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

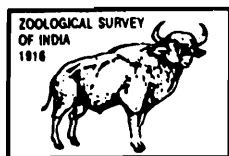
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Dr. J. R. B. ALFRED
Director
Zoological Survey of India



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A REPORT ON FLIES (DIPTERA : INSECTA) AS FLOWER VISITORS AND POLLINATORS OF KOLKATA AND IT'S ADJOINING AREAS

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Dipterans are among the most common insects that visit flowers, and considered to be primitive pollinators with their suctorial or lapping mouthparts (Kevan and Baker 1983). In tropical areas, the diversity of Diptera can rival or exceed that of Hymenoptera (Inouye, 2001). A total of 42 families (Nematocera 12 and Brachycera 30) of Diptera are reported as flower visitors in the tropical world (Roubik, 1995), of them 37 families (Nematocera 12 and Brachycera 25) are present in India. Some of the more notable pollinating flies belong to the families Syrphidae, Bombyliidae, Tabanidae, Tephritidae, Stratiomyidae, Tachinidae, Calliphoridae, Pipunculidae, Muscidae, Bibionidae, Chironomidae, Culicidae, Empididae, Mycetophilidae, and Cecidomyiidae (Datta, 1998).

There is very little work on the flower visiting dipteran species of India. Therefore, the conservation status of fly pollinators also remain undocumented in India. Important contributors to our knowledge on the flower visiting Diptera in India as well as in the world are : Thien (1969), Hobby & Smith (1961), Hunter (1979), Dhara Jothi & Tandon (1993), Mukherjee *et al.*, (2002), Mitra & Parui (2002), Mitra *et al.*, (2002, 2003, 2004 and 2005). The main impediment to implementing any of the large-scale studies recommended is that intensive collecting efforts produce large numbers of species that require identification. Fly species identifications are often difficult, and the number of fly taxonomists is limited. In view of above, a long-term study was initiated by Diptera section, Z.S.I., Kolkata to identify the dipteran flower visitors along with their visited plant species, duration of their visit in the field, and their effectiveness as pollinator *etc.*, in different ecosystems of India.

The main objective of this present study was to identify dipteran flower visiting species from the adjoining areas of Kolkata metropolitan city (in between 88°10' and 88°40' East longitude and 22°20' and 22°45' North latitude), and make an inventory of flower visiting flies along with their

visited plant species. For this purpose 9 localities were studied during the year 2002–2004. As a result of this study 30 dipteran species under 23 genera of 9 families have been identified as flower visitors from Kolkata and its adjoining areas. This is the first comprehensive as well as consolidated study made on the flower visiting dipterans in and around Kolkata or any other metropolitan city.

MATERIALS AND METHODS

The present study was conducted in 9 different localities of the south (Baruipur, Narendrapur and Sonarpur), north (Madhyamgram, Badu, Duttapukur), east (Dapha east & Dapha west) and west (Howrah Botanical garden) of Kolkata in the districts of Howrah and 24 Parganas (North & South). Most of the localities are urban in nature and coming under Greater Kolkata, (Map 1).

The surveys were made at least twice in each station and observations taken throughout the day (from 6 am to 6 pm). The collections were made from different habitats like agricultural fields, orchards, medicinal plant gardens, nurseries, road side herbage, bushes, trees, seasonal flower gardens, managed gardens as well as from the wild.

FLIES

Generally the flies are minute to small soft-bodied insects; head highly mobile with large compound eyes, antennae of variable size and structure; suctorial mouthparts; prothorax and metathorax small and fused with large mesothorax; wings present only on mesothorax, the major morphological feature which distinguishes flies from other insects is their reduced hind wings, termed halteres (small, club-like structures that function as balancing organs during flight); legs with 5-segmented tarsi; abdomen with variable number of visible segments, female genitalia simple in most species, male genitalia complex and presence of cerci.

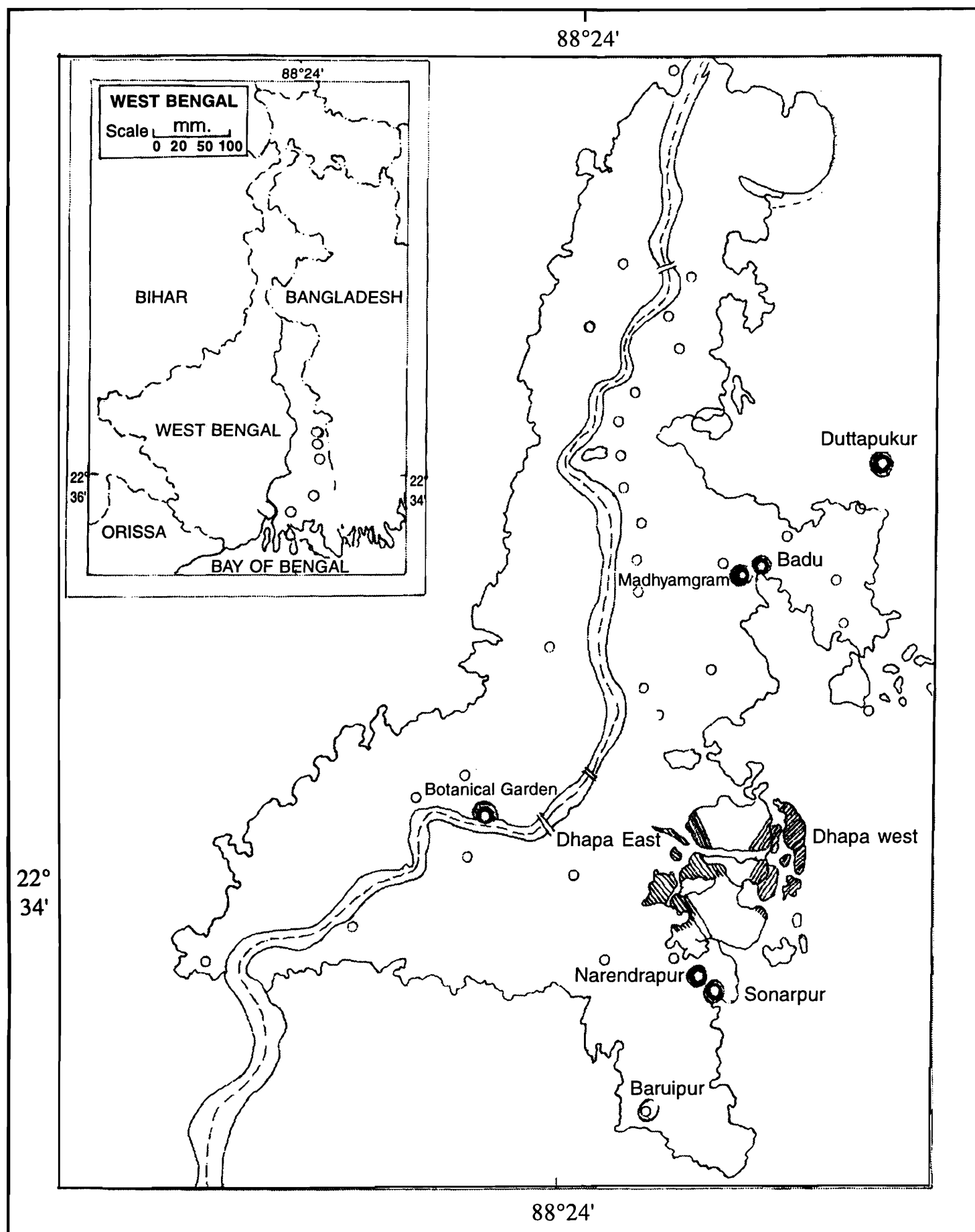
Family STRATIOMYIDAE

The members of the family Stratiomyidae are commonly known as 'soldier flies'. The flies are small to rather large, more or less flattened, and often colourfully white, yellow or metallic green. They are mostly strong fliers, and are often seen sitting on flowers; the adults are pollen or nectar feeders.

1. *Sargus metallinus* Fabricius

1805. *Sargus metallinus* Fabricius, *Syst. Antliat.*, : 258.

Diagnosis : Head brilliantly metallic violet-blue to light green, bearing moderately dense grey pubescence on upper part, and more brownish about the middle; face and lower part of head,



Map 1. : Map of Kolkata with adjoining areas (not to scale).

including proboscis, varying from brownish orange to pale yellowish with light yellowish pubescence; thorax with dorsum and scutellum brilliantly shining metallic green, bronze-green; abdomen metallic shining, yellowish bronze; legs pale yellow, with very short pale yellow setae in male or whitish in female; wings pale yellowish grey or pale brownish.

Visiting plant species : *Bauhinia variegata* var. *candida* Linnaeus.

Distribution : Andaman Islands, Arunachal Pradesh, Bihar, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Meghalaya, Orissa, Uttar Pradesh, West Bengal.

Remarks : The species is reported for the first time as flower visitor of *Bauhinia variegata* var. *candida*.

2. *Oplodontha rubrithorax* (Macquart)

1838. *Odontomyia rubrithorax* Macquart, *Mém. soc. sci. Agric. Lille*, : 189.

Diagnosis : The fly is small in size, with black thorax and yellowish abdomen; legs orange yellow with a brown ring on fore femora and brown streak on underside of middle femur.

Visiting plant species : *Tagetes patula* Linnaeus.

Distribution : Uttar Pradesh, West Bengal.

Remarks : The species was reported earlier as a flower visitor of *Tagetes patula* from West Bengal (Mitra, *et al.* 2003). During this present investigation, the species was found also from the same flower in Narendrapur and Baruipur of south 24 Parganas.

3. *Microchrysa flaviventris* (Wiedemann)

1824. *Sargus flaviventris* Wiedemann, *Analecta Ent.*, : 31.

Diagnosis : This species is a small green metallic, with upper facets much larger than lower ones; legs pale yellow, hind femora with a broad median band and hind tibia with a broad apical band.

Visiting plant species : *Tagetes patula* Linnaeus.

Distribution : West Bengal.

Remarks : The species was also reported earlier as flower visitor of *Tagetes patula* from West Bengal (Mitra *et al.*, 2003). During this present investigation, like other species of the family Stratiomyidae, this species was also collected from Narendrapur and Baruipur of south 24 Parganas.

Family TABANIDAE

Tabanids are relatively large stout flies belonging to the suborder Brachycera. Body length ranges from 5–25 mm, compound eyes are well developed. As with most haematophagous Diptera

it is only the females that suck blood in addition to nectar with the males being solely nectar feeders, the eyes are coloured and are also used to sex the flies. Males are holoptic and the female's dichoptic. The antenna is stiff and projected forward. Adults are of the minor importance as mechanical transmitters of diseases.

4. *Chrysops dispar* (Fabricius)

1798. *Tabanus dispar* Fabricius, *Ent. Syst. Suppl.*, : 567.

Diagnosis : Small, slender flies; abdomen with inverted black markings on tergum 2, extensively yellowish; wing with posterior cell 5 having a large hyaline area up to hind margin; tibia never swollen (Fig. 11).

Visiting plant species : *Merremia vitifolia*. Hallierf.

Distribution : Nagaland, Tripura, West Bengal.

Remarks : The species was collected from the yellow flower of *Merremia vitifolia* at Calcutta University campus, Baruipur. This flower visiting species was encountered only once throughout the survey.

Family BOMBYLIIDAE

The bombyliids or “bee-flies” are a group of moderate to large sized colourful and beautiful flies of the superfamily Asiloidea under the suborder Brachycera. These flies are actually considered as mimics of bees and as their bodies are clothed with a coat of soft, variegated hair and they are of great importance as conveyors of pollen.

5. *Petrorossia ceylonica* (Brunetti)

1909. *Argyramoeba ceylonica* Brunetti, *Rec. Indian Mus.*, 2 : 471.

Diagnosis : Small flies, frons and face quite black, with thick short black hair, antennae black, third joint shortly onion-shaped, basal joint with black bristles; thorax black with short yellow hairs, sides of thorax ash-grey, scutellum black; abdomen ovate, black with yellow hairs, dorsum bare, with microscopic black hairs; legs uniformly tawny yellow, with minute bristles; wings grey with costal cell yellowish, longitudinal vein 2 with a deep loop towards the tip, fork of third vein with distinct appendix, halteres yellow, knob yellowish white with a black mark.

Visiting plant species : *Mimosa pudica* Linnaeus.

Distribution : Assam, Bihar, Mizoram, Tripura, Uttar Pradesh, West Bengal.

Remarks : The species was collected from Naredrapur Ramakrishna Mission medicinal plant garden and Calcutta University campus, Baruipur.

6. *Villa aureohirta* Brunetti

1909. *Anthrax aureohirta* Brunetti, *Rec. Indian Mus.*, **3** : 223.

Diagnosis : Small size, black flies; antennal joints 1 and 2 with stiff black hairs; proboscis long; thorax black with dense yellow hairs laterally; abdomen shining black, first segment densely hairy; wings pale brown upto the middle.

Visiting plant species : *Scaevola sericea* Vahl.

Distribution : Andhar Pradesh, West Bengal.

Remarks : The species is reported for the first time as flower visitor of *Scaevola sericea* Vahl.

7. *Villa panisca* (Rossi)

1790. *Bibio paniscus* Rossi, *Fauna Etrusca.*, **2** : 256.

Diagnosis : Medium size, black flies; antennal tip pointed ended with bristle; thorax dull black; scutellum with closely adhering black scales; abdomen black, 1st and 2nd segment rufous laterally, 7th segment with whitish pubescence laterally; clear iridescent wings.

Visiting plant species : *Scaevola sericea* Vahl.

Distribution : Arunachal Pradesh, Uttaranchal, Tamil Nadu.

Remarks : The species is reported for the first time as flower visitor of *Scaevola sericea* Vahl.

Family SYRPHIDAE

The family Syrphidae under the superfamily Syrphoidea of the infra order Cyclorrhapha in the section Aschiza is one of the largest and easily recognized groups of Diptera. The members of this family are commonly known as “flower flies” or “hover flies” Usually moderate to large sized flies, almost always bristleless, very brightly coloured flies and may be striped, spotted or banded yellow on a blue, black or metallic ground-colour. The black and yellow colouration often imparts to them a superficial resemblance to a wasp; other species are densely hairy and resemble bumblebees. Nearly all members of this family are attracted to flowers and may frequently be observed poised in air, their wings vibrating with extreme rapidity, hence the name of hover-fly. The venaspuria is one of their most characteristic features and is rarely found in other dipterans. It is a vein-like thickening of the wing membrane and may be distinguished from the veins in being fainter and terminating without association with other veins. These flies are pollinators of major significance. In some agro ecosystems, such as orchards, they out perform native bees in pollinating the fruits.

8. *Asarkina (Asarkina) ericetorum* (Fabricius)

1781. *Syrphus ericetorum* Fabricius, *Spec. Insect.*, 2 : 425.

Diagnosis : A medium sized yellowish species; frons yellow, vertex black but both with black pubescence; thorax and scutellum covered with bright yellow pubescence; abdomen orange yellow with all the segments black banded at posterior margin; legs yellow (Fig. 6).

Visiting plant species : *Sida acuta* Burn.

Distribution : Arunachal Pradesh, Assam, Gujarat, Jammu & Kashmir, Manipur, Meghalaya, Sikkim, Tamil Nadu, Tripura, West Bengal.

Remarks : This species was reported as the flower visitor of *Cassia tora* and *Commelina* sp. from Gujarat (Mitra & Parui, 2002). This species is reported for the first time as flower visitor of *Sida acuta*.

9. *Episyrphus balteatus* (De Geer)

1776. *Musca balteata* De Geer, *Mém. pour serv. Hist. Ins.*, 6 : 116.

Diagnosis : A medium sized yellowish species; antennal prominence yellowish with a small black dot above base of antennae; thorax blackish with 2 greyish stripes on fore part; scutellum yellow, pubescence on basal half, rest black pubescence; abdomen wholly orange with second to fifth segment indistinctly median spotten or black banded.

Visiting plant species : *Zinnia elegans* Linnaeus, *Solanum melongena* Linnaeus, *Capsicum frutescens* Linnaeus.

Distribution : Assam, Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Manipur, Meghalaya, Orissa, Sikkim, Tamil Nadu, West Bengal.

Remarks : Reported earlier from *Solanum nigrum*, (Jammu & Kashmir) by Mukherjee, *et al.* 2002. During the present study, it has been found as flower visitor of *Zinnia elegans* (Botanical garden), *Solanum melongana* (Dhapa east & west) and *Capsicum frutescens* (Dhapa east & west).

10. *Ischiodon scutellaris* (Fabricius)

1805. *Scaeva scutellaris* Fabricius, *Syst Antliat.*, : 252.

Diagnosis : A medium sized blackish species with frons and face bright sulphur yellow; thorax shining black with side margins bright yellow from anterior margin of wing; abdomen black with a pair of yellow spots on second segment, third and fourth with a yellow band on each segment, fifth segment with greater part orange; legs yellow with a broad subapical black ring on hind femora.

Visiting plant species : *Tagetes patula* Linnaeus, *Solanum melongena* Linnaeus, *Capsicum frutescens* Linnaeus.

Distribution : Andhra Pradesh, Assam, Arunachal Pradesh, Delhi, Gujarat, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, West Bengal.

Remarks : This species has been reported earlier as the flower visitor of *Cassia tora* and *Anogeissus pendula* from Gujarat (Mitra & Parui, 2002). During the present survey, it has been found as flower visitor of *Tagetes patula* (Sonarpur, Narendrapur), *Solanum melongena* (Dhapa east & west, Sonarpur and Duttapukur) and *Capsicum frutescens* (Dhapa east & west) from West Bengal.

11. *Baccha (Allobaccha) amphithoe* Walker

1849. *Baccha amphithoe* Walker, *List Dipt. Br. Mus.*, 3 : 549.

Diagnosis : Frons shining black dorsally and little yellowish ventrally; vertex black; face yellow with a clear bluish stripe on face from antennae to mouth; thorax metallic black with short golden yellow pile, humeri with yellow calli; scutellum yellowish brownish in middle; fore and mid legs bright yellow, hind femur with a median black band, tibiae black on apical half; wings clear; first segment of abdomen pale yellow, segment 2 very narrow, pale brown with a yellow band on hind margin, segment 3 with a reddish brown triangular mark on hind margin, segment 5 black.

Visiting plant species : *Helichrysum* sp.

Distribution : Arunachal Pradesh, Assam, Meghalaya, Sikkim, West Bengal; Sri Lanka, Taiwan, Flores Island.

Remarks : This species was collected for the first time as flower visitor of *Helichrysum* from the adjoining areas of Kolkata (Botanical garden, Howrah and Narendrapur).

12. *Paragus serratus* (Fabricius)

1805. *Mulio serratus* Fabricius, *Syst. Antliat.*, : 186.

Diagnosis : A small black species; eyes with three longitudinal stripes of white pubescence; thorax blue black with a pair of longitudinal grey stripes; scutellum black with serrated hind margin; abdominal segments reddish brown and black patterned; legs black and brown.

Visiting plant species : *Weddelia calendulaceae* Less.

Distribution : Assam, Bihar, Delhi, Goa, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Punjab, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal.

Remarks : This species was reported as flower visitor of *Weddelia calendulaceae* from West Bengal (Mitra *et al.*, 2004) and *Solanum nigrum* from Jammu & Kashmir (Mukherjee, *et al.*, 2002).

13. *Eristalinus (Eristalinus) arvorum* (Fabricius)

1787. *Syrphus arvorum* Fabricius, *Mantissa Insect.*, 2 : 335.

Diagnosis : A large yellow and black species; frons covered with black pubescence and face with pale yellow pubescence; thorax with four longitudinal black stripes, whole thorax and scutellum covered with pale yellow pubescence; abdomen black, second and third segments with a pair of yellow spots; all tibiae black basally to a varying extent (Fig. 7).

Visiting plant species : *Santalum album* Linnaeus, *Mangifera indica* Linnaeus, *Tagetes patula* Linnaeus.

Distribution : Arunachal Pradesh, Jammu & Kashmir, Meghalaya, Orissa, Sikkim, Tripura, West Bengal.

Remarks : Earlier reported by Mitra *et al.*, (2003) as the flower visitor of *Tagetes patula*. During the present study, this species was found to visit the flowers of *Santalum album* and *Mangifera indica* at Calcutta University campus, Baruipur.

14. *Eristalinus (Eristalinus) obscuritarsis* (de Meijere)

1908. *Eristalis obscuritarsis* de Meijere, *Tijdschr. Ent.*, 51 : 250.

Diagnosis : A medium black species with reddish antennae; thorax black with 3 yellow longitudinal stripes; scutellum yellowish; third abdominal segment with a pair of quadrate yellowish spot on each side; tip of all femora yellow, front, mid and hind tibiae at base yellow, rest black (Fig. 8).

Visiting plant species : *Aegle marmelos* (Linnaeus) Corr. *Tagetes patula* Linnaeus.

Distribution : Gujarat, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Orissa, Sikkim, West Bengal.

Remarks : This species was reported as flower visitor of *Aegle marmelos* and *Tagetes patula* from West Bengal (Mitra *et al.*, 2003 & 2004). During this present survey, it was collected only from the flower of *Tagetes patula* at Dhapa east.

15. *Eristalinus (Eristalinus) quinquestriatus* (Fabricius)

1794. *Syrphus quinquestriatus* Fabricius, *Ent. Syst.*, 4 : 289.

Diagnosis : A medium sized yellow and black species; frons and face with yellowish grey pubescence, antenna and arista brownish orange, thoracic dorsum with four black longitudinal stripes; scutellum yellowish; abdominal segments yellow and black patterned; all femora black except tip of fore and hind femora orange or yellow (Fig. 15).

Visiting plant species : *Tagetes patula* Linnaeus.

Distribution : Assam, Meghalaya, Bihar, Karnataka, Kerala, Madhya Pradesh, Orissa, Uttar Pradesh, West Bengal.

Remarks : This species was found very rare among the all syrphid flower visitors of *Tagetes patula*. Mitra *et al.*, (2003) reported earlier from Nadia of West Bengal. During this present study this species was also encountered once only from the flower head of *Tagetes patula* at Dhapa east (Fig. 15).

16. *Mesembrius bengalensis* (Wiedemann)

1819. *Eristalis bengalensis* Wiedemann, *Zool. Mag.*, 1 : 16.

Diagnosis : Frons and face wholly covered with yellow tomentum and concolorous pubescence; thorax bright yellow with three longitudinal black stripes; wings pale grey (Fig. 13).

Visiting plant species : *Weddelia calendulaceae* Less, *Sida acuta* Burn, *Tagetes patula* Linnaeus.

Distribution : Assam, Bihar, Gujarat, Karnataka, Kerala, West Bengal.

Remarks : This species was reported earlier by Mitra *et al.*, (2004) as flower visitor of *Weddelia* from Narendrapur and Mitra, *et al.*, (2003) also reported as flower visitor of *Tagetes patula* from Nadia of West Bengal. In this present study the species was collected only from the flower of *Tagetes* at various fields of Duttapukur, Madhyamgram and Badu. This species is also reported as flower visitor of *Sida acuta* from Baruipur.

17. *Mesembrium quadrivittatus* (Wiedemann)

1819. *Eristalis quadrivittatus* Wiedemann, *Zool. Mag.*, 1 : 17.

Diagnosis : A large yellow and black species; eyes not touching at any point in male; thorax yellow with three longitudinal black stripes; abdomen orange with black patterns; femora black, brownish tinge at tip, anterior and middle tibiae orange yellow on basal half (Fig. 5).

Visiting plant species : *Weddelia calendulaceae* Less, *Aegle marmelos* (Linnaeus) Corr., *Rauvolfia serpentina*, Benth.

Distribution : Andhra Pradesh, Assam, Bihar, Gujarat, Karnataka, Madhya Pradesh, Orissa, Tamil Nadu, Tripura, West Bengal.

Remarks : Mitra *et al.*, (2002 & 2004) reported this species from the flowers of *Rauvolfia*, *Aegle* and *Weddelia* from Narendrapur and New Barrackpore of West Bengal. During the present survey, the species was collected as the flower visitor of *Aegle marmelos* from Madhyamgram, Baruipur and Sonarpur. It is interesting to note that the species was attracted to three different colour of flowers (Green-white, Yellow and Reddish-white) of three different families of plant species (Table 1).

Table 1. : Dipteran flower visitors so far reported from adjoining areas of Kolkata with their visited plant species.

Pollinator Species	Family	Plant species	Family	Flower Colour
<i>Sargus metallinus</i>	Stratiomyidae	<i>Bauhinia variegata</i> v. <i>candida</i>	Leguminosae	White
<i>Oplodontha rubrithorax</i>	Stratiomyidae	<i>Tagetes patula</i>	Asteraceae	Yellow
<i>Microchrysa faviventris</i>	Stratiomyidae	<i>Tagetes patula</i>	Asteraceae	Yellow
<i>Chrysops dispar</i>	Tabanidae	<i>Merremia vitifolia</i>	Convolvulaceae	Yellow
<i>Petrorossia ceylonica</i>	Bombyliidae	<i>Mimosa pudica</i>	Leguminosae	Pink
<i>Villa aureohirta</i>	Bombyliidae	<i>Scaevola sericea</i>	Goodeniaceae	White
<i>Villa panisca</i>	Bombyliidae	<i>Scaevola sericea</i>	Goodeniaceae	White
<i>Paragus serratus</i>	Syrphidae	<i>Weddellia calendulaceae</i>	Asteraccae	Yellow
<i>Mesembrius bengalensis</i>	Syrphidae	<i>Weddellia calendulaceae</i>	Asteraceae	Yellow
		<i>Tagetes patula</i>	Asteraceae	Yellow
		<i>Sida acuta</i>	Malvaceae	Yellow
<i>Mesembrius quadrivittatus</i>	Syrphidae	<i>Weddellia calendulaceae</i>	Asteraceae	Yellow
		<i>Aegle marmelos</i> ,	Rutaceae	Greenish white
		<i>Rauvolfia serpentina</i>	Apocyanaceae	Reddish-white
<i>Asarkina (A) ericetorum</i>	Syrphidae	<i>Sida acuta</i>	Malvaceae	Yellow
<i>Eristalinus (E) obscuritarsis</i>	Syrphidae	<i>Tagetes patula</i> ,	Asteraceae	Yellow
		<i>Aegle marmelos</i> ,	Rutaceae	Greenish white
<i>Eristalinus (E) arvorum</i>	Syrphidae	<i>Santalum album</i>	Santalaceae	Purplish
		<i>Tagetes Patula</i>	Asteraceae	Yellow
		<i>Mangifera indica</i>	Anacardiaceae	White
<i>Eristalinus quinquestriatus</i>	Syrphidae	<i>Tagetes patula</i>	Asteraceae	Yellow
<i>Ischiodon scutellaris</i>	Syrphidae	<i>Tagetes patula</i> ,	Asteraceae	Yellow
		<i>Solanum melongena</i> ,	Solanaceae	Violet
		<i>Capsicum frutescens</i>	Solanaceae	White

Table 1. : (Cont'd.)

Pollinator Species	Family	Plant species	Family	Flower Colour
<i>Baccha (A) amphithoe</i>	Syrphidae	<i>Helichrysum sp.</i>	Asteraceae	White
<i>Episyrphus balteatus</i>	Syrphidae	<i>Zinnia elegance</i> <i>Solanum melongena</i> , <i>Capsicum frutescens</i>	Asteraceae Solanaceae Solanaceae	Violet White
<i>Dacus (Z) cucurbitae</i>	Tephritidae	<i>Cucurbita maxima</i>	Cucurbitaceae	Yellow
<i>Musca (M) domestica</i>	Muscidae	<i>Weddelia calendulaceae</i>	Asteraceae	Yellow
<i>Musca (B) ventrosa</i>	Muscidae	<i>Polianthus tuberosa</i>	Amaryllidaceae	White
<i>Orthellia timorensis</i>	Muscidae	<i>Scaevola sericea</i>	Goodeniaceae	White
<i>Lucilia porphyria</i>	Calliphoridae	<i>Scaevola sericea</i>	Goodeniaceae	White
<i>Stomorphina discolor</i>	Calliphoridae	<i>Tagetes patula</i> <i>Syzygium jambos</i> <i>Callistemon citrinus</i>	Asteraceae Myrtaceae Myrtaceae	Yellow Greenish Red
<i>Hemipyrellia pulchra</i>	Calliphoridae	<i>Santalum album</i> <i>Psidium guajava</i>	Santalaceae Myrtaceae	Purplish White
<i>Isomyia viridaurea</i>	Calliphoridae	<i>Catharanthus roseus</i>	Apocyanaceae	White, Pink
<i>Phaenicia cuprina</i>	Calliphoridae	<i>T. coronaria</i>	Apocyanaceae	White
<i>Phaenicia sericata</i>	Calliphoridae	<i>T. coronaria</i> <i>Begonia sp.</i> <i>Ficus carica</i>	Apocyanaceae Begoniaceae Moraceae	White Pink- white
<i>Chrysomya megacephala</i>	Calliphoridae	<i>Mikania cordata</i>	Asteraceae	White
<i>Iranihindia futilis</i>	Sarcophagidae	<i>T. coronaria</i>	Apocyanaceae	White
<i>Thelaira macropus</i>	Tachinidae	<i>Helichrysum sp.</i>	Asteraceae	White

Family TEPHRITIDAE

Most species of fruit flies are highly ornamented with brightly contrasting colour patterns on their bodies and usually elaborate markings on the wings. Many species are of great economic importance and causes serious damage to commercial fruits and vegetables.

18. *Dacus (Zeugodacus) cucurbitae* Coquillett

1899. *Dacus cucurbitae* Coquillett, *Ent. News.*, **10** : 129.

Diagnosis : Head light yellow; a median vitta on the posterior half of mesonotum; large spot on each side of metanotum; scutellum bearing two bristles; abdomen light yellow on first two segments, rest reddish yellow; wings hyaline; legs light yellow; hind tibiae reddish yellow or dark brown (Fig. 9).

Visiting plant species : *Cucurbita maxima* Duchesne.

Distribution : Throughout India.

Remarks : A good number of specimens were found as flower visitor of *Cucurbita maxima* in agricultural fields at Duttapukur.

Family MUSCIDAE

A family Muscidae is one of the most diversified and economically important group of the calyptrate Diptera belonging to the suborder Brachycera (Mc Alpine *et al.*, 1989). Adult Muscidae are generally small to medium sized flies and seldom exhibit any striking developments of colour or form (Pont, 1972).

19. *Musca (Musca) domestica* Linnaeus

1758. *Musca domestica* Linnaeus, *Syst. Nat.*, ed. 10, **1** : 596.

Diagnosis : Four black vittae on thorax, inner pair terminating towards posterior end, propleural depression with fine setulose hair; suprasquamal ridge without black setulae, all post dc strong; mid tibia without av and ad setae (Fig. 17).

Visiting plant species : *Weddelia calendulaceae* Less.

Distribution : Andaman Islands, Andhra Pradesh, Assam, Bihar, Chandigarh, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Maharashtra, Nagaland, Punjab, Tripura, Sikkim; Cosmopolitan.

Remarks : This species was reported earlier by Mitra *et al.*, (2004) as flower visitor of *Weddelia calendulaceae* from Narendrapur.

20. *Musca (Byomya) ventrosa* Wiedemann

1830. *Musca ventrosa* Wiedemann, *Aussereurop. zweifl. Insekt.*, 2 : 656.

Diagnosis : Eyes bare; propleural depression and suprasquamal ridge without any setulae; thorax shining black, thinly and evenly covered with whitish-grey dust, dorsum with four narrow rather inconspicuous vittae, the broad central silver pollinose stripe more definite; abdomen entirely orange, with few small patches of silver dust; wings hyaline, veins yellow towards base; legs black (Fig. 14).

Visiting plant species : *Polianthus tuberosa* Linnaeus.

Distribution : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chandigarh, Tamil Nadu, Uttar Pradesh, West Bengal.

Remarks : This is the first report of this species as flower visitor of *Polianthes tuberosa* from Baruipur and Duttapukur.

21. *Orthellia timorensis* (Robinneau-Desvoidy)

1830. *Lucilia timorensis* Robineau-Desvoidy, *Mém. prés. div. Sav. Acad. sci. Inst. Fr.*, 2 : 460.

Diagnosis : A medium metallic colored species; in male inner facets of eye markedly enlarged; thorax with 2 pairs of presutural dorsocentrals; mid tibia with an ad seta only; discal cell of wing with a bare longitudinal stripe, close to $M_3 + Cu_1$ (Fig. 12).

Visiting plant species : *Scaevola sericea* Vahl.

Distribution : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Kerala, Orissa, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal.

Remarks : Reported earlier by Mitra *et al.*, (2003) from Narendrapur medicinal plant garden. During this present survey, this species was observed as common visitor of *Scaevola sericea* Vahl (Fig. 12).

