.

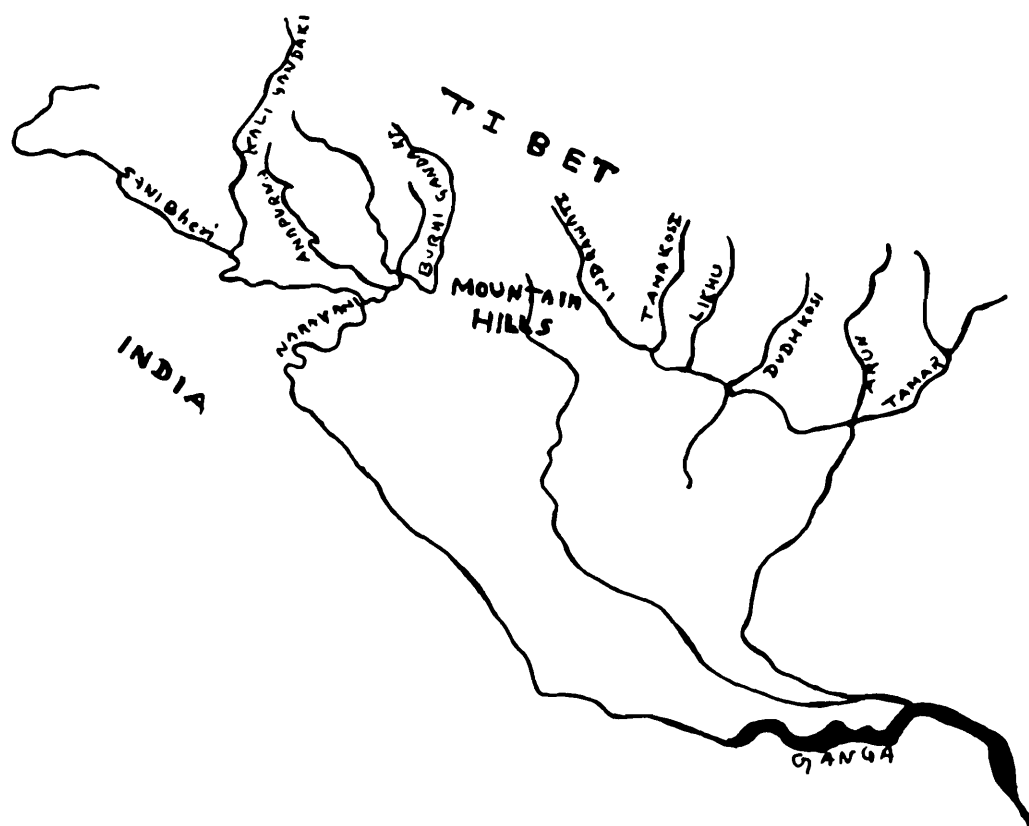


Fig. 1. Drainage system of Gandak and Kosi rivers.

Teissier (1948) has shown that the slope of functional line denotes the ratio of the standard deviations of y and x . It is also the geometric mean of the ordinary regression of X and Y (or vice versa) and for that reason it has been called the geometric mean (+GM) of functional regressions.

Length (L) Vs Breadth of the shell (B) :

$$B = 0.719589 L^{0.5985179}$$

Where,

B represents breadth and L represents length.

This relationship obeys the following equation :

The regression analysis ($b = 0.5985179 < 1$; $r = 0.948$, $P < 0.001$) shows higher degree of relationship between length and breadth of the shell of bivalve (*P. favidens*). But regression coefficient (b) tells us that breadth will decrease in size in relation to length. This is quite evident from our experimental outcome. This is highly significant.

$$W = 0.149541 L^{3.2371158}$$

Regression coefficient (b) shows its closeness to cube law of growth of animals which

indicates that the bivalve, *Parreysia favidens* increase its flesh weight with shell at a rate required for the maintenance of constant body proportion and vice versa. This is also highly significant.

Length (L) Vs Flesh weight without shell (W) :

The correlation ($r = 0.98511$, $P < 0.001$) and regression coefficients ($b = 3.676332$ (3)) were computed between length and flesh weight without shell and were found highly significant at 0.1% level. There is a positive and significant relationship between two variables ('b' value is greater than). This indicates that the increase in flesh weight without shell increase at a faster rate that required to maintain stable body proportions and vice versa. Its most probable functional relationship may be expressed as :

$$F_w = 0.076876 L^{3.676332};$$

Where F_w = Flesh weight, L = Length

Length (L) Vs Dry weight of flesh (DW) :

The regression analysis were ($b = 2.91822$, $r = 0.846156$, $P < 0.001$) was performed to get an appropriate model between these two variables. The significant value of 'r' suggest that the increase in length of the bivalve (*P. favidens*) causes the increase of dry weight of the entire flesh, its value shows that dry weight of entire flesh weight is increasing at greater rate compared as in the case of flesh weight without shell, which is due to variation in moisture content. Its functional relation may be written as

$$D_w = 0.315211, L^{2.91822}, \text{ Where } D_w = \text{Dry weight of flesh, } L = \text{Length.}$$

Breadth (B) Vs Flesh weight with shell (W) :

The correlation coefficient ($r = 0.937357$; $P < 0.001$) and regression coefficient ($b = 2.901316$ (3)) were computed between breadth and flesh weight with shell. It was found highly significant at 0.1% level. It may be concluded that increase in breadth of the (*P. favidens*) increases with the weight of the flesh and the shell. The value of regression coefficient pointed out that per unit change in breadth the flesh weight with shell increase by 2.901316. Its functional relation may be expressed as :

$DF_w = 0.562109 B = 2.901316$ Where, DF_w represents Dry weight of flesh with shell and B is breadth.

Breadth (B) Vs Flesh weight without shell (W) :

The positive and highly significant correlation coefficient ($r = 0.922055$; $P < 0.001$) has been observed between breadth and flesh weight without shell.

$$DF = 0.86088, B^{3.329802} \text{ Where, } DF_w = \text{Dry weight of flesh only.}$$

Breadth (B) Vs Dry weight of flesh (DW):

The regression analysis ($b = 2.892985 < 3$; $r = 0.866953$, $P < 0.001$) was also performed between two variables which shows that it is not very much close to the cubic law. It gives an idea that

in the absence of moisture flesh weight is not growing at much faster rate as compared to the breadth of the shell. Its probable model may be written as : $DF_w = 0.27349, B^{2.89295}$ (Plate-1).

DISCUSSION

Two different types of growth in animals have been recognised. They are isometric and allometric growth. In isometric growth $b = 1$ which shows growth of the different body parts are growing proportionally. In allometric growth $b > 1$ or $b < 1$. It shows the growth rate of different parts differ.

In the case of heterogony (dysharmony) the change of weight (W) is increasing faster or slower than length (L). Patil (1976) worked and found that in the *Lamellidans consobrinus* the shell is elliptical and bivalved. The two shell valves are hinged together by means of teeth ligament. The outer surface of the shell shows concentric lines of growth. Its inner surface has the impression of crystals of calcium carbonate of aragonite type bound together by the organic matrix called conchiolin.

Morton (1954) found that *Lasaea* grows to a larger average size (3.0 mm or more) in more sheltered conditions under deep crevices.

In certain species of bivalves allometric relationship in shell growth were examined. Width increased relatively faster than either length or height so that shell became progressively more spherical as they increase in size (Seed and Connor, 1980).

The annual nature of growth bands in the *Surf clam* has been documented (Ambrose, 1977; Jones *et al.*, 1978). The growth pattern of *Surf clam* range shows some overlap with that of *Arctica islandica*. Both of them have a sigmoidal growth curve (Arnold and Holland, 1976).

Longevity of bivalve is greater in contrast to previously documented for invertebrate group. Individuals over 90 years are not uncommon. One specimen had 149 bands.

Deposition of the lines which delimit the bands appears to coincide with spawning in late summer and complete change occur during abundant food supply.

Franeis *et al.* (1990) studies the juvenile and adult *Corbicula fluminea* in different months in 1985 from the New River in Narrows, Verginia. Shell weight and soft tissue dry weight were recorded for each individual. Regression analysis among all pairs of data were calculated monthly. All comparison among shell dimensions and dry tissue weight generated coefficient of determination $(R)^2$ 0.801. In all instances comparisons between shell dimensions and the cube root of dry tissue weight generated higher R^2 values than comparisons between shell dimensions and dry weight. Comparison of monthly regression lines generated between shell secretion and the cube root of dry weight suggests that accretion and tissue growth are not equivalent for all individuals in a population and are dependent on initial size of individuals and seasons.

The increase in tissue mass in larger individuals in May was most likely in preparation for reproductive activities. While the marked decrease in slope of the regression lines from May to June reflect initiation of spawning.

Both Fuji (1957) and Joy (1985) observed no growth in clams maintained at water temperature below 14°C, while the greatest rate of growth were observed at 24° to 30°C. In one work we have been seen that *P. favidens* growing faster in the spring season at 31.5°-32.9°C. Britton *et al.* (1979) reported a slowing of shell deposition in clams with shell - 10 mm in length during winter. While McMohan and Williams (1986) found growth rates of *Corbicula fluminea* individual to be characterized by large seasonal variation. Mattice and Wright (1986) observed varying growth rates for the Asiatic clam in field studies and had suggested that temperature plays a major role in growth determination.

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SUMMARY

Length- weight relationship of *Parreysia favidens* (Benson) collected from different drainage systems of North Bihar, were established. Allometric growth pattern were found in the case of length Vs breadth of the shell ($b = 0.5985$, $r = 0.948$; $p < 0.001$), length Vs flesh weight with shell ($b = 3.2371$, $r = 0.9606$; $P < 0.001$), length Vs flesh weight without shell ($b = 3.6763$, $r = 0.9851$; $p < 0.001$), length Vs dry weight of flesh ($b = 2.9182$, $r = 0.8461$; $p < 0.001$), breadth Vs flesh weight with shell ($b = 2.9013$, $r = 0.9373$; $p < 0.001$), breadth Vs flesh weight without shell ($b = 3.3298$; $r = 0.9229$; $p < 0.001$) and breadth Vs dry weight of the flesh ($b = 2.8929$, $r = 0.8668$; $p < 0.001$). The growth pattern of different parts of the body has been discussed in the text.

Key words : Length weight relationship, *Parreysia favidens*

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NEW RECORDS OF PESTIFEROUS LAND MOLLUSCS FROM RAJASTHAN, INDIA

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INTRODUCTION

More than 1500 species of land mollusc are recorded from India. Out of these, twelve species viz. *Achatina fulica* Bowdich, *Ariophanta bajadera* (Pfeiffer), *Ariophanta ligulata* Ferrussac, *Ariophanta solata* (Benson), *Bensonia monticola* Hutton, *Cryptozona belangiri* Deshayes, *Cryptozona (Nilgiria) semirugata* (Beck.), *Cryptozona (Xestina) bistrialis* Beck., *Macrochlamys indica* (Godwin-Austen), *Opeas gracile* (Hutton), *Zootecus insularis* (Ehrenberg) and *Mariaella dussumieri* (Gray) are known to cause damage to agricultural, horticultural and plantation crops in India (Raut & Ghosh, 1984; Srivastava, 1992 and Subba Rao, 1975). So far, only two pestiferous land mollusc *Opeas gracile* (Hutton) and *Zootecus insularis* (Ehrenberg) are reported from Rajasthan (Subba Rao & Mitra, 1979 and Raut & Ghosh, 1984). *Laevicaulis alte* (Ferussac) is reported from Udaipur, Rajasthan but not as a pest (Ray & Mukherjee, 1963). The present paper reports for the first time, two more pestiferous land mollusc - *Laevicaulis alte* (Ferussac) and *Macrochlamys indica* (Godwin-Austen), as severe pests of neem seedlings in forest nurseries of Rajasthan along with new distributional records.

SYSTEMATIC ACCOUNT

1. *Laevicaulis alte* (Ferussac, 1821)

Phylum : MOLLUSCA
Class : GASTROPODA
Subclass : GYMNO MORPHA
Order : STYLOMMATOPHORA
Family : VERONICELLIDAE
Genus : *Laevicaulis* Simroth, 1913.

Laevicaulis alte (Ferussac, 1821)

1821. *Vaginulus alte* Ferussac, Tabl. Syst. Anim. Moll., Paris, p. 14.

1925. *Meisenheimeria alte* Hoffman. Tena. Z. Naturw., Jena, 61 : 226-228. Pl. V, Fig. 45 b.

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Material examined 25 exs. AFRI, nursery, 06.xi.1995; 10 exs. Lokswell nursery, 10.viii.1994; 12 exs. Grass Farm nursery, 5.ix.1993. all from Jodhpur; 12 exs. SFD nursery, Oscian, 15.vi.1993; 16 exs. SFD nursery, Tinweri, 15.vi.1993; 12 exs. SFD nursery, Phalodi, 15.vii.1993. Coll. S. Kumar; and 10 exs. Grass Farm Nursery, Jaipur, Coll. S. Narayan.

Diagnostic Features Specimens young to adult, length 7 mm. to 62 mm. A soft bodied animal without shell. Body elongate, oval on contraction, linear when extended. Head with two pairs of tentacles, retractile. Dorsal surface blackish brown, mantle is pigmented with dark brown colour usually with a yellowish line down the middle. Ventral surface creamish white in colour, Hermaphrodite.

Distribution India Andaman and Nicobar Islands, Andhra Pradesh, Bihar, Gujarat, Maharashtra, Pondicherry, Punjab, Rajasthan (Udaipur), Tamil Nadu, Uttar Pradesh and West Bengal. Elsewhere : Australia, China, East Africa, Formosa, Hong Kong, Indonesia, Loyalty Islands, Madagascar, Mauritius, New Caledonia, Philippines, Reunion Islands and Sri Lanka. (Ray, 1961; Benthem Jutting, 1952).

Host Plants Known to cause extensive damage to garden plants (Subba Rao & Mitra, 1991) and vegetable crops (Rao & Ramdass, 1953).

Remarks : First time reported as pest of neem seedlings. All stages feed voraciously on neem seedlings in forest nurseries resulting in mortality.

2. *Macrochlamys indica* Godwin - Austen, 1883

Order : STYLOMMATOPHORA
 Family : ARIOPHANTIDAE
 Subfamily : MACROCHLAMYDINAE
 Genus *Macrochlamys* Gray, 1847

Macrochlamys indica Godwin-Austen, 1883

1883. *Macrochlamys indica* Godwin - Austen, *Moll. Indica*, 1 : 97, Pl. 18 Fig. 1-8.
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1979. *Macrochlamys indica* Subba Rao & Mitra, *Rec. Zool. Surv. India*, 75 : 15.

Material Examined 2 exs. M.L. Sukhadia Univ. Campus, Udaipur, 24.viii.1995; 4 exs. AFRI nursery, 12.viii.1993; 6 exs. Lokswell nursery, 10.viii.1993; 2 exs. Grass Farm nursery, 5.ix.1993. all from Jodhpur; 2 exs. SFD nursery, Oscian, 15.vi.1993; 6 exs. SFD nursery, Tinweri, 15.vi.1993. and 2 exs. SFD nursery, Phalodi, 15.vii.1993. Coll. S. Kumar.

Diagnostic Features : Shell perforate, pale brown with smooth and polished surface, with five and half whorls and low spire. Last whorl much wider than the rest, rounded at the periphery. Aperture is oblique, columellar margin curved and oblique, peristome thin.

Distribution : India : Andaman Islands, Assam, Bihar, Delhi, Maharashtra, Orissa, West Bengal, Kerala and Tamil Nadu.

Host Plants : It has been reported as a pest of *Luffa* sp. Beans, Lettuce, Cole crops, *Moringa oleifera*, *Amaranthus blitum*, *Abelmoschus esculentus*, *Tagetes* spp. and *Chrysanthemum* sp. (Raut & Ghosh, 1984) and Money plant (Subba Rao, 1975).

Remarks : It is being reported for the first time from Rajasthan and as a pest on neem seedlings. It is a voracious plant feeder and found devouring young neem seedlings in different forest nurseries of State Forest Department (SFD) Rajasthan and Arid Forest Research Institute, Jodhpur.

Habit and Habitat : Land molluscs are restricted to moist habitats. They hide during the day in holes, grass dumps etc, and become active at night. The snails and slugs aestivate or hibernate during adverse conditions. The aestivating/hibernating mollusc population is of great significance as this population becomes responsible for “restocking an infested area” With the onset of monsoon the snails and slugs which have survived the stress and strain of adverse climatic conditions during aestivation/hibernation becomes active again and resume their biological activities. Molluscs prefer slightly alkaline sandy soils (pH 7.0-8.0). The fallen leaves, debris, animal dung and dead snails serves as food for mollusc. The eggs are laid in moist places. The cluster contain 15-100 eggs, depending on the age of the mollusc. Mollusc rehabilitates itself by rebuilding its population, spread all over again and becomes a menace.

Nature of Damage : Both *Macrochlamys indica* and *Laevicaulis alte* are voracious plant feeders and devour all parts of the seedlings. The young molluscs prefer tender leaves and stem and avoid harder portions, while older ones attack young as well as grown up seedlings. They feed voraciously on the main tender stem above the collar region by licking the bark which results in the girdling of the stem and subsequently the seedlings die due to the damage to the cambium. The debarked stem becomes very fragile and weak and easily breaks off with the slightest movement of wind. It has been observed that damage is beyond survival, in seedlings ranging from 10 cm - 15 cm, as the seedlings are eaten up completely, older seedlings are defoliated and stem is debarked and the plant is able to revive when prevented from further attack.

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AGRYPNINAE (COLEOPTERA : ELATERIDAE) OF INDIA : A TAXONOMIC REVIEW AND CHECKLIST

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Key words : Taxonomy, Review, Agrypninae, Elateridae, Coleoptera.

INTRODUCTION

The family popularly known as 'click-beetles' is designated Elateridae under superfamily Elateroidea in the suborder Polyphaga.

The larvae of these primarily nocturnal beetles are known as 'wire worms', a serious pest of certain crops (Stebbing, 1914). These beetles are found throughout India where extensive vegetative covers are in extant. Some however, have been collected from sandy beds of hilly areas (members of the genus *Meristhus*).

The name of the family Elateridae Leach 1815 was based on the tribe Elaterites Leach, 1815. *Elater* Linnaeus, 1758 was the type genus of the tribe Elaterites. .

Supra specific definition and limit of this family remains confusing and the classification of this group of beetles has been regarded by some chief authors as 'almost hopeless' (Stibick, 1979). However, several schemes of classification have been forwarded by different authors (Laccordaire 1857, Candeze 1891, Fiautiaux 1941, Schwarz 1906, Stibick 1979).

Authorities varied in their opinion regarding limit and definition of various categories such as subtribes, tribes and subfamilies and some treat them as subfamilies of equal rank. For a number of reasons, including purposes of reference and classification, this arrangement has not been satisfactory. Several authors Hyslop (1917), Crowson (1961), Gurjeva (1969, 1974) tried to improve the elaterid classification.

Stibick (1979) classified Elateridae into 12 subfamilies and 27 tribes, 5 of those tribes are again divided into 20 subtribes; most of the subfamilies of other authors have been ranked as tribe by Stibick (op. cit.). Most of the authors, however, still follow the classification proposed by Fleutiaux (1941). In this classification he classified Elateridae into 21 subfamilies. Von Hayek (1973, 1979) and others have also followed this classification. For the present work, the category subfamily Agrypninae is used as proposed by Fleutiaux (von Hayek, 1973).

