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

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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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Rec. zool. Surv. India, 98(Part-2) : 1-4, 2000

ON A NEW SPECIES OF DERMAPTERA FROM PHILIPPINES ISLANDS

G. K. SRIVASTAVA
Zoological Survey of India, M-Block, New Alipore, Calcutta- 700 053

INTRODUCTION

Srivastava (1978, p. 277) recorded under *Labia curvicauda* (Motschylsky, 1863) 2 Males, 2 Females labelled as "Mindanao, Devao Province, E. Slope, Mt. MacKinley, 23.viii.1946, 4100 ft, in terminal leaf axil of *Pandanus*....." Out this, 1 Male and 1 Female was retained in the collection of Zoological Survey of India.

These specimens were re-examined and found to represent an undescribed species of the genus *Circolabia* Steinmann, redifined by Srivastava (1995).

At present five species viz., *C. curvicauda* (Motschulsky, 1863), *C. pilicornis* (Motschulsky, 1883) and *C. fruehstorferi* (Burr, 1897), *C. boettcheri* (Borelli, 1923), *C. emarginata* (Srivastava, 1978) are reported from the area.

The described species comes very close to *C. curvicauda* (Motschulsky) but differs by its slightly large size, i.e., from 7.3 to 8.2 mm, including forceps (*vs* 4.15-6.25 in *C. curvicauda*); pygidium in males, transverse, vertical and narrowed posteriorly (*vs* transverse, but apical portion horizontal and truncate posteriorly) and forceps, in males, deplanate in a little less than basal half with inner margin straight (*vs* in basal 1/3 with a flattened lobe or tooth with its inner margin convex) and genitalia with virga short and thick (*vs* long & thin).

Family : SPONGIPHORIDAE

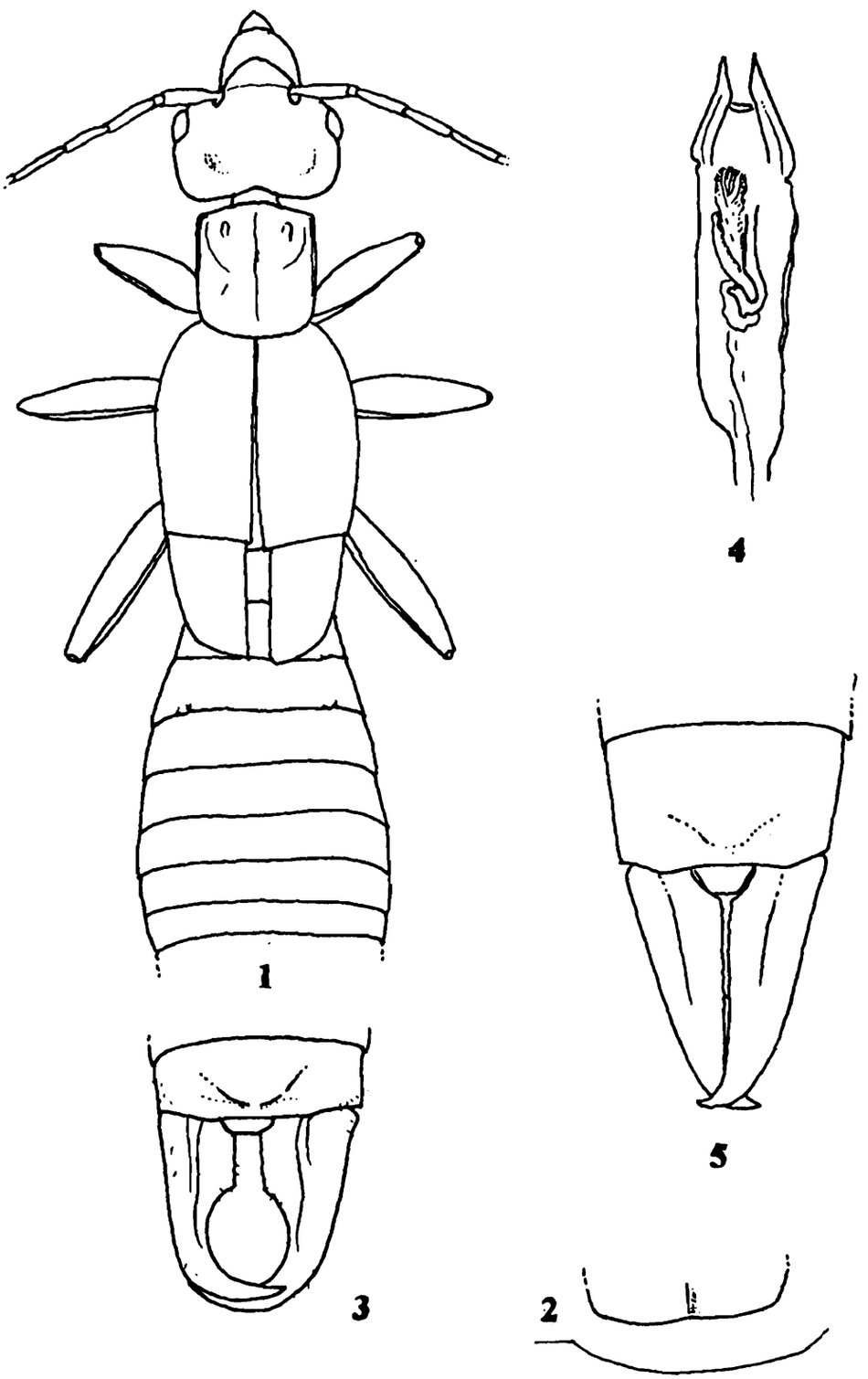
Subfamily : LABIINAE

Circolabia hoogstraali sp. n.

(Figs. 1-5)

Labia curvicauda (nec Motschulsky, 1863); Srivastava, 1978. *Eos, Madr.*, **52** : 277 (2 Males, 2 Females; Philippine Island, Mindanao, E. slope, Mt. Mckinley, 23.viii.1946, 4100 ft., in terminal leaf axils of *Pandanus*, *H. Hoogstraal* leg; excluding 2 Females, same data, 30.ix.1946, 3400 ft, under bark; 1 Female, Mainit, E. slope Mt. Apo, xi.1946, 4300 ft., on trees, *H. Hoogtsraal* leg).

Male : General colour yellowish brown; head and basal two antennal segments blackish brown; legs except basal half of tibia and whole of tarsi, posterior abdominal tergites and forceps dark brown. Form depressed. Finely pubescent, more prominent on elytra and wings.



Figs. 1-5. *Circolabia hoogstraali* sp. n., Holotype Male, 1. Dorsal view, except ultimate tergite and forceps, 2. Hind portion of penultimate sternite, 3. Ultimate tergite and forceps, 4. Genitalia; Paratype Female, 5. Ultimate tergite and forceps.

Head longer than broad, depressed, sutures obsolete, hind margin emarginate; eyes shorter than post-ocular area. Antennae (only six segments remaining on either sides) with segments long & slender; basal segment, stout, narrowed at base, about as long as the distance between antennal bases; 2nd short; 3rd & 4th slender almost equal; 5th & 6th slender. Legs typical for the genus. Pronotum longer than broad, sides depressed and straight, hind angles and margin gently rounded, median sulcus faint, prozona weakly raised and metazona depressed. Elytra and wings well developed, micro-reticulated, former with humeral angles well marked. Abdomen fusiform, tergites weakly depressed, micro-reticulated, lateral tubercles on 3rd and 4th tergites weakly marked but latter comparatively larger. Penultimate sternite with hind margin subtruncate, slightly emarginate in middle. Ultimate tergite transverse, smooth, depressed, posteriorly in middle with a faint depression, hind margin in middle hardly emarginate, laterally straight, above bases of forceps oblique. Forceps stout, at base separated by pygidium, branches depressed & flattened in a little less than basal half afterwards attennuate, strongly incurved in apical 1/3, apices strongly hooked and crossing. Pygidium vertical, narrowed apically. Genitalia as seen in fig. 4.

Female : Agrees with males in most characters except that the ultimate tergite narrowed posteriorly and forceps simple and straight.

Measurements (in mm) :

	Holotype Male	Paratype Female
Length of body	6.1	6.8
Length of forceps	1.2	1.4

Material examined : Holotype Male, Paratype 1 Male labelled as "Philippine Islands, Mindanao, Devao Province, E. Slope Mt. Mackinley, 4100 ft, 23.viii.1946 in terminal leaf axil of *Pandanus Hoogstraal leg*)"; det. as *Labia curvicauda* (Motschulsky) by G. K. Srivastava and deposited in the Zoological Survey of India, Calcutta, India.

1 Male, 1 Female det. by Srivastava (1978) with same data as the Holotype, now preserved in the Field Museum of Natural History, Chicago, U.S.A. are designated as the Paratypes.

Remarks : The described species comes close to *C. curvicauda* (Motschulsky) but it can be easily separated from all the known species of the genus from Philippines Islands by the folowing key :

1. Size larger (7.2-9.1 mm, including forceps). 2

- Size smaller (4.0-6.25 mm, including forceps). 5

2. Male pygidium deeply emarginate posteriorly. ..... *C. emarginata* Srivastava

- Male pygidium entire posteriorly. 3

3. Male forceps in a little less than basal half dilated internally, afterwards strongly arcuate. .. .. *C. hoogstraali* sp. n.

- Male forceps long, cylindrical, gently incurved near apices. 4

4. Pronotum slightly broader than long; male pygidium narrowed posteriorly to a small point and turned upwards. ..... *C. boettcheri* (Borelli)

- Pronotum longer than broad; male pygidium distinct not narrowed apically. .... *C. frushtorferi* (Burr)

5. Male forceps short, in basal 1/3-1/4 with a flat lobe or tooth, afterward strongly incurved; pygidium vertical, at base transverse, convex, posteriorly narrowed, horizontal with margin truncate and genitalia with virga short or long, parameres narrowed apaically with tip acute. ..... *C. curvicauda* (Motschulsky)

- Male forceps long, cylindrical; pygidium not vertical narrowed to a fine point or bifid; parameres narrowed, apices obtuse, virga long and arranged in a circular fashion. .... *C. pilicornis* (Motschulsky)

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The author is thankful to Dr. J.R.B. Alfred, Director, Zoological Survey of India, Calcutta, for providing necessary facilities.

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Rec. zool. Surv. India, **98**(Part-2) : 5-50, 2000

MOLLUSCS OF THE HIMALAYA

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INTRODUCTION

The Himalaya constitutes an important zoo-geographical region which harbours a large number of species of land and freshwater molluscs with a high percentage of endemicity.

An array of literature on molluscs of the Himalayan region in general, are available. Important reports which dealt with the molluscs of the Himalayan regions are as follows :

West and Northwest : Godwin-Austen (1899) presented a list of molluscs from Kashmir and a few other places in the western Himalaya. Hora (1928) separately discussed some important aspects of hibernation and aestivation in a few species of snails and slugs in Himachal Pradesh. Hora *et al* (1955) presented some interesting features of freshwater molluscs of Kashmir. Nevill (1878) gave an account of molluscs of Kashmir and its neighbourhood territories in the western Himalaya. Rajagopal and Subba Rao (1969, 1972) studied the entire land and freshwater molluscan fauna of Kashmir and presented comprehensive lists of species occurring there. Theobald (1878) gave notes on land and freshwater molluscs of Kashmir, particularly those of Jhelum valley below Srinagar.

Recent works on molluscs of the northwestern Himalaya include Davis et. al. (1986) and Davis and Subba Rao (1997) on the freshwater gastroped family Pomatiopsidae with description of a new species from Nainital; Subba Rao and Mitra (1995) which dealt with the species occurring in the eight districts of Uttar Pradesh, adjacent to the Himalaya.; Surya Rao and Mitra (1997) dealing with the molluscs collected from Nanda Devi Biosphere Reserve; Surya Rao and Mitra (in press) in two separate reports, on molluscs occurring in the 12 districts of Himachal Pradesh, adjacent to the Himalaya and also on the freshwater molluscs collected from the Renuka wetland, Himachal Pradesh. In addition to these, Annandale and Prashad (1923a, 1923b); Mozley (1935) and Woodward (1856) also made studies on molluscs of these areas.

East and Central : Molluscs of the eastern part are fairly well worked out. Major contributions to the knowledge of molluscs of these areas were from Godwin-Austen (1870, 1875, 1876a, 1876b, 1892, 1893); Godwin-Austen and Beddome (1894); Benson (1851, 1857, 1859a, 1859b) and Blanford (1862, 1865, 1868, 1870). Benson whose initial studies on land and freshwater molluscs in the sub-continent were a source of encouragement for the subsequent workers in the field, described 22 new species under 12 families. Blanford's studies included 13 new species under 9 families. Godwin-Austen who practically pioneered the serious and organised studies of land molluscs in

India, described approximately 100 species under different families like, Cyclophoridae, Diplommatinidae, Pupinidae, Corillidae, Helicarionidae, Subulinidae, Ariophantidae, Philomycidae, etc., from these areas. Besides, Annandale *et. al.*'s (1921) studies on the freshwater molluscs of Loktak Lake in Manipur included a few new species and a new planorbid genus *Indoplanorbis*. Preston (1914) made studies on a few species from Naga hills. Zoological Results of the Abor Hill Expedition (1911-12) included Ghosh (1913), Godwin-Austen (1914), Gude (1915) and Preston (1915a) in which a large number of species of land molluscs collected from the foot hills of Abor at the lower elevation of upto 2000 ft. (600 meter approx.) were described.

Recent works include Subba Rao *et. al.* (1994) on molluscs of Meghalaya wherein 223 species have been recorded; Dey *et. al.* (1985) on a collection of molluscs from Namdapha, Arunachal Pradesh; Mitra and Dey (1990) on some land molluscs collected from Darlak, Mizoram and Thakur *et. al.* (1992) who recorded 92 species of land and freshwater molluscs from the Darjeeling district of West Bengal including a large number of endemic species.

General Reports : In addition to these, Godwin-Austen (1910, 1920); Blanford and Godwin-Austen (1908); Gude (1914, 1921) and Preston (1915b) also dealt with molluscs of the Himalaya in general.

The geographical division of the Himalayan region in four zones, viz., Northwestern , Western, Central and Eastern have been done following Rodgers and Panwar (1988).

Though we do not have the data to correlate the distribution of species with altitudinal zonation, wherever possible the altitude from which a particular species was recorded has been mentioned.

Classification followed here is that of Vaught (1989).

SUMMARY AND DISCUSSION

In all, 689 species of land and freshwater molluscs (92 freshwater and 597 land) under 134 genera (31 freshwater and 103 land) and 45 families (15 freshwater and 30 land) are recorded here as occurring in the Himalayan region (Table - I). The eastern Himalaya represent 72.23% of the total species, followed by Central (18.13%), Northwestern (15.84%) and Western Himalaya (8.43%) Table - II.

FRESHWATER MOLLUSCS

Majority of the 92 species of freshwater molluscs (66) are recorded from the eastern parts. Northwestern and central parts record the least number of species. Lymnaeidae and Planorbidae, the two Pulmonate families are well represented in the northwest. Six species are endemic to Kashmir and also extend to other areas including Europe and Central Asia. Only 34 species have all India range of distribution, 18 are restricted to the east. Quite a few species are occurring in the east as well as Bangladesh, Myanmar etc. Out of the 92 species, 44 are endemic to the

Himalayan regions. Interestingly none of the species is common to all the four regions of the Himalaya. Six of the most widely distributed gastropod species viz. *Bellamya bengalensis typica* (Lamarck), *B. dissimilis* (Mueller), *Bithynia (Digoniostoma) pulchella* (Benson), *Lymnaea andersoniana* Nevill, *L. luteola typica* Lamarck and *Indoplanorbis exustus* (Deshayes) are each recorded from three regions. Distribution of the bivalves present a more interesting feature. Only two species are recorded from the whole Northwest and West, both of them are occurring throughout India. Kashmir records 4 species and all the 4 are endemic to Kashmir, the rigorous physical barriers may be the factor. Out of the 9 species of smaller bivalves (Pisidiidae) recorded, 7 are Himalayan. A few of the species are recorded from over 3000 m altitude. Incidentally *Pisidium stewarti*, a species from Tibet was recorded from above 4000 m, which happens to be a record for any bivalve species (Dance, 1967). The tiny gastroped genera, *Tricula, Erhaia* and *Ferrissia* are lotic in habit, occurring in flowing water bodies. All others being essentially stagnant water dwellers.

LAND MOLLUSCS

Out of 597 species of land molluscs recorded from the Himalaya in general, above 488 are recorded from the eastern and central parts, of which nearly 462 species (approx, 94.6%) are endemic to these areas. Eastern alone accounts for around 439 species among which around 379 (86.33%) species are endemic to this region and a number of species have extension to Myanmar, Bangladesh, China, etc.

The North-western and Western parts record 95 species of which 76 (80%) are endemic to these areas. Many of these species (e.g. genera like *Vallonia*, *Cerastua*, *Serina*, *Subzebrinus,* etc.) are palaearctic in origin, Kashmir with an unique status as a Zoo-geographical zone, has 51 species recorded from here, 15 of which are endemic. Seven species, *Subzebrinus boysiana* (Reeve), *Bradybaena radicicola* (Benson), *Lamellaxis gracile* (Hutton), *Kaliella barrakporensis* (Pfeiffer), *Plectotropis huttoni* (Pfeiffer), *Sitala rimicola* (Benson) and *Anadenus schlagintweiti* Heynemann, are common to both east and northwest. The number of species having all India range of distribution is less than 15 in all, and they include such ubiquitous species as *Gulella* (*Huttonella*) *bicolor*, *Lamellaxis gracile*, *Kaliella barrakporensis*, etc. A few species extend to Myanmar, China, Bangladesh and few other places in Europe and also central Asia. Endemicity of species in the Himalayan region is very high being above 94.6%. The genera like *Austenia*, *Girasia*, *Anadenus*, *Bensonies*, *Euaustenia*, *Philomycus*, *Oxytesta*, *Phaedusa*, *Pseudopomatias*, *Rahula*, are all Himalayan in distribution. Only three species *Kaliella barrakporensis* (Pfeifer), *Plectotropis huttoni* (Pfeiffer) and *Sitala rimicola* (Benson) are recorded from all the 4 regions of the Himalaya. Besides the Himalayan genera mentioned above, species like *Kaliella gratiosa* Godwin-Austen, *Subzebrinus nevilliana* (Theobald), *Macrochlamys vesicula* (Benson), *M. opipara* Godwin-Austen, *M. hodgsoni* (Benson), *Syama splendens* (Hutton), *Oxytesta orobia* (Benson), *M. glauca* (Pfeiffer) are recorded from the height of above 3000m (10,000ft). On the other hand, species like *Achatina fulica* (Bowdich) and *Filicaulis* (*Eleutherocaulis*) *altae* (Ferrussac) are recorded from Nongpoh in Meghalaya with an altitude of around 1000m and not beyond that. Incidentally, *A. fulica* which was introduced in Mussouri about a century back, failed to survive.

Among the families, Cyclophoridae, Helicarionidae, Subulinidae, Ariophantidae are the largely represented families with approximately 100 species under each. At the generic level, *Alycaeus* (96), *Macrochlamys* (76), *Diplommatina* (61), *Kaliella* (35), *Plectopylis* (23), *Cyclophorus* (23), *Subzebrinus* (18) and *Glessula* (18) are predominant.

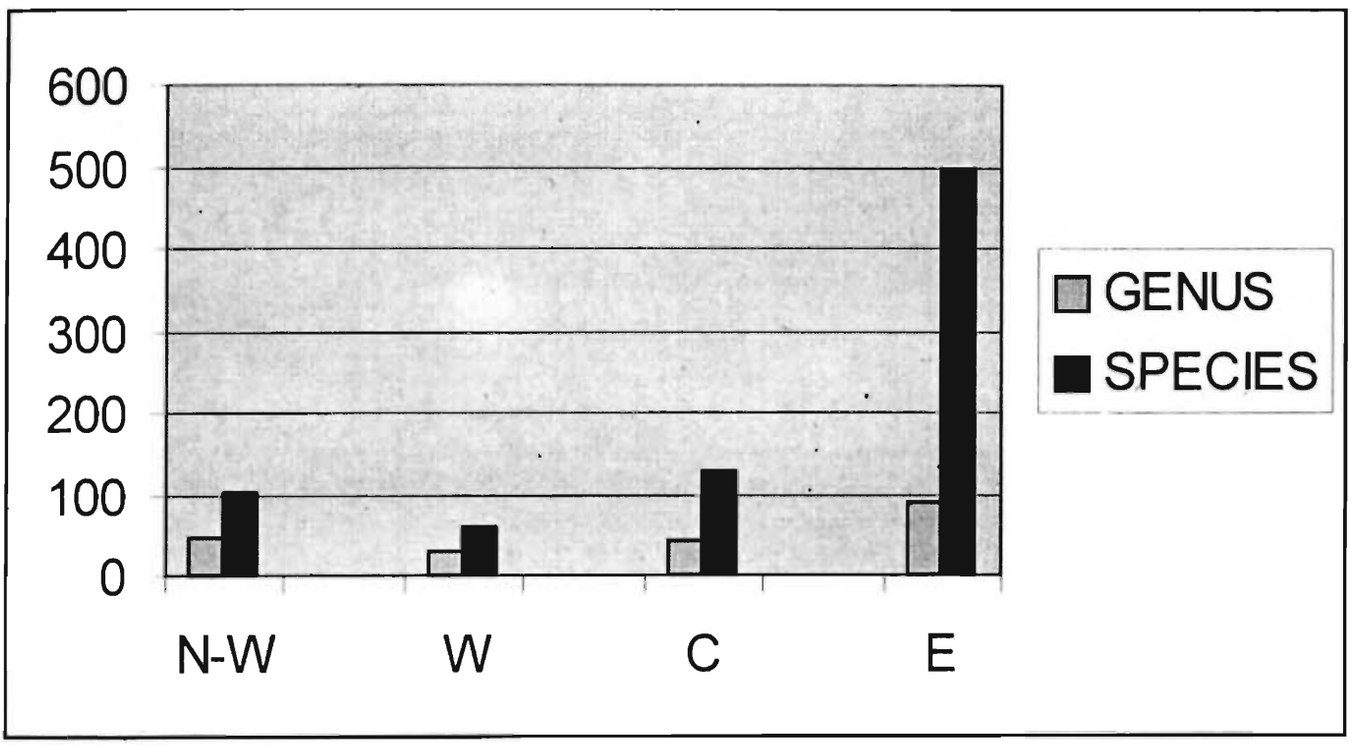
GENERAL

The towering range of the Himalaya and its foot-hills make an enormous impact on the distribution of molluscs, particularly the land forms. The number of species which are recorded in the Himalayan region (689) is just above 40% of the total number of Indian species. Total number of species endemic to the region is above 600 (above 80%). Family wise, all the families of Indian land molluscs are represented. Out of 20 families of freshwater molluscs recorded in India, 15 are represented. At the generic level, out of 137 genera of Indian land molluscs, 103 are recorded and out of 57 genera of freshwater molluscs 30 are represented. It is also revealed that the species recorded from eastern and central Himalaya, by far out number those recorded from the northwestern and western parts. Apparently the subtropic climatic condition with dense tropical evergreen forests producing a deep leaf and foliage litter, higher rainfall and less rigorous temperature extremes of the eastern and central Himalaya offer more suitable and favourable conditions for the molluscs, particularly the land forms, to thrive and flourish. Among the prominent genera *Cyclophorus*, *Alycaeus*, *Diplommatina*, *Cryptaustenia*, *Glessula*, *Kaliella*, *Oxytesta*, *Phaedusa, Plectopylis*, *Sitala* all of which are represented by a large number of species each, in the east-central, are totally absent or are just tokenly represented by 1 or 2 species each in the northwest-west. Strikingly, land operculates which are abundantly present in the east-central (approx. 250 spp. under 15 genera) are meagerly represented by 4 species under two genera in the other parts. The poor representation of land operculates indicates to the general atmospheric aridity of the west in contrast to the moist humid climate in the east. *Macrochlamys*, one of the most widely distributed pulmonate genera in India (plains and hills) is represented by 13 species from north-west and western part and 63 species from east and central. Interestingly, all the 13 western-north-western species are limited to those areas only. *Phaedusa* is represented by one endemic species in the north-west against 4 species in the east. On the other hand a few genera like *Parvatella*, *Syama*, which are represented in the north-west by a number of species each, are absent in the east. *Subzebrinus* which is represented by 16 species in the west-north-west, has only 2 species in the east.

The fauna of west and north-west Himalaya consists partly of oriental and partly of Palaearctic forms with some even of Ethiopian origin.

Kashmir, in particular, is the only region in India which shares many species with Central Asia, Europe and also Africa. *Pupisoma orcula*, *Vallonia costata*, *V. pulchella*, *Planorbis rotundatus*, *Gyraulus euphraticus*, *Hippeautis fontanus*, *Lymnaea lagotis* are some of such species. A few of these have radiated into endemic forms (*Bithynia tentaculata kashmirensis*). Two genera *Serina* and *Subzebrinus* the 'Palaearctic immigrants" (Gude, 1914) have migrated and colonised in India and have given rise to endemic species. Out of 18 species of *Subzebrinus* recorded from the Himalayan region, 16 are endemic to west-northwest.

The fauna of eastern zone include some of Indo-china or Malayan derivatives. A few of such species have extended their distribution starting from Nepal and China to east Himalaya to northwest up to Kashmir (*Lymnaea andersoniana*). Some range between Myanmar, north-west Himalaya through the east (*Indoplanorbis exustus*, *Hippeautis umbilicalis*). A few extend from east Himalaya to Myanmar and to the Andamans (*Macrochlamys pungi*). Some of the more common arid - zone species such as *Zootecus insularis*, *Pupoides coenopictus*, have very wide range of distribution from, Sahara and the Middle East to Western Himalaya, Gujarat, Rajasthan reaching down to the drier parts of the peninsular India.



N-W : North-Western Himalaya C : Central Himalaya
W : Western Himalaya E : Eastern Himalaya

Fig. 1. Histogram showing number of genera and species recorded from different zones of Himalaya.

Table I : Showing region-wise distribution of molluscs in the Himalaya

		North Western	Western	Central	Eastern	Elsewhere with Remarks
	1	2	3	4	5	6
	Phylum - MOLLUSCA Class - GASTROPODA Subclass - PROSOBRANCHIA Order - ARCHAEOGASTROPODA Family - HELICINIDAE					
1	*Pleuropoma arakanensis* Blanford	-	-	-	+	Myanmar
	Order - MESOGASTROPODA Family - CYCLOPHORIDAE Subfamily - CYLOPHORINAE					
2.	*Cyclophorus aborensis* Godwin-Austen	-	-	-	+	
3.	*C. aurora* (Benson)	-	-	+	-	
4.	*C. austenianus* Preston	-	-	-	+	
5.	*C. bapuensis* Godwin-Austen	-	-	-	+	
6.	*C. beddomeanus* Preston	-	-	-	+	
7.	*C. bensoni* Pfeiffer	-	-	-	+	
8.	*C. cybeus* (Benson)	-	-	-	+	
9.	*C. exul* Benson	-	-	+	-	
10.	*C. fultoni* Godwin-Austen & Beddome	-	-	-	+	
11.	*C. fusicolor* Godwin-Austen	-	-	-	+	
12.	*C. himalayanus* Pfeiffer	-	-	+	-	
13.	*C. khasiensis* Nevill	-	-	-	+	
14.	*C. koboensis* Godwin-Austen	-	-	-	+	

	1	2	3	4	5	6
15.	*C. muspratti* Godwin-Austen & Beddome	-	-	-	+	
16.	*C. nagaensis* Godwin-Austen & Beddome	-	-	-	+	
17.	*C. pealianus* Nevill	-	-	-	+	
18.	*C. pearsoni* Benson	-	-	-	+	
19.	*C. poeciloneurus* Godwin-Austen & Beddome	-	-	-	+	
20.	*C. sidiensis* Godwin-Austen	-		-	+	
21.	*C. stenomphalus* (Pfeiffer)	-	-	-	+	
22.	*C. theobaldianus* Benson	-	-		+	Myanmar
23.	*C. tryblium* Benson			+	-	
24.	*C. zebrinus* (Benson)		-		+	China, Myanmar
25.	*Cyathopoma garoense* Godwin-Austen	-			+	
26.	*C. jawaiensis* Godwin-Austen	-			+	
27.	*C. nevilli* Godwin-Austen	-			+	
28.	*Scabrina pinnulifera* (Benson)	-			+	
29.	*Theobaldius nivicola* (Godwin-Austen)	-			+	
30.	*T. oakesi* (Godwin-Austen)	-			+	
31.	*T. orites* Nevill		-	+	-	
32.	*T. phaenotopicus* (Benson)	-		+	-	
	Subfamily - ALYCAEINAE					
33.	*Alycaeus aborensis* Godwin-Austen	-		-	+	
34.	*A. asaluensis* Godwin-Austen	-	-	-	+	
35.	*A. barowliensis* Godwin-Austen	-		-	+	
36.	*A. beddomei* Godwin-Austen	-	-	-	+	
37.	*A. bembex* Benson	-	-	+	-	
38.	*A. bicrenatus* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
39. *A. birugosus* Godwin-Austen	-	-	-	+	
40. *A. brahma* Godwin-Austen	-	-	-	+	
41. *A. burrailensis* Godwin-Austen	-	-	-	+	
42. *A. burroiensis* Godwin-Austen	-	-	-	+	
43. *A. burti* Godwin-Austen	-	-	-	+	
44. *A. canaliculus* Godwin-Austen	-	-	-	+	
45. *A. chennelli* Godwin-Austen	-	-	-	+	
46. *A. conicus* Godwin-Austen	-	-	-	+	
47. *A. constrictus* (Benson)	-	-	+	-	
48. *A. costatus* Godwin-Austen	-	-	-	+	
49. *A. crenatus* Benson	-	-	-	+	
50. *A. crenulatus* Benson	-	-	+	-	
51. *A. crispatus* Benson	-	-	-	+	
52. *A. daflaensis* Godwin-Austen	-	-	-	+	
53. *A. dalingensis* Godwin-Austen	-	-	+	-	
54. *A. diagonius* Godwin-Austen	-	-	-	+	
55. *A. digitatus* Blanford	-	-	+	-	
56. *A. dihingensis* Godwin-Austen	-	-	-	+	
57. *A. dikrangensis* Godwin-Austen	-	-	-	+	
58. *A. distinctus* Godwin-Austen	-	-	-	+	
59. *A. duorugosus* Godwin-Austen	-	-	-	+	Myanmar
60. *A. edei* Godwin-Austen	-	-	-	+	
61. *A. elegans* Godwin-Austen	-	-	-	+	
62. *A. gemma* Godwin-Austen	-	-	-	+	
63. *A. gemmula* Benson	-	-	+	-	

1	2	3	4	5	6
64. *A. generosus* Godwin-Austen	-	-	-	+	
65. *A. globulus* Godwin-Austen	-	-	-	+	
66. *A. granum* Godwin-Austen	-	-	-	+	
67. *A. graphicus* Blanford	-	-	-	+	Myanmar
68. *A. habiangensis* Godwin-Austen		-	-	+	
69. *A. hebes* Benson	-	-	-	+	
70. *A. inflatus* Godwin-Austen	-	-	-	+	
71. *A. jaintiacus* Godwin-Austen	-	-	-	+	
72. *A. kamakiaensis* Godwin-Austen		-	-	+	
73. *A. kezamaensis* Godwin-Austen	-	-		+	
74. *A. khasiacus* Godwin-Austen			-	+	
75. *A. khunhoensis* Godwin-Austen				+	
76. *A. lahupaensis* Godwin-Austen				+	Myanmar
77. *A. lectus* Godwin-Austen			+		
78. *A. lenticulus* Godwin-Austen		-	+		
79. *A. logtakensis* Godwin-Austen		-		+	
80. *A. lohitensis* Godwin-Austen				+	
81. *A. luyorensis* Godwin-Austen		-		+	
82. *A. macgregori* Godwin-Austen		-		+	
83. *A. magnificus* Godwin-Austen		-		+	
84. *A. magnus* Godwin-Austen	-	-	-	+	
85. *A. mangutensis* Godwin-Austen		-	-	+	
86. *A. montanus* Nevill		-	+	-	
87. *A. multicostata* Godwin-Austen		-	-	+	Myanmar
88. *A. multirugosus* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
89. *A. mundulus* Godwin-Austen	-	-	-	+	
90. *A. muspratti* Godwin-Austen	-	-	-	+	
91. *A. mutatus* Godwin-Austen	-	-		+	
92. *A. neglectus* Godwin-Austen	-	-	-	+	
93. *A. nitidus* Blanford		-		+	Myanmar
94. *A. nongtunensis* Godwin-Austen	-	-		+	
95. *A. notatus* Godwin-Austen		-	-	+	
96. *A. nowgongensis* Godwin-Austen		-		+	
97. *A. obscurus* Godwin-Austen	-	-		+	
98. *A. oglei* Godwin-Austen		-		+	
99. *A. okhaensis* Godwin-Austen	-	-		+	
100. *A. otiphorus* Benson	-	-	+	-	Myanmar
101. *A. panchitaensis* Godwin-Austen		-	-	+	
102. *A. panggianus* Godwin-Austen				+	
103. *A. paucicostatus* Godwin-Austen		-		+	
104. *A. peilei* Preston	-	-		+	
105. *A. perplexus* Godwin-Austen		-		+	
106. *A. physis* Benson		-	+	-	
107. *A. plectochilus* Benson	-	-	+	-	
108. *A. prosectus* Benson	-	-	-	+	
109. *A. pusillus* Godwin-Austen	-	-	-	+	
110. *A. rechilaensis* Godwin-Austen	-	-	+	-	
111. *A. rotundatus* Godwin-Austen	-	-	-	+	
112. *A. rugosus* Godwin-Austen	-	-	-	+	
113. *A. sculpturus* Godwin-Austen	-	-	-	+	

	1	2	3	4	5	6
114.	*A. sculptilis* Benson	-	-	-	+	Myanmar
115.	*A. serratus* Godwin-Austen	-	-	-	+	
116.	*A. sibbumensis* Godwin-Austen	-	-	-	+	
117.	*A. stoliczkai* Godwin-Austen	-	-	-	+	
118.	*A. strangulatus* (Pfeiffer)	+	-	-	-	
119.	*A. strigatus* Godwin-Austen	-	-	-	+	
120.	*A. stylifer* Benson	-	-	+	-	
121.	*A. subculmen* Godwin-Austen	-	-	-	+	
122.	*A. subhumilis* Mollendorff	-	-	+	-	
123.	*A. subinflatus* Godwin-Austen	-	-	-	+	Myanmar
124.	*A. teriaensis* Godwin-Austen	-	-	-	+	
125.	*A. theobaldi* Blanford	-	-	-	+	
126.	*A. toruputuensis* Godwin-Austen	-	-	-	+	
127.	*A. vesica* Godwin-Austen	-	-	-	+	
128.	*A. yamneyensis* Godwin-Austen	-		-	+	
129.	*Dioryx urceolus* Godwin-Austen	-	-	-	+	
130.	*D. urnula* (Benson)	-		+	+	
131.	*D. varius* Godwin-Austen	-		-	+	
	Subfamily - PTEROCYCLINAE					
132.	*Pterocyclus aborensis* Godwin-Austen	-	-	-	+	
133.	*P. brahmakundensis* Godwin-Austen	-	-	-	+	
134.	*P. magnus* Godwin-Austen	-		-	+	
135.	*P. miriensis* Godwin-Austen	-	-	-	+	
136.	*P. parvus* (Pearson)	-	-	-	+	
137.	*P. spiramentum* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
138. *Pearsonia assamensis* (Fulton)			-	+	
139. *P. hispida* (Pearson)			-	+	
140. *P. kempi* (Godwin-Austen)			-	+	
141. *P. luyorensis* (Godwin-Austen)		-	-	+	
142. *P. mastersi* (Hanley & Theobald)			-	+	
143. *P. minima* (Godwin-Austen)			-	+	
144. *P. nagaensis* (Godwin-Austen & Beddome)				+	
145. *P. nevilli* Godwin-Austen			-	+	
146. *P. plana* Godwin-Austen			-	+	
147. *P. simplex* Nevill		-	-	+	
Family - DIPLOMMATINIDAE					
148. *Diplommatina acutulus* Godwin-Austen	-		-	+	
149. *D. ambigua* Godwin-Austen	-		-	+	
150. *D. animula* Godwin-Austen	-		-	+	Myanmar
151. *D. austeni* Blanford	-		-	+	
152. *D. blanfordiana* Benson			+		
153. *D. burti* Godwin-Austen	-		-	+	
154. *D. butleri* Godwin-Austen			-	+	Myanmar
155. *D. chennelli* Godwin-Austen	-	-	-	+	
156. *D. commutata* Godwin-Austen	-	-	-	+	Myanmar
157. *D. compacta* Godwin-Austen	-	-	-	+	
158. *D. convoluta* Godwin-Austen	-	-	-	+	
159. *D. daflaensis* Godwin-Austen	-	-	-	+	
160. *D. decorosa* Godwin-Austen	-	-	-	+	
161. *D. delicata* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
162. *D. depressa* Godwin-Austen	-	-	-	+	
163. *D. diplochilus* Benson	-	-	-	+	
164. *D. distincta* Godwin-Austen	-	-		+	
165. *D. dohertyi* Godwin-Austen	-	-	-	+	
166. *D. domuncula* Godwin-Austen	-	-		+	
167. *D. elongata* Godwin-Austen	-	-	-	+	
168. *D. fallax* Preston	-	-	-	+	
169. *D. folliculus* (Pfeiffer)		+	-	-	
170. *D. frumentum* Preston		-		+	
171. *D. garoensis* Godwin-Austen	-	-	-	+	
172. *D. gibberosa* Godwin-Austen		-		+	
173. *D. gibbosa* Blanford		-	-	+	
174. *D. godwini* Mollendorff		-		+	
175. *D. homei* Godwin-Austen	-	-	-	+	
176. *D. huttoni* Pfeiffer	-	+			
177. *D. jaintiaca* Godwin-Austen	-	-	-	+	
178. *D. japvoensis* Godwin-Austen		-		+	
179. *D. jatingana* Godwin-Austen	-	-	-	+	
180. *D. khunhoensis* Godwin-Austen		-	-	+	
181. *D. labiosa* Blanford	-	-	-	+	
182. *D. lapillus* Godwin-Austen	-	-	-	+	Myanmar
183. *D. levigata* Godwin-Austen	-	-	-	+	
184. *D. miriensis* Godwin-Austen	-	-	-	+	
185. *D. munipurensis* Godwin-Austen	-	-	-	+	Myanmar
186. *D. nengloensis* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
187. *D. oligopleuris* Blanford	-	-	-	+	
188. *D. oviformis* Fulton	-	-	+	-	
189. *D. pachychilus* Benson	-	-	+	-	
190. *D. parvula* Godwin-Austen	-	-	-	+	
191. *D. perobesa* Preston	+	-	-	-	
192. *D. polypleuris* Benson	-	-	-	+	Myanmar
193. *D. pullula* Benson	-	-	+	-	
194. *D. regularis* Fulton	-	-	+	-	
195. *D. saltuensis* Godwin-Austen	-	-	-	+	
196. *D. scalaria* Blanford	-	-	-	+	
197. *D. semisculpta* Blanford	-		+	-	
198. *D. sherfaiensis* Godwin-Austen	-	-	-	+	
199. *D. silvicola* Godwin-Austen	-		-	+	
200. *D. subrubella* Godwin-Austen	-	-	-	+	
201. *D. subtilis* Godwin-Austen	-	-	-	+	
202. *D. succinea* Godwin-Austen	-			+	
203. *D. theobaldi* Godwin-Austen	-	-	+		
204. *D. thomsoni* Godwin-Austen	-	-	-	+	Myanmar
205. *D. tumida* Blanford	-	-	-	+	
206. *D. ungulata* Blanford	-	-	+	-	
207. *D. unicrenata* Godwin-Austen	-	-	-	+	
208. *D. venustula* Godwin-Austen	-	-	-	+	
209. *Gastroptychia insignis* Godwin-Austen	-	-	-	+	
Family - PUPINIDAE					
Subfamily - PUPINELLINAE					
210. *Nodopomatias oakesi* (Godwin-Austen)	-	-	-	+	

1	2	3	4	5	6
211. *N. sibbumensis* (Godwin-Austen)	-	-	-	+	
212. *Pseudopomatias grandis* (Godwin-Austen)	-	-	-	+	
213. *P. himalayae* (Benson)	-	-	+	+	
214. *P. luyorensis* Godwin-Austen	-	-	-	+	
215. *P. pleurophorus* (Benson)	-	-	-	+	
216. *P. sibbumensis* Godwin-Austen	-	-	-	+	
217. *Raphaulus aborensis* Godwin-Austen	-	-	-	+	
218. *R. assamicus* Godwin-Austen	-	-	-	+	
219. *R. blanfordi* (Benson)	-	-	+	+	
220. *R. luyorensis* Godwin-Austen		-	+	+	
221. *R. miriensis* (Godwin-Austen)	-	-	-	+	
222. *R. oakesi* Godwin-Austen	-	-	-	+	
223. *R. yamneyensis* Godwin-Austen	-	-	-	+	
224. *Schistoloma funiculatum* (Sowerby)	-	-	+	+	
225. *S. tanychilum* (Godwin-Austen)	-	-	-	+	
Family - AMPULLARIIDAE					
226. *Pila olea* (Reeve)		-		+	
227. *P. theobaldi* (Hanley)	-	-	-	+	Myanmar
Family - VALVATIDAE					
228. *Valvata piscinalis* (Mueller)	+	-	-	-	Europe
Family - BITHYNIIDAE					
229. *Bithynia tentaculata kashmirensis* Nevill	+	-	-	-	
230. *B. (Digoniostoma) pulchella* (Benson)	+	-	-	+	Throughout India,Malaya Archepalago, Myanmar
231. *B. (D.) cerameopoma* (Benson)	+	-	-	+	Throughout the plains

1	2	3	4	5	6
232. *B. (D.) textum* Annandale	-	-	-	+	
Family - POMATIOPSIDAE					
Subfamily - TRICULINAE					
233. *Tricula montana* Benson	-	+	-	+	Sri Lanka
234. *Erhaia nainitalensis* Davis and Rao	-	+	-	-	
Family - VIVIPARIDAE					
235. *Bellamya bengalensis f. typica* (Lamarck)	+	-	+	+	Throughout India
f. mandiensis (Kobolt)	+	-	-	-	Maharashtra
f. balteata (Benson)	-	-	+	+	
236. *B. crassa* (Benson)	-		+	+	Orissa, Bangladesh
237. *B. crassispiralis* (Annandale)			-	+	
238. *B. dissimilis* (Mueller)	+	+	-	+	Throughout India
239. *B. micron* (Annandale)	-	-	-	+	
240. *Cipangopaludina lecythis* (Benson)	-	-	-	+	Myanmar, China and Bangladesh
241. *Angulyagra oxytropis* (Benson)	-	-	-	+	
242. *A. microchaetophora* (Annandale)	-	-	-	+	
Family - ASSIMINEIDAE					
243. *Acmella milium* (Benson)	-	-	-	+	
244. *A. tersa* (Benson)	-	-	-	+	
Family - THIARIDAE					
245. *Thiara scabra* (Mueller)	-	-	-	+	Throughout Indian plains
246. *Melanoides tuberculata* (Mueller)	+	-	-	+	Throughout India, plains and hills except Kashmir - a cosmopolitan species

1	2	3	4	5	6
247. *Tarebia lineata* (Gray)	-	-	+	+	**Plains of India, also Myanmar, Sri Lanka**
Family - PLEUROCERIDAE					
Subfamily - MELANATRINAE					
248. *Brotia costula* (Rafinesque)	-	-	+	+	Gangetic plains, Malaya Archepelago, Myanmar
249. *Sulcospira huegeli* (Philippi)	-	-	-	+	Western Ghat
Subfamily - PALUDOMINAE					
250. *Paludomus* (*P.*) *blanfordiana* Nevill	-	-	-	+	Myanmar
251. *P.* (*P.*) *conica* (Gray)	-	-	+	+	Bangladesh
252. *P.* (*P.*) *pustulosa* Annandale		-		+	
253. *P.* (*P.*) *regulata* Benson	-	-	+	+	Myanmar
254. *P.* (*P.*) *reticulata* Blanford	-	-		+	
255. *P.* (*P.*) *stephanus* (Benson)	-	-		+	Bangladesh
256. *P.* (*Tanalia*) *loricatus* Reeve	-			+	Sri Lanka
Sub class - GYMNOMORPHA					
Order - SOLEOLIFERA					
Family - VERONICELLIDAE					
257. *Fillicaulis* (*Eleutherocaulis*) *alte* (Ferussac)	-	-	-	+	(1000m) also in plains
Family - RATHOUISIIDAE					
258. *Atopos* (*Padangia*) *kempii* Ghosh	-	-	-	+	

1	2	3	4	5	6
Subclass - PULMONATA					
Order - BASOMMATOPHORA					
Family - LYMNAEIDAE					
259. *Lymnaea* (*Pseudosuccinea*) *acuminata f. typica* Lamarck	+	-	-	+	Throughout Indian plains
f. biacuminata Annandale & Rao	+	-	-	-	S. India
f. malleata Annandale & Rao	+	-	-	+	Throughout Indian plains
f. patula Troschel	+	-	-	+	do
f. rufescens Gray	+	-	-	+	do
260. *L.* (*P.*) *luteola f. australis* Annandale & Rao	+	-	-	+	do
f. ovalis Gray	+	-	-	+	Myanmar, Sri Lanka
f. succinea Deshayes	+	+	-	+	
f. typica Lamarck	+	+	-	+	Plains of India
261. *L.* (*P.*) *gedrosiana* Annandale & Prashad	+	-	-	-	
262. *L.* (*Radix*) *auricularia* Linnaeus	+	-	-	-	N. Asia, Europe
263. *L.* (*R.*) *brevicauda* Sowerby	+	-	-	-	
264. *L.* (*R.*) *lagotis* (Schrank)	+	-	-	-	Tibet, Central Asia
265. *L.* (*R.*) *peregra* (Mueller)	+	-	-	-	Tibet, Europe
266. *L.* (*R.*) *persica* Issel	+	+	-	-	Persia
267. *L.* (*Galba*) *andersoniana* Nevill	+	+	+	+	China, Nepal
268. *L.* (*G.*) *hookeri* Reeve	-	-	+	-	Tibet
269. *L.* (*G.*) *truncatula* (Mueller)	+	-	-	-	Europe, Ethiopea
Family - PLANORBIDAE					
270. *Planorbis planorbis tangitarensis* Germain	+	-	-	-	Central Asia
271. *P. rotundatus* Poiret	+	-	-	-	Europe

1	2	3	4	5	6
272. *Gyraulus barrackporensis* (Clessin)	-	+	-	-	West Bengal, Tibet
273. *G. convexiusculus* (Hutton)	+	-	-	+	Widely distributed plains of India, Iran to Philippines
274. *G. euphraticus* (Mousson)	+	-	-	-	Essentially Palaearctic, Afghanisthan
275. *G. labiatus* (Benson)	+	-	-	-	Plains of India, Myanmar
276. *G. ladacensis* Nevill	+	-	-	-	Tibet
277. *G. pankongensis* (von Marten)	+	-	-	-	Tibet
278. *Camptoceras* (*Calmenella*) *subspinosum* Annandale & Prashad	+	-	-	-	
279. *Segmentina* (*Polypylis*) *calatha* (Benson)	+	-	-	+	Plains of Eastern India
280. *Hippeautis* (*H.*) *fontanus* (Lightfoot)	+	-	-	-	Europe
281. *H.* (*Helicorbis*) *umbilicalis umbilicalis* (Benson)	-	+	-	+	Myanmar, Indonesia
Family - BULLINIDAE					
281. *Indoplanorbis exustus* (Deshayes)	+	+	-	+	Cosmopolitan species, throughout South east Asia
Family - ANCYLIDAE					
283. *Ferrissia baconi* (Bourguignat)	-	-	+	-	Myanmar
284. *F. ceylanica* (Benson)	-	-	-	+	Sri Lanka
285. *F. verruca* (Benson)	-	-	-	+	
286. *F. viola* Annandale & Prashad	-	-	-	+	

1	2	3	4	5	6
Order - STYLOMMATOPHORA					
Suborder - ORTHURETHRA					
Family - PUPILLIDAE					
287. *Pupilla eurina* (Benson)	+	-	-	-	Nepal
288. *P. gutta* (Benson)	+	-	-	-	
289. *P. muscorum* (Linnaeus)	+	+	-	-	China
290. *Pupoides coenopictus* (Hutton)	+	-	-	-	Delhi, Gujarat, South India
Family - VALLONIIDAE					
291. *Vallonia costata* (Mueller)	-	+	-	-	North America, North Africa, Europe
292. *V. ladakensis* Nevill	+	+	-	-	
293. *V. pulchella* (Mueller)	-	+	-	-	North America, North Africa, Europe
Family - VERTIGINIDAE					
294. *Pupisoma cacharicum* Godwin-Austen	-	-	-	+	
295. *P. orcula* (Benson)	+	-	+	-	South Africa, Japan
296. *P. seriola* (Benson)	-	-	+	+	
297. *Boysidia plicidens* (Benson)	+	-	-	+	
298. *Gastrocopta huttoniana* (Benson)	+	+	-	-	Penninsular India
Family - ORCULIDAE					
299. *Orcula* (*Sphyradium*) *himalayanum* (Benson)	+	+	-	-	
Family - PYRAMIDULIDAE					
300. *Pyramidula humilis* (Benson)	+	-	-	-	
Family - BULIMINIDAE					
301. *Mirus ceratina* (Reeve)	-	+	-	-	