Family CALLIPHORIDAE

The members of the family Calliphoridae are commonly referred to as blowflies, blue bottle flies or green bottle flies. The flies commonly frequent vegetation, flowers, decaying organic matter and excrement, some species are the causal agents of myiasis in man and domestic animals.

22. *Lucilia porphyryna* (Walker)

1856. *Musca porphyryna* Walker, *J. Proc. Linn. Soc. Lond. Zool.*, 1 : 24.

Diagnosis : A small green to purple coloured fly; third antennal segment 5 times of second; wing tinged brown, subcostal sclerite with stiff black hairs; squama dark brown.

Visiting plant species : *Scaevola sericea* Vahl.

Distribution : Arunachal Pradesh, Assam, Jammu & Kashmir, Himachal Pradesh, Sikkim, West Bengal.

Remarks : Reported earlier by Mitra *et al.*, (2003) from Narendrapur medicinal plant garden.

23. *Stomorphina discolor* (Fabricius)

1794. *Musca discolor* Fabricius, *Ent. Syst.*, 4 : 320.

Diagnosis : A small species with green coloured thorax and blackish abdomen; face, epistome and anterior half of gena shining black; anterior and middle femora black, rest of legs otherwise coloured.

Visiting plant species : *Tagetes patula* Linnaeus, *Syzgium jambos* Alston, *Callistemon citrinus* (Curtis).

Distribution : Arunachal Pradesh, Assam, Bihar, Kerala, Manipur, Meghalaya, Tripura, Uttar Pradesh, West Bengal.

Remarks : This species was reported as the flower visitor of *Zizyphus* sp. and *Anogeissus pendula* from Gujarat by Mitra & Parui (2002). During this present survey, this species was collected from Dhapa (east & west), Sonarpur and Baruipur.

24. *Hemipyrellia pulchra* (Wiedemann)

1830. *Musca pulchra* Wiedemann, *Aussereurop. zweiffl. Insekt.*, 2 : 406.

Diagnosis : Flies are wholly or partially metallic in colour; thorax metallic green with purple reflections, heavily dusted anteriorly and on the hypopleura; abdomen greenish to purple; genitalia hairy. Adults are oviparous and are attracted to dead animals, garbage and sometimes to flowering plants and fruits.

Visiting plant species : *Santalum album* Linnaeus, *Psidium guajava* Linnaeus.

Distribution : Tamil Nadu, West Bengal.

Remarks : During this present survey, this species was collected from Sonarpur and Baruipur and the first report as flower visitor of *Santalum* and *Psidium*.

25. *Isomyia viridaurea* (Wiedemann)

1819. *Musca viridaurea* Wiedemann, *Zool. Mag.*, 1 : 22.

Diagnosis : Medium to large flies, metallic green or blue; antennae dark brownish-yellow; thorax golden green, with very little white pile; abdomen golden-green, with some white pilose tessellation; femora metallic.

Visiting plant species : *Catharanthus roseus*.

Distribution : Throughout India.

Remarks : This is the first flower visiting Diptera reported from this medicinal plant.

26. *Phaenicia cuprina* (Wiedemann)

1830. *Musca cuprina* Wiedemann, *Aussereurop. zweifl. Insekt.*, 2 : 654.

Diagnosis : Medium size; thorax shining green; abdomen somewhat arched in profile, shining green, sternites with tufts of long hairs; wings hyaline, slightly yellow at the base, legs black.

Visiting plant species : *Tabernaemontana coronaria* R. Br.

Distribution : Throughout India.

Remarks : A large number of this calliphorid species was found to visit the flower of *Tabernaemontana coronaria* at Narendrapur and Baruipur.

27. *Phaenicia sericata* (Meigen)

1826. *Musca sericata* Meigen, *Syst. Besch. Europ. zweifl. Insekt.*, 5 : 53.

Diagnosis : Medium size; thorax shining green; abdomen shining green, not arched in profile, sternites without tuft of long hairs; wings hyaline, legs black (Fig. 18).

Visiting plant species : *Tabernaemontana coronaria* R. Br., *Begonia* sp., *Ficus carica* Linnaeus.

Distribution : Chandigarh, Punjab; Cosmopolitan.

Remarks : This species was collected from the Calcutta University campus, Baruipur.

28. *Chrysomya megacephala* (Fabricius)

1794. *Musca megacephala* Fabricius, *Syst. Ent.*, 4 : 317.

Diagnosis : A medium blue or green coloured fly with upper eye facets greatly enlarged, larger than lower third in male; wing hyaline, slightly dark at base; legs black (Fig. 16).

Visiting plant species : *Mikania cordata* Willd.

Distribution : Throughout India.

Remarks : The species was earlier reported as flower visitor of *Holarrhaena antidysenterica*, *Lantana camara* and *Tectona grandis* from Gujarat (Mitra & Parui, 2002). During this survey, the species was collected from Baruipur and Sonarpur.

Family SARCOPHAGIDAE

29. *Iranihindia futilis* (Senior-White)

1924. *Sarcophaga futilis* Senior-White, *Rec. Indian Mus.*, 26(3) : 246.

Diagnosis : Width of frons about two-fifths that of one eye; frontal vitta black; thorax black with three black longitudinal stripes; wings hyaline with brown veins; legs black; abdomen black with silvery checkered pattern; apical plate of paraphallus long and wide at end; lateral plate of paraphallus with unequal bifurcations, inner forceps with long hairs on basal part and a row of 4–5 stout comb-like spines on distal part.

Visiting plant species : *Tabernaemontana coronaria* R. Br.

Distribution : Arunachal Pradesh, Assam, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Orissa, Tamil Nadu, Tripura, Uttar Pradesh, Uttaranchal, West Bengal.

Remarks : Reported earlier by Mitra *et al.*, (2003) from Narendrapur medicinal plant garden. The species is reported for the first time from the flower of *Tabernaemontana coronaria*.

Family TACHINIDAE

This immense family of flies is very heterogeneous in the adult morphology, but a biologically uniform because the larvae are all endoparasites in Arthropods (Crosskey, 1977). They are commonly known as 'tachina flies'. The tachinids are free living, as adults visiting flowers and vegetation. Quite a few have been employed as biological control agents against different insect species but a few others, the so called-oozy fly cause serious damage to sericultural industries.

30. *Thelaira macropus* (Wiedemann)

1830. *Dexia macropus* Wiedemann, *Aussereurop. Zweiffl. Ins.*, 2 : 375.

Diagnosis : Large size; abdominal segments 2, 3 & 4 bright yellow front margin of fifth segment pale yellow; scutellum largely yellow on posterior half; T₂ with 2 ad setae in proximal half besides smaller setae in distal third, 0 pd and 2 hind setae; R₁ setose on most of its length; edge of 2nd segment as long as ½ to 3/5 of 3rd segment (Fig. 10).

Visiting plant species : *Helichrysum* sp.

Distribution : Assam, Himachal Pradesh, Jammu & Kashmir, West Bengal.

Remarks : Only once encountered throughout the survey and collected from Narendrapur.

SUMMARY

Altogether 30 species of 23 genera under 9 families of Diptera are reported here as flower visitors/pollinators of various plants of wild, orchards, managed gardens and agricultural crops

from Kolkata and its adjoining areas. Among the dipteran flower visitors, the family Syrphidae shares maximum number of species (10 spp.), followed by Calliphoridae (7 spp.), Muscidae (3 spp.), Stratiomyidae (3 spp.), Bombyliidae (3 spp.), Sarcophagidae (1 sp.), Tephritidae (1 sp.), Tachinidae (1 sp.) and Tabanidae (1 sp.), (Table 1). All these dipteran species were found to visit on 25 plant species of 15 families (Table 2). Among the plant species maximum number of visitor/pollinator species were found in *Tagetes patula* (7 spp.), followed by *Scaevola sericea* (4 spp.), *Weddelia calendulaceae* (4 spp.), *Tabernaemontana coronaria* (3 spp.), *Sida acuta* (2 spp.), *Aegle marmelos* (2 spp.), *Capsicum frutescens* (2 spp.), *Helichrysum* sp. (2 spp.). Rest of the plant species are having single insect visitor (Table 2). During this survey, it has been also observed that flies are mostly attracted by yellow and white flowers (Table 1).

Table 2 : Plant species and their flower visitors in and around Kolkata.

Sl. No.	Plant Species	Flower Visitors
1.	<i>Aegle marmelos</i>	<i>Mesembrius quadrivittatus</i> , <i>Eristalinus</i> (E) <i>obscuritarsis</i>
2.	<i>Begonia</i> sp.	<i>Phaenicia sericata</i>
3.	<i>Capsicum frutescens</i>	<i>Ischiodon scutellaris</i> , <i>Episyrphus balteatus</i>
4.	<i>Catharanthus roseus</i>	<i>Isomyia viridaurea</i>
5.	<i>Callistemon citrinus</i>	<i>Stomorphina discolor</i>
6.	<i>Cucurbita maxima</i>	<i>Dacus</i> (Zeugodacus) <i>cucurbitae</i>
7.	<i>Ficus carica</i>	<i>Phaenicia sericata</i>
8.	<i>Helichrysum</i> sp.	<i>Baccha</i> (Allobaccha) <i>amphithoe</i> , <i>Thelaira macropus</i>
9.	<i>Merremia vitifolia</i>	<i>Chrysops dispar</i>
10.	<i>Mimosa pudica</i>	<i>Petrorossia ceylonica</i>
11.	<i>Mikania cordata</i>	<i>Chrysomya megacephala</i>
12.	<i>Polianthes tuberosa</i>	<i>Musca</i> (Byomya) <i>ventrosa</i>
13.	<i>Psidium guajava</i>	<i>Hemipyrellia pulchra</i>
14.	<i>Rauvolfia serpentina</i>	<i>Mesembrius quadrivittatus</i>
15.	<i>Santalum album</i>	<i>Hemipyrellia pulchra</i> , <i>Eristalinus</i> (E) <i>arvorum</i>
16.	<i>Scaevola sericea</i>	<i>Orthellia timorensis</i> , <i>Lucilia porphyryna</i> , <i>Villa aureohirta</i> , <i>Villa panisca</i>
17.	<i>Solanum melongana</i>	<i>Ischiodon scutellaris</i> , <i>Episyrphus balteatus</i>
18.	<i>Syzygium jambos</i>	<i>Stomorphina discolor</i>
19.	<i>Tabernaemontana coronaria</i>	<i>Phaenicia cuprina</i> , <i>Phaenicia sericata</i> , <i>Iranihindia futilis</i>

20.	<i>Tagetes patula</i>	<i>Microchrysa flaviventris</i> , <i>Oplodontha rubrithorax</i> , <i>Eristalinus quinquestriatus</i> , <i>Mesembrius bengalensis</i> , <i>Eristalinus (E) obscuritarsis</i> , <i>Ischiodon scutellaris</i> , <i>Stomorphina discolor</i> , <i>Eristalinus arvorum</i>
21.	<i>Weddelia calendulaceae</i>	<i>Paragus serratus</i> , <i>Musca (M) domestica</i> , <i>Mesembrius</i> <i>quadrivittatus</i> , <i>Mesembrius bengalensis</i>
22.	<i>Bauhuinia variegata v. candida</i>	<i>Sargus metallinus</i>
23.	<i>Sida acuta</i>	<i>Asarkina (A) ericetorum</i> , <i>Mesembrius bengalensis</i>
24.	<i>Mangifera indica</i>	<i>Eristalinus (E) arvorum</i>
25.	<i>Zinia elegance</i>	<i>Episyrphus balteatus</i>

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PLATE I



Fig. 1. Flowers of *Rauvolfia serpentina* Benth



Fig. 2. Flowers of *Scaevola sericea* Vahl

PLATE II



Fig. 3. Flowers of *Tagetes patula* Linnaeus



Fig. 4. *Asarkina* sp. - a flower visitor



Fig. 5. *Mesembrius quadrivittatus* (Wiedemann)



Fig. 6. *Asarkina* (A) *ericetorum* (Fabricius)



Fig. 7. *Eristalinus* (*Eristalinus*) *arvorum* (Fabricius)



Fig. 8. *Eristalinus* (*Eristalinus*) *obscuritarsis* (de Meijere)

PLATE III



Fig. 9. *Dacus (Zeugodacus) cucurbitae* Coquillett



Fig. 10. *Thelaira macropus* (Wiedemann)



Fig. 11. *Chrysops dispar* (Fabricius)



Fig. 12. *Orthellia timorensis* (Robineau-Desvoidy)



Fig. 13. *Mesembrius bengalensis*
(Wiedemann)



Fig. 14. *Musca (Byomya) ventrosa*
Wiedemann

PLATE IV



Fig. 15. *Eristalinus quinquestriatus* (Fabricius)

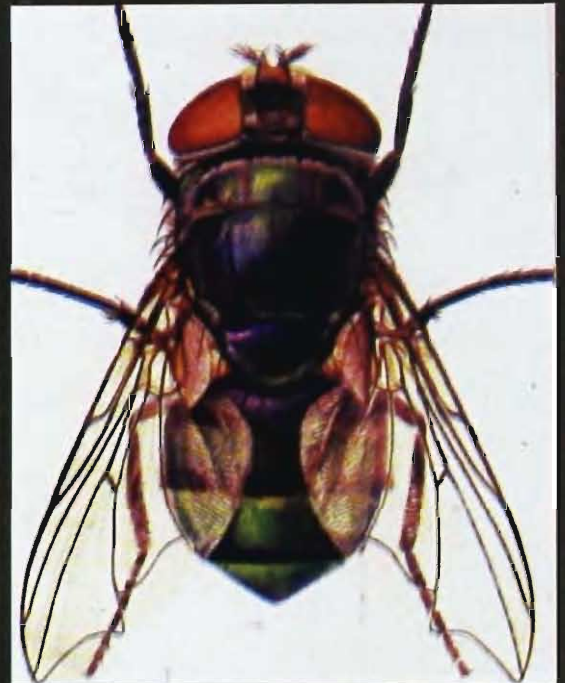


Fig. 16. *Chrysomya megacephala* (Fabricius)

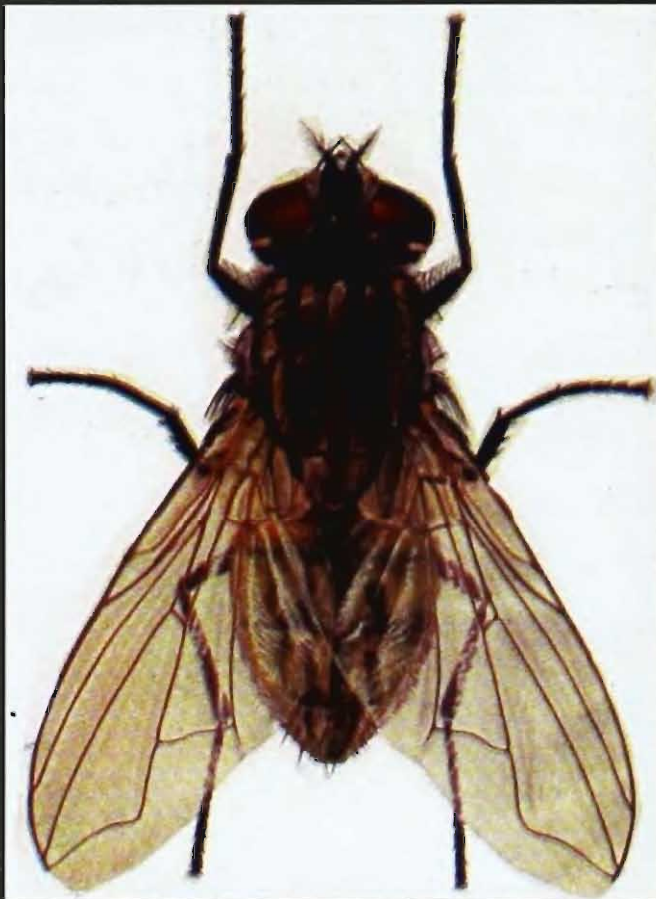


Fig. 17. *Musca (M) domestica* Linnaeus

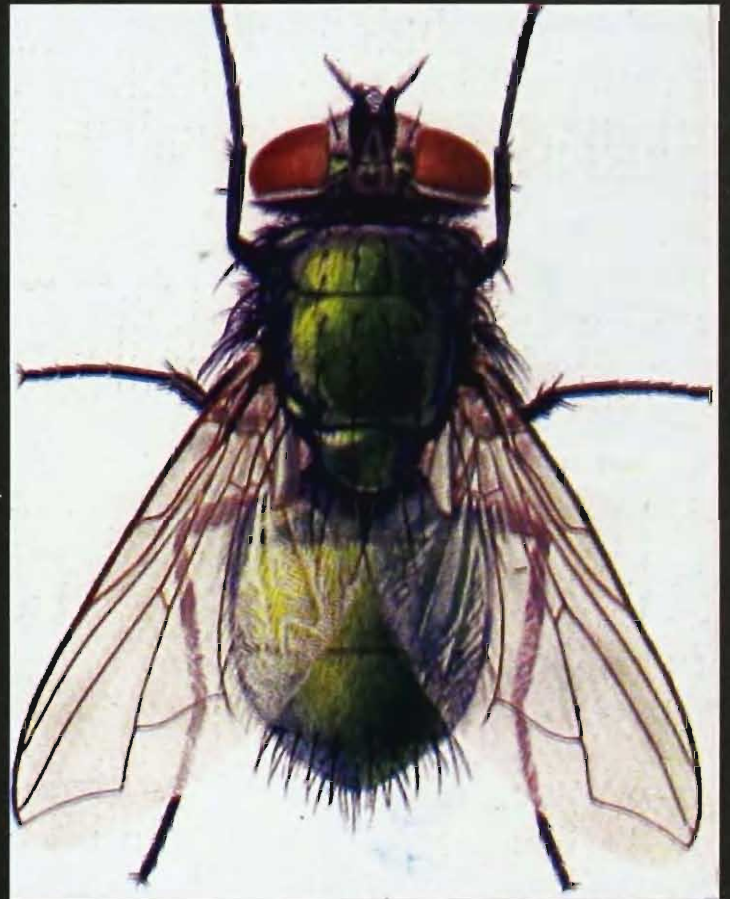
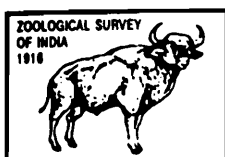


Fig. 18. *Phaenicia sericata* (Meigen)



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ON SOME ADDITIONAL RECORDS OF FISH FROM ANDHRA PRADESH, INDIA

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INTRODUCTION

Recent surveys of Chittoor and Nellore districts of Andhra Pradesh by the Southern Regional Station, Zoological Survey of India teams, led by Dr. M.B. Raghunathan and Dr. O.P. Srivastava during 2002–2004 revealed some interesting fish species including two introduced species which turned out to be new reports for the area. A systematic list is provided following Talwar & Jhingran (1991), Jayaram (1999) and Menon (1999) along with relevant remarks. River Pennar drains the two districts Chittoor and Nellore. A recent exhaustive report on the fish fauna of Andhra Pradesh by Barman (1993) does not include the 10 species listed here. Of these 9 are new records to Andhra Pradesh and are marked by an asterix.

Order CLUPEIFORMES

Family CLUPEIDAE

Subfamily PELLONULINAE

*1. *Ehirava fluviatilis* Deraniyagala

1929. *Ehirava fluviatilis* Deraniyagala, *Spoila Zeylan.*, 15 : 35, pl. 14. (Type locality : Western Province of Sri Lanka)

1991. *Ehirava fluviatilis*, Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. 1 : 115-116.

Material : 7 exs., 21.0–34.0 mm SL., F.7143, Venad, Pulicat Lake, 12.01.2003, M.B. Raghunathan; 3 exs., 22.0–27.0 mm SL., F.7218, Pulicat Lake, 12.01.2003, M.B. Raghunathan; and 138 exs., 21.0–29.0 mm SL., F.7569, Buchinayudu Kandriga, 16.10.2003, M.B. Raghunathan.

Diagnostic features : D. ii/10-11; A. iii/12; P. i/11-13; V. i/7; L.1. 36; Predorsal scales 14–15, Gill rakers 24 + 10.

A small, slender, pale yellow fish with a faint stripe along the sides; scales deciduous. Pelvic origin behind dorsal origin.

Distribution : Costal waters of southern India and Sri Lanka.

Remarks : The species thought to be endemic to Sri Lanka has been recorded from the coastal waters of south west India (Whitehead, 1984). Pethiyagoda (1991) remarks that it has been recorded from the Malabar coast of India and Western Sri Lanka and that its occurrence on the eastern coastal seas has not yet been recorded. This is the first report of the species from the east coast of India.

Order CYPRINIFORMES

Family CYPRINIDAE

Subfamily LEUCISCINAE

*2. *Aristichthys nobilis* (Richardson)

1844. *Leuciscus nobilis* Richardson, Voy. H.M.S. "Sulphur" : 140, Pl. 63, fig. 3. (Type locality : Canton, China)
1991. *Hypophthalmichthys nobilis*, Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, No. 1 : 332-333.
1999. *Aristichthys nobilis*, Rohan Pethiyagoda, *Freshwater Fishes of Sri Lanka*, p. 57.

Material : 1 ex., 120.0 mm SL., F.7489, Maraparakandriya, Chittoor district, Sriharikota, 24.02.2004, O. P. Srivastava.

Diagnostic features : D. iii/7; A. iii/11; P. i/19; V. I/7.

A silvery fish with a compressed body and with small eyes placed in the lower half of head. Similar to *Hypophthalmichthys molitrix* from which it is clearly distinguished by its pectoral fins extending well beyond the origin of the pelvics. Gill rakers separated (free) and slender vs. gill rakers continuous forming a crescentic horny membrane.

Distribution : Southern and Central China. Transplanted to North China, Japan, Taiwan, Vietnam, Thailand, Malaysia, Sri Lanka, Bangladesh and India.

Remarks : According to Alikunhi *et al.*, (1963) this species had been accidentally introduced into Indian waters along with silver carp fry. However, there were doubts regarding its introduction to India. The present collection of the species in the wild confirms its establishment in Indian waters.

*3. *Esomus thermoicos* (Valenciennes)

1842. *Nuria thermoicos* Valenciennes, *Hist. nat. Poiss.*, 16 : 238, Pl. 472. (Type locality : Hot springs at Kanniya, Sri Lanka)

1991. *Esomus thermoicos*, Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. 1 : 378-379.

1999. *Esomus thermoicos*, Jayaram, *The Freshwater Fishes of the Indian Region*, p. 75.

Material : 1 ex., 25.0 mm SL., F.7165, Kadevedu, Nellore district, 18.09.2002, O. P. Srivastava; 5 exs., 48.0–64.0 mm SL., F.7222, Nellore, Kavali, 23.09.2002, O. P. Srivastava; 7 exs., 20–35 mm SL., F.7199, Udayagiri, 16.01.2003, M. B. Raghunathan; 1 ex., 32 mm SL., F.7119, Pellekuru, 23.01.2003, M. B. Raghunathan; 2 exs., 40–60 mm SL., F.7586, Yempedu, 14.10.2004, M. B. Raghunathan.

Diagnostic features : D. ii/6; A. ii/5; P. i/11; V. i/7; L.1. 34–35; Pd. 18–20; Gill rakers 22 (17 + 5).

L1. complete, extending upto caudal peduncle. Maxillary barbels extend to end of pelvic, mandibular to posterior border of eye. Outer rays of pectoral and pelvic fins gradually prolonged, outer pectoral rays reaching beyond pelvic origin. A bold lateral band on body, a black streak on dorsal surface.

Distribution : Sri Lanka and South India.

Remarks : This species earlier known only from Sri Lanka is now found to be widespread in South India, Jayaram (1999).

*4. *Rasbora labiosa* Mukerji

1935. *Rasbora labiosa* Mukerji, *Rec. Indian Mus.*, 37(3) : 376, figs. 1, 2. (Type locality : Deolali, Nasik district, Maharashtra)

1999. *Rasbora labiosa*, Jayaram, *The Freshwater Fishes of the India Region*, p. 83.

Material : 3 exs., 24.0–29.0 mm SL., F.7591, Etteri, 28.02.2004, O. P. Srivastava.

Diagnostic features : D. ii/7; P. i/11; V. i/8; A. ii/5; L.1. 33; P.d. 14.

Body elongate and compressed, mouth small, lower lip hypertrophied and projects beyond upper jaw. Lateral band faint. Dorsal-hypural distance when carried forward falling before posterior border of eye.

Distribution : India : Maharashtra, Karnataka and Andhra Pradesh.

Remarks : The species collected from Andhra Pradesh show some differences from the typical *R. labiosa* from Maharashtra. Similar specimens were also recently reported from Karnataka (Krishnan, *et al.*, 2004).

*5. *Puntius bimaculatus* (Blkr.)

1864. *Gnathopogon bimaculatus* Bleeker, *Verh. Nat. Holl. Maatsch. Haarlem*, 20(2) : 17, Pl. 4, fig. 1. (Type locality : Sri Lanka)

1991. *Puntius bimaculatus*, Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. 1 : 259-260.

1999. *Puntius bimaculatus*, Jayaram, *The Freshwater Fishes of the Indian Region*, p. 110.

Material : 50 exs., 22.0–47.0 mm SL, F.7184, Mala palli, Chittoor, 9.9.2002, O. P. Srivastava; 2 exs., 35.0–40.0 mm SL, F.7226, Kavali, Nellore, 23.9.2002, O. P. Srivastava; 6 exs. 25.0–41.0 mm SL, F.7158, Vittalam, Chittoor, 10.9.2003, O. P. Srivastava; 2 exs., 19.0–22.0 mm SL, F.7554, Pulicat pond, 11.10.2003, M. B. Raghunathan; 1 ex., 49.0 mm SL, F.7589, Yempedu, 14.10.2003, M. B. Raghunathan; 2 exs., 24.0–26.0 mm SL, F.7246, Akkurti, Nellore, 25.1.2003, M. B. Raghunathan; 2 exs., 24.0 and 32.0 mm SL, F.7592, Etteri, Chittoor, 28.2.2004, O. P. Srivastava.

Diagnostic features : D. ii/7; A. iii/5; P. i/15; V i/8; L.1. 24–25, P.d. 8–10; L. tr. $3\frac{1}{2}/2\frac{1}{2}-3\frac{1}{2}$.

One pair of barbels, shorter than eye diameter; last unbranched ray non-osseous, weak and smooth. Live colour-back olive green, flanks & belly silvery, a crimson lateral band. Black spot at the base of 3rd to 7th rays of dorsal fin, another black spot at the end of lateral line at the base of caudal fin.

Distribution : Sri Lanka and Southern India.

Remarks : Earlier said to be restricted to Sri Lanka, has subsequently been collected from Southern States of India (Rema Devi *et al.*, 2000; Shaji *et al.*, 2000 & Gopi, 2000).

*6. *Puntius fraseri* Hora and Misra

1938. *Barbus fraseri* Hora and Misra, *J. Bombay nat. Hist. Soc.*, 40(1) : 29, Pl. 3, fig. 2. and text fig. 4 (Type locality : Darna river at Deolali, Maharashtra)

1991. *Puntius fraseri*, Jayaram, *The Freshwater Fishes of the Indian Region*, p.112.

Material : 2 exs., 29.0–33.0 mm SL, F.7566, Pollur, 12.10.2003, M. B. Raghunathan; 39 exs., 13.0–20.0 mm SL, F.7200, Udayagiri, Nellore, 16.1.2003, M. B. Raghunathan; 3 exs., 30.0–32.0 mm SL, F.7496, Dachur, Nellore, 22.2.2004, O. P. Srivastava; 2 exs., 21.0–22.0 mm SL, F.7538, Parosalli, Kalahasthi, Chittoor, 26.2.2004, O. P. Srivastava.

Diagnostic features : D. ii/8; A. iii/5; P. i/11–12; V. i/8; L.1. 45–47; L. tr. $7-7\frac{1}{2}/6$; P.d. 15–16; Gill rakers 12+2.

Body fairly deep and compressed. One pair of well developed barbels. Lateral line incomplete ceasing after 12–13th scale. Last unbranched rays of dorsal and anal fins elongated in adult male. Yellowish olive with a silvery streak on flanks, a faint golden spot on occiput. A small spot at base of dorsal fin, outer margin of dorsal spine dark, a thin lateral band ending in a spot at caudal base.

Distribution : India : Maharashtra : Dharna River, Andhra Pradesh : Pennar River.

Remarks : This species has not been reported in the wild since 1956 (Singh, 1994). He placed the species under 'Red alert' A recent paper on fishes of Northern Western Ghats by Yadav (2003) does not include this species. The discovery of this species in the eastern part of India and in another river system, the Pennar in Andhra Pradesh, is of great ichthyological significance.

Order CYPRINODONTIFORMES

Family APLOCHEILIDAE

7. *Aplocheilus parvus* (Sundara Raj)

1916. *Panchax parvus* Sundara Raj, *Rec. Indian Mus.*, **12** : 268 (Type locality : Madras)

1999. *Aplocheilus parvus*, Menon, *Checklist, Freshwater fishes of India*, P. 269–270.

1999. *Aplocheilus parvus*, Jayaram, *The Freshwater Fishes of the Indian Region*, P. 343.

Material : 7 exs., 20.0–27.0 mm SL, F.7129, Dakkili, 20.1.2003, M. B. Raghunathan; 1 ex., 18.0 mm SL, F.7206, Udayagiri, 16.1.2003, M. B. Raghunathan; 1 ex., 17 mm SL, F. 7214, Venad, 12.1.2003, M. B. Raghunathan; 2 exs., 18.0–32.0 mm SL, F.7464, Nellore Dam, 9.10.2003, M. B. Raghunathan; 5 exs., 18.0–27.0 mm SL, F.7478, Kovur, 7.10.2003, M. B. Raghunathan; 13 exs., 16.0–23.0 mm SL, F. 7459, Saidapuram 22.ii.2004, O.P. Srivastava; 2 exs., 23.0–28.0 mm SL, F.7499, Dachur, 22.2.2004, O. P. Srivastava; 1 ex., 28.0 mm SL, F.7509, Venkatagiri, Sri Kalahasti, 25.2.2004. O. P. Srivastava; 3 exs., 16.0–22.0 mm SL, F.7516, Laxhmipuram, Kalahasti, 24.2.2004, O. P. Srivastava; 2 exs., 22.0–23.0 mm SL, F.7534, Empedu, Srikalahasti, 25.2.2004, O. P. Srivastava; 1 ex., 28.0 mm SL, F.7549, Rampur, 8.10.2003, M. B. Raghunathan; 11 exs., 16.0–24.0 mm SL, F.7561, Nellore Tank, 9.10.2003, M. B. Raghunathan; 1 ex., 25.0 mm SL, F.7580, Buchinayudu, Kandriga, 16.10.2003, M. B. Raghunathan.

Diagnostic features : D. ii/6; A. iii/11; P. 14; V 6; L.1. 26–29.

Body elongate and compressed posteriorly. In male posterior rays of dorsal and anal fins prolonged and extend to caudal. Faint vertical bands on the dorsal third of the body in preserved specimens; a black spot at base of dorsal fin.

Distribution : India : Peninsular India : Coromandel Coast. Sri Lanka.

Remarks : Though Talwar and Jhingran (1991) placed *parvus* as a junior synonym of *blocki*, both Menon (1999) and Jayaram (1999) treated them as distinct species. Menon (1999) included river Pennar in the distributional range of *parvus*. However, the same has been included in this paper as an addendum to the Fauna volume by Barman (1993).

Order PERCIFORMES

Family CICHLIDAE

*8. *Oreochromis niloticus* (Hasselquist)

1957. *Labrus niloticus* Hasselquist, *Iter.*, Palae. t., : 346.

1999. *Oreochromis niloticus*, Rema Devi and Raghunathan, Report on the Ichthyofauna of North Arcot District Tamil Nadu. *Rec. zool. Surv. India* : **97** (Part-1) : 163–177.

Material : 2 exs., 49.0–50.0 mm SL, F.7467, Nellore Dam, 9.10.2003, M. B. Raghunathan.

Diagnostic features : D. XV–XVIII/11–15; A. III/8–11; L.1. 31–35; L. tr. 3½–5/13–18. Gill rakers, 17–25 on lower part of anterior arch.

Depth of body 2 to 2.6 times, length of head 2 to 3.2 in TL. Eye 3.5 to 5.6 in head length; 1–2.5 in interorbital width. Mouth 1/2 to 2/3 width of head, extending to below anterior border of eye or to between nostril and eye. Pectoral 1 to 1.3 times longer than head. Caudal truncate to rounded with thin distinct bars, variable in number.

Distribution : Introduced into India.