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Candeze in 1857 dealt the group as Agrypnides. The type genus was *Agrypnus* Eschscholtz. In 1925 Schenkiing elevated Agrypnides as a subfamily.

As far as the subfamily Agrypninae is concerned a number of new genera and subgenera have been established in recent years. But study of the literatures reveals that in almost all the cases the diagnosis of the old as well as the new genera and subgenera are little more than the brief summaries of the most conspicuous features of the type species. In very few cases the range of variations existing within the genus was indicated or any effort was made to define the genus. Attempts to identify these materials with existing literatures shows that many species cannot be accomodated satisfactorily in any genus while others can be placed equally well in two or more genera (von Hayek, 1973).

Von Hayek (1973, 1979) carried out extensive work and placed all previously described species in appropriate genera. While carrying out her work, she reviewed and evaluated all previously used characters and discovered new characters and made use of previously neglected characters. All nominal species included in Agrypninae by previous workers were evaluated and each one was assigned to an appropriate genus. With the help of collections from all over the world, she prepared a new generic classification of the subfamily (1973) which has been universally accepted.

While studying the identified materials present in Zoological Survey of India and identified by various workers it has been observed that with the present state of new knowledge the generic status of almost all the species have to be changed and to be assigned to other genera.

The materials which were listed in this list was collected by several foreign workers a long time ago. They did not gave any particular locality of the materials they collected. The published locality of a number of species was either 'Indes-Orientales' or 'India' Only in the recent years, the authors have tried to give the exact locality of the species. We have given the exact locality of these species where ever possible, otherwise the published locality have been given.

Accordingly this present work has been contemplated to review the genera and species of Agrypninae of India and to provide the current status of such genera and species so far known from India.

HISTORY AND PRESENT STATUS OF THE SPECIES OF AGRYPNINAE FROM INDIA

Fabricius (1775) was the first to describe a click-beetle, *Elater fuscipes* (now under *Lanelater*) collected by Koenig, a student of Fabricius who collected the material from South India. In 1891 Fabricius again described another species *Elater luridus* (now under *Lanelater*). The material came from 'Coromandal India' The last species in eighteenth century, *Elater tomentosus* (now under *Lanelater*) was also described by Fabricius in 1798. Specimens came from 'India Orienteles'

Thus eighteenth century ended with only three species of the subfamily Agrypninae from India.

In nineteenth century herbst (1806) described a species *Elater muticus* (now under *Agrypnus*). The material was from 'India Orientales' In 1840 Germar described one species *Lacon mustellinus* (now under *Agrypnus*). In 1844 Kollar described another species, *Lacon brachychaetus* (now

under *Agrypnus*). The material was collected from Kashmir.

In the middle of nineteenth century Candeze, pioneer worker of the family Elateridae, who published his first work 'Monographie des Elaterides I' in 1857. Here, he included 27 species from different parts of India, viz., *Lacon brunneipennis* (now under *Agrypnus*, material from N. India), *Lacon consobrinus* (now under *Agrypnus*), *Lacon costicollis* (now under *Agrypnus*), *Lacon desquamatus* (now under *Agrypnus*), *Lacon coenosus* (now under new name *Agrypnus deyrollei*), *Lacon ellipticus* (now under *Agrypnus*, material was from 'Himalaya'), *Lacon furunculoides* (now under *Agrypnus*), *Lacon haedulus* (now under *Agrypnus*), *Lacon lapideus* (now under *Agrypnus*), *Lacon molestus* (now under *Agrypnus*, material was from Dinapore, aux Indes-Orientales), *Lacon serrula* (now under *Agrypnus*), *Lacon torrefactus* (now under *Agrypnus*), *Lacon tostus* (now under *Agrypnus*), *Lacon transversus* (now under *Agrypnus*), *Lacon scutellatus* (now under *Agrypnus*, this was later recorded from U.P., India by Vats & Kashyap in 1992), *Lacon lupinosus* (now under *Agrypnus*, the material was later recorded from Kurukshetra by Vats & Kashyap, 1992), *Lacon adpersus* (now under *Adelocera*), *Lacon nebulosus* (now under *Adelocera*), *Agraeus mannerheimi* (now under *Adelocera*), *Pericus nitidus* (now under *Adelocera*, material was from North India), *Agrypnus aequalis* (now under *Lanelater*), *Agrypnus bipunctatus* (now under *Lanelater*), *Agrypnus cinereus* (now under *Lanelater*), *Agrypnus funestus* (now under *Lanelater*), *Agrypnus ocellatus* (now under *Lanelater*), *Meristhus pistrinarius* (now under *Rismethus*) and *Meristhus quadripunctatus*.

Next year (1858) a Russian entomologist, Motschulsky described a new species *Trachylacon lobicolis* (now under *Adelocera*) from India. In 1863, Candeze added another new species, *Scelisus sanguineus* (now under *Lacon*) from India. A decade later in 1874, Candeze described another seven new species viz. *Lacon coarctatus* (now under *Agrypnus*, the material was from Himalaya), *Lacon consors* (now under *Agrypnus*, the material was from Madras), *Lacon praetermissus* (now under *Agrypnus*), *Lacon minusculus* (now under *Adelocera*, the material was from Bombay), *Agrypnus attonitus* (now under *Lanelater*), *Agrypnus rufipes* (now under *Lanelater*, the material was from Pondicherry) and *Adelocera oliveri* (now under *Lacon*, the material was from Darjeeling).

Candeze (1882) described another new species, *Lacon delesserti* (now under *Agrypnus*). Later in 1889, Candeze again described six new species from India, viz. *Lacon jurulosus* (now under *Agrypnus*, the material was from Sikkim, Himalaya), *Lacon variatus* (now under *Agrypnus*, the material was from Chotanagpore), *Lacon demissus* (now under *Adelocera*, the material was from Bengal), *Adelocera collisa* (now under *Lacon*), *Adelocera insularis* (now under *Lacon*), *Agrypnus tippooi* (now under *Lanelater*).

Next year in 1890, Candeze described another 5 new species from India, viz *Lacon lustratus* (now under *Agrypnus*, material was from Chotanagpore), *Lacon melancholicus* (now under *Agrypnus*, material was from Nagpore), *Lacon variatus* (now under *Agrypnus*, material was from Chotanagpore), *Lacon succinatus* (now under *Adelocera*, material was from Bengal) and *Agrypnus renardi* (now under *Lanelater*, material was from Konbir, India). In 1892, Candeze described another new species, *Pericus discedens* (now under *Adelocera*, material was from Bengal). Next year in 1893 he again described another 6 species from different parts of India, namely *Lacon abreptus* (now under *Agrypnus*, material came from Kanara & Belgaum), *Lacon holocericeus* (now under *Agrypnus*,

material was from Kanara), *Lacon muscosus* (now under *Agrypnus*, material was from Kanara and Belgaum), *Lacon turbatus* (now under *Agrypnus*, material was from Bombay), *Lacon sulcifrons* (material was from Kanara) and *Agrypnus andrewsi* (now under *Lanelater*). In 1897, he described another three species viz., *Lacon duplex* (now under new name *Agrypnus blackburni*, material was from Sikkim), *Lacon inflatus* (now under *Agrypnus*, material was from Mysore) and *Adelocera monticola* (now under *Lacon*, materials was from Himalaya). Thus nineteenth century ended with a total number of 60 species from India.

At the beginning of the twentieth century in 1900 Candeze described another species, *Lacon aequalis* (now under *Agrypnus*, the material was from Kashmir).

In 1902 Schwarz described two new species namely, *Lacon oberndorferi* (now under *Agrypnus*, material was from Madras) and *Pericus oberndorferi* (now under *Adelocera*, the material was also from Madras). In the same year Fleutiaux described two species namely *Agrypnus bartoni* (now under *Lanelater*, material was from Ajmer) and *Adelocera robusta* (now under the new name *Lacon robustus*, the material was from Himalaya). In 1905, Schwarz described two new species, *Lacon niger* (now under *Agrypnus*) and *Allotypus duchoni* (now under *Lacon*). Particular locality of these two species is not known.

Then, there was a gap of long 27 years when no addition on the Indian Agrypninae fauna was made. In 1932, Fleutiaux described a new species, *Agraeus bhasini* (now under *Adelocera*, material was from Dehradun). In 1933 again he described another new species, *Trachylacon santali* (now under *Adelocera* material was from Aiyur). Two years later in 1935 he described another 4 new species viz., *Trachylacon doherti*, *Agraeus feai*, *Agraeus fryi* and *Agraeus indicus* (all the four species are now under *Adelocera*).

In 1944 Fleutiaux described the species *Octocryptus babaulti* from North India.

With a gap of nearly thirty years Ohira and Becker (1973) added two more species to Indian fauna, namely, *Meristhus pistrinarius* Candeze and *M. longicollis* Candeze.

Again for almost twenty years there was no taxonomic work on Indian Agrypnid fauna. It was only the last decade of the present century when Dr. L. K. Vats and his students started working under US PL-480 research project and financial assistance from USDA, Washington and Indian Council of Agricultural Research (ICAR), New Delhi. They have published a series of papers on Indian Elateridae. While working on Indian Elateridae they have also added a number of species to Indian Agrypninae. They have described 7 new species of *Adelocera*, 4 new species of *Lacon*, 40 new species of *Agrypnus* and 6 new species of *Lanelater*.

In 1992, Vats and Kashyap described seven new species of the genus *Adelocera* Latreille from North India, viz., *A. crenulatus*, *A. foveatus*, *A. imfoveatus*, *A. mayae*, *A. moriensis*, *A. pentagonalus* and *A. rectangulosus*. In the same year they again published four new species of the genus *Lacon* Castelnau, namely *L. carinatus*, *L. flavopilosus*, *L. kurukshetrensis* and *L. nigrofucus*.

In the year 1992 again Vats and Kashyap described forty new species of the genus *Agrypnus* Eschscholtz from North-West India viz., *A. acristatus*, *A. agrestis*, *A. argentosquamus*, *A. arorai*, *A. boomensis*, *A. campestris*, *A. concoloris*, *A. confertus*, *A. fuscoluridus*, *A. holontelius*, *A.*

impectinatus, *A. inlustris*, *A. jacksoni*, *A. kuluensis*, *A. lucidus*, *A. maisus*, *A. mohanensis*, *A. planocorpus*, *A. planus*, *A. plantaferusus*, *A. rajasthanensis*, *A. rameshi*, *A. repercussus*, *A. saltatus*, *A. solanensis*, *A. souslapisus*, *A. spinaparamerus*, *A. squamafraxineus*, *A. sternoviridis*, *A. striatulus*, *A. subargilus*, *A. subfaenum*, *A. sublapideus*, *A. substramentum*, *A. thuligadensis*, *A. triticumunsis*, *A. tuberculösus*, *A. tuberosus*, *A. upadhyai* and *A. vatsai*.

In the next year in 1893, Vats and Kashyap published six new species of the genus *Lanelater* Arnett from North India, viz., *L. afoveatus*, *L. densus*, *L. glabrosus*, *L. lucerus*, *L. scutopentagonus* and *L. vishvai*.

Thus 140 species belonging to 7 genera have so far been recorded from India while more than 1000 species under 19 genera are known from the world (Stibick, 1979). The agrypnid fauna still remains to be fully explored in India. Vats and his students have described more than 100 species of elaterid beetles belonging to different subfamilies of which about 57 belongs to Agrypninae. If intensive surveys are conducted many more new species are expected to be discovered in near future.

The following is the list of the click-beetles belonging to the subfamily Agrypninae so far recorded from India (geographical distribution also included) :-

Adelocera Latreille, 1829

Name of the species	Distribution
1. <i>A. adpersus</i> (Candeze, 1857)	India
2. <i>A. bhasini</i> (Fleutiaux, 1932)	India : Dehradun
3. <i>A. crenulatus</i> Vats & Kashyap, 1992	India : Haryana
4. <i>A. demissus</i> (Candeze, 1889)	India : Bengal
5. <i>A. discedens</i> (Candeze, 1892)	India : Bengal
6. <i>A. doherti</i> (Fleutiaux, 1935)	India : Assam
7. <i>A. feai</i> (Fleutiaux, 1935) (= <i>Agraeus mouhoti</i> Candeze, 1888)	India : Assam, Sikkim, Almora, Kulu, Thuligad, Mohan.
8. <i>A. foveatus</i> Vats & Kashyap, 1992	India : Rajasthan, Haryana, Kurukshetra.
9. <i>A. fryi</i> (Fleutiaux, 1935)	India : Assam
10. <i>A. imfoveatus</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Shahjahanpur
11. <i>A. indicus</i> (Fleutiaux, 1935)	India : Nilgiri
12. <i>A. lobicollis</i> (Motschulsky, 1858) (= <i>Agraeus mouhoti</i> Candeze, 1874, = <i>Agraeus duporti</i> Fleutiaux, 1918 = <i>Agraeus tonkinensis</i> Fleutiaux, 1927)	India Orientales
13. <i>A. mannerheimii</i> (Candeze, 1857) (= <i>Agraeus cuniculus</i> Candeze, 1874 = <i>Agraeus ritsemai</i> Candeze, 1883)	India

Name of the species	Distribution
14. <i>A. mayae</i> Vats & Kashyap, 1992	India : Haryana
15. <i>A. minusculus</i> (Candeze, 1874)	India : Bombay
16. <i>A. morniensis</i> Vats & Kashyap, 1992	India : Haryana
17. <i>A. nebulosa</i> (Candeze, 1857) (= <i>Lacon nebulosus</i> Candeze, 1857 = <i>Adelocera nebulosus</i> Fleutiaux 1926 = <i>Brachylacon nebulosus</i> Fleutiaux 1942)	Indes Orientales
18. <i>A. nitidus</i> (Candeze, 1857) (= <i>Pericus sanguinolentus</i> Candeze, 1893)	India : North India
19. <i>A. oberndorferi</i> (Schwarz, 1902)	India : Madras
20. <i>A. pentagonalus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
21. <i>A. rectangulosus</i> Vats & Kashyap, 1992	India : Haryana, Kurukshetra
22. <i>A. santali</i> (Fleutiaux, 1933)	India : Aiyur
23. <i>A. succinatus</i> (Candeze, 1890)	India : Bengal

Lacon Castelnau, 1836

1. <i>L. carinatus</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Haryana
2. <i>L. collisus</i> (Candeze, 1889)	India : Sikkim
3. <i>L. duchoni</i> (Schwarz, 1905)	India : Assam
4. <i>L. flavopilosus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
5. <i>L. insularis</i> (Candeze, 1889)	India : Andaman Islands
6. <i>L. kurukshetrensis</i> Vats & Kashyap, 1992	India : Haryana
7. <i>L. modestus</i> (Boisduval, 1835) (= <i>Elater costanidens</i> Gyllenhal, 1817 = <i>Agrypnus pruinus</i> Fairmaire, 1849 (Jan.) = <i>Adelocera pruinosa</i> Fairmaire, 1849 (July) = <i>Adelocera modesta</i> var. <i>guadulpensis</i> Fleutiaux & Salle, 1890 = <i>Adelocera vicina</i> Candeze, 1891 = <i>Adelocera modesta</i> var. <i>tessellata</i> Candeze, 1893 = <i>Lacon vicinus</i> (Candeze) Hayak, 1973)	India : Orientali
8. <i>L. monticola</i> (Candeze, 1897)	Himalaya
9. <i>L. nigrofucus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
10. <i>L. olivieri</i> (Candeze, 1874)	India : Darjeeling
11. <i>L. robustus</i> (Fleutiaux, 1902)	Himalaya
12. <i>L. sanguineus</i> (Candeze, 1863)	Hindustan Septentrional
13. <i>L. sulcifrons</i> Candeze. 1893	India : Kanara

Agrypnus Eschscholtz, 1829

1. <i>A. abreptus</i> (Candeze, 1893)	India : Kanara, Belgaum & S. Bombay
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Name of the species	Distribution
2. <i>A. acristatus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
3. <i>A. aequalis</i> (Candeze, 1900)	India : Kashmir
4. <i>A. agrestis</i> Vats & Kashyap, 1992	India : Uttar Pradesh
5. <i>A. argentosquamus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
6. <i>A. arorai</i> Vats & Kashyap, 1992	India : Himachal Pradesh
7. <i>A. blackburni</i> (Fleutiaux) 1926 (= <i>Lacon duplex</i> Candeze 1897)	India : Sikkim
8. <i>A. boomensis</i> Vats & Kashyap, 1992	India : Uttar Pradesh
9. <i>A. brachychaetus</i> (Kollar, 1844)	India : Kashmir
10. <i>A. brunneipennis</i> (Candeze, 1857)	India : North India
11. <i>A. campestris</i> Vats & Kashyap, 1992	India : Uttar Pradesh
12. <i>A. coarctatus</i> (Candeze, 1874)	India : Himalaya
13. <i>A. concoloris</i> Vats & Kashyap, 1992	India : Rajasthan
14. <i>A. confertus</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Himachal Pradesh
15. <i>A. consobrinus</i> (Candeze, 1857)	India : Himachal Pradesh, Uttar Pradesh
16. <i>A. consors</i> (Candeze, 1874)	India : Madras
17. <i>A. costicollis</i> (Candeze, 1857)	India : Uttar Pradesh
18. <i>A. delesserti</i> (Candeze, 1882)	India : Neelgherries
19. <i>A. desquamatus</i> (Candeze, 1857)	India : (Indes Orientales)
20. <i>A. ellipticus</i> (Candeze, 1857) (= <i>Lacon propinquus</i> Candeze, 1857)	India : Himalaya
21. <i>A. furunculoides</i> (Candeze, 1857)	India : (Des Indes Orientales)
22. <i>A. fuscoluridus</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Haryana
23. <i>A. haedulus</i> (Candeze, 1857)	India : India border (Indes orientales boreales)
24. <i>A. holontelius</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Himachal Pradesh
25. <i>A. holosericeus</i> (Candeze, 1893)	India : Kanara
26. <i>A. impactinatus</i> Vats & Kashyap, 1992	India : Himachal Pradesh
27. <i>A. inflatus</i> (Candeze, 1897)	India : Mysore
28. <i>A. inlustris</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Rajasthan
29. <i>A. jacksoni</i> Vats & Kashyap, 1992	India : Uttar Pradesh
30. <i>A. jurulosus</i> (Candeze, 1889)	India : Sikkim, Himalaya
31. <i>A. kuluensis</i> Vats & Kashyap, 1992	India : Himachal Pradesh
32. <i>A. lapideus</i> (Candeze, 1857)	India : (Indes Orientales)
33. <i>A. lucidus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
34. <i>A. lupinosus</i> (Candeze, 1857)	India : Kurukshetra, Indes orientales boreales