1	2	3	4	5	6
302. *M. nilagirica* (Pfeiffer)	-	-	-	+	South India
303. *M. smithei* (Benson)	+	+	-	-	
304. *M. vicaria* (Blanford)	-	-	-	+	
305. *Subzebrinus arcuata* (Kuester)	+	+	-	-	
306. *S. beddomeanus* (Nevill)	+	-	-	-	
307. *S. boysiana* (Reeve)	-	+	+	-	
308. *S. candelaris* (Pfeiffer)	+	+	-	-	
309. *S. coelebs* (Pfeiffer)	+	+	-	-	
310. *S. domina* (Benson)	+	-	-	-	
311. *S. eremita* (Reeve)	+	-	-	-	
312. *S. hazarica* Gude	+	-	-	-	
313. *S. kuluensis* (Kobelt)	-	+	-	-	
314. *S. kunawurensis* (Reeve)	-	+	-	-	
315. *S. longstaffi* Gude	+	-	-	-	
316. *S. mainwaringiana* (Nevill)	+	+	-	-	
317. *S. nevilliana* (Theobald)	+	-	-	-	
318. *S. nivicola* (Reeve)	+	-	-	-	
319. *S. pretiosa* (Reeve)	+	+	-	-	
320. *S. rufistrigata* (Nevill)	+	+	-	-	
321. *S. sindica* (Reeve)	-	-	+	+	
322. *S. vibex* (Kuester)	-	+	-	-	
Family - CERASTUIDAE					
323. *Cerastua segregata* (Reeve)	+	+	-	-	

1	2	3	4	5	6
Suborder - MESURETHRA					
Family - CLAUSILIIDAE					
Subfamily - PHAEDUSINAE					
324. *Phaedusa aborensis* Godwin-Austen	-	-	-	+	
325. *P. annandalei* Preston	-	-	-	+	
326. *P. bacillum* (Hanley & Theobald)	-	-	-	+	Myanmar
327. *P. cylindrica* (Pfeiffer)	+	-	-	+	
328. *P. ios* (Benson)	-	-	+	+	
329. *P. monticola* Blanford	-	-	-	+	
330. *P. shimangensis* Godwin-Austen	-	-	-	+	
331. *P. waageni* (Stoliczka)	+	-	-	-	
332. *Oospira assaluensis* (Blanford)	-	-	-	+	
333. *O. ferruginea* (Blanford)	-	-	-	+	
334. *O. loosjesiana* (Ray)	-	-	-	+	
335. *O. loxostoma* (Benson)	-	-	-	+	
Suborder - SIGMURETHRA					
Family - FERRUSSACIIDAE					
336. *Cecilioides balanus* (Reeve)	+	+	-	-	
337. *Coilostele scalaris* Benson	+	+	-	-	
Family - SUBULINIDAE					
338. *Bacillum casiacum* (Reeve)	-	-	-	+	
339. *B. daflaensis* (Godwin-Austen)	-	-	-	+	
340. *B. erosum* (Blanford)	-	-	+	-	
341. *B. muspratti* Gude	-	-	-	+	
342. *B. orthoceras* (Godwin-Austen)	-	-	-	+	

1	2	3	4	5	6
343. *Curvella blanfordi* Gude	-	-	+	-	
344. *C. khasiana* (Godwin-Austen)	-	-	+	+	
345. *C. munipurensis* (Godwin-Austen)	-	-	-	+	
346. *C. sikkimensis* (Reeve)	-	-	+	-	
347. *Glessula aborense* Godwin-Austen	-	-		+	
348. *G. baculina* Blanford		-	+	+	
349. *G. burrailensis* Godwin-Austen		-	-	+	
350. *G. butleri* Godwin-Austen			-	+	
351. *G. crassilabris* (Benson)	-		+	+	Myanmar
352. *G. crassula* (Reeve)		-	+	+	
353. *G. hastula* (Benson)		-	+	-	Myanmar
354. *G. hebes* (Pfeiffer)	-	-	-	+	
355. *G. huegeli* (Pfeiffer)	+	-	-		
356. *G. illustris* Godwin-Austen		-		+	
357. *G. notigena* (Benson)		-	+		Maharashtra
358. *G. naja* Pilsbry	-	-	-	+	
359. *G. oakesi* Godwin-Austen	-		-	+	
360. *G. orobia* (Benson)	-		+	+	
361. *G. pertenuis* (Blanford)	-	-	-	+	Myanmar
362. *G. pyramis* (Benson)	-	-	-	+	China
363. *G. subjerdoni* Beddome	-	-	+	-	Peninsular India
364. *G. tenuispira* (Benson)	-	-	+	+	Bangladesh, Myanmar
365. *Lamellaxis gracile* (Hutton)	+	-	+	+	Throughout India, Myanmar, Pakisthan, Sri Lanka

1	2	3	4	5	6
366. *L. latebricola* (Reeve)	+	-	+	+	
367. *L. nevilli* (Godwin-Austen)	-	-	-	+	
368. *Zootecus insularis* (Ehrenberg)	+	-	-	-	Plains of India, mostly drier part
Family - ACHATINIDAE					
369. *Achatina fulica* (Bowdich)	-	-	-	+	
Family - STREPTAXIDAE					
Subfamily - STREPTAXINAE					
370. *Streptaxis daflaensis* Godwin-Austen	-	-	-	+	
371. *S. theobaldi* Benson	-	-	-	+	
Subfamily - ENNEINAE					
372. *Ennea blanfordiana* Godwin-Austen	-	-	-	+	
373. *E. milium* Godwin-Austen	-	-	-	+	
374. *E. nagaensis* Blanford	-	-	-	+	
375. *E. stenopylis* Benson	-	-	+	+	
376. *E. vara* Benson	-	-	-	+	
377. *Gulella* (*Huttonella*) *bicolor* (Hutton)	-	-	-	+	Throughout India, Myanmar, Sri Lanka
Family - PLECTOPYLIDIDAE					
378. *Plectopylis* (*Endothyrella*) *affinis* Gude	-	-	-	+	
379. *P.* (*E.*) *blanda* Gude	-	-	-	+	
380. *P.* (*E.*) *fultoni* Godwin-Austen	-	-	-	+	
381. *P.* (*E.*) *gregorsoni* Gude	-	-	-	+	
382. *P.* (*E.*) *hanleyi* Godwin-Austen	-	-	+	-	
383. *P.* (*E.*) *macromphalus* Blanford	-	-	-	+	

1	2	3	4	5	6
384. *P. (E.) minor* Godwin-Austen	-	-	-	+	
385. *P. (E.) miriensis* Gude	-	-	-	+	
386. *P. (E.) oakesi* Gude	-	-	-	+	
387. *P. (E.) pinacis* (Benson)	-	-	+	-	
388. *P. (E.) plectostoma* (Benson)	-	-	+	+	
389. *P. (E.) sowerbyi* Gude	-	-	-	+	
390. *P. (Endoplon) aborensis* Gude	-	-	-	+	
391. *P. (Chersaecia) austeni* Gude	-	-	-	+	
392. *P. (C.) bedfordi* Gude	-	-	-	+	
393. *P. (C.) brahma* Godwin-Austen	-	-		+	
394. *P. (C.) munipurensis* Godwin-Austen	-			+	Myanmar
395. *P. (C.) muspratti* Gude		-	-	+	
396. *P. (C.) nagaensis* Godwin-Austen		-		+	
397. *P. (C.) oglei* Godwin-Austen	-	-	-	+	
398. *P. (C.) shiroiensis* Godwin-Austen		-		+	
399. *P. (C.) serica* Godwin-Austen	-	-	-	+	
400. *P. (C.) williamsoni* Gude	-			+	
Suborder - ELASMOGNATHA					
Family - SUCCINEIDAE					
401. *Succinea crassinuclea* Pfeiffer	+		-	-	
402. *S. elegantior* Annandale	-	-	-	+	
403. *S. indica* Pfeiffer	+	+	-	-	
404. *S. rutilans* Blanford	-		-	+	

1	2	3	4	5	6
Family - HELIXARIONIDAE					
Subfamily - SESARINAE					
405. *Sesara diplodon* (Benson)	-	-	-	+	Bangladesh
406. *S. episema* Ponsonby	-	-	-	+	
407. *S. galea* (Benson)	-	-	-	+	
408. *S. globosa* Godwin-Austen	-	-	-	+	
409. *S. harmeri* Gude	-	-	-	+	
410. *Kaliella animula* Godwin-Austen	-	-	-	+	
411. *K. annandalei* Godwin-Austen	-	-	-	+	
412. *K. barrakporensis* (Pfeiffer)	+	+	+	+	A cosmopolitan species
413. *K. bhutanensis* Godwin-Austen	-	-	+	-	
414. *K. bullula* (Hutton)	+	+	-	-	
415. *K. burrailensis* Godwin-Austen	-	-	-	+	
416. *K. chennelli* Godwin-Austen	-	-	-	+	
417. *K. cherraensis* Godwin-Austen	-	-	-	+	
418. *K. conulus* (Blanford)	-	-	-	+	
419. *K. dikrangensis* Godwin-Austen	-	-	-	+	
420. *K. costulata* Godwin-Austen	-	-	-	+	
421. *K. elongata* Godwin-Austen	-	-	-	+	
422. *K. fastigiata* (hutton)	+	-	-	+	
423. *K. flatura* Godwin-Austen	-	-	+	+	
424. *K. gratiosa* Godwin-Austen	-	-	-	+	
425. *K. kasiaca* Godwin-Austen	-	-	-	+	
426. *K. kezamahensis* Godwin-Austen	-	-	-	+	
427. *K. lailangkotensis* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
428. *K. lhotaensis* Godwin-Austen	-	-	-	+	
429. *K. jaintiaca* Godwin-Austen	-	-	-	+	
430. *K. manipurensis* Godwin-Austen	-	-	-	+	
431. *K. nana* (Hutton)	+	-	+	-	
432. *K. nagaensis* Godwin-Austen	-	-	-	+	
433. *K. nevilli* Godwin-Austen	-	-	+	-	
434. *K. nongsteinensis* Godwin-Austen	-	-	-	+	
435. *K. richilaensis* Godwin-Austen	-	-	+	-	
436. *K. risinula* Godwin-Austen	-	-	-	+	
437. *K. rissomensis* Godwin-Austen	-	-	+	-	
438. *K. ruga* Godwin-Austen	-	-	-	+	
439. *K. paucistriata* Godwin-Austen	-	-	-	+	
440. *K. shillongensis* Godwin-Austen	-	-	-	+	
441. *K. sikkimensis* Godwin-Austen	-	-	+	-	
442. *K. sadiyaensis* Godwin-Austen	-	-	-	+	
443. *K. subcostulata* Godwin-Austen	-	-		+	
444. *K. teriaensis* Godwin-Austen	-	-	-	+	
445. *Rahula aborensis* Godwin-Austen	-	-	-	+	
446. *R. bascauda* (Benson)	-	-	-	+	
447. *R. bacaudula* Godwin-Austen	-	-	-	+	
448. *R. burrailensis* Godwin-Austen	-	-	-	+	
449. *R. corys* (Benson)	-	-	-	+	
450. *R. daflaensis* Godwin-Austen	-	-	-	+	
451. *R. dihingensis* Godwin-Austen	-	-	-	+	
452. *R. koboensis* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
453. *R. lhotaensis* Godwin-Austen	-	-	-	+	
454. *R. macropleuris* (Benson)	-	-	+	-	
455. *R. munipurensis* Godwin-Austen	-	-	-	+	
456. *Rasama kala* (Godwin-Austen)	-	-	+	-	
457. *Sivella castra* (Benson)	-	-	+	+	Also in plains
458. *Tadunia oakesi* Godwin-Austen	-	-	-	+	
Family - ARIOPHANTIDAE					
Subfamily - DYAKIINAE					
459. *Staffordia daflaensis* Godwin-Austen	-	-	+	+	
460. *S. toruputuensis* Godwin-Austen	-	-	-	+	
Subfamily - PARMARIONINAE					
461. *Parmarion martensi* Simroth	-	-	-	+	
Subfamily - GIRASIINAE					
462. *Girasia burtii* (Godwin-Austen)	-	-	-	+	
463. *G. cinera* (Godwin-Austen)	-	-	-	+	
464. *G. crocea* (Godwin-Austen)	-	-	-	+	
465. *G. dalhousiae* Godwin-Austen	+	-	-	-	
466. *G. dikrangensis* (Godwin-Austen)	-	-	-	+	
467. *G. gladstonei* (Godwin-Austen)	-	-	-	+	
468. *G. hookeri* Gray	-	-	-	+	
469. *G. maculosa* Godwin-Austen	-	-	-	+	
470. *G. pankabariensis* Godwin-Austen	-	-	+	-	
471. *G. radha* (Godwin-Austen)	-	-	-	+	
472. *Austenia aborense* Godwin-Austen	-	-	-	+	
473. *A. alba* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
474. *A. annandalei* Godwin-Austen	-	-	+	-	
475. *A. butleri* (Godwin-Austen)	-	-	-	+	
476. *A. cacharica* (Godwin-Austen)	-	-	-	+	
477. *A. gigas* (Benson)	-	-	-	+	
478. *A. nagaensis* (Godwin-Austen)	-	-	-	+	
479. *A. sikkimensis* (Godwin-Austen)	-	-	+	-	
480. *A. siyomensis* Godwin-Austen	-	-	-	+	
481. *A. solida* (Godwin-Austen)	-	-	-	+	
482. *Cryptaustenia bicolor* Godwin-Austen	-	-	-	+	
483. *C. durrangensis* (Godwin-Austen)	-	-	-	+	
484. *C. globosa* (Godwin-Austen)	-	-	-	+	
485. *C. heteroconcha* (H. Blanford)	-	-	+	-	
486. *C. ovata* (H. Blanford)	-	-	+	-	
487. *C. silcharensis* (Godwin-Austen)	-	-	-	+	
488. *C. succinea* (Reeve)	-	-	+	-	
489. *C. verrucosa* (Godwin-Austen)	-	-	-	+	
490. *Cryptogirasia rubra* (Godwin-Austen)	-		-	+	
491. *Dihangia koboensis* Godwin-Austen	-	-	-	+	
Subfamily - MACROCHLAMYDINAE					
492. *Macrochlamys albulus* Godwin-Austen	-	-	-	+	
493. *M. atricolor* (Godwin-Austen)	-	-	-	+	Myanmar
494. *M. bapuensis* Godwin-Austen	-	-	-	+	
495. *M. beata* Godwin-Austen	-	-	-	+	
496. *M. bilineata* Godwin-Austen	-	-	-	+	
497. *M. burkalli* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
498. *M. cacharica* Godwin-Austen	-	-	-	+	
499. *M. castaneo labiata* Godwin-Austen	-	-	-	+	
500. *M. dalingensis* Godwin-Austen	-	-	+	-	
501. *M. damsangensis* Godwin-Austen	-	-	+	-	
502. *M. darjilingensis* Godwin-Austen	-	-	+	-	
503. *M. decussata* (Benson)	-	-	-	+	
504. *M. dorani* Godwin-Austen	-	-	-	+	
505. *M. fragosus* Godwin-Austen	-	-	-	+	
506. *M. glauca* (Pfeiffer)	+	+	-	-	3000m
507. *M. godwini* Tryon	-	-	-	+	
508. *M. hardwickii* Godwin-Austen	-	-	-	+	
509. *M. hengdanensis* Godwin-Austen	-	-	-	+	
510. *M. hepatizon* Godwin-Austen	-	-	-	+	
511. *M. hippocastanum* Godwin-Austen	-	-	-	+	
512. *M. hodgsoni* (Benson)	-	-	+	-	3000m
513. *M. hookeri* Godwin-Austen	-	-	-	+	
514. *M. koliaensis* Godwin-Austen	-	-	-	+	
515. *M. kuluensis* Blanford	-	+	-	-	
516. *M. lahupaensis* Godwin-Austen	-	-	-	+	
517. *M. lhotaensis* Godwin-Austen	-	-	-	+	
518. *M. longicauda* Godwin-Austen	-	-	-	+	
519. *M. lubrica* (Benson)	-	-	+	-	
520. *M. luyorensis* Godwin-Austen	-	-	-	+	
521. *M. mahadeoensis* Godwin-Austen	-	-	-	+	
522. *M. molecula* (Benson)	-	-	-	+	Myanmar

1	2	3	4	5	6
523. *M. munipurensis* Godwin-Austen	-	-	-	+	
524. *M. murdochi* Godwin-Austen	-	-	-	+	
525. *M. nengloensis* Godwin-Austen	-	-	-	+	
526. *M. nuda* (Pfeiffer)	+	-	-	-	
527. *M. opipara* Godwin-Austen	-	-	+	-	
528. *M. originaria* Godwin-Austen	-	-	-	+	
529. *M. pacata* Godwin-Austen	-	-	-	+	
530. *M. patane* (Benson)	-	-	+	-	
531. *M. perfragilis* Godwin-Austen	-	-	+	-	
532. *M. planuscula* (Hutton)	+	-	-	-	
533. *M. plicifera* Blanford	-	-	-	+	
534. *M. psittacinus* Godwin-Austen	-	-	-	+	
535. *M. pungi* (Theobald)	-	-	-	+	Andaman, Myanmar
543. *M. rakaensis* Godwin-Austen	-	-	+	-	
544. *M. richilaensis* Godwin-Austen	-	-	+	-	
538. *M. roberti* Godwin-Austen	-	-	-	+	
539. *M. rorida* (Benson)	-	-	+	-	
540. *M. rotungensis* Godwin-Austen	-	-	+	+	
541. *M. rozamiensis* Godwin-Austen	-	-	-	+	
542. *M. rubellocincta* (Blanford)	-	-	-	+	
543. *M. rusticola* Godwin-Austen	-	-	-	+	
544. *M. salmonea* (Ancey)	-	-	-	+	
545. *M. sata* Godwin-Austen	-	-	-	+	
546. *M. sathilaensis* Godwin-Austen	-	-	+	-	
547. *M. sequins* Godwin-Austen	-	-	+	-	

1	2	3	4	5	6
548. *M. shengorensis* Godwin-Austen	-	-	-	+	
549. *M. shimangensis* Godwin-Austen	-	-	-	+	
550. *M. shisha* (Godwin-Austen)	-	-	-	+	
551. *M. superflua* Blanford	-	-	+	-	
552. *M. tanirensis* Godwin-Austen	-	-	-	+	
553. *M. terminus* Godwin-Austen	-	-	-	+	
554. *M. tugurium* (Benson)	-	-	+	-	2100m
555. *M. uda* Godwin-Austen	-	-	-	+	
556. *M. umbraticola* Godwin-Austen	-	-	-	+	
557. *M. vesicula* (Benson)	-	+	-	-	3000m
558. *M. zemoensis* Godwin-Austen	-	-	+	-	
559. *M. (Euaustenia) cassida* Hutton	-	+	-	-	
560. *M. (E.) gurhwalensis* (Godwin-Austen)	+	+	-	-	
561. *M. (E.) monticola* (Pfeiffer)	+	+	-	-	
562. *M. (E.) paurhiensis* (Godwin-Austen)	-	+	-	-	
563. *M. (E.) theobaldi* (Godwin-Austen)	+	+	-	-	
564. *M. (Parvatella) altivaga* (Godwin-Austen)	+	-	-	-	
565. *M. (P.) austeniana* (Nevill)	+	-	-	-	
566. *M. (P.) flemingi* (Pfeiffer)	+	+	-	-	
567. *M. (P.) magnifica* Reeve	+	-	-	-	
568. *Bapuia rengingensis* Godwin-Austen	-	-	-	+	
569. *Bensonies aborensis* (Godwin-Austen)	-	-	-	+	
570. *B. angelica* (Pfeiffer)	+	+	-	-	
571. *B. camura* Benson	-	-	+	-	
572. *B. convexa* (Reeve)	+	+	-	-	

	1	2	3	4	5	6
573.	*B. jacquemonti* (v. Martens)	+	-	-	-	
574.	*B. jamuensis* (Theobald)	+	-	-	-	
575.	*B. mainwaringi* (Godwin-Austen)	-	-	+	-	
576.	*B. monticola* (Hutton)	+	+	-	-	
577.	*B. nepalensis* Blanford	-	-	+	-	
578.	*B. theobaldiana* Godwin-Austen	+	+	-	-	
579.	*Dalingia bhutanensis* Godwin-Austen	-	-	+	-	
580.	*Khasiella austeni* (Blanford)	-	-	-	+	
581.	*K. chloroplax* (Benson)	+	-	-	-	
582.	*K. climacterica* (Benson)	-	-	-	+	
583.	*K. dinoensis* Godwin-Austen	-	-	-	+	
584.	*K. falcata* Blanford	-	-	-	+	Myanmar
585.	*K. hyba* (Benson)	+	+	-	-	
586.	*K. kashmirensis* (Nevill)	+	-	-	-	
587.	*K. serrula* (Benson)	-	-	-	+	
588.	*K. sonamurgensis* (Nevill)	+	-	-	-	
589.	*K. tandianensis* (Theobald)	+	-	-	-	
590.	*K. vidua* (Hanley & Theobald)	-	-	-	+	
591.	*Oxytesta aborensis* Godwin-Austen	-	-	-	+	
592.	*O. blanfordi* (Theobald)	-	-	+	-	
593.	*O. castor* (Theobald)	-	-	-	+	
594.	*O. cycloplax* (Benson)	-	-	+	-	
595.	*O. oglei* Godwin-Austen	-	-		+	
596.	*O. orobia* (Benson)	-	-	+	-	2400m
597.	*O. oxytes* (Benson)	-	-	+	+	

1	2	3	4	5	6
598. *O. pollux* (Theobald)	-	-	-	+	
599. *O. siyomensis* Godwin-Austen	-	-	-	+	
600. *Rotungia willamsoni* Godwin-Austen	-	-	-	+	
601. *Syama masuriensis* Godwin-Austen	-	+	-	-	
602. *S. prona* (Nevill)	+	+	-	-	
603. *S. splendens* (Hutton)	+	+	-	-	
604. *S. theobaldi* Blanford & Godwin-Austen	+	+	-	-	
605. *Taphrospira excavata* Blanford	-	-	-	+	
Subfamily - DURGELLINAE					
606. *Durgella aborense* Godwin-Austen	-	-	-	+	
607. *D. assamica* Godwin-Austen	-	-	-	+	
608. *D. kempi* Godwin-Austen	-	-	-	+	
609. *D. khasiaca* Godwin-Austen	-	-	-	+	
610. *D. mairangensis* Godwin-Austen	-	-	-	+	
611. *D. salius* (Benson)	-	-	+	+	
612. *D. seposita* (Benson)	-	-	+	-	
613. *Ibycus fissidens* Heynemann	-	-	+	-	
614. *I. minutus* (Godwin-Austen)	-	-	-	+	
615. *Sitala crenicincta* Godwin-Austen	-	-	-	+	
616. *S. gromatica* Godwin-Austen	-	-	-	+	
617. *S. intonsa* Godwin-Austen	-	-	-	+	
618. *S. phulongensis* Godwin-Austen	-	-	-	+	
619. *S. recondita* Godwin-Austen	-	-	-	+	
620. *S. rimicola* (Benson)	-	+	+	+	
621. *S. srimani* Godwin-Austen	-	-	-	+	

1	2	3	4	5	6
622. *S. uvida* Godwin-Austen	-	-	-	+	
Family - VITRINIDAE					
623. *Vitrina pellucida* (Mueller)	+	-	-	-	
Family - ZONITIDAE					
624. *Oxychilus fulva* Draparnaud	+	-	-	-	
625. *O. lucida* Draparnaud	+	-	-	-	
Family - LIMACIDAE					
626. *Limax* (*Kasperia*) *mayae* Godwin-Austen	+	+	-	-	
627. *Deroceras laeve* (Mueller)	-	-	+	+	
Family - CAMAENIDAE					
628. *Amphidromus masoni* (Godwin-Austen)	-	-	-	+	
629. *A. sinensis* (Benson)	-	-	-	+	China
630. *A. sylheticus* (Reeve)	-	-	-	+	
631. *Chloritis delibrata* (Benson)	-	-	-	+	Myanmar
632. *C. gabata* Gould	-	-	-	+	Myanmar
633. *C. ochthoplax* (Benson)	-	-	-	+	Myanmar
634. *Ganesella acris* (Benson)	-	-	-	+	
635. *G. galea* (Benson)	-	-	-	+	
Family - HYGROMIIDAE					
Subfamily - CAMAENINAE					
636. *Trichia hispida* (Linnaeus)	+	-	-	-	
Family - BRADYBAENIDAE					
637. *Bradybaena cestus* (Benson)	-	-	-	+	
638. *B. radicicola* (Benson)	-	+	+	-	
639. *Aegista catostoma* (Blanford)	-	-	-	+	Myanmar, China

1	2	3	4	5	6
640. *A. coeni* Preston	-	-	-	+	
641. *A. congenor* Preston	-	-	-	+	
642. *A. (Plectotropis) huttoni* Pfeiffer	+	+	+	+	Myanmar, China
643. *A. (P.) nutans* Gude	-	-	-	+	
644. *A. (P.) tapeina* (Benson)	-	-	-	+	
645. *Cathaica bactriana* (Hutton)	+	-	-	-	
646. *C. mataiaensis* (Nevill)	+	-	-	-	
647. *C. phaeozona* von Martens	+	-	-	-	Turkistan
Family - ARIONIDAE					
648. *Anadenus altivagus* (Theobald)	+	+	-	-	
649. *A. beebei* Cockerell	-	+	-	-	
650. *A. blanfordi* Godwin-Austen	-	-	+	-	
651. *A. giganteus* Heynemann	-	+	-	-	
652. *A. jerdoni* Godwin-Austen	+	-	-	-	
653. *A. modestus* Theobald	+	-	+	-	
654. *A. schlagintweiti* Heynemann	+	+	-	-	
Family - PHILOMYCIDAE					
655. *Philomycus (Meghimatium) campestris* Godwin-Austen	-	-	-	+	
656. *P. (M.) monticola* (Godwin-Austen)	-	-	-	+	
Class - BIVALVIA					
Order - UNIONOIDA					
Family - UNIONIDAE					
Subfamily - UNIONINAE					
657. *Physunio (Velunio) velaris* (Sowerby)	-	-	-	+	

1	2	3	4	5	6
658. *Scabies crispata* (Gould)	-	-	-	+	Thailand, Myanmar
659. *Solenaia soleniformis* (Benson)	-	-	-	+	
Subfamily - AMBLEMINAE					
660. *Lamellidens corrianus* (Lea)	-	-	+	+	Common throughout plains of India, Myanmar Bangladesh
661. *L. marginalis* (Lamarck)	-	-	+	+	do
662. *L. jenkinsianus* (Benson)	-	-	-	+	Bangladesh
L. jenkinsianus daccaensis (Preston)	-	-	-	+	Bangladesh
L. jenkinsianus obesa (Hanley & Theobald)	-	-	-	+	Bangladesh, Myanmar
663. *Parreysia* (*P.*) *corbis* (Benson)	-	-	-	+	
664. *P.* (*P.*) *corrugata laevirostris* (Benson)	-	-	-	+	Bihar, Andhra Pradesh, Bangladesh
P. (*P.*) *corrugata nagpoorensis* (Lea)	-	-	-	+	Andhra Pradesh, Orissa, Gujarat, Maharashtra
665. *P.* (*P.*) *favidens assamensis* (Preston)	-	-	-	+	Bihar
666. *P.* (*P.*) *gowhattensis* (Theobald)	-	-	-	+	
667. *P.* (*P.*) *sikkimensis* (Lea)	-	-	+	+	
668. *P.* (*P.*) *smaragdites* (Benson)	-	-	-	+	Myanmar
669. *P.* (*P.*) *triembolus* (Benson)	-	-	-	+	Plains of India
670. *P.* (*Radiatula*) *andersoniana* (Nevill)	-	-	+	+	Myanmar
671. *P.* (*R.*) *bonneaudi* (Eydoux)	-	-	-	+	West Bengal, Myanmar
672. *P.* (*R.*) *involuta* (Benson)	-	-	-	+	Bangladesh
673. *P.* (*R.*) *lima* (Simpson)	-	-	+	+	
674. *P.* (*R.*) *nuttaliana* (Lea)	-	-	-	+	
675. *P.* (*R.*) *occata* (Lea)	-	-	-	+	Plains of India,Bangladesh

1	2	3	4	5	6
676. *P. (R.) olivaria* (Lea)	-	-	-	+	Eastern India
677. *P. (R.) pachysoma* (Benson)	-	-	-	+	
678. *P. (R.) theobaldi* (Preston)	-	-	-	+	
679. *Trapezoideus exolescens exolescens* (Gould)	-	-	-	+	Myanmar
Order - VENEROIDA					
Family - CORBICULIDAE					
680. *C. assamensis* Prashad	-	-	-	+	Bangladesh
681. *Corbicula cashmirensis* Deshayes	+	-	-	-	
682. *C. striatella* Deshayes	+	-	-	+	Throughout India
Family - PISIDIIDAE					
683. *Pisidium (P.) casertanum* (Poli)	+	-	-	-	
684. *P. (Odhneripisidium) atkinsonianum* Theobald	-	-	+	+	
685. *P. (O.) ellisi* Dance	-	-	+	-	
686. *P. (O.) mitchelli* Prashad	+	-	-	-	
687. *Sphaerium (S.) austeni* Prashad	-	-	-	+	
688. *S. (S.) indicum* Deshayes	+	-	+	-	Common throughout plains of India
689. *S. (S.) kashmirensis* Prashad	+	-	-	-	

Table - II

Total number of genera : 134
Total number of species : 689

			1 North Western	2 Western	3 Central	4 Eastern
	Class	GASTROPODA				
	Subclass	PROSOBRANCHIA				
	Order	ARCHAEOGASTROPODA				
1.	Family	HELICINIDAE	-	-	-	G1 S1
	Order	MESOGASTROPODA				
2.	Family	CYCLOPHORIDAE	G1 S1	- -	G4 S23	G8 S124
3.	Family	DIPLOMMATINIDAE	G1 S1	G1 S2	G1 S7	G2 S51
4.	Family	PUPINIDAE	-	-	G3 S4	G4 S16
5.	Family	AMPULLARIIDAE	-	-	-	G1 S2
6.	Family	VALVATIDAE	G1 S1	-	-	-
7.	Family	BITHYNIIDAE	G1 S3	-	-	G1 S3
8.	Family	POMATIOPSIDAE	-	G2 S2	-	G1 S1
9.	Family	VIVIPARIDAE	G1 S2	G1 S1	-	G3 S8
10.	Family	ASSIMINEIDAE	-	-	-	G1 S2

		1 North Western	2 Western	3 Central	4 Eastern
11. Family	THIARIDAE	G1 S1	-	G1 S1	G3 S3
12. Family	PLEUROCERIDAE	-	-	G2 S3	G3 S9
Suborder	GYMNOMORPHA				
Order	SOLEOLIFERA				
13. Family	VERONICELLIDAE	-	-	-	G1 S1
14. Family	RATHOUISIIDAE	-	-	-	G1 S1
Subclass	PULMONATA				
Order	BASOMMATOPHORA				
15. Family	LYMNAEIDAE	G1 S10	G1 S3	G1 S2	G1 S3
16. Family	PLANORBIDAE	G5 S10	G2 S2	-	G3 S3
17. Family	BULINIDAE	G1 S1	G1 S1	-	G1 S1
18. Family	ANCYLIDAE	-	-	G1 S1	G1 S3
Order	STYLOMMATOPHORA				
Suborder	ORTHURETHERA				
19. Family	PUPILLIDAE	G2 S4	G1 S1	-	-
20. Family	VALLONIIDAE	G1 S1	G1 S3	-	-
21. Family	VERTIGINIDAE	G3 S3	G1 S1	G1 S2	G2 S3

			1 North Western	2 Western	3 Central	4 Eastern
22.	Family	ORCULIDAE	G1 S1	G1 S1	-	-
23.	Family	PYRAMIDULIDAE	G1 S1	-	-	-
24.	Family	BULIMINIDAE	G2 S14	G2 S12	G1 S2	G2 S3
25.	Family	CERASTUIDAE	G1 S1	G1 S1	-	-
	Suborder	MESURETHRA				
26.	Family	CLAUSILIIDAE	G1 S2	- -	G1 S1	G2 S11
	Suborder	SIGMURETHRA				
27.	Family	FERRUSSACIIDAE	G2 S2	G2 S2	-	-
28.	Family	SUBULINIDAE	G3 S4	- -	G4 S14	G4 S23
29.	Family	ACHATINIDAE	-	-	-	G1 S1
30.	Family	STREPTAXIDAE	-	-	G1 S1	G3 S8
31.	Family	PLECTOPYLIDIDAE	-	-	G1 S4	G1 S21
	Suborder	ELASMOGNATHA				
32.	Family	SUCCINEIDAE	G1 S2	G1 S1	-	G1 S2

		1 North Western	2 Western	3 Central	4 Eastern
33. Family	HELIXARIONIDAE	G1 S4	G1 S2	G3 S12	G5 S44
34. Family	ARIOPHANTIDAE	G5 S25	G5 S18	G11 S36	G17 S103
35. Family	VITRINIDAE	G1 S1	-	-	-
36. Family	ZONITIDAE	G1 S2	-	-	-
37. Family	LIMACIDAE	G1 S1	G1 S1	G1 S1	G1 S1
38. Family	CAMAENIDAE	-	-	-	G3 S8
39. Family	HYGROMIIDAE	G1 S1	-	-	-
40. Family	BRADYBAENIDAE	G2 S4	G2 S2	G2 S2	G2 S7
41. Family	ARIONIDAE	G1 S4	G1 S4	G1 S2	-
42. Family	PHILOMYCIDAE	-	-	-	G1 S2
Class Order	BIVALVIA UNIONOIDA				
43. Family	UNIONIDAE	-	-	G2 S5	G6 S24

		1 North Western	2 Western	3 Central	4 Eastern
Order	VENEROIDA				
44. Family	CORBICULIDAE	G1 S2	-	-	G1 S2
45. Family	PISIDIIDAE	G2 S4	-	G2 S3	G2 S2
	TOTAL	G47 (35.34%)	G28 (20.30%)	G44 (33.08%)	G90 (67.67%)
		S109 (15.84%)	S59 (8.43%)	S126 (18.13%)	S497 (72.23%)

G = Genera
S = Species

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Rec. zool. Surv. India, 98(Part-2) : 51-53, 2000

A NEW SPECIES OF SPIDER OF THE GENUS *PHILODROMUS* WALCKENAER (ARANEAE : PHILODROMIDAE) FROM MADHYA PRADESH, INDIA

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INTRODUCTION

The spiders of the family Philodromidae are little known in Indian Fauna. The genus was established by Walckenaer in 1825 with the Type-species *Philodromus aureolus* (Clerck). Tikader (1980) reillustrated and redescribed twelve species and three new species from different parts of India in *Fauna of India* series.

While studying the spider collection collected by the second author from different areas of Jabalpur city, we came across a new species of the genus *Philodromus* which is described here.

The type specimen will in due course be deposited in the National Collection, Zoological Survey of India, Calcutta.

Philodromus pali sp. nov.

General : Cephalothorax, legs and abdomen brown. Total length 6.90 mm. Carapace 2.10 mm. long, 2.20 mm. wide; abdomen 4.80 mm. long, 3.30 mm. wide.

Cephalothorax : Slightly wider than long, narrowing anteriorly, depressed but cephalic region slightly high, lateral margins with dark brown patches as in Fig. 1. Eyes round and black, the posterior medians further from each other than the laterals. Ocular quad longer than wide and narrow in front; lateral eyes ringed with prominent tubercles. Clypeus narrow, margin provided with hairs. Sternum heart-shaped, pointed behind, pale and clothed with pubescence and hairs. Legs relatively long, II leg slightly longer than I, clothed with fine hairs and spines and provided with brown dots. Femora I provided with five dorsal spines.

Abdomen : Longer than wide, pentagonal, depressed, clothed with fine pubescence; a spear-shaped brown patch present on the dorsum, margins of anterior end and posterior end with brown bands, the entire dorsal surface provided with clusters of brown dots and white dots as Fig. 1. Ventral side lighter, provided with whitish dots. Epigyne as in Fig. 2. Internal genitalia as in Fig. 3.

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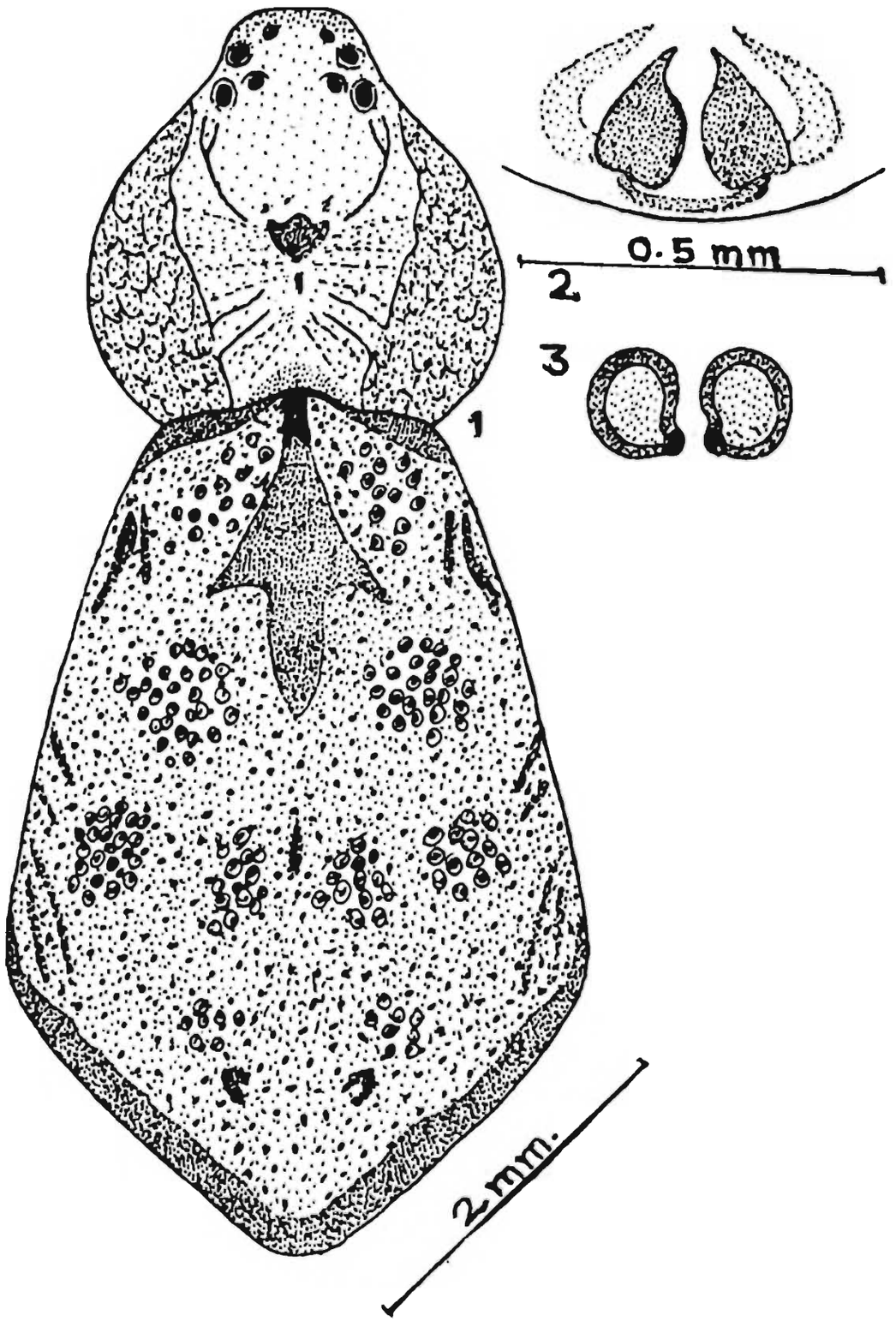

Figs. 1-3 *Philodromus pali* sp. nov. - 1. Dorsal view of female, legs omitted.; 2. Epigyne.; 3. Internal genitalia.

Type - specimen : *Holotype* female in spirit, other details as above.

Type - locality : Gwarighat, Jabalpur, M.P. , India ; Coll. *Pawan Gajbe*, 2.9.1997.

This species resembles *Philodromus betrabatai* Tikader but differs from it as follows : (i) A spear-shaped brown patch present on the dorsum but in *P. betrabatai*, such a patch is absent. (ii) Dorsal surface provided with clusters of brown dots and white dots but in *P. betrabatai*, such pigmented clusters are absent. (iii) Epigyne and internal genitalia also structurally different.

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Rec. zool. Surv. India, **98**(Part-2) : 55-57, 2000

A NEW SPECIES OF SPIDER OF THE GENUS *THOMISUS* WALCKENAER (ARANEAE : THOMISIDAE) FROM MADHYA PRADESH, INDIA

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INTRODUCTION

The genus *Thomisus* was established by Walckenaer in 1805 with type species *Thomisus albus* (Gmel in). Since the establishment of this genus Tikader (1980) reillustrated and redescribed seventeen species in *Fauna of India*, series.

While studying the spider collection collected by the second author from different areas of Jabalpur city, we came across a new species of *Thomisus* which is described here.

The type specimen in due course, will be deposited in the National Collection, Zoological Survey of India, Calcutta.

Thomisus sundari sp. nov.

General : Cephalothorax, legs and abdomen yellow with brown patches. Total length 7.30 mm. Carapace 2.70 mm. long, 3.50 mm. wide; abdomen 4.80 mm. long 5.00 mm. wide.

Cephalothorax : Wider than long, narrowing anteriorly antero-lateral sides with conspicuous dark brown patches as in fig. 1. Three double lines starting just below the ocular tubercles and meeting together in mid-thoracic region making a white patch. Eyes round, black, anterior row strongly recurved; anterior medians slightly larger than posterior medians. Clypeus high, subrectangular. Sternum heart-shaped, pointed behind, yellow with brown patches on lateral margins. Legs I and II much longer than III and IV and having transverse dark brown patches on coxae, trochanter, femora and tibae. Femora I and II with four and one dorsal spines respectively.

Abdomen : Round, nearly as long as wide, highly elevated, broadest in the middle, with two black spots on the tubercles; dorsal surface bearing one light brown patch with a sigilla and six pairs of light brown patches (when seen from above). Ventral side same in colour and with light brown patches, one big dark brown patch between the epigastric furrow and spinnerets. Epigyne as in fig. 2. Internal genitalia as in fig. 3.

Type - specimen : *Holotype* : female in spirit, other details as above.

Type - Locality : Tilwaraghat, Jabalpur, M.P., India Coll. *Pawan Gajbe* : 22.8.1998.

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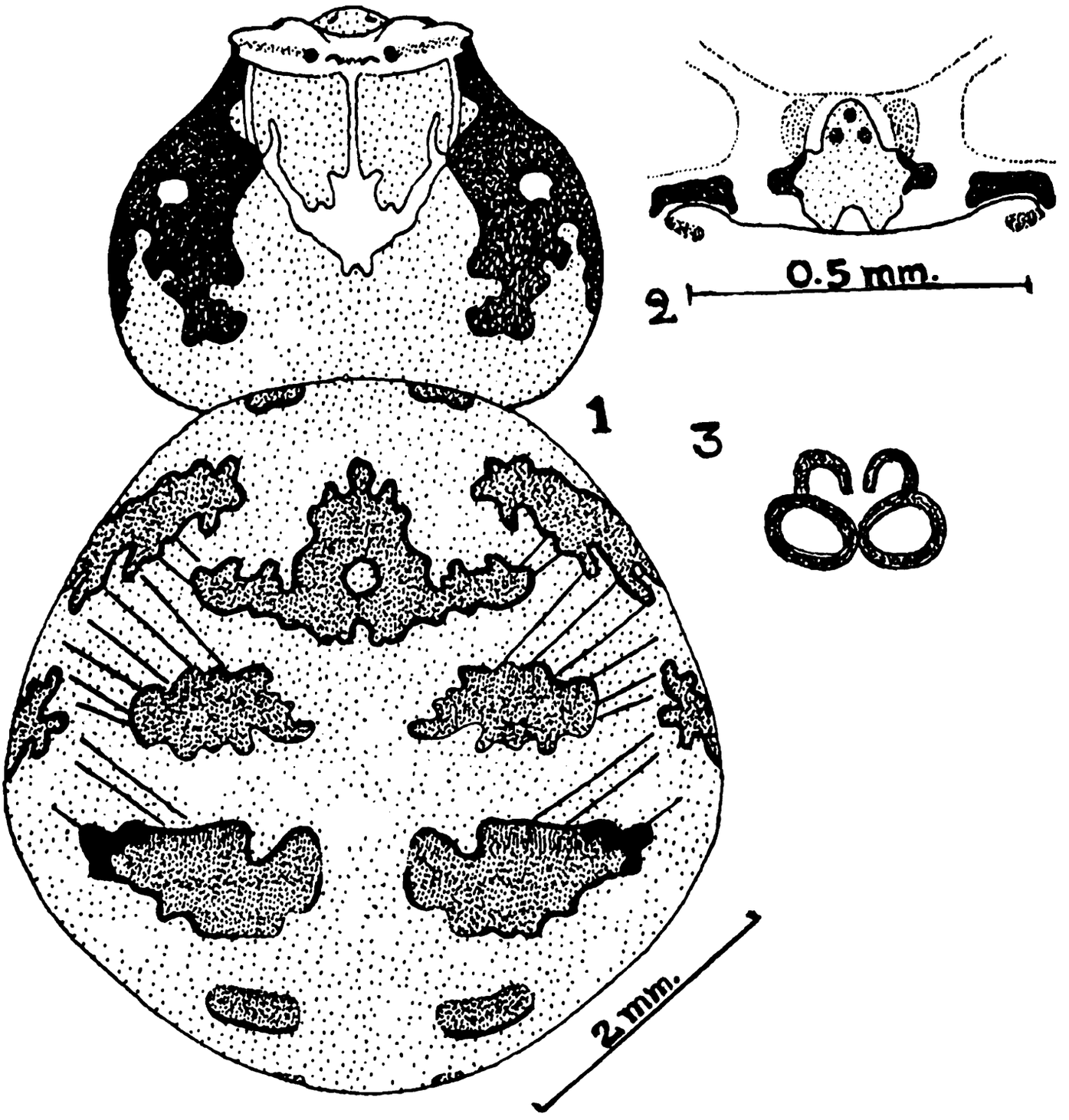

Figs. 1-3 *Thomisus sundari* sp. nov. - 1. Dorsal view of female, legs omitted.; 2. Epigyne.; 3. Internal genitalia.

This species resembles *Thomisus pooneus* Tikader but can be distinguished from it as follows : (i) Cephalothorax, legs and abdomen yellow but in *T. pooneus*, cephalothorax light brown, legs light green and abdomen white. (ii) Epigyne and internal genitalia also structurally different.

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PLANT AND SOIL NEMATODES (NEMATODA) 0F BIHAR

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INTRODUCTION

The terrestrial nematodes are generally called plant and soil nematodes. Though they are considered as one of the most diversified and important goups of invertebrates, their economic importance could be realised rather late in India. The first plant parasitic nematode was reported by Barber (1901) from south India, i.e., 158 year after the first discovery of phytophagous nematode (= now *Anguina tritici*) by Needhan in 1743. A review of the nematology literature reveals that only a few stray reports were published from India until Siddiqi (1959) and Das (1960) intiated series of research papers on taxonomy of plant and soil nematodes. During the last 40 years, a wealth of information has been gathered on the distribution of plant and soil nematodes in India. We feel that time has now come to prepare the baseline data on the distribution of these nematodes in different biogeographical zones/ecosystems/states (Baqri, 1994).