Remarks : Recently reported from North Arcot District, Tamil Nadu (Rema Devi and Raghunathan, 1999). The occurrence of *O. niloticus* in the wild, through stray reports, though not as widespread as its officially introduced congener *O. mossambicus*, is a cause for further concern to our bio-diversity.

Family CHANDIDAE

*9. *Parambassis lala* (Hamilton)

1822. *Chanda lala* Hamilton-Buchanan, *Fishes of Ganges* : 114, Pl. 1, 21, fig. 39 (Type locality Gangetic provinces)

1991. *Pseudambassis lala*, Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. II : 804.

1999. *Parambassis lala*, Jayaram, *The Freshwater Fishes of the Indian Region* : 370.

Material : 16 exs., 22–25 mm SL., F.7466, Nellore Dam, 9.10.03, Coll. M. B. Raghunathan.

Diagnostic features : D. VII/I 11; A. III/13; P. I/10; V. I/5; L1. 90; Gill rakers 16 on the lower arm of the first arch.

A small fish with rounded body and oblique mouth. Scales minute; cheek with 7 transverse scale-rows. It attains a length of 3 cm.

Colour : in life, translucent orangish-yellow with three longitudinal dusky bands extending dorsoventrally; operculum with dark stripe; dorsal, anal and caudal fins deep orange with blackish outer margin.

Distribution : India : West Bengal, Orissa, Brahmapatra, Ganga and Mahanadi basin, and Pennar in Andhra Pradesh. Myanmar : Irrawaddy.

Remarks : Earlier restricted to North India, the species was found in Nellore Dam in Andhra Pradesh. Since it is an aquarium species this could have escaped into natural water bodies.

Family BELONTIDAE

*10. *Colisa lalia* (Hamilton)

1822. *Trichopodus lalius* Hamilton-Buchanan, *Fishes of Ganges* : 120, 372 (Type locality : Gangetic Provinces)

1991. *Colisa lalia*, Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. II : 1007.

Material : 2 exs., 28.0 mm SL., F. 7465, Nellore Dam, 9.10.2003, M. B. Raghunathan; 1 ex., 23.0 mm SL., F. 7443, River Ramkalva, Rampur, Nellore, 21.2.2004, O. P. Srivastava.

Diagnostic features : D. xv–xvii/7–10, A. xvii–xviii/13–17; P.10., L.1. 27–28.

Body egg shaped and strongly compressed, preorbital denticulate; soft dorsal and anal fins rounded; caudal fin rounded to truncate. Anal fin densely scaled, scales covering fin to tips of posterior spines.

In life, body scarlet crossed by somewhat oblique bands of pale blue. Fins with scarlet spots or bars; anal fin with red margin.

Distribution : India : Ganga, Yamuna river system and Southern India. Pakistan. Bangladesh.

Remarks : *Colisa lalia* is found to be widely distributed in Southern India also (Ranjit Daniels, 2002).

SUMMARY

Barman (1993) gave a detailed report on the fishes of Andhra Pradesh based on his own collections and from earlier reports. This included 158 species. However from Nellore and Chittoor District only three species were collected by him viz. *Salmostoma bacaila*, *Puntius chola* and *Aplocheilus rubrostigma*. A recent survey of these districts by members of the Southern Regional Station yielded 51 freshwater species and 11 estuarine species. Of the primary freshwater species collected, nine species including 2 introduced species are new reports to Andhra Pradesh.

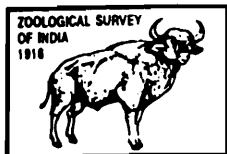
Regarding report of *A. rubrostigma* from Nellore district by Barman (1993) it is worthwhile to mention here that subsequently this species has been synonymised with *A. lineatus* (Val.) by Talwar and Jhingran (1999) and Jayaram (1999).

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Rec. zool. Surv. India : 105 (Part 3–4) : 29-35, 2005

TROPHIC STATUS OF THE LAKE, KONDAKARLA (ANDHRA PRADESH)

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INTRODUCTION

Studies on the trophic status of some lakes have been carried out earlier by Cheng and Tyler (1976) on Sorella and Crescent lakes of Tasmania, Zutshi (1976) on Mergozo of Italy, Pant *et al.*, (1979) on lakes of Kamaun, Vass (1980) on Kashmir lakes and Khan and Zutahi (1980) on Kashmir Himalayan lake. Similar attempt had been made by the author from the biotic and abiotic factors obtained from the lake during the three seasons of the year, 1997.

MATERIAL AND METHODS

Kondakarla lake is situated at about 50 km south-west of Visakhapatnam in Andhra Pradesh between latitudes 17°35'30" and 17°36'02" N, longitudes 82°59'27" and 83°01'0" E. It covers an area of 6.5 sq. kms. In order to cover the whole topography of the lake, six spots have been selected. Water samples were collected from the lake spots, during three different seasons of the year 1997 and its analysis was done with the help of APHA (1989) and the physico-chemical features were given in the Table-I. Plankton samples were also collected from the lake spots simultaneously and identified the Rotifera and Cladocera species with the aid of standard literature.

RESULTS AND DISCUSSION

Presently Oligotrophic lakes have been defined as low productivity ones and eutrophic lakes with high productivity. Nitrogen and Phosphorus are the nutrients that increase the primary productivity.

TABLE I. : PHYSICO CHEMICAL PARAMETERS OF KONDAKARLA LAKE

Sl. No.	Parameter	Cheemanapalle			Avasomavaram			Rajam			Centre Point			Kond Village			Vadrepalle			Haripalem		
		S	M	W	S	M	W	S	M	W	S	M	W	S	M	W	S	M	W	S	M	W
1.	Temp. (Air) C	32	31	23	32	–	25.5	32	31	26	32	31	26.5	31	31	23	32	31	28	32	31	29
2.	Temp. (Water) C	29	29	22.5	29	–	24	29	29	24	29	31	24	29	29	22	29	30	25	29	30	25
3.	pH	7.5	8.5	7.5	7.2	–	7.5	7.4	8.5	7.5	6.9	8.5	7.5	7.3	8.9	7.0	7.2	8.5	7.0	7.1	8.5	8.0
4.	E. Cond.	840	1340	780	730	–	630	810	860	540	810	860	540	560	960	830	430	1090	510	960	1720	830
5.	Turbidity (NTU)	6	60	8	540	–	6	5	50	8	5	50	8	5	50	8	20	10	8	4	60	8
6.	Dis. Oxygen mg. lr	7.6	8.2	3.2	7.2	–	5.8	7.9	12.2	6.6	7.9	12.2	6.6	2.4	5.6	3.0	2.8	9.2	6.0	3.4	9.8	5.0
7.	Carbonates “	70	90	NIL	35	–	80	45	20	NIL	45	20	NIL	NIL	NIL	NIL	45	60	NIL	NIL	20	NIL
8.	Bicarbonates “	190	185	295	200	–	135	155	255	230	155	255	230	430	290	300	235	210	180	280	315	350
9.	Free CO ₂ “	NIL	NIL	NIL	NIL	–	NIL	NIL	NIL	Traces	NIL	NIL	4.8	9.0	6.0	4.0	NIL	NIL	1.6	0.6	NIL	8.0
10.	Chloride “	149	170	110	142	–	80	142	175	75	142	175	75	184	210	70	156	145	55	160	185	70
11.	Total Hardness “	140	80	165	125	–	155	135	210	155	135	210	155	185	430	200	120	280	150	175	295	270
12.	Calcium “	46	17	48	38	–	40	40	34	42	40	34	42	59	92	61	40	52	40	36	50	59
13.	Magnesium “	7	10	12	9	–	15	10	31	13	10	31	13	11	51	13	6	38	13	22	38	32
14.	Nitrate – N	1	2	2	1	–	2	1	1	2	1	1	2	1	4	3	1	3	3	1	5	3
15.	Amm.Nitrogen “	NIL	NIL	NIL	NIL	–	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
16.	Total Nitrogen “	NIL	NIL	NIL	NIL	–	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
17.	Phosphorous “	NIL	15	10	Traces	–	15	NIL	10	NIL	Trace	5	5	NIL	5	10	Traces	40	5	Traces	10	10
18.	Silica “	30	40	25	25	–	20	25	35	25	30	25	20	25	30	25	20	30	20	25	35	25
19.	Sulphates “	10	250	40	10	–	10	10	260	40	15	240	10	70	190	40	10	300	10	25	220	40

S – Summer

M – Monsoon

W – Winter

Eutrophic water bodies have got characteristic features like : (i) shallow and broad littoral zone, (ii) greater ratio of epilimnion and hypolimnion, (iii) green to yellow or brownish green water, (iv) limited transparency, (v) depleted oxygen in summer hypolimnion, (vi) presence of algal blooms, (vii) biomass of profundal benthos is great particularly chironomid larvae and (viii) low species diversity and high density of algae dominated particularly cyanobacteria.

Oligotrophic water bodies have got (i) deep steeped bank, (ii) epilimnion volume is smaller than hypolimnion, (iii) water is blue or green in colour, (iv) poor plant nutrients and calcium, (v) oxygen is abundance in all levels, (vi) littoral plants are limited and poor phytoplankton, (vii) lack of algal blooms, (viii) low quality of profundal benthos and (ix) salmonids (ex : trout), and coregonids (white fish) dominant, (x) high species diversity and low density algae, dominated particularly by chlorophyceae.

The sources of nutrients in urban areas are domestic sewage, industrial wastes and storm, drainage, whereas in rural areas the sources of nutrients are those from agriculture, forest managements and rural dwellings. Out of which agricultural sources is the chief one. In general, rural dwellings dispose off their sewage into septic tanks that is likely to cause pollution. Since Kondakarla lake is situated in the rural areas, the main sources of the pollution are agriculture run off and rural dwellings. Since villages like Rajam, Cheemanapalle are also partly covered with forest areas in proper forest management is also a minor source of pollution. At the bank spot at Chemanapalle village. A lot of washermen washing the clothes were seen and the detergents that are being used for washing the clothes from which phosphates passes into the water body, leads to deteriorate the water quality. The Vadrepalle and Kondakarla villages have got more population and hence the rural dwelling into the lake may cause pollution. The surroundings of the villages—Kondakarla, Haripalem, Vadrepalle and Cheemanapalle and Ava somavaram are covered by sugarcane and paddy fields and the nutrients from these fields are also leading to deterioration of water quality. The effluents that are released into the water body from sugar factory at Thummapala through Sarada river are also responsible for this phenomena.

Kondakarla lake was found as a water body with shallow broad littoral zone. Its epilimnion volume is relatively small. Littoral plants are limited, without much water blooms, but were seen brownish water blooms in the centre point during summer. Benthic organisms are medium and chironomid larvae are lacking.

As far as the physico-chemical parameters are concerned, low values of turbidity were found in the lake. The lowest values of this factor were found in summer and winter seasons, whereas its highest were in monsoon season. But its exceptional highest value (540) was noticed in summer. The surface water temperature varied from 22.5 to 31°C.

The lowest value of dissolved oxygen (0.8 mg/lit.) was recorded in the winter season. The quantity of dissolved oxygen depends upon the time and depth of sampling. The lower values can

be seen in the morning and increases in mid day and declines in the evening hours. The reason could be attributed to photosynthetic activity.

The pH has shown alkaline tendency of the lake water. The concentration of free CO₂ was substantially low in the lake specifically in winter in general, but exceptionally highest value (9.0) was found in summer. The reason for winter maxima could be attributed to low photosynthetic activity in the season.

Vollenweider (1968), Zutshi (1976) and Cheng and Tyler (1976). Pant *et al.*, (1979) have attributed different trophic classifications to different water bodies. The physico-chemical factors such as high turbidity, higher concentration of nitrate, nitrogen, low dissolved oxygen high alkalinity, low free CO₂ values have placed the lake as mesotrophic status.

The observations on zooplankton composition of the water body, indicates more rotatorian diversity followed by Cladocera, Copepoda and Ostracoda. Since long time, the rotifers have been used as bio-indicators of water quality because of their species diversity and cosmopolitan distribution.

Among the rotatorians, presence of *Brachionus falcatus*, *B. forficula*, *B. quadridentatus*, *Tetramastix opiliensis* are the indicator species for clean water; *B. angularis*, *B. calyciflorus*, *Keratella tropica*, *Filinia longiseta*, *F. terminalis* and *Polyarthra multiappendiculata* are for polluted waters and *Epiphanes macrorus* for heavily polluted waters. A relative abundance of cladocerans especially the members of the family Chydoridae indicates eutrophic conditions (Khan and Seshagiri Rao, 1981). According to Mahajan (1981) *Diaphanosoma*, *Simocephalus* and *Ceriodaphnia* are indicators for eutrophication.

From the rotatorian and cladoceran fauna found from Kondakarla lake during the period of investigation *Brachionus calyciflorus* dominated among rotatorians and *Ceriodaphnia cornuta* in Cladocerans. The presence of *B. falcatus*, *B. forficula*, *B. quadridentatus* indicating the cleanliness of water. But the presence of *B. calyciflorus* and *Filinia longiseta* and *F. terminalis* among Rotifera and Genera *Diaphanosoma*, *Simocephalus* and *Ceriodaphnia* is indicating eutrophication. Hence the author is placing the water body as Mesotrophic and getting eutrophicated. As per the information procured from the villagers, the lake water was being used for drinking. But after the floods in the year 1990, the lake water has become polluted due to influx of heavy load of domestic sewage from the surrounding villagers, effluents from Thummapala sugar factory and agricultural wastes into the water body made the water body polluted and could not be used for drinking purpose at present.

Medium values of bicarbonates and calcium are found in the lake. Even though the phosphate contents were not found in some spots, these values are also found medium that shows mesotrophic nature of the system. Due to anthropogenic activities, the lake is purely cultural. The relative

Table II. : Physico chemical features (ranges) of Kondakarla lake water

Sl. No.	Parameter	Range	Drinking water Standards as per WHO (1971)		ISI Standards (1982)	Rawal's Data (1978)	
			Highest Desirable	Maximum permissible		Permissible	Excessive limits
I	II	III	IV	V	VI	VII	VIII
1.	pH	7.0–8.9	7.0–8.5	6.5–9.2	6.5–8.5	6.6–8.5	6.5–8.5
2.	Electric Conductivity (Microsiemens/cm)	480–1640	–	–	–	–	–
3.	Turbidity (N.T.U.)	4–60	5.0	2.5	–	–	–
4.	Dis. Oxygen (mg/lit.)	0.8–12.2 (except. 16.2)	–	3.0	6.0	3.0	–
5.	Carbonates (mg/lit.)	0–90	–	–	–	–	–
6.	Bicarbonates (mg/lit.)	120–430	–	–	–	–	–
7.	Free CO ₂ (mg/lit)	0–9.0					
8.	Chloride (mg/lit.)	45–185	200	600	–	250	600
9.	Total Hardness (mg/lit.)	80–295 (Except. 430)	100	500	300	150	500
10.	Calcium (mg/lit.)	17–92	–	–	200	75	200
11.	Magnesium (mg/lit.)	6–51	30	150	100	50	150
12.	Nitrate (mg/lit.)	1–4	45	45	20	10	–
13.	Amm. Nitrogen (mg/lit.)	NIL	–	–	–	–	–
14.	Total Nitrogen (mg/lit.)	NIL	–	–	–	–	–
15.	Phosphorus (mg/lit.)	0–15	–	–	–	2.0	5.0
16.	Silica (mg/lit.)	20–40	–	–	–	–	–
17.	Sulphate (mg/lit.)	10–300	200	400	–	–	–

enrichment has a direct impact of cultural activities made by growing human population surrounding the lake basin, discharging the sewage into the water body, the effluents that are being let into river from Thummapala sugar factory and the detergents that are being used for washing activities. These three activities are disturbing the catchment lake equilibrium and leading to increase the trophic nature of the water body up to certain extent.

Pejler (1957) has described rotatorian species viz., *Brachionus* sp. *Keratella cochlearis*, *K. quadrata*, *Anuraeopsis fissa*, *Trichocerca birostria*, *T. capucina*, *T. cylindrica*, *T. porcellus*, *T. pusilla*, *Polyarthura euryptera*, and *Filinia longiseta* from mesotrophic lakes.

SUMMARY

This paper communicates the trophic status of Kondakarla lake, Visakha district, Andhra Pradesh, from the studies on its biotic and abiotic factors during the three seasons of the year 1997. Totally 19 parameters have been studied from the water samples collected from seven spots of the water body, in three seasons. The water was found alkaline with pH ranging between 7.0 and 8.9, bicarbonate alkalinity from 120–430 mg/litre, Nitrates between 1 and 5 mg/litre and phosphorus from 0 to 5 mg/litre. The results indicate that the water is useful for irrigation and aquacultural purposes. The author has placed the water body, as a mesotrophic one.

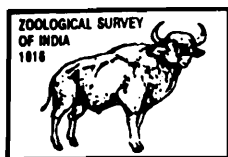
ACKNOWLEDGEMENTS

The author is grateful to Dr. J. R. B. Alfred, Director, Zoological Survey of India (ZSI), Calcutta, Dr. S. Z. Siddiqui, Officer-in-charge, Freshwater Biological Station (FBS) ZSI, Hyderabad for encouragements and facilities. Thanks are also due to all scientific personnel of FBS, ZSI, Hyderabad for their assistance in field work.

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Rec. zool. Surv. India : 105 (Part 3–4) : 37-42, 2005

DESCRIPTION OF THREE NEW SPECIES OF THE GENERA *THOMISUS* WALCKENAER, *CHEIRACANTHIUM* KOCH, C. L. AND *TINUS* CAMBRIDGE OF THE FAMILIES THOMISIDAE, CLUBIONIDAE AND PISAURIDAE FROM INDIA

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INTRODUCTION

Spiders of the families Thomisidae, Clubionidae and Pisauridae have received attention by Tikadar (1960-1980), Biswas (1981-1992, 1995, 1997, 2000, 2003, 2004), Gajbe (1999) after the fauna of British India, Arachnida by Pocock (1900). While examining the spider collections from Silent Valley Expedition, we came across three new species of the genera *Thomisus* Walckenaer, *Cheiracanthium* Koch, C. L. and *Tinus* Cambridge (Araneae : Thomisidae, Clubionidae and Pisauridae) which are described in this paper.

The types are deposited in the National Collection of the Zoological Survey of India, Kolkata.

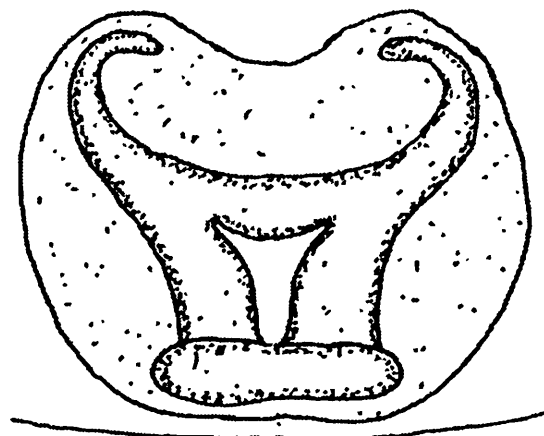
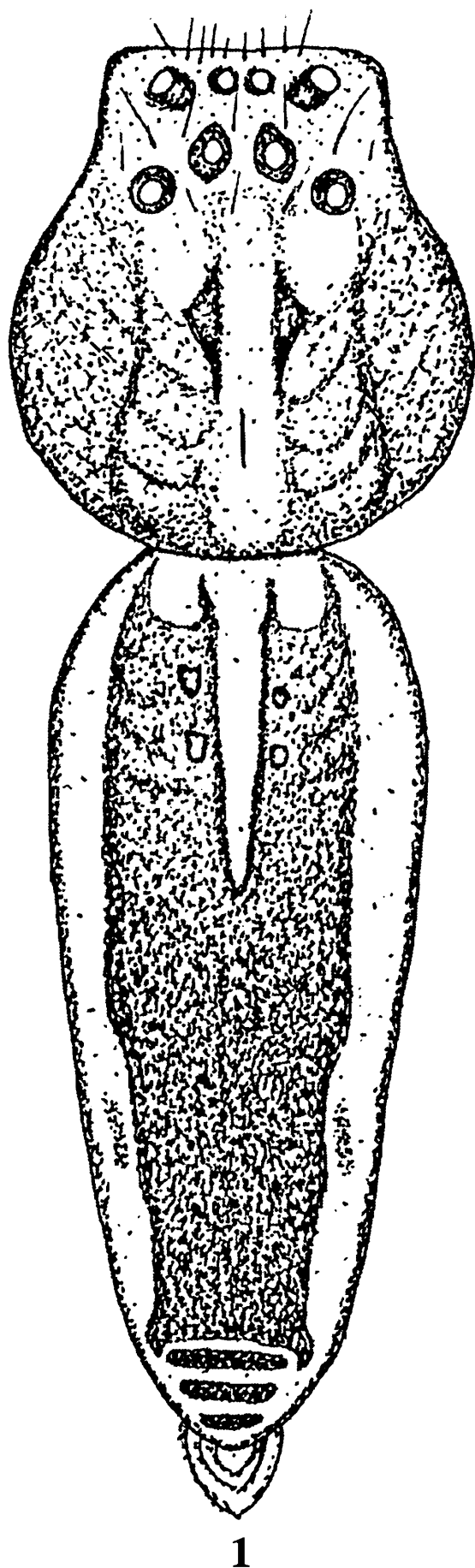
1. *Tinus arindamai* sp. nov.

(Figs. 1-3)

General : Cephalothorax, legs yellowish brown and abdomen brownish black. Total length 10'00 mm. Carapace 4'00 mm. long, 3'50 mm. wide; abdomen 6'50 mm. long, 2'50 mm. wide.

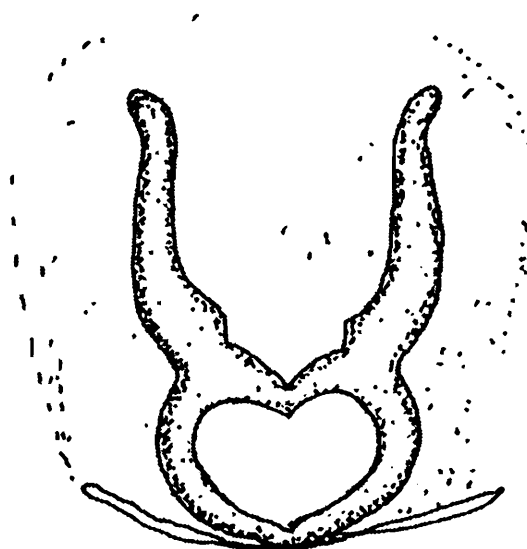
Cephalothorax : Slightly longer than wide, anterior part convex, cephalic region high with prominent fovea, narrowing in front; two distinct brown patch on either side of fovea with scattered brown reticulated bands. Light brown patches on the margin of the cephalic region. Three rows of eyes, first row with four showing slightly procurved in appearance. Middle and posterior row showing strongly procurvedness. Eyes with distinct black tubercles. Median eyes of the first row smaller than the laterals. Eyes of the third row largest. Sternum heart shaped, yellowish in colour. Legs are very long, yellowish colour with spines. Leg formulae are 1/2/4/3.

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2

1.00 mm



3

Figs. 1-3. : *Tinus arindamai* sp. nov. 1. Dorsal view of female, Holotype (Legs are omitted); 2. Epigyne; 3. Internal genitalia.

Abdomen : Longer than wide, two yellowish bands extending from anterior to posterior and of the abdomen laterally. Anterior half of abdomen with lance-shaped yellowish patch. Extreme part of the abdomen provided with three transverse deep brown stripes remain separated by narrow yellowish band.

Type specimen : Holotype female, paratype one female preserved in rectified spirit (70%). Registration numbers 5574-75/18.

Type-locality : Karapara Expedition, Silent Valley, Panthanthedu, Kerala, India, 13.xii.1980, coll. R. S. Pillai & party.

Remarks : *Tinus arindamai* is compared with *Tinus sikkimus* Tikader which differs in the following characters (1) Two distinct brown patches on either side of fevea with scattered brown reticulated bands in *T. arindamai* sp. nov. but there is no such in *T. sikkimus* Tikader (2) Two yellowish bands extending from anterior and of the abdomen laterally but there is no such in *T. sikkimus* (3) Extreme part of the abdomen provided with three transverse deep brown stripes in *T. arindamai* sp. nov. which is not found in *T. sikkimus* Tikader (4) Epigyne and internal genitalia are also structurally different.

2. *Cheiracanthium tanmoyi* sp. nov.

(Figs. 4-6)

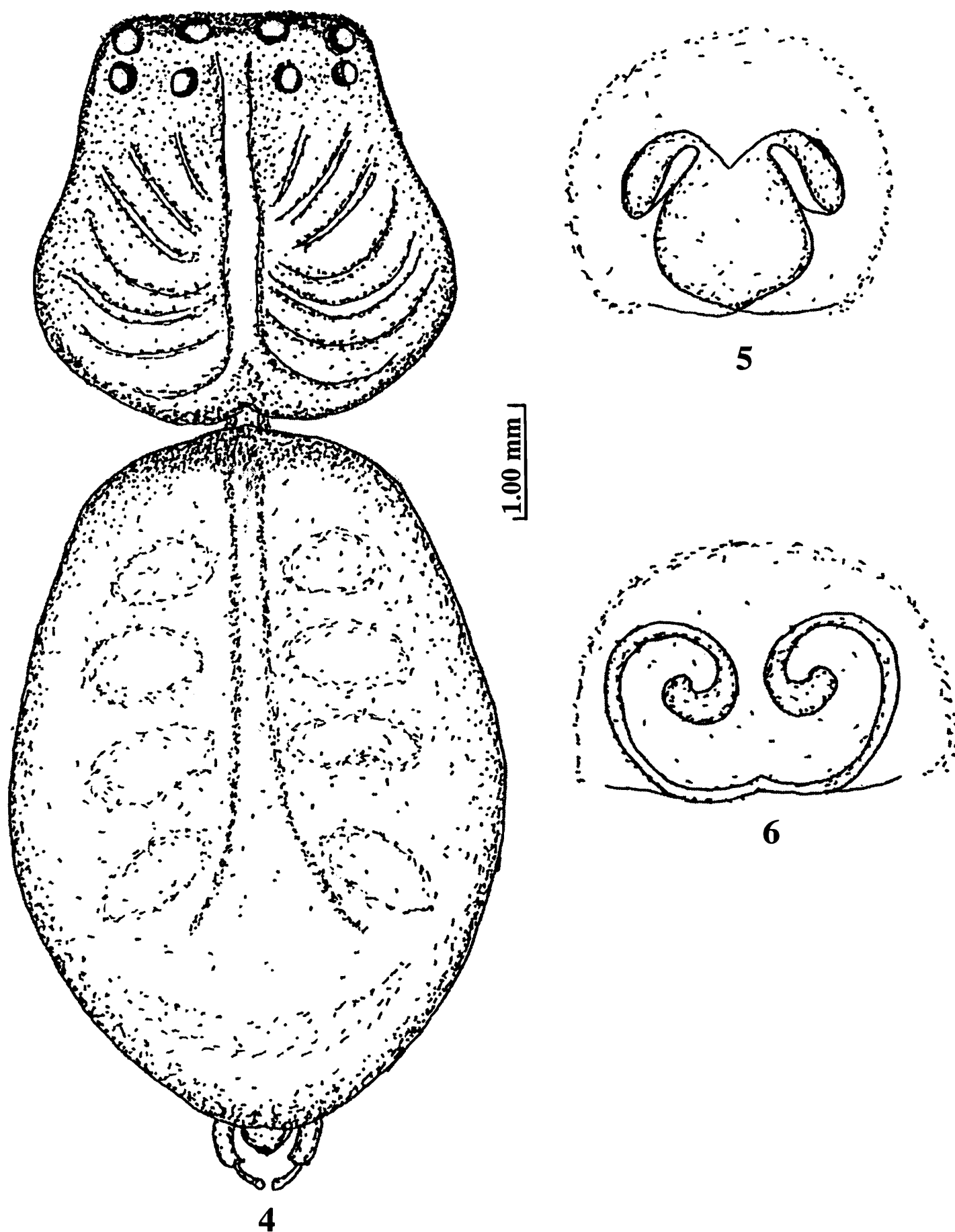
General : Cephalothorax dark brown in colour, legs moderately brown and abdomen comparatively light brown in colour. Total length 11.50 mm. Carapace 4.00 mm long, 3.00 mm wide; abdomen 7.50 mm long, 4.00 mm wide.

Cephalothorax : Longer than wide, convex anteriorly, wider posteriorly, covered with fine pubescence, having no distinct favea. Two rows of eyes present. Anterior row slightly procurved and posterior slightly recurved. Median eyes of both anterior and posterior row larger than the laterals. Ocular quad wider than long. Chelicerae dark brown in colour, prominent, longer than wide, inner margin with three and outer margin with two teeth. Maxillae and labium longer than wide, scopulated anteriorly. Sternum oval, covered with fine pubescence. Legs are longer than wide. Leg formulae are 1/4/2/3.

Abdomen : Oval in shape, longer than wide, covered with fine hair. Dorsum of the abdomen with deep brown patch on the middle. Male is unknown.

Type specimen : Holotype female preserved in rectified spirit (70%). Registration number is 5576/18.

Type-locality : Silent Valley Expedition, locality Kummathanthodu, Kerala, India, 22.iv.1980, coll. R. S. Pillai.



Figs. 4-6. : *Cheiracanthium tanmoyi* sp. nov. 4. Dorsal view of female, Holotype (Legs are omitted); 5. Epigyne; 6. Internal genitalia.

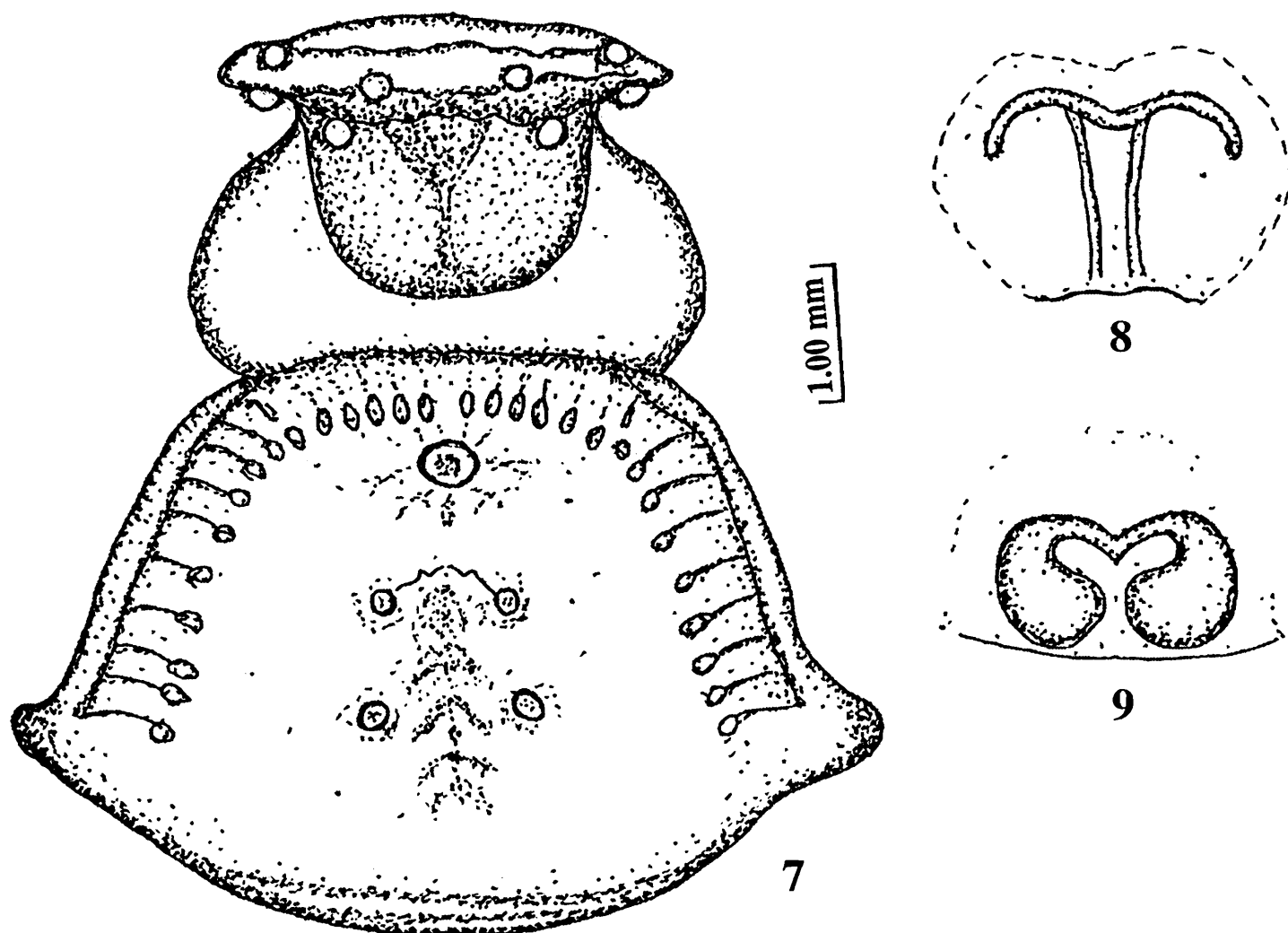
Remarks : *Cheiracanthium tanmoyi* sp. nov. is compared with *Cheiracanthium murina* Thorell which differs in the following characters (1) Colour of the cephalothorax and abdomen varies from *C. murina*. (2) Middle of the dorsum of the abdomen of *C. tanmoyi* bears deep brown patch longitudinally but in *C. murina* no such patch. (3) Epigyne and internal genitalia are also structurally different.