Name	of the species	Distribution
35.	<i>A. lusitanus</i> (Candeze, 1890)	India : Chotanagpore
36.	<i>A. malabaricus</i> Vats & Kashyap, 1992	India : Himachal Pradesh
37.	<i>A. melancholicus</i> (Candeze, 1890)	India : Nagpore
38.	<i>A. madhensis</i> Vats & Kashyap, 1992	India : Uttar Pradesh
39.	<i>A. montanus</i> (Candeze, 1857)	India : Dinapur
40.	<i>A. muscosus</i> (Candeze, 1893)	India : Kanara, Belgaum
41.	<i>A. mustellinus</i> (Germar, 1840) (= <i>Lacon birmanicus</i> Candeze, 1874)	India
42.	<i>A. muticus</i> (Herbst, 1806)	India
43.	<i>A. niger</i> (Schwarz, 1905)	India : Darjeeling
44.	<i>A. oberndorferi</i> (Schwarz, 1902)	India : Madras
45.	<i>A. planocarpus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
46.	<i>A. planus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
47.	<i>A. plantaferusus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
48.	<i>A. praetermissus</i> (Candeze, 1874)	Indes Orientales
49.	<i>A. rajasthanensis</i> Vats & Kashyap, 1992	India : Rajasthan
50.	<i>A. rameshi</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Himachal Pradesh
51.	<i>A. repercussus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
52.	<i>A. saltatus</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Himachal Pradesh
53.	<i>A. scutellatus</i> (Candeze, 1857)	India : Uttar Pradesh
54.	<i>A. serrula</i> (Candeze, 1857)	India border
55.	<i>A. solanensis</i> Vats & Kashyap, 1992	India : Himachal Pradesh
56.	<i>A. souslapisus</i> Vats & Kashyap, 1992	India : Himachal Pradesh
57.	<i>A. spinaparamerus</i> Vats & Kashyap, 1992	India : Haryana
58.	<i>A. squamafraxineus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
59.	<i>A. sternoviridis</i> Vats & Kashyap, 1992	India : Uttar Pradesh
60.	<i>A. striatulus</i> Vats & Kashyap, 1992	India : Rajasthan
61.	<i>A. subargilus</i> Vats & Kashyap, 1992	India : Himachal Pradesh.
62.	<i>A. subfaenum</i> Vats & Kashyap, 1992	India : Himachal Pradesh
63.	<i>A. sublapideus</i> Vats & Kashyap, 1992	India : Uttar Pradesh
64.	<i>A. substramentum</i> Vats & Kashyap, 1992	India : Uttar Pradesh
65.	<i>A. thuligadensis</i> Vats & Kashyap, 1992	India : Uttar Pradesh
66.	<i>A. torrefactus</i> (Candeze, 1857)	Indes Orientales
67.	<i>A. tostus</i> (Candeze, 1857)	India : Uttar Pradesh, Haryana (Indes Orientales)
68.	<i>A. transversus</i> (Candeze, 1857)	India : Uttar Pradesh
69.	<i>A. triticumunsis</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Himachal Pradesh
70.	<i>A. truncatus</i> (Herbst, 1806) (= <i>Lacon cylindricus</i> Candeze, 1857)	India : Chotanagpore
71.	<i>A. tuberculosus</i> Vats & Kashyap, 1992	India : Uttar Pradesh

Name of the species	Distribution
72. <i>A. tuberosus</i> Vats & Kashyap, 1992	India : Uttar Pradesh, Himachal Pradesh, Rajasthan
73. <i>A. turbatus</i> (Candeze, 1893)	India : Bombay
74. <i>A. upadhyai</i> Vats & Kashyap, 1992	India : Uttar Pradesh
75. <i>A. variatus</i> (Candeze, 1890)	India : Chotanagpore
76. <i>A. vatsai</i> Vats & Kashyap, 1992	India : Himachal Pradesh
<i>Meristhus</i> Candeze, 1857	
1. <i>M. (Sulcimerus) quadripunctatus</i> Candeze, 1857	India border
2. <i>M. (Sulcimerus) indecorus</i> Candeze, 1892	India : Bengal, Barwai
3. <i>M. longicollis</i> Candeze, 1896	India : Bengal
4. <i>M. (M.) pistrinarius</i> Candeze, 1857	India : Bengal
5. <i>M. (Sulcimerus) ornatulus</i> Candeze, 1897	India : Bengal, Barwai
<i>Rismethus</i> Fleutiaux, 1947	
1. <i>R. pistrinarius</i> (Candeze, 1857)	India Border (Des Indes orientales)
<i>Lanelater</i> Arnett, 1952	
1. <i>L. aequalis</i> (Candeze, 1857)	India : (Des Indes orientales)
2. <i>L. afoveatus</i> Vats & Kashyap, 1993	India : Uttar Pradesh, Haryana
3. <i>L. andrewsi</i> (Candeze, 1893)	India : Belgaum S.
4. <i>L. attonitus</i> (Candeze, 1874)	India
5. <i>L. bartoni</i> (Fleutiaux, 1902)	India : Ajmer
6. <i>L. bipunctatus</i> (Candeze, 1857)	India : India border (published locality 'Sylhet')
7. <i>L. cinereus</i> (Candeze, 1857)	Des Indes Orientales
8. <i>L. densus</i> Vats & Kashyap, 1993	India : Uttar Pradesh
9. <i>L. funestus</i> (Candeze, 1857)	Des Indes Orientales
10. <i>L. fuscipes</i> (Fabricius, 1775)	India Orientali Koenig
11. <i>L. glabrosus</i> Vats & Kashyap, 1993	India : Uttar Pradesh, Haryana
12. <i>L. lucerus</i> Vats & Kashyap, 1993	India : Uttar Pradesh
13. <i>L. luridus</i> (Fabricius, 1781)	India : Coromandal, Des Indes Orientales
(= <i>Agrypnus punctatus</i> Candeze, 1857 = <i>Agrypnus sondaicus</i> Candeze, 1857 = <i>Agrypnus moestus</i> Candeze, 1857 = <i>Agrypnus gilvus</i> Candeze, 1865)	
14. <i>L. ocellatus</i> (Candeze, 1857)	India : Des Indes Orientales
15. <i>L. renardi</i> (Candeze, 1890)	India : Konbir

Name of the species	Distribution
16. <i>L. rufipes</i> (Candeze, 1874)	India : Pondicherry
17. <i>L. scutopentagonus</i> Vats & Kashyap, 1993	India : Uttar Pradesh
18. <i>L. tippooi</i> (Candeze, 1889)	India : Koimbatour
19. <i>L. tomestusus</i> (Fabricius, 1798)	India : Uttar Pradesh, India Orientali
20. <i>L. vishvai</i> Vats & Kashyap, 1993	India : Uttar Pradesh, Haryana
<i>Octocryptus</i> Candeze, 1892	
1. <i>O. babaulti</i> Fleutiaux, 1944	India : North India
2. <i>O. cardoni</i> Candeze, 1892	India : North India

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SUMMARY

In the present paper an effort has been made for the first time to review the taxonomic development of the subfamily Agrypninae found in India. It includes 7 genera and 140 species. All the species of the subfamily Agrypninae so far described from India have been assigned to appropriate genera and a check-list is provided. Authors have tried to provide the exact locality of all the described species.

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SPECIES COMPOSITION OF ZOOPLANKTON IN A TROPICAL FLOODPLAIN LAKE, ASSAM (N. E. INDIA)

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INTRODUCTION

The floodplain lakes, locally called 'beels', 'jheels', 'mauns', 'chaurs', 'pats', or 'tals' are distributed in Eastern Uttar Pradesh, Northern Bihar, West Bengal and in different parts of North-Eastern India. The beels deserve special mention in the state of Assam which cover (0.12 million ha) about 93% of its total lentic fish-prone area. Little is, however, known about their zooplankton diversity in India in general and Assam in particular. There is so far no published report on these organisms from Assam but the available information is restricted to unpublished works of Lahon (1983), Kar (1984), Goswami (1985), Yadava (1987) and Goswami (1997).

This paper deals with zooplankton composition of a tropical floodplain lake of the Brahmaputra basin, upper Assam with remarks on its nature and composition, temporal variations in species richness and community similarities.

MATERIALS AND METHODS

The present study, a part of general limnological survey, was conducted in Samuajan beel (area : 54 ha; depth : 0.7-2.4 m) located (Long : 94° 56' E; Lat. : 26° 75' N) in the Dhemaji district, Upper Assam. Aquatic macrophytes noticed in the lake included *Eichhornia crassipes* and species of *Potamogeton*, *Hydrilla* and *Nymphaea*.

Qualitative plankton samples were collected from limnetic and littoral regions of Samuajan beel, at regular monthly intervals, during March, 1994 - February, 1995. The collections were obtained by towing a nylobolt plankton net (No. 25) and were preserved in 5% formalin. Various zooplankton taxa were isolated, mounted in Polyvinyl alcohol - lectophenol mixture and were identified following Koste (1978), Fritter and Manuel (1986), Michael and Sharma (1988), Battish (1992) and Segers (1995). Percentage similarities between different zooplankton communities were calculated *vide* Sorensen's index (Sorensen, 1948).

RESULTS AND DISCUSSION

Fifty-three species of zooplankton (including two species of the miscellaneous group) are

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documented from Samuajan beel while its limnetic and littoral communities included 49 species (Table 1) and 51 species (Table 2) respectively. The studied taxocoenosis, therefore, is fairly rich and diversified and broadly corresponded with 57 species reported from Pichhola-Fatehsagar wetland complex, Rajasthan (Vyas, 1989). On the other hand, the qualitative diversity is distinctly higher than other beels from Assam (Lahon, 1983; Goswami, 1985; Yadava, 1987; Goswami, 1997) as well as those elsewhere in India (Rai and Dutta-Munshi, 1982; Yousuf *et al.* 1986; Khan, 1987; Baruah *et al.* 1993; Nandi, *et al.* 1993; Sinha *et al.* 1994; Sanjer and Sharma, 1995).

Zooplankton fauna of Samuajan beel depicted general tropical character (*vide* Green, 1972; Fernando, 1980; Dumont, 1983; Dussart *et al.* 1984; Sharma and Michael, 1987; Sharma, 1991a, 1991b, 1996) and it is comprised broadly of Cosmopolitan > Cosmotropical / Pantropical elements. In addition, *Lecane hastata*, *Ascomorpha ovalis*, *Pleosoma lenticulare*, *Trichocerca elongata*, *Synchaeta oblonga*, *Monommata* sp. and *Bosmina longirostris* are examples of regional distributional importance. Of these, the genus *Monommata* is so far reported only from N. E. India (Sharma, 1996); *A. ovalis* and *P. lenticulare* are recently documented from Central India (Sharma and Naik, 1996); *B. longirostris*, the most common limnetic cladoceran of N. E. region, is characterised by much restricted occurrence in other parts of India (Sharma, 1991b). The tropical nature of the studied fauna is, however, supported by relative richness of the lecanid and the brachionid rotifers (Sharma, 1991a, 1996). Further, acidic to slightly alkaline waters (Sharma and Hussain, 1999) of this floodplain lake reflected paucity of *Brachionus* spp. and thus agreed with the findings of Fernando and Zankai (1981), Segers (1995) and Sharma (1996).

Rotifera (37 species) > Cladocera (8 species) > Rhizopoda (4 species) > Copepoda (2 species) contributed to zooplankton richness in Samuajan beel. Qualitative dominance of Rotifera is in concurrence with the observations by Lahon (1983), Goswami (1985), Yousuf *et al.* (1986), Khan (1987), Yadava (1987), Sanjer and Sharma (1995) and Goswami (1997). This feature is, however, in distinct contrast to poor rotifer diversity (3 species) noticed in 65 wetlands of West Bengal (Nandi *et al.* 1993). The cladoceran richness broadly agreed with that in Chandubi beel, Assam (Yadava, 1987) and Trigamsar, Kashmir valley (Khan, 1987) but is slightly lower than 11 species known from Naranbagh (Khan *lo cit.*) and 13 species from floodplain lake of Bihar (Sanjer and Sharma, 1995). The diversity of Rhizopoda corresponded with the findings of Yadava (1987) and Sanjer and Sharma (*op. cit.*) but is lower than the reports by Lahon (1983) and Goswami (1985). The present study indicated very poor richness (2 species) of Copepoda and the miscellaneous group (2 species) is represented by the facultative planktonic ephemeropteran larvae and aquatic mite.

The species richness of zooplankton exhibited notable monthly variations in both the limnetic and littoral regions. It ranged between 12 - 26 species in the former region and depicted a broadly bimodal pattern (Table 1), with peak richness during monsoon (July, 94) and secondary maxima during early winter (December, 94) while lowest richness is observed in mid-monsoon (September, 94). The qualitative diversity in this region is, however, relatively higher (20-26 species) from March-August, 94. On the other hand, littoral zooplankton communities (Table 2) registered diversity ranging between 18-27 species which, in turn, followed a multimodal pattern; peak and minimum richness are noticed in May, 94 and March, 94 respectively. In addition, annual ranges of zooplankton richness in Samuajan beel are higher than the reports by Rai and Dutta-Munshi (1982), Lahon (1983), Yousuf *et al.* (1986), Yadava (1987) and Goswami (1997).

The present study depicted considerable variations in overall community structure within limnetic and littoral zooplankton. This generalisation is supported (Tables : 3 and 4) by their community similarities (*vide* Sorensen's index) which ranged between 25.8 - 92.0% and 30.0 - 75.7% respectively. The former recorded fewer instances of percentage similarity values $> 70.0\%$ or $< 30.0\%$ while in a majority of cases (79%), it varied between 40.0 - 60.0%; their maximum and minimum similarities are noticed in the samples collected between March / April and between September / November respectively. Referring particularly to the littoral region, the community similarity ranged between 40.0 - 70.0 % in about 94% instances; maximum percentage similarity is noticed between the samples collected during winter (January / February, 95) while its minimum value is recorded between August, 94 / February, 95. Further, a comparison of monthly species composition of limnetic and littoral zooplankton exhibited notable variations in their community similarities (47.4 - 81.6%). Relatively low similarity values are noticed between the two communities during September, 94 (48.6%), October, 94 (47.4%), August, 94 (50.0%) and February, 95 (48.5%) while during the rest of the months, it ranged between 61.5 - 81.6% and the peak community similarity is noticed between the two regions during March, 94.

SUMMARY

Fifty - three species of zooplankton belonging to Rotifera > Cladocera > Rhizopoda > Copepoda = miscellaneous group are reported from Samuajan beel, upper Assam. Limnetic and littoral communities included 49 and 51 species respectively, depicted broadly tropical character and included several species of regional zoogeographical interest. The monthly qualitative richness of zooplankton in limnetic and littoral regions ranged between 12 - 26 species and 18 - 27 species and registered 25.8 - 92.0 % and 30.0 - 75.8 % community similarities respectively.

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Table 1 : Monthly variations in Species composition of Limnetic Zooplankton

	Mar.	Apr.	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
R H I Z O P O D A												
<i>Arcella discoides</i> Ehrenberg	+	+	+	+	+	+	+	+	+	+	+	+
<i>Centropyxis aculeata</i> (Ehrenberg)	+	+	+	+	+	+	-	+	+	-	-	+
<i>C. ecornis</i> (Ehrenberg)	+	+	+	+	+	-	-	-	+	+	-	+
<i>Diffugia</i> sp.	+	+	+	+	+	+	-	-	-	-	+	-
R O T I F E R A												
<i>Anuraeopsis fissa</i> (Gosse)	-	+	-	+	-	-	-	-	-	-	-	-
<i>Brachionus angularis</i> Gosse	-	-	+	-	+	-	-	-	+	+	+	-
<i>B. falcatus</i> Zacharias	-	-	-	-	+	+	-	-	-	-	-	-
<i>B. patulus</i> (Müller)	+	+	+	+	+	+	-	-	-	-	-	-
<i>B. quadridentatus</i> (Hermann)	-	-	-	-	+	-	-	-	-	-	-	-
<i>Platytias quadricornis</i> (Ehrenberg)	+	+	-	+	+	-	-	-	-	-	-	-
<i>Keratella tropica</i> (Apstein)	-	-	-	-	+	+	+	-	-	+	+	+
<i>Euchlanis dilatata</i> (Ehrenberg)	+	+	+	+	-	-	-	-	+	+	+	+
<i>Dipleuchlanis propatula</i> (Gosse)	-	-	-	+	-	-	+	-	-	-	-	-
<i>Mytilina ventralis</i> (Ehrenberg)	+	+	-	-	-	-	-	-	-	-	+	+
<i>Lecane curvicornis</i> (Murray)	-	-	-	+	-	+	-	-	-	-	-	-
<i>Lecane hastata</i> (Murray)	-	-	-	-	-	-	-	-	+	+	-	-
<i>L. leontina</i> (Turner)	+	+	+	+	+	+	-	-	-	+	-	-
<i>L. papuana</i> (Murray)	-	-	-	-	-	-	-	-	-	+	-	-
<i>L. ploenensis</i> (Voigt)	-	-	+	-	-	-	-	-	-	-	-	-
<i>L. signifera</i> (Jennings)	-	-	-	+	-	+	-	-	-	-	-	-
<i>L. ungulata</i> (Gosse)	-	-	-	-	-	-	-	-	-	+	+	-
<i>L. inopinata</i> Harring & Myers	-	-	+	+	-	-	-	-	-	-	-	-
<i>L. bulla</i> (Gosse)	+	+	+	+	+	-	+	-	-	-	-	-
<i>Cephalodella</i> sp.	+	-	-	-	-	-	-	+	+	-	-	-
<i>Monommata</i> sp.	-	-	-	-	-	-	+	+	-	-	-	-
<i>Ascomorpha ovalis</i> (Bergendal)	+	-	-	-	+	+	+	+	-	+	+	+
<i>Pleosoma lenticulare</i> Herrick	-	-	+	-	+	-	-	-	-	-	-	-
<i>Trichocerca cylindrica</i> (Imhof)	-	-	-	-	+	+	-	-	-	+	-	-
<i>T. elongata</i> (Gosse)	-	-	+	+	+	+	-	+	+	+	-	-
<i>Asplanchna priodonta</i> Gosse	+	+	-	-	+	-	-	-	-	-	-	-
<i>Polyarthra vulgaris</i> Carlin	-	-	-	+	+	-	-	+	+	-	-	-
<i>Synchaeta oblonga</i> Ehrenberg	-	-	+	-	-	+	-	-	+	+	-	-
<i>Testudinella patina</i> (Hermann)	+	+	+	-	+	+	-	-	-	-	-	-
<i>Filinia opoliensis</i> (Zacharias)	-	-	-	-	+	+	+	+	-	-	-	-
<i>Philodina</i> sp.	-	-	-	-	-	-	-	+	+	-	-	-
<i>Rotaria rotatoria</i> (Pallas)	-	-	-	+	-	-	+	-	-	-	-	-
<i>R. neptunia</i> (Ehrenberg)	-	-	-	-	-	-	-	-	-	+	+	-
C L A D O C E R A												
<i>Ceriodaphnia cornuta</i> Sars	+	+	+	+	-	-	+	-	+	+	+	-
<i>Scapholeberis kingi</i> Sars	+	+	-	+	+	-	-	+	+	+	+	+

Table 1 (continued)

	Mar.	Apr.	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
<i>Bosmina longirostris</i> (Müller)	-	-	+	+	+	+	-	-	-	-	-	-
<i>Moina micrura</i> Kurz	+	+	+	-	+	+	+	-	-	-	-	-
<i>Chydorus sphaericus</i> (Müller)	+	+	+	+	+	-	+	+	-	+	+	+
<i>Alona costata</i> Sars	+	+	-	-	-	-	-	+	-	+	+	-
<i>A. rectangula</i> Sars	+	+	-	-	-	-	-	+	-	+	-	-
<i>Pleuroxus similis</i> Vavra	+	+	+	+	-	-	-	+	+	+	-	+
C O P E P O D A												
<i>Cylops</i> sp.	+	+	+	+	+	+	+	+	+	+	+	+
<i>Diaptomus</i> sp.	+	+	+	+	+	+	-	+	-	+	-	-
Nauplius larvae	+	+	+	+	+	+	+	+	+	+	+	+
M I S C E L L A N E O U S G R O U P												
Aquatic mites	-	-	-	-	-	+	+	+	-	-	-	-
Ephemeropteran nymphs	-	+	-	-	-	-	+	+	+	-	+	+
Total Number of Species	23	23	22	24	26	20	14	18	16	22	15	12