An attempt has been made in this paper to provide information on the distribution of known species of plant and soil nematodes in Bihar state so that the database may be prepared. As per nematological records from Bihar, Lal Das (1957), Sen (1960) and Siddiqi, Parsad and Ansari (1961) reported two species of root knot nematodes (*Meloidogyne incognita* and *M. javanica*) from various localities. In 1961, Chakravorti & Singh reported *Anguina tritici* causing 40% loss in corp yield of a local variety of wheat. Siddiqi (1964) added *Xiphinema orbum* as a new species to science from Bihar. Birat and his co-workers (1964 -'68) reported a number of species of phytophagous nematodes (*Hirschmanniella oryzae*, *Hoplolaimus indicus*, *Meloidogyne incognita*, *Meloidogyne javanica*, *Paralongidorus citri*, *Xiphinema insigne*, etc.) from different localities of the state. Meanwhile, Siddiqi (1965), Mathur, Khan & Parsad (1966) and Khan, Parsad & Mathur (1967) described many species of the orders Tylenchida and Dorylaimida from Bihar. During the last three decades, the contribution of the following nematologistis is worth mentioning : Mulk & Jairajpuri, 1975, Chaturvedi & Kansal, 1984; Gupta & Uma, 1985; Ganguli & Khan, 1987; Ahmad, Khan & Bilgrami, 1988; Chaturvedi & Kansal, 1991(a) & 1991(b); Khan & Ahmad, 1991; Nath & Pathak, 1993; Ahmad & Khan 1994; Haider, Jha & Nath, 1995; etc.

The present paper reports one hunderd and eleven species which have been reported from Bihar till date. Out of these 111 species, 67 belong to Tylenchida, 8 to Aphelenchida, 11 to Dorylaimida, 2 to Triplonchida and Mononchida each while the remaining 21 saprophgous species have been reported under the order Alaimida, Enoplida, Monhysterida, Rhabditida, etc.

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In this paper, all the known species of plant parasitic and predaceous nematodes belonging to the order Tylenchida, Aphelenchida, Dorylaimida, Triplonchida and Mononchida are being listed according to their systematic position along with the information to their host(s) and locality (ies). The names of free living (saprophagous) nematodes belonging to different orders have been listed under the seprate heading "Miscellaneous" Out of 21species listed under miscellaneous groups, seven have been identfied up to genus level. Since the free living or saprophagous nematodes are either prayed upon by the other inverterbates or they feed on dead organic matter directly in the soil, the information on the plant host is not important and thus habitat has been mentioned.

Order TYLENCHIDA THORNE, 1949
Suborder TYLENCHINA Chitwood in Chitwood & Chitwood, 1950
Family : TYLENCHIDA Orley, 1880

1. ***Tylenchus butteus*** Thorne & Malek, 1968

Hosts : Chilli, Castor

Locality : Raant, district Madhubani

2. ***Filenchus filliformis*** (Butschli,1873) Mely, 1961

Hosts : Arhar (*Cajanus*), Radish, Rice, Sponge gourd, Brinjal, Castor, Chilli, Gram, Okra, Turmeric.

Localities : Patot, Kanpa, Umerabad, Inglis, Baikathpur, Bakhtyarpur, Mosimpur, Nukumpura, Metra and Hathidan, district Patna; Bherakhara, district Vaishali; Basantpur, Nawkatola, Khusitola, Chhota Berawat and Bara Barawat, district West Champaran.

3. ***Coslenchus costatus*** (de Man, 1921) Siddiqi, 1978

Host : Rice

Localities : Madhubani, Sitamarhi and West Champaran districts.

4. ***Neopsilenchus magnidens*** (Thorne, 1949) Thorne & Malek, 1968

Host : Rice

Locality : Madhubani district.

5. ***Neopsilenchus microdens*** Ahmad & Khan, 1994*

Host : Rice

Locality : Raanti, district Madhubani.

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* Species described as new to science from Bihar

6. ***Basiria graminophila*** Siddiqi, 1959

Host : Rice

Localities : Gopalganj, East Champaran, West Champaran, Muzaffarpur and Madhubani districts.

7. ***Basiria lathyrae*** Kakar, Siddiqi & Khan, 1994*

Host : Chapta mattar or Hiran Khuri (*Lathyrus sativus*)

Locality :

8. ***Basiria tumida*** (Colbran, 1960) Geraert, 1968

Host : Rice

Localities : Madhubani, Sitamarhi and West Champaran districts.

9. ***Malenchus nobilis*** Andrassy, 1981

Hosts : Tomato, Potato

Localities : Bhadas and Mabsauri, district Khagaria.

10. ***Malenchus*** sp.

Host : Rice

Localities : Madhubani, Sitamarhi and West Champaran districts.

11. ***Zanenchus oryzae*** Khan & Ahmad, 1991*

Host : Rice

Locality : Madhubani district.

Family : DOLICHODORIDAE Chitwood in Chitwood & Chitwood, 1950 (Skarbilovich, 1959).

12. ***Tylenchorhynchus brassicae*** Siddiqi, 1961

Host : Brinjal, Tomato, Chilli

Localities : Sharabjal, district Vaishali; Basantpur, Basantitola, Bhitaha and Bara Berawat, district West Champaran.

13. ***Tylenchorhynchus clarus*** Allen, 1955

Hosts : Brinjal, Green gram

Locality : Lai, district Patna

14. ***Tylenchorhynchus divittatus*** Siddiqi, 1961

Hosts : Brinjal, Rice

Localities : Kutupur, district Patna; Madhubani, Sitamarhi and West Champaran districts.

15. ***Tylenchorhynchus elegans*** Siddiqi, 1961
= ***T. goldeni*** Rashid & Singh, 1982

Host : Turmeric

Localities : Muzaffarpur and Sitamarhi districts.

16. ***Tylenchorhynchus mashhoodi*** Siddiqi & Basir, 1959

Hosts : Okra, Cauliflower, Potato, Cholai (*Amaranthus* sp.), Sponge gourd, Spinach, Brinjal, Radish, Lobia, Cucumber, Chilli, Turmeric, Pointed gourd.

Localties : Kanpa, district Patna; Bhadas and Mahasauri, district Khagaria; Patedha.

17. ***Tylenchorhynchus nudus*** Allen, 1955

Hosts : Paddy, Turmeric

Localities : Gopalganj, East Champaran, West Champaran, Samastipur, Mazarffarpur, Sitamarhi and Madhubani districts.

18. ***Bitylenchus dubius*** (Butschli, 1873) Siddiqi, 1986

Hosts : Maize, Okra, Brinjal, Castor, Coriander

Localities : Bhidipur, Sitamarhi; Nirpur, Lai, Hardasbigha, Athmalgola and Dargahitolá, district Patna.

19. ***Bitylenchus brevillineatus*** (Williams, 1960) Siddiqi, 1986

Locality : Patna

20. ***Telotylenchus indicus*** Siddiqi, 1960

Hosts : Brinjal, Tomato, Chilli

Localities : Sherabjal, district Vaishali; Basantpur, Basantitola, Bhitaha, Bara Berawat, district West Champaran.

Family : PSILENCHIDAE Paramonov, 1967 (Khan, 1969)

21. ***Psilenchus*** sp.

Host : Tomato

Locality : Maner, district Patna.

Family : HOPOLOLAIMIDAE Filipjev, 1934

22. ***Hoplolaimus dubius*** Chaturvedi & Khera, 1979

Hosts : Castor, Coriander, Tomato, Cabbage, Brinjal.

Localities : Bhadas, Bachchota, Mehsauri and Sansarpur, district Khagaria.

23. ***Hoplolaimus indicus*** Sher, 1963

Hosts : Arhar, Coriander, Castor, Sunhemp, Kidney bean (Bakla), Tomato, Onion, Peas Mustard, Cauliflower, Okra, Lobia, Radish, Cucumbar, Sponge gourd, Chilli, Rice, Turmeric.

Localities : Kasimpur, Srinagar, Nirpur, Nukunpura, Pandarak, Chhatarpur, Barkatpur, Bidhipur and Sahnaura, district Patna; Adastola & Purainea, district Vaishali; Kargahia, Nawkatola, Khusitola, Bhitaha and Chhota Berawat, district West Champaran; many localities in East Champaran, Muzaffarpur, Gopalganj, Madhubani, Sitamarhi, and Samastipur districts.

24. ***Rotylenchus robustus*** (de Man, 1876) Filipjev, 1936
= ***Hoplolaimus uniformis*** Thorne, 1949

Hosts : Peas, Okra

Localities : Sabour, Kanke, Netrahat and Nawada Farms.

25. ***Helicotylenchus astriatus*** Khan & Najappa, 1972

Host : Rice

Localities : Gopalganj, East Champaran, Muzaffarpur, Sitamarhi and Madhubani districts.

26. ***Helicotylenchus behari*** Mulk & Jairajpuri, 1975*

Locality : Gaya

27. ***Helicotylenchus digonicus*** Perry in Perry, Darling & Thorne, 1959

Host : Cucumbur, Bean, Brinjal, Gram, Pea, Sponge gourd, Pumpkin, Okra.

Localities : Manpura, Manar, Baikathpur, Bakhtyarpur, Faridpur, Silauhari and Dariyapur, district Patna.

28. ***Helicotylenchus dihystera*** (Cobb, 1893) Sher, 1961

Localities : Madhubani, Sitamarhi and West Champaran districts.

29. ***Helicotylenchus erythrinae*** (Zimmermann, 1904) Golden, 1956

Hosts : Chilli, Banana, Castor, Potato, Brinjal, Cucumbur, Sponge gourd, Okra.

Localities : Bachhota, district Khagaria; Pantepur, district Vaishali; Khusitola, Bhitaha and Bara Berawat, district West Champaran.

30. ***Helicotylenchus indicus*** Siddiqi, 1963

Hosts : Banana, *Cajanus*, Brinjal, Potato, Sponge gourd, Radish, Turmeric.

Localities : Bedhari-Inglish, Dilwarpur and Barkathpur, district Patna; Chandpur, district Vaishali; Khusitola and Bhitola, district West Champaran; Muzaffarpur and Sitamarhi districts.

31. ***Helicotylenchus macronatuis*** Mulk & Jairajpur, 1975*

Host : Lens culinaris

Locality : Gaya.

32. ***Helicotylenchus multicinctus*** (Cobb, 1893) Golden, 1956

Host : Banana

Locality : Chattarpur, district Patna.

33. ***Helicotylenchus paraconurus*** Rashid & Khan, 1972

Host : Plum

Locality : Pachmarhi.

34. ***Helicotylenchus*** **pisi** Swarup & Sethi, 1968

Host : Brinjal

Locality : Khusitola, district West Champaran.

35. ***Helicotylenchus pseudorobustus*** (Steiner, 1914) Golden 1956

Host : Turmeric.

Localities : Muzaffarpur and Sitamarhi districts.

36. ***Rotylenchoides whiteheadi*** Ganguli & Khan, 1987*

Host : Bhindi (*Abelmoschus esculentus*)

Locality : Pusa.

Family : ROTYLENCHULIDAE Husain & Khan, 1967

37. ***Rotylenchulus reniformis*** Linford & Oliveira, 1940

Hosts : Castor, *Cajanus*, Brinjal, Tomato, Cauliflowers, Okra, Lobia, Sponge gourd, Pointed gourd, Turmeric.

Localities : Dargahitola, Hardasbigha and Chhatarpur, district Patna; Kutupur and Bachhota, district Khagaria; Purainea, district Vaishali; Chhawani, Basantitola, Bhitaha and Bara Berawat, district West Champaran; Muzaffarpur district and Sitamarhi district.

Family : PRATYLENCHIDAE Thorne, 1949

38. ***Pratylenchus coffeae*** (Zimmerman, 1898) Filipjev & Schuurmans Stekhoven, 1941

Host : Banana

Localities : Bachhota, district Khagaria; Machubani, Sitamarhi and West Champaran districts.

39. ***Pratylenchus crentus*** Loof, 1960

Hosts : Cucumber. Sponge gourd.

Locality : Bhitaha, district West Champaran

40. ***Pratylenchus fallax*** Seinhorst, 1968

Host : Chaulai (*Amaranthus* sp.), Brinjal, Tomato, Cauliflower, Sponge gourd.

Localities : Basantitola, Jamadartola, Kargahia and Batiah, district West Champaran.

41. ***Pratylenchus penetrans*** (Cobb, 1917) Filipjev & S. Stekhovan, 1941

Host : Brinjal

Localities : Mehasauri and Sansarpur, district Khagaria.

42. ***Pratylenchus pratensis*** (de Man, 1880) Filipjev, 1936

Hosts : Sponge gourd, Brinjal, Greengram (Mung), Cucumbur, Castor.

Localities : Faridpur, Lai, Manar and Patat, district Patna; Bhitaha and Bara Barawat, district West Champaran.

43. ***Pratylenchus teres*** Khan & Singh, 1974

Host : Potato

Locality : Sharabjal, district Vaishali

44. ***Pratylenchus thornei*** Sher & Allen, 195

Host : Rice

Localities : Madhubani, Sitamarhi and West Champaran districts.

45. ***Pratylenchus zeae*** Graham, 1951

Host : Turmeric

Localities : Muzaffarpur and Sitamarhi districts.

46. ***Hirschmanniella exacta*** Kakar, Siddiqi & Khan, 1994*

Host : Rice

Locality :

47. ***Hirschmanniella oryzae*** (van Breda de Haan, 1902) Luc & Goodey, 1964

Hosts : Rice, Sponge gourd, Okra

Localities : Umerabad, district Patna; Mirchram, district Vaishali; Jamadartola, Nawkatola, Chhota and Beraiot, district West Champaran; Gopalganj, East Champaran, Sitamarhi and Madhubani districts.

Family : MELOIDOGYNIDAE Skarbilovich, 1959

48. ***Meloidogyne areneria*** Cooper, 1955

Host :

Locality :

49. ***Meloidogyne incognita*** (Kofoid & White, 1919) Chitwood, 1949

Hosts : Brinjal, Okra, Turmeric, Potato, Groundnut, Pea, Tomato, Chilli, Papaya.

Localities : Nagwan, district Patna; Muzaffarpur district; Kanke Farm, district Ranchi; Sitamarhi, Netrahat Sarbour and Nawada Farms.

50. ***Meloidogyne javanica*** (Treub, 1885) Chitwood, 1949

Hosts : Okra, Potato, Brinjal, Tomato, Rice.

Localities : Silhauri, district Patna; Kanke Farm, district Ranchi; Netrahat, Newada and Sabour Farms.

Family : HETERODERIDAE Filipjev & Schuurmans Stekhoven, 1941

51. ***Heterodera cajani*** Koshy, 1967

Host : Arhar (*Cajanus cajan*)

Localities IARI Substation, Pusa : Darbhanga.

52. ***Heterodera zeae*** Koshy, Swarup & Sethi, 1971

Host : Maize (*Zea mays*)

Localities : Fathepur and Manika, district Muzaffarpur; Dwarka Nagar, Motipur and Surajpur, district Darbhanga; Pusa IARI Substation; Dholi Agricultural College Farm; Mour and Gaajpur, district Patna; Kandi, district Gaya.

53. ***Golobodera rostochiensis*** (Woolenweber, 1923) Behram, 1975

Host :

Locality :

Remarks : Sen (1960) reported a species of *Heterodera* which he tentetively identified as *H. rostochiensis* (= now *Globodera rostochiensis*) from Bihar. However, its identification was neither confirmed by him or the later workers.

Suborder : CRICONEMATINA Siddiqi, 1980

Family : CRICONEMATIDAE Taylor, 1936

54. ***Hemicriconemoides*** **cocophillus** (Loos, 1949) Chitwood & Birchfield, 1957

Host : Rice

Localities : Madhubani, Sitamarhi and West Champaran districts.

Family : CALOOSIDAE Siddiqi, 1980

55. ***Caloosia exilis*** Mathur, Khan, Nand & Prasad, 1969*

Host : Rice

Locality : Nokha, district Arrah.

56. ***Caloosia paxi*** Mathur, Khan, Nand, & Prasad, 1969*

Host : Rice

Locality : Nokha, district Arrah.

Family : PARATYLENCHIDAE Thorne, 1949 (Raski, 1962)

57. ***Paratylenchus nainianus*** Edward & Misra, 1963

Host : *Cajanus* sp.

Locality : Patna.

58. ***Paratylenchus neonanus*** Mathur, Khan & Prasad, 1967*

Host : Bair (*Zyzyphus* sp.)

Locality :

59. ***Paratylenchus nawadus*** Khan, Prasad & Mathur, 1967*

Host : Papaya

Locality : Nawada

Suborder : HEXATYLINA Siddiqi, 1980

Family : ANGUINIDAE Nicoll, 1935

60. ***Angunia tritici*** (Steinbuch, 1799) Filipjev, 1936

Host : Wheat

Localities : Jahanabad, Gaya, Nawada, Darbhanga, Muzaffarpur, Monghyr, Patna districts.

Remarks : Nath & Pathak (1994) have reported that ear-cockle disease caused by *A. tritici* affected almost all the wheat growing areas of Bihar. It was most prevalent in Gaya and Nawada districts followed by Jahanabad and Jamui during 1991-93.

61. ***Ditylenchus myceliophagus*** Goodey, 1958

Host : Mustard

Locality Bhadas, district Khagaria.

62. ***Ditylenchus*** sp.

Host : Coriander

Locality : Hardasbigha, district Patna.

63. ***Safianema anchilisposoma*** (Tarjan, 1958) Siddiqi, 1980

Hosts : Arhar (*Cajanus* sp.), Brinjal, Chilli, Tomato, Castor & Pointed gourd.

Localities : Patat, district Patna; Mehasauri and Sausarpur, district Khagaria; Purainea, district Vaishali; Basantipur, Khusitola and Bara Berawat, district West Champaran.

64. ***Safianema indicum*** (Sethi & Swarup, 1967) Siddiqi, 1986

Hosts : Mustard, Castor, Cauliflower, Cucumber, Sponge gourd, Brinjal, Chilli.

Localities : Bidhipur, Nirpur and Nikumpura, district Patna; Killa Betial and Bhitaha, district West Champaran.

65. ***Nothotylenchus alii*** Khan & Siddiqi, 1968

Host : Rice

Localities : Gopalganj, East Champaran, West Champaran, Muzaffarpur and Sitamarhi districts

66. ***Nothotylenchus bhatanagari*** Tikyani & Khera, 1969

Hosts : Brinjal, Bean, Onion, Saunf, Pea, Castor.

Localities : Hathidah, Bidhipur, Dargahitola, Chattarpur, Nukumpura and Pandarak, district Patna.

67. ***Nothotylenchus oryzae*** (Mathur, Khan & Prasad, 1966) Siddiqi, 1986

Host : Rice

Locality : Bikramganj, district Arrah (Bhojpur)

Order : APHELENCHIDA Siddiqi, 1980

Family : APHELENCHIDAE Fuchs, 1937 (Thorne, 1949)

1. ***Aphelenchus avenae*** Bastian, 1865

Hosts : Castor, Lemon, Okra, Turmeric, Lobia, Brinjal, Smooth gourd, Onion, Tomato, Chilli, Cauliflower, Banana, Bean, Coriander, Pea, Pigeonpea, Gram, Anisud, Spinach, Sponge gourd, Pointed gourd.

Localities : Dargahitola, Silauhani, Palganj, Inglis and Kanpa, district Patna; Bachhota, Mehasauri and Parmaupur, district Khagaria; Bherukhera, Basantitola, Chawani, Jamadartola, Bara Berawat and Chota Berawat, district West Champaran.

Family : APHELENCHOIDIDAE Skarbilovich, 1947 (Paramonov, 1953)

2. ***Aphelenchoides asterocaudatus*** Das, 1960

Host : Chilli

Locality : Bachhota, district Khagaria

3. ***Aphelenchoides besseyi*** Christie, 1942

Host : Rice

Localities : Madhubani, Sitamarhi and West Champaran districts.

4. ***Aphelenchoides bicaudatus*** (Imamura, 1931) Filipjev & Shuurmans Stekhoven, 1941

Hosts : Coriander, Tomato

5. ***Aphelenchoides perientinus*** (Bastian, 1865) Steiner, 1932

Hosts : *Cajanus* sp., Brinjal

Locality : Hathidah and Patna, district Patna.

6. ***Aphelenchoides saprophilus*** Franklin, 1957

Host : Castor

Locality : Dargahitola, district Patna.

7. ***Aphelenchoides subtenuis*** (Cobb, 1926) Steiner & Buhrer, 1932

Hosts : Brinjal, Chilli, Cauliflower, Sponge gourd, Lobia, Okra.

Localities : Sharabjal, district Vaishali; Chhawani, Bhitah, Chota Berawat and Bara Berawat, district West Champaran.

Family : SEINURIDAE Husain & Khan, 1967

8. ***Seinura hechlerae*** Chaturvedi & Khera, 1979

Hosts : Chilli, Castor, Okra

Localities : Dargahitola and Kasimpur, district Patna; Mehsauri, district Khagaria; Chotta Berawat, district West Champaran.

Order : DORYLAIMIDA Pearse, 1942

Suborder : DORYLAIMINA Pearse, 1936

Family : DORYLAIMIDAE de Man, 1876

1. ***Ischiodorylaimus paraugandanus*** Khan & Ahmad, 1994*

Host : Rice

Locality : Janki Asthan, district Sitamarhi

Family : THORNENEMATIDAE Siddiqi, 1969

2. ***Thornenema mauritianum*** (Williams, 1959) Baqri & Jairajpuri, 1967

Hosts : Tomato, Castor.

Locality : Kutupur and Bachhta, district Khagaria.

3. ***Thornenema*** sp.

Hosts : Cauliflower, Okra.

Localities : Purainea, district Vaishali; Bara Berawat, district West Champaran.

Family : LONGIDORIDAE Thorne, 1935

4. ***Longidorus vineacola*** Sturhan & Weischer, 1964

Host Potato

Locality : Adastola, district Vaishali

5. ***Longidorus*** sp.

Host : Brinjal
Locality : Bara Berawat, district West Champaran.

6. ***Paralongidorus citri*** (Siddiqi, 1959) Siddiqi, Hooper & Khan, 1963

Host :
Locality :

Family : XIPHINEMATIDAE Dalmasso, 1969

7. ***Xiphinema insigne*** Loos, 1949

Host : Rice
Localities : Madhubani, Sitamarhi and West Champaran districts.

8. ***Xiphinema orbum*** Siddiqi, 1964*

Host : Rice
Locality : Patna

Family : BELONDIRIDAE Thorne, 1939

9. ***Dorylaimellus parvulus*** Thorne, 1939

Host : Banana
Locality : Bachhota, district Khagaria

Family : MYDONOMIDAE Thorne, 1964

10. ***Dorylaomoides modestus*** Siddiqi, 1965*

Host : Citrus
Locality : Kharagpur.

Suborder : NYGOLAIMINA Ahmad & Jairajpuri, 1979

Family : NYGOLAIMIDAE Thorne, 1935

11. ***Aquatides thornei*** (Schneider, 1937) Ahmad & Jairajpuri, 1982

Host : Rice
Locality : Magadh University Campus, district Bodh Gaya

Order : TRIPLONCHIDA Cobb, 1920

Suborder : DIPHTHEROPHORINA Coomans & Loof, 1970

Family : DIPHTHEROPHORIDAE Micoletzky, 1922

1. ***Diphtherophora*** sp.

Host : Brinjal

Locality : Bhawanpur, district Vaishali.

Family : TRICHODORIDAE Thorne, 1935 (Siddiqi, 1961)

2. ***Paratrichodorus porosus*** (Allen, 1957) Siddiqi, 1974

Host : Rice

Localities : Madhubani, Sitamarhi and West Champaran districts.

Order : MONONCHIDA Jairajpuri, 1969

Family : MYLONCHULIDAE Jairajpuri, 1969

1. ***Mylonchulus lacustris*** (N. A. Cobb in M. V. Cobb, 1915) Andrassy, 1958

Hosts : Tomato, Banana

Localities : Kutupur, Bhadas and Bachhota, district Khagaria.

2. ***Mylonchulus*** sp.

Host : Okra

Loality : Bidhipur, district Patna.

MISCELLANEOUS GROUPS
(SAPROPHAGOUS OR FREE LIVING NEMATODES)

1. ***Alaimus*** sp.

Habitats : From soil around roots of Brinjal, *Amaranthus* sp., Cauliflower, Cucumber, Okra.

Localities : Sharabjal, district Vaishali; Basantitola, Killa Betiah, Bhitaha and Chhota Berawat, district West Champaran.

2. ***Amphidelus candidus*** Siddiqi & Basir, 1965

Habitat From soil around roots of Cauliflower.

Locality : Bhadas, district Khagaria.

3. ***Rhabdolaimus terrestries*** de Man, 1880

Habitats : From soil around roots of Brinjal, *Amaranthus* sp., Cauliflower, Sponge gourd, Okra, Castor, Chilli, and Lobia.

Localities : Sharabjal, district Vaishali; Basantitola, Chhawanti, Jamadartola, Kargahia, Ghusukpur, Killa Betiah, Nawkatola, Khusitola, Bhitaha, Chhota Berawat and Bara Berawat, district West Champaran.

4. ***Chronogaster*** sp.

Habitat : From soil around roots of *Amaranthus* sp.

Locality : Basantitola, district West Champaran.

5. ***Plectus granulosus*** Bastian, 1865

Habitat : From soil around roots of Okra, Chilli.

Localities : Nawkatola, Bhitaha and Chhota Berawat, district West Champaran.

6. ***Achromadora ruricola*** (de Man, 1880) Micoletzky, 1925

Habitat : From soil around roots of Mustard

Locality : Mehsauri, district Khagaria.

7. ***Ironus longicaudatus*** de Man, 1876

Habitats : From soil around roots of Banana and Chilli.

Locality : Bachhota and Sansarpur, district Khagaria.

8. ***Abunema indicum*** Khera, 1971

Habitat : From soil around roots of Brinjal

Locality : Khusitola (Betiah), district West Champaran.

9. ***Prismatolaimus andrassyi*** Khera & Chaturvedi, 1977

Habitats : From soil around roots of Potato, Cauliflower and Brinjal

Localities : Permanpur, district Khagaria; Chhawani, Kargahia and Khusitola, district West Champaran.

10. ***Acrobeles ciliatus*** Linstow, 1877

Habitat : From soil around roots of Brinjal.

Locality : Hirachak, district Vaishali.

11. ***Acrobeles eleboratus*** Thorne, 1925

Habitat From soil around roots of Potato.

Locality : Chandpura, district Vaishali.

12. ***Acrobeles timmi*** Chaturvedi & Khera, 1979

Habitat : From soil around roots of Tomato.

Localities : Bhada and Sansarpur, district Khagaria.

13. ***Acrobeloides bustchlii*** (de Man, 1884) Steiner and Buherer, 1953

Habitats : From soil around roots of Brinjal and Cucumber.

Localities : Sansarpur, district Khagaria; Sharabjal, district Vaishali; Bhitaha, district West Champaran.

14. ***Cephalobus persegnis*** Bastian, 1865

Habitats : From soil around roots of Brinjal, Cauliflower, Castor, Okra, Cucumber, Sponge gourd, Chilli, Turmeric, Pointed gourd and Lobia.

Localities : Sharabjal, district Vaishali; Ghusukpur, Khusitola; Bhitaha, Chhota Berawat and Bara Berawat, district West Champaran.

15. ***Chiloplacus lentus*** (Maupas, 1900) Thorne, 1937

Habitats : From soil around roots of Chilli, Potato, Brinjal, Okra and Sponge gourd.

Localities : Bhesukhera, Amritpur, Maderna, district Vaishali; Nawkatola and Bara Berawat, district West Champaran.

16. ***Chiloplacus*** sp.

Habitats : From soil around roots of Brinjal and Chilli.

Locality : Kutupur and Meshauri, district Khagaria.

17. ***Eucephalobus*** sp.

Habitats : From soil around roots of Potato, Cauliflower and Brinjal.

Locality : Ghogatola, district Vaishali; Kargharia and Bara Berawat, district West Champaran.

18. ***Seleborca timmi***

Habitats : From soil around roots of Potato, Cauliflower, Tomato and Okra.

Localities : Abastola and Patedha, district Vaishali; Basantitola, Nawkatola, district West Champaran.

19. ***Panagrolaimus*** sp.

Habitats : From soil around roots of Brinjal and Okra.

Localities : Nagwan, district Patna; Nawkatola, district West Champaran.

20. ***Turbatrix aceti*** (Muller, 1783) Peters, 1927

Habitat : Cauliflower

Locality : Kargahia, district West Champaran.

21. ***Mesorhabditis*** sp.

Habitat : Potato

Locality : Ghogatola, district Vaishali.

DISCUSSION

In all, 111 species of plant and soil nematodes have been reported from Bihar till date. On the basis of frequency of occurrence in different localities, the following species may be considered as serious pests in the state : *Tylenchorhynchus brassicae, T mashhoodi, T nudus, Hoplolaimus indicus, Helicotylenchus astriatus, H. dihystera, H. erythrinae, H. indicus, Rotylenchulus reniformis, Pratylenchus coffeae, P. pratensis, Hirschmanniella oryzae, Meloidogyne incognita, M. javanica, Heterodera cajani, H. zeae, Anguina tritici* and *Aphelenchoides besseyi.* The recent report of wide spread disease 'ear cockle' caused by *Anguina tritici* inflicting heavy losses in wheat crop is alarming in the state (Nath & Pathak, 1994). Though the 'white-tip' disease in rice crop has not been noticed, the report of *Aphelenchoides besseyi* by Ahmad, Khan and Bilgrami (1988) from Madhubani, Sitamarhi and West Champaran districts of Bihar is also important.

The information on the distribution of plant and soil nematodes furnished in this paper reveals that Bihar still remains a poorly surveyed state in India. The total number of known species (111) from Bihar comes to about 7% of the known Indian nematode fauna (about 1600 spp.). This conclusion may easily be supported from the fact that about the same number of species have been reported from Haryana, a small state of India occupying only 1.34% area of the country whereas Bihar occupies about 5.29% area. Our knowledge on the distribution of important nematode pests of the suborder Criconematina, superfamily Longidoroidea and family Trichodoridae is insignificant whereas they are frequently encountered in Gangetic plains of Uttar Pradesh and West Bengal.

Amongst the predaceous nematodes, the following families of the suborder Dorylaimina are yet to be recorded from Bihar : Aporcelaimidae, Oudsianematidae, Nordiidae, Actinolaimidae, Carcharolaimidae, Tylencholaimidae, Leptonchidae, etc. Similarly, the members of the suborders Nyglaimina and Mononchina are represented only by one and two species, respectively, in Bihar occupying 1,73,877 sq. kms. area.

The analysis of the literature further reveals that only the following districts have been surveyed

significantly; East Champaran, West Champaran, Khagaria, Madhubani, Muzaffarpur, Nawada, Patna, Sitamarhi and Vaishali. The names of important districts like Dhanbad, Jamshedpur, Jha Jha, Purnia, Ranchi, Siwan, etc. do not exist in nematology literature while the other districts have been surveyed insignificantly. The information on the degree of dominance and abundance of important nematode pests of crops is not available.

SUMMARY

An attempt has been made in this papar to collate information on the distribution and hosts/ habitat of plant and soil nematodes from Bihar state so that the baseline data may be prepared. In all, 111 species of phytophagous, predaceous and saprophagous groups of nematodes have been reported from Bihar till date. In view of their economic importance, the phytophagous and predaceous nematode species have been listed according to their systematic position under the following orders : Tylenchida (67 spp.), Aphelenchida (8 spp.), Dorylaimida (11 spp.), Triplonchida (2 spp.) and Mononchida (2 spp.). A list of 21 species of free living nematodes has been provided under the heading "Saprophagous" (Miscellaneous). The following species of plant parasitic nematodes have been found widely distributed : *Tylenchorhynchus brassicae*, *T. mashhoodi*, *T. nudus*, *Hoplolaimus indicus*, *Helicotylenchus astriatus, H. dihystera, H. erythrinae, H. indicus Rotylenchulus reniformis*, *Pratylenchus coffeae*, *P. pratensis*, *Hirschmanniella oryzae*, *Meloidogyne incognita*, *M. javanica*, *Heterodera cajani*, *H. zeae*, *Anguina tritici* and *Aphelenchoides besseyi*. Recent reports of ear-cockle disease in wheat crop, caused by *Anguina tritici*, have been found alarming in many districts. The report of *Aphelenchoides besseyi* from rice fields in a few districts should also be considered an important finding.

On the basis of the information furnished in the paper, this has been concluded that Bihar should be considered as one of the poorly surveyed states of India. The names of the families comprising important nematode species (phytophagous/predaceous), which still remain unrepresented in Bihar, have been mentioned. Besides, the significantly surveyed and not surveyed districts have also been identified.

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NEMATODES FROM WEST BENGAL (INDIA). XXV. QUALITATIVE AND QUANTITATIVE STUDIES OF PLANT AND SOIL INHABITING NEMATODES ASSOCIATED WITH PADDY CROP IN MALDA AND JALPAIGURI DISTRICTS

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INTRODUCTION

Baqri and his co-workers (1980-91) have published a series of papers on plant and soil nematodes collected during the surveys of paddy crop in different districts of West Bengal. These papers also report, besides taxonomical work, the results of qualitative and quantitative studies identifying the potential/serious nematode pests of paddy crop in the districts of the state (Baqri *et. al.* 1983, 1991a, 1991b). Such information becomes more useful in chalking out any strategy on the management of phytophagous nematodes.

The present paper reports the results of qualitative and quantitative estimation of plant and soil nematodes associated with paddy crop in Malda and Jalpaiguri districts of West Bengal. These studies were conducted under the All India Coordinated Research Project on Nematode Pests (sponsored by ICAR, New Delhi) during the years 1978-85. The data on the information furnished herewith is the unpublished part of the final report of the Coordinated project submitted to the ICAR, New Delhi.

MATERIAL AND METHODS

The sampling was made at random. For the quantitative estimation, the methodology described by Baqri *et al.* (1983) was followed. The nematode population per 200 ml (beaker) soil was counted from each sample under stereoscopic binocular microscope. From each root sample, 10 gm roots were processed through blender and phytophagous nematode population (genera wise) was also estimated.

RESULTS AND DISCUSSIONS

A. QUALITATIVE STUDY

I. District Malda

During November, 1983, 40 soil and root samples were collected from nine localities of district Malda. In all, 13 species of the established/suspected phytophagous nematodes of Order

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Tylenchida have been identified from the district. Besides, 21 species of saprophagous and predaceous groups have also been identified under the Orders Aphelenchida and Dorylaimida.

Order TYLENCHIDA Thorne, 1949

1. ***Filenchus*** sp.
2. ***Tylenchorhynchus mashhoodi*** Siddiqi & Basir, 1959
3. ***T. devittatus*** Siddiqi. 1961
4. ***Hoplolaimus indicus*** Sher, 1963
5. ***Helicotylenchus minzi*** Sher, 1966
6. ***H. retusus*** Siddiqi & Brown, 1964
7. ***Pratylenchus pratensis*** (de Man, 1880) Filipjev, 1936
8. ***P. scribneri*** Steiner, 1943
9. ***P. thornei*** Sher & Allen, 1953
10. ***Hirschmanniella gracilis*** (de Man, 1880) Luc & Goodey, 1964
11. ***Meloidogyne graminicola*** Golden & Birchfield, 1965
12. ***Macroposthonia ornata*** (Raski, 1958) de Grisse & loof, 1965
13. ***Hexatylus*** sp.

Order APHELENCHIDA Siddiqi, 1980

1. ***Aphelenchus avenae*** Bastian, 1865

Order DORYLAIMIDA de Man, 1976

1. ***Dorylaimus stagnalis*** Dujardin, 1845
2. ***Laimydorus siddiqii*** Baqri & Jana, 1982
3. ***Calodorylaimus simplex*** Baqri & Jana, 1982
4. ***Thornenema mauritianum*** (Williams, 1959) Baqri & Jairajpuri, 1967
5. ***T. pseudosartum*** Carbonell & Coomans, 1987
6. ***Aporcelaimellus heynsi*** Baqri & Jairajpuri, 1968
7. ***Lenonchium oryzae*** Siddiqi, 1965
8. ***Miranema gracile*** Thorne, 1939
9. ***Proleptonchus clarus*** Timm, 1964
10. ***Dorylaimoides arcuicaudatus*** Baqri & Jairajpuri, 1969
11. ***D. constrictoides*** Goseco, Ferris & Ferris, 1976
12. ***D. leptura*** Siddiqi, 1965
13. ***D. micoletzkyi*** (de Man, 1921) Thorne & Swanger, 1936
14. ***D. paulbuchneri*** Meyl, 1956
15. ***Tylencholaimus pakistanensis*** Timm, 1964

16. ***Basirotyleptus basiri*** Jairajpuri, 1964
17. ***Dorylaimellus deviatus*** Baqri & Jairajpuri, 1968
18. ***D. indicus*** Siddiqi, 1964
19. ***D. projectus*** Heyns, 1962
20. ***Paraoxydirus gigas*** (Jairajpuri, 1964) Jairajpuri & Ahmad, 1979

II. District Jalpaiguri

During the survey of district Jalpaiguri, 42 soil samples were collected from ten localities. These samples have yielded 13 phytophagous nematode species belonging to the orders Tylenchida. Besides, 18 species of saprophagous and predaceous nematodes under the orders Aphelenchida, Dorylaimida and Mononchida have also been recorded.

Order TYLENCHIDA Thorne, 1949

1. ***Tylenchorhynchus mashhoodi*** Siddiqi & Basir, 1959
2. ***Hoplolaimus indicus*** Sher, 1963
3. ***Helicotylenchus dihystera*** (Cobb, 1893) Sher, 1961
4. ***H. abunaamai*** Siddiqi, 1972
5. ***H. digitatus*** Siddiqi & Husain, 1964
6. ***H. microcephalus*** Sher, 1966
7. ***Pratylenchus scribneri*** Steiner, 1943
8. ***Hirschmanniella gracilis*** (de Man, 1880) Luc & Goodey, 1964
9. ***H. oryzae*** (van Breda de Haan, 1902) Luc & Goodey, 1964
10. ***Meloidogyne graminicola*** Golden & Birschfield, 1965
11. ***Hemicriconemoides cocophillus*** (Loos, 1949) Chitwood & Birschfield, 1957
12. ***Macroposthonia ornata*** (Raski, 1958) de Grisse & Loof, 1965
13. ***Gracilacus janai*** Baqri, 1979

Order APHELENCHUS Siddiqi, 1980

1. ***Aphelenchus avenae*** Bastian, 1865

Order DORYLAIMIDA Pearse, 1942

1. ***Laimydorus siddiqii*** Baqri & Jana, 1982
2. ***Calodorylaimus*** sp.
3. ***Thornenema mauritianum*** (Williams, 1959) Baqri & Jairajpuri, 1967
4. ***Sicagutuur coomansi*** (Baqri & Jana, 1980) Carbonell & Coomans, 1986
5. ***Aporcelaimellus heynsi*** Baqri & Jairajpuri, 1968

6. ***Belondria neortha*** Siddiqi, 1964
7. ***Dorylaimellus indicus*** Siddiqi, 1964
8. ***Axonchium amplicolle*** Cobb, 1920
9. ***Neoactinolaimus*** sp.
10. ***Proleptonchus clarus*** Timm, 1964
11. ***Doryaimoides indicus*** Jairajpuri, 1965
12. ***Basirotyleptus basiri*** Jairajpuri, 1964
13. ***Tylencholaimus pakistanensis*** Timm, 1964
14. ***Tyleptus projectus*** Thorne, 1939
15. ***Discomyctus cephalatus*** Thorne, 1939
16. ***Laievides paraaquaticus*** (Paetzold, 1958) Ahmad & Jairajpuri, 1982

Order MONONCHIDA Jairajpuri, 1969

1. ***Mononchus aquaticus*** Coetaee, 1968

B. QUANTITATIVE STUDY

I. District Malda

The results of the quantitative estimation of important parasitic genera and other nematodes (saprophagous and predaceous) from the surveyed localities of Malda district have been furnished in Table-I and III. Table-I provides information about the surveyed localities, number of samples collected, range with average and percent of frequency of ocurrence and dominance of important nematode genera estimated in the soil of paddy fields. The information about frequency of ocurrence and degree dominance (average) of key nematode pests from soil and roots of paddy crop has been furnished in Table-III.

Upon analysis (Table-III), it was noted that *Hirschmanniella gracilis*, *Meloidogyne graminicola* (larvae) and *Tylenchorhynchus mashhoodi* were most abundant species because their frequency of ocurrence was observed in 97.5%, 80% and 72.5% in soil samples respectively. *Hirschmanniella gracilis* was found dominating in 77.5% samples while the dominance of *Tylenchorhynchus mashoodi* and *Meloidogyne graminicola* has been noted in 15% and 7.5% soil respectively. The results of the quantitative estimation of nematodes from roots /10 gm reveal that the number of *Meloidogyne graminicola* (2nd stage juveniles) ranges from 2-664 with an average of 119, which is considered to be very high. The frequency of occurrence of this species has been noted in 70% root samples. The range of *Hirschmanniella gracilis* (adults and juveniles) was counted from 4-82 with an average of 18 in 97.5% root samples. On the basis of all these results, this can easily be concluded that *M. graminicola* and *H. gracilis* are serious pests. Besides, *Tylenchorhynchus mashhoodi* is a potential pest in district Malda.

II. District Jalpaiguri

The results of quantitative estimation of nematodes from 42 soil and root samples collected

from 10 villages near Jalpaiguri have been furnished in Table-II. The information on average of soil and root populations has been incorporated in Table-III. The analysis in Table-II reveals that *Hirschmanniella spp.* (mostly *H. gracilis*), *Meloidogyne graminicola* and *Tylenchorhynchus mashhoodi* are also abundant in Jalpaiguri district. *Hirschmanniella* spp. were noted in 90.5% and found dominating in 73% soil samples over other parasitic nematodes (Table-III). The occurrence of *Meloidogyne graminicola* and *Tylenchorhynchus mashhoodi* was noted in 66% and 26% samples whereas they dominated in 20% and 7% samples respectively. The occurrence of *Helicotylenchus* spp. (*H. retusus* & *H. dihystera*) and *Pratylenchus thornei* and other parasitic nematodes was not significant. The results of estimation of nematode populations/10gm roots conclude that the 2nd stage juveniles of *Meloidogyne graminicola* are abundant and found in high number, i.e. from 2-128 with an average of 97 and frequency of occurrence 66.3%. The *Hirschmanniella* spp. (mainly *H. gracillis*) were estimated from 01-40 with an average of 06 and frequency of occurrence 90.5%.

All these results confirm that *M. graminicola* and *Hirschmanniella* spp. are the key pests of paddy crop in Jalpaiguri district.

SUMMARY

The present paper reports the results of qualitative and quantitative studies of plant and soil nematodes associated with paddy crop in Malda and Jalpaiguri districts of West Bengal. In Malda district, 34 species were identified, of which 13 belong to phytophagous group of the Order Tylenchida. The remaining 21 species were either predaceous or saprophagous belonging to the orders Aphelenchida and Dorylaimida. The frequency of occurrence of *Hirschmanniella gracilis* was observed in 97.5% but dominated in 77.5% samples. *Meloidogyne graminicola* and *Tylenchorhynchus mashhoodi* were the other two important nematode pests in district Malda. Though they were encountered in 80% and 72.5% soil samples, but were found dominant only in 15% and 7.5% samples, respectively. The estimation of nematodes/10gm roots of paddy from the same fields also confirm the above results.

In all, 31 species of the orders Tylenchida, Aphelenchida, Dorylaimida and Mononchida have been identified from Jalpaiguri district. Of these, 13 species of the order Tylenchida are phytophagous and the remaining are either saprophagous or predaceous. The quantitative estimation of the phytophagous nematodes from soil and root samples reveal that *Hirschmanniella* spp. mainly *H. gracilis*, *Meloidogyne graminicola* and *Tylenchorhynchus mashhoodi* are the most important pests of rice crop in Jalpaiguri district because their frequency of occurrence has been calculated in 90.5%, 66% and 26% soil samples, respectively. *Hirschmanniella* spp. and *M. graminicola* (both endoparasites) have also been recorded from 90.5% and 66% root samples. Hence, our study reveals that these species are the key pests of paddy crop in Jalpaiguri district.

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TABLE - I

Results of the survey of Paddy crop in Malda district, West Bengal.
Range of nematode number with its avarage per 200 ml of soil.
Figures in parenthesis indicate percent frequency of occurence.

	LOCALITY / VILLAGE				
	Jalanga	Maligram	Sugandighi	Kanchantar	Jadhupur
No. of samples collected	6	6	6	3	4
Nematode associated					
1. *Meloidogyne*	10-460 : 140 (100)	30-380 : 110 (83.3)	10-80 : 44 (83.3)	10-40 : 25 (100)	10-20 : 15 (50)
2. *Tylenchorhynchus*	40-210 : 165 (33.3)	20-210 : 102 (83.3)	10-150 : 48 (100)	30-220 : 125 (100)	30-110 : 87 (75)
3. *Hoplolaimus*	-	-	60 : 60 (16.6)	-	-
4. *Pratylenchus*	-	-	20 : 20 (16.6)	-	20 : 20 (25)
5. *Hirschmanniella*	20-350 : 190 (100)	250-1010 : 542 (100)	20-1230 : 428 (100)	210-390 : 283 (100)	30-190 : 57 (75)
6. Longidorus	-	10 : 10 (16.6)	-	-	-
7. Other dorylaims	190-1060 : 635 (100)	330-1320 : 647 (100)	180-720 : 405 (100)	170-290 : 183 (100)	200-960 : 400 (100)
8. Saprophagous	30-240 : 108 (100)	40-160 : 142 (16.6)	70-210 : 127 (100)	30-150 : 93 (100)	80-100 : 76 (75)

Table I contd.

Results of the survey of Paddy crop in Malda district, West Bengal.

	LOCALITY / VILLAGE			
	Gabgachi	Pukherpara	Srirampur	Banriatola
No. of samples collected	2	4	5	4
Nematode associated				
1. *Meloidogyne*	100-120 110 (100)	20-40 : 30 (100)	20-120 56 (100)	20 20 (50)
2. *Tylenchorhynchus*		10 : 10 (25)	40-260 152 (100)	30-270 : 148 (100)
3. *Hoplolaimus*	-	-	40 40 (20)	-
4. *Pratylenchus*	20-290 155 (100)	-	200 : 200 (20)	-
5. *Hirschmanniella*	30-310 : 170 (100)	100-850 : 358 (100)	20-900 450 (100)	600-1020 : 815 (100)
6. *Longidorus*	-	-	-	-
7. Other dorylaims	210-440 325 (100)	70-420 : 235 (100)	320-1160 : 652 (100)	280-410 : 350 (100)
8. Saprophagous	160 : 160 (100)	20-170 : 73 (100)	60-180 : 120 (100)	60-380 : 148 (100)

TABLE - II

Results of the survey of Paddy crop in Jalpaiguri district, West Bengal.
Range of nematode number with its average per 200 ml of soil.
Figures in parenthesis indicate percent frequency of occurrence.

	LOCALITY / VILLAGE				
	Hakimpara	Mohitnagar	Dhabgunj	Dangapara	Dethapara
No. of samples collected	2	5	5	2	5
Nematode associated					
1. *Meloidogyne*	10-200 : 115 (100)	10 : 10 (20)	30 : 30 (20)	20-350 : 185 (100)	20-370 : 195 (40)
2. *Tylenchorhynchus*	-	-	-	-	70-100 : 85 (40)
3. *Helicotylenchus*	-	-	-	10 : 10 (50)	-
4. *Pratylenchus*	-	-	-	-	-
5. *Hirschmanniella*	60-70 : 65 (100)	30-240 : 135 (40)	20-120 : 70 (100)	20-40 : 30 (100)	20-240 : 136 (100)
6. *Hemicriconemoides*	-	-	30 : 30 (20)	-	-
7. Other tylenchids	-	-	-	-	30-40 : 35 (40)
8. Other dorylaims	80-110 : 95 (100)	80-520 : 318 (100)	110-240 : 156 (100)	80-150 : 115 (100)	20-90 : 45 (100)
8. Saprophagous	30-600 : 315 (100)	40-80 : 62 (100)	10-50 : 40 (100)	40-70 : 55 (100)	20-110 : 57.5 (100)

Table - II contd.

Results of the survey of Paddy crop in Jalpaiguri district, West Bengal.

	LOCALITY / VILLAGE				
	Choto Chowdhury para	Habupara	Brahmatal	Sakarpara	Dangapara II
No. of samples collected	6	4	5	1	7
Nematode associated					
1. *Meloidogyne*	30-80 : 55 (33)	10-80 : 45 (50)	10-30 : 16 (60)	-	20-230 190 (57)
2. *Tylenchorhynchus*	10 : 10 (16.7)	10 : 10 (25)	20-150 : 85 (40)	20	-
3. *Helicotylenchus*	-	-	-	160	-
4. *Pratylenchus*	-	-	-	20	-
5. *Hirschmanniella*	30-210 : 96.7 (100)	90-160 : 125 (100)	20-110 : 50 (100)	20	20-410 118 (100)
6. *Hemicriconemoides*	-	-	-	-	-
7. Other tylenchids	-	20-40 : 30 (100)	10-40 : 25 (40)	-	-
8. Other dorylaims	10-390 : 135 (100)	30-190 : 130 (100)	130-270 : 186 (100)	390	10-130 : 86 (100)
9. Saprophagous	20-80 : 43 (100)	20-50 : 40 (100)	10-50 : 30 (100)	120	10-170 : 50 (100)

TABLE - III

Comparative results of the survey of Paddy crop in Malda and Jalpaiguri districts, West Bengal State.
Range of important nematode number (potential parasities) with its average per 200 ml of soil and 10 gm roots.
Figures as parenthesis indicate percent frequency of occurrence with dominance in soil/only occurence in roots.