3. *Thomisus keralae* sp. nov.

(Figs. 7-9)

General : Cephalothorax brownish yellow, ocular area yellowish, triangular with transverse yellow patch between the posterior median eyes. Abdomen chalk-white in colour. Total length 7.00 mm. Carapace 2.50 mm long, 3.00 mm wide; abdomen 5.00 mm long, 5.50 mm wide.

Cephalothorax : Wider than long. Eyes are comparatively small in size, more or less equal. Two rows of eyes. Anterior row of eyes strongly procurved, posterior row of eyes more or less in straight line. Postero-median eyes situated on triangular head and anterior median eyes situated



Figs. 7-9. : *Thomisus keralae* sp. nov. 7. Dorsal view of female, Holotype (Legs are omitted); 8. Epigyne; 9. Internal genitalia.

in front of the head. Two broad light brown patches present on the lateral side of the cephalic region starting from the whitish middle portion towards the lateral side. Legs yellowish in colour and unevenly swollen. I and II pair of legs longer than III and IV III pair of legs smallest in size. Sternum heart shaped brownish yellow in colour, pointed behind. Leg formulae are 1/2/4/3.

Abdomen : Pentagonal, overlapping the posterior region of cephalothorax in front, broadest just behind the middle. One pair of brown spots present on the postero lateral side of dorsum of the abdomen. Sigilla five in number, anterior sigilla bigger in size and single in number situated at the mid-dorsal of the abdomen. Rest four sigilla are pairs in orientation. Several depressions are present on the anterior roundish part of the dorsum.

Type specimen : Holotype female preserved in rectified spirit (70%). Registration number is 5577/18.

Type-locality : Thekkady, Silent Valley, Mullayane, Kerala, India, 23.ii.1981, coll. K. Mathew.

Remarks : *Thomisus keralae* sp. nov. is compared with *Thomisus bulani* Tikader but differs in the following characters (1) Colour pattern of both the species are different. (2) One pair of brown spots present on the postero-lateral side of dorsum of the abdomen but in *Thomisus bulani* Tikader three pairs reddish brown spots present. (3) Epigyne and internal genitalia are also structurally different.

SUMMARY

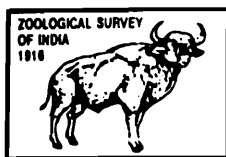
Three new species under genera *Tinus* Cambridge, *Cheiracanthium* Koch, C. L. and *Thomisus* Walckenaer (Families : Pisauridae, Clubionidae, Thomisidae) described and illustrated in this paper.

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Rec. zool. Surv. India : 105 (Part 3–4) : 43-49, 2005

BIODIVERSITY OF PLANT AND SOIL NEMATODES FROM ANDAMAN AND CAR NICOBAR ISLANDS

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INTRODUCTION

Analysis of the nematology literature from India reveals that our information on the fauna of plant and soil nematodes is meagre from Andaman and Car Nicobar Islands, which form a fragile ecosystem. Jairajpuri (1965, 1969), Khan (1968), Sukul (1968-1969), Rao, G. C. (1975), Baqri and Khera (1976), Khan *et al.*, (1978), Rahman *et al.*, (1994) and a few others are the only available important references on the survey, distribution and taxonomy of plant and soil nematodes from these islands. During 1990-1991, random surveys were conducted by one of us (QHB) in the following islands of Andaman and Nicobar : Diglipur, Mayabander, Rangat, Baratang, Havelock, Ross, Port Blair, Car Nicobar, Kamorta, Nancowry, Katchal, Great Nicobar.

The collected soil samples yielded 62 species of the following four Orders : Tylenchida (9 spp.), Aphelenchida (1 sp.), Dorylaimida (41 spp.) and Mononchida (11 spp.). However, in order to provide over all information on the known diversity of these economically important organisms, already known species from Andaman and Nicobar islands have also been listed in the paper.

MATERIALS AND METHODS

The nematodes were fixed in hot 4% formalin, dehydrated slowly in a desiccator and mounted in anhydrous glycerine.

RESULTS

The nematode species identified by the authors and species already known from the islands are being listed hereunder according to their systematic position in Table 1.

Table 1. : Distribution of plant and soil Nematodes in the Andaman & Car Nicobar Islands.

Order, Family & Nematode species	Locality(ies)
Order : TYLENCHIDA Family : TYLENCHIDAE	
<i>Aglenchus agricola</i> * (de Man, 1884) Meyl, 1961	Hut Bay, Little Andaman, Port Blair, Kamorta, Nicobar Islands
Family : HOLOMAIMIDAE	
<i>Hoplolaimus indicus</i> * Sher, 1963	Malaka, Car Nicobar, Campbell Great Nicobar, Port Blair
<i>Hoplolaimus (Basirolaimus) seinhorsti</i> Luc, 1958	Havelock Islands, Andaman
<i>Helicotylenchus dihystra</i> * (Cobb, 1893) Sher, 1961	Kamorta, Nicobar Island
<i>Helicotylenchus crenacauda</i> * Sher, 1966	Malaka, Car Nicobar, Havelock, South Andaman, Diglipur, North Andaman
<i>Helicotylenchus exallus</i> Sher, 1966	Car Nicobar
<i>Helicotylenchus multicinctus</i> * (Cobb, 1893) Golden, 1956	Diglipur, North Andaman
Family : TELOTYLENCHIDAE	
<i>Tylenchorhynchus annulatus</i> (Cassidy, 1930) Golden, 1971	Havelock, Andaman
<i>Tylenchorhynchus nudus</i> Allen, 1955	Mayabander, Andaman
<i>Tylenchorhynchus robustus</i> * Thome & Malek, 1968	Wibertigunj, South Andaman
<i>Quinisulcius curvus</i> (Williams, 1960) Siddiqi, 1971	Car Nicobar
Family : CRICONEMATIDAE	
<i>Hemicriconemoides cocophillus</i> * (Loos, 1949) Chitwood & Birchfield, 1957	Cambene cave, Port Blair
<i>Hemicriconemoides mangiferae</i> * Siddiqi, 1961	Campbell Bay, Nicobar
Order : APHELENCHIDA Family : APHELENCHIDAE	
<i>Aphelenchus avenae</i> Bastian, 1865	Malaka (Car Nicobar), Havelock (South Andaman), Kadmatata (Middle Andaman), Shayama Jetty (Middle Andaman)

Table 1. : (Cont'd.)

Order, Family & Nematode species	Locality(ies)
Order : DORYLAIMIDA	
Family : DORYLAIMIDAE	
<i>Mesodorylaimus recurvus</i> * Andrassy, 1964	Malaka, Car Nicobar
<i>Laimydorus baldus</i> * Baqri & Jana, 1982	Havelock, South Andaman
<i>Thornenema longicaudatum</i> * Jairajpuri, Ahmad & Dhanachand, 1979	Tugapur, Middle Andaman
<i>Thornenema mauritianum</i> (William, 1959) Baqri & Jairajpuri, 1969	Wibertigunj, South Andaman, Kamorta, Nicobar Island
<i>Paratimminema brevibulbum</i> Rahman, Ahmad & Khan, 1994	Campbell, Great Nicobar
Family : APORCELAIMIDAE	
<i>Aporcelaimellus heynsi</i> Baqri & Jairajpuri, 1968	Malaka, Car Nicobar, Mamorta, Nicobar, Hut Bay, Little Andaman
<i>Aporcelaimellus paraconicaudatus</i> (Meyl, 1956), Heyns, 1965	Heyns, 1965 Mayabander, Andaman
<i>Aporcelaimellus porcus</i> Thorne, 1974	Car Nicobar
Family : QUDSIANEMATIDAE	
<i>Labronema obesum</i> * Thorne, 1974	Katchal near Jetty, Nicobar Island
<i>Eudorylaimus sabulophilus</i> Tjipkema, Ferris & Ferris, 1971	Havelock, Andaman
<i>Labronemella andrassyi</i> * (Baqri & Khera, 1975) Andrassy, 1985	Kamorta, Nicobar Island
<i>Discolaimus major</i> Thorne, 1939	Kamorta, Nicobar Island
<i>Disclaimium clavatum</i> Baqri & Khera, 1976	Malaka, Car Nicobar Islands
<i>Myiodiscus nanus</i> * Thorne, 1939	Kamorta, Nicobar Island
<i>Discolaimoides bulbiferus</i> * (Cobb, 1906) Heyns, 1963	Katchal, Nicobar Island
<i>Moshajia warriari</i> (Jairajpuri, 1965) Siddiqi, 1982	Kamorta, Nicobar Island
<i>Moshajia idiofora</i> * Siddiqi, 1982	Kamorta, Nicobar Island
Family : NORDIIDAE	
<i>Oriverutus labiatus</i> * Ahmad & Jairajpuri, 1987	Kamorta, Nicobar Island
Family : LONGIDORIDAE	
<i>Paralongidorus rosundatus</i> Khan, 1987	Port Blair, Andaman

Table 1. : (Cont'd.)

Order, Family & Nematode species	Locality(ies)
Family : XIPHINEMATIDAE	
<i>Xiphinema elongatum</i> Sch. Stekhoven & Teunissen, 1938	Havelock, South Andaman
<i>Xiphinema elitum</i> Khan, Chawla & Saha, 1978	Andaman Island
<i>Xiphinema insigne</i> * Loos, 1949	Kamorta, Nicobar Island
Family : BELONDIRIDAE	
<i>Belondira apitica</i> * Thorne, 1939	Mayabander, Middle Andaman
<i>Belondira ortha</i> * Thorne, 1939	Rosa Island, Port Blair
<i>Belondira tenuidens</i> * Thorne, 1964	Kamorta, Nicobar Island
<i>Belondira thornei</i> * Suryawanshi, 1972	Kamorta, Nicobar Island
<i>Axonchium (Axonchium) amplicolle</i> * Cobb, 1920	Canimaka, Car Nicobar Island
<i>Axonchium (Axonchium) shamimi</i> Baqri & Khera, 1976	Neill Islands, Andman
<i>Dorylaimellus (Dorylaimellus) indicus</i> * Siddiqi, 1964	Hut Bay, Little Andaman
<i>Dorylaimellus (Belondorylaimellus) belondirelloides</i> Siddiqi, 1968	Havelock, Andaman
<i>Oxydirus elongatus</i> * Altherr, 1963	Havelock, Sippighat, South Andaman
<i>Paraoxydirus novus</i> * (Jairajpuri, 1965) Jairajpuri & Ahmad, 1979	Havelock, Sippighat, South Andaman
Family : TYLENCHOLAIMIDAE	
<i>Discomyctus cephalatus</i> * Thorne, 1939	Tugapur, Mayabander Middle
Family : LEPTONCHIDAE	
<i>Leptonchus granulosus</i> * Cobb, 1920	Havelock, South Andaman
<i>Proleptonchus clarus</i> * Timm, 1964	Danapur, Mayabande Middle Andaman
<i>Proleptonchus indicus</i> * Siddiqi & Khan, 1964	Hut Bay, Little Andaman
<i>Proleptonchus aestivus</i> * Laordello, 1955	Malaka, Car Nicobar Island
<i>Tyleptus projectus</i> * Thorne, 1939	Wibertigunj, South Andman
<i>Tyleptus variabilis</i> * Jairajpuri & Loof, 1966	Wibertigunj, South Andaman
<i>Doryllium minor</i> * Jairajpuri, 1963	Malaca, Car Nicobar

Table 1. : (Cont'd.)

Order, Family & Nematode species	Locality(ies)
<i>Meylis dicephalus</i> * (Yeates, 1967) Goseco, Ferris & Ferris, 1974	Katchal, Nicobar Island
<i>Oostenbrinkella oostenbrinki</i> Jairajpuri, 1965	Katchal, Nicobar Island
Family : MYDONOMIDAE	
<i>Dorylaimoides (Digidorylaimoides) pakistanensis</i> Siddiqi, 1964	Neill Island, Mayabander, Andaman
<i>Dorylaimoides (Digidorylaimoides) micoletzkyi</i> * (De Man, 1922), Thorne & Swanger, 1936	Katchal, Nicobar Island
<i>Dorylaimoides (Longidorylaimoides) lepidus</i> * Timm, 1964	Katchal, Nicobar Island
<i>Dorylaimoides (Longidorylaimoides) leptura</i> * Siddiqi, 1995	Danapur, Mayabander Middle Andaman
<i>Dorylaimoides (Tarjania) bulbosa</i> (Brzeski & Szczgiel, 1961) Szczgiel, 1965	Car Nicobar
<i>Dorylaimoides (Arcidorylaimoides) arcuatus</i> Siddiqi, 1964	Chiriatapu, Andaman
<i>Dorylaimoides (Arcidorylaimoides) saueri</i> * Baqri & Jairajpuri, 1969	Katchal, Nicobar Island
<i>Morasia dimorphicauda</i> * Baqri & Jairajpuri, 1969	Katchal, Nicobar Island
Family : NYGOLAIMIDAE	
<i>Nygolaimus anneckeii</i> * Heyns, 1968	Mayabander, Middle Andaman
<i>Clavicaudoides trophurus</i> (Heyns, 1968) Ahmad & Jairajpuri, 1982	Mayabander, Andaman
<i>Laevides laevis</i> * (Thorne, 1939) Thorne, 1974	Wibertigunj, South Andaman
<i>Solididens bisexualis</i> (Thorne, 1939) Thorne, 1974	Neill, Andaman
Order : MONONCHIDA Family : MONONCHIDAE	
<i>Mononchus aquaticus</i> * Coetzee, 1968	Canni Malaca, Car Nicobar
Family : MYLONCHULIDAE	
<i>Mylonchulus brachyuris</i> * (Butschli, 1873) Andrassy, 1958	Kamorta, Nicobar Island

Table 1. : (Cont'd.)

Order, Family & Nematode species	Locality(ies)
<i>Mylonchulus minor</i> * (Cobb, 1893) Andrassy, 1958	Malaca, Car Nicobar
<i>Mylonchulus contractus</i> * Jairajpuri, 1970	Havelock, South Andaman, Hut Bay, Little Andaman, Kamorta, Nicobar Island
<i>Mylonchulus dentatus</i> * Jairajpuri, 1970	Shayama Jetty, Middle Andaman, Havelock, South Andaman
<i>Mylonchulus hawaiiensis</i> (Cassidy, 1931) Andrassy, 1958	Neill Islands, Andaman
<i>Mylonchulus lacustris</i> * (N. A. Cobb in M. V. Cobb, 1915) Andrassy, 1958	Kamorta, Nicobar Island
Family : ANATONCHIDAE	
<i>Miconchoides studeri</i> * (Steiner, 1914) Jairajpuri, 1982	Campbell, Great Nicobar
Family : IOTONCHIDAE	
<i>Iotonchus indicus</i> Jairajpuri, 1969	Rangat, Middle Andaman
<i>Iotonchus trichuris</i> (Cobb, 1917) Andrassy, 1958	Wibertigunj, South Andaman
<i>Parahadronchus shakili</i> (Jairajpuri, 1969) Mulvey, 1978	Kamorta, Nicobar Island

DISCUSSION

The analysis of Nematology literature reveals that only 31 species of plant and soil nematodes had been recorded by earlier Nematologists till 2003. After adding our information, 80 species are now known from Andaman and Nicobar Islands. Out of these, 49 species are being recorded for the first time from the Islands by the present authors.

In spite of the above mentioned achievements, identification of nematodes like root-knot (*Meloidogyne* spp.) which are not only cosmopolitan in their distribution, but also polyphagous are yet to be recorded and the cyst nematode (*Heterodera* spp.) have not been recorded from Andaman and Nicobar Islands till date. Some families belonging to Order Dorylaimida (Nordiidae, Longidoridae, Tylencholaimidae, Nygolaimidae) are poorly represented in the Islands. Predatory nematodes of families like Mononchidae, Cobbonchidae etc., of the Order Mononchida, which are abundantly found in Indo-Malayan region, still remain unrecorded.

SUMMARY

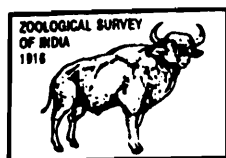
Present paper reports 62 species of plant and soil nematodes, identified by authors from Andaman and Nicobar islands. These species belong to 41 genera, 19 families of four Orders. In order to provide an overview of nematode diversity from the islands, already known species have also been listed in paper. After adding already known species, a total of 80 species belonging to 46 genera under 19 families of four Orders are known now from islands. Out of 62 species identified by the authors, 49 species are being reported for the first time from Andaman and Nicobar islands. Our study and analysis of nematological literature reveal that *Tylenchorhynchus* spp., *Hoplolaimus* spp. and *Helicotylenchus* spp. are widely distributed in the islands. Presently known diversity of plant and soil nematodes from Andaman and Nicobar comes to about 4.7% of terrestrial nematode fauna of India.

ACKNOWLEDGEMENT

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Rec. zool. Surv. India : 105 (Part 3–4) : 51-56, 2005

REDESCRIPTION OF *MACROBRACHIUM PEGUENSE* (TIWARI, 1952) (DECAPODA : CARIDEA : PALAEMONIDAE)

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INTRODUCTION

While examining the collection of Decapoda from Bilgiri Rangasamy temple Wildlife Sanctuary deposited in the Southern Regional Station of Zoological Survey of India, Chennai, the authors came across the Palaemonid prawn *Macrobrachium peguense*, which is a new record to India. *Macrobrachium peguense* was earlier described from Myanmar by Tiwari (1952). Since the original description of the species is inadequate, the species is redescribed.

MATERIAL EXAMINED

(Plate : *Macrobrachium peguense* (Tiwari) – Female, Male)

The details of the material examined are given in the following table :

Locality	Collector	Date	Total No. of Exs.	No. of Males	No. of Females		Total length of Males (mm)	Total length of Females (mm)	
					Berried	Non berried		Berried	Non berried
Budipadaka	S. Krishnan	18.ii.1999	65	21	14	30	23.2 to 46.2	38.5 to 50.6	23.2 to 0.8
Bhanuwadi	S. Krishnan	19.ii.1999	16	5	Nil	11	29 to 33	Nil	30 to 42
Harangi Damsite	G. Thirumalai	9.iv.1999	24	16	Nil	8	24 to 40.5	Nil	30 to 40.5
Seebinaekare	S. Krishnan	7.iv.2000	3	2	1	Nil	36.5 to 37.2	Nil	49.3

DIAGNOSTIC FEATURES

Rostrum always longer than the antennular peduncle and slightly shorter than or rarely equal to the antennal scale. Rostral formula 6–10/3–5 usually with 7–9/3–4, with one or two post orbital teeth, in the lower margin the teeth are equidistant, in the upper margin though the teeth are equidistant slight variations in distance are also observed. The upper margin is with or without sub apical teeth, when present also it is not widely separated from the remaining teeth. The rostral formula of the specimens examined is given in the following table.

Rostral formula	Budipadaka	Bhanuwadi	Harangi Damsite	Seebinaekare	Total
6/3.....	2	Nil	Nil	Nil	2
6/4.....	6	3	Nil	1	10
6/5.....	1	Nil	Nil	Nil	1
7/3.....	1	Nil	2	1	4
7/4.....	30	9	Nil	1	40
7/5.....	3	Nil	Nil	Nil	3
8/3.....	Nil	Nil	4	Nil	4
8/4.....	12	1	3	Nil	16
8/5.....	3	Nil	Nil	Nil	3
9/3.....	Nil	Nil	1	Nil	1
9/4.....	2	3	7	Nil	12
9/5.....	3	Nil	Nil	Nil	3
10/4.....	1	Nil	1	Nil	2
Total	64	16	18	3	101

Eyes are well developed, cornea broad and well pigmented.

Stylocerite small and reaching only proximal 1/4th of antennular segment of antennular peduncle.

Antennular peduncle is shorter and about 0.6 times of the carapace.

Antennal scale is about 3.5 times as long as its breadth.

I. Cheliped : It is slightly shorter than or equal to the antennal scale. Finger equal to or slightly shorter than palm (F/P = 0.8 – 1). Chela 3.7 to 5 times of its breadth. Chela is sub equal to the half of the length of the carpus, i.e., it may be equal to the half of the length of the carpus or 0.1–0.2 mm longer or shorter than the half of the length of carpus. Carpus is distinctly longer than the merus.

II. Cheliped : Equal on both the sides and similar in both sexes. It is sub equal to the half of the total body length. It over reaches the antennal scale by the entire chela and $1/5^{\text{th}}$ of the carpus. In males the length of the cheliped is 1 or 2 mm shorter than the half of the total body length, but in females it is 0.3 to 3.6 mm longer than the half of the total body length. Carpus is distinctly longer than the merus. Chela is sub equal to the carpus. Mostly carpus is slightly longer (0.1–1.1 mm) than the chela, occasionally it is equal to or slightly (0.1–1.1 mm) shorter than the chela. Finger is always shorter than the palm (0.6–0.8 mm). Fingers are with delicate hairs, cutting edges of both movable and immovable fingers of males are smooth without any tubercles. But in the case of females cutting edge of the movable finger usually armed with 2 minute tubercle like teeth, while that of the fixed finger with a smaller tooth fitting in the gap between those of the movable finger when closed, rest of the cutting edge smooth. Palm is mostly longer than the half of the carpus but in rare cases it is slightly (0.05–0.2 mm) shorter than the half of the carpus, irrespective of size and gender. Carpus is always longer than the merus, cylindrical and is 6.8 to 11.6 (average = 9.35) times as long as its distal diameter.

The average percentage length of the various segments of the II cheliped are as follows.

Ischium	Merus	Carpus	Palm	Fingers
17.88%	21.26%	28.57%	15.06%	10.55%

Sixth abdominal segment about 1.7 times as 5^{th} abdominal segment in length. Appendix masculina 1.4–1.5 times as long as appendix interna and 0.69–0.9 times as long as the endopod.

The relative lengths of appendix masculina, appendix interna and endopod second pleopod male is shown in the table.

Locality	Length of Endopod (mm)	Length of Appendix masculina (mm)	Length of Appendix interna (mm)	Appendix masculina Endopod (mm)	Appendix masculina Appendix interna (mm)
Budipadaka	3.3	2.7	1.9	0.82	1.42
"	3.2	2.6	1.8	0.8	1.4
"	3.3	3	1.9	0.9	1.59
Bhanuwadi	3	2.5	1.8	0.8	1.4
Harangi Damsite	3.5	2.4	1.6	0.69	1.5
Seebinaekare	2.9	2.5	1.7	0.86	1.47

Telson 1.36 times as long as 6^{th} abdominal segment. Dorsal spines 2 pairs, posterior margin ending in a triangular median point, and also provided with two pairs of spines of which inner pair is longer and stouter than the outer one. Between inner pairs 2–3 pairs of plumose setae are present.

Uropod is without accessory sub apical spine on outer margin of exopod.

Eggs : Number and size of eggs were examined in 11 berried females collected from Budipadaka. The number of eggs varies from 67–122 and size of the eggs ranges from $1.2\text{--}1.8 \times 0.9\text{--}1.5$ mm.

The following table shows the comparison of *Macrobrachium peguense* described by Tiwari from Myanmar and the present species from B.R.T. Hills.

Myanmar	B.R.T. Hills
1. Rostrum exceeding antennular peduncle slightly behind the antennal scale.	1. Rostrum like the Myanmar specimen, occasionally equal to the antennal scale.
2. Rostral formula 6–9/2–4.	2. Rostral formula 6–10/3–4.
3. Chela of the first pair of pereopods shorter than half the length of carpus.	3. Chela of the first pair of pereopods usually shorter than half the length of the carpus but in some cases it is equal to or longer than half of the carpus.
4. The total length of the second pereopods is slightly shorter than the half of the total body length.	4. It is usually like the Myanmar specimen, occasionally it is equal to or longer than half of the total body length.
5. Carpus about eight times as long as its distal diameter.	5. Carpus is 7–11.6 times as long as its distal diameter.
6. Palm slightly longer than half the length of carpus and about a fourth longer than finger.	6. Like Myanmar species but very rarely palm is slightly (0.1 mm) shorter than half of the carpus and 1.2 to 1.5 times longer than the finger.
7. Entire chela a shade longer than carpus.	7. Entire chela a shade longer than or shorter than or equal to the carpus irrespective of size and gender.
8. Eggs large, egg bearing females 42 to 46 mm in body length.	8. Egg bearing female 38.5–50.6 mm and the number of eggs varies from 67–122, the size of the egg ranges from $1.2\text{--}1.8 \times 0.9\text{--}1.5$ mm.

DISCUSSION

In his report on the diagnosis of some new species and sub species of the genus *Palaemon* Fabricius, Tiwari (1952) has given the description of *Macrobrachium peguense* and has mentioned that this species closely resembles *Macrobrachium lanchesteri* (De man), *Macrobrachium naso* (Kemp) and *Macrobrachium lamarrei* (H. Milne Edwards) and he also has stated that *Macrobrachium peguense* can be easily distinguished from their congeners species by the shape and dentition of the rostrum and the individual joints of the II cheliped. While studying the freshwater prawns of the genus *Macrobrachium* Bate, 1868 from Karnataka Jalihal *et al.*, (1988) have compared the second cheliped of *Macrobrachium peguense* with *Macrobrachium tiwarii* Jalihal *et al.*, and *Macrobrachium kistnense* Tiwari and have concluded that the chela is subequal or longer irrespective

of size in *Macrobrachium peguense* but in the remaining species the chela is longer only in larger individuals. Jayachandran (2001) in his account on biodiversity, taxonomy, biology and management of the Palaemonid prawns, has stated that *Macrobrachium peguense* resembles *Macrobrachium sankollii* Jalihal *et al.*, but the former can be easily differentiated from the latter by the absence of the accessory sub-apical spine in the exopod of the uropod.

It is not always easy to decide whether a given genus or species is of Indo-Chinese or of Malayan origin. These two faunas have intermingled in a most complex manner in Assam and Burma and are also often ecologically isovalent. It was this complex of the fauna that spread westwards along the Himalayan forest and southwards to the Peninsula and it is the impoverished relicts of this complex that we find today in the Southern Block, in discontinuous distribution, (Mani, 1974). Further examples of aquatic animals from the Westernghats having east Himalayan, Indochinese or Malayan affinities have been provided by Banarescu and Nalbant (1982). During the study besides fishes (*Noema cheilinae*), Margaritiferid mussels and ampullarid snails, freshwater crab, stone flies and Caddis flies also exhibited similar distribution. Thirumalai (1996, 2000) also reported about a similar type of distribution (for aquatic Heteroptera). For the first time a freshwater prawn species reported from Myanmar is also found to exhibit a similar type of distribution from the Westernghats, namely Bilgiri Rangaswamy Temple Wildlife Sanctuary.

From the above study it is observed that the specimens from Bilgiri Rangasamy Temple Wild Life Sanctuary bear very close resemblance to *Macrobrachium peguense* and the occurrence of the Myanmar species in Western Ghats is of great Zoogeographical significance. Since Bilgiri Rangasamy Temple Wild Life Sanctuary is a chip of Western Ghats the recording of this species gain further importance in the Zoogeographical studies.

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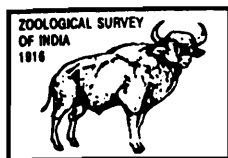
PLATE I



Fig. 1. : *Macrobrachium peguense* (Tiwari, 1952), Female.



Fig. 2. : *Macrobrachium peguense* (Tiwari, 1952), Male.



Rec. zool. Surv. India : **105** (Part 3–4) : 57-80, 2005

STUDIES ON SOME SPIDERS OF THE FAMILY THOMISIDAE (ARANEAE : ARACHNIDA) FROM MADHYA PRADESH, INDIA

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INTRODUCTION

The interesting family of hunting crab spiders is Thomisidae. These spiders look like small crabs in their appearance due to the arrangement of their legs. Most of the legs of these spiders move side-wise like those of a crab and so that the common name for these spiders is crab-spiders. Crab spiders are one of the most handsome forms of spiders, possessing bright and beautiful colours. A large variety of crab-spiders live on plants, especially on the flowering shrubs and bushes and still other forms prefer green leaves. Generally these spiders have short, wide, considerably flattened bodies and some of the legs are extended laterally almost at right angles to the body. The crab-spiders wander on the ground and on plants. Their flattened body helps them to live in narrow crevices, under bark or in debris. Rarely the crab-spiders come out at night but most seem to be dependent on day flying insects. The crab-spiders are fortified with extremely venom, in compensation for weak chelicerae. Their legs are very unequal in size, the first two pairs are very long and robust and the posterior two pairs considerably shorter and weaker. These spiders are very sluggish. They are usually found on flower heads, where they wait at leisure for the insects which come to the flowers for pollen or nectar. Some spiders of the genera *Misumena*, *Misumenops*, *Misumenoides*, *Thomisus* and *Xysticus* can also change their colour according to the colour of the flower. They can change their colour from white to yellow and from yellow to white. These spiders sit motionless in the flower and pounce on the insect as soon as it alights.

Some crab-spiders are not good climbers and live under stones. The spiders of the genera *Oxyptila* and *Xysticus* mainly live on the ground. Their dull brown grey colours mingle with the dried leaves and the debris of the soil and they feed on ants and other small insects and conceal themselves in the crevices of bark and other cracks.

Some delicate green spiders of the genus *Synaema* essentially live on green foliage.

SYSTEMATICS

Family THOMISIDAE Sundevall

1833. *Thomisidae* Sundevall, *Conspectus arachnidum* London : 27.

1869. *Thomisidae* : Stoliczka, *J. Asiat. Soc. Bengal*, **38** : 225.

The typical members have a peculiar crab-like appearance. Cephalothorax and abdomen are usually short and broad, but somewhat elongated. Homogenously coloured eyes, free rather than fused chelicerae, the lower margin of which is indistinct and unarmed; presence of two toothed tarsal claws on each laterigrade leg, one pair of book lungs, a single median tracheal opening near the spinnerets, the absence of cribellum and clavamistrum characterise the family, first two pairs of legs are long, stout and frequently move sideway as in a crab; the legs are less obviously laterigrade. The member of the genus *Oxyptila* have the integument furnished with some characteristic clavate setae, but in the other genera the hairs and spines are normal.

Pocock (1900) in his "Fauna of British India, Arachnida," has dealt with spiders which are common and conspicuous apart from scorpions, Uropygi, Amblypygi, Solifugae, he recorded two hundred species of spiders from India, Burma, and Sri Lanka. Many common and well known families like Thomisidae were not reported from India. Basu (1963 a, b, 64 a, b, 65); Biswas (1977); Sen (1963); Sen and Basu (1963); Sen and Basu (1972); Tikader (1960 a, b, 63 a, b, 64, 65, 66 a, b, 71, 80) described many species of the Thomisid spiders from India.

All the type specimens are deposited in National Zoological Collection, Zoological Survey of India, Kolkata.

Type-genus : *Thomisus* Walckenaer

Distribution : All over the world.

Key to the Genera of the Family THOMISIDAE

1. Lateral eyes on strong conical protuberence 2
- Lateral eyes are not on conical protuberence 3
2. Abdomen widened and truncated behind *Thomisus* Walckenaer
- Abdomen long, lateral sides with longitudinal muscular corrugation *Runcinia* Simon
3. Anterior median eyes closer to the lateral eyes than to each other *Xysticus* Koch
- Anterior median eyes not closer to lateral eyes *Synaema* Simon

Genus 1. *Thomisus* Walckenaer

1805. *Thomisus* Walckenaer, *Tabl. Aron.* : 28.

1869. *Thomisus* : Stoliczka, *J. Asiat. Soc. Bengal*, **38** : 225.

1980. *Thomisus* : Tikader, *Fauna of India, Spiders*, **1(1)** : 30.