+ = present

- = absent

Table 2 : Monthly variations in Species composition of Littoral Zooplankton

[illegible]

Table 2 (continued)

	Mar.	Apr.	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
<i>Lepadella patella</i> (Muller)	-	-	+	+	+	-	-	-	-	+	+	+
<i>Lecane hastata</i> (Murray)	+	+	+	-	+	+	-	-	+	+	-	-
<i>L. leontina</i> (Turner)	+	+	+	-	-	-	-	+	+	+	-	-
<i>L. papuana</i> (Murray)	+	-	-	-	-	-	-	-	+	+	-	-
<i>L. ploenensis</i> (Voigt)	-	-	-	+	+	-	-	+	-	-	-	-
<i>L. signifera</i> (Jennings)	+	+	-	-	-	-	-	-	-	-	-	-
<i>L. bulla</i> (Gosse)	+	-	+	+	+	-	+	+	+	-	-	-
<i>Cephalodella</i> sp.	+	-	-	-	-	-	-	+	+	-	-	-
<i>Monommata</i> sp.	-	-	-	-	-	-	-	+	+	-	-	-
<i>Ascomorpha ovalis</i> (Bergendal)	+	-	-	+	+	+	+	+	+	+	+	+
<i>Pleosoma lenticulare</i> Herrick	-	+	+	+	-	+	-	+	+	-	-	+
<i>Trichocerca cylindrica</i> (Imhof)	-	-	-	-	-	-	+	-	-	-	-	+
<i>T. elongata</i> (Gosse)	-	-	+	-	+	-	-	+	+	+	-	-
<i>T. porcellus</i> (Gosse)	-	-	-	-	-	-	-	+	-	+	-	-
<i>Asplanchna priodonta</i> Gosse	+	-	-	-	+	-	-	-	-	-	-	-
<i>Polyarthra vulgaris</i> Carlin	-	-	-	+	+	+	+	+	+	-	-	-
<i>Synchaeta oblonga</i> Ehrenberg	-	-	+	-	-	-	-	-	+	+	-	-
<i>Testudinella patina</i> (Hermann)	+	+	+	+	+	+	+	-	-	-	-	+
<i>Filinia opoliensis</i> (Zacharias)	-	-	-	-	+	+	+	-	-	-	-	-
<i>Philodina</i> sp.	+	+	-	-	-	-	+	+	+	-	-	-
<i>Rotaria rotatoria</i> (Pallas)	-	-	-	-	+	+	-	-	-	-	-	-
<i>R. neptunia</i> (Ehrenberg)	-	-	-	-	-	-	-	-	-	-	+	+
C L A D O C E R A												
<i>Ceriodaphnia cornuta</i> Sars	+	+	+	+	-	+	-	-	+	+	+	-
<i>Scapholeberis kingi</i> Sars	+	+	-	+	+	-	-	+	+	+	+	+
<i>Bosmina longirostris</i> (Muller)	-	+	+	+	+	+	+	-	-	-	-	-
<i>Moina micrura</i> Kurz	+	-	+	+	+	+	+	-	-	-	-	-
<i>Chydorus sphaericus</i> (Muller)	+	+	+	+	-	+	+	+	-	+	+	-
<i>Alona costata</i> Sars	+	+	+	-	-	-	+	-	+	+	-	-
<i>A. rectangula</i> Sars	+	-	+	-	-	-	-	-	-	+	-	-
<i>Pleuroxus similis</i> Vavra	+	+	+	+	-	-	-	+	+	+	+	+
C O P E P O D A												
<i>Cylops</i> sp.	+	+	+	+	+	+	+	+	+	+	+	-
<i>Diaptomus</i> sp.	-	-	+	+	+	+	+	-	-	-	-	-
Nauplius larvae	+	+	+	+	+	+	+	+	+	+	+	+
M I S C E L L A N E O U S G R O U P												
Aquatic mites	-	-	-	-	-	-	+	-	+	-	-	-
Ephemeropteran nymphs	-	-	-	-	-	-	+	-	+	+	+	+
Total Number of Species	26	19	27	22	25	19	23	20	26	21	18	21

+ = present - = absent

Table 3 : Percentage similarities (*vide* Sorensen index) between limnetic Zooplankton

[illegible]

Table 4 : Percentage similarities (*vide* Sorensen index) between littoral Zooplankton

[illegible]

ON A SMALL COLLECTION OF FISHES FROM SIKKIM

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INTRODUCTION

A faunastic survey tour to Sikkim was conducted by the author during March-April, 1996, with special reference to the collection of helminth parasites of vertebrates of Sikkim. In the field while examining the host material a good number of fish hosts were examined to investigate parasitic infection and host fishes were preserved for taxonomic studies. The present paper deals with the said fish material collected from a hill stream at the confluence of the river Ramam with the river Ranjeet at Nayabazar (Jorthang) District West Sikkim in April, 96 by the author. The river Ramam is essentially a hill stream which has close association with Darjeeling district of West Bengal.

McClelland (1845) described *puntius spinulosus* (McClelland), *Puntius clavatus* (McClelland) and *Ctenops nobilis* McClelland from Sikkim. Hora (1927 and 1935) in two reports recorded *Glyptothorax gracilis* (Gunther) and described two new species, *Noemacheilus devdevi* Hora and *Noemacheilus inglisi* Hora from Sikkim. In addition Gunther (1868), Day (1878), Hora and Silas (1951, 1952) and Menon (1954, 1964), in separate reports recorded the occurrence of 8 species under 6 genera from Sikkim. Raj Tilak (1972) compiled the earlier works and studying the collections present in the Zoological Survey of India made a consolidated list.

In the present communication a list of 30 species of fishes so far from the area are provided which include all the species mentioned above.

SYSTEMATIC LIST

Order : CYPRINIFORMES
Family : CYPRINIDAE
Subfamily : RASBORINAE

Barilius bendelisis (Hamilton-Buchanan)

Barilius vagra (Hamilton-Buchanan)

Barilius barna (Hamilton-Buchanan)

Barilius Sp.

Brachydanio rerio (Hamilton-Buchanan)

Danio aequipinnatus (McClelland)

Subfamily CYPRININAE

Accrossocheilus hexagonolepis (McClelland)
Crossocheilus latius (Hamilton-Buchanan)
Garra annandalei Hora
Garra gotyla gotyla (gray)
Garra lamta (Hamilton-Buchanan)
Labeo dyocheilus (McClelland)
Neolissochilus spinolosus (McClelland)
Puntius clavatus (McClelland)
Schizothorax plagiostomus Heckel
Schizothorax richardsonii (Gray)
Tor mosal (Hamilton-Buchanan)
Tor putitora (Hamilton-Buchanan)

Family : COBITIDAE

Noemacheilus devdevi Hora
Noemacheilus deTerrai Hora
Noemacheilus inglisi Hora
Noemacheilus rupicola (McClelland)
Pangio pangia (Hamilton-Buchanan)

Order SILURIFORMES

Family : SISORIDAE

Euchiloglanis hodgarti (Hora)
Glyptothorax striatus (McClelland)
Glyptothorax gracilis (Gunther)
Glyptosternum maculatum (Regan)
Laguvia shawi Hora
Pseudochensis sulcatus (McClelland)

Order : PERCIFORMES

Family BELONTIDAE

Ctenops nobilis McClelland

SYSTEMATIC ACCOUNT

Order : CYPRINIFORMES

Family : CYPRINIDAE

Subfamily RASBORINAE

Genus *Danio* Hamilton-Buchanan, 1822

Danio aequipinnatus (McClelland)

1839. *Perilampus aequipinnatus* McClelland, *Asiat. res.*, 19(2) : 393, pl. 60, fig. 1 (type-locality : Assam).

1991. *Danio aequipinnatus* Barman, Occ. Papers, Zool. Surv. India, No. 137, p. 22.

Material : 2 exs. (7.2-8 cm. total length) Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis : Head 5 in total length, Dorsal rays 1/11, Ventral rays 8, Pectoral rays 12, Anal rays 14-15. Lateral line scales 34-35. Barbels 2 pairs, snout obtuse. Mouth anterior, obliquely upwards, the end of lower jaw with a knob at symphysis.

Distribution : Widely distributed in India. Elsewhere : Bangladesh, Nepal, Malay, Myanmar, Sri Lanka, Sumatra, Thailand, Yunnan Provinces, China.

Genus *barilius* Hamilton-Buchanan, 1822

Barilius bendelisis (Hamilton-Buchanan)

1807. *Cyprinus bendelisis* (Hamilton-Buchanan), journey in Mysore, 3 : 345, pl. 32, (Type locality : Rivers of Mysore).

1991. *Barilius bendelisis* Talwar and Jhingran, Inland fishes of India and adjacent countries, 1 : 346. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Material : 2 exs. (7.2-12.5 cm. total length), Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis : Adult specimen - Head 5 in total length, eye 6 mm. Lateral line scale 42-44. Maxillary barbel one pair (short). Pectoral fin rays 12. Absence of any band on the body. Black spot in between the scales all through the body. Lateral line scales low, above 3 transverse scales from abdomen. Transverse scales 11, snout with prominent tubercles.

Juvenile specimen-Total length 7.2 cm. Number of vertical bands 11 extend from back to lateral line. Lateral line scales all through the body.

Distribution : Through out India including Sikkim. Elsewhere : Bangladesh, Pakistan, Sri Lanka.

Subfamily : CYPRININAE

Genus *Crossocheilus* Van Hasselt, 1823

Crossocheilus latius (Hamilton-Buchanan)

1822. *Cyprinus latius* Hamilton-Buchanan, *Fishes of Ganges* : 345, 393.

1991. *Crossocheilus latius latius*, Talwar and Jhingran, Inland fishes of India and adjacent countries 1 : 416, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Material : 1 ex. (18.2 cm. total length) Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis : Head 5.51 in total length. Lateral line scales 39-41, Rostral barbels 3 cm. long. Maxillary barbels could not be traced. D.3/7, V.9, A.2/5. 4.5 rows of scales between lateral line and pelvic base. Snout overhanging mouth. Upper lip indented on the edge.

Distribution : Drainage of the Ganga and Brahmaputra; Mahanadi river drainage in Orissa; and Western ghats, South to the head water of Krishna river. Sikkim and West Bengal.

Genus *Garra* Hamilton-Buchanan, 1822

Garra annandalei Hora

1921. *Garra annandalei* Hora, *Rec. Indian mus.*, **22**(5) : 657 (Type locality : Mahananda river, below Darjeeling).

1964. *Garra annandalei*, Menon, *Mem. Indian Mus.*, **14**(4) : 173-200.

Material : 1 ex. (11.4 cm. total length), Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis : Head 5.4 in total length. Branched rays of dorsal fin 8, pectoral 14-15. Lateral line scales 35, barbels 2 pairs. Absence of any transverse grooves and tubercles on the snout.

Distribution Assam, Bihar, Sikkim and West Bengal. Elsewhere : Nepal, Bangladesh.

Garra gotyla gotyla (Gray)

1832. *Cyprinus gotyla* Gray, *Illust. Indian Zool.* Hardwicke, 1, pl. 88, figs. 3, 3a (Type locality : Northern India).

1964. *Garra gotyla gotyla*, Menon, *Mem. Indian Mus.*, **14**(4) : 173-200.

Material 2 exs. (9-13 cm. total length), Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis : Snout transversely grooved. 14 tubercles on snout. Dorsal 3/8, Pectoral 1/14, Ventral 1/8, Anal 2/5. Barbels 2 pairs. Lateral line scales 34.

Distribution : All along the Himalayas, Chotanagpur plateau and Vindya-Satpura mountains of the Indian Peninsula, Sikkim. Elsewhere Bangladesh, Nepal, Upper Myanmar, Pakistan (Peshawar).

Genus *Schizothorax* Heckel, 1838

Schizothorax richardsonii (Gray)

1830-32. *Cyprinus richardsonii* Gray, *Ill. Indian Zool.*, pl. 14, fig. 2 (Illustration only).

1987. *Schizothorax richardsonii* Tilak, *Fauna of India : Pisces Teleostomi* : 50, figs. 12-24.

Material 1 ex. (17.3 cm. total length), Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis Head 5.4 in total length. Barbels 2 pairs. Lateral line scales 98-100. D.3/8, p.16-17, v.10, a.7. Dorsal spine strong, upper half serrated, dentation 10. Absence of any tubercles on the snout. Snout rounded, mouth inferior. Transverse suctorial disc on the posterior edge of lower jaw. Mouth as a whole having suctorial adaptation.

Distribution : Jammu and Kashmir to Assam (along the Himalayas), Sikkim. Elsewhere : Bhutan, Nepal, Pakistan, Afghanistan.

Genus *Tor* Gray, 1834

Tor putitora (Hamilton-Buchanan)

1822. *Cyprinus putitora* Hamilton-Buchanan, *Fishes of Ganges* : 303, 308.

1991. *Tor putitora* Talwar and Jhingran, Inland fishes of India and adjacent countries, 1 : 308. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Material : 1 ex. (13.1 cm. total length), Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis : Head 5.03 in total length. Eyes 8 cm. Lateral line scales 27-28, Barbels 2 pairs, Maxillary barbels 1 cm. long, Rostral. 5 cm. long. Dorsal rays 3/7, Pectoral 15-16, ventral fin to lateral line 2.5 scales. Caudal rays 24-25, depth of body 3 cm.

Distribution : Assam Uttar Pradesh and West Bengal. Elsewhere : Afganistan, Bangladesh, Nepal, Pakistan.

Family : COBITIDAE

Subfamily : NOEMACHEILINAE

Genus *Noemacheilus* Van Hasselt, 1823

Noemacheilus devdevi Hora

1935. *Noemacheilus devdevi* Hora, *Rec. Indian Mus.*, 37 : 54, pl. 3, fig. 503 (Type locality : Eastern Himalyas, small stream below Darjeeling and Sikkim).

1987. *Noemacheilus devdevi* Menon, *Fauna of India, Pisces*, 4 : 36-197, pl. 1, fig. 7.

Material : 1 ex. (5.5 cm. total length), Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis : Head 5 in total length. 7-8 irregular white bands from caudal base to middle of the body. Barbels 3 pairs, Nasal opening very prominent. A slender fish, upper profile slightly arched. Ventral profile straight. Caudal end furcate.

Distribution : Sikkim and West Bengal.

Subfamily : COBITINAE

Genus *Pangio*

Pangio pangia (Hamilton-Buchanan)

1878. *Acanthopthalmus pangia*, Day, *Fishes of India* : 610.

1991. *Pangio pangia*, Talwar and Jhingran, Inland fishes of India and adjacent countries, 1 : 531. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Material 1 ex. (7 cm. total length) Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis Head 7 in total length. Dorsal 2/6, Pectoral 10, Anal 2/5, Caudal 19. Barbels 3 pairs, dorsal fin little anterior to anal. A pair of pelvic fin present on ventral surface. Distance between snout and pelvic origin 3.5 cm., snout to anal origin 4.7 cm., Anal origin 11 cm posterior to pelvic origin. Depth 8 cm. Eyes minute.

Distribution Sikkim and West Bengal. Elsewhere Bangladesh, Myanmar.

Order SILURIFORMES
Family Sisoridae
Genus *Laguvia* Hora, 1921
Laguvia shawi Hora

1921. *Laguvia shawi*, Hora, *Rec. Indian mus.*, **22** (5) 740.

1991. *Laguvia shawi*, Talwar and Jhingran, *Inland fishes of India and adjacent countries 2* : 672, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Diagnosis Adhesive disc present on the chest is faintly developed. Pectoral spine serrated internally. Dorsal spine smooth. The skin is full of black spots. White vertical bands on the body as well as on the caudal fin.

Distribution West Bengal (Tista drainage, Darjeeling Himalaya) and Sikkim. Elsewhere : Bangladesh.

Genus *Pseudecheneis* Blyth, 1860
Pseudecheneis sulcatus (McClelland)

1842. *Glyptosternon sulcatus* McClelland, *Calcutta J. nat. Hist.*, **2** : 587, pl. 6 (Type locality : Khasi Hills).

1991. *Pseudecheneis sulcatus* Talwar and Jhingran, *Inland fishes of India and adjacent countries 2* : 679-30, Oxford and IBH Publishing co. Pvt. Ltd., New Delhi.

Material 2 exs. (8-10 cm. total length) Ramam river, Nayabazar, West Sikkim, 2.iv.1996, D. K. Kundu coll.

Diagnosis : Barbels 4 pairs, Dorsal 1/6, spine of ventral modified as adhesive apparatus, Thorax consisting of 14 transverse folds of skin.

Distribution : Meghalaya, Sikkim and West Bengal. Elsewhere : Bangladesh, Nepal.

SUMMARY

Eleven species of hill stream fishes belonging to ten genera under three families are reported here of them four species viz., *Crossocheilus latius* (Hamilton-Buchanan), *Laguvia shawi*

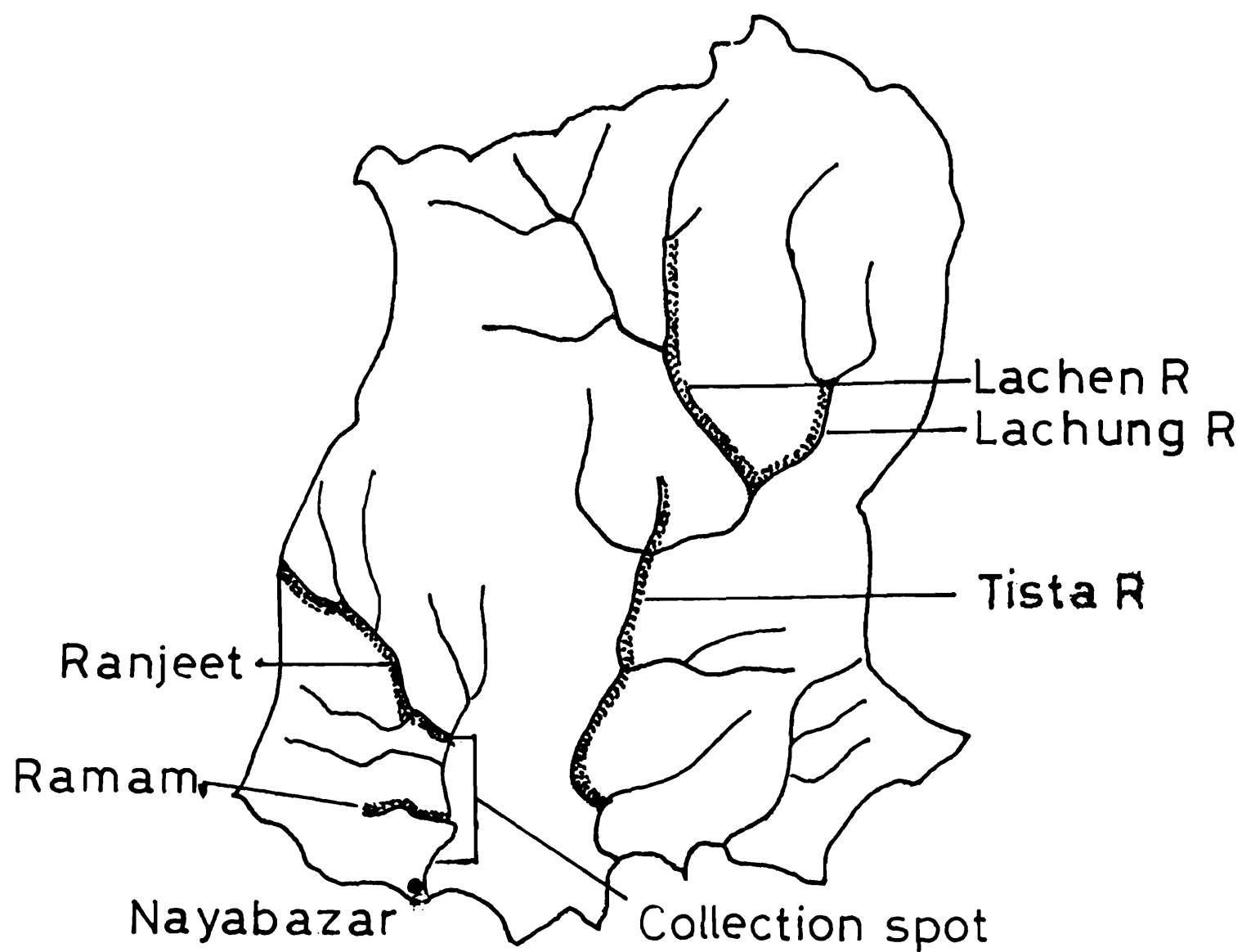
Hora, *Pangio pangia* (Hamilton-Buchanan) and *Tor putitora* (Hamilton-Buchanan) are first record from the state.