Name of the district	Malda		Jalpaiguri	
	Soil Population	Root Population	Soil Population	Root Population
Potential Nematodes				
1. *Meloidogyne*	10-460 : 72.5 (80 : 7.5)	2-664 : 119 (70)	10-350 : 56.5 (66 : 20)	2-128 : 97 (66.0)
2. *Tylenchorhynchus*	10-270 : 102 (72.5 : 15)	-	10-150 : 65 (26 : 7)	-
3. *Hirschmanniella*	20-1230 : 404 (97.5 : 77.5)	4-82 : 18 (97.5)	20-240 : 77.5 (90.5 : 73)	1-40 : 6 (90.5)

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REDESCRIPTION OF A LITTLE KNOWN MYRMICINE ANT *RECURVIDRIS RECURVISPINOSA* (FOREL) (HYMENOPTERA : FORMICIDAE)

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INTRODUCTION

The genus *Recurvidris* was first described a century back from India, and named *Trigonogaster*. Unfortunately this was preoccupied by a Pteromalid chalcid and hence Bolton (1992) proposed new name to this genus as *Recurvidris*, genuinly based on one of the most striking habitus characters of all workers under this genus, the long upward and forward-curved propodeal spine.

The genus was earlier placed somewhere in Pheidologetonini (Forel, 1917; Emery, 1922) or in Solenopsidini (Wheeler, 1922, 1927). But Ettershank (1966) removed this genus from the above two tribes due to the lack of anterior-median seta on clypeus.

The genus is Oriental and Indo-Australian in distribution. It is represented by small, yellow ants belong to the subfamily Myrmicinae. They range from India and Sri Lanka eastwards to Japan and southwards to Sulawesi in Indonesia. The genus has not yet been reported from New Guinea and Australia.

Regarding habitat, these little ants are reported from the forest area, lying under leaf litters. Till date, only workers are represented under the genus except males of only one species. The queens are yet to be reported.

Bolton (1992) revised this genus and described *proles*, *browni*, *hebe*, *pickburni* and *williami* as new species, besides earlier described species *kemneri* and *recurvispinosa*.

Bingham (1903) in ***Fauna of British India*** (Hymenoptera : Formicidae) mentioned only one species *Trigonogaster recurvispinosa* Forel and his descriptions are confined to few lines, and quite insufficient, even the diagram does not represent the specific characters.

The present work is an attempt to provide sufficient description of the species with detailed diagrams, which can be properly utilised for comparison, if one comes across some other species of the genus *Recurvidris*.

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The following abbreviations have been used in this work : F - Flagellar segment; T - Tergite; DZCU - Department of Zoology, University of Calicut.

Genus ***Recurvidris*** Bolton

1890. *Trigonogaster* Forel, *Ann. Soc. Ent. Belg., C. R.*, **34** : 108.

1992. *Recurvidris* Bolton, *Psyche*, **99** : 36.

Type-species : *Trigonogaster recurvispinosus* Forel, 1890.

Diagnostic features : The genus is represented by monomorphic caste and has got the following combination of characters (Bolton, 1992) :

(1) Palp formula 4, 3.

(2) Mandibles with 4-5 teeth on oblique apical margin.

(3) The isolated median seta on anterior clypeal margin replaced by a pair of long setae; median portion of the clypeus weakly bicarinate, vestigial to absent in certain species, when distinct, the carinae widely separated and parallel to each other.

(4) Median portion of the clypeus moderately broadly inserted between the frontal lobes.

(5) Antennae 11-segmented, club prominent and formed of 3 apical segments.

(6) Frontal carinae and antennal scrobes absent.

(7) Alitrunk long, pro-mesonotum highly arched in profile; mesonotum with a long slope posteriorly to the propodeum, the latter at a much lower level than pro-mesonotal arch.

(8) Propodeal spiracles small, pinhole-like, situated at the mid length of sclerite.

(9) Bulla of metapleural gland with its dorsalmost point widely separated from propodeal spiracle.

(10) Propodeal spines present, curving upwards and forwards from their bases.

(11) Metapleural lobes very small to vestigial, rounded.

(12) Metasternal process absent.

(13) Tibial spurs absent from middle and hind legs.

(14) Posteriormost hair on mesonotal dorsum single, not paired.

(15) Petiole pedunculate, the spiracle at about the mid length of the peduncle, the node low and weakly conical in profile.

(16) Post petiole reduced, shallow in profile, dorso-ventrally narrowed posteriorly; helcium very deep, almost or quite as deep as the body of the node.

(17) First gastral segment extremely dorso-ventrally compressed in profile immediately behind the post petiole.

(18) First gastral segment in profile almost flat dorsally and strongly convex ventrally.

(19) Sting spatulate.

Distribution : India, Indonesia, East and West Malaysia, Sri Lanka, China, Nepal, Hongkong, Japan and Myanmar.

Discussion : The genus can be easily distinguished from all other genera by its unique characters, such as the peculiar type of dentition; recurved propodeal spine; single (unpaired) posterior most hair on the mesonotal mid line; the extremely specialised post petiole with its deep helcium; reduced node and constricted articulation with the gaster, and the form of gaster.

Recurvidris recurvispinosa (Forel)

(Figs. a-c)

1890. *Trigonogaster recurvispinosus* Forel, *Ann. Soc. Ent. Belg., C. R.*, **34** : 109, fig. Syntype : Workers, INDIA : Poona (MHN).

1903. *Trigonogaster recurvispinosus,* Bingham, *Fauna Brit. India* (Hymenoptera : Formicidae), **2** : 285.

1927. *Trigonogaster recurvispinosa,* Wheeler, *Amer. Mus. Novitates,* **255** : 5, *Male.*

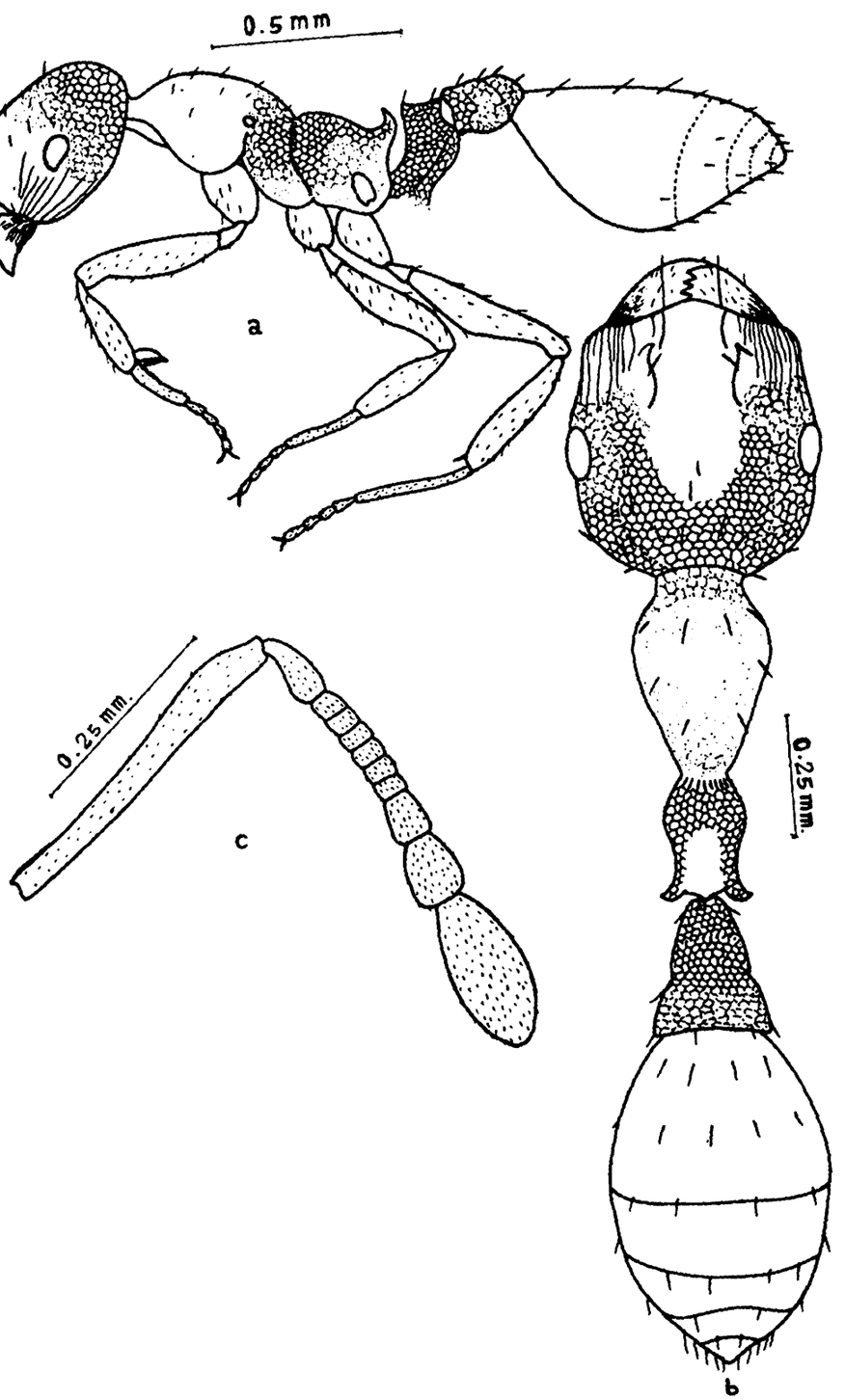
1992. *Recurvidris recurvispinosa,* Bolton, *Psyche,* **99** : 46.

Worker : Total length : 2.1 mm; Head length : 0.49 mm; Head width : 0.43 mm; Cephalic index : 87; Scape length : 0.40 mm, Scape index : 93; Eye diameter : 0.09 mm; Alitrunk length : 0.6 mm; Pronotal width : 0.24 mm.

Colour : Orange yellow, eyes black, teeth of mandibles brown.

General sculpture and hair pattern : Pubescence almost absent except very minute yellow ones on antennae and tarsi; pilosity restricted to erect yellow sparse hairs on head, thorax and gaster, and small appressed hairs on legs; gastral apex with a few long thin hairs. Head (except antero-median portion and clypeus) mesonotum, metanotum and pedicel very minutely finely reticulate. Clypeus, antero-median portion of head, pronotum, pro-meso- and metapleura, region between propodeal spines, legs and gaster smooth, shining but reticulation very slightly indicated in certain reflections of light in these regions; region in front of the eyes and mandibles longitudinally finely striate.

Head : Elongate, rectangular, widely and very slightly emarginate posteriorly in front view; in profile, head anteriorly truncate, occipital corners narrowly rounded; mandibles narrow with four teeth, basal teeth broader than other three and bifurcated at its tip; maxillary palpi 4, labial palpi 3-jointed, clypeus vertical, medially bicarinate, carinae starting with a pair of setae on either side; anteriorly carinae end in 2 pairs of closely set long setae, anterior margin of clypeus complete, arched, its posterior margin faintly indicated, frontal area not distinct, antennal toruli wide apart, each lobe narrower than clypeus produced between them. Antennae 11-jointed; scape almost



Figs. a-c. *Recurvidris recurvispinosa* (Forel). a- body profile; b- body dorsal view; c- antenna

reaching posterior margin of head; F1 long, subequal to preceding 4 segments combined; F2-F7 transverse; club formed of apical 3 segments, terminal segment more than 2x preceding one; eyes oval, antero-ventrally pointed; placed on median line, maximum diameter 0.21x HW; frontal carinae and antennal scrobes absent.

Thorax : Elongate, broad anteriorly; pro-mesonotum forming a single convexity; mesonotum narrow; pro-mesonotal suture absent; meso-metanotal suture deep, thorax emarginate in this suture; metanotum dorsally flat; meso- and metanotum laterally slightly compressed; propodeal spines strong, curving upwards and forwards from their bases, bulla of metapleural gland widely separated from propodeal spiracle, propodeal spiracle small, situated high on side, approaching dorsal line and a little mid line; metapleural lobes rounded, metasternal process absent; legs of moderate size; mid and hind tibae with simple spur; claws simple.

Abdomen : Petiole with a long thick peduncle in front; node low and weakly conical in profile; peduncle anteriorly with an acute ventral spine beneath; petiole dorsally emarginate; spiracle at about mid length of peduncle, post petiole reduced, shallow in profile, helcium very deep; in dorsal view post petiole 1.8x broader than petiole node. Gaster : T1 dorsally flat, strongly convex ventrally, T1 extremely dorso-ventrally compressed in profile immediately behind post petiole; in dorsal view attachment to post petiole broad; tergites strongly covering sternites. T1 covering more than half length of gaster.

Plesiotype : Worker. INDIA : Kerala, Calicut University Campus, Coll. S. Sheela, 17.vi.1995 (DZCU)

Other material examined : 1 Worker, INDIA : West Bengal, Calcutta, Coll. S. N. Ghosh, 5.vi.1997.

Distribution : INDIA : Uttar Pradesh : Dehradun; Assam : Kaziranga; Kerala : Calicut; Tamilnadu : Walayar forest, Coimbatore, Siruvani; West Bengal : Calcutta. *Elsewhere* : Nepal : Kathmandu; Myanmar : Pegu; Hongkong : King's Park; Japan : Is. Ishigaki, Mt. Omoto; China : Back Liang.

Discussion : So far 7 species have been reported from this genus of which only a single species *recurvispinosa* represents the Indian subcontinent. In 1890, Forel described this species from Poona under name *Trigonogaster recurvispinosus.*

This species differs from its nearest relatives *R. pickburni* and *R. hebe* in that : (1) in *pickburni* and *hebe*, the propodeal spines much narrower and occipital margin of head broadly rounded vzs : propodeal spines not much narrower and occipital margin of head narrowly rounded. (2) Basal tooth of mandible acutely pointed in *pickburni* vzs : basal tooth of mandible broad and bifurcated at tip in *recurvispinosa.* (3) Post petiole in dorsal view narrower in *hebe* vzs : broader in *recurvispinosa.*

SUMMARY

The present work "Redescription of a little known Myrmicine ant *Recurvidris recurvispinosa* (Forel) (Hymenoptera : Formicidae)" is an attempt to provide sufficient description of the species with detailed diagrams, which can be properly utilized for comparison, if one comes across some other species of the genus *Recurvidris*. The genus is distributed through the Oriental and Indo-

Australian regions and the species of the genus are found from the forest beds.

The species *R. recurvispinosa* (Forel, 1890) is reported here for the first time from West Bengal, India (Calcutta). Forel (1890) first described this species under the genus *Trigonogaster* which was recorded by Bingham (1903) and ultimately the species was transferred to genus *Recurvidris* by Bolton (1992).

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THE GENUS *ARCOPPIA* (ACARI, ORIBATEI, OPPIIDAE) FROM INDIAN SOILS

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INTRODUCTION

The genus *Arcoppia* Hammer, 1977 is an oppiid mite well distributed in the world and is presently represented in the world by nearly fifty species (Subias and Balogh, 1989). In India the genus was first reported by Sarkar (1984) who recorded *A. bidentata* Hammer, 1979 and *A. rotunda* Hammer, 1979 from Tripura. Later Chakraborty and Bhattacharyya (1992) and Bhattacharyya and Chakraborty (1995) recorded one species *A. meadami* Balogh and Balogh (1986) and one subspecies *A. fenestralis orientalis* Balogh and Balogh (1986) from South district of Tripura. During studies on orbatid mite fauna of India the present authors examined five species of *Arcoppia* from soil samples of different Indian states (*viz.*, Himachal Pradesh, Meghalaya, Tripura and West Bengal), all of which are new to science. In this communication the genus *Arcoppia* from Indian soils is discussed which includes description of five new species and a key for the identification of five new and four known species and subspecies of the genus from Indian soils. All measurements are in micron.

The types of all the new species described here are desposited in the National Zoological Collection of Zoological Survey of India, Calcutta.

Genus *Arcoppia* Hammer

Arcoppia Hammer, 1977. *Biol. Skr. Dan. Vid. Selsk.*, **21** (4) : 32.

The genus *Arcoppia* was described by Hammer (1977) from mountainous soils of Northwest Pakistan with a suggestion to include five species described earlier under the genus *Oppia* and one described species of the genus *Damaeosoma* under *Arcoppia*. Balogh (1983) erected a new subfamily Arcoppiinae under the family Oppiidae Grandjean, 1954 and placed *Arcoppia* under this subfamily. Rodriguez and Subias (1984) reviewed the genus *Arcoppia*. Subias and Balogh (1989) gave a list of 47 valid species of *Arcoppia*, some of which were previously described under the genera *Oppia, Damaeosoma* and *Pletzenoppia*.

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Distribution India, S.E.Asia (Borneo, Hongkong, Java, Pakistan, Philippines, Thailand, Vietnam), Japan, Korea, Spain, Africa, Maruitius and Reunion, South America, Cuba, Australia, New Guinea, Pacific Islands (Fiji, Tonga, Tahiti), New Zealand.

Key to Indian species of the genus *Arcoppia*

1(2) Rostrum not tripartite; dialated part of sensillus without tooth..... *rotunda* Hammer, 1979

2(1) Rostrum tripartite; dialated part of sensillus with or without tooth.

3(5) Sensillus with one branch.

4(13) Sensillus with 3-4 branches.

5(8) Length of the branch of sensillus smaller than or nearly equal to the length of the sensillus.

6(7) Larger species (Length 655); rostral setae very long, upper half strongly curved inward, unilaterally barbed, lamellar setae originating anterior to transcostular arch .... *meghalayensis* sp. nov.

7(6) Smaller species (length 510); rostral setae short, upper half not strongly curved inward, smooth; lamellar setae originating in an area enclosed by transcostular arch .... *sambhui* sp. nov.

8(5) Length of the branch of sensillus larger than that of the sensillus.

9(10) Dialated part of sensillus with two tiny tips or teeth; a light furrow in front of interlamellar setae..... *bidentata* Hammer, 1979

10(9) Dialated part of sensillus without teeth; no light furrow in front of interlamellar setae.

11(12) Costular arch complete, enclose two transverse lines; interlamellar area with four pairs of rounded light spots; notogastral setae long, strong, barbed..... *tripuraensis* sp. nov.

12(11) Costular arch incomplete, no transverse lines; interlamellar area with two pairs of rounded light spots; notogastral setae fine, smooth ..... *meadami* Balogh and Balogh, 1986

13(14) Sensillus with four branches, distance r_1-r_1 shorter than distance *ta-ta*; tooth-like prodorsal projection from bothridium ..... *indica* sp. nov.

14(13) Sensillus with three branches; distance r_1-r_1 shorter than or equal to distance *ta-ta*; no tooth-like prodorsal projection from bothridium.

15(16) Anterior branch of sensillus extremely short; distance between r_1-r_1 shorter than distance *ta-ta*; no enclosed lamellar area, no light spots in interlamellar area. .... *fenestralis orientalis* Balogh and Balogh, 1986

16(15) Anterior branch of sensillus moderately long; distance between r_1-r_1 nearly equal to distance *ta-ta*; costular lines form an enclosed lamellar area; two pairs of light spots at the base of interlamellar area..... *montana* sp. nov.

Arcoppia meghalayensis sp. nov.
(Text Figs. 1-2)

Colour : Brown (Prodorsum dark brown).

Size : Length 655, Width 374.

Prodorsum : Little wider than long, heavily chitinized, darker than the rest of the body. Rostrum tripartite, rostral setae very long (78), strongly curved, emerging from small tubercles, directed first outward then inward, unilaterally barbed for two third of its length, distal part free of such barbs. The rostral setae basally comparatively wide, but gradually becoming fine and ending in a pointed tip, their tips almost touch each other. Length of rostral setae nearly 2.5 times greater than their mutual distance. An arcuate, fine line present at the base of rostral setae. The costular and transcostular arches are joined to form a strongly arcuate band which is very broad and uniformly wide, posteriorly terminating near the bothridial cup on each side. Lamellar setae very short (8), nearly 10 times shorter than rostral setae, fine, directed backward and inward, each lamellar setae originating close to each other from an oval field with distinct margins, the fields not similar to the light spots found in the interlamellar area of its congeners, and positioned in front of the anterior margin of the transcostular band. Mutual distance between lamellar setae x1.5 less than that between rostral setae. Lamellar setae originating nearer to interlamellar setae than to rostral setae, the distance between rostral and lamellar setae being nearly twice the distance between lamellar and interlamellar setae. Interlamellar setae (uprooted, not studied) originating in front of a large light area in the interbothridial region, their mutual distance less than that between rostral setae but little more than the mutual distance between lamellar setae. The sensillus (100) with a dialated, fusiform head which gives out one long, fine branch, the length of the branch being almost equal to that of the sensillus. Exobothridial setae strong, fine, smooth with acutely pointed tip.

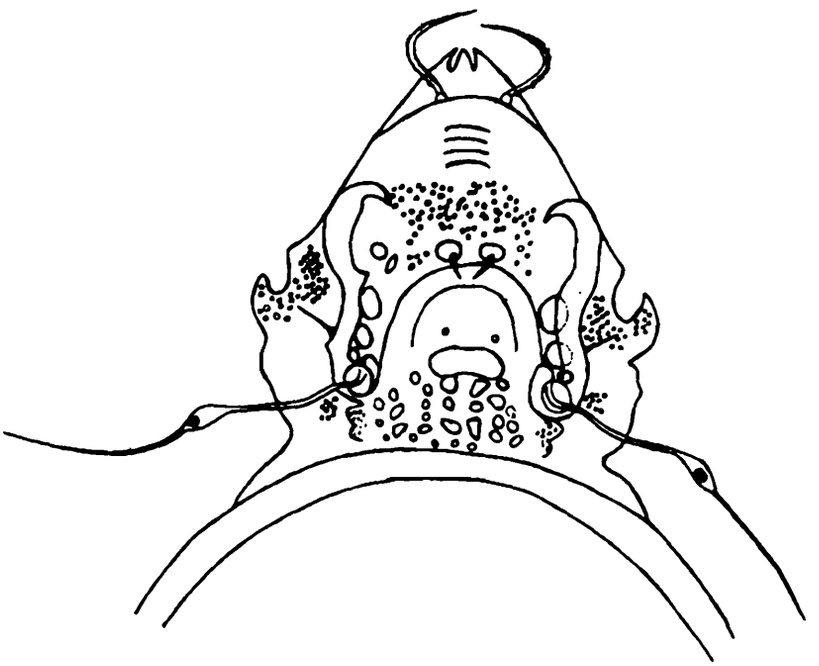

Fig. 1. *Arcoppia meghalayensis* sp. nov. : dorsal aspect.

The prodorsum bears distinct granulate structures scattered at its middle part, above the arcuate transcostular line. Four small, thin, short, slightly convex transverse lines exist in the area behind the fine arcuate line at the base of the rostral setae and anterior to the granulate area. Three light areas are present between the lateral margin of the costular line and the lateral ridge, their size decreasing from anterior to posterior side. The microsculpture at the posterior part of the prodorsum is composed of distinct, small fields of varying size and shape; apparently arranged in several longitudinal rows. The lateral aspect of the basal half of the prodorsum from the base of leg I to the anterior margin of notogaster is sculptured with prominent granules. A small chitinized area showing minute granules exists immediately below the bothridial cup.

Notogaster : The notogastral shield of the holotype badly damaged, so could not be studied.

Epimeral region : Epimeral region shows some complexity. The area between the tip of infracapitulum and ep_2 appears to be darker than the rest part of the ventral side due to comparatively stronger chitinization. ep_2 appears to be partly covered by a chitinized shield which overlaps the lower, less chitinized epimeral area. Plates of ep_1 incompletely separated from each other, ep_3 and ep_4 fused together. A pair of chitinized tooth-like projection exists at the antero-medial aspect of ep_2. Epimeral setal formula 3-1-2-3, all epimeral setae minute, smooth. The epimeral plates with distinct reticulation on their surface, the margin of each reticulated field very prominent and strong, especially on ep_4.

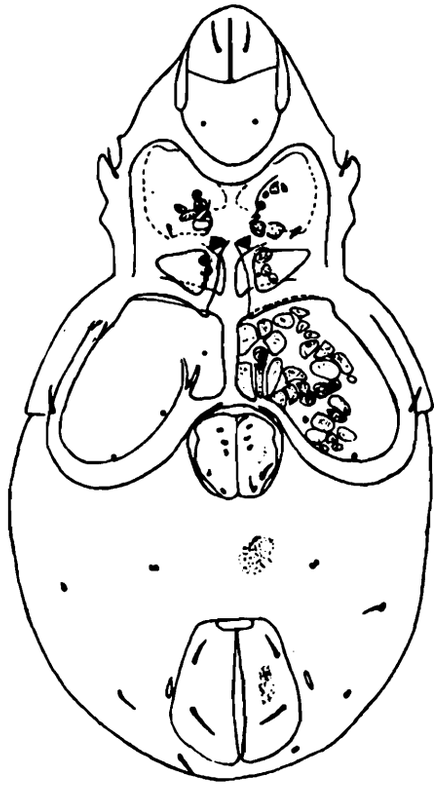

Fig. 2. *Arcoppia meghalayensis* sp. nov. : ventral aspect.

Anogenital region : Genital aperture as long as broad. Genital setae six pairs, minute (7-9). Genital plate finely punctate. There are two thickened areas on the anterolateral and posterolateral aspect of each genital plate. Anal aperture as long as broad, tapering slightly towards its anterior aspect. Anal setae smooth, thin, with finely pointed tip. Anal plate finely punctate. Adanal setae three pairs, ad_3 preanal, ad_2 paranal and ad_1 postanal. All adanal setae smaller than anal setae. Fissure *iad* lying close to the lateral margin of anal aperture, being parallel to it. Ventral plate showing fine punctation.

Legs : Monodactylous.

Holotype : Adult female, INDIA : East Garo Hills : Meghalaya : Rongnil, 8.x.1988, from litter and soil, coll. B.J. Sarkar.

Paratypes : Two females, data same as holotype.

Remarks : The new species from Meghalaya can be included in the species group of *Arcoppia* having a single branch of the sensillus. This group includes species like *bidentata* Hammer, 1979, *corniculifera* (Mahunka, 1978), *dissimile* (Berlese, 1905), *grucheti* (Mahunka, 1978), *incerta* Balogh and Balogh, 1983, *kaindicola* Balogh and Balogh, 1986, *meadami* Balogh and Balogh, 1986, *praearcuata* Balogh and Balogh, 1986, *robustior* (Berlese, 1913), *rotunda* Hammer, 1979, *viperea* (Aoki, 1959), etc. Besides, it resembles species of *Arcoppia* like *brachyramosa* Hammer, 1977, *corniculifera* (Mahunka, 1978), *fenestralis* (Wallwork, 1961), *perqeli* Mahunka, 1982, *tuberosa* Mahunka, 1988, *varia* Hammer, 1979, etc. due to the presence of tuberculate microsculpture at the base of the prodorsum. However, the new species can be distinguished from the above species mainly due to the presence of very large rostral setae with its upper half strongly curved inward so that their tips meet each other; the area anterior to lamellar setae showing prominent tubercles; lamellar setae originating anterior to transcostular line and not behind it as in other *Arcoppia* species; and epimere II partly covered by a chitinized shield.

Some characters in the new species, specially the presence of lamellar setae anterior to the transcoustlar line and prominent tubercles in front of lamellar setae are very peculiar which may be worth creating a seperate supra-species category for this species. But it is felt at present that more specimens with similar character combinations have to be examined before suggesting creation of a new taxa on the basis of these characters.

Arcoppia tripuraensis sp. nov.

(Text Figs. 3-6)

Colour : Brown.

Size : Length 404, Width 235.

Prodorsum : Rostrum tripartite. Rostral setae (28) twice as long as their mutual distance (14), smooth, thin, directed forward, curved outward at the basal half then inward at the upper half. A thin, short line joins the base of the rostral setae. The distinct costular line is broad, well chitinized, extend posteriorly upto half way between costular and transcostular setae. Anteriorly

the costular lines converge inwards and are joined by a short, slightly thinner and less chitinized transcostular line. A faint arcuate line exists anterior to the transcostular line. Lamellar setae originate very colse to the inner border of the costular line, slightly below the point where costular line meets the transcostula. Lamellar setae (21) smooth, thin, directed forward being curved outward at the basal half then inward at the upper half, smaller than their mutual distance (26). Interlamellar setae (44) longest of all prodorsal setae, smooth and longer than their mutual distance (35), originate lateral to the light areas, sensillus (54) with a moderately long stalk and a dialated head which gives out a long, setiform branch. The branch (63) is longer than the sensillus. Three faint rounded pseudoscales exist adjacent to the upper margin of the sensillus in a linear arrangement.

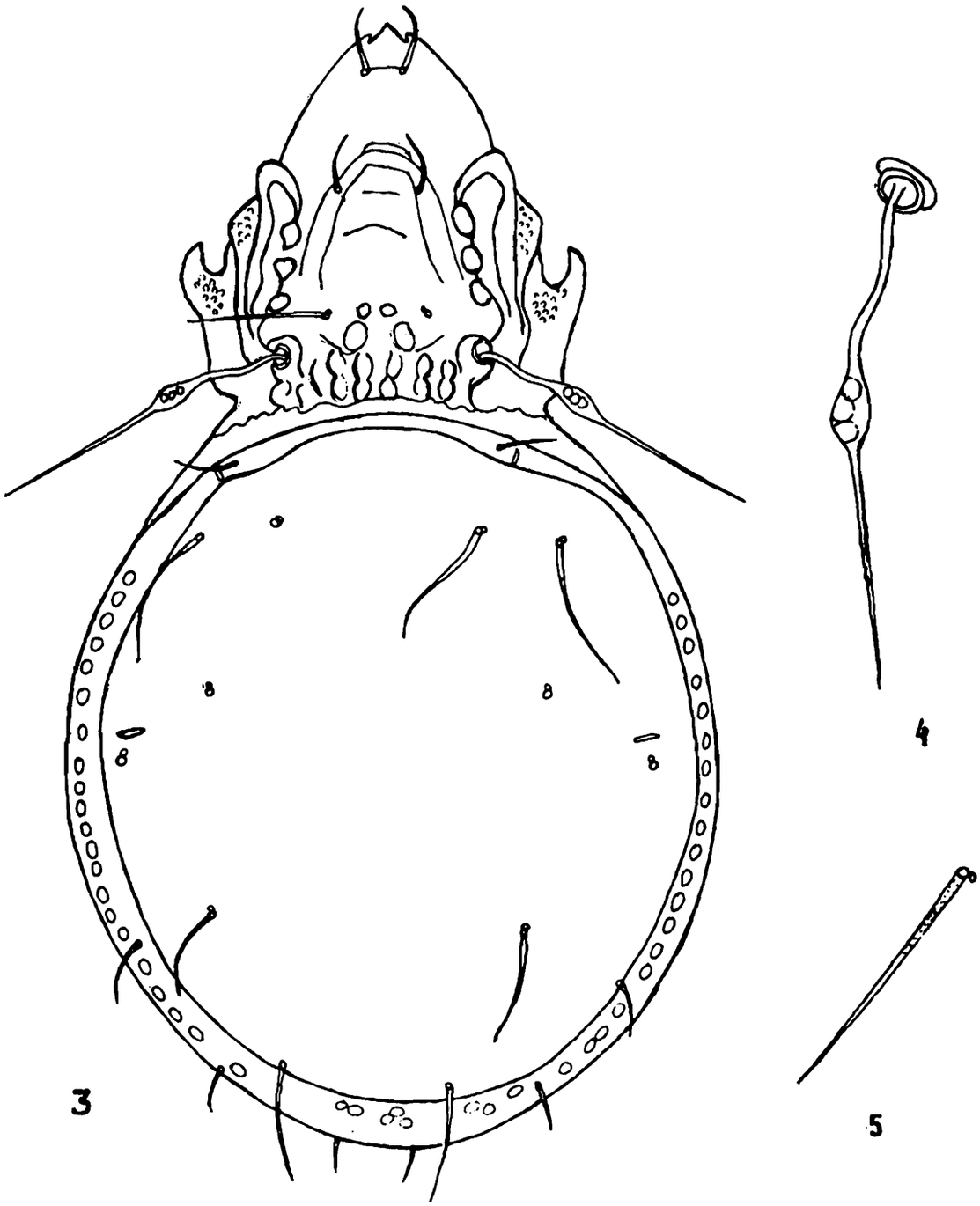

Fig. 3-5. *Arcoppia tripuraensis* sp. nov. : 3, dorsal aspect; 4, sensillus; 5, notogastral seta.

The prodorsum shows two prominent transverse lines in the area enclosed by the costular line, the lower one is slightly curved. Two pairs of light areas observed in between the interlamellar setae. Two faint curved diagonal streaks touch the lower large light area. The basal part of the prodorsum immediately above the dorsosejugal suture shows few rounded, tuberculate microsculptures, arranged in four rows. The field between the lateral ridge and lateral margin of prodorsum covered with granules. There are three light areas of almost equal size arranged vertically in the area between the lateral ridge and lamellar line.

Notogaster : Oval in shape with 10 pairs of setae (some of which uprooted, not studied) and broad chitinous band along the entire margin of the notogaster. Notogastral setae long, thin and slightly barbed on their outer margin. Setae *ti, te* being longer than the other observable setae. The mutual distance of notogastrical setae is greatest between *ms-ms* (127) followed by r_2-r_2 (117), *ta-ta* (82), *ti-ti* (70). There are some small oval-shaped markings along the lateral and posterior margin of the notogaster.

Epimeral region : All apodemes are thick and irregular, (ep_1) more thickened medially, irregular shaped and with six radiating corners. There are small nodulous structures on the ventral plate at the posterolateral aspect of ep_4. Epimeral plates show light areas of irregular shape. Epimeral setal formula 3-1-2-3. All epimeral setae smooth.

Anogenital region : Genital plate nearly as long as broad with six pairs of small, smooth genital setae. Each genital plate with a thickened margin at its anterolateral aspect, setae g_1 originating from this thickened area. Anal plate little longer than broad, oval, setae smooth, long (14). Adanal setae 3 pairs, long (12-16) and smooth. ad_3 preanal, ad_2 paranal and ad_1 postanal. Fissure *iad* situated close to the lateral margin of anal aperture, lying parallel to the slightly anteriorly tapering lateral margin of anal field.

Legs : Monodactylous.

Holotype : Adult female, INDIA : Tripura : Karbuk (Amarpur) : 5 km south of Patichari, 4.iii.1992, from soil with decomposed leaves, coll. S. Saha.

Paratypes : 1 female, data same as holotype; 2 females, Tripura : Jolaibari (Belonia), 4.vii.1993, from soil with decomposed leaves below shrub, coll. S. Saha

Remarks : The new species from Tripura shows affinity with the species of *Arcoppia* having single branch of sensillus, and also with some other species showing tuberculate microsculpture on the prodorsum (see Remarks after *A. meghalayensis* sp. nov.). But it differs from other species in the shape of sensillus. The new species shows some similarities with *A. arcualis* (Berl., 1913) in having tripartite rostrum, in the shape of costular and transcostular line and interlamellar setae, presence of 2 pairs of light areas and slightly unilaterally barbed notogastral setae. But the new species differs from *A. arcualis* by the presence of smooth rostral and lamellar setae, a line joining the bases of rostral setae, a faint concave line in front of transcostular line, a pair of transverse line in the area enclosed by costular line, three light areas in the space between the lateral line and costular line and prominent tuberculate microsculpture. The sensillus is single branched in the new species, but in *A. arcualis* the sensillus is with two branches. Moreover, the dorso-sejugal suture is more or less straight in *A. arcualis* but it is concave in the new species, setae

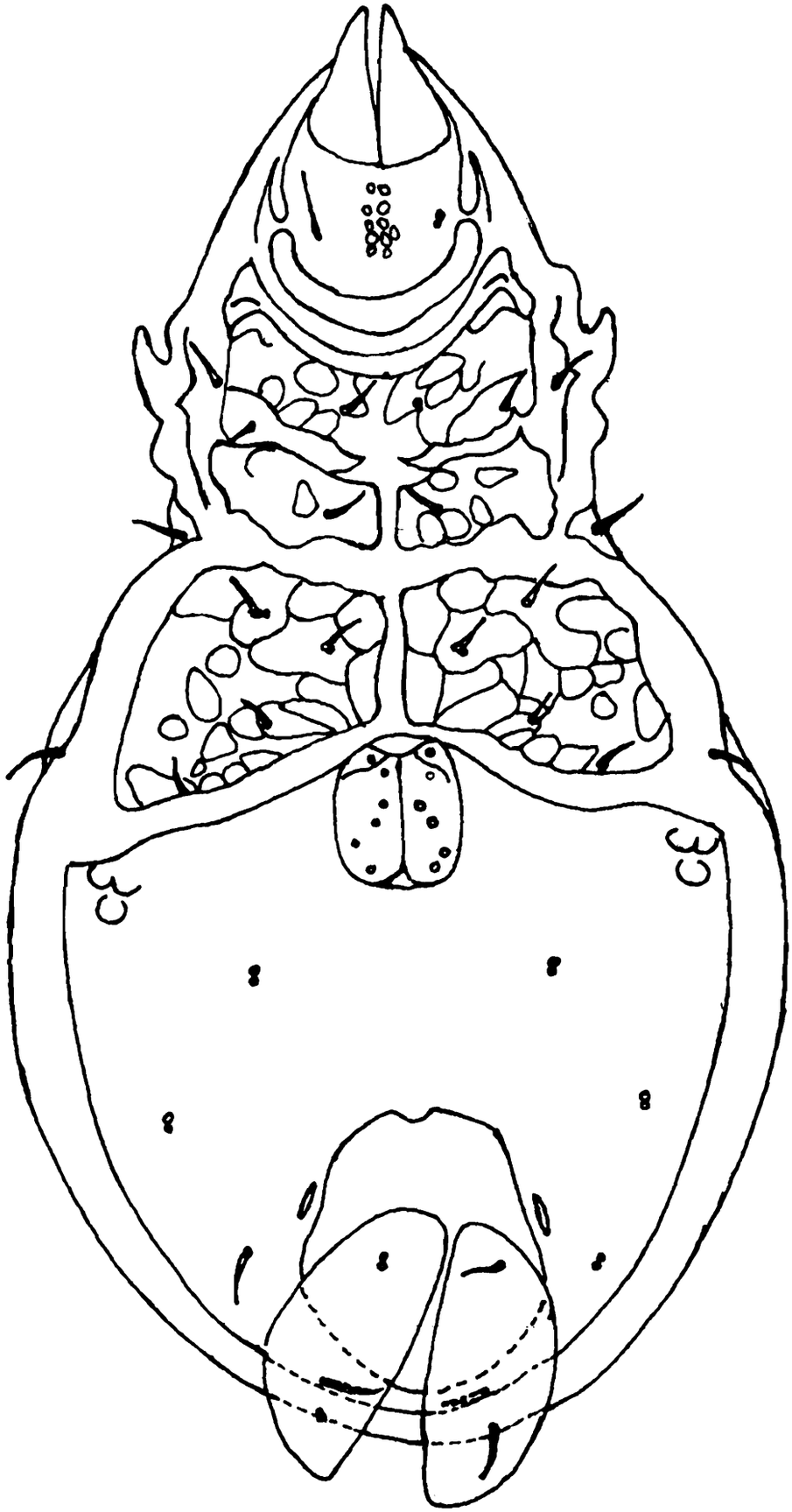

Fig. 6. *Arcoppia tripuraensis* sp. nov. : ventral aspect.

p_3 and p_2 exist more or less parallely in the new species, but r_2 exists posterolateral to p_3 in *A. arcualis*.

Arcoppia sambhui sp. nov.
(Text Figs. 7-8)

Colour : Yellowish brown.

Size : Length 510, Width 270.

Prodorsum : Prodorsum longer than wide. Rostrum tripartite, rostral setae (37) thin with finely pointed tip, surface of rostral setae smooth, the setae originating from small tubercles situated immediately in front of a thin, arcuate line and directed forward, their tips curved inward. Mutual distance between rostral setae is little less than their length. The costular line is uniformly broad, distinct, extending posteriorly upto halfway between lamellar and interlamellar setae. Anteriotly it is directed medially joining the transcostula which is as broad as the costula. Lamellar setae (22) shortest of all prodorsal setae except exobothridial setae. Lamellar setae originate inside the transcostular arch, being located close to the point where costular line meets the transcostular line. Lamellar setae curved anteromedially, their tips touching each other. Interlamellar setae very long (62), x1.7 as long as rostral setae and x3 as long as lamellar setae, fine with finely pointed apical part, extended posteriorad beyond the anterior margin of the notogaster, its apex reaching beyond the origin of setae *ta*. The sensillus (78) with a slightly thickened, fusiform head which give out a single branch (59) with finely pointed tip. The length of the branch is less than the length of the sensillus. Three faint, rounded pseudoscales are observed in the thickened head of the sensillus.

The anterior half of the prodorsum is devoid of any granulate structure. The prodorsum, however, shows some faint, short, curved transverse lines on a punctated field midway between the origin of lamellar and interlamellar setae. A pair of faint rounded 'light spots' present in the area between the bases of interlamellar setae. The lateral margin of the basal half of prodorsum, between base of leg I and anterior margin of notogaster, covered with granulations which are often attached to one another so that each granule cannot be distinctly identified. The basal part of prodorsum immediately above anterior margin of notogaster shows microsculpture of rounded nature, the rounded areas being scattered on a punctated field.

Notogaster : Notogaster oval, longer than broad, with a distinct, broad chitinous band along the entire margin of the notogaster. Notogastral setae 10 pairs, thin, smooth, with finely pointed apex. the arrangement of the notogastral setae generally conforms the type found in other species of *Arcoppia*. Among the middle row of setae r_2-r_2 has the greatest mutual distance (157) followed in order by *ta-ta* and *ms-ms* (both 114), r_1-r_1 (107), *ti-ti* (81) and p_1-p_1 (8). Fissure *ia* situated near seta *ta* immediately behind the broad anterior margin of the notogaster, *im* above r_3 and *ip* midway between p_1 and p_2. The notogaster shows fine punctation on the whole surface.

Epimeral region : Epimeral plates of epimere I incompletely separated from one another and also with ep_1, ep_3 and ep_4 fused together. Epimeral setal formula 3-1-2-3. All epimeral setae smooth,

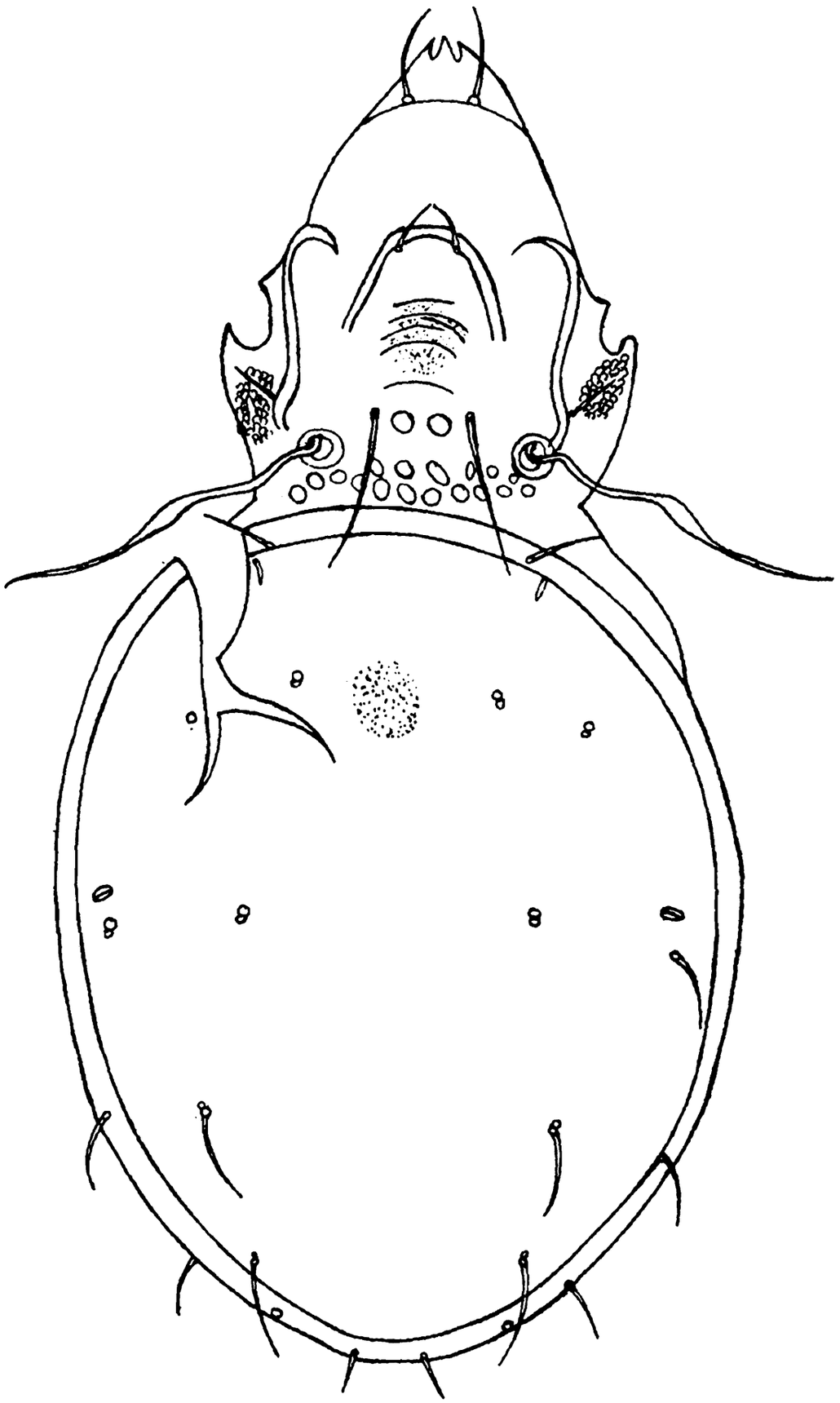

Fig. 7. *Arcoppia sambhui* sp. nov. : dorsal aspect.

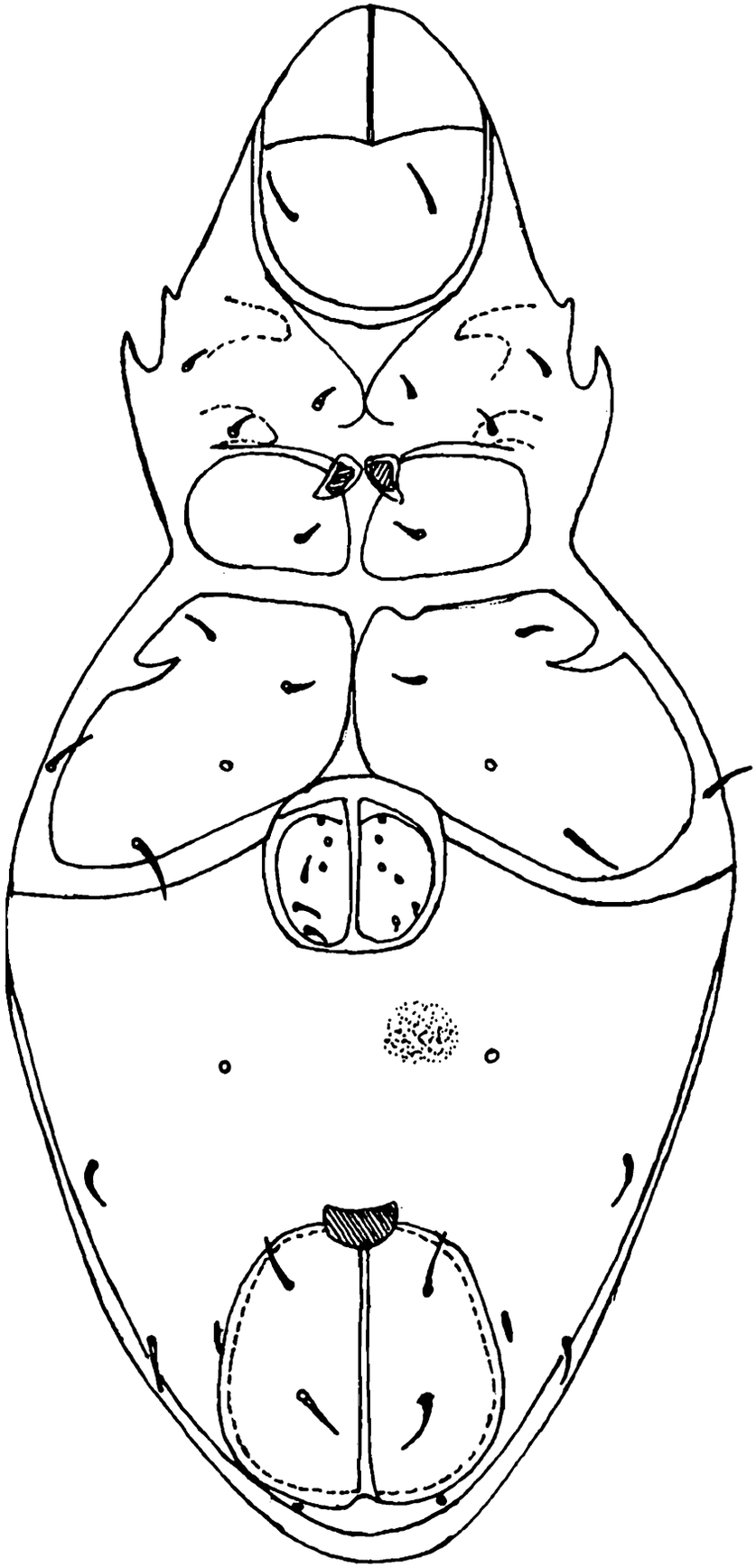

Fig. 8. *Arcoppia sambhui* sp. nov. : ventral aspect.

short (except *4b*), strong. At the anteromedial aspect of ep_3 a pair of triangular area, each housing a dark chitinized tooth, can be observed. Epimeral plates I-IV without any light area or other sculpture.