Characters : Cephalothorax truncated in front, with the upper fore corners strongly and conically protuberant and divergent bearing the lateral eyes. Eyes very small. Abdomen narrow and truncated in front, enlarging to a considerable width behind, where at either corner of the dorsal side is a short blunt conical protruberance. Legs long. I and II much longer than III and IV Typical crab-like appearance.

Type-species : *Thomisus albus* (Gmelin)

Distribution : Europe, Africa, Asia, Australia and America.

Key to the species of the Genus *Thomisus* Walckenaer

1. Abdomen wider than long. Metatarsi I and II provided with five pairs of ventral spines. Abdomen with a pairs of shoulder tubercles each with a black spot, situated inwardly in the middle *pugilis* Stoliczka
- Abdomen longer than wide. Metatarsi I and II provided with variable-pairs of ventral spines 2
2. Metatarsi I and II provided with six pairs of ventral spines 3
- Metatarsi I and II with variable number of ventral spines 4
3. Carapace longer than wide. Abdomen provided with light brownish spots and light yellowish transverse bands *meenae* sp. nov.
- Carapace broader than long. Abdomen provided with four pairs of roundish black spots and one roundish black spot posteriorly with conspicuous transverse muscular corrugations *dhananjayi* sp. nov.
4. Metatarsi I and II provided with five pairs of ventral spines 5
- Metatarsi I and II provided with four or eight pairs of ventral spines 7
5. Carapace middorsally provided with U-shaped white patch. Abdomen dorsally provided with light brownish reticulations *pritiæ* sp. nov.
- Carapace middorsally without U shaped patch. Abdomen dorsally not provided with light brownish reticulations 6
6. Legs uniform in colour without any spots. Abdomen middorsally provided with seven black spots, posteriorly with four transeverse deep bands *manjuæ* sp. nov.
- Legs provided with light brown patches. Abdomen dorsally provided with light brown spots *manishæ* sp. nov.
7. Cephalothorax provided with chalk white band on ocular area. Abdomen dorsally provided with brownish spots and some reticulations *ashishi* sp. nov.
- Cephalothorax with lateral longitudinal deep brown bands. Abdomen dorsally not provided with brownish spots 8

8. Cephalothorax with lateral longitudinal deep brown bands *cherapunjeus* Tikader
 — Cephalothorax without lateral longitudinal bands 9
9. Antero-lateral part of abdomen with some black spots *lobosus* Tikader
 — Antero-lateral part of abdomen without black spots 10
10. Broadest portion of abdomen tuberculated laterally and black spots on the tubercle
 *projectus* Tikader
 — Broadest portion of abdomen not tuberculated laterally. Cephalothorax without lateral longitudinal bands *elongatus* Tikader

1. *Thomisus pugilis* Stoliczka

1869. *Thomisus (Xysticus) (Sic) pugilis* Stoliczka, *J. Asia Soc. Bengal*, **38** : 225.

1929. *Thomisus pugilis* : Sherriffs, *Ann. mag. nat. Hist.*, **4**(1) : 243.

Specimen examined : 1 ♀, on the bank of Hiran river near Patan Jabalpur, Madhya Pradesh, Coll. U. A. Gajbe, 29.IX.1981, (Reg. No. A/1756). 1 ♀, P.W.D. Rest House, Amanganj, Panna district, Coll. R. K. Singh, 19.II.1987.

Distribution : India : West Bengal, Kolkata. *Type-locality* : Tamil Nadu, Punjab, Madhya Pradesh. Pakistan : Lahore.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

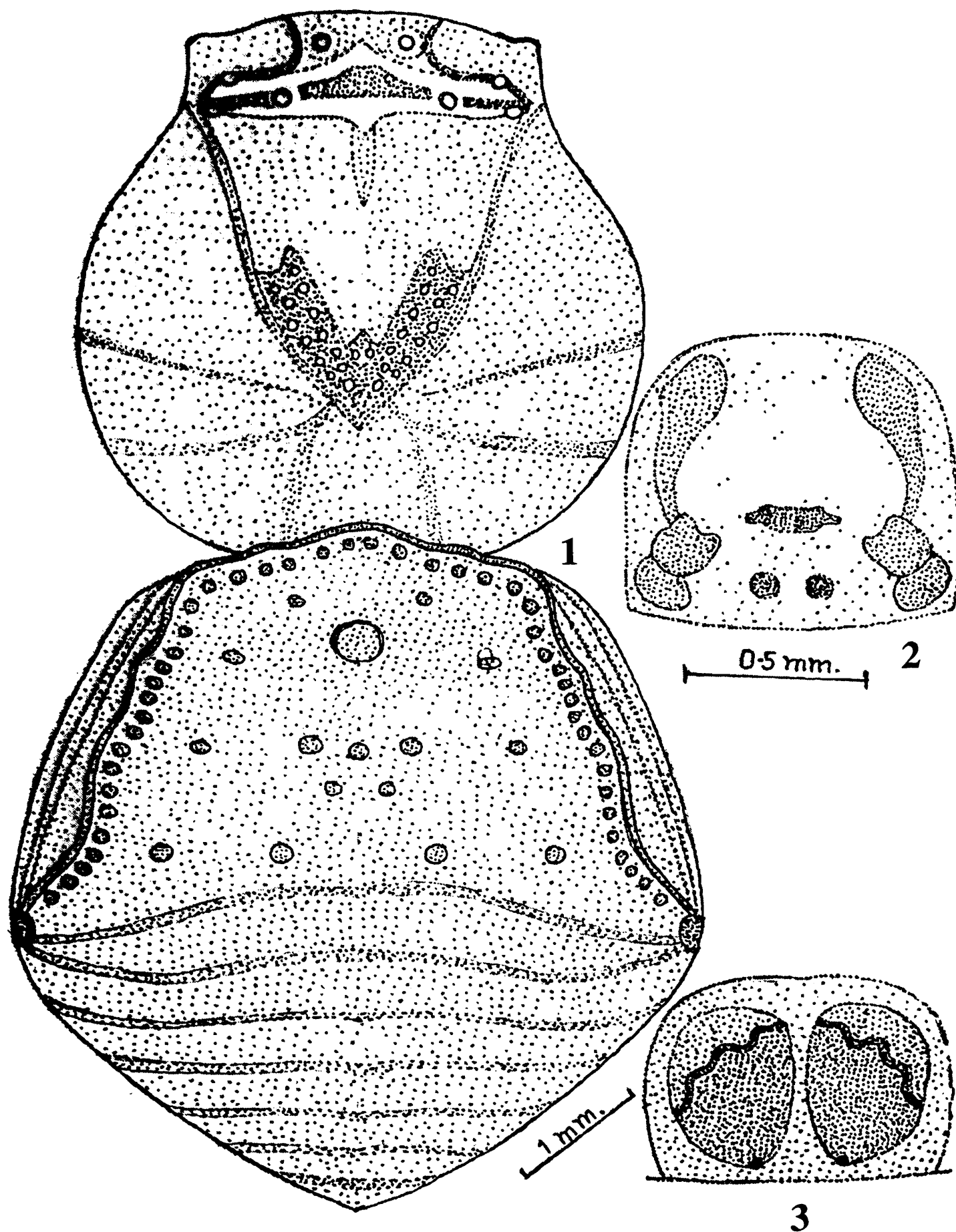
2. *Thomisus meenae* sp. nov.

(Figs. 1-3)

General : Cephalothorax and legs light brownish-green, abdomen yellowish-green. Total length 8.90 mm. Carapace 4.20 mm. long, 4.00 mm. wide; abdomen 5.00 mm. long, 4.90 mm. wide.

Cephalothorax : Longer than wide, narrowing slightly in front with transverse black band on ocular area. Eyes black, anterior row of eyes more recurved than the posterior row (as seen from in front), anterior medians slightly smaller than the anterior laterals and closer to each other than to adjacent laterals. Posterior row of eyes slightly recurved, posterior medians slightly larger than the posterior laterals and closer to adjacent laterals than to each other. Clypeus long, subrectangular. Median ocular quadrangle broader than long and wider behind than in front. Legs long and stout, I and II longer than III and IV. I and II legs provided with three and one black roundish spots respectively. Metatarsi I and II provided with six pairs of ventral spines. Legs III and IV without black spots and ventral spines.

Abdomen : Nearly pentagonal, slightly overlapping the posterior region of cephalothorax in front, broadest at the middle, this portion tuberculating laterally and a black conspicuous spot laterally on the top of the tubercle, provided with light brownish spots and posteriorly light yellowish



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

transverse bands as in fig. 1. Ventral side slightly lighter than the dorsal. Epigyne as in fig. 2. Internal genitalia as in fig. 3.

Type-specimen : *Holotype* : ♀ in spirit, other details as above. Registration No. 5436/18.

Type-locality : India : Madhya Pradesh, Nunsar village, Patan Tehsil, Jabalpur district, Coll. U.A. Gajbe, 29.IX.1981.

Remarks : This species closely resembles *Thomisus andamanensis* Tikader but differs from it as follows : (i) Ocular area provided with a transverse black band but in *T. andamanensis* ocular area provided with a transverse yellowish band. (ii) Metatarsi I and II provided with six pairs of ventral spines but in *T. andamanensis* metatarsi provided with four pairs of ventral spines. (iii) Epigyne and internal genitalia also structurally different.

3. *Thomisus dhananjayi* sp. nov.

(Figs. 4-6)

General : Cephalothorax and legs brownish-green, abdomen yellowish-green. Total length 9.20 mm. Carapace 4.10 mm. long, 4.30 mm. wide; abdomen 5.40 mm. long, 5.00 mm. wide.

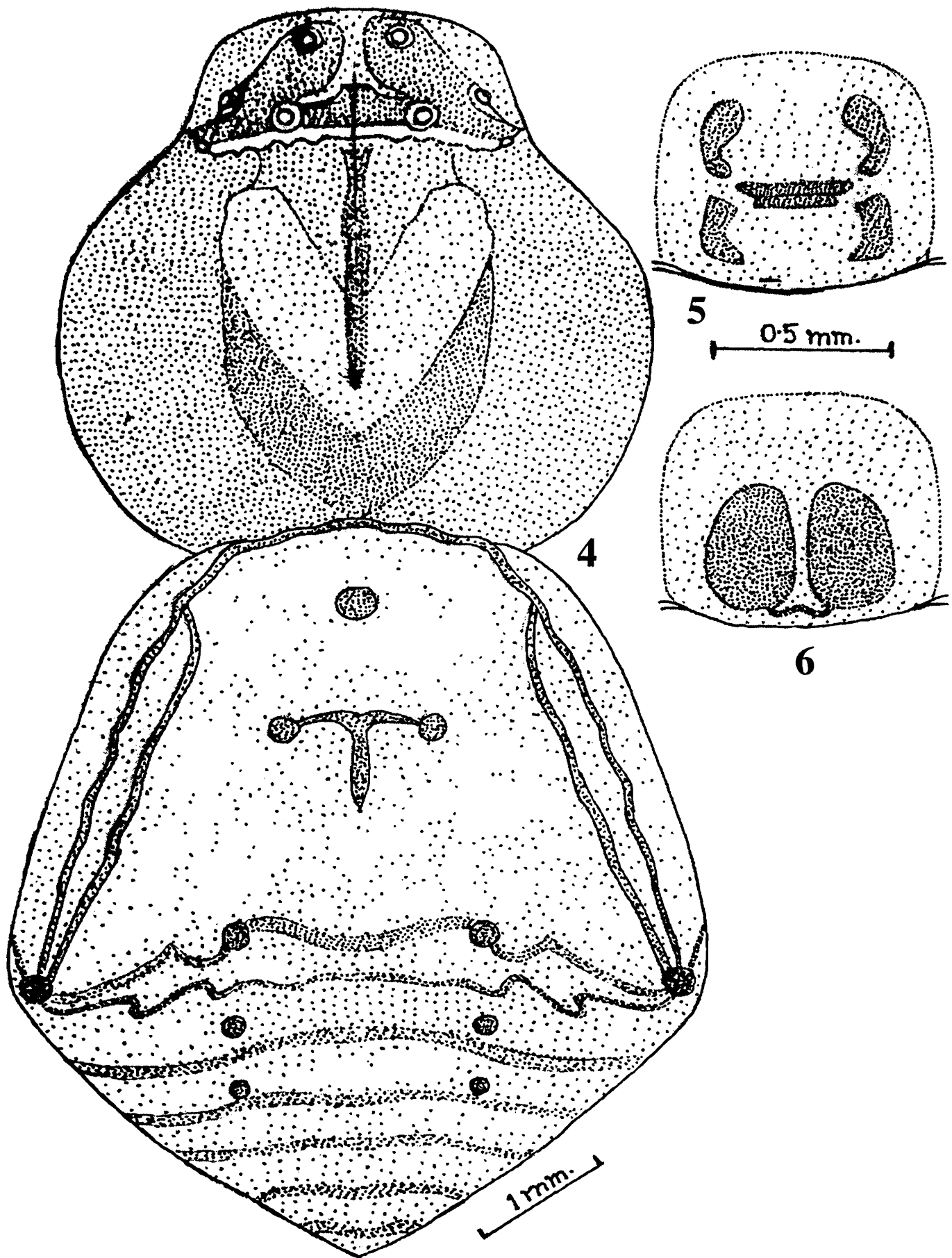
Cephalothorax : Broader than long, narrowing slightly in front, maximum width slightly more than length. Eyes black in two rows. Anterior row of eyes more recurved (as seen from in front), medians same in size as laterals, anterior medians slightly closer to each other than to adjacent laterals. Posterior row of eyes slightly recurved. Posterior medians slightly larger than the lateral and closer to adjacent laterals than to each other. Ocular area yellowish-brown with yellow transverse patch. Clypeus long, subrectangular. Legs long and stout. I and II legs longer than III and IV. Femur, tibia and metatarsi of legs I and II provided with single dorsal roundish patches. Metatarsi I and II legs provided with six pairs of ventral spines, III and IV without spots and spines.

Abdomen : Pentagonal, slightly longer than wide, overlapping the posterior region of cephalothorax in front, broadest just behind the middle, middorsally provided with four pairs of roundish black spot as in fig. 4. Posterior end provided with conspicuous transverse muscular corrugations. Ventral side slightly lighter than the dorsal and midventrally provided with four pairs of brown spots. Epigyne as in fig. 5. Internal genitalia as in fig. 6.

Type-specimen : *Holotype* : ♀, in spirit, other details as above. Registration No. 5437/18.

Type-locality : India : Madhya Pradesh, Barela village, Jabalpur district, Coll. U. A. Gajbe, 22.XII.1981.

Remarks : This species closely resembles *Thomisus dhakurensis* Tikader but differs from it as follows : (i) Cephalothorax deep brownish-green but in *T. dhakurensis* cephalothorax brownish-green. (ii) Abdomen yellowish-green, but in *T. dhakurensis* abdomen chalk white. (iii) Metatarsi



Figs. 4-6. *Thomisus dhananjay* sp. nov.;

4. Dorsal view of female, legs omitted; 5. Epigyne; 6. Internal genitalia.

of first and second legs provided with six pairs of ventral spines but in *T. dhakurensis* metatarsi of I and II legs provided with five pairs of ventral spines. (iv) Abdomen middorsally provided with nine black spots but in *T. dhakuriensis* abdomen dorsolaterally provided with seven black spots. (v) Epigyne and internal genitalia also structurally different.

4. *Thomisus pritiae* sp. nov.

(Figs. 7-9)

General : Cephalothorax and legs light brownish-green abdomen light yellowish-green. Total length 8.00 mm., Carapace 3.20 mm. long, 2.80 mm. wide; abdomen 4.90 mm. long, 4.30 mm. wide.

Cephalothorax : Longer than wide, narrow in front, middorsally with U-shaped white patch upto ocular area light yellow with light brownish transverse band. Eyes black in two rows. Anterior row of eyes strongly recurved (as seen from in front), medians larger than laterals and closer to each other than to adjacent laterals, posterior row of eyes slightly recurved, medians larger than laterals and nearly equidistant from each other. Clypeus very high, rectangular and provided with yellow transverse patch anteriorly. Legs long and stout, I and II longer than III and IV Tibiae and metatarsi of legs provided with four small and a big roundish black spots dorsally. Metatarsi I and II provided with five pairs of ventral spines. Legs I and II without spines.

Abdomen : Nearly pentagonal, longer than wide, slightly overlapping the posterior region of cephalothorax in front, broadest behind the middle. Abdomen dorsally provided with light brownish reticulations as in fig. 7. Ventral side slightly lighter than the dorsal. Epigyne as in fig. 8. Internal genitalia as in fig. 9.

Type-specimen : *Holotype* : ♀, in spirit, other details as above. Registration No. 5438/18.

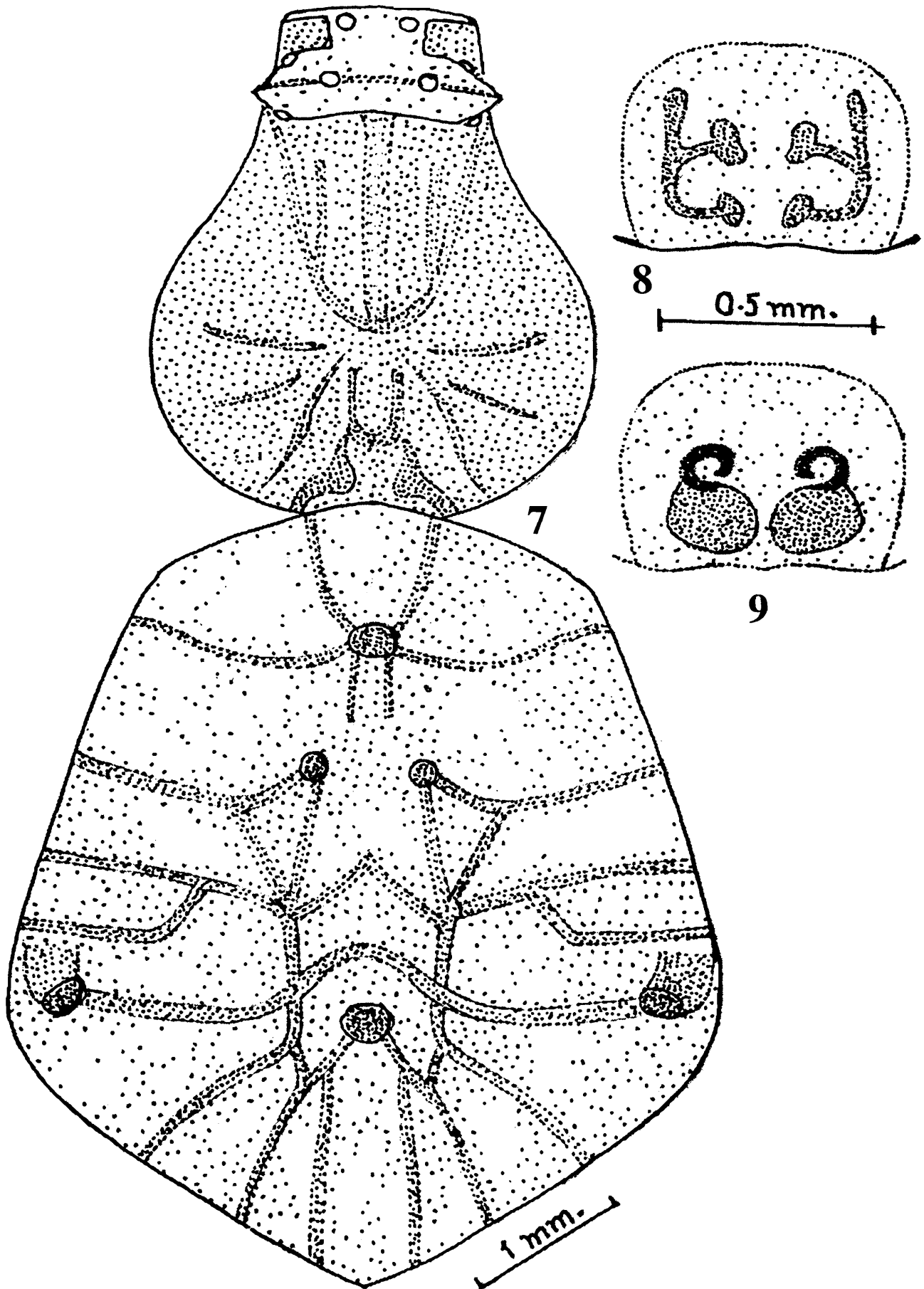
Type-locality : India : Madhya Pradesh, Nunsar village, Patan Tahsil, Jabalpur district, Coll. U.A. Gajbe, 29.IX.1981.

Remarks : This species closely resembles *Thomisus pugilis* Stliczka but differs from it as follows : (i) Carapace with U-shaped white patch extending upto ocular area but in *T. pugilis* no U-shaped white patch. (ii) Abdomen provided with light brownish reticulations but in *T. pugilis* abdomen provided with transverse grooves. (iii) Epigyne and internal genitalia also structurally different.

5. *Thomisus manjuae* sp. nov.

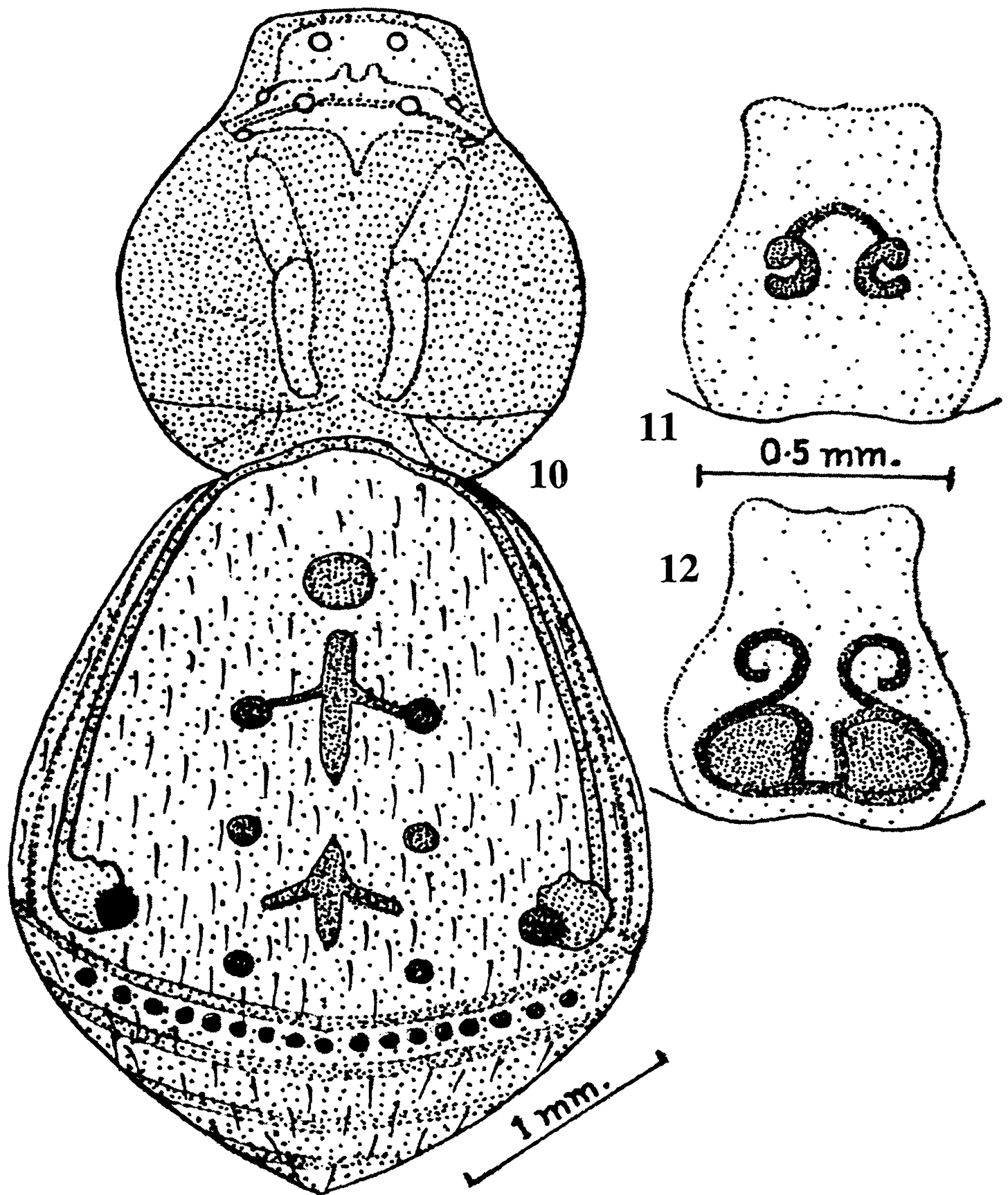
(Figs. 10-12)

General : Cephalothorax and legs deep brownish-green, abdomen yellowish-green. Total length 5.20 mm. Carapace 2.10 mm. long, 2.00 mm. wide; abdomen 3.40 mm. long, 2.80 mm. wide.



Figs. 7-9. *Thomisus pritiae* sp. nov.;

7. Dorsal view of female, legs omitted; 8. Epigyne; 9. Internal genitalia.



Figs. 10-12. *Thomisus manjuae* sp. nov.;
 10. Dorsal view of female, legs omitted; 11. Epigyne; 12. Internal genitalia.

Cephalothorax : Longer than wide, narrowing in front with a transverse yellowish band on ocular area, maximum width slightly less than length. Anterior row of eyes recurved (as seen from in front) medians slightly larger than laterals and closer to each other than to adjacent laterals and nearly equidistant to each other. Clypeus long, subrectangular. Median ocular quadrangle slightly longer than wide and wider behind than in front. Legs long and stout, I and II longer than III and IV. Legs uniform in colour without any spots. Tibiae and metatarsi I and II provided with three and five pairs of ventral spines respectively.

Abdomen : Longer than wide nearly pentagonal, slightly overlapping the posterior region of cephalothorax in front, broadest behind the middle, this portion tuberculating laterally with a black spot on the top of tubercle clothed with hairs. Abdomen middorsally provided with seven spots as in fig. 10. Posterior end of abdomen provided with four transverse deep yellow bands. Ventral side slightly lighter than the dorsal and midventrally provided with five pairs of brown spots. Epigyne as in fig. 11. Internal genitalia as in fig. 12.

Type-specimen : *Holotype* : ♀, in spirit, other details as above. Registration No. 5439/18.

Type-locality : India : Madhya Pradesh, Bargi village, Jabalpur district, Coll. U.A. Gajbe, 20.VI.1979.

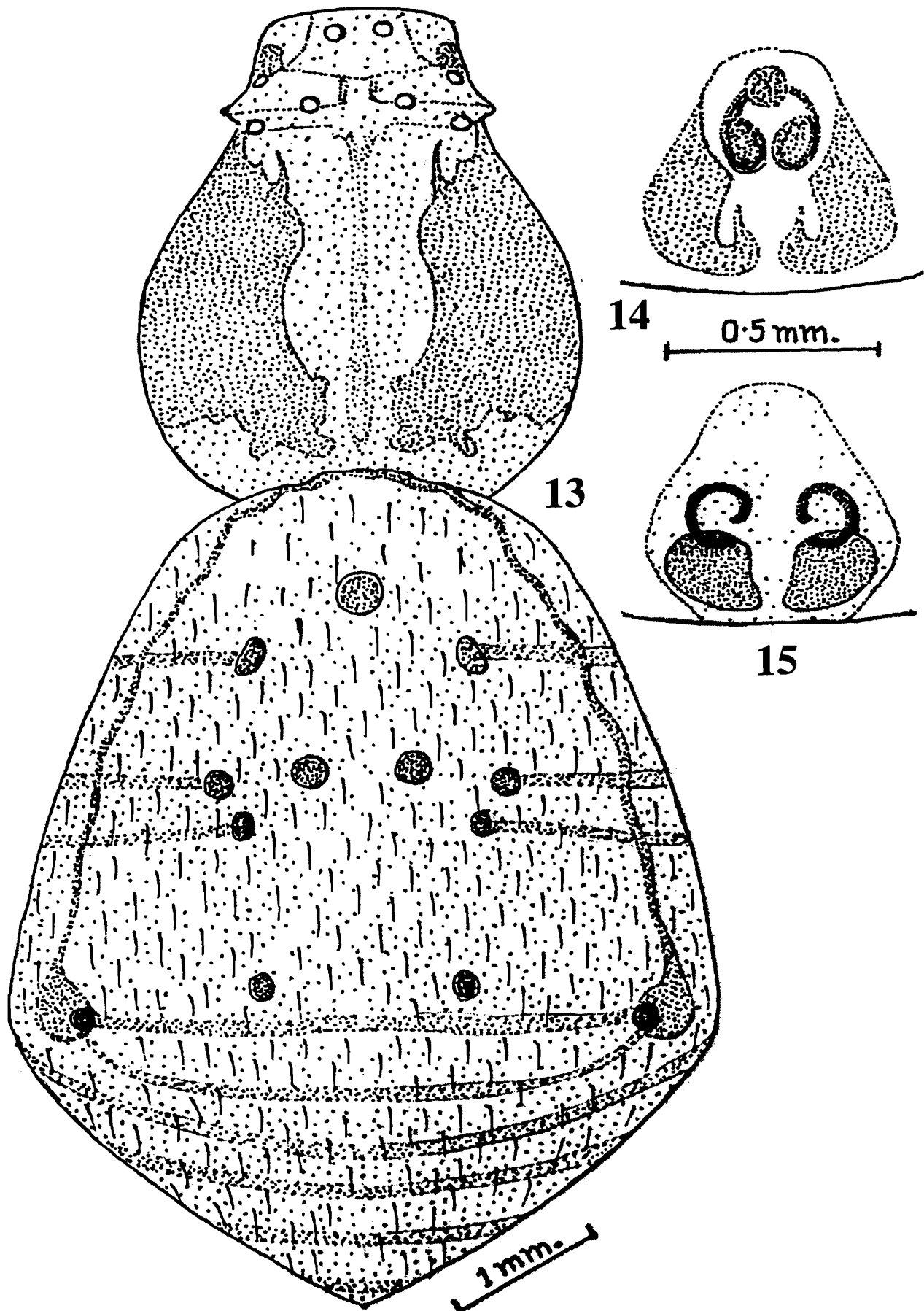
Remarks : This species closely resembles *Thomisus projectus* Tikader but differs from it as follows : (i) Cephalothorax and legs deep brownish-green but *T. projectus*, cephalothorax and legs greenish. (ii) Anterior median eyes slightly larger than the anterior lateral eyes. (iii) Metatarsi I and II provided with five pairs of ventral spines, but in *T. projectus* metatarsi I and II provided with six pairs of ventral spines. (iv) Abdomen dorsally provided with seven black spots but in *T. projectus* abdomen dorsally provided with five spots. (v) Epigyne and internal genitalia also structurally different.

6. *Thomisus manishae* sp. nov.

(Figs. 13-15)

General : Cephalothorax and legs deep yellowish-green, abdomen light yellowish-green. Total length 8.40 mm. Carapace 3.30 mm. long, 2.90 mm. wide; abdomen 5.40 mm. long, 4.40 mm wide.

Cephalothorax : Longer than wide, narrowing in front, antero-lateral sides with longitudinal deep brown patches and middorsally with white longitudinal patch as in fig. 13. Eyes black in two rows. Anterior row of eyes recurved (as seen from in front), anterior medians slightly larger than the anterior laterals and closer to each other than the adjacent laterals. Posterior row of eyes slightly recurved, posterior medians slightly smaller than the posterior laterals and slightly closer to posterior laterals than to each other. Clypeus long, subrectangular, provided with white patch. Median ocular quadrangle longer than broad and wider behind than in front. Sternum heart-shaped and posteriorly



Figs. 13-15. *Thomisus manishae* sp. nov.;
13. Dorsal view of female, legs omitted; 14. Epigyne; 15. Internal genitalia.

provided with black patch. Legs long and stout, I and II longer than III and IV. Femur, patella, tibiae of I and II legs provided dorsally with light brown to deep brown patches, III and IV legs without patches. Tibiae and metatarsi of I and II legs provided with two and five pairs of ventral spines respectively. II and IV legs without patches and spines.

Abdomen : Nearly pentagonal, clothed with spine like hairs, longer than wide, slightly overlapping the posterior region of cephalothorax in front, broadest just behind the posterior region of cephalothorax in front, broadest just behind the middle, laterally on the broadest portion with muscular elevation and this portion with a roundish black spots and between two spots there is a transverse light brown line. Abdomen dorsally provided with light brown spots. Ventral side slightly lighter than the dorsal and in between the epigastric furrow and spinnerets there is black longitudinal patch. Epigyne as in fig. 14. Internal genitalia as in fig. 15.