ACKNOWLEDGEMENT

The author is thankful to Dr. J. R. B. Alfred, Director, Zoological Survey of India, Calcutta for providing necessary facilities and Dr. A. G. K. Menon, Scientist Emeritus for kindly going through the manuscript and suggestions. I am also thankful to Sri P. Parui, Sri S. C. Mitra, Dr. I. B. Dutta and Sri S. Kar of Zoological Survey of India, Calcutta for their help and co-operation.

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Map of Sikkim showing the drainage and the places of collection.

TAXONOMIC STUDIES ON *MERISMOMORPHA* WITH THE DESCRIPTION OF THREE NEW SPECIES FROM INDIA (HYMENOPTERA : CHALCIDOIDEA : PTEROMALIDAE)

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INTRODUCTION

The genus *Merismomorpha* is Indo-Australian in distribution and represented by 11 species from Australia and one undescribed species from India (Boucek, 1988). According to Boucek (1988) the genus is an intriguing cluster of species and some of them seem rather aberrant. He has provided an account on the diagnostic characters of the genus and its affinities with other related genera. In this paper 3 new species of *Merismomorpha* are described from India. For the present study I have examined the type of the genus, *M. acutiventris* Girault and two undescribed species of *Merismomorpha* in QM determined by Boucek. Based upon the study, a revised account on the diagnostic characters of the genus is provided. A key to Indian species of *Merismomorpha* is also provided.

The type specimens of the new species described here are deposited in Zoological Survey of India, Western Ghats Field Research Station, Calicut, India.

The morphological terminology used in this paper follows that of Boucek (1988) and Boucek & Rasplus (1991). The following abbreviations are used in the text : F1-F5 - funicular segments 1 to 5; MV - marginal vein; OOL - ocellocular distance; PMV - postmarginal vein; POL - postocellar distance; SMV - submarginal vein; STV - stigmal vein; T1-T5 - gastral tergites 1 to 5; QM - Queensland Museum, Brisbane, Australia.

Genus *Merismomorpha* Girault

- 1913 : 82-83. *Merismomorpha* Girault. Type species *M. acutiventris* Girault, by original designation. Description repeated by Girault, 1913b : 321. (Examined).
- 1915 : 335. *Epipolycystus* Girault. Type species *E. asilus* Girault, by original designation. Synonymy by Boucek, 1988 : 461.
- 1915 : 336. *Neopolycystella* Girault. Type species *N. sicarius* Girault, by original designation, synonymy by Boucek, 1988 : 461.
- 1913 : 440 : 4. *Giorgonia* Girault. Type species *Giorgonia flavipetiole* Girault by monotypy. Synonymy by Boucek, 1988 : 461.

The genus belongs to the subfamily pteromalinae and can be distinguished by the following combination of characters *Head* : little wider than mesosoma, finely to moderately reticulate; lower face often convex along the median line, the convexity continuing down to the apex of clypeus; occiput immargined; clypeal area finely striate, lower margin produced and often rounded-subconical, but in some species apex angulate, blunted or truncate or even slightly emarginate. Gena posteriorly with a fine carina. Malar sulcus finely indicated. Antennae inserted above middle of face, in female with 3 anelli and 5 funicular segments; flagellum slightly to obviously clavate, clava only slightly enlarged. Male flagellum with 2 transverse anelli and 6 funicular segments.

Mesosoma arched in profile, finely to moderately reticulate. Pronotum less wider than mesoscutum, collar anteriorly not carinate. Mesoscutum with notauli complete or incomplete. Scutellum without frenal line indicated, except in one case. Propodeum with nucha distinct, though sometimes short and with converging submedian channels; spiracles small, oval; postspiracular sulcus distinct; supracoxal flange narrow. Prepectus distinctly longer than tegula, reticulate. Upper mesepimeron shiny, separated by a transverse fovea from lower mesepimeron. Forewing with basal part almost bare; marginal fringe present; MV longer than PMV. Legs slender; hind tibia with one spur.

Gaster : ovate, lanceolate; petiole always long and more or less sinuate, at apex embraced from below by the thin and narrow extension of the first gastral sternite; T3 mostly enlarged and convex, the shorter T2 has a median notch on hind margin; sometimes T1 also has such a notch or short incision.

Merismomorpha closely resembles *Lomonosofiella* Girault and according to Boucek (1988) the latter might be only a species group of *Merismomorpha* and eventually be synonymised under it. *Lomonosofiella* has been maintained valid by him mainly on the differences of antenna, scutellum and supported by petiolar characters. *Lomonosofiella* has flagellum with 2 anelli and 6 funicular segments, scutellum with frenal line indicated by a row of deeper punctures and the frenal area has the reticulation shallower, and petiole always very long, slightly sinuate, in dorsal view thickened before middle and with very evident reticulation. Boucek (1988) mentioned that *M. flavipetiole* (Girault) has the frenal groove indicated.

In *M. minuta* sp. nov. and *M. truncata* sp. nov. the reticulation is shallower on frenal area than the rest of the scutellum and the petiole is widened in the middle (Figs. 1, 12). On the contrary, in *M. elongata* sp. nov. the petiole is long and widened before middle (Fig. 7) and the reticulation on the frenal area moderate. Considering the above I have the opinion that the characters that can be considered valid for the genus *Lomonosofiella* are the flagellum with 2 anelli and 6 funicular segments and evident reticulation on petiole.

Key to the Indian species of *Merismomorpha*, females

1. Forewing (Fig. 11) with PMV only slightly shorter than MV (0.9x); basal hairline indicated; antennae with scape reaching to upper margin of median ocellus; propodeum (Fig. 10) with median carina *M. elongata* sp. nov.

- PMV distinctly shorter than MV (0.5-0.7x) (Figs. 3, 14); basal hairline not indicated; scape hardly reaching lower margin of median ocellus; propodeum (Figs. 4, 15) without median carina 2
- 2. Lower margin of clypeus truncate (Fig. 13); lower face not evidently convex along the median line; petiole as long as hind coxa, embraced below by a very short extension of first gastral sternite (Fig. 12); exposed part of T3 slightly longer than T4; hind margin of T1 & T2 without median incision; propodeum (Fig. 15) with basal deep and broad *M. truncata*, sp.nov.
- Lower margin of clypeus angulate (Fig. 9); lower face distinctly convex along the median line; petiole distinctly shorter than hind coxa (Fig. 1) embraced by a longer extension of gastral sternite; exposed part of T3 distinctly longer than T4; hind margin of T1 & T2 incised in the middle; propodeum (Fig. 4) with basal fovea not broad and deep as above *M. minuta* sp. nov.

1. *Merismomorpha minuta*, sp. nov.

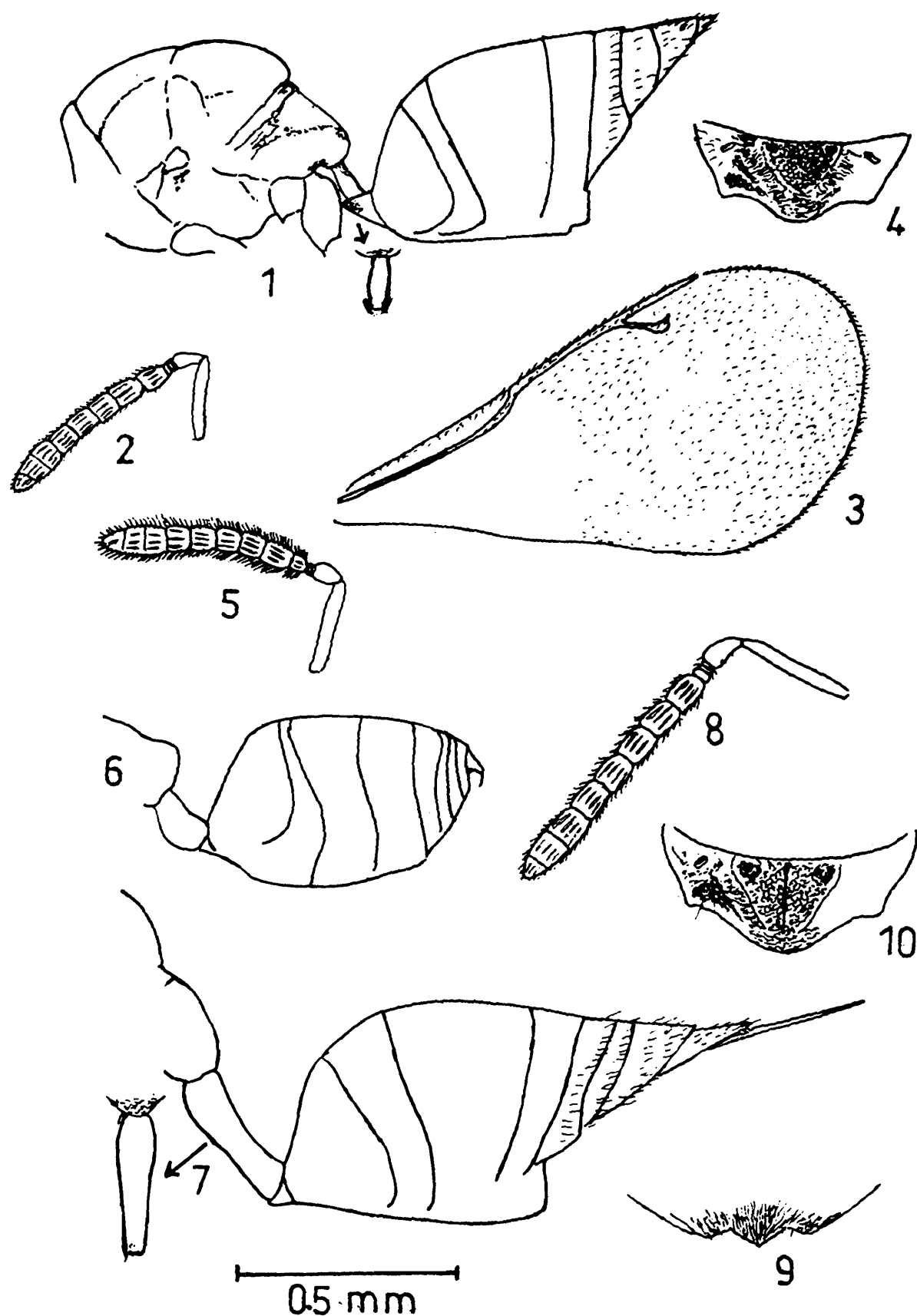
(Figs. 1-6)

Female : Length 1.5 - 2.1mm (Holotype 1.8mm). Head and mesosoma bluish black; gaster mostly metallic bluish black except T1 and ventral part of gaster dark brown. Antennae brown with scape pale. Coxae and femora brown, remaining parts of legs testaceous. Tegulae brown; wings hyaline; veins pale brown.

Head : 1.2x as broad as mesosoma; finely reticulate, almost shiny on the median convex line of lower face; pubescence very small. In dorsal view head width 2.1x length and in front view width 1.2x height; temple length 0.5x eye length; POL 1.3x OOL; lower margin of clypeus angulate; malar space length 0.5x eye height; eyes separated by 1.4x their height; eye height 1.5x width; malar sulcus indistinct. Antennae (Fig. 2) inserted only little above middle of face; toruli very slightly above anterior margin of clypeus than to upper margin of head (12 : 11); scape slender, hardly reaching lower margin of median ocellus, length 0.7x eye height; length of pedicel plus flagellum 0.8x head width; pedicel as long as F1; third anellus little longer than others; all funicular segments little longer than wide; clava as long as 2.5 preceeding segments combined.

Mesosoma : (Fig. 1) length 1.3x width; pubescence very small; pronotal collar finely reticulate. Mesoscutum width 2.2x length, mid lobe finely reticulate, lateral lobes very finely reticulate; notauli almost complete. Scutellum similarly sculptured as mid lobe of mesoscutum, reticulation shallower on frenal area; frenal line not indicated; scutellum medially little longer than mesoscutum (9.5 : 8.5). Propodeum medially 0.6x as long as scutellum; median area moderately reticulate ; median carina absent; submedian channels moderately deep. Forewing (Fig. 3) length 2.1x width; pubescence moderately dense; basal hairline not indicated; PMV distinctly shorter than MV (0.65x). Relative lengths : SMV 15, MV 10, PMV 6.5, STV 3.5.

Gaster : (Fig. 1) short, ovate; petiole short, length 2.3x width in profile, widened medially, embraced by a long extension of first gastral sternite below; gaster (excluding petiole) slightly longer than head plus mesosoma and 2.3x as long as hind tibia; hind margin of T1 & T2 incised in the middle; T3 medially 2.6x T4.



Figs. 1-10, 1-6. *Merismomorpha minuta*, sp. nov. Female : 1, body without head in profile (petiole also in dorsal view); 2, antenna; 3, forewing; 4, propodeum in dorsal view; 5, male antenna; 6, male gaster in profile. 7-10, *Merismomorpha elongata* sp. nov. Female : 7, gaster in profile (petiole also in dorsal view); 8, antenna; 9, lower margin of clypeus; 10, propodeum in dorsal view.

Male : (Figs. 5,6) length 1.6mm. Resembles female but differs in having antenna with 2 anelli and 6 funicular segments, F1 short and anelliform, flagellum with dense pubescence; gaster short and compressed and petiole with very short extension of first gastral sternite.

Holotype Female : INDIA Kerala, Palghat district, Malampuzha, 15.i.1986, Coll. P. M. Sureshan.

Paratypes : 9 Female, 1 Male, data same as that of holotype; 2 Female, Kerala, Malappuram district, Calicut University Campus, v.1998; 1 Female, Kerala, Wynad district, Tirunelli, 1.iii.1994, Coll. P. M. Sureshan.

Remarks : This species closely resembles *M. acutiventris* Girault in the nature of antenna, clypeus, gaster and general sculpture of the body but differs in having petiole distinctly shorter than hind coxa, embraced below by a long extension of first gastral sternite, forewing with short PMV and without basal hairline indicated; notauli almost complete and groove like (in *acutiventris* petiole long, slightly longer than hind coxa, appears two segmented with a short extension of gastral sternite; forewing with PMV long, only little shorter than MV, basal hairline indicated and notauli incomplete and shallow).

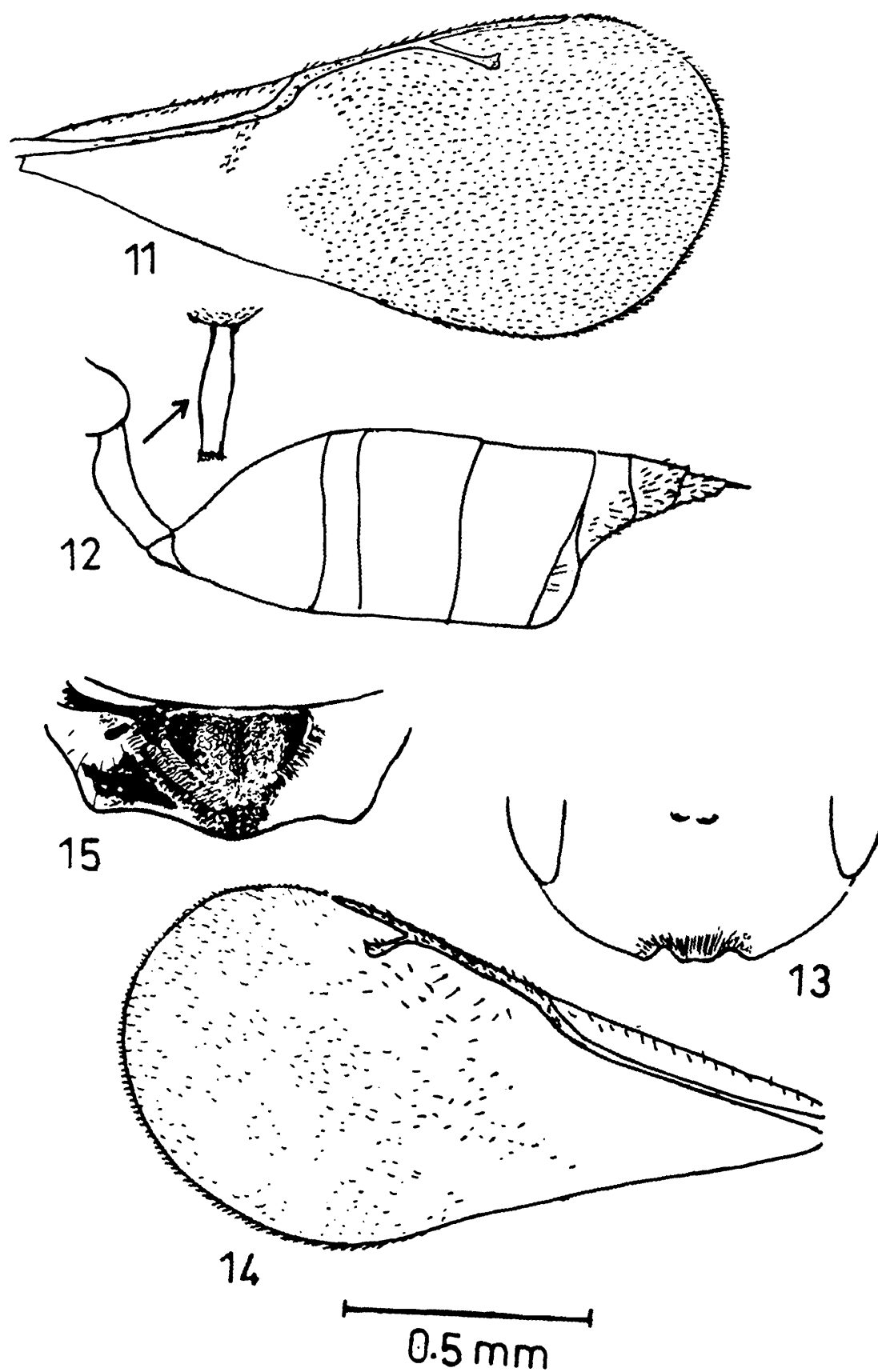
2. *Merismomorpha elongata*, sp. nov.