Anogenital region : Genital aperture nearly as long as broad. Genital plate with 6 pairs of genital setae which are very short (4-5.5) and smooth. The anal aperture is little more broad than long, anal setae (15-18) thin, an_1 only little longer than an_2. Anal plate showing fine punctations. Adanal setae located close to the posterolateral margin, ad_2 situated halfway between ad_1 and ad_3. Adanal setae shorter than anal setae, all adanal setae equally long (13), fine and smooth, ad_3 preanal in position, ad_2 paranal and ad_1 postanal. Fissure *iad* lying parallel to the lateral margin of anal field.

Legs : Monodactylous.

Holotype : Adult female, INDIA : West Bengal : South 24-Parganas : Mathurapur, 15.vii.1992, from soil at 10-15 cm depth, coll. Sambhu N. Chakraborty.

Paratypes : One female, data same as holotype.

Remarks : The new species from West Bengal shows affinity with the species of *Arcoppia* having single branch of the sensillus and also with some other species showing tuberculate microsculpture on the basal aspect of the prodorsum (see remarks after *A. meghalayensis* sp. nov.). However, the shape of the sensillus of the new species, especially the head, differs from that in other species except *A. kaindicola* Balogh and Balogh, 1986 which again differs from the new species in the length of interlamellar setae and in the absence of prodorsal microsculpture in *kaindicola*. The new species also shows some similarity with *A. corniculifera* (Mahunka, 1978) in having long interlamellar setae extending posteriorad beyond the anterior margin of notogaster, shape of costular and transcostular line, type of rostral setae, etc. But the new species differs from *corniculifera* in the nature of prodorsal tuberculate microsculpture, nature of head of sensillus and arrangement of some notogastral setae, especially in their relative position i.e. p_2 and p_3 originating posterolateral to r_2 and r_3 respectively.

Arcoppia montana sp. nov.
(Text figs. 9-10)

Colour : Brown.

Size : Length 327, Width 263.

Prodorsum : Rostrum tripartite. Rostral setae originating from small tubercles situated on a thin arcuate line at the anterior part of the prodorsum. Rostral setae (28) less than twice their mutual distance (18), directed forward being curved outward at the basal half, then inward at the upper half. The rostral setae appear smooth, at best with faintly rough surface, but not barbed. The faint costular lines are first diverging a little outward at the basal part then converging at the upper half to meet the transcostula which is a straight, horizontal band. The two costular lines are joined by a very faint line at their bases, thus forming a somewhat enclosed lamellar area. Lamellar setae (uprooted, not studied) originating close to the lower margin of the transcostula, with the same

mutual distance as between rostral setae. Interlamellar setae (uprooted, not studied) originating from 'light spots' and having a smaller mutual distance (13). Sensillus with a flat, dialated head which give out three asymmetrical branches, the lowermost branch longest and the uppermost branch shortest. The longest branch (35) having nearly the same length as that of the sensillus (33). Exobothridial setae setiform, smooth, short (14), directed outward and lateriorad. Exobothridial region finely granulate.

Only two pairs of faint 'light spots' are seen at the base of interlamellar setae, the setae originating from the larger, upper pair. The area between costular line and lateral ridge showing few pairs of rounded 'light spots' The basal part of prodorsum, immediately above the anterior margin of notogaster, shows a microsculpture of tubercles of different shape.

Notogaster : Notogaster oval in shape, with a broad, chitinous band along the entire margin of notogaster except at the anteriormost part between the base of seta *ta*. Notogastral setae 10 pairs (of which some are uprooted, recognised only by their alveoli), setiform, short, smooth. None of the notogastral setae reach the origin of the next row of setae. Length of notogastral setae varies between 12-18. Mutual distance of notogastral setae greatest between *ms-ms* (77), followed in decreasing order by r_2-r_2 (76), r_1-r_1 (70), *ta-ta* (68), *ti-ti* (65) and p_1-p_1 (26). Fissure *ia* situated below seta *ta*, *im* above r_3 and *ip* between p_1 and p_2.

Epimeral region : Each plate of ep_1 and ep_2 incompletely separated from each other. ep_3 and ep_4 fused together. The epimeral plates show faint light spots of irregular shape and size. Epimeral setal formula 3-1-2-3. All epimeral setae minute, smooth, setae on ep_2 arising from light spots.

Anogenital region : Genital aperture nearly as long as broad. Genital setae 6 pairs, minute, smooth. A distinct, small, band like structure present at the anterior part of genital plate. Aggenital setae a little longer than genital setae, smooth. Anal plate little longer than broad, anal setae smooth, long (12) but shorter than ad_3 and ad_2. Fissure *iad* parallel to the anal field. 3 pairs of adanal setae which are long, smooth, ad_3 and ad_2 having twice the length of aggential setae, ad_1 minute. Setae ad_3 preanal, ad_2 situated lateral to the lower end of *iad*, ad_1 postanal.

Legs. : Monodactylous.

Holotype : Adult female, INDIA : Himachal Pradesh : Kangra District : 7 km. north of Binwa, 2500 m., 30.v.1990, from litter and soil under Oak (*Quercus* sp.), coll. D. Sengupta.

Paratype : One female, data same as holotype.

Remarks : The new species from Himachal Pradesh belongs to the species-group of *Arcoppia* having three branches of the sensillus. It shows closest resemblance with *A. brachyramosa* Hammer, 1977 mainly in the features like tripartite rostrum; thin, convex and transverse line at the base of rostral setae; 3-branched sensillus; nature of costular and transcostular line and tuberculate microsculpture at the base of prodorsum. But *A. montana* sp. nov. can be distinctly separated from *A. brachyramosa* on the basis of following characters : rostral setae without barb, their length less than twice their mutual distance; lamellar setae having the same mutual distance as between rostral setae; head of sensillus with distinctly asymmetrical branches, the longest branch having nearly the same length as that of the sensillus; nature of microsculpture at the base of

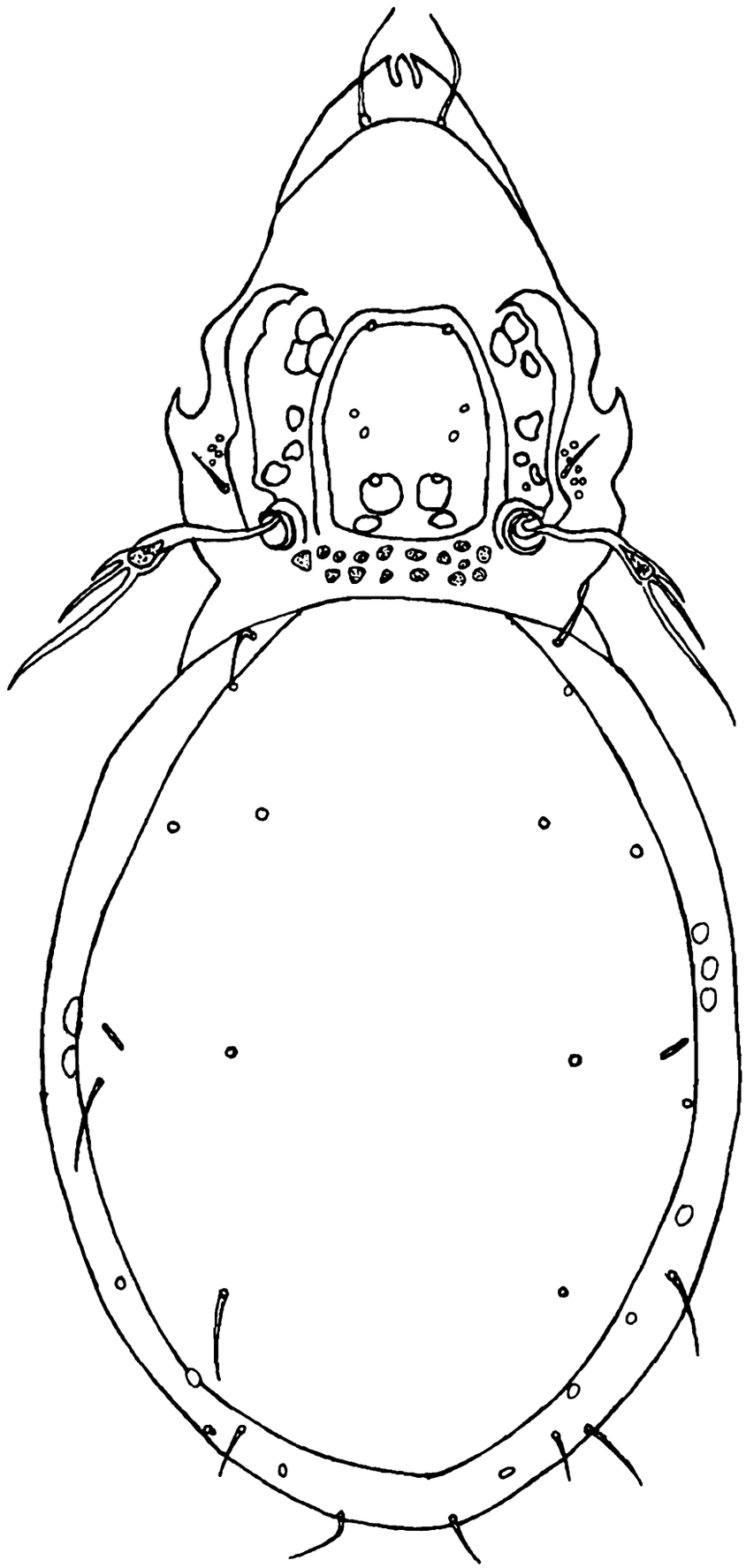

Fig. 9. *Arcoppia montana* sp. nov. : dorsal aspect.

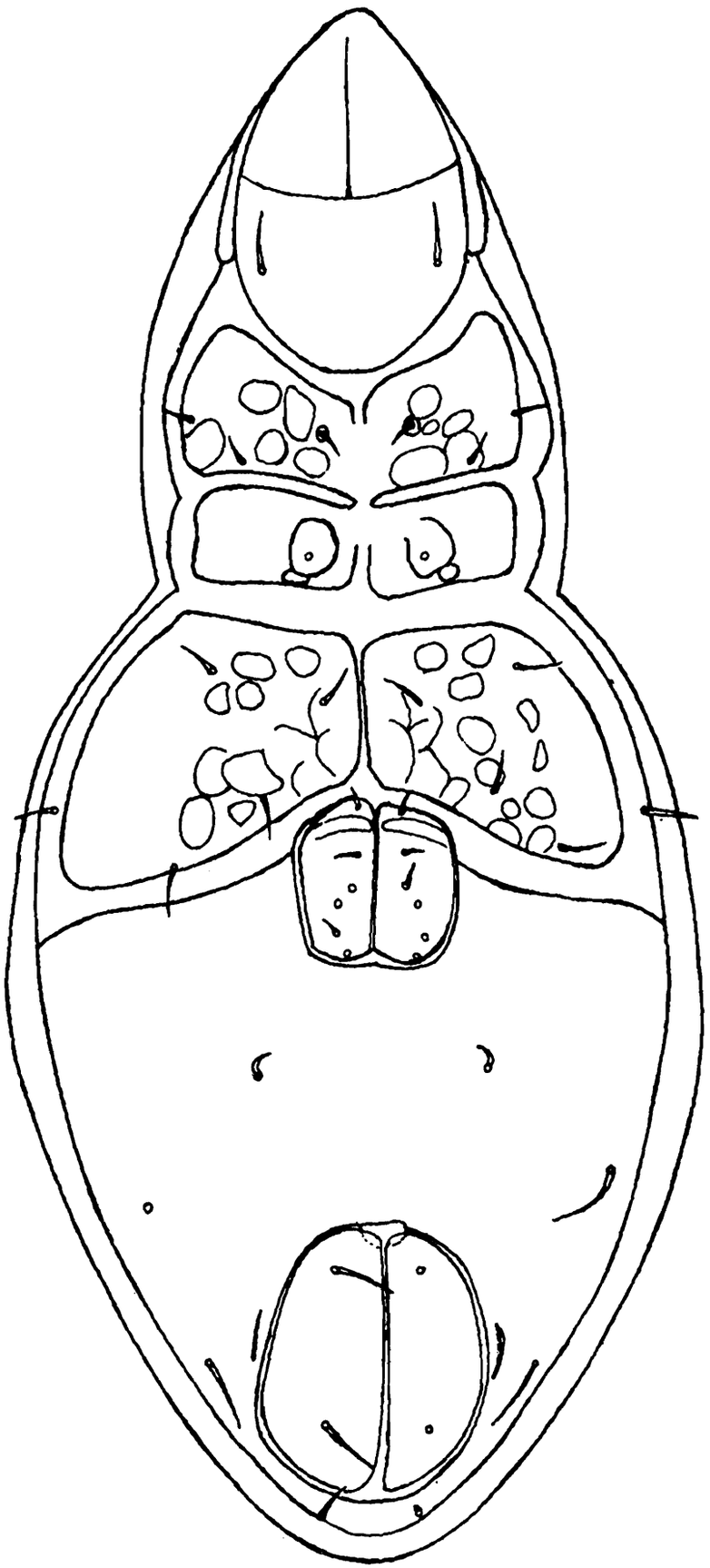

Fig. 10. *Arcoppia montana* sp. nov. : ventral aspect.

prodorsum different; anterior border of notogaster without chitinous band but lateral and posterior parts with prominent band; shorter notogastral setae which are devoid of barbs; small chitinous band at the anterior aspect of genital plate; epimeral, aggential, anal and adanal setae smooth.

Arcoppia indica sp. nov.
(Text Figs. 11-12)

Colour : Yellowish brown.

Size : Length 292, Width 144.

Prodorsum : Rostrum tripartite. Rostral setae originating from small tubercles situated on a thin, arcuate line at the anterior part of the prodorsum. Rostral setae (21) long, thin, smooth, less than twice their mutual distance (16), directed forward being curved outward at the basal half, then inward at the upper half. The costular lines are distinct which originate from the bothridium and converge anteriorly to join the prominent horizontal transcostular band. A thin, concave line exists in front of the anterior border of transcostula. A faint, broken line joins the basal part of the costular lines and extends between the bothridia, thus forming an enclosed area on the prodorsum. The lamellar setae (uprooted, not studied) originating close to the posterior border of transcostula with slightly greater mutual distance (18) than that of rostral setae. The interlamellar setae (16) thin, smooth, shorter than their mutual distance (28). Sensillus with a flat, dialated head beset with pseudoscales and with four distal branches (one paratype shows five distal branches). The length of the branches gradually increases from anterior to posterior aspect, measuring18-25. The larger branch (25) is shorter than the length of the stalk of the sensillus (30).

A pair of light areas are found near the base of each interlamellar setae. Two broad tooth like prodorsal projections exist below the bothridia, their tips facing the lower border of the bothridium, the latter with some posteriorly directed processes. There are three large light spots in the area between lamellar line and lateral ridge on each side. The integument on the lateral aspect of the basal half of the prodorsum shows conspicuous, chitinous, ribbon like microsculptures which touch the dorsosejugal suture and are alternately short and long.

Notogaster : Oval in shape, devoid of any microsculpture, with 10 pairs of setae (some of which were uprooted and could not be seen) and broad chitinous band along the entire margin of the notogaster. Notogastral setae moderately long (9-23), simple, very thin and finely pointed at the tip. The distance between *ms-ms* (84) is greatest, followed in decreasing order by r_2-r_2 (80), *ta-ta* (70), *ti-ti* (61), r_1-r_1 (54) and p_1-p_1 (16). Fissure *ia* situated below *ta, im* between *ms* and r_3 and *ip* between p_1 and p_2.

Epimeral region : Each half of epimere incompletely separated from the other, ep_2 completely separated from each other, ep_3 and ep_4 fused together. Epimeral setal formula 3-1-3-3. The epimeral plates show faint light spots of irregular shape and size. All epimeral setae smooth.

Anogenital region : Genital plate as long as broad (28). There are 6 pairs of smooth and short (7) genital setae. 3 pairs of adanal setae (ad_1-4.5, ad_2-9 and ad_3-14), smooth. ad_2 located nearer

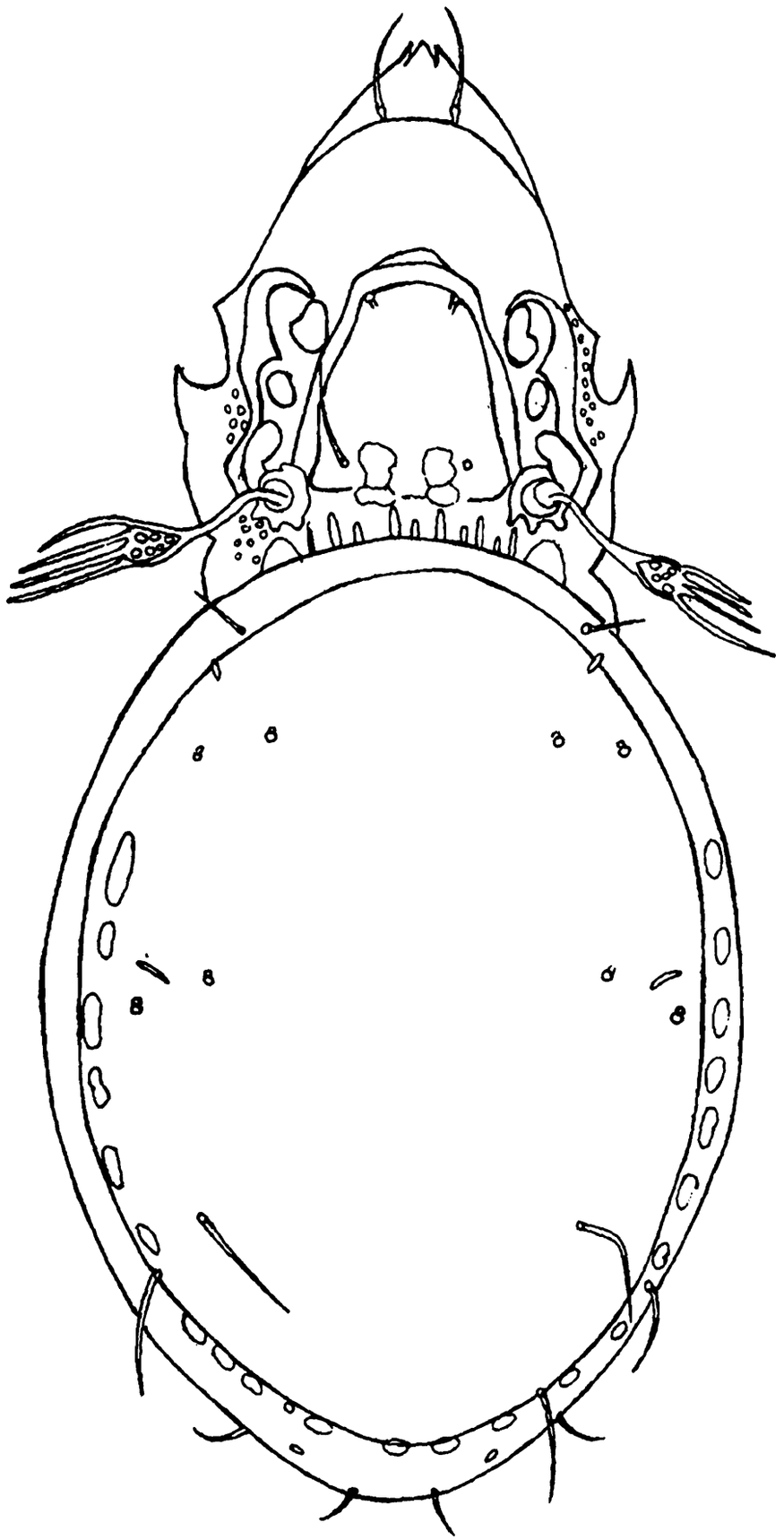

Fig. 11. *Arcoppia indica* sp. nov. : dorsal aspect.

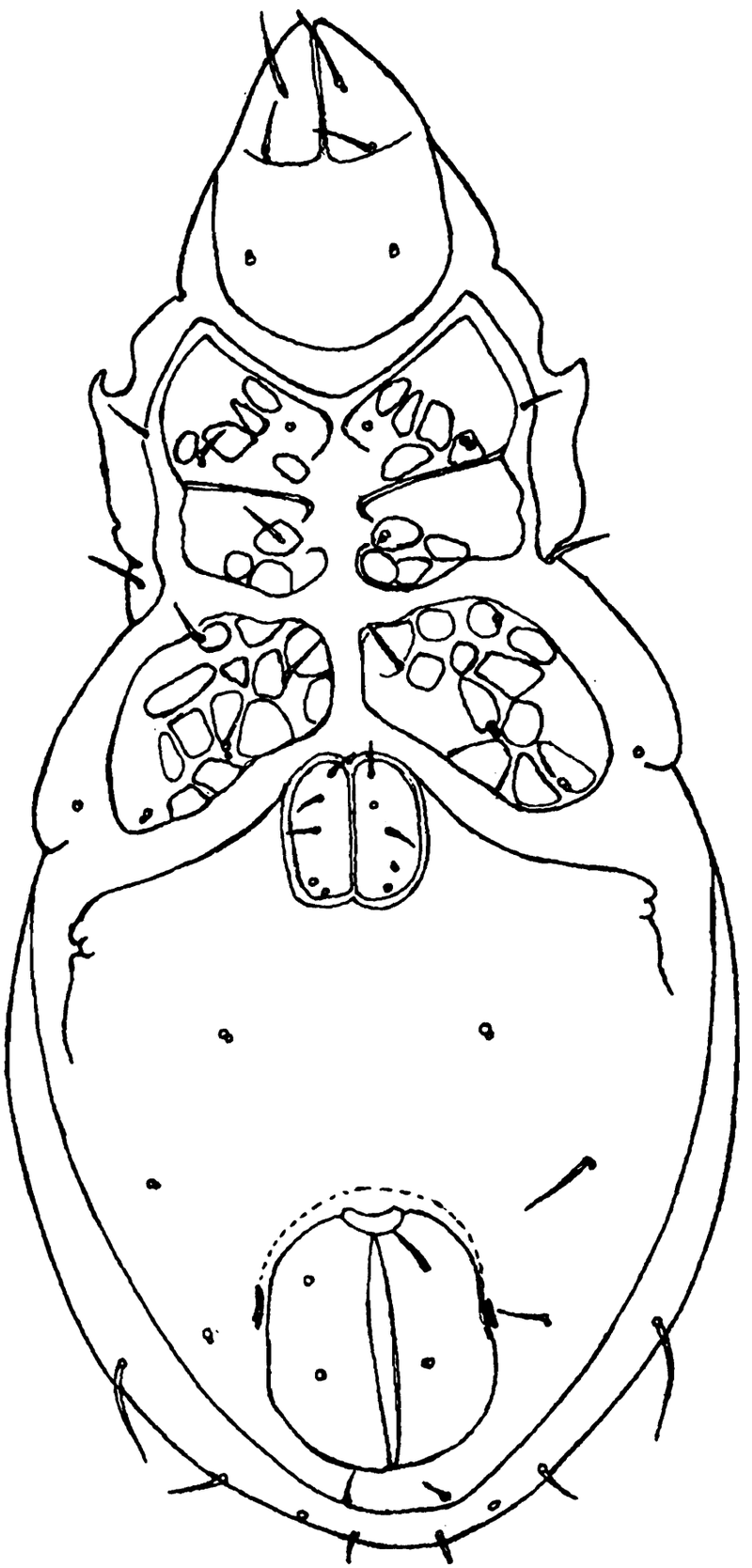

Fig. 12. *Arcoppia indica* sp. nov. : ventral aspect.

to ad_3 than to ad_1, ad_1 postanal, ad_2 paranal and ad_3 preanal. Anal plate little longer than broad, anal setae smooth, fine, shorter (9) than both ad_3 and ad_2. Fissure *iad* paranal, located very close to lateral margin of anal aperture.

Legs : Monodactylous.

Holotype : Adult female, INDIA : Tripura : Rang Kang, 5 km towards Natunbazar from Amarpur, 4.ii.1992, from decomposed leaves beside paddy fields, coll. S. Saha.

Paratypes : 5 females, data same as holotype.

Remarks : The new species closely resembles *A. vittata* Hammer, 1979 in the presence of sensillus with flat head having four branches, shape and position of notogastral setae and position of fissure *ia* and *im*. But the new species can easily be distinguished from Hammer's species by the presence of a faint line at the anterior of transcostula, the head of the sensillus beset with pseudoscales and four distal branches which are gradually increasing in length, two tooth like prodorsal projections opposite the posterior margin of bothridium, posterior margin of bothridial cup with three projections in new species. Further in the new species the posterior half of the prodorsum with fine, prominent granules. In *vittata*, there are four short conspicuous chitinous ribbons between the pseudostigmata, but in the new species, there are about ten such structures of two types, long and short, which are alternately arranged.

SUMMARY

The genus *Arcoppia* Hammer, 1977 from Indian soils is discussed in this paper. Five new species, *viz.*, *A. meghalayensis* (Meghalaya), *A. tripuraensis* (Tripura), *A. sambhui* (West Bengal), *A. montana* (Himachal Pradesh) and *A. indica* (Tripura) are described. A key is provided for identification of nine Indian species which include five new species described and four known species, *viz.*, *A. bidentata* Hammer, 1979, *A. rotunda* Hammer, 1979, *A. meadami* Balogh and Balogh, 1986 and *A. fenestralis orientalis* Balogh and Balogh, 1986 which were earlier recorded from India.

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Rec. zool. Surv. India, **98**(Part-2) : 119-121, 2000

A NEW SPECIES OF THE GENUS *NEOSCONA* SIMON (ARANEAE : ARANEIDAE) FROM MADHYA PRADESH, INDIA

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INTRODUCTION

The spiders of the genus *Neoscona* are little known in Indian fauna. The genus was established by Simon in 1864 with the Type-species *Neoscona anabesca* (Walckenaer). Tikader (1982) reillustrated and redescribed seventeen species from different parts of India in *Fauna of India* series.

While studying the spider collection collected by the second author from different areas of Jabalpur city, we came across a new species of the genus *Neoscona* which is described here.

The type specimen will in due course be deposited in the National collection, Zoological Survey of India, Calcutta.

Neoscona platnicki sp. nov.

General : Cephalothorax and legs brown, abdomen greyish brown. Total length 7.80 mm. Carapace 3. 50 mm. long. 2.70 mm. wide; abdomen 5.00 mm. long, 3.60 mm. wide.

Cephalothorax : Longer than wide, narrowing in front, clothed with pubescence and hairs, provided with two dark brown bands on lateral sides, one double line starting just behind the median eyes and ending before the thoracic groove. Ocular quad longer than wide and wider in front than behind. Medians encircled by black rings; anterior medians larger than posterior medians; lateral eyes close, both rows of eyes recurved. Sternum heart-shaped, pointed behind, clothed with pubescence and hairs, dark brown, provided with a yellow mid-longitudinal bar. Labium wider than long, dark brown with pale distal border. Maxillae longer than broad, yellowish and provided with distinct scopulae. Chelicerae strong, light brown with prominent boss. Legs long and strong, clothed with hairs and spines.

Abdomen : Longer than wide, nearly perfect oval, clothed with pubescence and hairs, overlapping on the cephalothorax and provided with a mid-dorsal, greyish yellow band running the entire length of the abdomen. Lateral sides brownish with blackish lines and spots. Ventral side brown; a big deep brown patch bordered by yellow spots present between the epigastric furrow and spinnerets. Epigyne with a long and thin scape as in figs. 2 & 3. Internal genitalia as in fig. 4.

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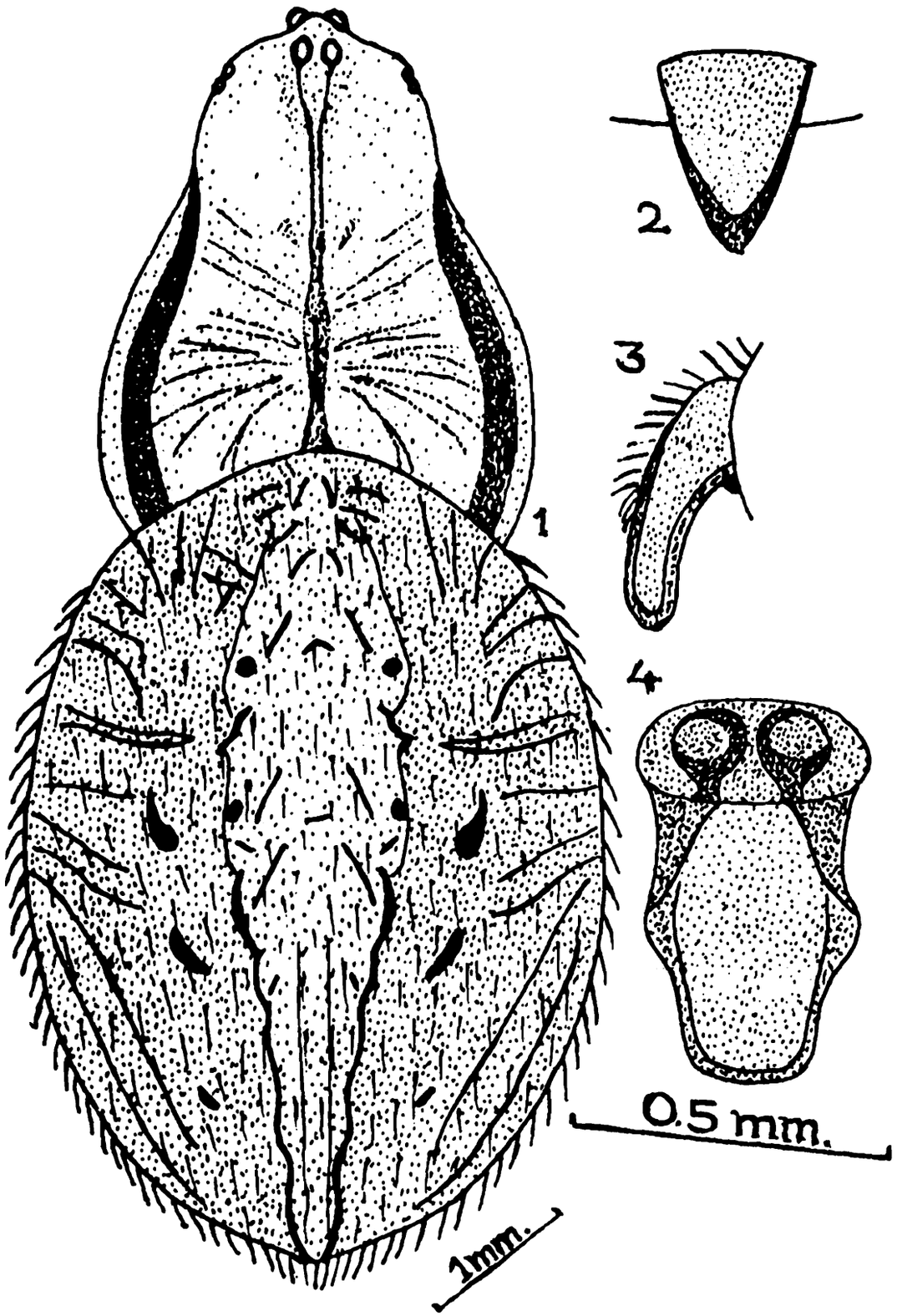

Figs. 1-4 *Neoscona platnicki* sp. nov. - 1. Dorsal view of female, legs omitted.; 2. Epigyne, ventral view.; 3. Epigyne, lateral view.; 4. Internal genitalia.

Type - specimen : Holotype : Female in spirit, other details as above.

Type - locality : Sanjivani Nagar, Jabalpur, M.P., India. Coll. *Pawan Gajbe*, 8.8.1998.

This species resembles *Neoscona theis* Walckenaer but differs from it as follows : (i) Cephalothorax with two dark brown bands on lateral sides but in *N. theis*, cephalothorax with two lateral and one mid-longitudinal dark brown bands. (ii) Epigyne and internal genitalia also structurally different.

ACKNOWLEDGEMENT

The authors are grateful to Dr. J. R. B. Alfred, Director, Zoological Survey of India, Calcutta for providing necessary facilities.

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Rec. zool. Surv. India, 98(Part-2) : 123-125, 2000

A NEW SPECIES OF THE GENUS *OXYOPES* LATREILLE (ARANEAE : OXYOPIDAE) FROM JABALPUR, MADHAYA PRADESH, INDIA

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INTRODUCTION

Spiders of the family Oxyopidae have received very little attention in India. The genus was established by Latreille, 1804 with the type species *Oxyopes heterophthalmus* Latreille. Since the establishment of the genus, Pocock (1901) described four species of *Oxyopes*. Sherriffs (1951) redescribed and figured Pocock's species of *Oxyopes* found in the oriental region. Tikader (1965, 1969, 1970), Patel (1977), Gajbe (1992) described eleven and one species respectively.

While studying the spiders of the family Oxyopidae collected by the second author from different areas of Jabalpur city, we came across a new species of *Oxyopes* Latreille which is described here.

The type specimen in due course will be deposited in the National Collection, Zoological Survey of India, Calcutta.

Oxyopes pankaji sp. nov.

General : Cephalothorax, legs and abdomen reddish-green. Total length 10.00mm. Carapace 3.70mm. long, 2.90mm. wide; abdomen 6.10mm. long, 2.50mm. wide.

Cephalothorax : Longer than wide, cephalic region high and broad, clothed with fine hairs and some deep brown special type of blunt hairs mainly on the lateral sides and mid-thoracic region as in fig. 1. Center of thorax with a sharp fovea. Eyes pearly white: anterior row strongly recurved, posterior row procurved; posterior medians and laterals equi-distant to each other; base of each eye encircled with a black patch, anterior medians smallest of all eyes. Clypeus long, provided with two black lines as in fig. 2. Sternum heart-shaped, pointed behind, clothed with fine hairs and conspicuous long spines. Legs long and strong, clothed with fine hairs and long spines; femora of all legs provided with longitudinal black lines.

Abdomen : Long, narrowing behind, clothed with fine hairs, anterior mid-dorsally with a lens-shaped light greenish patch which is bordered by brownish, whitish and light greenish stripes. Lateral sides blackish with three pairs of silvery white stripes as in fig. 1. Ventral side dirty white but mid-ventrally provided with a broad deep brown band extending from epigastric fold to spinnerets. Epigyne as in fig. 3. Internal gentalia as in fig. 4.

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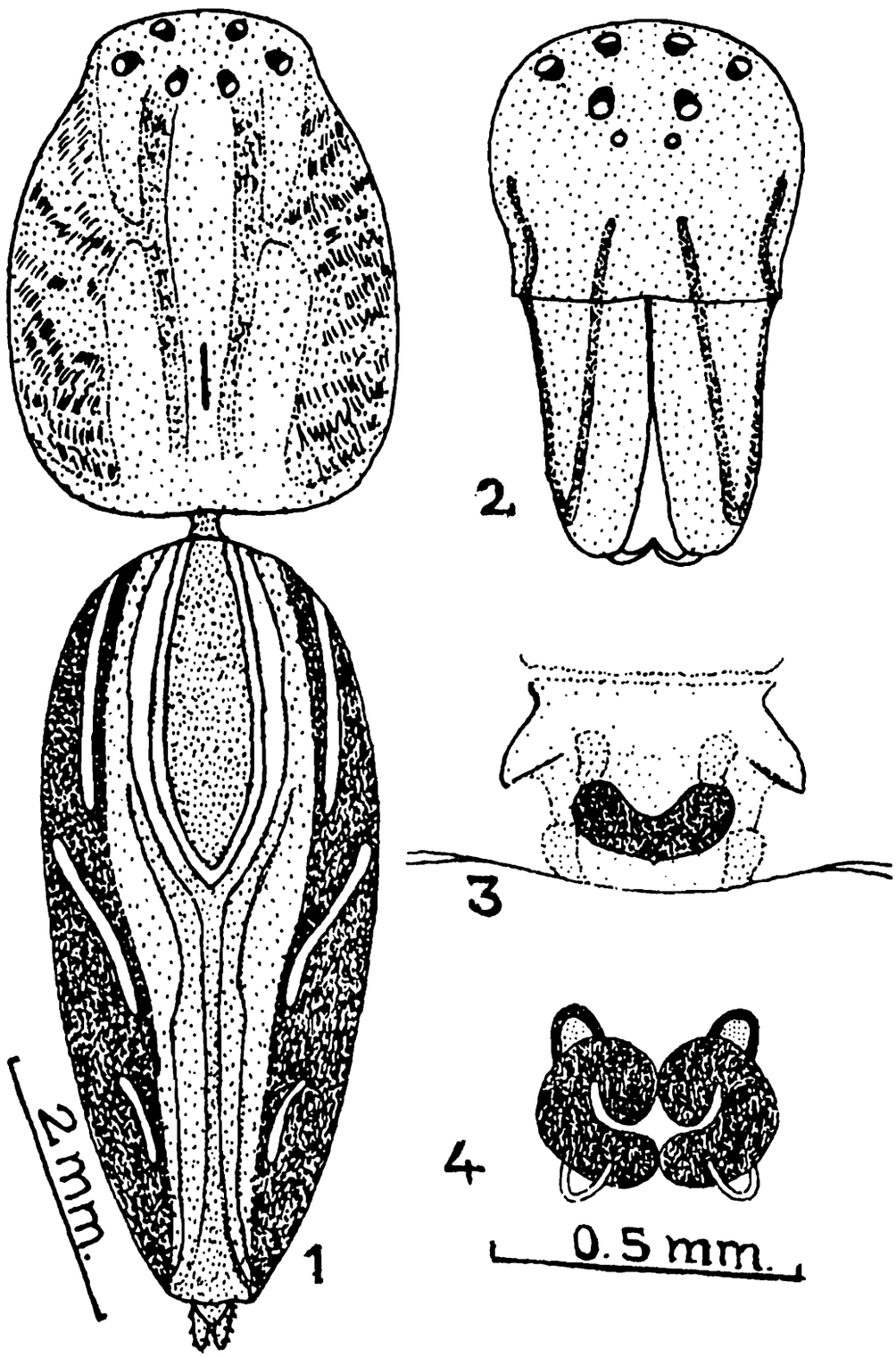

Figs. 1-4 *Oxyopes pankaji* sp. nov. 1. Dorsal view of female, legs omitted.; 2. Clypeus.; 3. Epigyne.; 4. Internal genitalia.

Type-specimen : Holotype : female in spirit, other details as above.

Type-locality : MR-4 Road, Jabalpur, M.P., India; Coll. *Pawan Gajbe*, 16.8.1998.

This species resembles *Oxyopes sunandae* Tikader but can be distinguished from it as follows : (i) Abdomen dorso-laterally blackish with three pairs of silvery white stripes but in *O. sunandae, such* stripes are absent. (ii) Epigyne and internal genitalia also structurally different.

ACKNOWLEDGEMENT

We are grateful to Dr. J. R. B. Alfred, Director, Zoological Survey of India, Calcutta for facilities.

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Tikader, B. K. 1969. On some new species of spiders of the family Oxyopidae from India. *Oriental Ins.*, 3 : 33-36.

Tikader, B. K. 1970. Spider fauna of Sikkim *Rec. zool. Surv. India*, 64 : 69-81.

Rec. Zool. Surv. India, **98**(Part-2) : 127-130, 2000

PODAGRION SCYLLA FERNANDO (HYMENOPTERA : CHALCIDOIDEA : TORYMIDAE) PARASITIC ON OOTHECA OF *HIERODULA* SP. (MANTODEA : INSECTA) FIRST RECORD FROM INDIA

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INTRODUCTION

Podagrion Spinola is represented in all warmer regions of the world (100 spp.). All the species of the genus are parasites in the oothecae of mantids and there are 36 species known from the Oriental Region (Grissell, 1995). Narendran (1994) recorded 24 species of *Podagrion* from the Indian subcontinent. *Podagrion scylla* was described from Sri Lanka based on 12 female and 8 male specimens reared from the ootheca of mantid *Hierodula membranacea* without designating the holotype (Fernando, 1957). Narendran (1994) and Grissell (1995) listed this species and mentioned the type depository as University of Ceylon, Colombo. They did not examine the type and Narendran mentioned the probable loss of syntypes of the species. Recently I could identify the species *P. scylla* from a collection of Chalcidoids provided by Dr. Ghate, Pune for identification. The specimens were reared from the ootheca of the mantid *Hierodula* sp. This is the first record of *Podagrion scylla* from India and the first time it is being reported after it was originally described from Sri Lanka in 1957.

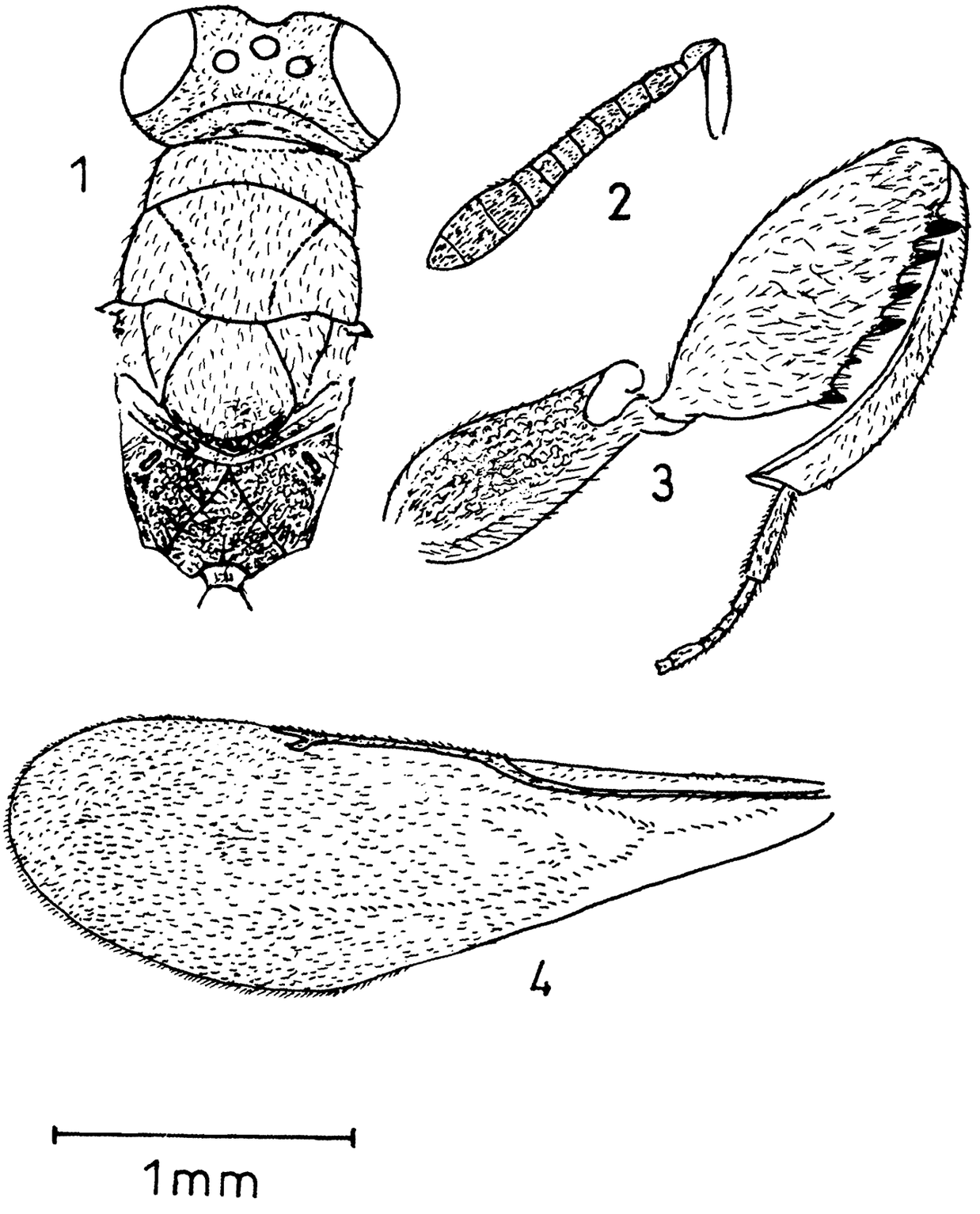
Since the original description of the species is inadequate, a redescription is provided here based on the female specimens examined.

Abbreviations used : F1-F7 — Funicular segments 1 to 7; OOL — Oculo-Ocellar length; POL — Postero-Ocellar length; SMV — Submarginal vein; MV — Marginal vein; PMV — Postmarginal vein; STV — Stigmal vein.

Podagrion scylla Fernando
(Figs. 1-4)

Podagrion scylla Fernando, 1957 : 215-216, 12 Females, 8 Male syntypes, Rampur, Sri Lanka (Syntypes probably lost).

Female : Length, Body 3 mm, ovipositor 4mm. Head and thorax dark metallic green with brassy reflection; gaster blackish brown, paler ventrally, dorsally with metallic blue reflection; ovipositor sheaths blackish brown; ovipositor reddish brown. Antennae with scape dark testaceous, remainder brown with club black. Fore and mid coxae and femora and hind tibiae dark brown;



Figs. 1-4. *Podagrion scylla* Fernando. 1. Head and thorax in dorsal view; 2. Antenna; 3. Hind leg; 4. Forewing.

hind coxae and femora blackish brown, metallic blue reflection on fore and hind coxae and hind femora; fore and mid tibiae and all tarsi dark testaceous. Tegulae dark brown; wing membrane hyaline; veins pale brown; pubescence of wing dark brown and of body silvery white.

Head : (Fig.1) 1.1x as broad as thorax, in dorsal view 1.7x as broad as long and 1.2x as broad as heigh in front view; sculpture finely reticulate punctate, more finer on lower face and gena; pubescence short, denser on lower face; occiput margined posteriorly, carina weak, but distinct; temple length about 0.3x eye length; POL 3x OOL; inter ocellar area slightly raised; anterior margin of clypeus straight; scrobal cavity deep, ending vaguely less than one ocellar diameter below median ocellus; parascrobal area slightly raised; malar space length 0.36x eye height; eyes seperated by little less than their individual height, which is 1.3x the maximum diameter. Antennae inserted below middle of face (Fig. 2); scape reaching almost level of vertex, length 0.6x eye height; pedicel plus flagellum length 1.4x head width; F1 little shorter than pedicel; anelli transverse; F2 as long as F1; F3 slightly shorter than F2 and as long as F4; F5 shorter than F4; F6 and F7 equal but shorter than F5; club almost as long as 5 preceding segments combined, sutures visible.

Mesosoma : (Fig. 1) Length 1.9x width; uniformly and finely reticulate; pronotal collar not margined anteriorly. Mesoscutum width 1.6x length. Scutellum less convex, posterior margin angulate, median length slightly shorter than mesoscutum, sub apical margin with a row of small punctures, reticulation finer on sides. Dorsellum almost smooth. Propodeum with median length little shorter than scutellum, uniformly and moderately reticulate with an inverted 'V' shaped carina; spiracles elongate, oval. Metapleuron almost shiny, with long white hairs on the margins. Upper mesepimeron shiny, seperated by a small deep fovea from the lower mesepimeron, which is finely reticulate. Mesepisternum moderately reticulate with long white hairs anteriorly. Prepectus finely reticulate. Hind coxa uniformly and finely reticulate, hind femora almost shiny, very finely reticulate with 6 teeth, the second tooth smallest (Fig. 3). Forewing (Fig. 4) length 2.8x width, pubescence dense, speculum and basal cell closed below; basal vein setate; costal cell with 3 complete row or hairs on the upper part; MV 5x PMV. Relative lengths of SMV, MV, PMV and STV as 42, 25.5, 5.5 and 2.

Gaster : Petiole very short, gaster including petiole little longer than thorax (40 : 38); ovipositor 2.7x as long as gaster and 1.3x rest of the body.

Material examined : 4 females : INDIA : Maharashtra; Pune, i. 2000, Coll. H. V. Ghate (ex. ootheca of Mantis *Hierodula* sp.).