Type-specimen : *Holotype* : ♀, in spirit, other details as above. Registration No. 5440/18.

Type-locality : India : Madhya Pradesh, Shantinagar Colony, Rajnandgaon district, Coll. U.A. Gajbe, 22.XII.1983.

Remarks : This species closely resembles *Thomisus lobosus* Tikader but differs from it as follows : (i) Cephalothorax and legs deep yellowish-green but in *T. lobosus* cephalothorax brown and legs light green. (ii) Legs I and II provided with black patches but *T. lobosus* legs without black patches. (iii) Metatarsi of I and II legs provided with five pairs of ventral spines but in *T. lobosus* metatarsi with four pairs of ventral spines. (iv) Epigyne and internal genitalia also structurally different.

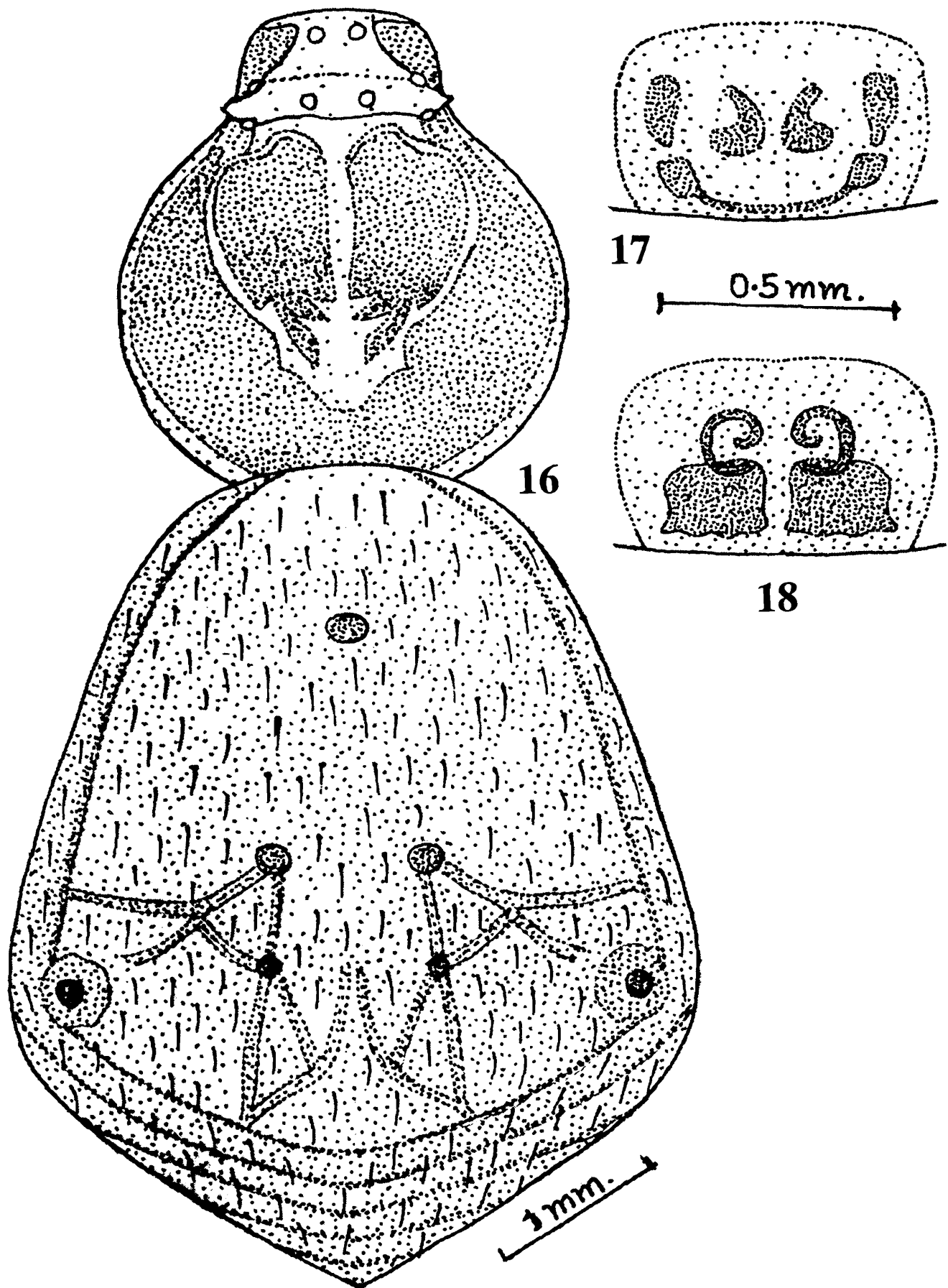
7. *Thomisus ashishi* sp. nov.

(Figs. 16-18)

General : Cephalothorax light brownish-green, legs yellowish-green, abdomen light yellowish-green. Total length 7.80 mm. Carapace 3.00 mm. long, 2.80 mm. wide; abdomen 5.00 mm. long, 4.00 mm. wide.

Cephalothorax : Longer than wide with a transverse chalk white band on ocular area, narrowing in front, chalk white longitudinal band starting from middle of cephalothorax to ocular area. Eyes black in two rows, both row recurved. Anterior row more recurved than the posterior row (as seen from in front), anterior medians slightly larger than the anterior laterals and closer to each other than to adjacent laterals. Clypeus long, subrectangular. Median ocular quadrangle longer than wide and wider behind than in front. Legs long and stout. I and II longer than III and IV, provided with chalk-white bands. Tibiae and metatarsi of I leg provided with four pairs of ventral spines each.

Abdomen : Nearly pentagonal, widest behind the middle, slightly overlapping the posterior region of cephalothorax in front, clothed with spine like hairs. Abdomen dorsally provided with



Figs. 16-18. *Thomisus ashishi* sp. nov.;
 16. Dorsal view of female, legs omitted; 17. Epigyne; 18. Internal genitalia.

brownish spots and some reticulations as in fig. 16. Ventral side slightly lighter than the dorsal. Epigyne as in fig. 17. Internal genitalia as in fig. 18.

Type-specimen : Holotype : ♀, in spirit, other details as above. Registration No. 5441/18.

Type-locality : India : Madhya Pradesh, Charama, Baster district, Coll. U.A. Gajbe, 5.I.1984.

Remarks : This species closely resembles *Thomisus andamanensis* Tikader but differs from it as follows : (i) Cephalothorax provided with chalk-white longitudinal bands but in *T. andamanensis* cephalothorax not provided with such bands (ii) Tibiae and metatarsi of I leg provided with four pairs of ventral spines each but in *T. andamanensis* tibiae and metatarsi of I leg provided with two pairs of ventral spines respectively. (iii) Abdomen dorsally provided with brown reticulations but in *T. andamanensis* abdomen not provided with brown reticulations. (iv) Epigyne and internal genitalia also structurally different.

8. *Thomisus cherapunjeus* Tikader

1966. *Thomisus cherapunjeus* Tikader, *Proc. Indian Acad. Sci.*, **64**(1) : 54.

1980. *Thomisus cherapunjeus* : Tikader, *Fauna of India, Spiders*, **1**(1) : 54.

Specimen examined : 1 ♀, on the bank of Aloni river Shahnagar, Panna district, Madhya Pradesh, Coll. R. K. Singh, 26.II.1987, (Reg. No. A/1753). 1 ♀, P.W.D. Rest House, Amanganj, Panna district, Madhya Pradesh, Coll. R. K. Singh, 19.II.1987, (Reg. No. A/1754). 1 ♀, on the bank of Hiran river near Patan, Jabalpur district, Madhya Pradesh, Coll. U. A. Gajbe, 29.IX.1981.

Distribution : India : Meghalaya, Kench's trace Shillong (Type-locality), Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

9. *Thomisus lobosus* Tikader

1965. *Thomisus lobosus* Tikader, *Proc. Indian Acad. Sci.*, **61**(5) : 285.

1980. *Thomisus lobosus* : Tikader, *Fauna of India, Spiders*, **1**(1) : 36.

Specimen examined : 1 ♀, Konta, Bastar district, Madhya Pradesh, Coll. Y N. Gupta, 25.XI.1988 (Reg. No. A/1755).

Distribution : India : Poona, Maharashtra, Bastar, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

10. *Thomisus projectus* Tikader

1960. *Thomisus projectus* Tikader, *J. Bombay nat. Hist. Soc.*, **57** : 182

1980. *Thomisus projectus* : Tikader, *Fauna of India, Spiders*, **1**(1) : 40.

Specimen examined : 2 ♀ ♀, on the bank of Ken river, Marha, Panna district, Madhya Pradesh, Coll. H. P. Agrawal, 22.XI.1988, (Reg. No. 1757). 1 ♀, Saucer, Chhindwara district, Madhya Pradesh, Coll. Y N. Gupta, 20.XI.1989, (Reg. No. A/1758).

Distribution : India : Habra near Kolkata, West Bengal; Panna and Chhindwara districts of Madhya Pradesh.

Remarks : This species is being reported for the first time from Madhya Pradesh.

11. *Thomisus elongatus* Stoliczka

1869. *Thomisus (Xysticus) (Sci) elongatus* Stoliczka, *J. Asiat Soc. Bengal*, **38** : 227.

1971. *Thomisus elongatus* : Tikader, *Mem. Zool. Surv. India*, **15**(3) : 25.

1980. *Thomisus elongatus* : Tikader, *Fauna of India, Spiders*, **1**(1) : 56.

Specimen examined : 4 ♀ ♀, 1 ♂, on the bank of Ganga Mund Pond, Jagdalpur, Bastar district, Madhya Pradesh, Coll. Y N. Gupta, 28.XI.1988, (Reg. No. A/1752).

Distribution : India : Kolkata, West Bengal, Bastar, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

Genus 2. *Runcinia* Simon

1875. *Runcinia* Simon, *Ar. Fr.*, **2** : 254.

1895. *Runcinia* Simon, *Hist. Nat. Araign.*, **1**(4) : 1024.

1980. *Runcinia* Tikader, *Fauna of India, Spiders*, **1**(1) : 58.

Characters : Cephalothorax slightly wider than long; Cephalic region with prominent ocular tubercle, clothed with hairs and spines. Legs long and stout, I and II remarkably longer than others. Abdomen long, spined, narrowing behind. Lateral sides with conspicuous longitudinal muscular corrugations.

Type-species : *Runcinia laterals* (Koch).

Distribution : Europe, Africa, Asia and Australia.

12. *Runcinia escheri* Reimoser

1934. *Runcinia escheri* Reimoser, *Reync. Scise Zool.*, **41**(32) : 487.

1980. *Runcinia escheri* : Tikader, *Fauna of India, Spiders*, **1**(1) : 59.

Specimen examined : 1 ♀, Barghat village, Seoni district, Madhya Pradesh, Coll. U. A. Gajbe, 7.III.1987, (Reg. No. A/1766).

Distribution : India : Andhra Pradesh, Seoni, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

Genus 3. *Xysticus* Koch

1835. *Xysticus* Koch, *H. Schacff. Deutsch. Ins.*, : 35.

1951. *Xysticus* : Locket & Millidge, *British Spiders, London*, 1 : 175.

1980. *Xysticus* : Tikader, *Fauna of India, Spiders*, 1(1) : 107.

Characters : Cephalothorax rather square fronted, clothed with simple isolated hairs and spines, which are usually pointed, rarely blunt, but never clavate. Posterior eyes nearly equidistant, median smaller than laterals, the anterior medians usually a little farther from each other than from the anterior laterals. The lateral eyes situated in low subconfluent tubercles. The tibiae and metatarsi of the anterior legs usually furnished with more than three pairs of inferior spines. Tarsal claws furnished with five or six isolated teeth. Abdomen much wider behind than in front, usually bearing dentate band on its dorsal surface. These live under stones and leaves or under loose bark, a few live on small plants and bushes.

Type-species : *Xysticus critatus* (Clerck).

Distribution : Africa, Europe, Asia and America.

Key to the species of the genus *Xysticus* Koch

1. Total length less than 6 mm. Clypeal margin with seven spines directed forward. Tibiae I and II with two pairs of ventral spines. Abdomen with a single transverse complete deep brown line. 2
- Total length more than 6 mm. Clypeal margin with more than seven spines. Tibiae I and II with more than two pairs of ventral spines. Abdomen without complete deep brown line. 4
2. Abdomen with a single transverse complete deep brown line. *minutes* Tikader
- Abdomen with more than one transverse line 3
3. Cephalothorax light to deep brown *bengalensis* Tikader
- Cephalothorax uniform dark *kali* Tikader & Biswas
4. Clypeal margin provided with ten strong spines directed forward. Tibiae I and II provided with four pairs of ventral spines. Abdomen dorsally clothed with spine like hairs and provided with brownish patches. *viveki* sp. nov.
- Clypeal margin provided with sixteen strong spines directed forward. Tibiae I and II provided with four pairs of ventral spines. Abdomen dorsally clothed with hairs and provided with brownish patches. *yogeshi* sp. nov.

13. *Xysticus minutes* Tikader

1960. *Xysticus minutes* Tikader, *J. Bombay nat. Hist. Soc.*, 57(1) : 173.

1980. *Xysticus minutes* : Tikader, *Fauna of India, Spiders*, 1(1) : 120.

Specimen examined : 1 ♀, Gwari village on Jabalpur, Mandla road, Mandla district, Madhya Pradesh, Coll. U. A. Gajbe, 22.XII.1981, (Reg. No. A/1761). 1 ♀, Lametaghat, Jabalpur district, Madhya Pradesh, Coll. R. K. Singh, 26.XI.1974, (Reg. No. A/1762). 3 ♀ ♀, 1 ♂, Bhesdehi, Betul district, Madhya Pradesh, Coll. H. S. Sharma, 31.III.1990, (Reg. No. A/1763). 3 ♀ ♀, Singhpur Panna district, Coll. R. K. Singh, 16.II.1987, (Reg. No. A/1764). 1 ♀, Supkhar, Kanha National Park, Mandla district, Madhya Pradesh, Coll. R. K. Singh, 1.XII.1986, (Reg. No. A/1765). 1 ♂, Dhaurai village, Narayanpur Tahsil, Bastar district, Madhya Pradesh, Coll. Y. N. Gupta, 4.XII.1986. 1 ♀, on the bank of Ken river Marha, Panna district, Madhya Pradesh, Coll. H. P. Agrawal, 22.XI.1988.

Distribution : India : West Bengal, Dhakuria, Kolkata (Type-locality); Poona, Maharashtra; Shillong, Meghalaya; Gujarat; Madhya Pradesh.

Remarks : This species is being reported for the first time from Madhya Pradesh.

14. *Xysticus bengalensis* Tikader & Biswas

1974. *Xysticus bengalensis* Tikader & Biswas, *Proc. Indian Acad. Sci.*, **80**(6) : 262.

1980. *Xysticus bengalensis* : Tikader, *Fauna of India, Spiders*, **1**(1) : 127.

Specimen examined : 1 ♂, Gunour village, Panna district, Madhya Pradesh, Coll. R. K. Singh, 22.II.1987, (Reg. No. A/1760).

Distribution : India : Darjeeling, West Bengal; Panna, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

15. *Xysticus kali* Tikader & Biswas

1974. *Xysticus kali* Tikader & Biswas, *Proc. Indian Acad. Sci.*, **80**(6) : 265.

1980. *Xysticus kali* : Tikader, *Fauna of India, Spiders*, **1**(1) : 130.

Specimen examined : 1 ♂, P.W.D. Rest House, Amanganj, Panna district, Madhya Pradesh, Coll. R. K. Singh, 18.II.1987, (Reg. No. A/1759).

Distribution : India : Darjeeling, West Bengal; Panna, Madhya Pradesh.

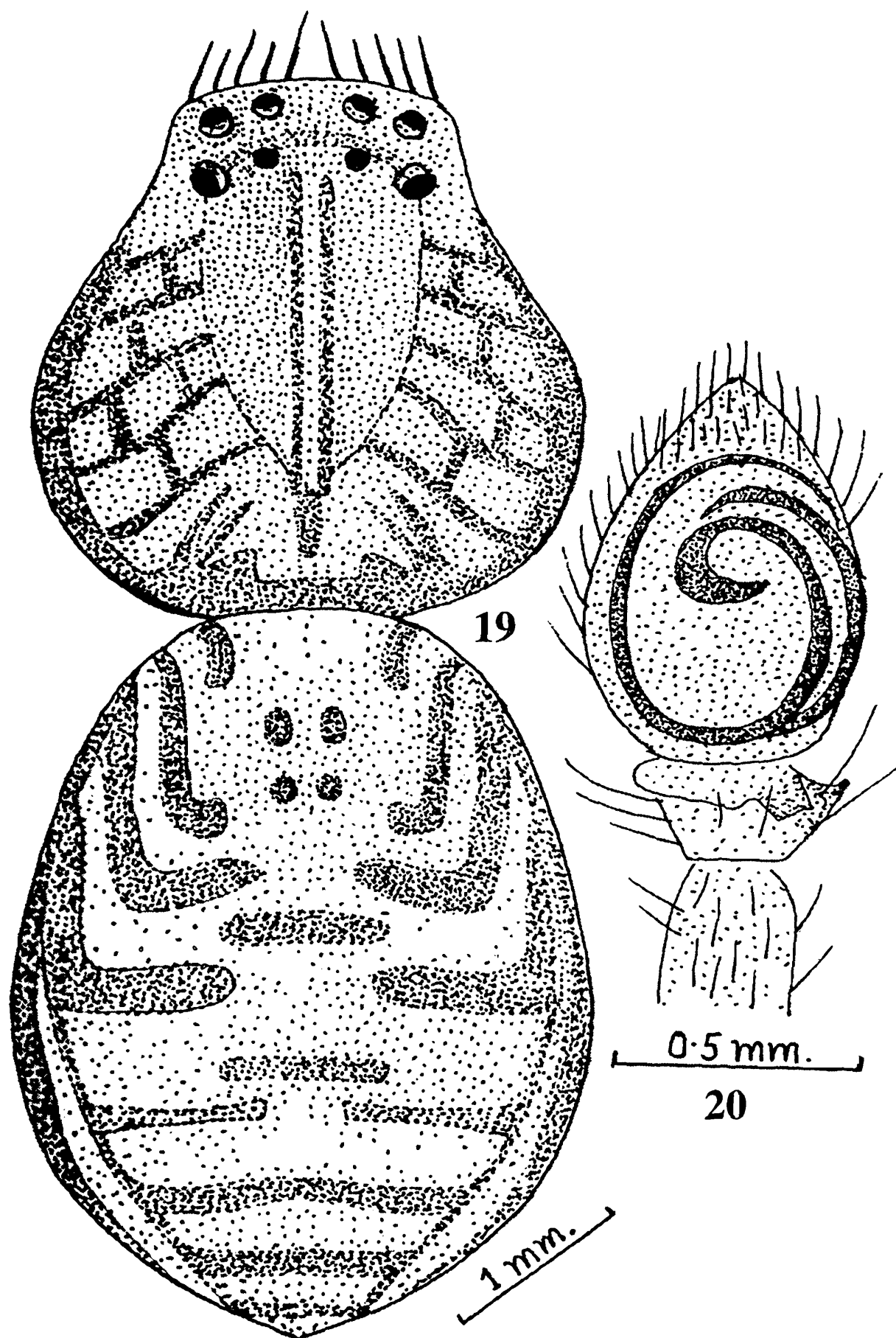
Remarks : This species is being reported for the first time from Madhya Pradesh.

16. *Xysticus viveki* sp. nov.

(Figs. 19-20)

General : Cephalothorax reddish-green, legs brownish-black, abdomen chalk-white. Total length 7.00 mm. Carapace 3.10 mm., long, 3.00 mm. wide; abdomen 4.00 mm. long, 3.10 mm. wide.

Cephalothorax : Longer than wide, narrowing in front and provided laterally and middorsally with black reticulations. Clypeus high and broad, margin provided with ten strong spines



Figs. 19-20. *Xysticus viveki* sp. nov.;
19. Dorsal view of male, legs omitted; 20. Male palp, ventral view.

directed forward. Eyes round, black, ringed with whitish-brown tubercles, both rows recurved (as seen from in front). Anterior row of eyes slightly recurved, anterior medians smaller than the laterals and closer than laterals than to each other. Median ocular quadrangle broader than long and wider behind than in front. Sternum oval, pointed behind, rebordered and densely clothed with fine hairs. Legs strong and spined, I and II longer than III and IV. Tibiae and metatarsi I provided with four and two pairs of ventral spines respectively. Male palp as in fig. 20.

Abdomen : Longer than wide, clothed with small spine like hairs and provided with brownish patches as in fig. 19. Ventral side slightly lighter than the dorsal and laterally provided with small brownish patches.

Type-specimen : *Holotype* : ♂, in spirit, other details as above. Registration No. 5442/18.

Type-locality : India : Madhya Pradesh, Baragon village near Chotedonger, Bastar district, Coll. U. A. Gajbe, 24.XII.1983.

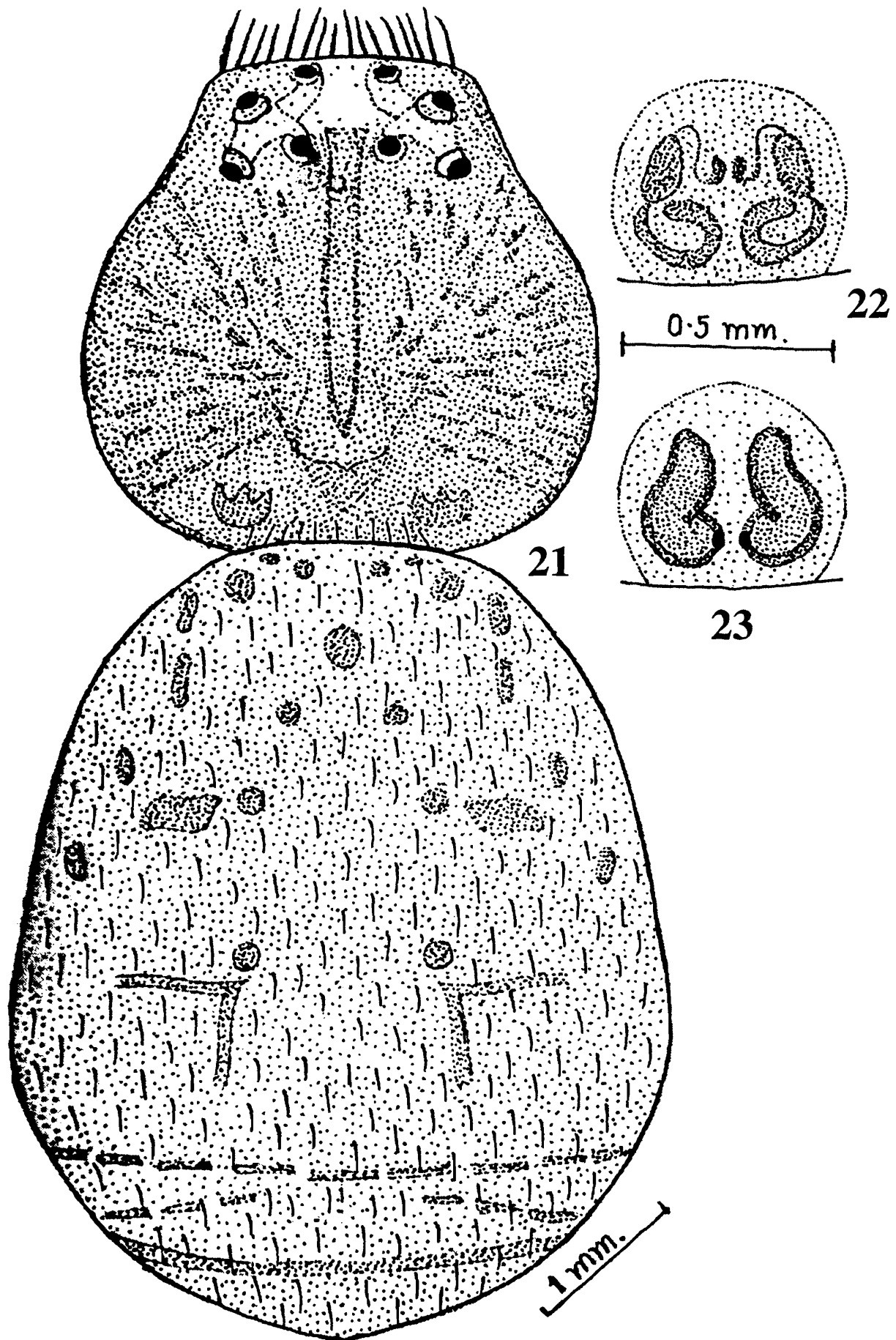
Remarks : This species resembles *Xysticus kamakhyai* Tikader but differs from it as follows : (i) Cephalothorax provided with brownish reticulations but in *X. kamakhyai*, cephalothorax provided with U-shaped broad, dark brown patch. (ii) Clypeus provided with ten strong spines but *X. kamakhyai* clypeus provided with six spines. (iii) Tibiae and metatarsi of I leg provided with four and two pairs of ventral spines respectively but in *X. kamakhyai* tibiae and metatarsi provided with two and three pairs of ventral spines respectively. (iv) Abdomen provided with brownish patches but in *X. kamakhyai* abdomen provided with two longitudinal deep brown irregular patches. (v) Male palp also structurally different.

17. *Xysticus yogeshi* sp. nov.

(Figs. 21-23)

General : Cephalothorax and legs reddish-green, abdomen yellowish-green. Total length 8.40 mm. Carapace 3.30 mm. long, 3.30 mm. wide; abdomen 5.20 mm. long, 4.10 mm. wide.

Cephalothorax : As long as wide, slightly narrowing in front, clothed with small hairs and provided laterally and middorsally with black reticulations. Clypeus high and broad, margin provided with sixteen strong spines directed forward. Eyes eight in two rows, round, black-ringed with whitish-brown tubercles, both rows recurved (as seen from in front). Anterior row of eyes slightly recurved, anterior medians smaller than the laterals and nearly equidistant to each other. Posterior row of eyes more recurved, medians smaller than the laterals and closer to adjacent laterals than to each other. Median ocular quadrangle wider than long and slightly wider behind than in front. Sternum oval, pointed behind and densely clothed with fine hairs and pigmented brown spots. Legs strong and spined, I and II longer than III & IV. Tibiae and metatarsi of I and II leg provided with four and three pairs of ventral spines, respectively.



Figs. 21-23. *Xysticus yogeshi* sp. nov.;
21. Dorsal view of female, legs omitted; 22. Epigyne; 23. Internal genitalia.

Abdomen : Longer than wide, widest behind the middle clothed with hairs and provided with brownish patches as in fig. 21. Ventral side slightly lighter than the dorsal. Epigyne as in fig. 22. Internal genitalia as in fig. 23.

Type-specimen : *Holotype* : ♀, in spirit, other details as above. Registration No. 5443/18.

Type-locality : India : Madhya Pradesh, Narayanganj, Mandla district, Coll. U. A. Gajbe, 23.I.1985.

Remarks : This species closely resembles *Xysticus shyamrupus* Tikader but differs from it as follows : (i) The margin of clypeus provided with sixteen spines directed forward but in *X. shyamrupus* the margin of clypeus provided with nine spines. (ii) Cephalothorax provided laterally and middorsally with black reticulations but in *X. shyamrupus* cephalothorax laterally with deep brown patch. (iii) Tibiae and metatarsi of I and II leg provided with four and three pairs of ventral spines but in *X. shyamrupus* tibiae and metatarsi provided with three and four pairs of ventral spines respectively. (iv) Abdomen dorsally provided with brownish patches but in *X. shyamrupus* abdomen dorsally ornamented with brown and dirty white patches. (v) Epigyne and internal genitalia also structurally different.

Genus 4. *Synaema* Simon

1864. *Synaema* Simon, *Hist. Nat. Ar.*, 1 : 70.

1884. *Synaema* : Keyserling, *Varh. Zool. bot. Ges. Wien.*, 33 : 667.

1980. *Synaema* : Tikader, *Fauna of India, Spiders*, 1(1) : 134.

Characters : The genus *Synaema* is closely allied to *Xysticus* but differs in the following characters. The median ocular area is a little more narrow in front than behind, the anterior eyes equidistant or even with the median nearer to each other than to the lateral eyes, the tarsal claws of the first two pairs of legs furnished with more than five to six teeth, and the teeth extend beyond the middle of the claw, the cuticle smooth. Abdomen dorso-ventrally compressed. These spiders are found on the foldings of leaves of lower plants and bushes.

Type-species : *Synaema globosus* (Fabr.).

Distribution : Asia, America and Africa.

18. *Synaema decorata* Tikader

1960. *Synaema decorata* Tikader, *J. Bombay, nat. Hist. Soc.*, 57(1) : 174.

1980. *Synaema decorata* : Tikader, *Fauna of India, Spiders*, 1(1) : 136.

Specimen examined : 1 ♀, Chhotedonger, Narayanpur Tahsil, Bastar district, Madhya Pradesh, Coll. U. A. Gajbe, 24.XII.1983, (Reg. No. A/1768). 1 ♀, Singhpur, Panna district, Madhya Pradesh, Coll. R. K. Singh, 16.II.1987, (Reg. No. 1769).

Distribution : India : West Bengal; Dhakuria, Kolkata (Type-locality) Karnataka, Maharashtra, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

19. *Synaema mysorensis* Tikader

1980. *Synaema mysorensis* : Tikader, *Fauna of India, Spiders*, 1(1) : 138.

Specimen examined : 1 ♀, on the bank of Machna river, Banka village, Betul district, Madhya Pradesh, Coll. H. S. Sharma, 20.III.1990, (Reg. No. A.1767).

Distribution : India : Bangalore, Karnataka, Betul, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

SUMMARY

This paper deals with 19 species under 4 genera of the family Thomisidae out of which 8 species are described as new to science.

ACKNOWLEDGEMENTS

I am thankful to the Director, Zoological Survey of India, Kolkata for providing necessary facilities.

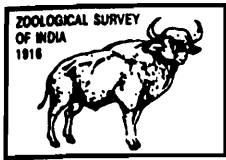
I am also thankful especially to Dr. Mrs. A. S. Dippenaar Schoeman, Department of Agricultural technical services, Plant Protection Research Institute, Private Bag, 134, Pretoria, Africa, Dr. C. D. Dondale, Bio Systematics Research Institute, Research Branch, Agriculture Canada, Ottawa, Ontario Canada and Dr. H. Ono, Department of Zoology National Science Museum, 3-23-1, Hyakunin-echo Shinjuku-ku, Tokyo-169, Japan for help with Literature on thomisid spiders.

I also acknowledge Shri. D. P. Dwivedi, Jr. Hindi Translator, Zoological Survey of India, Central Regional Station, Jabalpur, (M.P.) for typing the manuscript.

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Rec. zool. Surv. India : 105 (Part 3–4) : 81-84, 2005

**FIRST RECORD OF *PAPUOPSIA* BOUCEK FROM
THE ORIENTAL REGION WITH THE DESCRIPTION
OF A NEW SPECIES FROM SRI LANKA
(HYMENOPTERA : CHALCIDOIDEA : PTEROMALIDAE)**

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INTRODUCTION

During the studies on a collection of Pteromalidae received from the Bohart Museum of Entomology, University of California, I encountered some interesting taxa from the countries of Southeast Asia, some of them are being described and published [(Sureshan & Narendran, 2004, Sureshan, 2004, Sureshan & Narendran (in press)]. In continuation of such studies, a rare genus is reported here for the first time from the Oriental region by describing a new species from Sri Lanka. *Papuopsia* Boucek is a monotypic genus with the type species *P. setosa* Boucek described from Papua New Guinea which belongs to the rare subfamily of Pteromalidae viz. *Erotolepsiinae* Boucek. The subfamily was erected by Boucek to hold the genera *Erotolepsia* Howard from the Neotropical region, *Eunotopsia* Boucek and *Papuopsia* Boucek from the Australasian region and *Balrogia* Hedqvist from Brazil (Boucek, 1988). All these genera have very limited distribution and known by their type species only. A new species of *Papuopsia* is described here based on the collections made from Sri Lanka. Affinities of the new species with *P. setosa* Boucek is discussed and a key to separate the species of *Papuopsia* is also provided.

Key to the species of *Papuopsia* Boucek

1. Gaster with T1 having short striae, middle one the longest; antenna with 6 funicular segments, club 2 segmented, as long as pedicel; toruli above lower margin of eyes and is much closer to lateral eye margins than to each other; eyes 1.4x as long as wide. Length 1.5 mm Papua New Guinea *P. setosa* Boucek

- Gaster (Fig. 2) with T1 having longer striae on sides reaching up to middle; antenna (Fig. 1) with 7 funicular segments when club counted 3 segmented, longer than pedicel; toruli below lower margin of eyes, separated from lateral eye margins by a distance almost equal to that between them; eyes 2x as long as wide. Length 2.2 mm. Sri Lanka *P. striata* sp. nov.