(Figs. 7-11)

Female Length 2.3mm. Head and mesosoma bluish black; gaster dark metallic blue, brown ventrally; petiole brownish black. Antennae brown with scape, pedicel and anelli pale. Coxae concolrous with mesosoma, remaining parts of legs testaceous with tips of tarsi brown. Tegulae brown; wings hyaline; veins pale brown.

Head : 1.2x as broad as mesosoma, moderately reticulate with moderately dense pubescence; reticulation fine on vertex and lower face, almost shiny on the convex median line of the lower face. in dorsal view head width 2.1x length and in front view width 1.3x height; temple length 0.7x eye length; POL little shorter than OOL (6.5 : 7); lower margin of clypeus (Fig. 9) angulate; malar space length 0.6x eye height; eyes separated by 1.6x their height; eye height 1.8x width. Antennae (Fig. 8) inserted distinctly above middle of face; scrobe deep; scape slender, reaching to upper margin of median ocellus, length 0.8x eye height; length of pedicel plus flagellum little shorter than head width; flagellum with long pubescence; pedicel as long as F1; third anellus as long as first and second combined; all funicular segments longer than wide; clava as long as 2.5 preceeding segments combined.

Mesosoma : Length 1.3x width; moderately reticulate punctate with long white pubescence. Mesoscutum width 2.3x length; notauli complete. Scutellum medially little longer than mesoscutum; frenal line not indicated. Propodeum (Fig. 10) medially 0.8x as long as scutellum; median area moderately reticulate, lateral area finely reticulate; median carina indicated; submedian channels shallow, outer margins of them developed into a fine but distinct carina. Metapleuron almost shiny with a depression on upper and lower margins. Forewing (Fig. 11) length 2.3x width; basal part almost bare except three rows of hairs on basal vein; costal cell with upper part hairy. Relative lengths : SMV 22, MV 11.5, PMV 10, STV 5.



Figs. 11-15, 11. *Merismomorpha elongata* sp. nov. Female forewing. 12-15, *Merismomorpha truncata* sp. nov. Female : 12, gaster in profile (petiole also in dorsal view); 13, lower margin of clypeus; 14, forewing; 15, propodeum in dorsal view.

Gaster : Elongate, ovate; petiole as long as hind coxa, length 3.1x maximum width in profile, broadened before middle, embraced by a very short extension of first gastral sternite; gaster (excluding petiole) slightly longer than head and mesosoma combined (42 : 40) and 2.3x hind tibia; hind margins of T1 & T2 incised in the middle; T3 medially 2.4x T4.

Holotype : Female : INDIA : Kerala, Palghat district, Agali, 12.xii.1987, Coll. P. M. Sureshan.

Remarks : This species can be readily distinguished from the other two species as given in the key.

3. *Merismomorpha truncata*, sp. nov.

(Figs. 12-15)

Female Length 2.2mm. Head and mesosoma black; gaster brownish black with slight metallic blue reflection and brown basically. Antennae brown with lower part of scape pale. Coxae brownish black; femora and tibiae dark brown; tarsi pale brown with tips darker. Tegulae dark brown; wings hyaline; veins pale brown.

Head : 1.1x as wide as mesosoma, finely reticulate, pubescence small and inconspicuous. in dorsal view head width 2x length and in front view width 1.3x height; temple length 0.5x eye length; lower face not evidently convex along the median line; POL 1.3x OOL; lower margin of clypeus truncate; malar space length 0.7x eye height; eyes separated by 1.2x their height; eye height 1.6x width. Antennae inserted very little above middle of face; scape hardly reaching lower margin of median ocellus, length 0.7x eye height; other wise antennae similar as in *M. minuta*.

Mesosoma : Length 1.4x width; sculpture and pubescence as in *M. minuta*. Mesoscutum width 2.4x length; notauli complete. Scutellum medially little longer than mesoscutum; frenal line not indicated, reticulation shallower on frenal area. Propodeum (Fig. 15) medially 0.6x as long as scutellum; median area raised, finely reticulate, basal foveae broad and deep; submedian channels moderately deep. Forewing (Fig. 14) length 2x width; pubescence as in *M. minuta* except for few hairs below MV more distinct; basal hairline not indicated. Relative lengths SMV 23, MV 12.5, PMV 6.5, STV 3.

Gaster : (Fig. 12) elongate, ovate, dorsally slightly collapsing at the base; petiole as long as hind coxa, widened at the middle, embraced by a short extension of gastral sternite; petiole length 3x maximum width in profile; gaster (excluding petiole) as long as head plus mesosoma combined and 2.5x as long as hind tibia; hind margin of T1 & T2 almost entire; exposed part of T3 only little longer than T4 (10 : 9).

Holotype : Female : INDIA : Kerala, Malappuram district, Calicut University Campus, 3.v.1988, Coll. P. M. Sureshan.

Remarks : This species can be readily distinguished from other species in having lower margin of clypeus truncate, gaster with T3 little longer than T4, lower face not evidently convex along median line and propodeum with broad basal foveae.

SUMMARY

Three new species of *Merismomorpha* Girault viz., *M. minuta*, *M. elongata* and *M. truncata* are described from India. Diagnostic characters and affinities of *Merismomorpha* and a key to Indian species are provided.

ACKNOWLEDGEMENTS

I am grateful to the Director, Zoological Survey of India, Calcutta and the Officer-in-charge, Zoological Survey of India, Western Ghats Field Research Station, Calicut for providing necessary facilities and constant encouragement. I am grateful to Dr. Chris Burwell, Queensland Museum, Brisbane, Australia for arranging the loan of *M. acutiventris* and other specimens of *Merismomorpha*. My sincere thanks are due to Dr. T. C. Narendran, Professor, University of Calicut, Kerala for valuable suggestions.

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A LIST OF MENOPONIDAE (PHTHIRAPTERA) FROM INDIA

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INTRODUCTION

Mallophaga are small, dorsoventrally flattened parasitic insect group infesting mostly birds. Several workers, viz., Kellong and Nakayama (1915), Hopkins & Clay (1953), Ansari (1956), Lakshinarayan (1979) worked on this group. Under the family Menoponidae about 115 spp have been recorded from India. Here an attempt has been made to make a list of these species with host name and distributional range within Indian sub-continent and also to provide keys and brief description in some cases.

Order : PHTHIRAPTERA
Suborder : AMBLYCEROPHTHIRINA
Family : MENOPONIDAE

1. Genus *Actornithophilus* Ferris

1. *Actornithophilus grandiceps* (Piaget, 1880)
2. *Actornithophilus himantopi* Blagoveshtehensky, 1951
3. *Actornithophilus hoplopteri* (Mjoberg, 1910)
4. *Actornithophilus limosae* (Kelloogg, 1908)
5. *Actornithophilus lyallpurensis* Ansari, 1955
6. *Actornithophilus paludosus*, Clay, 1962
7. *Actornithophilus patellatus* (Piaget, 1890)
8. *Actornithophilus pustulosus* (Piaget, 1880)
9. *Actornithophilus spinulosus* (Piaget, 1880)
10. *Actornithophilus totani* (Scrank, 1803)
11. *Actornithophilus umbrinus* (Burmeister, 1838)

2. Genus *Amyrsidea* Euing

12. *Amyrsidea minuta* Emerson, 1961
13. *Amyrsidea phaeostoma* (Nitzsch, 1866)

3. Genus *Ardeiphilus* Bedford

- 14. *Ardeiphilus mirzai* (Quadri, 1935)
- 15. *Ardeiphilus trochioxus* (Burmeister, 1838).

4. Genus *Austromenopon* Bedford

- 16. *Austromenopon crocatum* (Nitzsch, 1866)
- 17. *Austromenopon leucurae* Timmerman, 1955
- 18. *Austromenopon limosae* Timmerman, 1955

5. Genus *Chapinia* Ewing

- 19. *Chapinia acutovulvata* (Piaget, 1881)
- 20. *Chapinia clayae* Elbel, 1967

6. Genus *Ciconiphilus* Bedford

- 21. *Ciconiphilus decimfasciatus* (Boisduval & Lacordaire, 1835)
- 22. *Ciconiphilus matosai* (Tendeiro, 1958)
- 23. *Ciconiphilus quadripustulatus* (Burmeister, 1838)
- 24. *Ciconiphilus temporalis* (Piaget, 1880)

7. Genus *Colpocephalum* Nitzsch

- 25. *Colpocephalum aethiopicae* Price & Beer, 1965
- 26. *Colpocephalum apivorus* Tendeiro, 1953
- 27. *Colpocephalum asiatici* Price & Beer, 1965
- 28. *Colpocephalum cooki* Price & Beer, 1963
- 29. *Colpocephalum flavescens* (Haan, 1829)
- 30. *Colpocephalum fregili* Denny, 1842
- 31. *Colpocephalum heterosoma* Piaget, 1880
- 32. *Colpocephalum impressum* Rudow, 1866
- 33. *Colpocephalum indi* Price & Beer, 1963
- 34. *Colpocephalum leucocephali* Price & Beer, 1965
- 35. *Colpocephalum longicaudum* Nitzsch, 1866
- 36. *Colpocephalum malanocephalae* Price & Beer, 1965
- 37. *Colpocephalum occipitale* Nitzsch, 1864
- 38. *Colpocephalum oscitansi* Price & Beer, 1965
- 39. *Colpocephalum pectinatum* Osborn, 1902
- 40. *Colpocephalum percnopteri* Price & Beer, 1963

41. *Colpocephalum platalae* Price & Beer, 1965
42. *Colpocephalum polybori* Rudbow, 1869
43. *Colpocephalum rosai* Price & Emerson, 1974
44. *Colpocephalum salimalii* Clay, 1951
45. *Colpocephalum sinensis* Price, 1968
46. *Colpocephalum tansi* (Ansari, 1951)
47. *Colpocephalum tirkhan* (Ansari, 1951)
48. *Colpocephalum turbinatum* Denny, 1842
49. *Colpocephalum uchidi* (Quadri, 1936)
50. *Colpocephalum zerafae* Ansari, 1955

8. Genus *Ctenigogus* Eichler & Zlatorzycka

51. *Ctenigogus erinaceimorphus* Eichler & Zlatorzycka

9. Genus *Cuculiphlius* Uchida

52. *Cuculiphlius cathartaepapae* (Nitzsch, 1861)
53. *Cuculiphlius gypsis* (Eichler, 1944)
54. *Cuculiphlius snodgrassi* (Kellog & Kuwana, 1902)
55. *Cuculiphlius upak* Ansari, 1951

10. Genus *Dennyus* Neumann

56. *Dennyus cypsiurus* Thompson, 1948
57. *Dennyus giganteus* Emerson & price, 1968
58. *Dennyus hirundinis* (Linn., 1761)
59. *Dennyus vonarxi* Buttikar, 1954

11. Genus *Eidmanniella* Kelar

60. *Eidmanniella subrotundata* (Piaget, 1880)

12. Genus *Eucolpocephalum* Bedford

61. *Eucolpocephalum femorale* (Piaget, 1880)

13. Genus *Heleonomus* Ferris

62. *Heleonomus elbeli* Price, 1970
63. *Heleonomus laveryi* Price, 1970
64. *Heleonomus macilentus* (Nitsch)
65. *Heleonomus semiluctus* (Gervais, 1866)

14. Genus *Holomenopon* Eichler

- 66. *Holomenopon leucoxanthum* (Burmeister, 1838)
- 67. *Holomenopon tadornae* (Gervais, 1844)

15. Genus *Kelerimenopon* Council

- 68. *Kelerimenopon psittaculae* Price & Emerson, 1966

16. Genus *Kurodia* Uchida

- 69. *Kurodia deignani* Elbel & Emerson, 1960
- 70. *Kurodia fulvofasciata* (Piaget, 1880)
- 71. *Kurodia punjabensis* (Ansari, 1951)

17. Genus *Menacanthus* Newmann

- 72. *Menacanthus annulatus* (Giebel, 1874)
- 73. *Menacanthus gonophocus* (Burmeister, 1838)
- 74. *Menacanthus masudi* Qudri, 1935
- 75. *Menacanthus monochromateus* (Kellog & Paine, 1914)
- 76. *Menacanthus safedgal* Ansari, 1951
- 77. *Menacanthus stramineus* (Nitzsch, 1818)
- 78. *Menacanthus tristisi* Quadri, 1935
- 79. *Menacanthus unicolor* (Piaget, 1880)

18. Genus *Menopon* Nitzsch

- 80. *Menopon gallinae* (Linne., 1758)
- 81. *Menopon productum* Piaget, 1880

19. Genus *Myrsidea* Waterston

- 82. *Myrsidea amandava* Clay, 1970
- 83. *Myrsidea assamensis* Tandon, 1972
- 84. *Myrsidea bharat* Tandon & Clay, 1971
- 85. *Myrsidea bhutanensis* Tandon, 1972
- 86. *Myrsidea brunnea* (Nitzsch, 1866)
- 87. *Myrsidea chilchil*, Ansari, 1951
- 88. *Myrsidea clayae* Klockenhoff, 1969
- 89. *Myrsidea cornicis* (De Geer, 1778)
- 90. *Myrsidea cucularis* (Nitzsch, 1818)
- 91. *Myrsidea cyrtostigma* (Kellog & Chapmann, 1902)

92. *Myrsidea dukhunensis* Ansari, 1951
93. *Myrsidea flavirostratus*, Ansari, 1951
94. *Myrsidea himalayensis* Klockenhoff, 1969
95. *Myrsidea ishizawai* Uchida, 1926
96. *Myrsidea isostoma* (Nitzsch, 1866)
97. *Myrsidea macraidoia* Tandon, 1972
98. *Myrsidea manipurensis* Tandon, 1972
99. *Myrsidea nigra* (Kellog & Paine, 1911)
100. *Myrsidea orientalis* Tandon, 1972
101. *Myrsidea pycnonoti* Eichler, 1947
102. *Myrsidea salimalii* Tandon & Clay, 1971
103. *Myrsidea satbhai* Ansari, 1951
104. *Myrsidea sehri* Ansari, 1951
105. *Myrsidea sikkimensis* Tandon, 1972
106. *Myrsidea singularis* Tandon, 1972
107. *Myrsidea srivastavai* Clay, 1970
108. *Myrsidea sultanpurensis* Ansari, 1951
109. *Myrsidea thoracica* (Giebel, 1874)

20. Genus *Piagetiella* Neumann

110. *Piagetiella titan* (Plaget, 1880)

21. Genus *Pseudomenopon* Mjoberg

111. *Pseudomenopon concretum* (Piaget, 1880)
112. *Pseudomenopon dolium* (Rudow, 1869)
113. *Pseudomenopon lanceolatum* (Tendeiro, 1965)
114. *Pseudomenopon phoenicuri* Price, 1974
115. *Pseudomenopon pilosum* (Scopoli, 1763)

Key to the species of genus *Actornithophilas* Ferris

- Metanotum with long anterior setae 1
- Metanotum without long anterior setae 2
- 1. Abdominal pleurites without pattern of internal thickening; internal anterior processes undeveloped, tergites with never more than one row of anterior setae, tergum of last segment without anterior setae, shape of head characteristic (prosternal plate with 1-2 elongated setae).
..... *patellatus* (Piaget)

- Without above combination of character D.P.S. I relatively long and stout 2
- 2. Male tergite with row of stout elongated submarginal setae and rows of smaller setae. Female penultimate sternite broad and interrupted medially 3
- 3. Lingual selerite and epipharyngeal crest reduced; tergum of last segment of female usually without anterior setae. *pustulosus* (Piaget)
- Lingual selerite and epipharyngeal crest not reduced, tergum of last segment of female with anterior setae *umbrinus* (Burmeister)
- 4. Tergum of last abdominal segment without anterior setae 5
- Tergum of last abdominal segment with anterior setae 10
- 5. Tergite vi & vii at least with tergal pattern A 6
- Tergite vi & vii with more central setae 8
- 6. Pre occular and occipital nodi small; d.p.s. minute, central setae of viii long and stout, tergite ii-viii each with a well marked row of anterior setae *lyallpurensis* Ansari
- Nodi well developed, tergites i-vii with setal pattern A, viii with A1 prosternal setae surrounded by prosternal plate, post spiracular setae i & iii and tergal setae shorter *hoploperi* (Mjoberg)
- 7. Marginal prothoracic seta 5 and marginal metathoracic seta 2 not short and fine, dorsal prothoracic seta 1 not minute
- All tergites normally with 6 central setae *himantopi* Blagoveshtchensky
- 8. Tergite I with one marginal and one anterior row of setae *grandiceps* (Piaget)
- 9. Pleurites not narrow, tergites I-VII with not setal pattern A.
- 10. Prosternal setae surrounded by prosternal plate; genital selerites short, usually not more than 4-5 mesosernal setae *totani* (Schrank)
- Stout submarginal setae of tergite VIII thicker relative to rest of dorsal setae *spinulosus* (Piaget)
- 11. Tergite VII with 8 or less central setae. Mesosternum with 7-11 setae, prosternal setae not surrounded by prosternal plate; Head nodi small; At least three tergites with a row of anterior setae *limosae* (Kellogg)

1 Genus *Actornithophilus* Ferris

1916. *Actornithophilus* Ferris, Canad. Ent., 48 : 303.

1 *Actornithophilus grandiceps* (Piaget), 1880, Pediculines, 558.

Diagnosis : Head nodi larger. In females there are two to three inner posterior setae each side of the last abdominal segment.

Hosts : *Ibidorhyncha struthersii* Vigors

Distribution : India (Kashmir). Elsewhere : China.

2. *Actornithophilus himantopi* Blagoveshtchensky 1951, Mag. Parasit., 13 : 281.

Diagnosis : Total central setae on tergites II to VII less than 44. Dorsal prothoacic seta I rather stout; marginal metathoracic seta 2 stout.

Host : *Himantopus* (h) *himantopus* (Linne.).

Distribution : India.

3. *Actornithophilus hoplopteri* (Mjoberg) 1910. Ark. Zool., 6(13) : 40.

Diagnosis : Large size of preocular, occipital and thoracic nodi, marginal prothoacic seta 5 and metathoracic seta 2 short and fine, tergites with well developed internal anterior processes. Some of the tergites have one or more anterior setae and some segments have a definite row.

Host : *Vanellus malabaricus* (Boddaert).

Distribution : India.

4. *Actornithophilus limosae* (Kellogg) 1908. Wytsaman's Gen. Ins. (Mallophaga), 56.

Host : *Limosa lapponica* (linne.)

Distribution : India.

5. *Actornithophilus lyallpurensis* Ansari 1955. Proc. VII. Pak. Sci. Conf. Agri., 55.

Diagnosis : On segment III to VI the central setae vary from six to eight, segment VIII usually has setal pattern A but may have fine central setae. All the tergites may have a row of anterior setae but on I and VIII the anterior setae may be reduced in number or absent.

Host : *Tringa O. ochropus* Linne.

Distribution : India. Elsewhere : Pakistan.

6. *Actornithophilus paludosus* Clay 1962. Bull. Br. Mus. nat. Hist. (Ent.) 11(5) : 219.

Diagnosis : Presence of long dorsal setae on the metathorax, the prosternal plate not enclosing the prosternal setae and the form of the sclerite of the genital sac.

Host : *Tringa nebularia* (Gunnerus)

Distribution India. Elsewhere : Sri Lanka.

7. *Actornithophilus patellatus* (Piaget) 1890. Tijdschr. Ent. 33 : 254.

Host *Numenius* (a) *arquata* (Linne.)

Distribution : India.

8. *Actornithophilus pustulosus* (Piaget) 1880. Pediculines, 522.

Host *Philomachus* *pugnax* (Linne.).