SUMMARY

Podagrion scylla Fernando is redescribed and reported for the first time from India.

ACKNOWLEDGEMENTS

I am grateful to the Director, Zoological Survey of India, Calcutta and the Officer-in-charge, Zoological Survey of India, Calicut for providing facilities and encouragement. I am also grateful to Dr. H. V. Ghate, Modern college, Pune for providing me the specimens for identification and

Dr. T. C. Narendran, Professor, University of Calicut for encouragement and useful suggestions.

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Rec. zool. Surv. India, 98(Part-2) : 131-139, 2000

SAC SPIDERS OF BANGLADESH-II : GENERA *CASTIANEIRA* KEYSERLING, *SPHINGIUS* THORELL AND *TRACHELAS* KOCH (ARANEAE : CLUBIONIDAE)

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INTRODUCTION

'Sac spiders' (Family Clubionidae) are one of the common predators of pest insects in agricultural crops In Bangladesh, very few works (Chowdhury & Nagari 1981; Chowdhury & Pal, 1984; Biswas, *et al.*, 1993; Okuma, *et al.*, 1993; Begum & Biswas, 1997; Biswas & Raychaudhuri, 1994) are available on these arthropods, although a number of works are found in different parts of the world (Pocock, 1900; Patel & Patel, 1973; Dyal, 1935; Tikader, 1975 '81; Tikader & Biswas, 1981; Majumder & Tikader, 1991; Dondale & Redner, 1982; Ono, 1989; Chen & Zhang, 1989; Platnick, 1987, '92; Platnick & Shadab, 1974; Reiskind, 1969; Locket & Millidge, 1951; Roberts, 1985; Koh, 1989; Shinkai & Takano, 1984; Yaginuma, 1986).

In India, Majumder and Tikader (1991) carried out a thorough study on these spiders. Their report contains a detailed description of 84 species belonging to 15 genera under 4 subfamilies. The present paper deals with a study of 3 (three) species on the genera *Castianeira* Keyserling *Sphingius* Thorell and *Trachelas* Koch of which *Trachelas devi* is described as new to science. The 2 (two) species of the genera *Castianeira* and *Sphingius* are new records for the country.

SYSTEMATICS

Genus : ***Castianeira*** Keyserling

1879. *Castianeira* Keyserling, Verh. Zool. Bot. Ges. Win., 29: 334.

1932. *Castianeira* : Mello-Leitao, Arach. Mus. Nac. Rio de Janeiro, 2: 12.

1981. *Castianeira* : Tikader, Bull. Zool. Surv. India, 4(3): 257.

1991. *Castianeira* : Majumder & Tikader, Rec. Zool. Surv. India, Occ. Pap. no. 102: 130.

Type-species : *Castianeira rubicunda* Keyserling, 1879

1. Department of Zoology, Government P. C. College, Bagerhat-9301, Bangladesh

Distribution : AFRICA; ASIA; EUROPE; CANADA; NORTH AMERICA; SOUTH AMERICA.

1. ***Castianeira zetes*** Simon

(Figs. 1-7)

1897. *Castianeira zetes* Simon, Bull. Mus. Hist. nat. Paris, 3(7) : 294.

1991. *Castianeira zetes* : Majumder & Tikader, Rec. Zool. Surv. India, Occ. Pap. no. 102 : 132.

Material examined : 1♀, P. C. College, Dist. Bagerhat, 8.ix.1990, coll. V. Biswas; 1♀,1♂ Gaurnadi, Dist. Barisal, 18.ii.1992, coll. V. Biswas; 2♀, 1♂, BRRI, Joydevpur, Dhaka, 18.xii.1992, coll. V. Biswas; 2♀, ADI, Faridpur, 2.ix.1992, coll. V. Biswas; 2♀, Bagharpara, Dist. Jessore, 12.iv.1992, coll. V. Biswas; 1♀, Shikerpur, Dist. Jhenidah, 2.vii.1993, coll. V. Biswas; 1♀, Lakmipur, Dist. Kustia, 12.iv.1993, Coll. V. Biswas; 1♀, BAU campus, Mymensingh, 15.v.1992, Coll. V. Biswas.

Distribution : BANGLADESH : Bagerhat, Barisal, Dhaka, Faridpur, Jessore, Jhenidah, Kustia, Mymensingh; INDIA (Majumder & Tikader, 1991).

Genus: ***Sphingius*** Thorell

1890. *Sphingius* Thorell, Ann. Mus. Civ. Stor. nat. Genova, 30: 285.

1897. *Thampilus*: Simon, Hist, nat. des Araign., 2(1): 154.

1931. *Sphingius*: Gravely, Rec. Indian Mus., 33: 269.

1991. *Sphingius*: Majumder & Tikader, Rec. Zool. Surv. India, Occ. Pap. no. 102 : 147.

Type-species : *Sphingius thecatus* Thorell, 1890

Distribution : ASIA.

2. ***Sphingius barkudaensis*** Gravely

(Figs. 8-14)

1931. *Sphingius barkudaensis* Gravely, Rec. Indian Mus., 33 : 271.

1991. *Sphingius barkudaensis* : Majumder & Tikader, Rec. Zool. Surv. India, Occ. Pap. no. 102 : 152.

Material examined : 1♀, Karapara, Dist. Bagerhat, 3.vii.1991, coll. V. Biswas; 1♀, Jhalokathi, Dist. Barisal, 5.ix.1994, coll. V. Biswas; 1♀, Pirojpur, Dist. Barisal, 11.v.1992, coll. V. Biswas; 2♀, Brahmanbaria, Dist. Comilla, 12.vii.1992, coll. V. Biswas; 2♀, Keshobpur, Dist. Jessore, 9.viii.1991, coll. V. Biswas; 1♀, 1♂, Harishankarpur, Dist. Jhenidah, 9.ix.1990, coll. V. Biswas; 2♀, Batiaghata, Dist. Khulna, 11.v. 1993, Coll. V. Biswas; 2♀, Alamdanga, Dist. Kustia, 28.v.1992, coll. V. Biswas; 1♀, BAU campus, Mymensingh, 8.ix.1992, Coll. V. Biswas.

Distribution : BANGLADESH : Bagerhat, Barisal, Comilla, Jessore, Jhendah, Kustia, Khulna, Mymensingh; INDIA (Majumder and Tikader, 1991).

Genus : **Trachelas** Koch

1866. *Trachelas* Koch, Die. Arach. Fam. Drassiden, : 346.

1991. *Trachelas* : Majumder & Tikader, Rec. Zool. Surv. India, Occ. Pap. no. 102 : 109.

Type-species : *Trachelas minor* Cambridge, 1872

Distribution : AFRICA; ASIA; AUSTRALIA; EUROPE; NORTH AMERICA; SOUTH AMERICA.

3. ***Trachelas devi*** n. sp.

(Figs. 15-21)

General : Cephalothorax brown ; legs yellow; abdomen black. Total body length 3.00 mm. Carapace length 1.10 mm. Carapace width 1.00 mm; abdominal length 1.90 mm; abdominal width 1.20 mm. Legs as in Table-1.

Cephalothorax : Longer than wide, anteriorly narrowing, posteriorly overlapped by abdomen; cephalic region raised; cervical furrows weakly distinct; posteromedially with a fovea; radial furrows deeply distinct. Eyes pearly-white, based with black band, unequal in size, anterolaterals largest; anterior row of eyes strongly recurved and posterior row nearly straight; anteromedian eyes close while posteromedians distantly placed; laterals closely placed; ocular quad longer than wide. Chelicerae brown, strong, both inner and outer margins with 2 teeth (Figs. 17). Maxillae and labium brown, maxillae broad, longer than wide (Figs. 18); labium broad, as long as wide (Figs. 18); both maxillae and labium anteriorly scopulate. Sternum dark brown, broad, nearly heart-shaped (Figs. 19). Legs long and slender, each of tibia and metatarsi I and II with 3 ventral spines; tarsi with 2 claws; leg formula 4132 and the measurements (in mm) as in Table-1.

Table-1 : Measurments (in mm) of different parts of legs of *Trachelas devi* n. sp.

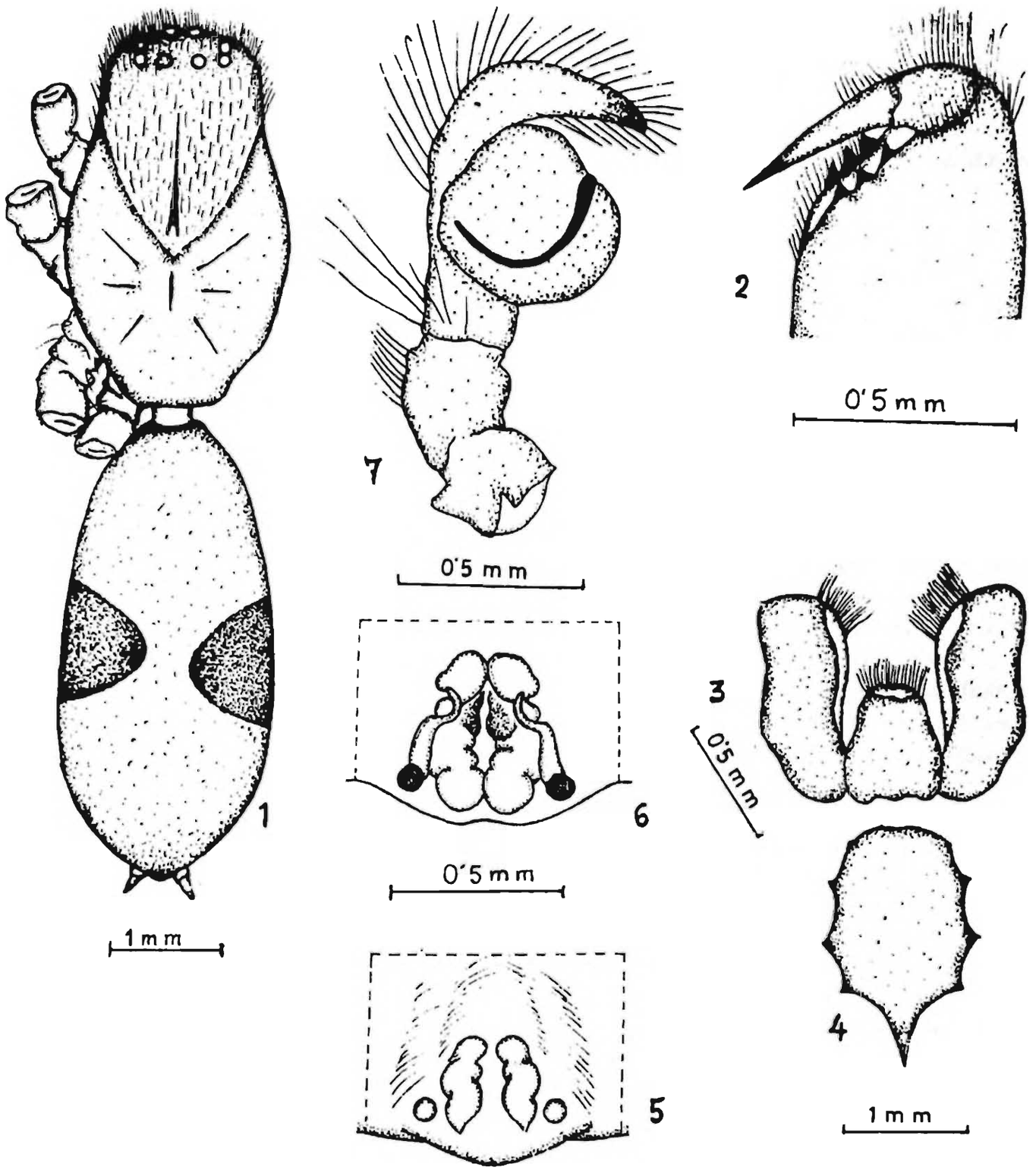
Leg	Femur	Patella	Tibia	Metatarsi	Tarsus	Total
I	0.7/0.7	0.2/0.2	0.3/0.3	0.9/0.9	0.3/0.3	3.0/3.0
II	0.6/0.6	0.3/0.3	0.5/0.5	1.0/1.0	0.4/0.4	1.18/1.18
III	0.5/0.5	0.8/0.8	0.7/0.7	0.2/0.2	0.6/0.6	2.8/2.8
IV	0.7/0.7	0.3/0.3	1.1/1.1	1.1/1.1	0.7/0.7	3.9/3.9

Abdomen : Oval, dorsum submarginally with serially arranged black patches leaving the white longitudinal mid-dorsal area (Figs. 15) Epigyne and internal genitalia as in figs. 20 and 21.

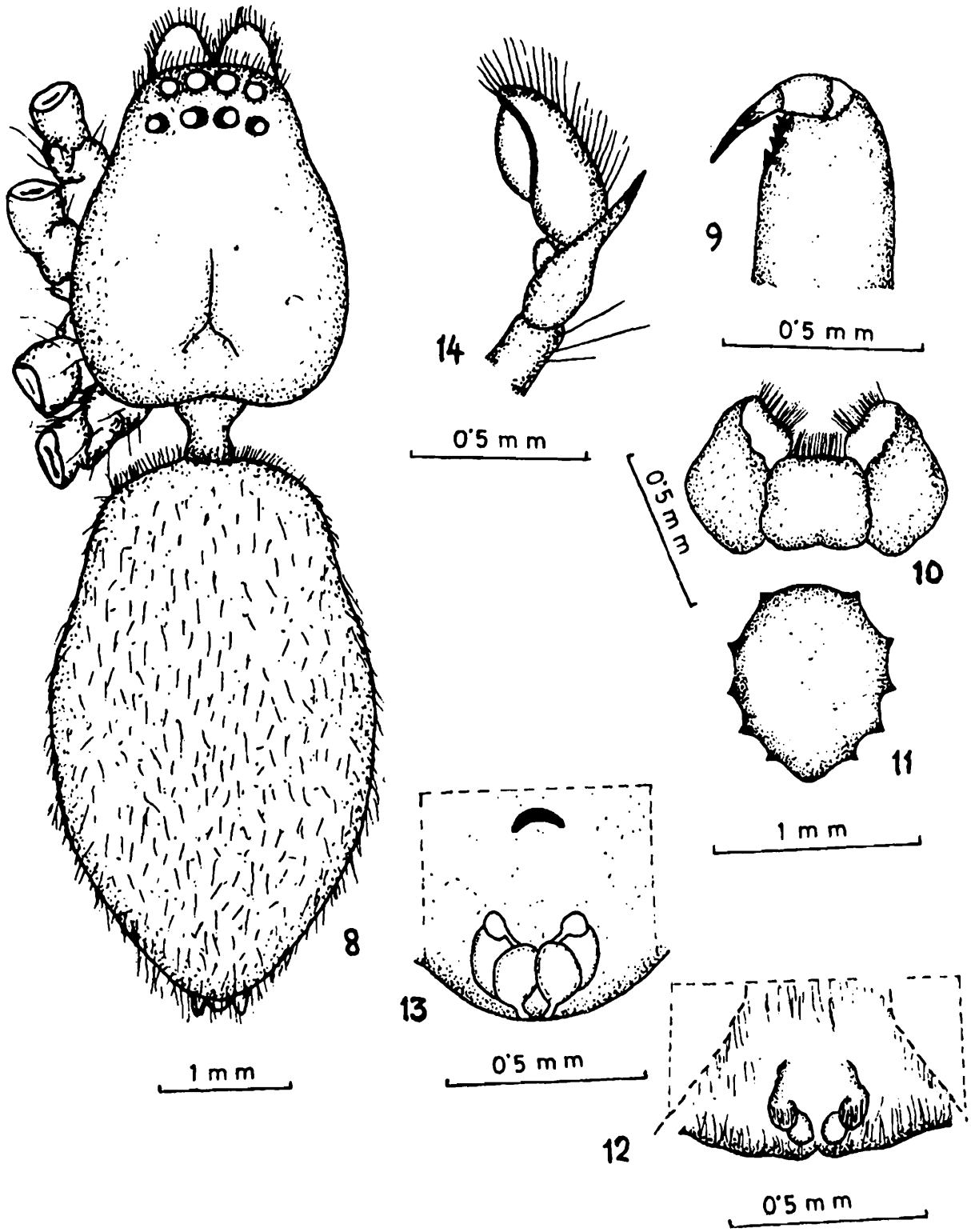
Male Unknown.

Holotype : Female in spirit.

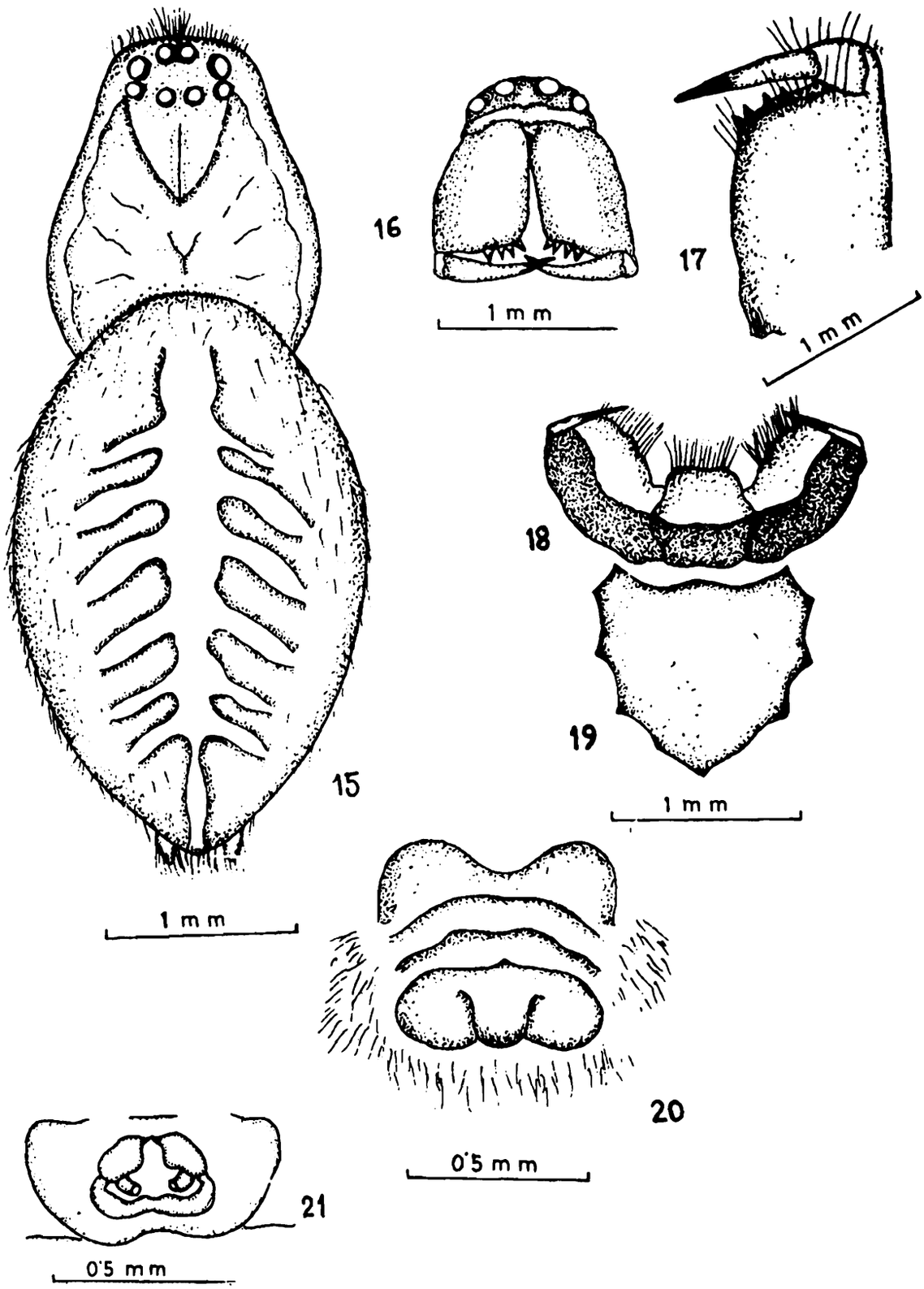
Types are at present in the Department of Zoology, Government P. C. College, Bagerhat and will be deposited to the Museum of the Department of Zoology, University of Dhaka, Bangladesh, in due course of time.



Figs. 1-7 : *Castianeira zetes* Simon Fig. 1 : Whole body (Dorsal view); Fig. 2 : Chelicera; Fig. 3 : Maxillae and Labium; Fig. 4 : Sternum; Fig. 5 : Epigynum; Fig. 6 : Internal genitalia; Fig. 7 : Male palp (retrolateral view)



Figs. 8-14 : *Sphingius barkudaensis* Gravely Fig. 8 : Whole body (Dorsal view); Fig. 9 : Chelicera; Fig. 10 : Maxillae and Labium; Fig. 11 : Sternum; Fig. 12 : Epigynum; Fig. 13 : Internal genitalia; Fig. 14 : Male palp (lateral view)



Figs. 15-21 : *Trachelas devi* n. sp. - Fig. 15 : Whole body (Dorsal view); Fig. 16 : Clypeus showing chelicerae and frontal eyes; Fig. 17 : Chelicera; Fig. 18 : Maxillae and Labium; Fig. 19 : Sternum; Fig. 20 : Epigynum; Fig. 21 : Internal genitalia

Etymology : The species is named after the famous Philosopher Dr. G.C. Dev of Dhaka University, Bangladesh.

Type-locality : BANGLADESH : Dhaka, date 24.ii.1992, Coll. Biswas.

Diagnosis : The Indian *Trachelas* species (Majumder & Tikader, 1991) do not seem to be related to the present species *T. devi* n. sp. because the latter is with abdomen broad at anterior 1/3rd region, without any sigilla, cephalic region not constricted, contiguous anteromedian and lateral eyes and typical epigynum. These sufficiently justify the erection of the new species. Abdominal shape of the present species even though may be related to the *T. taiwanicus* (Hayashi & Yoshida, 1993) but stands distinct because of the characters indicated above. The species even show too many structural differences, though it has a similarity in the general appearance with that of *T. japonicus* (Shinkai & Takano, 1984).

Therefore, the species is described as new to science.

SUMMARY

The sac spiders of the genera *Castianeira* Keyserling, *Sphingius* Thorell and *Trachelas* Koch, Bangladesh, is represented by each of single species *C. zetes* Simon, *S. barkudaensis* Gravely and *T. devi* n. sp.

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STUDIES ON *CHLOROCYTUS* GRAHAM (HYMENOPTERA : CHALCIDOIDEA : PTEROMALIDAE) OF THE INDIAN SUBCONTINENT WITH THE DESCRIPTION OF A NEW SPECIES

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INTRODUCTION

The genus *Chlorocytus* was erected by Graham in 1956 with the type species *Pteromalus pulchripes* Walker designated by him. Though well represented in Europe (about 20 spp.) and Nearctic regions (more than 12 spp.) the genus is little known from East Africa, Asia and Australia (Boucek, 1988, Gibson *et al* 1997). Members of the genus are parasites of insect larvae, mainly of Diptera, Hymenoptera and Coleoptera boring in stems of Gramineae. From the Indian subcontinent two species are known under the genus viz. *C. murriensis* Graham from Pakistan and *C. xanthopus* (Cameron) from Pakistan and India (Delhi) (Farooqi & Subba Rao, 1986). Here one new species *C. indicus* is described under the genus from India. The single extant type of *C. xanthopus* (Cameron) (Lectotype) in BMNH designated by Boucek (Boucek, *et. al.* 1979) is redescribed here. Key to seperate the species of *Chlorocytus* from the Indian subcontinent is also provided.

Abbreviations used : F1-F6 — Funicular segments 1 to 6; POL — Postero-Ocellar length; OOL — Oculo-Ocellar length; SMV — Submarginal vein; MV — Marginal vein; PMV — Post marginal vein; STV – Stigmal vein; T4 — Gastral tergite 4; BMNH — British Museum (Natural History), London, U.K.

Key to the species of *Chlorocytus* from the Indian subcontinent

1. Pronotal collar not sharply margined; median area of propodeum with coarse wrinkles and distinct foveolae subapically; median carina not complete (Fig. 4). .... *C. xanthopus* (Cameron)

- Pronotal collar sharply margined; median area of propodeum without coarse wrinkles and subapical foveolae, median carina complete or nearly so, fairly sharp. 2

2. Propodeum with plicae indicated only anteriorly, median area moderately reticulate; antenna with F6 distinctly longer than wide; MV 2.7x as long as STV; general colour including most of gaster metallic blue; length. 1.6-2.3 mm. .....*C. indicus* sp. nov.

Propodeum with plicae sharp over at least posterior half, median area less strongly sculptured; antenna with F6 quadrate or hardly elongate; MV 1.7-2x as long as STV; colour of head and thorax green or bluish green; gaster black with green to blue and bronze reflection; length 2.6-3.15mm. ..... *C. murriensis* Graham

1. ***Chlorocytus xanthopus*** (Cameron)
(Figs. 1-4)

Etroxys xanthopus Cameron, 1906 : *J. Bombay Nat. Hist. Soc.* XVII. 97. F. Pakistan : Quetta (Lectotype BMNH).

I have examined the lectotype of this species designated by Boucek in BMNH. As the original description of the species by Cameron (1906) is inadequate for identifying the species, the lectotype is re-described here.

Lectotype : Female : Length 3mm. Metallic bluish green with brassy tint; gaster brown with slight greenish reflection; scape and pedicel testaceous, remainder of antenna brown; fore and mid coxae brown; hind coxae concolorous with thorax, remainder of legs testaceous with tips of tarsi brown. Tegulae testaceous; wing membrane hyaline, veins yellow.

Head : (Fig. 1) 1.1x as broad as thorax, closely and distinctly punctured, more coarsely on frons and vertex; clypeus radiately striated, clearly demarkated from rest of the face, lower margin shallowly emarginate. In dorsal view head width 2x length, in front view width 1.3x height; temple length about half of eye length; POL 1.4x OOL; malar space length 0.54x eye height; eyes seperated by 1.3x their height. Antennae inserted a little below middle of face; scrobe locally deep; scape slender, slightly curved, length 0.83x eye height; pedicel plus flagellum length 1.1x head width; pedicel as long as F1; anelli equal; club as long as two preceding segments combined.

Mesosoma : Uniformly reticulate punctate. Pronotal collar raised in the anterior margin, margin not sharp. Mesoscutum width 2x length. Scutellum as long as wide, convex. Propodeum (Fig. 4) finely reticulate, median area produced beyond hind margin of supracoxal flanges, with several irregular wrinkles; median carina broken in the middle; plicae almost complete, slightly broken medially; basal foveae deep; spiracles large and oval. Mesopleuron moderately reticulate except on upper mesepimeron shiny with a small fovea between upper and lower mesepimeron. Metapleuron finely reticulate with transverse furrows on upper and lower margins, which are narrowed at bases. Prepectus finely reticulate. Forewing (Fig. 2) length 2.6x width; pubescence less dense, basal part almost bare; basal vein not setate; marginal fringe small. Relative lengths of SMV, MV, PMV and STV as 38, 20.5, 21.5 and 10.

Gaster : (Fig. 3) Elongate, lanceolate, longer than head and mesosoma combined (1.1x), 3.7x as long as wide in dorsal view and 2.3x as long as hind tibia.

Material examined : Lectotype : Female : Quetta (Baluchistan), vi. 1902, Nurse coll. (BMNH coll. type Hymenoptera No. 6. 705).

2. ***Chlorocytus indicus*** sp. nov.
(Figs. 5-8)

Female : Length 1.6-2.3mm. (Holotype 2.2mm). Bright metallic blue with golden reflections; Head little darker; scape and pedicel dark testaceous, remainder of antenna brown; fore and mid coxae brown; hind coxae concolorous with thorax, remainder of legs yellow with tips of tarsi brown; tegulae testaceous; wing membrane hyaline, veins pale brown.

Head : (Figs. 5 & 6) 1.3x as broad as thorax, closely and distinctly punctate, vertex more coarsely reticulate; in dorsal view head width 2x length and in front view width 1.3x height; temple length 0.5x eye length; POL 1.3x OOL; malar space length half of eye height; eyes seperated by 1.3x their height; clypeus demarkated from rest of the face, lower margin emarginate. Antennae (Fig. 6) inserted a little below middle of face; scape reaching median ocellus, not beyond level of vertex, 0.82x as long as eye height; pedicel plus flagellum length 1.2x head width; pedicel little shorter than F1, which in turn little longer than F2; F2-F4 equal; F5 little shorter than F4; F6 little shorter than F5; club almost as long as two preceding segments combined.

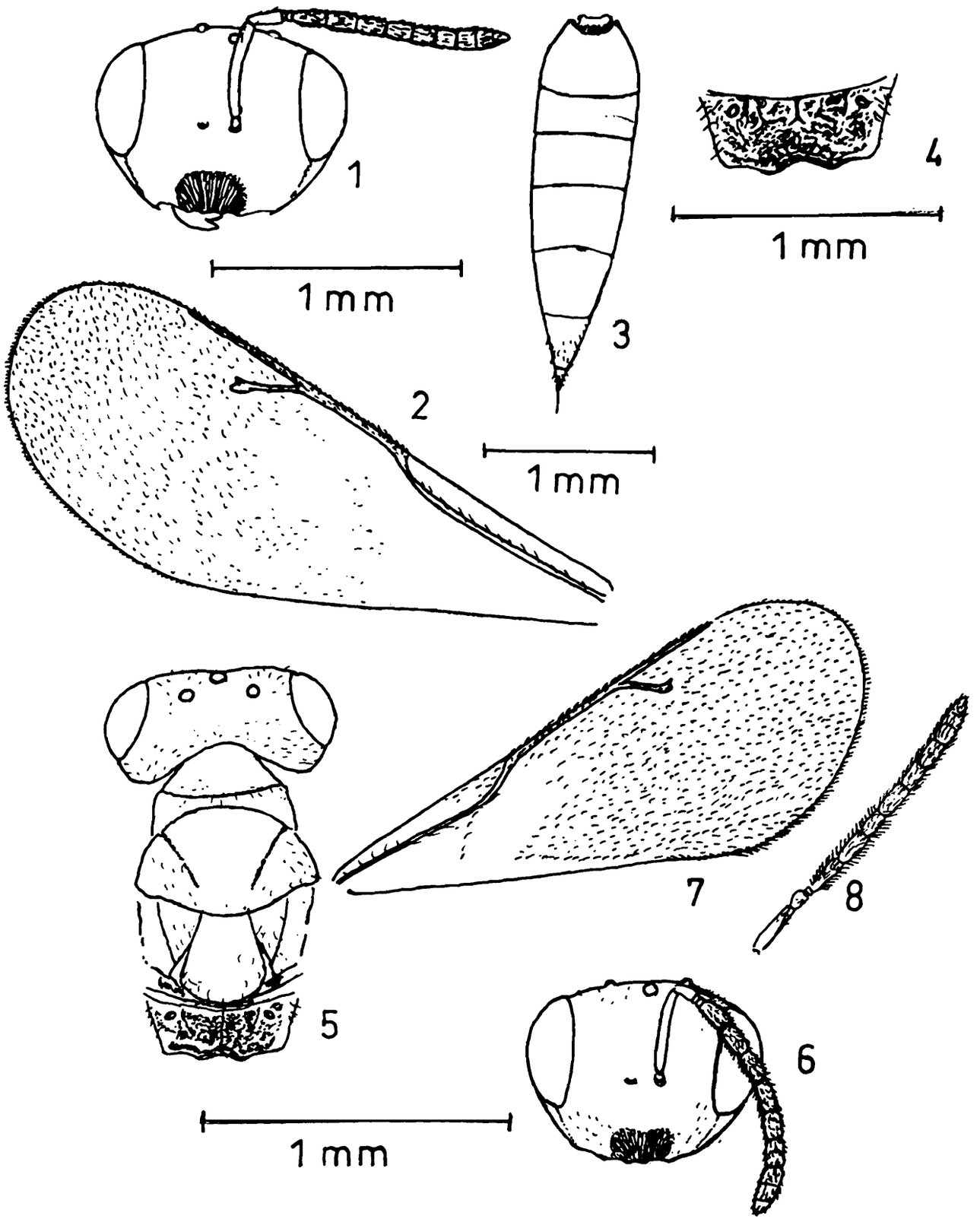
Mesosoma : (Fig. 5) Closely and distinctly punctate; 1.6x as long as broad; pronotal collar sharply carinate. Mesoscutum width 1.6x length. Scutellum convex, length 1.1x width. Propodeum finely and uniformly reticulate; median area little produced beyond hind margins of supracoxal flanges, without wrinkles; median carina fine, but complete, plicae not reaching beyond middle; basal foveae deep; spiracles oval, propodeum width 2.6x median length. Forewing (Fig. 7) length 2.5x width; pubescence less dense; basal vein setate; costal cell with a single row of hairs in the middle, completely hairy towards the distal tip. Relative lengths of SMV, MV, PMV and STV as 29, 19, 14 and 7.

Gaster : Longer than head plus mesosoma combined (1.1x), dorsally collapsing; hypopygium reaching upto hind margin of T4 and half length of gaster.

Male : (Fig. 8) Length 1-2.0mm. Resembles female but differs in having longer pubescence on antenna and funicular segments elongated; gaster with petiole more distinct, highly collapsing, completely brown with an yellow spot medially.

Material examined : Holotype : Female : INDIA : Kerala : Tellichery (Cannore), 4.ii.1995, Coll. P. M. Sureshan; Allotype : Male : Kerala : West hill (Calicut), 25.v.1987, Coll P. M. Sureshan; Paratypes : 3 Females, data same as that of holotype; 4 Females, Kerala : Puzhamudi (Waynad), 22.ii.1988; 5 Females, Manantody (Waynad), 22.ii.1988; 3 Females, Kerala : Thariyod (Waynad), 22.ii.1988; 6 Females, Kerala, Shertallai, 27.ii.1989; 2 Females, Thekkadi (Idukki), 10.v.1986; 2 Females, Malampuzha, 14.i.1987; 7 Females, Silent valley, 9.ii.1987; 4 Females, Kalkandi (Palghat), 13.xii.1987; 1 Female, Kotiyam (Quilon), 23.11.1989; 1 Female, Atingal, 23.ii.1989; 1 Female, Vazhani (Trichur), 7.ii.1989; 5 Females, Ernakulam, 9.ii.1989; 1 Female, Neeleswaram (Kasaragod), 26.ii.1988 (Coll. P. M. Sureshan) (in Zoological Survey of India, Calicut).

Remarks : This species resembles *C. murriensis* Graham in having sharply margined pronotal collar, complete median carina on propodeum and similar gaster but differs in colour, size, nature of antenna, propodeum and in forewing.



Figs. 1-4. *Chlorocytus xanthopus* (Cameron), Female : 1, head in front view; 2, forewing; 3, gaster in dorsal view; 4, propodeun in dorsal view.

Figs. 5-8. *Chlorocytus indicus* sp. nov., Female : 5, head and thorax in dorsal view; 6, head in front view; 7, forewing; 8, male antenna.

SUMMARY

A new species of *Chlorocytus* Graham viz., *C. indicus* is described from India. *C. xanthopus* (Cameron) is redescribed from the lectotype.

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FURTHER NEW RECORDS OF BATS FROM MIZORAM, INDIA

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INTRODUCTION

Faunistic surveys were conducted in Mizoram, specially for mammals during December, 1993 - January, 1994; March - May, 1995 and January - February, 1997 by scientists of the Zoological Survey of India. The collections thus obtained contain several species of bats, of which, fourteen, namely, *Rousettus leschenaulti leschenaulti* (Desmarest), *Cynopterus brachyotis* Müller, *Sphaerias blanfordi* (Thomas), *Eonycteris spelaea* (Dobson), *Rhinolophus pearsoni* Horsfield, *Rhinolophus rouxi rouxi* Temminck, *Myotis formosus formosus* (Hodgson), *Myotis montivagus montivagus* (Dobson), *Myotia muricola* (Gray), *Eptesicus pachyotis* (Dobson), *Pipistrellus circumdatus* (Temminck), *Scotozous dormeri* Dobson, *Muirna tubinaris* (Scully), *Murina cyclotis cyclotis* Dobson were found to be unrecorded from that state (Blanford 1891, Ellerman and Morrison-Scott 1966, Lekagul and McNeely 1977, Corbet and Hill 1992, Agrawal *et al.* 1992, Wilson and Reeder 1993, Das *et al.* 1995, Mandal *et al.* 1998, Sinha, Y. P. (in press). Since the finalisation of a detailed faunal account of mammals of Mizoram will take some more time, it was thought worthwhile to publish the new distributional records of these bats hereunder.

External measurements have been taken in the field and the skull-measurements in the laboratory. All measurements are in millimetre and have been taken after Khajuria (1953).

Following is a list of abbreviations used for various measurements :

c^1-c^1	=	distance between outer surface of upper canines;
cc1	=	condylocanine length;
cw	=	cranial width;
E	=	length of ear;
Fa	=	length of forearm;
F & c1	=	length of foot and claw;
H & B	=	length of head and body;
iw	=	least interorbital width;
l	=	greatest length of skull;
m^3-m^3	=	distance between outer surface of third upper molars;
ml	=	mandibular length;
mtr	=	length of maxillary tooth-row;
Tb	=	length of tibia;
Tl	=	length of tail;
zw	=	zygomatic width.

SYSTEMATIC ACCOUNT

Order : CHIROPTERA
Family : PTEROPODIDAE

Rousettus leschenaulti leschenaulti (Desmarest, 1820)
Indian Fulvous Fruit Bat

1820. *Pteropus leschenaulti* Desmarest, *Encyl. Meth. Mammal.*, 1 : 100 (Environments of Pondicherry, India).

Material examined : Mizoram : Aizawl district : 1♂ : Aibawk (c 800m), 9.12.1993; 4♂, 2♀ : North Khawbung (c 1500m), 15-18.12.1993; Teirei (Dampa), (c 250m) 26.12.1993; coll. Ajoy Kumar Mandal.

Measurements : External : 2 ♂ : Fa 86.0, 84.3; E 19.0, 19.0; Tb 41.7, 38.3; F & cl 17.0, 21.0. Cranial : 2 ♂ : *l* 39.7, 36.8; *mtr* 14.0, 13.7; c^1-c^1 8.3, 7.7; *iw* 8.1, 6.7; *cw* 15.6, 15.2; *zw* 24.3, 22.8; m^3-m^3 11.6, 10.7; *ml* 30.7, 29.2. 2♀ : *l* 36.2, 36.7; *mtr* 13.6, 13.7; c^1-c^1 7.1, 6.9; *iw* 7.7, 7.1; *cw* 15.2, 15.7; *zw* 22.3, 20.3; m^3-m^3 10.8, 10.4; *ml* 29.1, 29.0.

Distribution : *Rousettus leschenaulti leschenaulti* is known within Indian limits from Jammu and Kashmir to Arunachal Pradesh and south to Kerala. The present specimens constitute the first authentic record of this species from Mizoram.

Cynopterus brachyotis (Müller, 1838)
Smaller short-nosed Fruit Bat

1838. *Pachysoma brachyotis* Müller, *Tijdschr. Natuur. Gesch.* 5, 1 : 146. (Borneo).

Material examined : Mizoram : Chimtuipui district : 5♂, 2♀ : Ngengpui (c 200m), coll. T.P. Bhattacharyya, 8-10.4.1995.

Measurements : External : 2♂ : Fa 64.7, 64.4; E 17.5, 18.0; Tb 24.0, 24.2; F & cl 13.1, 12.5. 2♀ : Fa 63.3, 62.9; E 17.0, 16.6; Tb 25.0, 25.0; F & cl 11.3, 12.5. Cranial : 2♂ : *l* 31.0, 31.1; *ccl* 28.8, 28.9; *mtr* 10.7, 10.3; c^1-c^1 7.0, 6.6; *cw* 13.2, 13.4; *iw* 6.0, 5.7; m^3-m^3 9.1, 9.0; *zw* 19.0, 18.4; *ml* 23.7, 23.8. 2♀: *l* 30.9, 30.0; *ccl* 28.6, 28.0; *mtr* 10.0, 9.8; c^1-c^1 6.5, 6.3; *cw* 13.4, 13.3; *iw* 5.7, 5.8; m^3-m^3 9.2, 8.5; *zw* 18.9, -; *ml* 23.3, 22.8.

Distribution : *Cynopterus brachyotis* is known within the Indian limits from Arunachal Pradesh, Assam, Bihar, Kerala and Andaman and Nicobar Islands. The present specimens constitute the first authentic record of this species from Mizoram.

Sphaerias blanfordi (Thomas, 1891)
Blanford's Fruit Bat

1891. *Cynopterus blanfordi* Thomas, *Ann. Mus. Civ. Stor. nat. Genova*, 2, 10 : 884, 921-922, pl. XI, figs. 1-2 (Leito, Cheba, Karen Hills, 1000m, Burma).

Material examined : Mizoram : Aizawl district : 1♀ : Tuikual Duty Post I (c 850m), Murlen National Park, coll. S.S. Saha, 18.12.1993. Lunglei district : 9♂, 7♀ : Sairep (c 1500m), coll. T.P. Bhattacharyya, 23-27.4.1995.

Measurements : External : 2♂ : Fa 51.1, 54.7; E 17.5, 16.6; Tb 19.7, 20.6; F & cl 11.9, 10.7. 2♀ : Fa 51.7; 51.9; E 17.5, 17.8; Tb 19.0, 20.6; F & cl 10.0, 11.9. Cranial : 2♂ : *l* 27.1, 27.8; *ccl* 24.8, 25.1; *mtr* 8.0, 8.2; c^1-c^1 6.3, 6.5; *cw* 12.3, 12.8; *iw* 5.2, 5.0; *zw* 17.4, 17.7; m^3-m^3 8.1, 7.9; *ml* 20.2, 20.8. 2♀: *l* 27.4, 27.0; *ccl* 25.1, 24.7; *mtr* 8.5, 7.8; c^1-c^1 6.5, 6.2; *iw* 4.9, 5.4; *cw* 11.5, 12.0; *zw* 16.4, 16.7; m^3-m^3 7.5, 8.0; *ml* 20.4, 20.1.

Distribution : *Sphaerias blanfordi* is known from Arunachal Pradesh, West Bengal and Uttar Pradesh in India. The present specimens constitute the first authentic record of this species from Mizoram.

Eonyctris spelaea (Dobson, 1871)
Dobson's, Long-tongued Fruit Bat

1871. *Macroglossus spelaea* Dobson, *Proc. Asiat. Soc. Beng.* : 105, 106 (Farm Caves, Moulmein, Tenasserim, Myanmar).

Material examined : Mizoram : Aizawl district : 8♂ : Teirei (c 250m), Dampa, coll. Ajoy Kumar Mandal, 26.12.1993. Lunglei district : 1♂, 4♀ : Lungsen (c 650m), coll. T.P. Bhattacharyya, 22-26.1.1997.

Measurements : External : 2♂ : Fa 74.0, 72.0; E 21.0, 19.5; Tb 33.0, 33.5; F & cl 19.0, 19.0. 2♀ : Fa 68.2, 67.5; E 19.5, 20.0; Tb 31.2, 32.7; F & cl 19.5, 20.0. Cranial : 2♂ : *l* 37.0, 36.0; *mtr* 13.1, 12.6; c^1-c^1 7.5, 7.4; *iw* 7.2, 6.7; *cw* 15.4, 14.9; *zw* 20.2, 21.7; m^3-m^3 8.8, 9.4; *ml* 27.0, 27.7. 2♀: *l* 34.4, 35.0; *mtr* 12.3, 12.5; c^1-c^1 6.4, 6.5; *iw* 6.2, 6.4; *cw* 14.4, 14.0; *zw* 18.5, 18.4; m^3-m^3 8.5, 8.8; *ml* 26.2, 25.5.

Distribution : Within the Indian limits, *Eonycteris spelaea* is reported from Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Manipur, Meghalaya, West Bengal, Sikkim, Uttar Pradesh, Andhra Pradesh, Karnataka. The present specimens, thus, constitute the first authentic record of this species from Mizoram.

Family : RHINOLOPHIDAE

Rhinolophus pearsoni Horsfield, 1851
Pearson's Horse-shoe Bat

1851. *Rhinolophus pearsoni* Horsfield, *Cat. Mammal. Mus. Hon. East-India Co.* : 33 (Darjiling, Darjiling district, West Bengal, India).

Material examined : Mizoram : Lunglei district : 1♂, 1♀ : Sairep (c 1500m), coll. T.P. Bhattacharyya, 17,26.4.1995.

Measurements : External : 1♂,1♀: Fa 52.7, 50.4; Tl 31.7, 33.6; E 20.8, 19.2; Tb 26.6, 21.1; F & cl 10.0, 9.4. Cranial : 1♀ : *l* 21.0; *ccl* 18.2; *mtr* 7.8; c^1-c^1 5.0; *iw* 2.7; *cw* 8.6; m^3-m^3 7.8; *zw* 11.0; *ml* 13.9.

Distribution : *Rhinolophus pearsoni* is known within the Indian limits from Uttar Pradesh, West Bengal, Sikkim and Meghalaya. Hence, the present specimens constitute the first authentic record of this species from Mizoram.

Rhinolophus rouxi rouxi Temminck, 1835
Rufous Horse-shoe Bat

1835. *Rhinolophus rouxi rouxi* Temminck, *Monogr. Mammal.*, 2 : 30b (Pondicherry and Calcutta, India).

Material examined : Mizoram : Aizawl district : 5♂, 7♀ : Teirei (c 250m) Dampa coll. Ajoy Kumar Mandal, 26.12.1993. Lunglei district : 5♂, 1♀ : Lungsen (c 650m), coll. T. P. Bhattacharyya, 26,27.1.1997.

Measurements : External : 2♂ : Fa 47.8, 47.8; E 17.5, 17.8; Tb 23.0, 24.0; F & cl 11.0, 10.5. 2♀ : Fa 51.0, 49.0; E 24.0, 19.0; Tb 25.0, 23.8; F & cl 11.5, 11.2. Cranial : 2♂ : *l* 21.5, 22.0; *ccl* 18.7, 19.0; *mtr* 8.5, 8.8; c^1-c^1 5.6, 5.9; *zw* 10.5, 10.9; *iw* 2.0, 2.4; *cw* 9.5, 10.0; m^3-m^3 7.8, 8.1; *ml* 14.4, 14.7. 2♀: *l* 22.5, 21.5; *ccl* 19.5, 18.8; *mtr* 8.6, 8.4; c^1-c^1 6.0, 5.8; *zw* 10.9, 10.6; *iw* 2.7, 2.5; *cw* 10.0, 9.3; m^3-m^3 8.2, 8.1; *ml* 15.2, 14.3.

Distribution : *Rhinolophus rouxi rouxi* is known within the Indian limits from Andhra Pradesh; Arunachal Pradesh; Goa; Himachal Pradesh; Karnataka; Kerala; Madhya Pradesh; Maharashtra; Orissa; Pondicherry; Tamil Nadu; Uttar Pradesh and West Bengal. The present specimens constitute the first authentic record of this form from Mizoram.

Family : VESPERTILIONIDAE
Myotis formosus formosus (Hodgson, 1835)
Hodgson's Bat

1835. *Vespertilio formosa* Hodgson, *J. Asiat. Soc. Beng.*, 4 : 700 (Nepal).

Material examined : Mizoram : Lunglei district 1♂, 1♀ : Sairep (c 1500m), coll. T.P. Bhattacharyya, 17,25.4.1995.

Measurements : External : 1♂, 1♀: HB 54.1, 51.2; Tl 45.1, 39.2; F & cl 9.7, 8.5; E 14.3, 15.3; Tr 6.7, 7.3; Tb 20.7, 17.1; Fa 45.8, 44.4. Cranial : 1♂, 1♀: *l* 17.3, 17.4; *mtr* 8.3, 7.0; c^1-c^1 4.8, 4.9; *cw* 7.9, 8.2; *zw* 11.1, 11.4; *iw* 4.2, 3.9; m^3-m^3 7.3, 7.1; *ml* 13.2, 13.3.

Distribution : Within Indian limits, *Myotis formosus formosus* is known from Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Maharashtra, Meghalaya, Punjab, Sikkim, Uttar Pradesh and West Bengal. Hence, the present specimens constitute the first authentic record of this species from Mizoram.

Myotis montivagus montivagus (Dobson, 1874)
Burmese Whiskered Bat

1874. *Vespertilio montivagus* Dobson, *J. Asiat. Soc. Beng.*, 43(2) : 237 (Hotha, Yunnan, China).

Material examined : Mizoram : Lunglei district : 2♂, 2♀ : Sairep (c 1500m), coll. T.P. Bhattacharyya, 26.4.1995.