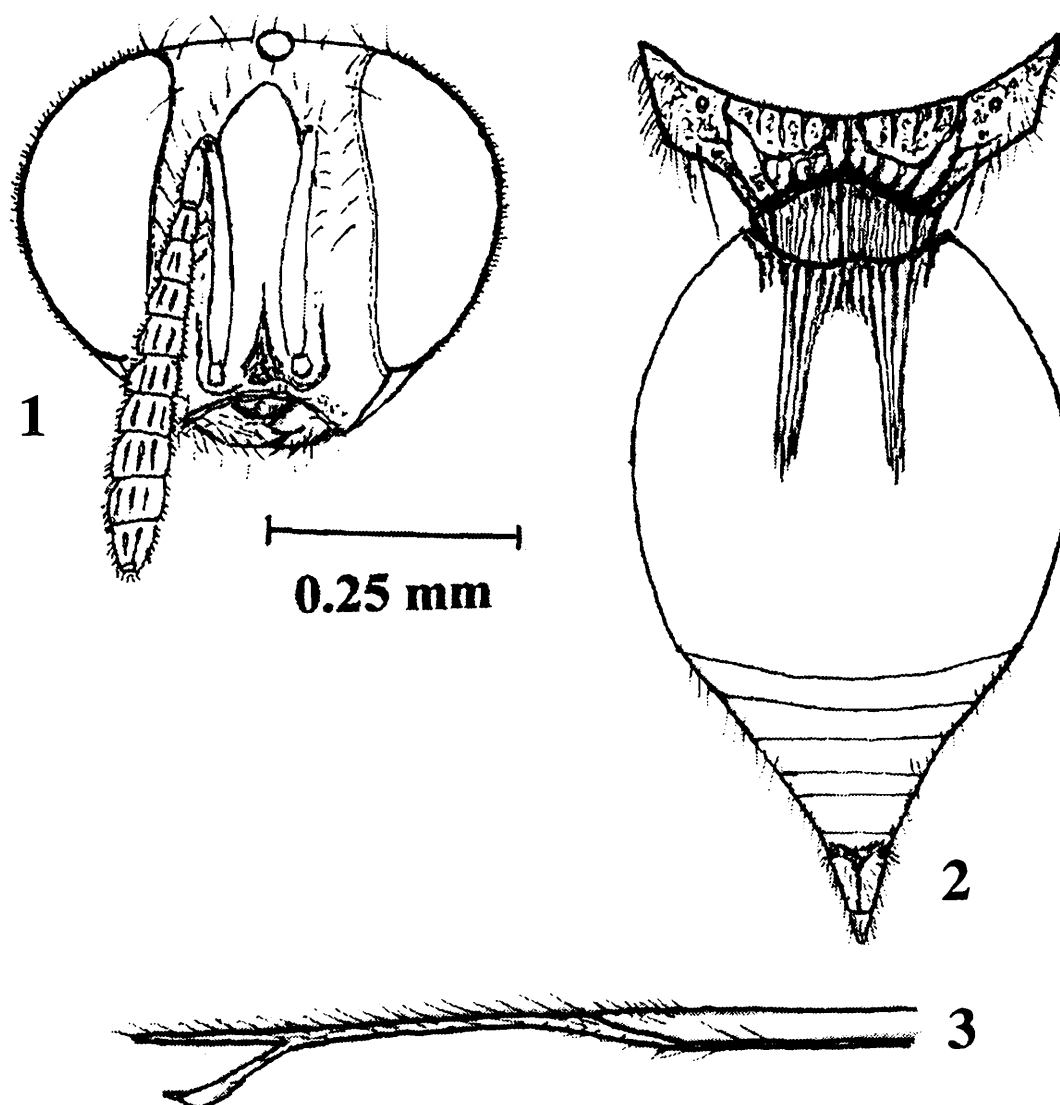
Papuopsia striata sp. nov.

(Figs. 1-3)

Female : Length : 2.2 mm. Black with faint metallic gloss; antennae with scape testaceous, remainder brown except club testaceous; eyes dirty white; mandibles brown; bristles on body and wings brown; coxae concolorous with body, remainder of legs testaceous with fore and hind femora brownish; wings sub hyaline, veins pale brown.

Head : (Fig. 1) In front view 1.25x as wide as long, closely and shallowly reticulate with shallow piliferous punctures and sparse strong brown bristles; malar space 0.3x as long as eye; eyes with minute pubescence, 2x as long as wide, separated by 0.71x their height (measured at maximum width at lower face); scrobal cavity deep, smooth and polished, converging upwards, margin carinate, on lower half reaching orbits, inter antennal ridge reaching one third length; upper edge of scrobe separated from front ocellus by a distance slightly shorter than its diameter; clypeus reduced, its anterior margin round; mandibles 2 toothed; malar grooves distinct, slightly arched; gneae narrow with several irregular longitudinal rugae, posteriorly carinate; toruli separated from lateral eye margin by a distance almost equal that between them; no temple; POL slightly greater than 2x OOL, ocelli large. Antennae (Fig. 1) slender, scape long, 0.75x as long as eye, pedicel as long as F1 and F2 combined; anellus small, transverse, funicle with 6 segments (if club counted 2 segmented, then funicle with 7 clearly separated segments) each with a single row of sensillae, pubescence small, basal funicular segments longer than wide, distal segments sub transverse, gradually becoming thick towards the tip, club three segmented, longer than pedicel, sub acuminate.

Thorax : Pronotum short and broad, crescentric, dorsally not carinate, anterior margin of collar with a row of strong backwardly directed bristles, collar almost smooth, neck transversely reticulate; lateral panel with a distinct transversely striated area; prepectus smooth and shiny. Mesoscutum uniformly reticulate, covered with long bristles, notauli finely groove like, complete; axillae smooth. Scutellum similarly sculptured as on mesoscutum and covered with strong bristles, frenal area smooth and bare, its beginning marked on either side by a strong long bristle. Dorsellum smooth, broad, medially with a crescentric depression. Propodeum (Fig. 2) with distinct median carina, plicae and a weak oblique costula, which never connect to median carina directly, in front of costula with several longitudinal rugae, behind costula depressed, outside of plicae with deep depressions sloping to short supracoxal flanges; spiracles small, oval, near to metanotal border. Thoracic pleura smooth with mesepisternum distinctly reticulate, upper mesepimeron with a sizeable depression. Metapleuron smooth and concave. Legs slender, but hind coxae stout, transversely striate reticulate, dorsally bare, ventrolaterally hairy; hind femur slightly clavate, hind tibiae with



Figs. 1-3. : *Papuopsia striata* sp. n. Female : Head in front view; 2. propodeum and gaster in dorsal view; 3. forewing venation.

2 strong unequal spurs. Forewing (Fig. 3) 2.61x as long as broad, pilosity becoming proximally longer, almost bristly, including basal and cubital hairline; marginal fringe moderate; SMV with 8 strong setae; speculum very narrow and closed below; basal cell with 8 strong setae and few small scattered setae, closed below by complete cubital hair line; basal hair line complete; speculum open below; costal cell hairy on the upper half. Relative lengths of SMV 19, MV 9, PMV 4.5, STV 3.5.

Gaster : (Fig. 2) Petiole 2x as broad as long; gaster 1.7x as long as broad in dorsal view; T1 covering 0.6x total length of gaster, anteriorly narrowed, dorsally at base depressed and with radiating striae, longer on sides reaching up to middle of T1.

Holotype : Female : Sri Lanka : Kegalla district (1 km S. Rambukkana), 7.xi.1993, coll. Soderlund (deposited in Bohart Museum of Entomology, University of California).

Etymology : The species is named is after the nature of peculiar striae on gaster.

Remarks : This species closely resembles *P. setosa* Boucek in general morphology but differs from it in having gaster with base of T1 having longer striae on sides reaching up to middle and

antenna with 6 funicular segments (when club counted 3 segmented (which is longer than pedicel), but the basal segment of club is well separated and can be considered as the 7th funicular segment, then club with 2 segments, toruli situated below lower margin of eyes and are separated from lateral eye margin by a distance almost equal to that between them and eyes 2x as long as wide and malar space wide. In *Paupopsia setosa* Boucek T1 of gaster with only short striae at the base, of which the middle longest and antenna with 6 funicular segments and club three segmented which is as long as pedicel, the basal segment of club is not well separated as in the opposite case; the toruli above lower margin of eyes and are also much closer to lateral eye margins than to each other. It has eyes 1.4x as long as wide and narrow malar space.

P. stiata also shares some character states with *Erotolepsia* Howard (Bocuek & Heydon, in Gibson *et al.*, 1997) such as the facial features, mainly arrangement of bristles, position and nature of antenna to some extent *etc.* However, it has the characteristic propodeum, gastral petiole, thoracic and wing features of *Papuopsia*. Later studies of more material belonging to both these genera may clarify the true relationship and status of this species in the subfamily.

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NEW RECORDS OF ORIBATID MITES (ACARI) FROM BANGLADESH

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INTRODUCTION

More than 4000 species of oribatid mites are known from different countries of the world. But till recently these mites were not known from Bangladesh. Only 3 species under 3 genera are so far known from the country (Sanyal *et al.*, 2004 and Gupta *et al.*, 2004). The present author while visiting Bangladesh in December, 2003 collected few soil and litter samples from Chittagong and Pabna districts and extracted oribatid specimens from the samples. The present paper is based upon the specimens collected which includes 11 species belonging to 9 genera and 9 families. Of these, 2 species under 2 genera are already known from Bangladesh.

The specimens reported here are deposited in the National Zoological Collection in Zoological Survey of India, Kolkata.

SYSTEMATIC ACCOUNT

Key to the families of ORIBATID mites from Bangladesh

- 1(6) Anogenital region of macropyline type; ventral plate absent; tibia and genu of similar length and shape.
- 2(3) Body dichoid *i.e.* articulation between legs II and III; preanal plate present.....
..... LOHMANIIDAE
- 3(2) Body holoid *i.e.* the body regions rigidly coalesced; preanal plate absent.
- 4(5) Two pairs of setae on epimere 3; genital setae 16–20 pairs; adanal setae two pairs
..... TRHYPOCHTHONIIDAE
- 5(4) Three pairs of setae on epimere 3; 4–12 pairs of genital setae; adanal setae three pairs
..... MALACONOTHRIDAE
- 6(1) Anogenital region of brachypyline type; ventral plate present; tibia and genu of different length and shape.

- 7(10) Notogaster pycnonotic *i.e.* ototaxic organs absent; usually pteromorphae absent.
- 8(9) Prodorsum with lamellae; dorsosejugal suture absent TECTOCEPHEDAE
- 9(8) Prodorsum without true lamellae; dorsosejugal suture present OPPIIDAE
- 10(7) Notogaster poronotic *i.e.* areae porosae, sacculi or pori present; pteromorphae usually present.
- 11(12) Pteromorphae movable, articulate or semicircular; prodorsum without true projecting lamellae; some chitinous lines on the prodorsum GALUMNIDAE
- 12(11) Pteromorphae immovable but never articulate sometimes absent.
- 13(14) Prodorsum with tutorium; usually six pairs of genital setae (exceptionally five or four pairs); lamellae broad, sometimes synlamella type AUSTRACHTERIIDAE
- 14(13) Prodorsum without tutorium; usually 3–5 pairs of genital setae (exceptionally six pairs); lamellae not broad.
- 15(16) Notogaster with true areae porosae; pteromorphae movable; 5–6 pairs of genital setae present XYLOBATIDAE
- 16(15) Notogaster with sacculi; pteromorphae immovable or absent; usually 4, rarely 3, exceptionally 5 or 1 pair of genital setae present SCHELOBATIDAE

1. Family LOHMANIIDAE Berlese, 1916

Key to the genera of LOHMANIIDAE

- 1(2) Ano-adanal setae five pairs *Haplacarus* Wallwork, 1962
- 2(1) Ano-adanal setae four pairs *Javacarus* Balogh, 1961

1. Genus *Haplacarus* Wallwork, 1962

1. *Haplacarus foliatus bengalensis* Bhattacharya, Bhaduri & Raychaudhuri

1974. *Haplacarus foliatus bengalensis* Bhattacharya, Bhaduri and Raychaudhuri, *Oriental Insects.*, 8(2) : 281.

Diagnosis : Setae on prodorsum smooth; sensillus pectinate with 10–12 branches; notogastral setae 10 pairs; foliate, usually smooth; notogaster with 10 transverse bands; an excrescence in the posterior margin of preanal plate; genital setae 10 pairs.

Material examined : Bangladesh : 2 ♀, Chittagong, Maheshkhali, near salt field, 24.xii.2003, ex. soil from grassland, coll. A. K. Sanyal.

Distribution : Bangladesh (Chittagong). *Elsewhere* : India.

2. Genus *Javacarus* Balogh, 1962

2. *Javacarus foliatus* Hammer

1972. *Javacarus kuhnelti* Bal. var. *foliatus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 19(3) : 1.

1984. *Javacarus foliatus* n. stat., Sarkar and Subias, *Oriental Insects.*, 18 : 25.

Diagnosis : Large-sized tubercles on prodorsum; prodorsal setae long, lanceolate; sensillus with 10 secondary branches besides few very fine ones distally on posterior border; notogastral setae long, foliate with mid rib. Undulating chitinized keels along the sides of dorsum; ventral side with irregular pattern of sculpture; 10 pairs of genital setae.

Material examined : Bangladesh : 1 ♀, Chittagong, Maheshkhali, near salt field, 24.xii.2003, ex. soil from grassland, coll. A. K. Sanyal.

Distribution : Bangladesh (Chittagong). *Elsewhere* : India, Tahiti.

2. Family TRHYPOCHTHONIIDAE Willmann, 1931

3. Genus *Archeozetes* Grandjean, 1931

3. *Archeozetes tuberculatus* Sarkar

1985. *Archeozetes tuberculatus* Sarkar, *Uttar Pradesh J. Zool.*, 5(1) : 83.

Diagnosis : Prodorsal setae long, thick, unilaterally barbed; sensillus long, outer margin thinly barbed; no exobothridial setae; transverse chitinous thickening in front of interlamellar setae and close to lateral margins of prodorsum; notogastral setae 15 pairs, unilaterally barbed; setae f_1 lacking; posterior end of body with characteristic blunt tubercle; genital setae 7 pairs, thin, simple, moderately long; anal setae 2 pairs, thin, long; adanal setae 3 pairs, stout, longer than anal setae; aggenital setae absent; epimeral setae $3b$ thrice as long as other setae, epimeral setal formula 3 : 1 : 3 : 3; legs monodactylous.

Material examined : Bangladesh : 1 ♀, Pabna, Dogachhi village, 29.xii.2003, ex. soil from fallow land, coll. Sucheta Sanyal.

Distribution : Bangladesh (Pabna). *Elsewhere* : India.

3. Family MALACONOTHRIDAE Berlese, 1916

4. Genus *Malaconothrus* Berlese, 1904

4. *Malaconothrus rostopilosus* Saha & Sanyal

1996. *Malaconothrus rostopilosus* Saha and Sanyal, *Entomon.*, 21(1) : 105.

Diagnosis : Rostral setae pilose, clavate-shaped; lamellar and interlamellar setae thin, smooth, tip pointed; light polygonal reticular markings and punctations present in area between lamellar ridges; notogastral setae 15 pairs, thin, smooth, long, of different sizes; punctate double-lined oval area near fissure ip , genital setae 3 pairs, an undulating chitinous ridge just above anterior part of genital plate; no anal setae; 3 pairs of smooth adanal setae; legs monodactylous.

Material examined : Bangladesh : 2 ♀ ♀, Chittagong, Rangamati, hill top, 26.xii.2003, ex. soil from field with wild vegetation, coll. A. K. Sanyal.

Distribution : Bangladesh (Chittagong). *Elsewhere* : India.

4. Family TECTOCEPHEIDAE Grandjean, 1954

5. Genus *Tectocephus* Berlese, 19135. *Tectocephus velatus* (Michael)

1888. *Tectocephus velatus* (Michael), Ray. Soc., 65.

Diagnosis : Rostrum trifid; lamellae large detached blades, lying nearly horizontal, extend beyond the lateral margin of the cephalothorax, median portion broad, cups narrow or thick, almost reaching the tip of rostrum; rostral and lamellar setae curved inward and barbed unilaterally; interlamellar setae minute, smooth; sensillus long with slender stalk, head licheniform; dorsosejugal suture interrupted; paired *iad* large.

Material examined : Bangladesh : 12 ♀ ♀, Chittagong, Maheshkhali, near salt field, 24.xii.2003, ex. soil from grassland, coll. A. K. Sanyal; Chittagong, Rangamati, hill top, 26.xii.2003, ex. soil from field with wild vegetation, coll. A. K. Sanyal.

Distribution : Bangladesh (Chittagong). *Elsewhere* : Africa, Central Asia, Easter Island, Europe, Fiji, India, Indonesia, Japan, Jordan, New Zealand, North America, Pakistan, South America, Spitsbergen, Tonga Island, Turkey.

5. Family OPPIIDAE Grandjean, 1954

6. Genus *Oppia* Koch, 18366. *Oppia yodai* Aoki

1965. *Oppia yodai* Aoki, Nat Life Southeast Asia, 4 : 169.

Diagnosis : Finely barbed prodorsal setae; lamellar setae twice as long as their mutual distance; interlamellar setae directed backwards; sensillus spindle-shaped beset with fine bristles; one pointed protrusion behind the bothridium; 5 pairs of notogastral setae.

Material examined : Bangladesh : 1 ♀, Chittagong, Meheshkhali, near salt field, 24.xii.2003, ex. soil from grassland, coll. A. K. Sanyal.

Distribution : Bangladesh (Chittagong). *Elsewhere* : India, Japan.

6. Family XYLOBATIDAE Balogh & Balogh, 1984

7. Genus *Xylobates* Jacot, 19297. *Xylobates capucinus* (Berlese)

1908. *Protoribates capucinus* Berlese, Redia, 5 : 2.

1989. *Xylobates capucinus* Norton and Kethly, Redia, 62(2) : 428.

Diagnosis : Rostral setae small, fine, smooth; lamella broad in the middle, tip pointed; lamellar setae smaller than rostral setae, smooth; interlamellar setae long, fine, barbed unilaterally, sensillus with long stalk with swollen head barbed outwardly; 11 pairs of minute notogastral setae.

Material examined : Bangladesh : 4 ♀ ♀, Chittagong, Maheskhali, near salt field, 24.xii.2003, ex. soil from grassland, coll. A.K. Sanyal; Chittagong, Rangamati, hill top, 26.xii.2003, ex. soil from field with wild vegetation, coll. Ayan Sanyal; 1 ♀, Pabna, Dogachhi village, 29.xii.2003, ex. soil from fallow land, coll. A.K. Sanyal.

Distribution : Bangladesh (Chittagong, Pabna). *Elsewhere* : Bulgaria, India, Indonesia, Italy, New Zealand, North America, Pakistan, Sahara, Samoa, South America, Spain, Tonga Tapu Is., Turkey, U.S.S.R.

7. Family SCHELLORIBATIDAE Grandjean, 1953

8. Genus *Scheloribates* Berlese, 1908

Key to the species of *Scheloribates*

- 1(2) Hysterosoma as broad as long; sensillus with short stalk and disc-shaped head
 *albialatus* Hammer, 1961
- 2(1) Hysterosoma longer than broad; sensillus with lanceolate head
 *thermophilus* Hammer, 1961

8. *Scheloribates albialatus* Hammer

1961. *Scheloribates albialatus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 13(1) : 94.

Diagnosis : Rostral and lamellar setae barbed; interlamellar setae smooth; sensillus with short, round, disc-shaped head set with fine scales; no setae on notogaster; chitinous pores on notogaster; genital setae 4 pairs.

Material examined : Bangladesh : 40 ♀ ♀, Chittagong, Maheshkhali, near salt field, 24.xii.2003, ex. soil from grassland, coll. A. K. Sanyal; 22 ♀ ♀, Chittagong, Rangamati, hill top, 26.xii.2003, ex. soil from field with wild vegetation, coll. A. K. Sanyal.

Distribution : Bangladesh (Chittagong). *Elsewhere* : India, Peru.

9. *Scheloribates thermophilus* Hammer

1961. *Scheloribates thermophilus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 13(1) : 95.

Diagnosis : Rostral setae about twice as long as their mutual distance, barbed; lamellar setae short, thick, slightly longer than their mutual distance, barbed; interlamellar setae thick, barbed; sensillus slender with lanceolate head; notogastral setae minute; legs tridactylous.

Material examined : Bangladesh : 1 ♀, Chittagong, Cox's Bazar, Himchari, 24.xii.2003, ex. soil under banana plant, coll. A. K. Sanyal; 2 ♀ ♀, Chittagong, Maheshkhali, beside Adinath temple, 24.xii.2003, ex. soil under banana plant, coll. A. K. Sanyal; 6 ♀ ♀, near salt field, 24.xii.2003, ex. soil from grassland, coll. A. K. Sanyal.

Distribution : Bangladesh (Chittagong). *Elsewhere* : Fiji, India, Peru.

8. Family AUSTRACHTERIIDAE Luxton, 1985

9. Genus *Lamellobates* Hammer, 1958

10. *Lamellobates palustris* Hammer

1958. *Lamellobates pulustris* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 10(1) : 100.

Diagnosis : Inner cuspides of lamellae rounded, outer lamellar cuspides tapering into a short and sharp point; lamellar setae equally very thick throughout, rough; interlamellar setae long, rough; sensillus club-shaped, tip pointed, beset with short setae; notogastral setae 9 pairs; genital setae 6 pairs.

Material examined : Bangladesh : 6 ♀ ♀, Chittagong, Maheshkhali, near salt field, 24.xii.2003, ex. soil from grass field, coll. A. K. Sanyal; 2 ♀ ♀, Chittagong, Rangamati, hill top, 26.xii.2003, ex. soil from field with wild vegetation, coll. Ayan Sanyal.

Distribution : Bangladesh (Chittagong). *Elsewhere* : Argentina, Fiji, India, Indonesia, New Zealand, Pakistan, Seychelles, Thailand, Tonga Tapu Island.

Remarks : The species is already known from Dhaka, Bangladesh (Gupta *et al.*, 2004).

9. Family GALUMNIDAE Jacot, 1925

10. Genus *Galumna* von Heyden, 1826

11. *Galumna* sp.

Material examined : Bangladesh : 1 ♀, Chittagong, Maheshkhali, beside Adinath temple, 24.xii.2003, ex. soil under banana plant, coll. Sucheta Sanyal.

Remarks : The genus was earlier recorded from Bangladesh (Dhaka) by Sanyal *et al.*, (2004). The specimen could not be identified upto species level as the specimen was not in good condition.

SUMMARY

A total of 11 species of soil inhabiting oribatid mites belonging to 9 genera under 9 families collected from Chittagong and Pabna districts in Bangladesh are reported in the paper. Of the 11 species 10 are reported here for the first time from Bangladesh. One species viz., *L. palustris* and

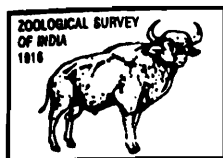
the genus *Galumna* were earlier recorded from Bangladesh by Sanyal *et al.*, (2004) and Gupta *et al.*, (2004) respectively. Keys to identification of families, genera and species reported in the paper, diagnostic features, collection data and distribution of the species have been incorporated in the paper.

ACKNOWLEDGMENTS

The author expresses gratefulness to Dr. J.R.B. Alfred, Director, Zoological Survey of India, Kolkata for providing facilities. He is also thankful to Mili, Sucheta and Ayan Sanyal for assisting in collection of mite specimens.

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Rec. zool. Surv. India : 105 (Part 3–4) : 93-101, 2005

ON THE OCCURRENCE OF FIVE LEECHES *BARBRONIA WEBERI*, *GLOSSIPHONIA ANNANDALEI*, *GLÖSSIPHONIA HETEROCLITA*, *GLOSSIPHONIA RETICULATA* AND *PLACOBDELLA UNDULATA* IN WEST BENGAL, INDIA

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INTRODUCTION

During field survey leeches are collected from different districts of West Bengal [21°25'–26°50' (N) Longitude, 86°–89°58' (E) Latitude]. The lower Gangā plain extending from foot hills of Darjeeling, Himalaya in the north to the Bay of Bengal in south (580 km.) and Chotanagpur high lands in the west to the border of Bangladesh and Assam in the east (200 km.). Out of these leeches, five leeches are unreported in West Bengal. Harding and Moore (1927) provided a comprehensive account of the Indian leeches. Other workers like Blanchard (1923), Bhatia (1930), Baugh (1960), Soos (1965), Mahajan and Chandra (1976), Soota and Ghosh (1977), Nandi and Raut (1987) and Mandal (2004a, 2004b, 2004c) have contributed a lot on the taxonomy of this group. The paper deals with the description of five species of the leech for the first time from West Bengal, India.

KEY WORDS : *Survey, Leech, West Bengal, India.*

MATERIAL AND METHOD

In course of survey almost all niches are taken into consideration to find out the leech individuals occurring in the habitat/ecosystem. In case of free living species 5 sites from a selected ecosystem (water body) are taken into consideration to note the number of leeches occurring in the system. From each site/station and area of 1 sq. ft. has been selected at random and the number of leeches occurring there are counted. The mean of such five readings is considered for actual population density per sq. ft.. In case of parasitic and malacophagous leeches attempt are made to note the

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number of leeches attached with the host body. In such case five or more host individuals are taken into account at random and mean would be considered for population density of this external parasite per host. The malacophagous leeches are counted on the basis of samplings of pelagic molluscs from an area of 1 sq. ft. from the concerned water body. In this case also five such sampling sites are taken and the leeches attached/infested with snails are counted and mean of the five readings have been considered for the final data.

The breeding season of the leeches are determined on the basis of observation of the egg, young and mating activities. The leeches are narcotized and preserved (Kapur, 1968).

DESCRIPTION OF THE MATERIAL COLLECTED FROM WEST BENGAL

Barbronia weberi (Blanchard, 1897)

(Plate 1; Figure 1)

Slender body, tapering anteriorly. Head very small. Circular posterior sucker, mouth small, lip narrow. Colour pinkish white in living. Anterior part whitish but posterior part pinkish. Colour fade up in preservative. Eyes three pairs, one large pair on dorsum of II, two smaller pairs on sides of anterior annulus of IV. Gonopores separated by five annuli. Male pore situated at XII b1/B2. Female pore on the middle of XIII b1. Anus large somites I and II are uniannulate, III biannulate, IV triannulate. Pale yellow colour in preservative.

Two examples of the species were collected by C. K. Mandal on January 23, 1995 from Piasbari Nursery Pond, Malda.

Remarks : It is first recorded from West Bengal. Due to pollution the size decreases.

Glossiphonia annandalei Oka, 1921

(Plate 1; Figure 2)

Elliptic lanceolate body, little flattened. Due to devoid of papillae body surface is smooth. Minute dark dots from hair like lines on the dorsal surface. Mouth small. Posterior sucker circular less in diameter than the greatest width of the body. Number of ring 68. Somites I–III and XXVII uniannulate. Somite IV biannulate. Somite VII–XXIV are triannulate. XXV and XXVI biaannulate, Anterior ring about twice as broad as a posterior. Colour grey. White in preservative. Eyes three pairs, occupies a position unique among the family Glossiphonidae. Pigment cups of eyes on ring 4 are directed forward and ring 5 are backward. Male and Female pore separated by two rings. Male pore opens between the furrow of ring 24 and 25 (Somites XI and XII) Female pore opens between rings 26 and 27. Crop six pairs, first pair simple and unbranched. The anus opens behind the last ring.

One example of the leech was collected by C. K. Mandal on January 23, 1995 from Piasbari Nursery Pond, Malda.

Remarks : *Glossiphonia annandalei* or Lanceolate Indo-Burman Leech is first recorded from Malda, West Bengal.

PLATE I

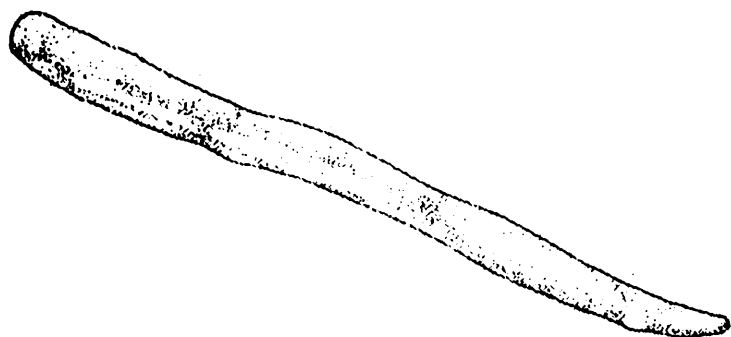


Fig. 1. : *Barbronia weberi* (Dorsal view)

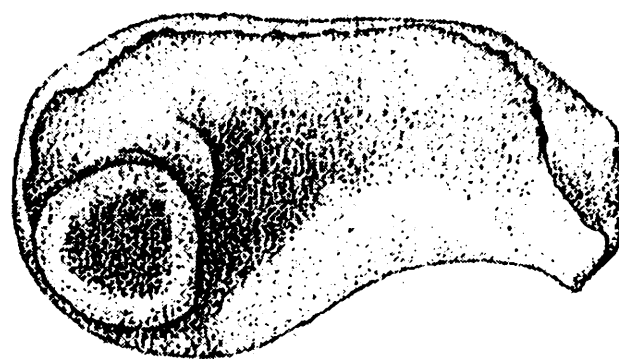


Fig. 2. : *Glossiphonia annandalei* (Ventral view)

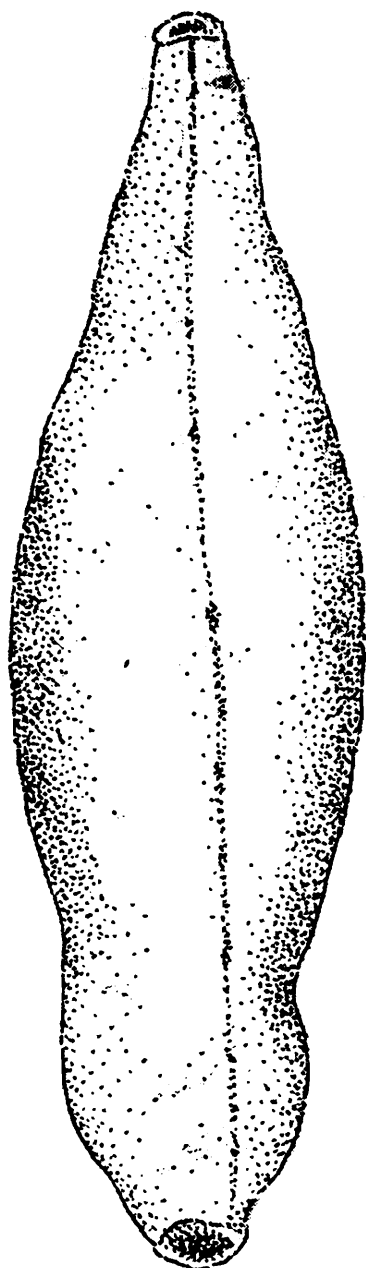


Fig. 3. : *Glossiphonia heteroclita* (Dorsal view)

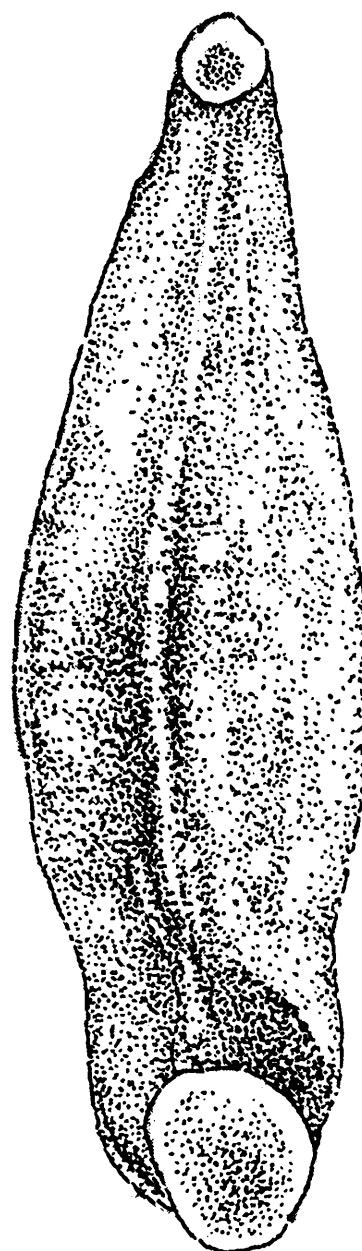


Fig. 4. : *Glossiphonia heteroclita* (Ventral view)

Glossiphonia heteroclita Linnaeus, 1971

(Plate 1; Figures 3 & 4)

Ovate acuminate, flattened body. Body colour amber yellow in living and greyish in preserved state. Three pairs of eyes. The first pair lies in ring 5, Second and third pairs situated respectively in rings 7 and 8. Both male and female genital ducts open by a common pore between the first and second rings of Somite XII. Total rings of the body 70. Length 8–12 mm at rest, width 2.5–3 mm. 15 mm. in full extension.