Distribution India.

9. *Actornithophilus spinulosus* (Piaget) 1880. Pediculines, 523.

Host : *Limosa limosa* (Linne.).

Distribution : India. Elsewhere : Sri Lanka.

10. *Actornithophilus totani* (Schrank)

Pediculus totani (Schrank) 1803, Fauna Boica, 191.

Actornithophilus totani (Schrank) 1962. Bull. Br. Mus. nat. Hist. 11(5) : 215.

Diagnosis : Anterior dorsal setae on the last segment of abdomen in male, prosternal plate surrounding the prosternal setae. In females at least two or more tergites have seven or more central setae and tergites II-VIII have a row of anterior setae.

Host : *Tringa totanus* (Linne.).

Distribution : India. Elsewhere : Pakistan, Sri Lanka.

11. *Actornithophilus umbrinus* (Burmeister)

Colpocephalum umbrinus Burmeister 1838. Handb. Ent. 2 : 438.

Actornithophilus umbrinus (Burmeister) 1962. Bull. Br. Mus. nat. Hist. 11(5) : 212,

Diagnosis : Thoracic setae is long and stout, the metanotum has long anterior setae. In male, the tergites have a row of stout elongate submarginal setae and rows of smaller setae, the last tergite has anterior dorsal setae.

Host : *Calidris m. minuta* (Leister).

Distribution : India. Elsewhere Pakistan.

2. Genus *Amyrsidea* Ewing

1927. *Amyrsidea* Ewing, J. Wash. Acad. Sci., 17 : 90.

1. *Amyrsidea minuta* Emerson 1961. *Florida Entomol.*, 44(3) : 117.

Host : *Pavo cristatus* Linne.

Distribution : India (M.P.) Elsewhere : Bangladesh.

2. *Amyrsidea phaeostoma* (Nitzsch) 1866. *Z. ges. Nat. Wiss.*, 28 : 391.

Host : *Pavo cristatus* Linne.

Distribution : India, (M.P.). Elsewhere : Burma.

3. Genus *Ardeiphilus* Bedford

1939. *Ardeiphilus* Bedford, Onderstepoort J. Vet. Sci., 12 : 139.

1. *Ardeiphilus trochioxus* (Burmeister) 1838. *Handb. Ent.* 2 : 438.

Host : *Ardeola grayii* (Sykes).

Distribution : India.

2. *Ardeiphilus mirzai* (Quadri) 1935. *Z. Parasitenk.*, 8 : 232.

Host : *Ardeola grayii* (Sykes).

Distribution : India.

4. Genus *Austromenopon* Bedford

1939. *Austromenopon* Bedford, J. Vet. Sci. 12 : 122.

1. *Austromenopon crocatum* (Nitzsch) 1866. *Z. ges. Nat. Wiss.*, 28 : 392.

Host : *Numenius arquata* (Linne.).

Distribution : India.

2. *Austromenopon leucurae* Timmernan 1955. *Bonn. Zool. Beitr.*, 5 : 200.

Host : *Vanellus leucurus* (Lichtenstein).

Distribution : India. Elsewhere : Pakistan.

3. *Austromenopon limosae* Timerman 1955. Born. Zool. Beitr., 5 : 202.

Host *Limosa limosa* (Linne.).

Distribution : India (Rajasthan).

5. Genus *Chapinia* Ewing

1927. *Chapinia* Ewing, J. Wash. Acad. Sci., 17 : 88.

Key to the species of *Chapinia* Ewing

1. Venter of the 3rd femora and posterolateral margins of abdominal sternites IV-VI each have large thick brushes of normal setae. Male genitalia have endomeres possessing on each outer rim a triangular internal knob that is longer than wide *acutovulvata* (Piaget)

Venter of 3rd femora and postero lateral margin of abdominal sternite IV-VI each have small scattered brushes of normal setae. Male genitalia have endomeres possessing on each outer rim a triangular knob that is wider than long *clayae* Elbel

1. *Chapinia acutovulvate* (Piaget) 1881. Tijdschr. Ent., 24 : 5.

Diagnosis : Male larger in size, lateral margin of abdominal II-VI with a short setae. Abdominal sternite II with 42-54 setae and a median row of setae on posterior margin.

Host : *Anthracoseros coronotus* (Boddart).

Distribution : India (M.P., Bihar). Elsewhere : Sri Lanka, Nepal, Thailand, Burma.

2. *Chapinia clays* Elbel 1967. Proc. U.S. nat Hist. Mus., 120 (3558) : 21.

Diagnosis : Male smaller in size. Lateral margin of abdominal tergites II-VI with a short setae. Abdominal sternite II with 38-50 setae and a median row on posterior margin.

Host : *Tockus birostris* (scopoli).

Distribution : India (Rajasthan, M.P., U.P.). Elsewhere : Nepal.

6. Genus *Ciconiphilus* Bedford

1939. *Ciconiphilus* Bedford, onderstepoort J. Vet. Sci., 12 : 141

1. *Ciconiphilus decimfasciatus* (Boisduval & Lacordaire) 1835. Fauna ent. Environs, Paris : 123

Host *Ardea purpurea* Linne.

Distribution : India. Elsewhere : Pakistan.

2. *Ciconiphilus matosi* (Tendeiro) 1958. Publ. Cult. Cia Diamant, Angola, 40 : 92.

Host : *Ibis leucocephalus* (Pennant).

Distribution : India.

3. *Ciconiphilus quadripustulatus* (Burmeister) 1838. Handb. Ent., 2 : 438.

Host : *Ciconia e. episcopus* (Proddaert).

Distribution : India.

4. *Ciconiphilus temporalis* (Piaget) 1880. Pediculines : 487.

Host : *Leptoptilos dubius* (Gmelin).

Distribution : India.

7. Genus *Colpocephalum* Nitzsch

1818. *Colpocephalum* Nitzsch, Germer's Mag. Ent., 3 : 298.

1. *Colpocephalum aethiopicae* Price & Beer 1965. Ann. Ent. Soc. Amer., 58(1) : 121.

Host : *Threskiornis m. molucca* (Cuvier).

Distribution : India.

2. *Colpocephalum apivorus* Tendeiro 1953. Publ. Cult. de camp: Diam. Angola, No. 40 : 89.

Host : *Pernis ptilorhynchus ruficollis* Lesson.

Distribution : India.

3. *Colpocephalum asiatici* Price & Beer 1965. Ann. Ent. Soc. Amer., 58(1) : 114.

Diagnosis : In female mid dorsal head setae short. Tergite II-V with long marginal setae, shorter anterior setae on tergite I-VII.

Host : *Xenorhynchus a. asiaticus* (Latham).

Distribution : India.

4. *Colpocephalum cooki* Price & Beer 1965. Ann. Ent. Soc. Amer., 58(1) : 116.

Diagnosis : In female median tergal setae shorter on III-VII, post spiracular setae very long on I-III, VIII, short on IV-VII, sternal setae fine.

Host : *Leptoptilos javanicus* (Horsfield).

Distribution India. Elsewhere : Burma.

5. *Colpocephalum flavescens* (Hann) 1829. Mem. Mus. Hist. nat. Paris., 18 : 309.

Host : *Haliastur indus* (Boddaert).

Distribution : India.

6. *Colpocephalum fregili* Denny 1842. Mon. Anopl. Brit., 198 : 208.

Host : *Corvus splendens* Vieillot.

Distribution : India.

7. *Colpocephalum heterosoma* Piaget 1880. Pediculines, 572.

Host : *Phonicopterus roseus* Pallas.

Distribution : India.

8. *Colpocephalum impressum* Rudow 1866. Z. ges. Nat. Wiss. 27 : 475.

Host : *Aquila n. nipalensis* (Hodson).

Distribution : India.

9. *Colpocephalum indi* Price & Beer 1963. Canad. Ent. 95(7) : 751.

Host : *Haliastur indus* (Boddaert).

Distribution : India.

10. *Colpocephalum leucocephali* Price & Beer 1965. Ann. Ent. Soc. Amer., 58(1) : 116.

Diagnosis : In female Tergocentral setae on II of uniform median length.

Host *Ibis leucocephalus* (Pennant).

Distribution : India. Elsewhere : Thailand, Sri Lanka.

11. *Colpocephalum longicaudum* Nitzsch 1866. Z. ges. Nat. Wiss., 28 : 39.

Host : *Columba livia* (domestica) (Gmelin).

Distribution : India.

12. *Colpocephalum malanocephalae* Price & Beer 1965. Ann. Ent. Soc. Amer., 58(1) : 121.

Host : *Threskiarnis melanocephala* (Latham).

Disrtibution : India.

13. *Colpocephalum occipitale* Nitzsch 1864. Z. Ges. Nat. Wiss., 28 : 394.

Diagnosis : In female mid dorsal head setae of equal length. Metanotum with 10 marginal setae, post spiracular setae very long on I-III, V-VI & Viii, shorter on IV & VII. Marginal pair of setae on medianplate of VIII usually as long as corresponding setae on preceeding tergites.

Host : *Anastomus oscitans* (Boddaert).

Distribution : India. Elsewhere : Thailand.

14. *Colpocephalum oscitansi* Price & Beer 1965. Ann. Ent. Soc. Amer., 58(1) : 126.

Host : *Anastomus oscitans* (Boddart).

Distribution : India.

15. *Colpocephalum peetinum* Osborn 1902. Ohio. Nat., 2 : 201.

Host : *Athene Brama indica* (Franklin).

Distribution : India.

16. *Colpocephalum percnopteri* Price & Beer 1963. Canad. Ent., 95(7) : 758.

Host : *Neophron percnopteri* (Linne.)

Distribution : India.

17. *Colpocephalum plataleae* Price & Beer 1965. Ann. Ent. Soc. Amer., 58(1) : 123.

Host : *Platalea leucordia* (Linne.).

Distribution : India.

18. *Colpocephalum polybori* Rudow 1869. Z. Ges. Nat. Wiss., 34 : 397.

Host : *Aegypocetus monachus* (lionne.).

Distribution : India.

19. *Colpocephalum rosai* Price & Emerson 1974. J. Kans. Ent. Soc., 47(1) : 63-66.

Host : *Phoenicopterus rosae* (Pallas).

Distribution : India.

20. *Colpocephalum salimalii* Clay 1951. Ann. Mag. nat. Hist., 12(4) : 1162.

Host : *Phoenicopterus roseus* Pallas.

Distribution : India.

21. *Colpocephalum sinensis* Price 1968. Ann. Ent. Soc. Amer., 61(4) : 419.

Host : *Centropus sinensis sinensis* (Stephens).

Distribution : India.

22. *Colpocephalum tausi* (Ansari) 1951. Proc. nat. Inst. Sci. India, 17(2) : 151.

Host : *Pavo cristatus* (Linne.).

Distribution : India.

23. *Colpocephalum tirkhan* (Ansari) 1951. Proc. nat. Inst. Sci. India, 7(2) : 164.

Host : *Picus squamatus squamatus* Vigor.

Distribution : India.

24. *Colpocephalum turbinatum* Denny 1842. Mon. Anopl. Brit., 198 : 209.

Host : *Gyps indicus* (Scopli).

Distribution : India.

25. *Colpocephalum uchidi* (Quadri) 1936. Z. Parasitenk., 8 : 64.

Host : *Ciconia e. episeopus* (Boddaert).

Distribution : India.

26. *Colpocephalum zerafae* (Ansari) 1955. Proc. 7th. Pak. Sci. Conf. Sec. Agri., 52.

Host : *Falco tinnunculus* Linne.

Distribution : India.

8. Genus *Ctenigogys* Eichler & Zlotorzyska

1963. *Ctenigogys* Eichler & Zlotorzyska, Angew. Parasitol., 4 : 40.

1. *Ctenigogys erinaceimorphus* Eichler & Zlotorzyska 1963. Angew. Parasitol., 4 : 40.

Host : *Gyps bengalensis* (Gmelin).

Distribution : India.

9. Genus *Cuculiphlius* Uchida

1926. *Cuculiphlius* Uchida, J. Coll. Agri, Tokyo, 9(1) : 47.

1. *Cuculiphlius cathartaepapae* (Nitzsch) 1861. Z. ges. Nat. Wiss., 17 : 518.

Host : Domestic duck.

Distribution : India.

2. *Cuculiphlius gypsis* (Eichler) 1944. Dtsch. ent. Ztg. 57.

Host : *Gyps bengalensis* (Gmelin).

Distribution : India.

3. *Cuculiphlius snodgrassi* (Kellog & Kuwana) 1902. Proc. nat. Acad. Sci. Wash., 4 : 486.

Host : *Centropus sinensis* (Stephens).

Distribution : India.

4. *Cuculiphlius upak* Ansari 1951. Proc. nat. Inst. Sci. India, 17(2) : 156.

Host : *Cuculus varius* Vahl.

Distribution : India (Punjab).

10. Genus *Dennyus* Neumann

1906. *Dennyus* Neumann, Bull. Soc. Zool. Fr., 20 : 60.

1. *Dennyus cypsiurus* Thompson 1948. Bol. Ent. Venezol., 7 : 4.

Host : *Cypsiurus parvus batasinensis* (Gray).

Distribution : India (Andhra Pradesh, Maharashtra). Elsewhere : Sri Lanka.

2. *Dennyus giganteus* Emerson & Price 1968. Proc. Biol. Soc. Wash., 81 : 87.

Host : *Chaetura gigantea indica* (Hume).

Distribution : Indica (Punjab).

3. *Dennyus hirundinis* (Linne.) 1761. Fauna Suceica., 2 : 479.

Host : *Apus affinis affinis* (Gray).

Distribution : India (West Bengal, Utter Pradesh, Madhya Pradesh). Elsewhere : Nepal, Sri Lanka.

4. *Dennyus vonarxi* Buttikar 1954. Acta. trop., 11(2) : 161.

Host : *Apus melba bakeri* Hartert.

Distribution : India (M.P.). Elsewhere : Sri Lanka.

11. Genus *Eidmanniella* Keler

1938. *Eidmanniella* Keler, Ann. Mus. Zool. Polon., 13 : 81.

1. *Eidmanniella subrotundata* (Piaget) 1880. Pediculines., 453:

Host : *Phalacrocorax nigar* (Vieillot).

Distribution : India. Elsewhere : Sri lanka.

12. Genus *Eucolpocephalum* Bedford

1930. *Eucolpocephalum* Bedford, Rep. Vet. Res. S. Afr., 16, 161.

1. *Eucolpocephalum femorale* (Piaget) 1880. Pediculines., 484.

Host : *Platalea leucordia* Linne.

Distribution : India.

13. Genus *Heleonomus* Ferris

1916. *Heleonomus* Ferris, Canad. Ent., 48 : 305.

Key to the species of genus *Heleonomus* Ferris

1. Sternite V either fused with pleurites or narrowly separated from them *laveryi* Price
 - Pleurites widely separeted from sternite V 2

2. Short mesosternal plate. Very short preocular seta 11. Female ventral preanal plate usually divided. Male with 18 or fewer marginal setae on tergite 11 *semiluctus* (Gerecis)
- Long mesosternal plate. Female ventral preanal plate entire 3
3. Female tergite III not transversely divided. Margin of pronotum with fewer than 18 setae ..
..... *elbeli* Price
- Female tergite III transversely divided. *macilantus* (Nitzsch)

1. *Heleonomus elbeli* Price 1970. Ann. Ent. Soc. Amer., 63 (4) : 1170.

Diagnosis : Margin of pronotum with less than 18 setae; ventral preanal plate in female deeply notched.

Host : *Anthropoides virgo* (Linne.).

Distribution : India (Andhra Pradesh).

2. *Heleonomus laveryi* Price 1970. Ann. Ent. Soc. Amer., 63(4) : 1171.

Diagnosis : Pleurites narrowly separated from sternites, marginal terget seta lateral to post spiracular setae on II to V. Prosternum without additional setae.

Host : *Grus antigone* (Linne.).

Distribution : India (Rajasthan).

3. *Heleonomus macilentus* (Nitzsch) 1866. Z. ges. Nat. Wiss., 28 : 394.

Diagnosis : Tergite III in female transversely divided. In male sternal setae on V & VI usually 71-80.

Host : *Grus grus* (Linne.).

Distribution : India.

4. *Heleonomus semiluctus* (Gervais) 1844. Hist. nat. Ins., 3 : 322.

Diagnosis : Female tergite III without transverse division and post spiracular setae on tergite VI not extending to spiracle of following segment.

Host : *Balearica pavonina* (Linne.).

Distribution : India (West Bengal).

14. Genus *Holomenopon* Eichler

1941. *Holomenopon* Eichler, Stethiner Entomol. Ztg., 102 : 125.

1. *Holomenopon leucoxanthum* (Burmeister) 1838. Handb. Ent., 2 : 440.

Host : *Netta rufina* (Pallas).

Distribution : India (Rajasthan).

2. *Holomenopon tadornae* (Gervais) 1844. Hist. Nat. Inst., 3 : 323.

Host : *Tadorna ferruginea* (Pallas).

Distribution : India (Rajasthan).

15. Genus *Kelerimenopon* Conci

1942. *Kelerimenopon* Conci, Ann. Mus. Civ. Stor. nat. genova, 61 : 262.

1. *Kelerimenopon psittaculae* Price & Emerson 1966. Pacific Insects, 8(2) : 360.

Host : *Psittacula krameri manillensis* (Bechstein).

Distribution : India (Uttar Pradesh).

16. Genus *Kurodia* Uchida

1926. *Kurodia* Uchida, J. Coll. Agric. Tokyo, 9(1) : 50.

1. *Kurodia deignani* Elbel & Emerson 1960. Proc. Biol. Soc. Wash., 73 : 119.

Host : *Glaucidium Cuculoides* (Vigors).

Distribution : India (Sikkim).

2. *Kurodia fulvofasciata* (Piaget) 1880. Pediculines : 417.

Host : *Buteo buteo* (Linne.).

Distribution : India.

3. *Kurodia punjabensis* (Ansari) 1951. Proc. nat. Inst. Sci. India, 17(2) : 160.

Host : *Athene brama indica* (Franklin).

Distribution : India. Elsewhere : Pakistan.

17. Genus *Menacanthus* Neumann

1912. *Menacanthus* Neumann, Arch. Parasit, Paris, 15 : 353.

1. *Menacanthus annulatus* (Giebel) 1874. Insecta epizoa : 285.

Host : *Passer indicus* Jardine et Salby.

Distribution : India (Punjab).

2. *Menacanthus gonophoeus* (Burmeister) 1838. Handb. Ent., 2 : 440.

Host : *Corvus corax laurencei* Hume.

Distribution : India (West Bengal). Elsewhere : Nepal.

3. *Menacanthus masudi* Quardi 1935. Z. Parasit., 8 : 227.

Host : *Corvus s. splendens* Vieill.

Distribution : India (U.P.).

4. *Menacanthus monochromateus* (Kellog & Paine) 1914. Rec. Indian Mus., 10(4) : 240.

Diagnosis : In female head wider than long, clypeus with two fine hairs, occiput concave, prothorax with 12 hairs and the sides and posterior margin continuous.

Abdomen all segments except the last of about equal length, the last longer and with a fringe of hairs. Each abdominal segment with a transverse, sub marginal series of hairs, the lateral one largest.

Host : *Garrulus lanceolatus* Vigors.

Distribution : India (H.P.).

5. *Menacanthus safedgal* Ansari 1951. Proc. nat. Inst. Sci. India, 17(2) : 141.

Diagnosis : In male head large, preantennal region almost twice as long as post antennal region, occipital margin concave, bearing 8 hairs. Antennae 4 segmented.