Measurements : External : 2♂ : Fa 41.7, 40.6; Tl 40.5, 40.5; E 13.5, 13.3; Tr 6.3, 6.1; Tb 17.1, 17.0; F & cl 7.9, 7.6. 2♀ : Fa 40.7, 40.6; Tl 39.8, 40.1; E 13.2, 13.5; Tr 5.9, 6.2; Tb 16.9, 16.7; F & cl 7.3, 7.6. Cranial : 2♂ : *l* 15.7, 15.4; *mtr* 6.3, 6.1; c^1-c^1 4.2, 4.3; *zw* 10.5, 10.8; *iw* 3.9, 3.9; *cw* 7.0, 7.6; m^3-m^3 6.7, 6.7; *ml* 11.5, 11.4. 1♀: *l* 15.8; *mtr* 6.1; c^1-c^1 4.3; *zw* 10.6; *iw* 3.8; *cw* 7.3; m^3-m^3 6.8; *ml* 11.7.

Distribution : *Myotis montivagus montivagus* is known from Myanmar, southern China and Thailand. The present specimens constitute the first authentic record of this species for India from Mizoram.

Myotis muricola (Gray, 1846)
Whiskered Myotis

1846. *Vespertilio muricola* Gray, *Cat. Hodgson Coll. Br. Mus.*, : 4 (Nepal).

Material examined : Mizoram : Lunglei district : 1♂, 1♀ : Sairep (c 1500m), coll. T.P. Byattacharyya, 16.4.1995, 14.1.1997. 1♀ : Lungsen (c 650m), coll. T.P. Bhattacharyya, 26.1.1997.

Measurements : External : 1♂ : Fa 36.6; Tl 38.4; E 11.3; Tr 5.4; Tb 17.7; F & cl 6.4. 2♀ : Fa 36.0, 37.8; Tl 42.0, 43.7; E 11.0, 12.8; Tr 5.4, 5.8; Tb 17.4, 17.8; F & cl 6.5, 6.4. Cranial : 1♂ : *l* 13.9; *mtr* 5.3; c^1-c^1 3.6; *zw* 8.7; *iw* 3.3; *cw* 6.6; m^3-m^3 5.7; *ml* 9.9. 2♀: *l* 13.9, 14.2; *mtr* 5.4, 5.4; c^1-c^1 3.7, 3.7; *zw* 9.2, 8.7; *iw* 3.2, 3.1; *cw* 6.7, 6.9; m^3-m^3 6.0, 5.8; *ml* 10.1, 10.3.

Distribution : Corbet & Hill (1992) has mentioned the distributional range as 'N. Pakistan and Kashmir through N. India, Nepal and Burma to S. China.....' Hence, the present specimens constitute the basis for the first authentic record of *Myotis muricola* for India, from Mizoram.

Eptesicus pachyotis (Dobson, 1871)
Thick-eared Bat

1871. *Vesperugo* (*Vesperus*) *pachyotis* Dobson, *Proc. Asiat. Soc. Beng.* : 211 (Khasi Hills, Meghalaya, India).

Material examined : Mizoram : Lunglei district : 1♂ : Sairep (c 1500m), coll. T.P. Bhattacharyya, 16.4.1995.

Measurements : External : 1♂ : HB 57.0; Tl 40.2; F & cl 6.9; E 14.1; Tr 4.9; Tb 16.5; Fa 39.2. Cranial : 1♂ : *l* 15.3; *mtr* 5.2; c^1-c^1 5.3; *cw* 8.0; *zw* 11.0; *iw* 4.5; m^3-m^3 7.1; *ml* 10.9.

Distribution : *Eptesicus pachyotis* is known only from Khasi Hills, Meghalaya. The present specimen, thus, constitutes the first authentic record of this species from Mizoram.

Remarks : The specimen was collected by placing mistnets near a water source inside the forest and is the first collection beyond the type-series.

Pipistrellus circumdatus (Temminck, 1840)
Large Black Pipistrelle

1840. *Vespertilio circumdatus* Temminck, *Monogr. Mammal.*, 2 : 214 (Tapos, Java).

Material examined : Mizoram : Lunglei district : 1♀ : Sairep (c 1500m), coll. T.P. Bhattacharyya, 25.4.1995.

Measurements : External : 1♀ : HB 51.6; Tl 41.4; F & cl 8.4; E 13.5; Tr 5.4; Tb 17.1; Fa 40.6. Cranial : 1♀ : *l* 16.0; *mtr* 5.9; c^1-c^1 5.0; *cw* 8.7; *zw* 16.2; *iw* 4.5; m^3-m^3 7.2; *ml* 11.4.

Distribution : Within the Indian limits, *Pipistrellus circumdatus* is known only from Meghalaya. The present specimen constitutes the first authentic record of this species from Mizoram.

Remarks : The specimen was collected by placing mistnet on the hill top near a water hole at the edge of the forest. The above specimen contained one foetus in the right horn of the uterus in early stage of development, measuring 15.0 mm.

Scotozous dormeri Dobson, 1875
Dormer's Bat

1875. *Scotozous dormeri* Dobson, *Proc. zool. Soc. Lond.*, : 373 (Bellary Hills, Bellary district, Karnataka, India).

Material examined : Mizoram : Lunglei district : 1♂, 1♀: Lungsen (c 650m), coll. T.P. Bhattacharyya, 28.1.1997.

Measurements : External : 1♂ : HB 41.7; Tl 39.1; F & cl 7.5; E 10.3; Tr 4.6; Tb 15.5; Fa 34.1; 1♀ : HB 46.5; Tl 43.1; F & cl 7.2; E 11.0; Tr 5.2; Tb 14.9; Fa 33.8. Cranial : 1♂ : *l* 12.7; *mtr* 4.7; c^1-c^1 4.0; *cw* 8.8; *zw* 8.8; *iw* 3.7; m^3-m^3 5.8; *c*-m_3 5.1; *ml* 9.0. 1♀: *l* 12.9; *mtr* 4.6; c^1-c^1 4.0; *cw* 6.6; *zw* 8.6; *iw* 3.5; m^3-m^3 5.7; *ml* 9.0.

Distribution : *Scotozous dormeri* is widely distributed in the Indian mainland from Jammu & Kashmir, south at least to Karnataka and from Gujarat east to West Bengal. The present specimens, thus, constitute the first authentic record of this species from Mizoram.

Remarks : The specimens were collected by placing mistnets near a water source down in the valley.

Murina tubinaris (Scully, 1881)
Scully's Tube-nosed Bat

1881. *Harpiocephalus tubinaris* Scully, *Proc. zool. Soc. Lond.*, : 200 Fig. 1 (Gilgit, Gilgit district, Jammu & Kashmir, India).

Material examined : Mizoram : Lunglei district : 2♂, 2♀ : Sairep (c 1500m), coll. T.P. Bhattacharyya, 17-26.4.1995.

Measurements : External : 2♂ : Fa 31.2, 32.6; Tl 34.4, 36.0; E 14.1, 15.0; Tr 6.3, 6.5; Tb 17.2, 17.5; F & cl 7.4, 7.5. 2♀ : Fa 34.4, 34.6; Tl 39.6, 33.3; E 15.7, 14.2; Tr 6.3, 6.3; Tb 17.7, 17.5; F & cl 8.0, 7.5. Cranial : 2♂ : *l* 16.4, 16.6; *mtr* 5.3, 5.1; c^1-c^1 3.9, 3.8; m^3-m^3 5.4, 5.4; *zw* 8.7, 8.5; *cw* 7.2, 7.2; *ml* 10.4, 10.1. 2♀: *l* 16.3, 16.7; *mtr* 5.2, 5.0; c^1-c^1 3.8, 4.0; m^3-m^3 5.6, 5.9; *zw* 8.8, 9.2; *cw* 7.2, 7.7; *ml* 10.7, 11.0.

Distribution : *Murina tubinaris* is known within the Indian limits from Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Meghalaya, Sikkim and West Bengal. The present specimens constitute the first authentic record of this species from Mizoram.

Murina cyclotis cyclotis Dobson, 1872
Round-eared tube-nosed Bat

1872. *Murina cyclotis* Dobson, *Proc. Asiat. Soc. Beng.*, : 210 (Darjeeling = Darjiling, Darjiling district, West Bengal, India).

Material examined : Mizoram : Lunglei district : 2♂, 1♀ : Sairep (c 1500m), coll. T.P. Bhattacharyya 16-23.4.1995.

Measurements : External : 2♂ : Fa 28.7, 30.4; Tl 32.1, 33.9; E 12.8, 12.8; Tr 5.8, 6.0; Tb 16.6, 17.1; F & cl 6.6, 7.4. 1♀ : Fa 30.6; Tl 34.5; E 13.5; Tr 6.9; Tb 17.4; F & cl 7.4. Cranial : 2♂ : *l* 15.5, 16.1; *mtr* 4.9, 5.2; c^1-c^1 3.8, 3.8; m^3-m^3 5.5, 5.5; *zw* 8.5, 8.9; *cw* 7.3, 7.7; *ml* 9.9, 10.3. 1♀: *l* 16.1; *mtr* 5.2; c^1-c^1 4.0; m^3-m^3 5.6; *zw* 9.0; *cw* 7.7; *ml* 10.4.

Distribution : *Murina cyclotis cyclotis* is known within Indian limits from Andhra Pradesh, Meghalaya, Sikkim and West Bengal. The present specimens constitute the first authentic record of this species from Mizoram.

SUMMARY

Fourteen species of bats namely, *Rousettus leschenaulti leschenaulti*, *Cynopterus brachyotis*, *Sphaerias blanfordi*, *Eonycteris spelaea*, *Rhinolophus pearsoni*, *Rhinolophus rouxi rouxi*, *Myotis formosus formosus*, *Myotis montivagus montivagus*, *Myotis muricola*, *Eptesicus pachyotis*, *Pipistrellus circumdatus*, *Scotozous dormeri*, *Murina tubinaris*, *Murina cyclotis cyclotis* have been recorded for the first time from Mizoram, India. Out of these, two species namely, *Myotis montivagus montivagus* and *Myotis muricola* have been recorded for the first time in India. Their collection locality, measurements and distribution in India have been given.

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Rec. zool. Surv. India, 98(Part-2) : 155-157, 2000

A NEW SPECIES OF THE GENUS *RUNCINIA* SIMON (ARANEAE : THOMISIDAE) FROM MADHYA PRADESH, INDIA.

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The spiders of the family Thomisidae are little known in Indian Fauna. The genus was established by Simon in 1875 with Type-species *Runcinia lateralis* (Koch). Tikader (1980) reillustrated and redescribed three species and one new species from different parts of India in *Fauna of India* series.

While studying the spider collection collected by the second author from different areas of Jabalpur city, we came across a new species of the genus *Runcinia* which is described here.

The type specimen will in due course be deposited in the National Collection, Zoological Survey of India, Calcutta.

Runcinia yogeshi sp. nov.

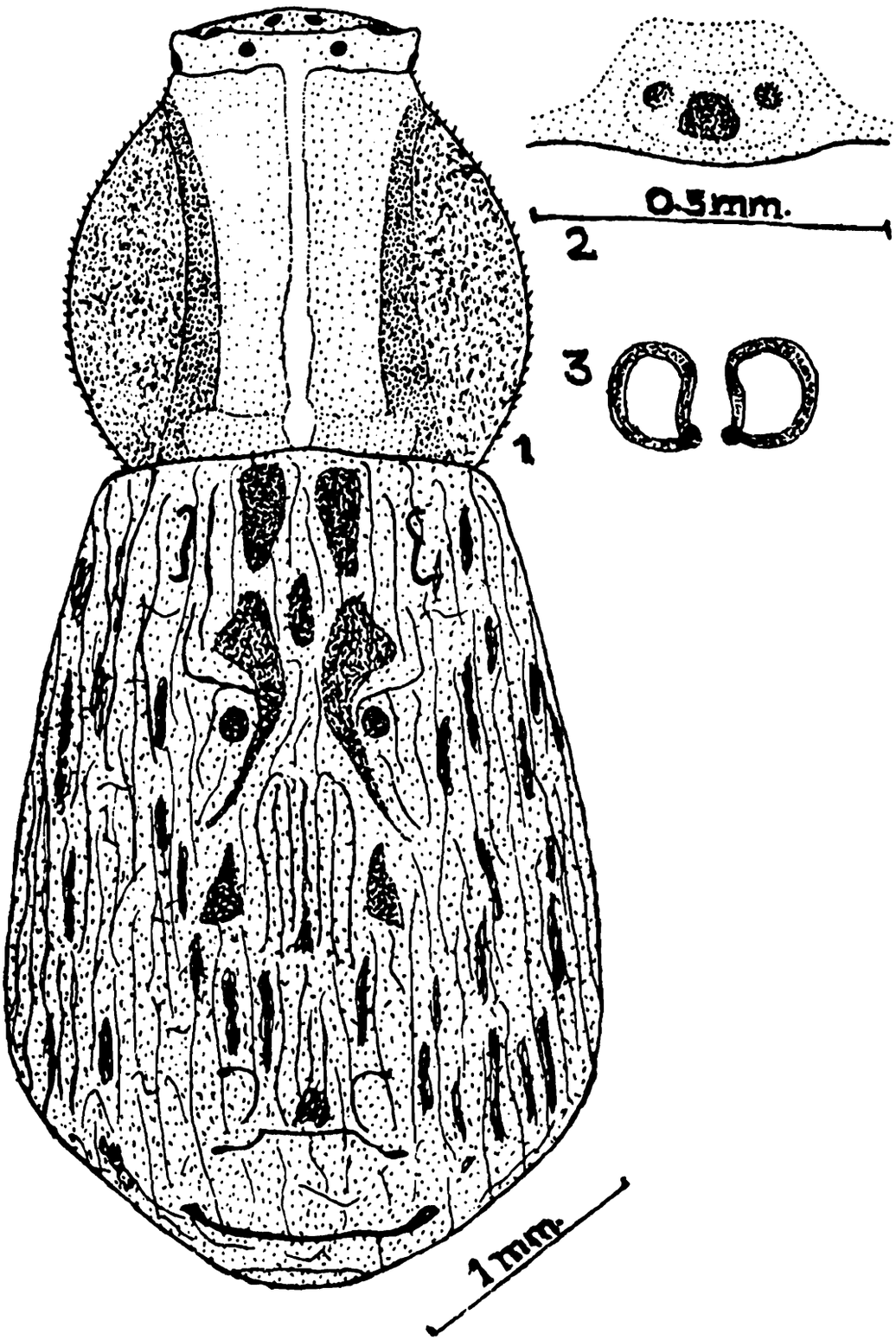
General : Cephalothorax and legs dark brown, abdomen blackish-brown with whitish patches. Total length 5.20 mm. Carapace 1.90 mm. long, 1.90 mm. wide; abdomen 3.40 mm. long, 2.40 mm. wide.

Cephalothorax : Nearly as long as wide, narrowing anteriorly, with rounded lateral edges; truncated in front, clothed with fine pubescence. Anterior median eyes slightly larger than posterior medians but smaller than anterior laterals; posterior medians also smaller than posterior laterals. Eyes of both the rows recurved; one double line starting below the posterior medians and ending at the posterior end of cephalothorax; lateral sides of thoracic region darker in colour as in fig. 1. Clypeus dark brown; subrectangular narrowing anteriorly and with stout spines pointing forward. Sternum heart-shaped, pointed behind, dark brown and clothed with fine pubesence. Legs I and II much longer and more spiny than III and IV. Tibiae I and II with five and four pairs of ventral spines respectively.

Abdomen : Longer than wide, cylindrical, broadest posteriorly, entire dorsal surface having muscular corrugations and provided with blackish and whitish lines and spots as in fig. 1. Ventral side same in colour and texture, a longitudinal blackish band running from the epigastric furrow to the spinnerets.Epigyne as in fig. 2. Internal gentialia as in fig. 3.

Type-specimen : *Holotype* : female in spirit, other details as above.

* Government Autonomous Science College, Jabalpur



Figs. 1-3 *Runcinia yogeshi* sp. nov. - 1. Dorsal view of female, legs omitted.; 2. Epigyne.; 3. Internal genitalia.

Type-locality : Gwarighat, Jabalpur, M.P., India. Coll. *Pawan Gajbe*, 2.9.1997.

This species resembles *Runcinia chauhani* Sen and Basu but can be distinguished from it as follows: (i) The entire dorsal and ventral surface of abdomen provided with muscular corrugations but in *R. chauhani* without such muscular corrugations. (ii) Epigyne and internal genitalia also structurally different.

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Rec. zool. Surv. India, **98**(Part-2) : 159-172, 2000

EIGHT NEW SPECIES OF *GLABRIDORSUM* TOWNES FROM INDIA AND NEPAL (HYMENOPTERA : ICHEUMONIDAE)

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INTRODUCTION

The genus *Glabridorsum* Townes belongs to the family Ichneumonidae, tribe Ishnini. This is known from Eastern Palaeactic and Indo-Papuan regions. It contains small to medium sized species measuring 4.75-8.5 mm in length. Townes (1970 : 174) and Gupta (1987 : 787) referred to this genus only one species viz., *Glabridorsum stokesii* (Cameron) from Australia.

Eight new species are described here from India and Nepal. This is the first record of this genus from India and Nepal. A key to the species from India and Nepal is provided.

SYSTEMATIC ACCOUNT

Genus ***Glabridorsum*** Townes

1970. *Glabridorsum* Townes, *Mem. Amer. Ent. Inst.*, **12** : 174. Type-species : *Gambrus stokesii* Cameron. Original designation.

1971. *Glabridorsum* Townes : Gupta, *Mem. Amer. Ent. Inst.*, **41** : 787.

This genus can readily be distinguished by having mesoscutum polished and more or less impunctate and hairless. Clypeus rather small and strongly convex, without a median tooth.

Body slender. Thorax sometimes strongly convex in front. Clypeus 1.8x as long as wide, strongly convex and without apical median tooth, its apical margin arched or truncate. Malarspace about 0.8-1.0x as long as the basal width of mandible. Mandible with its lower tooth equal to or slightly shorter than the upper tooth. Head behind the ocellar triangle flat. Mesoscutum polished, the front 0.15 to 0.33 of its length with fine setiferous punctures, rest polished, impunctate and hairless. Notauli sharp but not deep, reaching beyond the center of mesoscutum. Propodeal spiracles round, apical carina of propodeum strongly sinuate, medially week or absent, laterally forming crest-like apophyses. Base of hind coxa moderately deep, with a very short vertical groove descending from its attachment on antro-basal face. Base of first tergite usually with lateral tooth, its spiracle near its apical 0.43, ventro-lateral and dorso-lateral carinae complete but rather weak, and median-dorsal carinae present or absent, if present not extending beyond spiracle; second tergite weakly to moderately mat, its setiferous punctures usually weak and quite sparse, sometimes

stronger and dense. Wing venation as in figure 1a, b, except nervellus intercepted at its lower 0.25 to 0.4 and brachiella often short or absent. Ovipositor sheath about 0.7 as long as hind tibia. Ovipositor moderately stout, somewhat compressed, its tip segittate (fig. 1c).

Length : Female : 4.75 mm. Fore wing 4-6.5 mm. Ovipositor sheath 1-2.5 mm.

Type-species : *Gambrus stokesii* Cameron.

Glabridorsum Townes is close to *Ischnus* Gravenhorst in having first tergite moderately slender, its spiracle near apical 0.25; clypeus strongly transversely convex and propodeal spiracle less than 1.5 times as long as wide. However, it is distinguished by having mesoscutum mostly and entirely polished, impunctate and hairless.

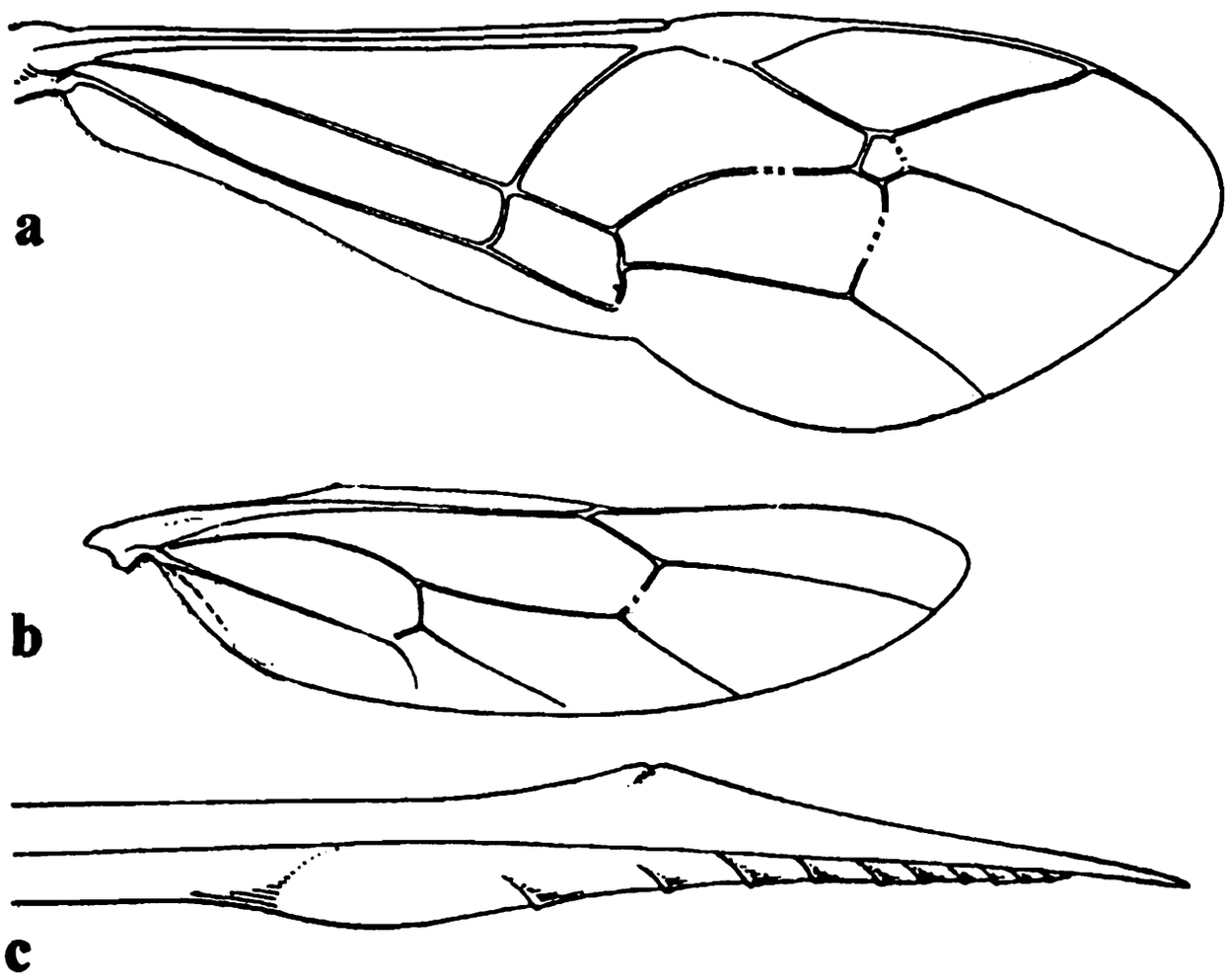

Fig. 1. *Glabridorsum* Townes : a, b, fore & wings venation; c, ovipositor tip.

Key to the species of ***Glabridorsum***

1. First abdominal tergite with a lateral tooth at its base. 2
- First abdominal tergite without a lateral tooth at its base 3
2 First abdominal tergite with a few scattered punctures, second and third tergites densely punctate, following tergite mat and subpolished. Nervellus intercepted at its lower 0.4. Face not black along clypeal groove ..... ***varibalteatum***, sp. nov.
- All abdominal tergites impunctate and subpolished. Nervellus intercepted at its 0.25. Face along clypeal groove black ..... ***punctatum***, sp. nov.
3. Body with its posterior part of mesopleurum, postscutellum, metapleurum, propodeum, first tergite and legs in general, red. Third and fourth abdominal tergites totally black and without apical bands ..... ***glabrosum***, sp. nov.
- Body largely with black and yellow marks, and without red markings 4
4. Mesopleurum finely sparsely punctate 5
- Mesopleurum trans-striate or rugoso-striato-punctate 6
5. Upper margin of pronotum infront of notaulus strongly swollen like a tubercle; abdominal tergites smooth and shiny. Face black along clypeal groove, all abdominal bands narrowed in the middle ..... ***nepalensis***, sp. nov.
- Upper margin of pronotum infront of notaulus not swollen; abdominal tergites mat and subpolished. Face not black along clypeal groove, abdominal bands on second and third tergites not narrowed in the middle ..... ***similis***, sp. nov.
6. First and second tergites mat with sparse and shallow punctures. Mesopleurum marked yellow at subtegular ridge and also two oval marks, one below subtegular ridge and one near base of middle caxa ..... ***orbitalis***, sp. nov.
- First, second and following abdominal tergites mat and subpolished, without any punctation. Mesopleurum at subtegular ridge and a broad oblong mark in middle, and some times a small mark at speculum 7
7. Speculum black. Metapleurum with moderately large punctures, tending to be rugoso-punctate ..... ***semilunatum***, sp. nov.
- Speculum with a small yellow mark. Metapleurum trans-striato-punctate. ..... ***simulatum***, sp.nov.

1. ***Glabridorsum varibalteatum***, sp. nov.

This species is close to *G. punctatum*, sp. nov. in having lateral tooth at the base of first abdominal tergite. It is also close to *G. simulatum*, sp. nov. in having similar markings on mesopleurum. However, it can be distinguished by having face not black along clypeal groove, first abdominal tergite with a few scattered punctures, second and third tergites densely punctate and nervellus intercepted at its lower 0.4 (fig. 2a).

Female : Body largely shiny. Clypeus smooth with a few scattered weak punctures. Face in the middle finely trans-straite, sparsely and shallowly punctate at sides. Malarspace granulose, 0.6x the basal width of mandible. Mandible smooth, with a few weak punctures in the middle. Frons smooth and polished, median longitudnal groove not well defined. Vertex and temple smooth and polished. Pronotal scrobe all along strongly striate, its margin subpolished with sparse, moderately large and shallow punctures, pronotal collar more or less smooth, extreme upper margin of pronotum (when viewed from dorsal side) moderately strongly swollen, epomia short. Scutellum with a few sparse shallow punctures, its lateral carina confined to its base. Postscutellum smooth. Mesopleurum in the middle with coarse shallow punctures; area just below subtegular ridge anteriorly along speculum and prepectal carina closely to sparsely striate; speculum smooth and shiny. Mesosternum finely and closely punctate, mesopleural groove with short strong ridges, prepectal carina extending up to the base of subtegular ridge. Metapleurum with coarse shallow and close punctures, towards the juxtacoxal carina strongly wrinkled. Propodeum between basal carina and apex moderately strongly rugoso-wrinkled; based of basal carina with irregular or distinct punctures, and short striae along the basal carina, spiracles round and small, both the transverse carinae present, apophyses low crest-like. First tergites with distinct basal lateral tooth, tergite mat with a few scattered shallow punctures, second and third tergites densely punctate, following tergites mat and subpolished, areolet pentagonal, moderate sized, about 0.6x as high as the portion of second recurrent vein above bulla; nervulus opposite to basal vein, nervellus intercepted at its lower 0.4 (fig. 2a).

Black. 7th to 16th (sometimes 6th-18th) antennal flagellar segments distinctly white. The following are brownish : Flagellum with scape, pedicle, first and second segments brownish in front. The following are yellow : Face, clypeus, except some times at sides, mandibles except the teeth, orbital mark all along the eye (fig. 2b), upper margin of pronotum, pronotal collar, a roundish mark at the apex of middle lobe of mesoscutum, postscutellum, tegula, subtegular ridge, speculum, a broad elongate-oval mark in the middle of mesopleurum, metanotum near the base of hind wing, metapleurum broadly in the middle, an inverted horse-shoe-shaped mark on propodeum, all the tergites with apical bands. Legs in general reddish-brown, except fore and middle coxae and trochanters yellow and their apical tarsal segments light to dark brown. Hind coxa with an oval yellow mark above, and sometimes a brown mark at the apex of tibia, basal 0.25-0.75 of first tarsal segment, apical 0.5 to fourth and fifth segment wholly dark brown. Wings clear hyaline. First tergite at base and ventrally reddish-brown.

Male : Similar to female, except more polished, slender and weakly sculptured. Face and clypeus with a few indistinct punctures, rest of head smooth and shiny. Pronotum with a few short striae in the scrobes and along the posterior margin. Mesopleurum finely and closely punctate with fine trans-striations above.

Colour pattern also similar to female except as follows; 9th to 17th flagellar segments white, mesosternum also yellow, this mark joining with the broad oval mark on mesopleurum. Metapleurum almost wholly yellow. Mark on propodeum extensive. Apical 0.75 of first tergite yellow. Hind leg with coxa broadly yellow, except apically above black. Mark on trochanteral segments, apex of femur, apical 0.3 of tibia, base of first tarsal segment and 5th segment wholly, black.

Length : Female, 5-8.5 mm. Fore wing 4.0-6.5 mm. Ovipositor sheath 1.3-3.5 mm. Male, 6.5 mm. Fore wing 5 mm.

Holotype : ♀, INDIA : UTTAR PRADESH : Gargia, 610 m, 22.iv.1967, J. K. Jonathan, No. J 219. *Allotype* : ♂, INDIA : UTTAR PRADESH : Gargia, vill. Dibri, 610 m, 13.iv.1968, D. Ram, No. 305. *Paratypes* : 64♀♀, 3♂. INDIA : UTTAR PRADESH : Gargia, 610 m, 28♀♀, 1♂, 20-24.iv.1967, Colls. J. K. Jonathan, M. K. Kamath, D. T. Tikar, V. K. Gupta, Colln Nos. J 215, J 217, K 173, 263; Gargia, Vill. Dibri, 1♀, 12.iv.1968, D. Ram, No. 304 and 1♀, 26-29.iv.1969, V. K. Gupta, No. 335. BIHAR : Ranchi, Namkum, 2♀, 5-25.x.1955, C. Tirky; 1♂, 21.xi.1955, V. K. Gupta; 5♀♀, 6-22.xii.1955, V. K. Gupta; 2♀♀, 13.iv. & 3.v.1956. C. Tirky; 1♀, 6.i.1956, C. Tirky; 2♀♀, 15-21.ii.1956, V. K. Gupta; 4♀♀, 8-26.iv.1965, Colls. V. K. Gupta and C. Tirky; 2♀, 2.v.1956, 1♀, 22.xii.1956, all by V. K. Gupta, 1♀, 1.iii.1957, 1♀, 3.iv.1957, V. K. Gupta. Torpa, 1♀, v.1957, C. Tirky. Kunti, 1♀, 3.v.1957, V. K. Gupta. Ambero-Bero, 1♀, 25.ii.1959, C. Tirky; Namkum, 1♀, 11-30.iv.1957, V. K. Gupta and C. Tirky; 2♀♀, 3-15.xii.1957, V. K. Gupta and C. Tirky. UTTAR PRADESH : Jeolikote in Kumaon Hills, 2660 m, 1♀, 19.v.1963, V. K. Gupta, No. 49. MADHYA PRADESH : Raigarh, 500 m, 1♀, 5.ii.1977, M. Rath, No. R 9, Ratanpur in Bilaspur Dist., 1♂, 2.ii.1977, P. Chand, P 7. MEGHALAYA : (Formerly Assam) : Jowai in Jaintia Hills, 1♀, 31.iii.1966, J. K. Jonathan, No. J 117 (Z. S. I., Calcutta). United Province, 1♀, 1949 m, Coll. F. Bianchi, no further data (A. E. I., Florida).

Distribution : India : Bihar, Madhya Pradesh, Meghalaya and Uttar Pradesh.

Remarks : Specimens from Jowai and Raigarh differs in having first abdominal tergite black, except the apical yellow band.

2. ***Glabridorsum punctatum***, sp. nov.

This species is close to G. *varibalteatum*, sp. nov. in having a lateral tooth at the base of first abdominal tergite and almost similar colour pattern. However, it can be distinguished by having all the abdominal tergites impunctate and polished and nervellus intercepted at its lower 0.25 (fig. 2c). Face along clypeal groove, black.

Female : Body largely subpolished to shiny. Face finely and closely punctate. Clypeus sparsely punctate. Frons and vertex shiny with fine scattered punctures. Temple shiny with indistinct scattered punctured. Melarspace granulose, 0.66x the basal width of mandible. Mandible distinctly punctate. Pronotum in the middle and in the scrobes coarsely and closely striate, its upper margin coarsely and shallowly punctate, pronotal collar weakly punctate, epomia short, upper margin of pronotum not swollen. Scutellum with moderately large and sparse punctures, lateral carina confined to its base. Postscutellum with moderately close punctures. Mesopleurum and mesosternum coarsely and closely punctate, mesopleurum in the upper half with transverse striations, striae strong below subtegular ridge and along the speculum, speculum smooth and shiny. Metapleurum coarsely and closely punctate, wrinkled towards metapleural fold, juxtacoxal carina present. Propodeum between basal carina and apex moderately strongly wrinkled, basad of basal carina punctate, both the transverse carinae strongly present, apical carina sinute, laterally forming weak crests-like apophyses, all the tergites mat and subpolished, first to third tergites with scattered setiferous punctures. Nervulus opposite to basal vein. Nervellus intercepted at its basal 0.25 (fig. 2c).

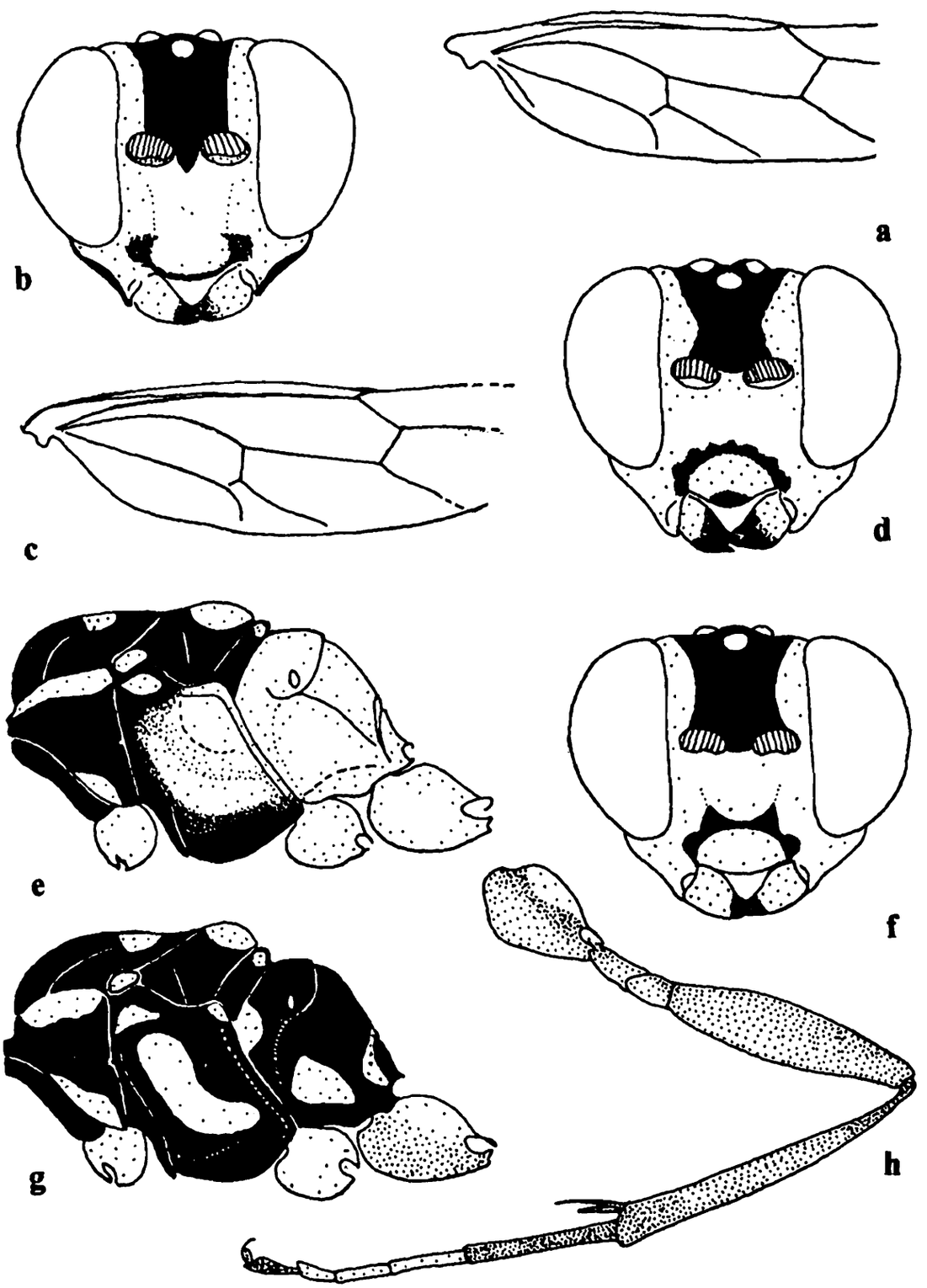

Fig. 2. *Glabridorsum varibalteatum* : a, hind wing showing venation; b, front view of head showing colour pattern. *Glabridorsum punctatum* : c, hind wing showing venation; d, front view of head showing colour pattern. *Glabridorsum glabrosum* : colour pattern : e, side view of thorax. *Glabridorsum nepalensis* : colour pattern : f, front view of head; g, side view of thorax; h, hind leg.

Black. 6th to 12th flagellar segments white. Clypeus apically in the middle, face along the clypeal groove and sometimes also two longitudinal line, dark brown to black (fig. 2d). Mark on speculum small, hind coxa red or reddish-brown, with an oval yellowish mark above and a dark brown area just below oval yellow mark; mark on propodeum also narrow like a sinuate band, rest of the colour similar to *G. simulatum,* sp. nov. and *G. varibalteatum,* sp. nov.

Male : Unknown.

Length : Female, 6-8.5 mm. Fore wing 4.75-6.5 mm. Ovipositor sheath about 1.5-2 mm.

Holotype : ♀, INDIA : HIMACHAL PRADESH : Ahla, 2286 m, 16.x.1971, Girish Chandra, Colln. No. J. D. 138. *Paratypes*: 2♀♀ INDIA : HIMACHAL PRADESH : Dalhousia, 2133 m, 1♀, 6.x.1971, Giridh Chandra, Colln. No. J. D. 206. Manali, 1828 m, 1♀, 18.v.1970, A. K. Gulati, No. K 215 (Z. S. I., Calcutta).

Distribution : India : Himachal Pradesh.

3. ***Glabridorsum glabrosum***, sp. nov.

This species is readly distinguished by having largely smooth and polished body; posterior half of mesopleurum, postscutellum, metapleurum, first tergite and legs in general, red (fig. 2e); third and fourth abdominal tergites totally black and without usual apical bands.

Female : Body largely shiny. Face, clypeus, frons and vertex smooth and polished, without any sculpture. Malar space 0.8 the basal width of mandibles. Pronotal groove and its posterior margin with a few striations, rest smooth and shiny; epomia moderately long. Scutellum and postscutellum smooth and shiny. Mesopleurum in the middle finely striate, along prepectal carina near sternaulus striato-punctate, speculum smooth and polished, prepectal carina extending (1.0) almost up to the base of subtegular ridge. Propodeum between basal carina and apex moderately strongly rugose, basad of basal carina mat and subpolished; its spiracle round and small, both the carinae present except apical carina broadly interrupted in the middle and laterally forming distinct crest-like apophyses. First tergite without distinct basal lateral tooth, tergite largely smooth and shiny, second and third tergite mat and subpolished, following tergites smooth and shiny. Areolet in fore wing moderately large, pentagonal, about as high as the portion of second recurrent vein above bulla; nervulus opposite to basal vein, nervellus intercepted at its basal 0.4.

Black. 8th to 11th antennal segments white above. The following are whitish-yellow : orbit all along the eye margin, clypeus, except its apical margin, extreme base of mandible, pronotal collar in its lower half, upper margin of pronotum, an oval mark on middle lobe of mesoscutum, scutellum, tegula, mesopleurum with its subtegular ridge, an oblong longish mark in middle, fore coxa wholly, its first trochanteral segment, an irregular mark on middle coxa above, apices of second and fifth to eighth abdominal tergites, and second to fourth hind tarsal segments. The following are red : posterior half of mesopleurum, postscutellum, metapleurum, propodeum, first tergite, middle and hind coxae (fig. 2e). Legs in general red, except as stated above and their tibiae and tarsi reddish-brown and hind first and fifth tarsal segments, dark brown.

Male : Unknown

Length : Female 6.5 mm. Fore wing 5.5 mm. Ovipositor sheath 1.5 mm.

Holotype : ♀, INDIA : TAMIL NADU : Kodaikanal 1958 m, J. K. Jonathan, No. J 193 (Z. S. I., Calcutta).

Distribution : Tamil Nadu.

4. ***Glabridorsum nepalensis,*** sp. nov.

This species is close to *G. similis*, sp. nov., but can be recognised by having upper margin of pronotum infront of notaulus strongly swollen like a tubercle, abdominal tergites smooth and shiny. Face black along clypeal groove, all abdominal apical bands narrowed in the middle.

Female : Clypeus with weak, fine scattered punctures. Face along the clypeal groove with fine and closely placed punctures. Malarspace mat, 1.0x the basal width of mandible. Pronotum almost smooth and polished, epomia short, upper margin of pronotum in front of notaulus strongly swollen like a tubercle. Mesopleurum with fine and sparse punctures, speculum smooth, area infront of speculum with a few short weak ridges, prepectal carina extending up to the base of subtegular ridge, notauli moderately deep and not interrupted by short ridges. Scutellum and postscutellum smooth and shiny, lateral carina of scutellum confined to its base. Metapleurum below juxtacoxal carina closely punctate, above juxtacoxal carina with scattered shallow punctures. Propodeum largely smooth, except for a few punctures between apical and basal carinae and area near spiracles, basal carina sinuate, apophyses weak crest-like, spiracle small round. First tergite without basal lateral tooth, tergite short and thick, smooth and shiny, without distinct punctures; following tergites smooth and shiny. Nervulus opposite to basal vein, nervullus intercepted at its lower 0.33.

Black. 8th to 12th flagellar segments white, scape in front brown. The following are yellow : Face, clypeus and orbits broadly along the eye margin, except face along the clypeal groove (fig. 2f), pronotal collar, upper margin of pronotum, an oval mark on the middle lobe of mesoscutum, tegula, subtegular ridge, elongate-oval mark on mesopleurum, scutellum, postscutellum, near base of hind wing, metapleurum broadly, a ring shaped mark on propodeum (fig. 2g), apices of all the tergites, band narrow in the middle, broad at sides; fore and middle coxae and their first trochanteral segment. Legs in general brownish-yellow. Hind coxa with an oval yellow mark above, its first trochanteral segment, apex of tibia, first and fifth tarsal segments, dark brown, its second to fourth tarsal segments white (fig. 2h). Wings clear hyaline.

Male : Unknown.

Length : Female, 4.75 mm. Fore wing 4.25. Ovipositor sheath about 1 mm.

Holotype : Female and *Paratype* female, NEPAL : Phulchowki, 2400 m, 3-6.x.1970, Tek Chand, No. 359-368. (Z. S. I., Calcutta).

Distribution : Nepal.

5. ***Glabridorsum similis***, sp. nov.

Essentially similar to *G. nepalensis,* sp. nov. in sculpture and colour, except as follows :

Female : Face and clypeus minutely and sparsely punctate. Pronotum above not strongly swollen like a tubercle. Mesopleurum sparsely and minutely punctate anteriorly. Metapleurum and area basad of basal carina of propodeum densely and shallowly punctate. Abdominal tergites mat and subpolished.

Black. Face without black mark along the clypeal groove. Apical band on second and third tergites not narrowed in the middle.

Male : Unknown.

Length : Female, 6 mm. Fore wing 5 mm. Ovipositor sheath 1.5 mm.

Holotype : ♀, INDIA : WEST BENGAL : Rangiroon in Darjeeling Hills, 1758 m, 27.v.1966, J. K. Jonathan, No. J. 159 (Z. S. I., Calcutta). *Paratype* : 2♀♀ MEGHALAYA (Formerly Assam) : Cherrapunji in Khasi Hills, 1272 m, 1♀, 4.iv.1966, D. T. Tikar, No. T 168. UTTAR PRADESH : Mussoorie, 1♀, 13.ix.1965, J. K. Jonathan No. J 69 (Z. S. I., Calcutta).

Distribution : India : Meghalaya, Uttar pradesh and West Bengal.

6. ***Glabridorsum orbitalis***, sp. nov.

This species is close to *G. semilunatum*, sp. nov. and *G. simulatum*, sp. nov. in having mesopleurum trans-rugoso-striate. However, it can be easily distinguished by having first and second tergites mat with sparse and shallow punctures, mesopleurum with two yellow oval marks.

Female : Body largely subpolished to shiny. Face and clypeus with small, sparse and shallow punctures, except face above with a few trans-striations and apical 0.3 of clypeus smooth and shiny. Mandible with fine and sparse punctures. Malarspace granulose, 1.0x as long as basal width of mandible. Frons smooth and polished, with a shallow median vertical groove. Vertex smooth and shiny. Temple shiny sparsely and shallowly punctate. Pronotum largely trans-striate, its upper margin shiny, sparsely and shallowly punctate, pronotal collar with indistinct punctures, and weak fine aciculations, epomia short, upper margin of pronotum opposite to notaulus moderately strongly swollen. Scutellum sparsely and shallowly punctate, lateral carinae extending at its basal 0.25. Postscutellum smooth and subpolished. Mesopleurum below subteglar ridge trans-striate, further below rugoso-striato-punctate, mesosternum shiny with small and sparse punctures, speculum smooth and polished, prepectal carina extending 0.8 the height of mesopleurum. Metapleurum finely trans-striate, juxtacoxal carina present. Propodeum between basal carina and apex largely finely obliquely wrinkled, towards the apex tending to be rugose, basad of basal carina with undefined sparse punctures, near spiracles rough, both the transeverse carinae moderately strong and complete, apophyses crest-like. First tergite mat and subpolished with a few scattered shallow punctures, at base without lateral tooth. Second tergite mat with sparse and shallow setiferous punctures, following tergites mat and subpolished. Nervulus in fore wing opposite to basal vein, nervellus intercepted at its lower 0.4.

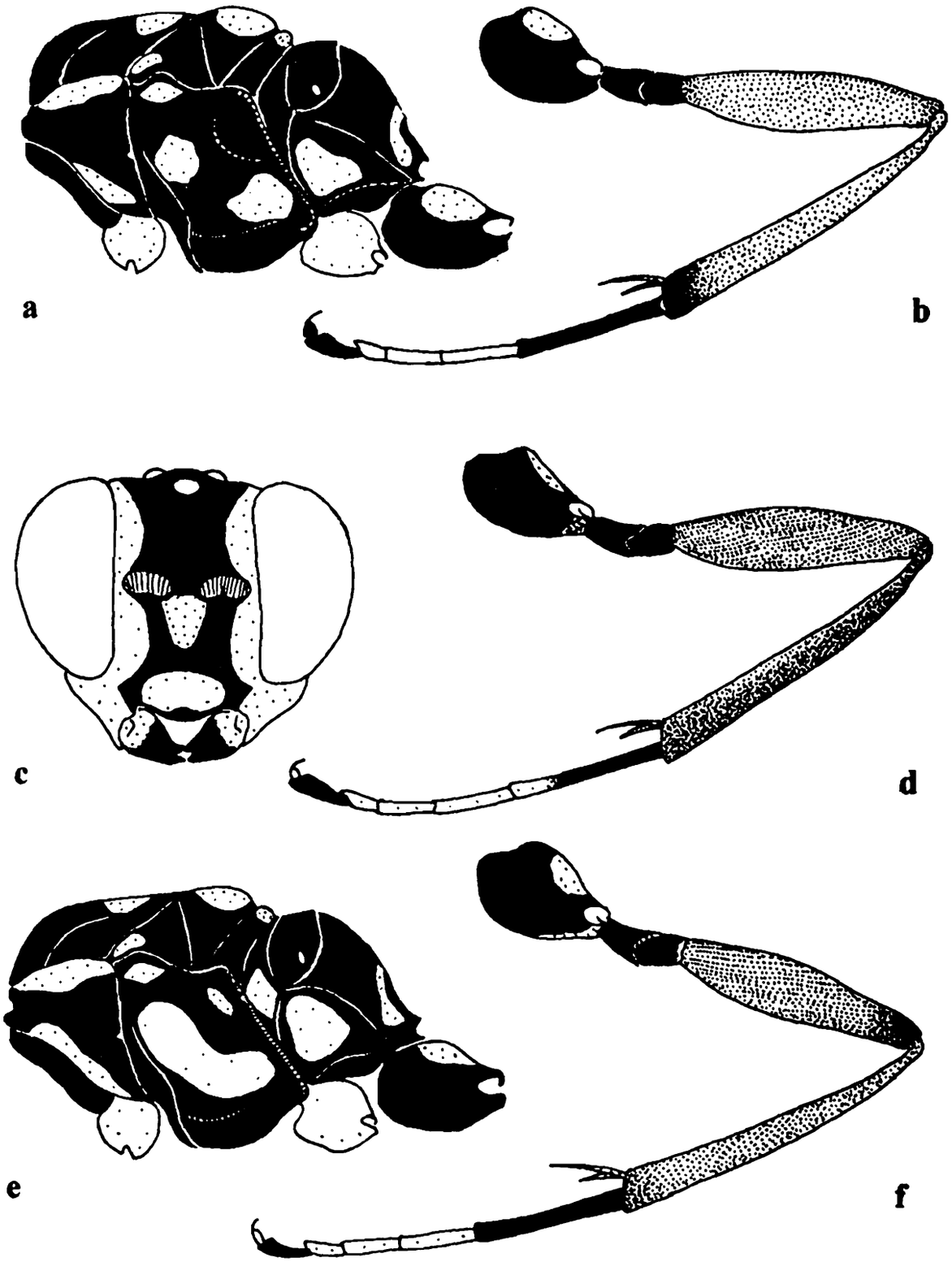

Fig. 3. Colour pattern : *Glabridorsum orbitalis* : a, side view of thorax; b, hind leg. *Glabridorsum semilunatum* : c, front view of head; d, hind leg. *Glabridorsum simulatum* : e, side view of thorax; f, hind leg.

Black. 8th and 9th antennal flagellar segments distinctly white. The following are yellow : Face with a small to large squarish mark in the middle, clypeus except along the margin, base of mandible, face, frons, vertex, temple and malarspace broadly, orbit all along the eye margin, upper margin of pronotum, pronotal collar below, middle lobe of mesoscutum at base, scutellum, postscutellum, subtegular ridge, an oval mark in front of speculum and another above the base of middle coxa on mesopleurum, a broad mark at the base of hind wing, a roundish mark at the base of metapleurum, a bow-shaped mark (all along the apical carina) on propodeum (fig. 3a), apices of all the tergites, fore and middle coxae (except at base, black) and an oval mark on hind coxa. All the trochanters largely black, except fore trochanter narrowly yellow (fig. 3b); rest of all the legs reddish, except fore and middle tarsi tending to be darker (brown), apex of hind tibia, first and fifth segments of its tarsus wholly blackish; its 2-4 segments pure white. Wings clear hyaline.

Male : Unknown.

Length : Female, 8 mm. Fore wing 7 mm. Ovipositor sheath 2 mm.

Holotype : ♀, INDIA : HIMACHAL PRADESH : Narkanda, 2571 m, in Shimla Hills, 13.x.1971, D. Ram No. 381, *Paratype* : 10♀♀ INDIA : HIMACHAL PRADESH : Narkanda, 2571 m, in Shimla Hills, 2♀♀, 2-5.x.1962, V. K. Gupta, Nos. 26, 30; 1♀, 5-6.x.1966, J. K. Jonathan, No. J 176; 1♀, 12.x.1971, D. Ram, No. 379. Dhenkund, 2743 m, nr. Dalhuosie, 1♀, 12.x.1971, Tulsi Ram, No. JD 222; Ahla, 2286 m, nr. Dalhousie, 1♀, 3.x.1971, Tulsi Ram, No. JD 198; Chini Bunglow, 1457 m, nr. Shimla, 1♀, 11.x.1962, V. K. Gupta, No. 40; Kalatop, 2488 m, 1♀, 13.x.1971, Girish Chandra, No. JD 223. UTTAR PRADESH : Dwali in Kumaon Hills, 2743 m, 2♀, 8.x.1973, Colls. V. K. Gupta, K. Ghorpade, Nos. 585, A 15 (Z. S. I., Calcutta).

Distribution : Himachal Pradesh and Uttar Pradesh.

7. ***Glabridorsum semilunatum,*** sp. nov.

This species is close to *G. simulatum,* sp. nov. in having abdominal tergites without punctations and mesopleurum with broad oblong mark in the middle. However, it can be recognised by having its metapleurum with moderately large punctures, area tending to be rugoso-punctate.

Female: Face in the middle punctate, punctures shallow, their interspaces more than their own diameter, at sides mat and subpolished. Clypeus largely smooth and subpolished, except for a few scattered shallow punctures. Frons, vertex and temple smooth and shiny. Malarspace granulose, 1.0x the basal width of mandible. Mandibles coarsely punctate. Pronotum with 7-8 strong transverse striations in the scrobes, its upper margin and collar smooth and shiny, epomia short and weak, upper margin normal. Scutellum and postscutellum smooth and shiny lateral carina more or less conifined to its base. Mesopleurum moderately strongly transversely rugoso-punctate, area below subtegular ridge and infront of speculum smooth, mesosternum closely punctate, prepectal carina extending more or less up to the base of subtegular ridge. Metapleurum with moderately large punctures, punctures towards the metapleural carina dense tending to be rugoso-punctate, juxtacoxal carina present. Propodeum between basal carina and apex finaly wrinkled, basad of basal carina sparsely punctate, both the transverse carinae strong and sinuate, apophyses like weak lateral

crests. First tergite without distinct lateral tooth, all the tergites mat and subpolished. Nervulus more or less opposite to basal vein, nervellus intercepted at its lower 0.33.

Black. 7th to 11th flagellar segments white. The following are yellow : Clypeus, except along the margin, face with an elongate triangular mark, base of mandibles, orbital mark encircling the eye (fig. 3c), pronotal collar, upper margin of pronotum, an oval mark on the middle lobe of mesoscutum, scutellum, tegula, subtegular ridge, and elongate curved mark on mesopleurum, a mark near the base of hind wing, a large triangular mark on metapleurum, a broad semilunar mark on propodeum, apices of all the tergites, fore and middle coxae, yellow. Legs in general reddish-brown; except first fore and middle trochanteral segments yellow with small to broad black marks. Fore and middle tarsi clouded with dark brown; hind coxa and trochanter black, except coxa above with an oval mark and narrowly at apex yellow, its tibia broadly at apex and along the upper margin, basal 0.7 of first tarsal segment and fifth segment wholly dark brown to black, rest of hind tarsus, white (fig. 3d). Wing clear hyaline.

Male : Essantially similar to female except as follows : Body more slender. Pronotum largely smooth and shiny, without distinct striations. Mesopleurum largely finely transversely striato-punctate. Metapleurum finely trans-rugoso-punctate. Propodeum with more strong and oblique wrinkles.

Black : 10th to 16th flagellar segments white. Scape in front yellow. Fore and middle first trochanternal segments without black marks; rest of the colour as in female.

Length : Female, 8 mm. Fore wing 7.2 mm. Ovipositor sheath 1.75 mm. Male, 7.2 mm. Fore wing 6.5 mm.

Holotype : ♀, INDIA : HIMACHAL PRADESH : Kalatop, 3438 m, 4.x.1971, Girish Chandra, No. JD 200. *Allotype* : ♂, INDIA : JAMMU & KASHMIR : Gulmarg, 2430 m, 21.vi.1966, V. K. Gupta, No. 206. *Paratype* : 6♂♂, 1♀ INDIA : HIMACHAL PRADESH : Dalhousie, 2132 m, 1♀, 3.x.1971, A. K. Gulati, No. JD 197. JAMMU & KASHMIR : Gulmarg, 2430 m, 5♂♂, 17-22.vi.1966, Colls. V. K. Gupta, M. K. Kamath, D. Ram, Colls Nos. 205-208 & K 121; Rahla nr. Manali, 2743, 1♂, 7.vi.1970, M. Gupta, No. M 27 (Z. S. I., Calcutta).

Distribution : India : Jammu & Kashmir and Himachal Pradesh.

8. ***Glabridorsum simulatum***, sp. nov.

This species shows affinities with *G. semilunatum,* sp. nov. and *G. punctatum*, sp. nov. It can be distinguished by the absence of lateral tooth at the base of first tergite, metapleurum trans-striato-punctate and speculum on mesopleurum with a small yellow mark (fig. 3e).

Female : Body largely shiny. Face and clypeus smooth, except for a few scattered setiferous punctures. Frons, vertex and temple smooth and polished. Malarspace granulose, 1.0x the basal width of mandible. Pronotum almost smooth and shiny, without distinct striae in the scrobes and without punctures on collar and upper margin, upper margin not swollen. Mesopleurum transversely rugoso-punctate, striate below subtegular ridge and along speculum, speculum smooth, mesosternum shallowly punctate, prepectal carina extending up to the base of subtegular ridge. Scutellum and

postscutellum smooth. Metapleurum transversely striato-punctate, juxtacoxal carina present. Propodeum between basal and apical carinae weakly obliquely wrinkled, apicad of apical carina with weak sparse punctures and rugosities; basad of basal carina minutely and sparsely punctate, both the carinae moderately strong, apical carina strongly sinuate, laterally forming weak crest-like apophyses. First tergite without basal lateral tooth, tergite smooth, following tergites mat and subpolished. Nervellus intercepted at its basal 0.33.

Colour similar to *G. punctatum*, except hind coxa black, with an oval mark above and extreme apex below, yellow (fig. 3e, f).

Male : Essentially similar to female, except more slender and polished. Face and clypeus somewhat closely and shallowly punctate. Mesopleurum and mesosternum minutely and sparsely punctate, finely striate along the speculum. Metapleurum with moderate sized close punctures.

Colour similar to female, except 10th to 13th flagellar segments and scape in front, yellow. Hind leg with coxa above and apically broadly, yellow, its first trochanteral segment black; second segment, femur and tibia reddish-brown, except for a mark on second trochanteral segment, femur at apex, tibia at apex and along the upper margin, black; first and fifth tarsal segments, black, and second to fourth segments white.

Length : Female, 6.5 mm. Fore wing 5 mm. Ovipositor sheath 1.5 mm. Male, 6 mm. Fore wing 4.5 mm.

Holotype : ♀and *allotype*, ♂, INDIA : WEST BENGAL : Darjeeling, Botanical Garden, 1943 m, 4-8.v.1966, Colls. D. T. Tikar & V. K. Gupta, Colln No. T 239 & 168. *Paratypes* : 2♀♀, 2♂. INDIA : UTTAR PRADESH : Phata in Garhwal Hills, 1430 m, 1♀, 12.v.1967, J. K. Jonathan, No. J 221; Bhyundar in Garhwal Hills, 2286 m, 1♂, 31.v.1965, T. M. Prasad, No. P 8; Harsil, 2550 m, 1♀, 10.vi.1977, G. Singh, No. 77.3.6. HIMACHAL PRADESH : Khajjiar, 1800 m, 1♂, 28.vi.1965, T. M. Prasad, No. P 19 (Z. S. I., Calcutta).

Distribution : India : Himachal Pradesh, Uttar Pradesh and West Bengal.

SUMMARY

This paper deals with eight new species of *Glabridorsum* Townes viz., *G. varibalteatum, G. punctatum, G. glabrosum, G. nepalensis, G. similis, G. orbitalis, G. semilunatum and G. simulatum* from India and Nepal.

This genus has been recorded from Japan and Indo-Papuan area. This is the first record of this genus from India and Nepal.

ACKNOWLEDGEMENTS

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FIVE NEW SPECIES OF *ITAMOPLEX* FOERSTER FROM INDIA (Hymenoptera : Ichneumonidae)

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INTRODUCTION

The genus *Itamoplex* belongs to the family Ichneumonidae, tribe Ishnini. This genus is known from Holarctic, African and Oriental regions. It contains small to medium sized species measuring 6-12 mm in length. Townes (1970 : 193) refered to this genus only one species viz., *Itamplex carinifrons* (Cameron) from oriental region (India and Pakistan).

Five new species are described here from India. *Itamoplex carinifrons* (Cameron) which is widely distributed in the hilly areas of India, is redescribed. A key to all the species from India is provided.

SYSTEMATIC ACCOUNT

Genus ***Itamoplex*** Forester

1804. *Cryptus* Fabricius, Systema Piezatorum, p. 70. Name preoccupied by Jurine, 1901. Type-species : *Cryptus viduatorius* Fabricus. Desiganted by Curtis, 1837.

1868. *Itamoplex* Forester, *Verh. Naturh Ver. Rheinlande*, **25** : 188. Type-species : *(Cryptus americanus) = albitarsis* Cression. Designated by Viereck, 1914.

1903. *Plesiocryptus* Cameron, *Ztschr. system. Dipt.* **3** : 299. Type-species : *Plesiocryptus carinifrons* Cameron. Monobasic. Syn. by Towners et al., 1961.

Body modertaly slender. Clypeus medium sized, about 2.2 as wide as long, moderately convex, without a median tooth or irregularity. Malar space 0.7 to 1.8x as long as basal width of mandible; mandible of moderate length, lower tooth a little shorter than the upper. Mesoscutum polished, with medium sized to small, moderately close to dense or crowded punctures, sometimes rugulose next to the edge of notauli, notauli weak reaching a little behind center of mesoscutum. Basal carina of propodeum usually distinct, apical carina complete, with weak to moderately strong lateral crests; propodeal spiracle about 2.4 x as long as wide. Base of hind coxa deep, without a distinct groove but with a short shallow, almost horizontal impression at its attachment. Wing venation as in figure 1a, b, intercubiti strongly convergent and second recurrent vein nearly always weakly sinuate. First abdominal tergite of moderate proportions, without lateral tooth at base, its spiracle near apical 0.35, ventrolateral carina of first tergite distinct and complete; in males dorsolateral and dorsomedian carinae absent or indistinct; in female dorsolateral carina

usually week and dorsomedian carina usually strong, reaching on to the base of postpetiole; second tergite mat with fine setiferous, punctures dense in male, quite sparse in female. Ovipositor sheath 1.1 to 2.2 as long as hind tibia, ovipositor weakly compressed, its tip usually elongate (fig. 1c, 3a).

Length : Female : 6-14 mm Fore wing 6-9 mm. Ovipositor sheate 1.5-3.5 mm.

Type-species : *Cryptus viduatorius* Fabricius.

Itamoplex Foerster is close to *Bauthra* Cameron and *Hedycryptus* Cameron in having first tergite not so long and slender, its sternite seldom reaching half the distance between spiracle and apex; thyridium usually more than 0.6 as wide as long. However, it is distinguished by the absence of a pit dorso-laterad to each antennal sockets on frons; petiole of first targite with ventro-lateral and dorso-lateral carinae and second recurrent vein usually sinuate.

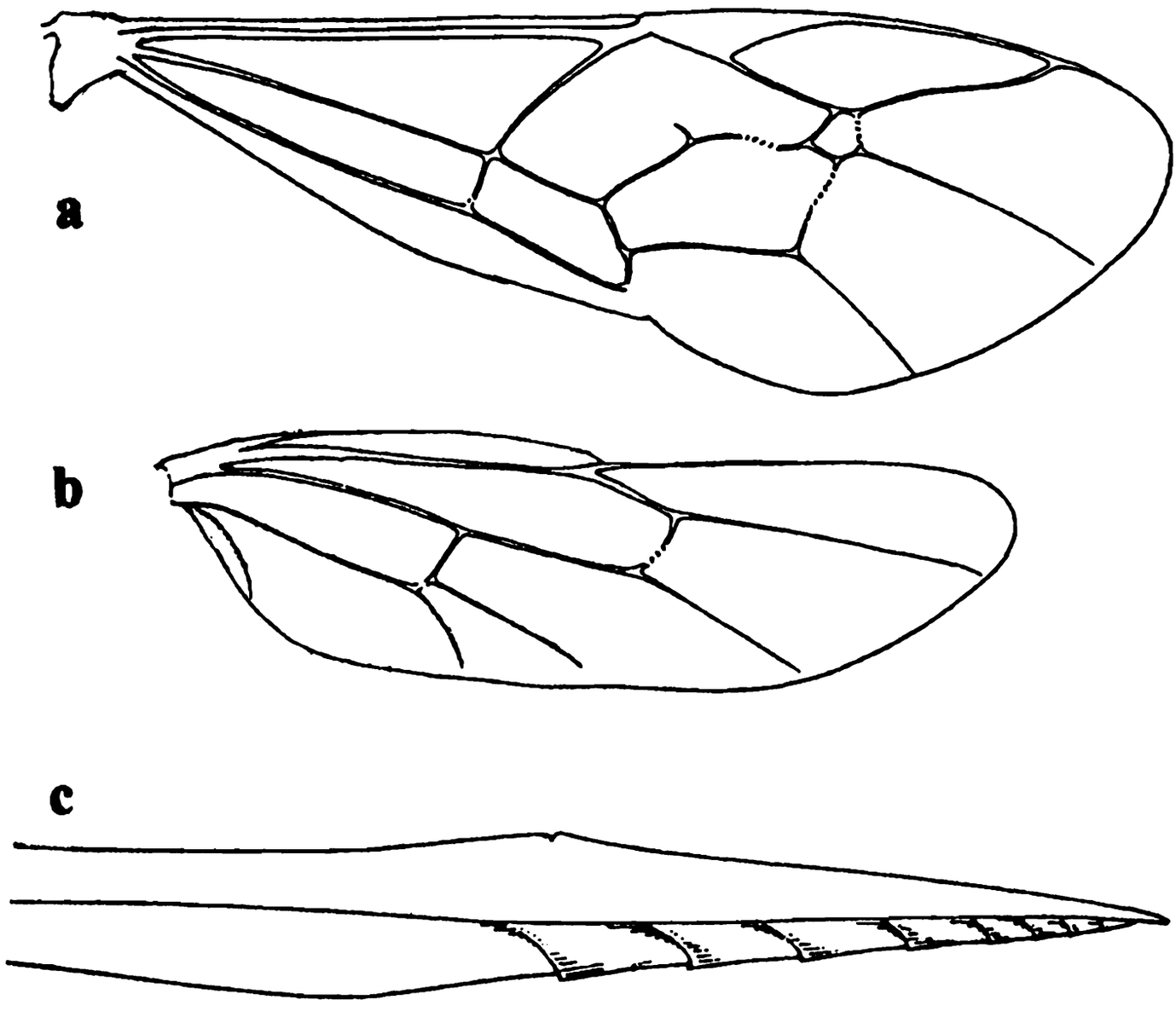

Fig. 1. *Itamoplex* Forester : a, b, fore wings showing venation; c, ovipositor tip.

Key to the species of *Itamoplex*

1. Frons strongly depressed, laterally along the eye margin strongly raised like a ridge. Propodeal spiracle elongate-oval, about 2x as long as wide. Abdomen dull, mat-granulated. Antennal flagellum without a whitish band. ..... 1. ***carinifrons*** (Cameron)

- Frons neither strogly depressed nor raised along the eye margin. propodeal spiracle oval, about 1.5x as long as wide. Abdomen subpolished or shiny with setiferous or minute punctures. Antennal flagellum with whitish or yellowish band. 2

2. Abdomen largely black. Wings infumate. 3

- Abdomen largely red. Wings yellowish. 4

3. Ovipositor tip lanceolate, with a distinct nodus, both the valves uniformly tapering towards a pointed apex. Scutellum shiny with sparse indistinct punctures. Basal carina of propodeum complete, juxtacoxal carina almost absent. ..... .2. ***lanceolatum***, sp. nov.

- Ovipositor tip not lanceolate, without a distinct nodus, upper value heavy, gradually arched towards the tip, lower valve sharply narrowed towards the apex. Scutellum subpolished with distinct, dense punctures. Basal carina of propodeum sublaterally weak to absent. Juxtacoxal carina strongly persent. ..... 3. ***longiterebratum***, sp. nov.

4. All coxae and trachanters, red (legs almost red). Orbital mark encircling the whole of orbit. Upper margin of pronotum, tegula, apophyses, scutellum with two marks, postscutellum and speculum on mesopleurum, yellow. ..... 4. ***indicum,*** sp. nov.

- All coxae and trochanters, black. Orbital mark not completely encircling the whole orbit. Upper margin of pronotum, tegula, apophyses, postscutellum and speculum, black. Scutellum with a single oval mark at the apex, yellow. 5

5. Nervulus opposite to basal vein. Postpetiole wider than long, about 0.8x as long as wide at base. Antennal scrobes moderately deep with fine transverse striatioins, frons above weakly rugose. Antennal flagellum with 5th-9th segments white above. .... 5. ***kashmirensis,*** sp. nov.

- Nervulus distinctly basad of basal vein. Postpetiole longer than wide, about 1.3x as long as wide at base. Antennal scrobe not deep, strongly trans-rugose, frons above strongly wrinkled. Antennal flagellum with 5th & 6th segments only white. ..... 6. ***himalayensis,*** sp. nov.

1. Itamoplex carinifrons (Cameron)

1903. *Plesiocryptus carinifrons* Cameron, *Zstchr. System. Hymen. Dipt.*, **3** : Female, des. Type : Female, India : Shimla (British Mus.).

1923. *Plesiocryptus carinifrons* Cameron : Dutt, *Mem. Dept. Agr. India* (*Ent.*), **8** : 22. Pakistan : Murree, 7500 ft.

1961. *Trachysphyrus carinifrons* (Cameron) : Townes et al., *Mem. Amer. Ent. Inst.*, **1** : 164. Syn.

1970. *Itamoplex carinifrons* (Cameron) : Townes, *Mem. Amer. Ent. Inst.*, **12** : 193-194.

This is a distinct species and can be recognised from rest of the species by having frons strongly depressed, along the eye margin strongly raised like a ridge. Propodeal spiracles elongate-oval, about 2x as long as wide. Antennal flagellum without a band.

Female : Face subpolished, moderately convex in the middle, with obliquely running rugae, with sparse fine punctures. Clypeus shiny, minutely and sparsely punctate. Malarspace granulose, 0.9x the basal width of mandible. Mandible rugoso-punctate. Frons subpolished, strongly depressed, at sides strongly raised like a ridge (fig. 2a), scrobe moderately trans-striate, above obliquely striate with sparse small punctures. Vertex mat and subpolished, with small sized dense punctures. Temple subpolished, with coarse, dense punctures. Pronotum subpolished, largely with strong wrinkles, above finely striate with fine punctures in between the striae, pronotal collar with small dense punctures, epomia strong and moderately long. Mesoscutum mat and subpolished with moderate sized, close to dense punctures. Scutellum shiny, with small, moderately deep punctures with a few fine longitudinal striations, lateral carinae extending at its basal 0.25. Postscutellum shiny, sparsely and minutely punctate; mesopleurum largely rugose, area below subtegular ridge longitudinally striato-punctate, speculum with coarse closely placed puncture; prepectus, area above sternaulus and mesosternum with median sized, close to sparse punctutes, prepectral carina extending 0.75 x the height of mesopleurum. Metapleurum ruguso-wrinkled, juxtacoxal carina short. Propodeum between apical carina and apex finely and between the apical and basal carinae moderately strongly rugoso-wrinkled, based of basal carina somewhat reticulo-punctate, apical carina transverse in the middle basal carina laterally indistinct. First abdominal tergite largely granulose (mat), subpolished, near the spiracles rugose; following tergites mat and subpolished with fine dense setiferous punctures, punctures on a apical tergites not defined. Ovipositor sheath about 1.3x as long as hind tibia.

Black. The following are yellow : Orbit along the eye margin, a line on malarspace (fig. 2b), pronotal collar narrowly above, a small mark at the upper end of epomia, subtegular ridge faintly. All the coxae and trochanters, black; all femora red; fore and middle tibiae reddish-brown, their tarsi brown to dark brown; hind tibia and tarsus dark brown-blackish, execpt tibia at base narowly reddish-brown (fig. 2c). Wings clear hyaline.

Male : Not known.

Length : Female, 6.75-12.5 mm. Fore wing 6.75-9.5 mm. Ovipositor sheath about 2.8-4.5 mm.

Material examined : INDIA : Jammu & Kashmir; Khillanmarg, 3000m, 1♀ 23.vi.1966, V. K. Gupta, No. 221 (Homotype of *Plesiocryptus carinifrons* Cameron, det. V. K. Gupta, 1967).

Additional material examined : 168 Females : INDIA : Himachal Pradesh : Khadral, 2800m, 5♀♀, 25.vi.1950, G. D Basin (FRI Collection); Naldera in Shimla Hills, 4♀♀, 12.iv.1923, 7-3.vii.1938, 4.vii.1950 Colls. S. K. Pillai, C. F. C. Beeson and G. D. Bhasin (FRI Collection). Nichar, 2500m, 21♀♀, 9-12.vi.1972, Colls. T. Chand, Girish, S. Gupta, Colln. 389-393, G 10, G 11. Ahla, 2286m, 37♀♀, 3-30.v.1971, Colls. Kamath, C. Singh, D. Ram, Colln. Nos. DH 24-61 and JD 5-7; 3♀♀, 3-5.vi.1971, Colls. Joseph, D. Ram, Sukhdev, Colln. Nos. JD 11 & 186, DH 70. Dalhousi, 2132 m, 1♀, 7.vii.1965, Coll. Tikar, No. 61; 13♀♀, 26-6.vi.1971, Colls Kamath, C. Singh, D. Ram. T. Chand and Malaise Trap III, Colls. Nos. DH 8-53. Kalatop, 2438m, 1♀, 1.x.1968, Coll. V. K. Gupta. No. 323; 14♀♀, 4.v-28.ix.1971, Colls. Kamath, D. Ram, V. K.

Gupta, A. K. Gulati, Colln. Nos. DH 25-38 and JD 180. Narkanda, 2700 m, 5♀♀, 4-8.x.1962, V. K. Gupta. Nos. 29-34; 4♀♀, 5-13.x.1971, Colls Joseph, Kamath, M. Gupta, D. Ram, Colln. Nos. J. 126, K 330, M 158, 381. Rahla, 2743m, 8♀♀, 7-10.vi.1970, Colls. Kamath, M. Gupta, Colls. Nos. K 278 & 285, M 27 & 29. Manali, 1828 m, 8♀♀, 16.v-6.vi.1970, Colls. A. K. Gulati, T. Chand, Kamath, M. Gupta, Colls. Nos. 204-262 and M 23. Koti, 2438m, 5♀♀, 8-10.vi.1970, Colls. D. Ram, Sharma, Colls. Nos. K 283 & 238. Uttar Pradesh : Harsil, 22550m, 26♀♀, 9-13.vi.1972, Colls. Gupta, Tripathi, Rathore. Bharon Ghatti, 2820m, 1♀, 10.vi.1972, N. Rathore. Garhwal Hills : Mossoorie, 2100m, 3♀♀, V. K. Khanna, No. V 24-27. Kumaon Hills : Nainital, 2100m, 1♀, 22.iv.1977, V. Tripathi, No. T 44; Bhowali, 1♀, 5-10.vi.1968, V. K. Gupta, No. 316; Chaubatia. 1900m, V. K. Gupta, No. 45; Bhyundar, 2200 m, 7♀♀, 4.iv-29.v.1965, Colls. D. Ram, Gupta, Tikar, Nos. 31-101 (Z. S. I., Calcutta).

Distribution : India : Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh.

2. ***Itamoplex lanceolatum***, sp. nov.

This species is close to *I. longiterebratum*, sp. nov. by sharing characters of abdomen (black) and wings (infumate), but can be distinguished by having ovipositor tip lanceolate, with a distinct nodus. Scutellum shiny with sparse indistinct punctures. Basal carina of propodeum complete and justacoxal carina almost absent.

Female : Face subpolished, minutely punctate, punctures close in the middle, dense at sides. Clypeus shiny, sparsely punctate, smooth at apex. Malarspace granulose, 1.0x the basal width of mandible. Mandible subpolished, with close and shallow punctures. Frons mat and subpolished, rugoso-punctate, rugae behind the antennal sockets transverse. Vertex mat and subpolished, ocellar triangle sparsely punctate. Temple shiny, with small, closely placed, distinct punctures. Pronotum subpolished, in the scrobe trans-rugose, sometimes rugae not transverse, weak with small punctures in between the rugae. Pronotum above, collar and lower corner with minute dense punctures, punctures running into fine striations, epomia short. Mesoscutum shiny, small sized, moderately deep, close to little sparse punctures. Scutellum smooth and shiny, with sparse, weak punctures, its lateral carina extending at its basal 0.5. Postscutellum smooth and shiny, execpt, for a few minutes indistinct punctures. Mesopleurum shiny, in the middle finely rugoso-wrinkled, subtegular ridge, area below the ridge, prepectus, area above strenaulus in front and mesosternum with close to dense, small to minute punctures, sometime punctures running into striations, mesopleurum in some specimens largely rugoso-punctate, punctures with transverely running striations, and mesopleurum in the center largely rugose, speculum in the center smooth and shiny, perpectal carina extending 0.75x the height of mesopleurum. Metapleurum subpolished, moderately strongly wrinkled, juxtacoxal carina not defined. Propodeum between apical carina and apex finely wrinkled, between apical and basal carinae with strong oblique ridges or striations, basad of basal carina finely wrinkled, basal carina weak at sides (fig. 2d). First abdominal tergite largely smooth and shiny, postpetiole weakly mat, near the spiracles sparsely punctate. Second and third tergites with minute dense punctures, following tergites smooth and shiny. Ovipositor sheath about 1.2x as long as hind tibia; ovipositor tip as shown in figure 2e.

Black. 5th to 7th (sometimes 5th-9th) flagellar segments white. The following are yellow : orbits all along the eye margin narrowly, except interrupted at vertex and near malarspace, a line

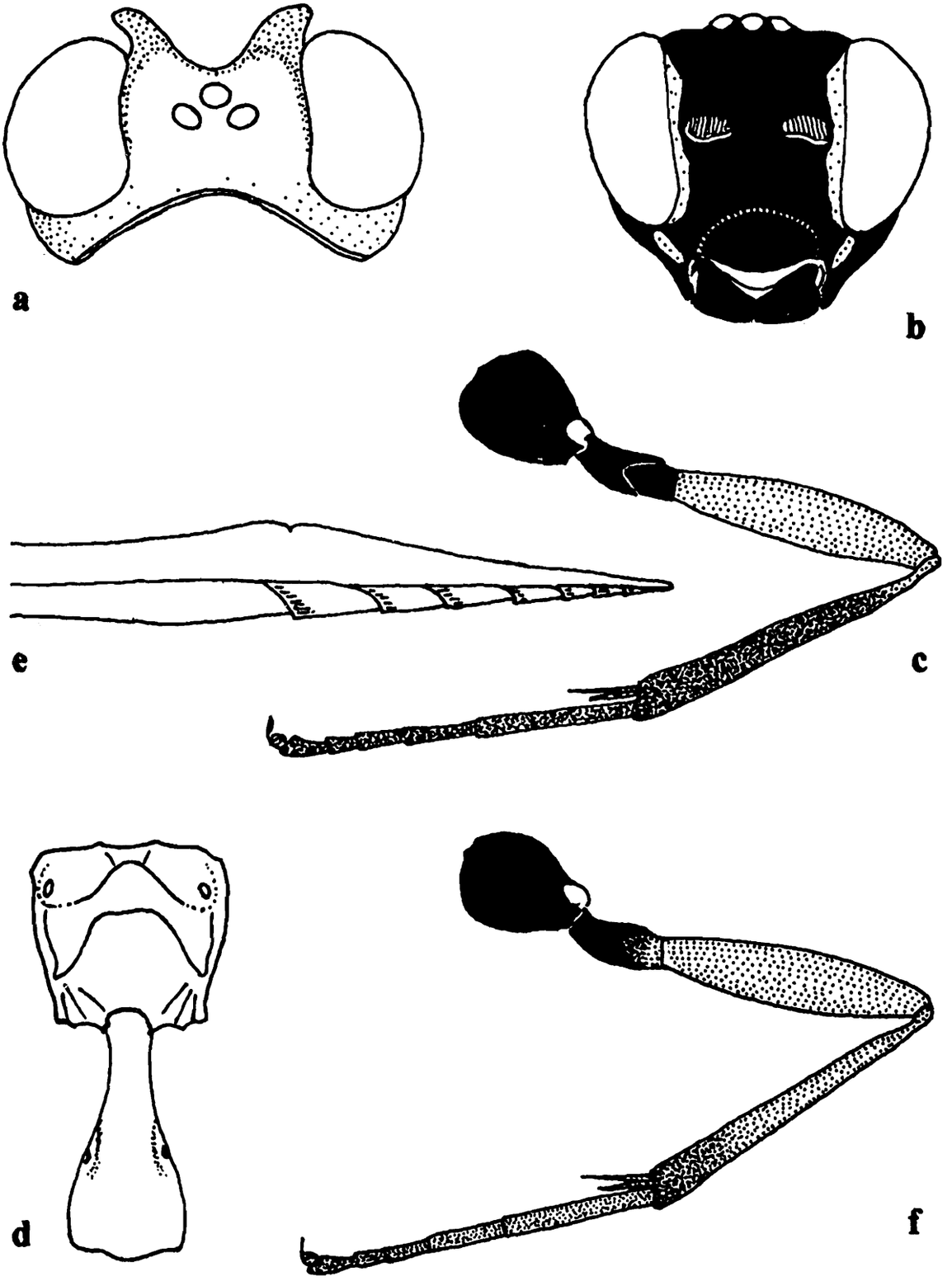

Fig. 2. *Itamoplex carinifrons* (Cameron) : a, dorsal view of head showing raised margins of frons; colour pattern : b, front view of head; c, hind leg. *Itamoplex lanceolatum* : d, dorsal view of propodeum & first tergite; e, ovipositor tip; f, hind leg showing colour pattern.

on malar area. Legs in general red or reddish-brown, execpt all the coxae and all the first trochanteral segments, black; all the tarsi and also apex of hind tibia, dark brown (fig. 2f). Wings brownish, hyaline and irredecent.

Male : Not known.

Length : Female 6-9 mm. Fore wing 4 -6 mm. Ovipositor sheath 2.5-4 mm.

Holotype : ♀, INDIA : Jammu & Kashmir : Gulmarg, 2429m, 17.vi.1966 V. K. Gupta, No. 147. *Paratypes* 99 ♀♀ INDIA : Kashmir Himalaya : Gulmarg, 2429 m, 97♀♀, 17-24.vi.1966, Colls. V. K. Gupta, T. Chand J. K. Jonathan, Colln. Nos. 147-212 & J. 164; Khillanmarg, 300m, 2 ♀♀, 21-24.vi.1966, Colls. V. K. Gupta & T. Chand, Colln. Nos. 211, 214 (Z. S. I., Calcutta).

Distribution : India : Jammu and Kashmir.

3. Itamoplex longiterebratum, sp. nov.

This species is close to *I. lanceolatum* sp. nov. but can be recognised by its ovipositor tip not lanceolate, without a distinct nodus, upper valve heavy, lower valve sharply narrowed towards the apex (fig. 3a), scutellum distinctly punctate. Juxtacoxal carina strong.

Female : Head and throax subpolished, abdomen shiny. Face convex in the middle, uniformly minutely and densely punctate, near eye margin mat with weak closely placed punctures. Clypeus somewhat sparsely punctate, at apex smooth. Malarspace granuloso-punctate, dull, 0.75x the basal width of mandible. Mandible striato-punctate. Frons below median ocellus finely wrinkled, further below wrinkled with small sized punctures, at sides mat, closely punctate, frontal scrobes with a few trans-striations. Vertex with small dense punctures, punctures at some places coalescent. Temple with moderate sized punctures, punctures closely placed above, sparse towards the base of mandible. Pronotum largely with moderate sized, dense punctures, punctures running into striations or at some places forming rugosities, in the middle with coarse transverse wrinkles, epomia short. Mesoscutum with small, dense punctures, forming fine recticulations. Scutellum distinctly punctate, punctures moderate size and close, its lateral carina more or less confined to its base. Postscutellum minutely and sparsely punctate. Mesopleurum largely with small sized, dense punctures, punctures running into striations and at some places forming fine reticulations, in the middle finely wrinkled. Mesosternum and area above sternaulus in front minutely and densely punctate, speculum in front smooth, prepectal carina extending 0.66x the height of mesopleurum. Metapleurum somewhat finely rugoso-reticulate, juxacoxal carina present but incomplete. Propodeum between basal carina and apex reticulo-wrinkled, basad of basal carina with medium sized, dense punctures, punctures forming rugosities, basal carina weak in the middle, apical carina interrupted sublaterally. First tergite with a few scattered minute punctures. The following tergites smooth, except second with minute, dense setiferous punctures. Ovipositor sheath about 1.8x as long as hind tibia; ovipositor tip as shown in figure 3e.

Black. Apex of 5th to base of 9th flagellar segment white above. Orbits all along the eye margin narrowly except below, subtegular ridge faintly, yellow; legs in general red, except all the coxae and trochanters, black; hind tarsus with second to third segments white, its first segment reddish-brown and fifth segment dark brown. Wings hyaline with yellowish hue.

Male : Not known.

Length : Female, 11 mm. Fore wing 7.5 mm. Ovipositor sheath 5.5 mm.

Holotype : ♀, INDIA : West Bengal : Darjeeling, 1980 m, 21.v.19, L. K. Sharma, No. B 19b (Z. S. I., Calcutta). *Paratypes* 2 ♀♀ INDIA : West Bengal : Darjeeling, 1980 m, 1♀, 6.v.1966, D. Ram, No. J. 235. Ghoom, 2206m, 1♀, 22.v.1967, L. K. Sharma, No. B. 20b (Z. S. I., Calcutta).

Distribution : India : West Bengal.

4. Itamoplex indicum, sp. nov.

This species is close to *I. kashmirensis*, sp. nov. and *I. himalayensis*, sp. nov. in having abdomen largely red and wings yellowish, but can be distinguished by having all coxae and trochanters, red; orbital mark encircling the whole orbit, scutellum with two lateral linear marks, metapleurum and speculum, yellow.

Female : Face subpolished, minutely punctate, with a weak median tubercle; clypeus smooth and shiny. Malar space granulose, 1.0x the basal width of mandible. Frons moderately depressed, scrobe shiny with trans-striations in the middle, below median ocellus obliquely rugoso-striate. Vertex mat and subpolished. Temple shiny, minutely punctate. Pronotum rugoso-punctate, pronotal collar densely punctate, epomia strong, reaching upper margin. Mesoscutum subpolished, minutely punctate. Scutellum shiny, sparsely punctate, lateral carina more or less confined to its base. Postscutellum subpolished, smooth. Mesopleurum subpolished, with small, distinct dense punctures, punctures at some places running into fine striations, speculum smooth and shiny, prepectal carina extending 0.9 the height of mesopleurum. Metapleurum moderately strongly rugose, juxta coxal carina absent. Propodeum rugoso-wrinkled, apophyses moderately strong. First abdominal tergite mat, near the spiracle rugose, following tergites mat and subpolished. Ovipositor sheath about 1.2x as long as hind tibia.

Black. The following are yellow : orbital mark along the eye margin, a line on malar space, clypeus at base, pronotal collar, upper margin of pronotum, tegula, subtegular ridge, an elongate mark on speculum, two lateral marks on scutellum, postscutellum wholly and apophyses (fig. 3b). Abdomen wholly red. All the legs in general reddish-brown, except hind tarsus dark brown.

Male : Unknown.

Length : Female 8.5 mm. Fore wing 6 mm. Ovipositor sheath about 3 mm.

Holotype : ♀ : INDIA : No further data, 10.viii.1949, Coll. Khanna (Z. S. I., Calcutta).

Distribution : India.

5. *Itamoplex kashmirensis*, sp. nov.

This and the following species are readily recognised by having legs largely black, orbital mark not encircling the whole orbit. This species can be distinguished by having nervellus opposite

to basal vein (fig. 3c), postpetiole 0.8x as long as wide at base (fig. 3d) and antennal flagellum with a white band on 5th to 9th segments,

Female : Body subpolished. Face in the middle weakly raised, at sides flat, with small punctures, punctures in the middle with interspace as wide as their own diameter, punctures at sides close and shallow, surface mat. Clypeus with moderately large and deep punctures, punctures towards the apex sparse. Malarspace granulose, 1.2x the basal width of mandible. Mandible somewhat rugoso-punctate. Frons with antennal scrobes deep, in the scrobes finely trans-striate, above rogoso-punctate, at side mat with sparse shallow punctures. Vertex strongly mat, with close shallow pynctures, punctures in the ocellar triangle moderately large and deep. Temple with moderate sized deep punctures, interspaces 1.0x or more than their diameter. Mesoscutum with medium sized, close to little sparse punctures. Scutellum shiny, minutely and sparsely punctate, lateral carina extending to its basal 0.33. Postscutellum with small, closely placed punctures. Mesopleurum largely rugoso-wrinkled, area below subtegular ridge, along the anterior and posterior margins striato-punctate; subtegular ridge, speculum, area above sternaulus near prepectal carina and mesosternum with medium sized evenly spaced punctures, interspaces 1.0x or little more than their diameter, prepectal carina extending about 0.7x the height of mesopleurum. Metapleurum reticulo-wrinkled, juxtacoxal carina not well defined. Propodeum largely moderately strongly reticulo-wrinkled, basal carina laterally weak. First tergite largely smooth and subpolished, except for a few scattered shallow punctures and area near spiracles rugoso-punctate, second and third tergites mat, with fine dense setiferous punctures, following tergites mat and subpolished. Ovipositor sheath about 0.7x as long as hind tibia.

Black. 5th to 9th flagellar segments white above. Face, frons temple narrowly along the eye margin (fig. 3e), scutellum with a small mark, yellow. Abdomen reddish, except first abdominal segment at base blackish. Legs in general reddish to reddish-brown, except all the coxae and trochanters black, and their tarsi brownish.

Male : Unknown.

Length : Female, 8.5 mm. Fore wing 6 mm. Ovipositor sheath 2 mm.

Holotype ♀, INDIA : JAMMU & KASHMIR : Gulmarg, 2429 m, 7.vi.1966, Coll. V. K. Gupta. No. 197. *Paratype* ♀, same data as holotype, 21.v.1966, Coll. No. 205 (Z. S. I., Calcutta).

Distribution : India Jammu & Kashmir.

6. ***Itamoplex himalayensis***, sp. nov.

This species can be distinguished from *I. kàshmirensis*, sp. nov. by having nervulus distinctly basad of basal vein (fig. 3f). Postpetiole longer than wide, about 1.3x as long as wide at base (fig. 3g) and antennal flagellum with a white band on 5th to 6th segments.

Female : Body largely subpolished. Face medially convex, with small sized dense punctures, punctures running into striations. Clypeus with intermixed small and moderately large punctures, punctures towards the apex sparse. Malarspace granulose, 1.2x the width of mandible. Mandible strongly striato-punctate. Frons in the middle below median ocellus wrinkled, at sides with coarse

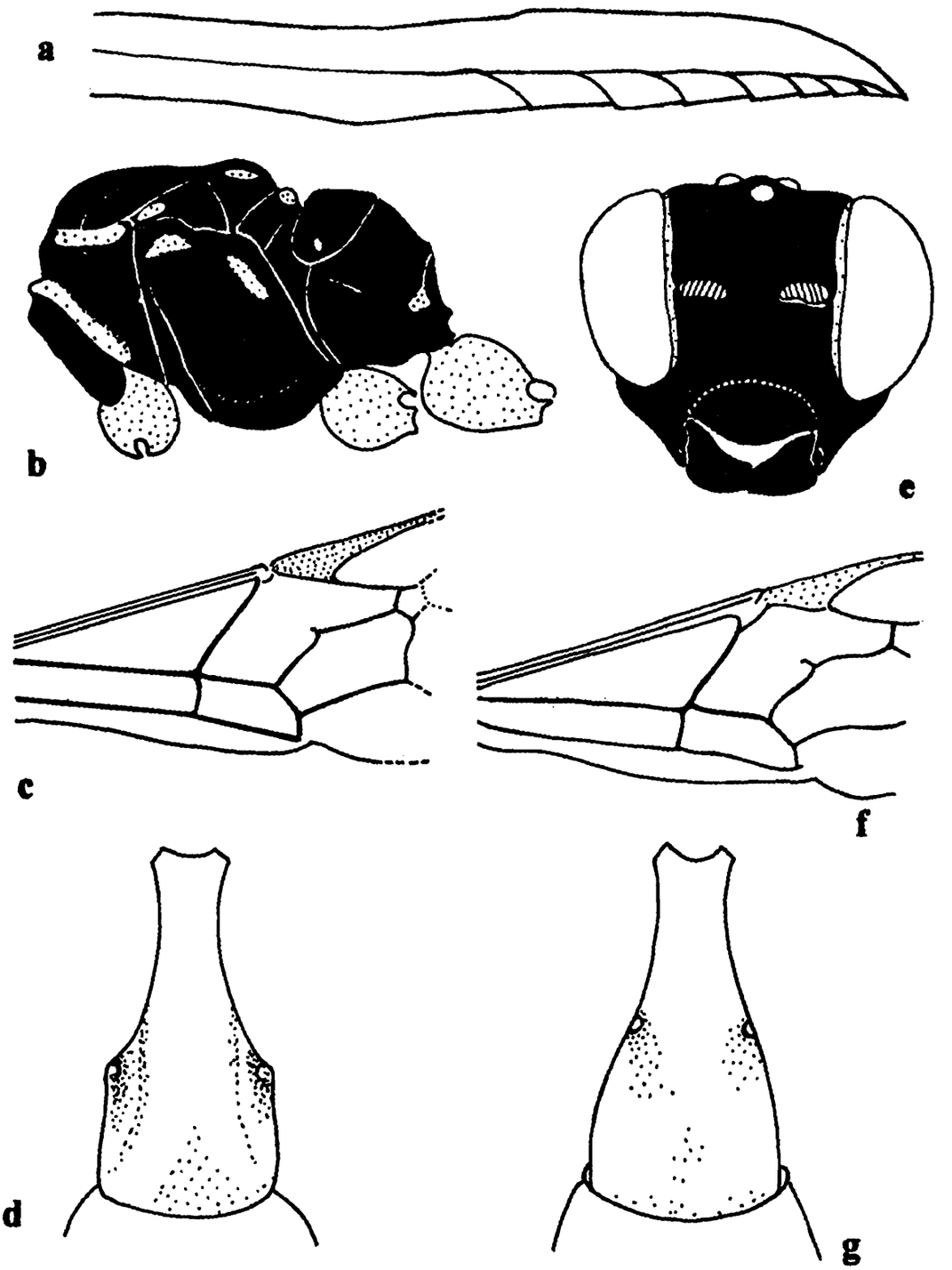

Fig. 3. *Itamoplex longiterebratum* : a, ovipositor tip. *Itamoplex indicum* : colour pattern : b, side view of thorax. *Itamoplex kashmirensis* : c, fore wing; d, dorsal view of first tergite; e, front view of head showing colour pattern. *Itamoplex himalayensis* : f, fore wing; g, dorsal view of first tergite.

closely placed punctures, behind antennal sockets coarsely trans-striate or striate. Vertex in ocellar triangle densely, behind the triangle and at sides with small sized close punctures, punctures sparse near the eye margin. Temple with moderately deep, small sized punctures, interspace more than their own diameter. Pronotum in the scrobe moderately strongly rugose, above with coarse, deep and dense punctures, forming rugosites; pronotal collar and lower margin with small sized moderately deep, close to sparse punctures; epomia short but strong. Mesoscutum with moderate sized close punctures, punctures at some places running into striations. Scutellum shiny with spares small sized punctures, lateral carina more or less confined to its base. Postscutellum smooth, with a few minute punctures. Mesopleurum broadly in the middle rugoso-wrinkled, speculum with coarse deep punctures and a few striations; prepectus, area above sternaulus anteriorly, mesosternum, area around subtegular ridge finely punctate, interspace 1.5-2.0x their own diameter; prepectal carina extending 0.6-0.7x the height of mesopleurum. Metapleurum largely rugoso-wrinkled, at some places forming reticulate pattern, juxtacoxal carina absent. propodeum between basal carina and apex moderately strongly wrinkled, basad to basal carina finely reticulo-wrinkled with a few punctures at extreme base, both the transverse carinae strong and complete, apophyses strong. First abdominal tergite largely smooth and subpolished, except postpetiole with small scattered punctures and near the spiracles rugoso-punctate. Second tergite mat with fine dense setiferous punctures; following tergites mat and subpolished. Ovipositor sheath about 1.1x as long as hind tibia.

Black. 5th and 6th flagellar segments white above. the following are yellow: orbit narrowly all along the eye margin, except above, malarspace, tegula (in paratype black), subtegular ridge, extreme upper margin of pronotal collar and a small mark on scutellum. Abdomen red, except basal 0.6 of first segment black, sometimes black colour extended on second tergite. Legs in general reddish, except all the coxae and trochanters black, all the tarsi brown or dark brown, hind tibia reddish-brown. Wings clear hyaline.

Male: Unknown.

Length : Female, 9.5 mm. Fore wing 7.5. Ovipositor sheath about 4 mm.

Holotype : ♀, INDIA : Uttar Pradesh : Dehra Dun, 23.i.1921. Zoology colln. (Z. S. I. Calcutta). *Paratype* : ♀, INDIA : Himachal Pradesh: Rahla, 2743 m, in N. W. Himalaya, 7.vi.1970, M. L. Gupta, No M 27 (Z. S. I., Calcutta).

Distributioin : India : Himachal Pradesh and Uttar Pradesh.

SUMMARY

This paper deals with five new species of *Itamoplex* Foerster viz., *I. lanceolatum I. longiterebratum, I. indicum, I. kashmirensis* and *I. himalayensis* from India. A redescription of *I. carinifrons* (Cameron) is also provided. This genus has been recorded from Holarctic, African and Oriental region.

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