Prethorax large, posterior lateral margin straight, with two long hairs and a spine; Meso thorax fused with the posterior segment, bearing a spine and 2-3 dorsal hairs on each half. Meta thorax short, posterior lateral angle with a spine and a long hair.

Abdomen elliptical, widest at the III segment, length of segment almost equal, posterior angles produced, each bearing one short and a long hair; last segment flatly rounded with 8-10 marginal hairs. Pleural plates well developed, with several spinous hairs on the posterior margin.

Host : *Pycnonotus l. leucogenys* (Gray).

Distribution : India (H.P.).

6. *Menacanthus stramineus* (Nitzsch) 1818. Germars Mag. Ent., 3 : 300.

Host : *Gallus domesticus* (Linne.).

Distribution : India (Punjab, West Bengal). Elsewhere Pakistan.

7. *Menacanthus tristisi* Quadri 1935. Z. Parasitenk., 8 : 226.

Host : *Acridotheres tristis* Quadri.

Distribution : India (Punjab).

8. *Menacanthus inucolor* (Piaget) 1880. pediculines, 471.

Host : *Phasianus colchicus torquatus* Gmelin.

Distribution : India.

18. Genus *Menopon* Nitzsch

1818. *Menopon* Nitzsch, Germer's Mag, Ent., 3 : 299.

1. *Menopon gallinae* (Linne.) 1758. Syst. Nat., 10 : 613.

Host : *Gallus gallus* (domesticus) (Linne.).

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

2. *Menopon productum* (Piaget) 1880. Pediculines, 461.

Host : *Houppier erythrophtha imus* (Raffles).

Distribution : India (Karnataka, West Bengal).

19. Genus *Myrsidea* Waterston

1915. *Myrsidea* Waterston, Ent. mon. Mag., 51 : 12.

1. *Myrsidea amandava* Clay 1970. H. D. Srivastava Commem. Vol. 565.

Host : *Estrilda amandava* (Linne.).

Distribution : India (Andhra Pradesh).

2. *Myrsidea assamensis* Tandon 1972. Bull. Br. Mus. nat. Hist. (Ent.), 27(7) : 390.

Host : *Gerrulax l. leucolophus* (Hardwicke).

Distribution : India (Uttar Pradesh).

3. *Myrsidea bharat* Tandan & Clay 1971. Trans R. Ent. Soc. London., 123(2) : 216.

Host : *Turdoides malcolmi* (Sykes).

Distribution : India (Andhra Pradesh, Rajasthan).

4. *Myrsidea bhutanensis* Tandan 1972. Bull. Br. Mus. nat. Hist. (Ent.), 27(7) : 385.

Host : *Garrulax ruficollis* (Jerdine & Selby).

Distribution : India (Manipur). Elsewhere : Bhutan.

5. *Myrsidea brunnea* (Nitzsch) 1866. Z. ges. Natwiss., 28 : 120.

Host : *Nucifraga caryocatactes hemispilla* Vigors.

Distribution : India (H.P.). Elsewhere : Pakistan.

6. *Myrsidea chilchil* Ansari 1951. Proc. nat. Ins. Sci. India., 17(2) : 181.

Diagnosis : Head broad, front rounded, a short hair on each side of the middle.

Prothorax hexagonal in outline, lateral angles produced, each with two spines and a hair. Mesothorax distinct, lateral margin bare, Metathorax, latero posterior angles, each with two spines and a hair.

Abdomen elliptical, widest at IV segment, each segment almost equal in length, posterior angles projecting, each with a hair and two spines, II sterrite with five, belonoid spines on a callosity. Genital plate distinct.

Host : *Turdoides c. caudatus* (Dumont).

Distribution : India (Rajasthan). Elsewhere : Pakistan.

7. *Myrsidea clayae* Klockenhoff 1969. Zool. Anz. 183(5/6) : 393.

Host : *Corvus macrorhynchos culminatus* Sykes.

Distribution : India (Maharashtra, Kerala).

8. *Myrsidea cornicis* (De Geer) 1778. Mem. Hist. Ins., 7 : 76.

Host : *Corvus (coronae) cornix* Linne.

Distribution : India (J. & K.).

9. *Myrsidea cucularies* (Nitzsch) 1818. Germar's Mag. Ent., 3 : 300.

Host : *Sturnus vulgaris indicus* Blyth.

Distribution India.

10. *Myrsidea cyrtostigma* (Kellogg & Chapmann) 1902. J. N. Y. ent. Soc., 10, 65.

Host *Lonchura punctulata* (Linne.).

Distribution : India (Andhra Pradesh). Elsewhere : Nepal.

11. *Myrsidea dukhunensis* Ansari 1951. Proc. nat. Inst. Sci. India., 17(2) : 174.

Diagnosis : In male Head is broader than the body, lateral margins bearing two long, one short and a minute hair. Prothorax large, posterolateral margins convex, each bearing a small hair. Mesothorax distinct, posterior margin straight with a transverse row of short hairs. Meta thorax trapezoidal, posterior lateral angles produced, each bearing two spines and a long hair. Abdomen elongate, elliptical, length of segments I-VIII almost equal, segment IX broader and segment X shortest, I- VI segments with a single transverse row of hairs on the posterior margin, VII segment with two hairs on each side, VIII segment with only one hair, IX segment with three long hairs in the posterior angles and host hair on the posterior margin, last segment flatly rounded and bare, II segment with asters of three heavy spines on each side of the sternite. Genitalia composed of an exceedingly long basal plate, parameres short and broad with pointed distal ends.

Host : *Metacilla alba dukhunensis* Sykes.

Distribution : India (H.P.).

12. *Myrsidea flavirostratus* Ansari 1951. Proc. nat. Inst. Sci. India, 17(2) : 174.

Host : *Kitta f. flavirostris* (Blyth).

Distribution : India (H.P.).

13. *Myrsidea himalayensis* Klockenhoff 1969. Zool. Anz., 183(5/6) : 386.

Host *Corvus macrorhynchus intermedius* Adama.

Distribution India (Bihar, U.P.).

14. *Myrsidea ishizawai* Uchida 1926. J. Coll. Agric. Tokyo, 9 : 8.

Host *Zoothera d. dauma* (Latham).

Distribution : India (Manipur).

15. *Myrsidea isostoma* (Nitzsch) 1866. Z. ges. Natwiss, 27 119.

Host : *Corvus f. frugilegus* Linne.

Distribution India (Punjab).

16. *Myrsidea macraidoia* Tandan 1972. Bull. Br. Mus. nat. Hist. (Ent.), 27(7) : 400.

Host : *Gerrulax a. albogularis* (Gould).

Distribution : India (Punjab, Sikkim). Elsewhere : Nepal.

17. *Myrsidea manipurensis* Tandan 1972. Bull. Br. Mus. nat. Hist. (Ent.), 27(7) : 377.

Host : *Gerrulax squamatus* (Gould).

Distribution : India (Assam, Manipur).

18. *Myrsidea nigra* (Kellogg & Paine) 1911. Bull. Ent. Res., 2 : 151.

Host : *Corvas (s) splendens* Vieillot.

Distribution : India (M.P., W.B.).

19. *Myrsidea orientalis* Tandan 1972. Bull. Br. Mus. nat. Hist. (Ent.), 27(7) : 398.

Host : *Garrulax p. pectoralis* (Gould).

Distribution : India (Manipur). Elsewhere : Burma.

20. *Myrsidea pycnonoti* Eichler 1947. Ark. zool., 39A(2) : 18.

Host : *Pycnonotus cafer* (Linne.).

Distribution : India. Elsewhere : Bhutan.

21. *Myrsidea salimalii* Tandan & Clay 1971. Trans. R. ent. Soc. Lond., 123(2) : 222.

Host : *Turdoides earlii* (Blyth).

Distribution : India (Delhi). Elsewhere : Pakistan.

22. *Myrsidea satbhai* Ansari 1951. Proc. nat. Inst. Sci. India, 17(2) : 178.

Diagnosis : In female head board, front broadly rounded. Temples expanded, antero-laterally produced, occipital margin flatly concave, with one hair on each side of the middle line.

Prothorax short, hexagonal in out line, lateral angles produced, each with a spine and a short spinous hair, Mesothorax distinct, lateral margin bare. Metathorax trapezoidal, lateral margin bare.

Abdomen elliptical, widest at segment V, each lateroposterior angles with a long hair and two spinous hairs, last segment with rounded posterior margin, furnished with a group of three long marginal hairs and one towards middle line. Each abdominal sternite with rows of short hairs, segment II with six heavy needle like spines. Genital plate with a row of short hairs along posterior margin.

Host *Turdoides striatus* (Dumont).

Distribution India (Maharashtra, Rajasthan, U.P.). Elsewhere : Nepal.

23. *Myrsidea sehri* Ansari 1951. Proc. nat. Inst. Sci. India, 17(2) : 177.

Diagnosis : Female, head broad, a short hair on fronto lateral margin, temples expanded, margins rounded, each with four very long, four short and a few minute hairs.

Prothorax short, lateral angles with two small spines. meso thorax narrow, metathorax trapezoidal, posterior lateral angles produced, each with three spines.

Abdomen elliptical, widest at IV segment, lateroposterior angles each with a long hair and 2-3 spines, posterior margin of each segment with a transverse row of 6-10 short hairs, last segment broadly rounded, with one minute, one long and a small hair. Ventral surface of each abdominal segment bearing rows of weak hairs.

Host : *Garrulax lineatus lineatus* (Vigors).

Diagnosis : India (H.P.).

24. *Myrsidea sikkimensis* Tandan 1972. Bull. Br. Mus. nat. Hist. (Ent.) 27(7) : 382.

Host : *Gerrulax striatus sikkimensis* (Ticehurst).

Distribution : India (Sikkim).

25. *Myrsidea singularis* Tandan 1972. Bull. Br. Mus. nat. Hist. (Ent.) 27(7) : 382.

Host : *Gerrulax* s. *subunicolor* (Blyth).

Distribution : India (Sikkim).

26. *Myrsidea srivastavai* Clay 1970. H. D. Srivastava Commem. Vol. 563.

Host : *Lonchura malabarica* (Linne.).

Distribution : India.

27. *Myrsidea sultanpurensis* Ansari 1951. Proc. nat. Inst. Sci. India, 17(2) : 183.

Diagnosis : Female head broad, front rounded. Temples expanded, each bearing four long, two slightly short and several short marginal hairs.

Prothorax hexagonal in outline, postero lateral margin slightly concave each bearing one minute and one short spinous hair, mesothorax distinct, a minute marginal spine on each side. Metathorax trapezoidal, posterior lateral angles produced, each with three spines.

Abdomen elliptical, broad at IV segment, posterior margin of last segment broadly rounded

with two long and two short hairs on each side of a fringe of fine hairs. Ventral surface of I-VII abdominal segments with a transverse row of short hairs, II with an aster of six spinous hairs, segment VIII with numerous hairs confined in the middle. Last segment with 24 short hairs on genital plate.

Host : *Myiophoneus caeruleus temminckii* (Vigors).

Distribution : India (H.P.).

28. *Myrsidea thoracica* (Giebel) 1874. Insecta epizoa : 287.

Host : *Turdus ruficollis astroglaris* Jerocki.

Distribution : India (Rajasthan). Elsewhere : Nepal.

20. Genus *Piagetiella* Neumann

1906. *Piagetiella* Neumann, Bull. Soc. Zool. Fr., 20 : 60.

1. *Piagetiella titan* (Piaget) 1880. Pediculines, 503.

Host : *Pelecanus onocrotalus* Linne.

Distributaion : India (Rajasthan).

21. Genus *Pseudomenopon* Mjoberg

1880. *Pseudomenopon* Mjoberg, Ark. Zool. 6(13) : 50.

Key to the species of genus *Pseudomenopon* Mjoberg

1. Principal genital selerite conspicuously bifarcate *Concretum* (Piaget)
- Principal genital selerite not conspicuously bifarcate 2
2. Principal genital selerite very long, broadened basally and with straight transverse median selerite *lanceolatum* Tendeiro
- Principal genital selerite shorter, usually at most 1/2 length of genitalia 3
3. Broadly rounded median gular plate. Head seta 7 shorter (not extending to base of seta 9) *pilosum* (Scopoli)
- Median gular plate tapering. Head seta 7 longer 4
4. Principal genital selerite at least 0.30 long, straight *phoenicuri* Price
- Principal genital selerite less than 0.30 long *dolium* (Rodow)

1. *Pseudomenopon concretum* (Piaget) 1880. Pediculines, 481.

Diagnosis : Male, median gular plate pointed. Marginal pronotal setae 3 at least twice length of setae I. Genitalia with unique forked sclerite.

Host : *Porphyrio (P.) poliocephalus* (Latham).

Diagnosis : India (Rajasthan).

2. *Pseudomenopon dolium* (Rudow) 1869. Z. ges. Nat. Wiss., 34 : 393.

Diagnosis : Male, genitalia with unique principal sclerite, slightly flexed at apex with short barb and vague forking terminally and conspicuous accessory basal sclerite.

Host : *Podiceps ruficollis* (Pallas).

Distribution : India.

3. *Pseudomenopon lanceolatum* Tendeiro 1965. Revta Estud. Gerais Univ. Mocambique 2 : 41.

Diagnosis : Male median gular plate narrow and pointed. Head seta 7 almost reaching base of seta 9. Marginal pronotal seta 3 & 1 subequal. Genitalia, principal sclerite broader basally and not heavily pigmented.

Host : *Metropidius indicus* (Latham).

Distribution : India.

4. *Pseudomenopon phoenicuri* Price 1974. Ann. ent. Soc. Amer., 67(1) : 79.

Diagnosis : Male metanotum with 11 or 12 marginal setae. Genitalia long, with long straight slender principal sclerite and with basal accessory sclerite about 1/2 of this length.

Host : *Amaurornis phoenicurus* (Pennant).

Distribution : India.

5. *Pseudomenopon pilosum* (Scopoli) 1763. Ent. Carniolica, 384.

Diagnosis : Male median portion of gular plate broadly rounded. Marginal pronotal seta 3 about as long as to twice length of seta 1. Head seta 7 less than 1/2 way to base of seta 9. Genitalia with principal sclerite variably flexed.

Host : *Gallinula chloropus* (Linne.).

Distribution : India (Rajasthan).

SUMMARY

A total of 115 sps. under 21 genera have been recorded so far. Among these, genus Myrsidae is the largest with 28 sps. Next genus Calpocephalum with 26 sps. Rest are all minor groups with lesser number of species.

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Short Communication

NEW DISTRIBUTIONAL RECORD OF *FICUS GRACILIS* (SOWERBY) AND *FICUS VARIEGATA* ROEDING, (GASTROPODA : FICIDAE) FROM COASTAL WATERS OF DIGHA, MIDNAPORE, WEST BENGAL.

INTRODUCTION

During the study of marine molluscs from coastal waters of Digha and adjoining areas (District : Midnapore), the authors have collected two specimens (one each) of *Ficus gracilis* (Sowerby) and *Ficus variegata* Roeding, from mudflat area of Digha mohana.

Molluscan fauna of West Bengal is known from the work of Subba Rao *et al.*, (1992 & 1995). In their accounts there is no mention of these two gastropods from the district Midnapore and hence the present record is for first time from this area.

A brief description of these two species have partain in view of enriching the checklist of invertebrates, as well as molluscan fauna of Digha.

Ficus gracilis (Sowerby)

1925. *Pyrula gracilis* Sowerby, Cat. Shells Tank., 17 : 62.

Diagnostic characters : Shell elongate, pyriform with elevated spire, body whorl rounded; apperture elongate, outer lip margin crenulated; columella concave, siphonal canal wide, open, rounded; sculpture consist of transverse flat ridges interstices with longitudinal striae giving reticulate in appearance.

Morphometrics (in m.m.)

Length : 107

Diametre : 51

Maximum height of the apperture : 101

Distribution : India : West Bengal : South 24 parganas; Orissa; Andhra Pradesh.

Elsewhere : Persian Gulf, China, Madagascar.

Now, Digha (District : Midnapore, West Bengal) is added as new distribution of this species.

Ficus variegata Roeding

1798. *Ficus variegata* Roeding, Mus. Bolten 148, sp. no. 1852.

1972. *Ficus variegata* Cernohorsky, *Mar. Shells of the Pacific*, 2 : 113, pl. 33. fig. 1.

Diagnostic characters Shell pyriformly ventricose, bulbous at the shoulder, spire depressed; sculptured with fine close set spiral thread and a finer intermediate thread and axial lirae in intercostal spaces; darkpink or brown, ornamented with 5 white lines with brown spots within and maculated with irregular.

Morphometrics (in m.m.)

Length : 56

Diametre 34

Maximum height of the apperture : 55

Distribution India West Bengal South 24 Parganas; Orissa; Andhra Pradesh; Tamilnadu; Kerala; Maharastra; Gujrat.

Elsewhere Red sea, Pakistan, Madagascar, Singapore, Thailand, China & Japan.

Now, Digha (District Midnapore, West Bengal) is added as new distributional record.

SUMMARY

From above discussion, it is assumed that though these species are reported earlier from the coast of West Bengal, but there was a discontinuity in their distributional record, as both of the specis were absent from above mentioned localities (Digha coast, district : Midnapore), before this findings

Now by findings of these two species from Digha mohana, that gap is filled and it indicates a continuous distribution throughout the coast of West Bengal and also upto Andhra pradesh.

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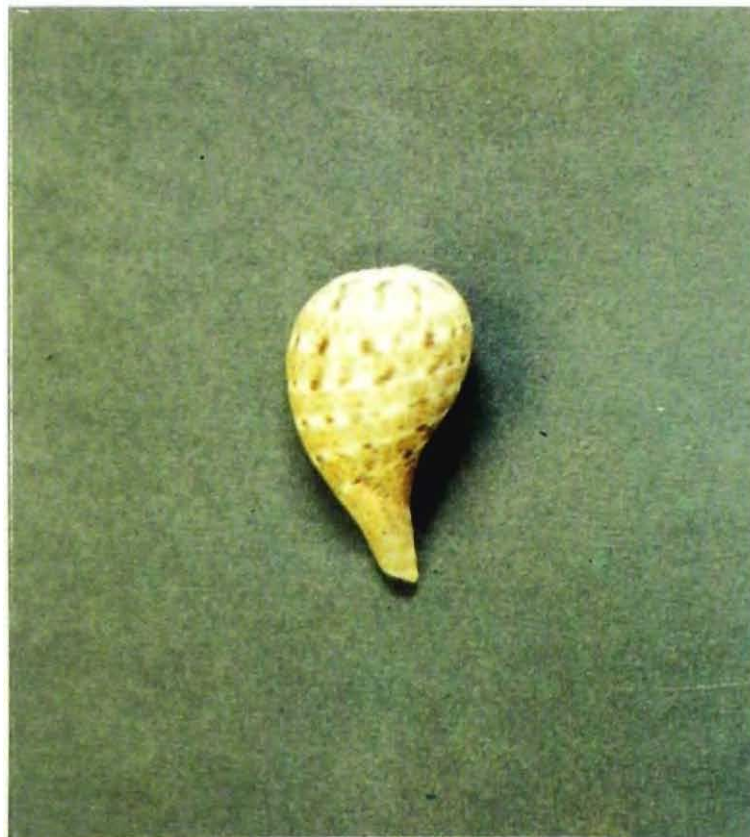
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Ficus gracilis (Sowerby)



Ficus variegata Roeding