One example of the species was collected by C. K. Mandal on August 10, 1995 from Bhadreswar, Hooghly and twelve examples on March 23, 1995 from Piasbari Nursery Pond Ramkeli, Malda, West Bengal. Some examples are taken from the molluscs and some from beneath the leaves of water hyacinth.

Remarks : This species is recorded from West Bengal (Hooghly and Malda districts) for the first time. The population density, feeding behaviour, number of egg of the specimen were also observed successfully for the first time. Due to the pesticides, the number of the specimens decreased.

Glossiphonia reticulata Kaburaki, 1921

(Plate 2; Figures 5 & 6)

Slender body, attenuated anteriorly. Rough dorsal surface due to the presence of numerous papillae. Colour olive in living, grey in preservative. Anterior sucker less in diameter than the half the width of the posterior sucker. The circular posterior sucker centrally attached and less than half the greatest width of the body. Total somites 27, Ring number 72, of which three are preocular. Somites I–IV are represented by the first six rings; V–XXIV are complete with three rings; Eyes two pairs; the first pair lie in ring 4 and the second and larger pair in ring 5. Male genital pore situated between the ring 26 and 27 in Somite XI. Female pore situated between the ring 28 and 29 just two ring behind this male pore. Mouth opens within anterior sucker. The anus lies between the ring 70 and 71 just two rings behind the posterior sucker. The crop or stomach has 7 pairs of branching diverticula. Some specimen found attached with *Lymnaea* (Molluscs) and some with the lower part of lotus leaf at Kandi, Murshidabad.

Remarks : It is also first recorded from West Bengal. During breeding season, some leeches of this species gave birth in the month of March-April and some in June-July of the year.

Placobdella undulata Harding, 1924

(Plate 2; Figures 7 & 8)

Elliptic lanceolate body. A constriction is seen at this 30 ring just behind the female pore. Dorsal surface rough due to the presence of papillae on each ring. Distinct head region. Posterior sucker circular and slightly oval, equal in width to half on the greatest width of the body. Colour greyish white in preserved state alcohol. Ring number 71. Somites V–XXIV complete with three annuli, XXV and XXVI biannulate. XXVIII uniannulate. Presence of one preocular ring single

PLATE II

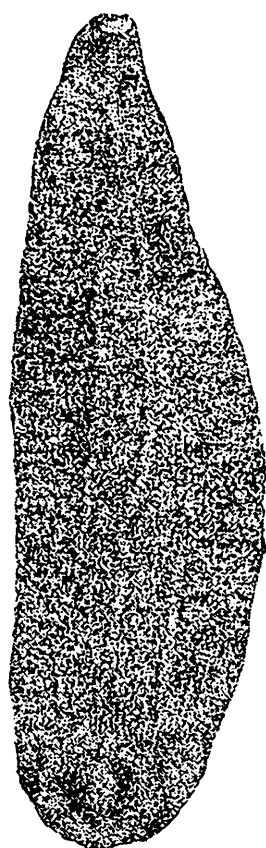


Fig. 5. : *Glossiphonia reticulata* (Dorsal view)



Fig. 6. : *Glossiphonia reticulata* (Ventral view)

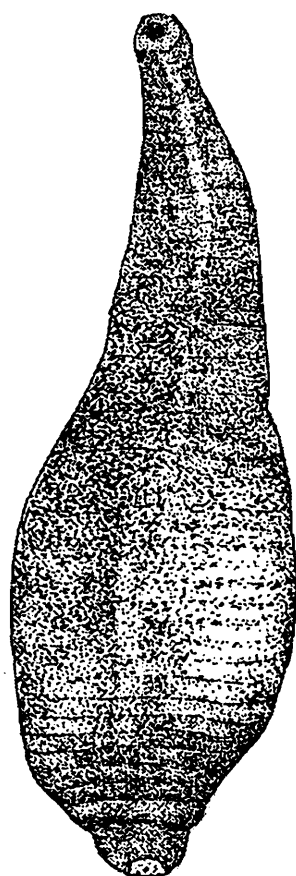


Fig. 7. : *Placobdella undulata* (Dorsal view)

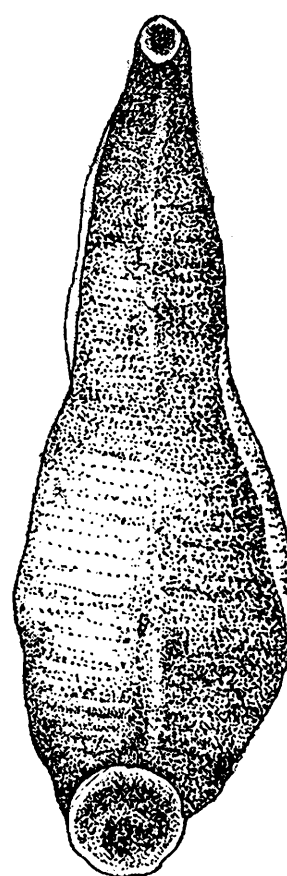


Fig. 8. : *Placobdella undulata* (Ventral view)

pair of eyes lie in the second ring. Male genital pore between ring 27 and 28 between somites XI and XII. Female pore between rings 29 and 30. The annus opens between rings 70 and 71. The mouth opens in the terminal position. Gastric caeca seven pairs, lobate.

Two examples of the species were collected by C. K. Mandal on July 18 and 20, 1995 from Galshi, Burdwan and Krishnagar, Nadia, one attached with mollusca (Length 5 mm, width 1.5 mm).

Remarks : *Placobdella undulata* or leech of undulated head is found first time from West Bengal (Nadia and Burdwan).

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For curatorial support authors are thankful to Dr. J. R. B. Alfred, Director, Zoological Survey of India, Kolkata for providing laboratory facilities to study the specimens. The authors are also thankful to Dr. A. Mishra, Zoologist, ZSI and Head, Department of Zoology, University of Kalyani for their kind help and necessary laboratory facilities.

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Table 1. : Difference between past and present collected *Barbronia weberi*.

	Past Collection	Present Collection
Locality	India : J & K., H.P., M.P. & U.P. Outside India : Java, Sumatra Celebes, Borneo, Phillippines, Pakistan, Nepal	West Bengal (Piasbari Nursery Pond, Dist. Malda)
Date of collection	1997 by Blanchard	January 23rd, 1995
Deposited	Not known	Deposited in Z.S.I. Reg. No. : An 3220/1
Host/Substratum	Under Stone	Lower leaf of water hyacinth
Length	36 mm	11 mm
Width	3.8 mm	1 mm
Colour	Not known in living condition	Pinkish white in living condition
Food	Not known	Molluscs
Breeding season	Not known	5-7
Number of eggs	Not known	May-July
Population density	Not known	1

Table 2. : Difference between past and present collected *Glossiphonia annandalei*.

	Past Collection	Present Collection
Locality	Inley Lake, Southern States, Burma	West Bengal (Piasbari Nursery Pond, Dist. Malda)
Date of collection	1921 by Oka	January 23rd, 1995
Deposited	Not known	Z.S.I.; Reg. No. : An 3219/1
Host/Substratum	Found on Snail	Under the leaf of water hyacinth where molluscs were present
Length	6 mm	2 mm
Width	2.8 mm	0.8 mm
Colour	Pale Grey	Grey
Food	Molluscs	Molluscs
Breeding season	Not known	June-July
Number of eggs	Not known	22
Population density	Not known	1

Table 3. : Difference between past and present collected Leech *Glossiphonia heteroclita*.

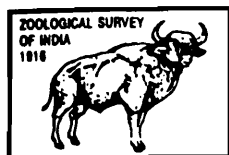
	Past Collection	Present Collection
Locality	Rajasthan (Nagaur), Bihar (Monghyr), North America, Europe and Burma	West Bengal (Bhadreshwar, Hooghly district) (Ramkeli, Malda district)
Date of collection	1922 by Oka from Burma	August 10, 1995 and March 23, 1995
Deposited	Not known	Deposited in Z.S.I.; Reg. No. An 2779/1 and An 2838/1
Host/Substratum	Gastropod <i>Pachylabra maura</i>	From beneath the leaves of water hyacinth in a pond of Bhadreswar station and from beneath the stone of a pond of Ramkeli
Length	10–13 mm at rest 17 mm in full extension	8–12 mm at rest 15 mm in full extension
Width	4.5 mm	2.5–3 mm
Colour	Amber yellow in living state	Grey to white in preserved state
Food	Parasite on molluscs	Parasitic on molluscs and insect larvae
Breeding season	Not known	June–July
Number of eggs	Not known	13–23 eggs
Population density	Not known	1 per sq. ft.

Table 4. : Difference between the past and present collected Leech *Glossiphonia reticulata*.

	Past Collection	Present Collection
Locality	Punjab, Himachal Pradesh, Maharashtra, Jammu	W. B. (Mandunir Beel, Kandi, district Murshidabad)
Date of collection	1921 by Kaburaki	March 25, 1995
Deposited	Type deposited : Z.S.I.	General collection : Deposited in Z.S.I. Reg. No. An 2850/1
Host/Substratum	Anodonta (Mollusc)	Lymnaea and Lotus leaf (Mollusc)
Length	11 mm	2.5 mm
Width	2 mm	0.8 mm
Colour	Olive in living	Greyish green in living
Food	Molluscs	Molluscs & Insect larvae
Breeding season	Not known	Mar.–Apr. and some on June–July
Number of eggs	Not known	22–23 eggs
Population density	Not known	2 per sq. ft.

Table 5. : Difference between past and present collected *Placobdella undulata*.

	Past Collection	Present Collection
Locality	Rajasthan (Jodhpur), H.P. (Solan), Kathua (J & K), Outside Sri Lanka	W. B. (Galsi, Burdwan; Krishna- nagar, Nadia)
Date of collection	Not known	July 18 and 19, 1995
Deposited	Type deposited : Z.S.I.	Z.S.I. Reg. No. : An 2791/1 and An 2827/1
Host/Substratum	From Fish (Koraliya) Colombo Lake, Cylon	From Mollusc and a stems of water hyacinth
Length	17.5 mm	4 mm
Width	4 mm (Body) 0.75 mm (Head region)	1.5 mm (Body) 0.18 mm (Head region)
Colour	Not known	Greyish in living, white in preserved state
Food	Coraliya Fish	Mollusca
Breeding season	Not known	May–July
Number of eggs	Not known	37–47
Population density	Not known	1



Rec. zool. Surv. India : 105 (Part 3–4) : 103-110, 2005

SOME NEW RECORDS OF PLANT ASSOCIATED MITES (ACARI) FROM BANGLADESH

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INTRODUCTION

Mite fauna from plants in Bangladesh is known only recently through the works of Sanyal *et al.* (2004) and Gupta *et al.* (2004). They recorded 17 species collected on different host plants from Dhaka. The first author of the present paper while visiting Bangladesh in December, 2003, collected mites from some plants and this paper is based on that collection. This communication reports 11 species under 2 families and 3 genera under the orders Prostigmata and Mesostigmata. All the species except *Tetranychus urticae* appear to be new records from Bangladesh.

SYSTEMATIC ACCOUNT

Key to the families, subfamilies and genera of plant mites from Bangladesh

1. One or two pairs of trichobothria on prodorsum or a pair on the posterodorsal aspect of hysterosoma usually without conspicuous pseudostigmata; stigmata situated at the base of gnathosoma or between chelicerae; palpi modified into thumb-claw complex
..... PROSTIGMATA, 2
- Pedipalpal ambulacrum represented by a tined claw like structure called apotele near the inner basal angle of the palptarsus; stigmata situated lateral to coxae II–IV and one on each side, usually with elongate peritremes MESOSTIGMATA, 3
2. Each claw terminating in a pair of tenent hairs or bordered with combs of tenent hairs, campodial claw pad-like (rarely appearing absent) often divided distally or with a basal divided spur, with or without tenent hairs, caudal aspect of idiosoma without highly modified setae TETRANYCHIDAE, 4

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3. Sternal shield with 0–4 pairs of setae, corniculae not modified distally, normally with fewer than 20 pairs of dorsal setae PHYTOSEIIDAE, 7
4. Empodium claw like with proximoventral hairs, duplex setae on tarsus I distal and approximate *Oligonychus*, 5
- Empodium splits distally usually into 3 pairs of hairs, duplex setae on tarsus I well developed *Tetranychus*, 6
5. Aedeagus bent ventrad, tarsus I with not more than single tactile on venter just distad of duplex setae *sapienticolus*
- Aedeagus bent dorsal, along the distal end may be directed ventrad, tarsus I with 2 tactile setae on venter just distad of duplex setae *indicus*
6. Upper surface of aedeagus knob straight or rounded with some kind of projection *urticae*
- Upper surface of aedeagus knob concave with anterior and posterior rounded projections .. *neocaledonicus*
7. Dorsal shield with 5 pairs of postlateral setae 8
- Dorsal shield with less than 5 pairs of postlateral setae *Amblyseius (Paraphytoseius) multidentatus*
8. Setae Z_5 , s_4 , Z_4 long and whip like, longer than distance between their basis; leg IV with macrosetae on genu and erect seta on tarsus *Amblyseius (Amblyseius)*, 10
- Seta, Z_5 shorter, at most as long as distance between their bases; leg I with macroseta or only one on genu, no erect seta on tarsus 9
9. Peritreme extends anteriorly upto j_3 ; anterior pair of preanal setae adjacent to anterior margin of ventrianal shield *A. (Typhlodromus) kalimpongensis*
- Peritreme not extends upto j_3 ; anterior pair of preanal setae removed from anterior margin *A. (Euscius)*, 11
10. Cervix of spermatheca elongated and of parallel diameter *A. (A.) largoensis*
- Cervix of spermatheca fundibuliform *A. (A.) herbicolus*
11. All setae on dorsal shield minute except j_1 , and Z_5 *A. (E.) ovalis*
- Besides Z_5 and j_1 some other setae also long 12
12. Spermatheca bell shaped *A. (E.) coccineae*
- Spermatheca not bell shaped, rather elongated *A. (E.) pruni*

Order PROSTIGMATA

Family TETRANYCHIDAE Donnadieu

Subfamily TETRANYCHINAE Berlese

Tribe Tetranychini Reck

1. Genus *Oligonychus* Berlese, 18861. *Oligonychus indicus* (Hirst.)

1923. *Paratetranychus indicus* Hirst, *Proc. zool. Soc. Lond.*, 990.

1994. *Oligonychus indicus*, Gupta and Gupta, *Mem. zool. Surv. India*, **18**(1) : 104-105.

Diagnosis : Greyish-green body with black blotches scattered over the body; aedeagus forms acute angle with axis of the shaft; tibia I with 2 sensory and 11 tactile setae in male; in female, tibia I with 1 sensory and 8 tactile setae; sensillum on palp tarsus 2 times as long as broad.

Material examined : Bangladesh : Chittagong, Cox's Bazar, Himchari, 3 ♀, 1 ♂, ex. banana leaf (*Musa sapientum*), 24.xii.2003, coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong. *Elsewhere* : India, Pakistan.

Remarks : The infestation of this mite species caused the appearance of reddish patches on banana leaves and such infested leaves gradually withered.

2. *Oligonychus sapienticolus* Gupta

1976. *Oligonychus sapienticolus* Gupta, 1976, *Oriental Ins.*, **10** : 342-343.

Diagnosis : Dorsal propodosomals and hysterosomals being longer than interval between their bases; in male, tibia I with 3 sensory and 9 tactile; in female, tibia I with 3 sensory and 7 tactile setae.

Material examined : Bangladesh : 2 ♀ ♀, 2 ♂ ♂, Chittagong, Himachari, ex. banana leaf (*Musa sapientum*), 24.xii. 2003, coll. A. K. Sanyal.

Distribdution : Bangladesh : Chittagong. *Elsewhere* : India.

Remarks : No noteworthy damage was caused by this species.

2. Genus *Tetranychus* Dufour, 18323. *Tetranychus neocaledonicus* Andre

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

1994. *Tetranychus neocaledonicus*, Gupta and Gupta, *Mem. zool. Surv. India*, **18**(1) : 131-133.

Diagnosis : Berry-like aedeagal knob in male, anterior rounded portion better developed than the rounded posterior projection; in female, tibia I with 1 sensory and 7 tactile setae, tarsus I with 2 sensory and 3 tactile setae.

Material examined : Bangladesh : 4 ♀ ♀, Chittagong, Cox's Bazar, Himchari, ex. arum leaf (*Colocassia esculenta*), 24.xii.2003, coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong. *Elsewhere* : Cosmopolitan.

Remarks : The species is a serious pest of agri-horticultural crops. The plants become sickly and the leaves turn yellow. However, in the present case, the infestation was of mild nature producing no noticeable damage symptoms.

4. *Tetranychus urticae* Koch

1836. *Tetranychus urticae* Koch, *Deu, Crust. Myr. Arach.*, 1 : 10.

1994. *Tetranychus urticae*, Gupta and Gupta, *Mem. zool. Surv. India*, 18(1) : 139-142.

Diagnosis : Female greenish or yellowish with two large black spots on either side of the body; anterior and posterior projections of aedeagal knob similar, axis of aedeagal knob parallel with axis of shaft; striae in female bears dorsal lobes.

Material examined : Bangladesh : 6 ♀ ♀, Chittagong, Cox's Bazar, Himchari, ex. arum leaf (*Colocassia esculenta*), 24.xii.2003, coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong. *Elsewhere* : Cosmopolitan.

Remarks : *T. urticae* is a very serious pest of a number of important crop plants. It is known to attack over 200 plants all over the world (Smith-Meyer, 1987, Gupta, 1985, Gupta and Gupta, 1994). The infestation causes yellowing of leaves and then producing brownish patches on the leaves. The species was earlier recorded from Bangladesh (Dhaka) by Sanyal *et. al.*, (2004) and Gupta *et. al.*, (2004).

Order MESOSTIGMATA

Family PHYTOSEIIDAE Berlese

3. Genus *Amblyseius* Muma

5. *Amblyseius (Amblyseius) herbicolus* (Chant)

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

2003. *Amblyseius (Amblyseius) herbicolus*, Gupta, *Mem. zool. Surv. India*, 20 : 18-20.

Diagnosis : Female : 357 µm. long, 255 µm wide; dorsal shield slightly rugose, with 17 pairs of setae; measuring j_1 -25, j_3 -33, s_4 -107, Z_5 -205, Z_4 -125. Ventrianal shield 116-120, 70-80 wide, macrosetae on genu IV-129, tibia IV-90, basitarsus IV-70, leg chaetotactic formula : genu II- $2 \frac{2}{0} \frac{2}{0}$ 1, tibia II- $1 \frac{1}{1} \frac{2}{1}$ 1, genu III- $1 \frac{2}{0} \frac{2}{1}$ 1, tibia III- $1 \frac{1}{1} \frac{2}{1}$ 1, spermatheca with fundibuliform cervix. Chelicera with 2 teeth.

Material examined : Bangladesh : 4 ♀ ♀, Chittagong, Cox's Bazar, Himchari, ex. banana leaf and arum leaf, 24.xii.2003, coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong. *Elsewhere :* India, Brazil, British West Indies, Taiwan, Thailand, Japan, Madagascar, Mexico, North America, Philippines, Portugal, South America, Taiwan, Thailand.

Remarks : The paper reports banana and arum as the first record of the habitat of the mite species. It is a very efficient predator of mostly tetranychid mites.

6. *Amblyseius (Amblyseius) largoensis* (Muma)

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

2003. *Amblyseius (Amblyseius) largoensis* (Muma), Gupta, *Mem. zool. Surv. India*, **20**(1) : 22-23.

Diagnosis : Smooth dorsal shield with 17 pairs of minute setae except j_1 , j_3 , s_4 , Z_5 and Z_4 ; which measure 30-36, 45-49, 94-100, 247-268 and 95-106, respectively. Sternal shield longer (86) than broad (74) with 3 pairs of setae. Ventrianal shield 105-110 long, 70-75 wide with 3 pairs of setae. Macrosetae on leg IV : genu 95-105, tibia 67-76, basitarsus 40-54. Leg chaetotactic formula genu II-2 $\frac{2}{0} \frac{2}{0} 1$, tibia II-1 $\frac{1}{1} \frac{2}{1} 1$, genu III-1 $\frac{2}{1} \frac{2}{0} 1$, tibia III-1 $\frac{1}{1} \frac{2}{1} 1$.

Material examined : Bangladesh : 4 ♀ ♀, Chittagong, Cox's Bazar, Himchari, ex. banana leaf, 24.xii.2003, coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong. *Elsewhere :* Angola, Brazil, China, Costa Rica, Guatemala, Honduras, Hong Kong, India, Israel, Jamaica, Japan, Kenya, Mexico, New Calidonia, New Zealand, Papua New guinea, Philippines, Puerto Rico, South Africa, Taiwan, Thailand, Trinidad, USA, Western and Northern Iran.

Remarks : This abundantly available mite species were recorded on a number of plant species. This species in India is reported to be efficient predator of tetranychid (*Panonychus citri*, *Oligonychus mangiferus*, *Tetranychus urticae*), tenuipalpid (*Brevipalpus lewisi*) and eriophyid (*Aceria litchi*) mites (Gupta, 2003).

7. *Amblyseius (Euseius) coccineae* Gupta

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

2003. *Amblyseius (Euseius) coccineae*, Gupta, *Mem. zool. Surv. India*, **20**(1) : 35-36.

Diagnosis : Reticulate dorsal shield with 17 pairs of minute setae; measuring : j_1 -25, j_4 - j_5 -10-20 each, J_2 -15, J_5 -6, j_3 -30, z_2 -20, z_4 -20, s_4 -35, Z_1 -11-14, S_2 -20, S_4 -22, S_5 -26, Z_5 -60, z_5 -9, Z_4 -13. Macrosetae on leg IV : genu-37-45, tibia-35, basitarsus-50. Leg chaetotactic formula genu III-2 $\frac{2}{0} \frac{2}{0} 1$, tibia II-1 $\frac{1}{1} \frac{2}{1} 1$, genu III-1 $\frac{2}{1} \frac{1}{1} 1$. Ventrianal shield vase-shaped with 3 pairs of preanal setae.

Material examined : Bangladesh : 5 ♀ ♀, Chittagong, Cox's Bazar, Himchari, ex. banana leaf, 24.xii.2003, coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong. *Elsewhere* : India.

Remarks : The species is known to feed on eggs of *Oligonychus indicus* and *Eutetranychus orientalis* (Gupta, 2003).

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

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

2003. *Amblyseius (Euseius) ovalis*, Gupta, *Mem. zool. Surv. India*, **20**(1) : 42-43.

Diagnosis : Dorsal shield with 17 pairs of small setae measuring j_1 -30, j_4 - j_6 , J_2 - J_5 -4-5 each, Z_5 -50, z_5 -4, Z_4 -6. Macrosetae on leg IV : genu-35, tibia-27, basitarsus-49. Ventrianal shield oval, with 3 pairs of preanal setae and a pair of crescent-shaped preanal pores; spermatheca bowl-shaped.

Material examined : Bangladesh : 1 ♀, Chittagong, Cox's Bazar, Himchari, ex banana leaf, 24.xii.2003, coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong, *Elsewhere* : Africa, Australia, Hawaii, Hong Kong, India, Indonesia, Japan, Malay, Mauritius, Mexico, Philippines, New Zealand.

Remarks : The species is reported to be an efficient predator of a large number species of tetranychid and tarsonemid mite as well as of white fly (Gupta, 2003).

9. *Amblyseius (Euseius) pruni* Gupta

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

2003. *Amblyseius (Euseius) pruni*, Gupta, *Mem. zool. Surv. India*, **20** : 43-44.

Diagnosis : Female : 315 µm long, 230 µm wide; dorsal shield reticulate, with 17 pairs of setae measuring j_1 -30, j_4 , j_5 , J_5 -15, J_5 -6, z_2 , z_4 -22, each, s_4 -34, Z_1 -15, S_2 -22, S_4 -22, S_5 -26, Z_5 -65 (serrate), z_5 , Z_4 -12-14 and 4 pairs of pores; sternal shield with 3 pairs of sternal setae, slightly longer than wide, metasternal plate slightly oval with a seta; genital shield wide with a pair of genital setae; ventrianal shield longer than wide, with 3 pairs of preanal setae, one pair of semilunar preanal pores, 4 pairs of setae and a few small platelets around ventrianal shield; spermatheca filamentous; chelicera with one or two teeth; macrosetae on leg IV : genu-35, tibia-30, basitarsus-49. Leg chaetotactic formula genu II-2 $\frac{2}{0} \frac{2}{0} 1$, tibia II-1 $\frac{1}{1} \frac{2}{1} 1$, genu III-1 $\frac{2}{0} \frac{2}{1} 1$, tibia II-1 $\frac{1}{1} \frac{2}{1} 1$.

Material examined : Bangladesh : 6 ♀ ♀, Chittagong, Cox's Bazar, Himchari, ex. banana leaf, 24.xii. 2003. coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong. *Elsewhere* : India.

Remarks : The record of this mite on Banana leaf (*Musa sapientum*) is made here for the first time. The economic importance of the species is not clearly known.

10. *Amblyseius (Paraphytoseius) multidentatus* (Swirski and Shechter)

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

2003. *Amblyoseius (Paraphytoseius) multidentatus*, Gupta, *Mem. zool. Surv. India*, **20**(1) : 59-60.

Diagnosis : Dorsal shield elongate, notched at the level of s_4 , with 14 pairs of setae; setae j_1 , j_3 , s_4 , Z_4 and Z_5 long, thick and serrate; measuring j_1 -30-36, 78-88, 115-120, 85-100 and 70-82, respectively. Ventrianal shield with 3 pairs of preanal setae. Macrosetae on leg IV : genu-30, tibia-35, basitarsus-40.

Material examined : Bangladesh : 2 ♀ ♀, Chittagong, Cox's Bazar, Himchari, ex. banana leaf, 24.xii.2003, coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong. *Elsewhere* : China, Hong Kong, India, Madagaskar, Malaysia, Nigeria, Philippines, Thailand.

Remarks : This is an abundantly occurring species of mite on different plants and is known to be feeding on or associated with tetranychid, tenupalpid and tarsonemid mites. However, predatory habit of the species is doubtful.

11. *Amblyseius (Typhlodomalus) kalimpongensis* Gupta

1970. *Amblyseius kalimpongensis* Gupta, *Bull. Ent.*, **10** : 128-129.

2003. *Amblyoseius (Typhlodomalus) kalimpongensis*, Gupta, *Bull. zool. Surv. India*, **20**(1) : 68-69.

Diagnosis : Smooth dorsal shield with 17 pairs of setae measuring j_1 -20, j_4 -18, j_5 -18, j_6 -18, J_2 -18, J_5 -6, j_3 -27, z_2 -25, z_4 -25, s_4 -30, Z_1 -18, S_2 -25, S_4 -20, S_5 -25, Z_5 -5, z_5 -16, Z_4 -25 and 5 pairs of pores; metasternal plates absent, only seta present; ventrianal shield vase-shaped, strongly concave laterally, with 3 pairs of preanal setae and a pair of pores. Macrosetae on leg IV : basitarsus-32.

Material examined : Bangladesh : 3 ♀ ♀, Chittagong, Cox's Bazar, Himchari, ex. banana leaf, 24.xii.2003, coll. A. K. Sanyal.

Distribution : Bangladesh : Chittagong. *Elsewhere* : India.

Remarks : This species is not regarded as an efficient predator.

SUMMARY

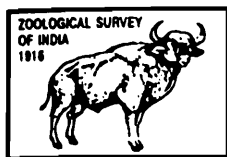
The paper reports 11 species of plant associated mites belonging to the orders of Prostigmata and Mesostigmata collected from banana (*Musa sapientum*) and arum (*Colocasia esculenta*) leaves from Cox's Bazar, Chittagong, Bangladesh. Of the 11 species belonging to 2 families and 3 genera, 10 are reported here for the first time from Bangladesh. The species *T. urticae* is already known from Bangladesh. Keys to identification of orders, families, genera and species; diagnostic features, distribution, collection data and economic importance if any of the species involved are incorporated in this paper.

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Rec. zool. Surv. India : 105 (Part 3–4) : 111-140, 2005

STUDIES ON SOME SPIDERS OF THE FAMILY GNAPHOSIDAE (ARANEAE : ARACHNIDA) FROM MADHYA PRADESH, INDIA

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INTRODUCTION

General : Gnaphosid spiders are found everywhere and can easily be seen running on the grassy land as well as on rocky ground and are strictly ground dwellers. Their body colour is brown and dull, so that they are inconspicuous on the ground vibrations or unturned the stones and they run inside the grass and hide under stones. Gnaphosid spiders occupy a variety of habitat from sea-shore to the high mountains, according to the specific requirements, viz. availability of food, humidity, temperature etc. Most of the gnaphosid spiders are nocturnal. Though the gnaphosid spiders in general do not spin webs, but some are seen to build the small tubular retreats, just underside of the stones, boulders where they stayed at day time and some prey is caught on the web, they come outside of the stone hole and caught, kill and suck the insects prey.

Most of gnaphosids are found under stones or barks or in moss. A few live on the leaves of plants which they roll like the clubionids or at the most they spin an irregular retreat at the time of oviposition. Some of the species that live under stones make a silken sac within which they live and in which the egg-sac is made. The chief food of gnaphosid spiders are insects. These spiders feed on a variety of insects like Diptera, small Lepidoptera, Dictyoptera, Hymenoptera, Coleoptera, Collembola, Dermaptera etc. They may even consume the young spiders of their own species as well as of different species showing cannibalism. Usually these feed in the night. Gnaphosids chase their prey, catch and bite them to inject the poison through the fangs and narcotise them. Then they suck the juices of the body of the prey. The chitinised remains of the insects can be seen on the ground or under stones of some gnaphosid species which inhabit there. The spiders of the family Gnaphosidae are very little known in the Indian fauna. Even the classical work of Pocock (1900) on Indian spiders contains no reference to this family. Caporiacco (1934) was the pioneer worker and he has described 10 species from Himalaya. Recently Tikader (1962, 64, 66, 73, 82),

Tikader & Gajbe (1975, 76, 77, 79) Gajbe (1979, 1983, a, b, 85a, b, c, d, 88, 89, 92a, b, c, d, e, f) described many species from various parts of India. Patel and Patel (1975) described three species from Gujrat.

All the type specimens are deposited in the National Zoological Collection, Zoological Survey of India, Kolkata.

Family GNAPHOSIDAE Pocock

1884. *Gnaphosidae* Pocock, *Ann. Mag. Nat. Hist.*, 2(7) : 219.

1905. *Drassidae* : Simon, *Annls. Soc. ent. Fr.*, 74 : 168-170.

Type-genus : *Gnaphosa* Latreille.

Distribution : All over the world.

Originally the family Gnaphosidae was a part of the family Drassidae. Pocock (1884) proposed to replace Drassidae when *Drassus* was shown to be an objective junior synonym of *Gnaphosa*. The gnaphosidae family formerly known as Drassidae are those spiders which have eight eyes, heterogenous, arranged in two rows. In these spiders the cephalic part is not sharply set off from the thoracic, the cephalothorax is hardly elevated. The Chelicerae have a boss and scopula and the margins of the cheliceral fang furrow are oblique and usually armed. The teeth may be considerably reduced in size to minute denticles, or a single denticle, or the inner margin may have a keeled lamina in place of teeth. The labium is longer than broad, with maxillae converging more or less and provided with scopulae. Usually the maxillae have an oblique or transverse depression. The posterior coxae are more or less separated by the sternum. The legs are generally spinose and the tarsi furnished with scopulae, two claws and claw tufts. Legs formula 4123. The abdomen is oval and usually rather flattened and in some males provided with a dorsal scutum on the abdomen. Many species are uniformly coloured, more often dark than and without markings. Some species have a striking or colourful pattern of lines or spots. The anterior spinnerets are cylindrical, longer than and more heavily sclerotized than the posterior and widely separated.

Most gnaphosids are found under stones or bark or in moss. A few live on the leaves of plants which they roll like the clubionids or at the most they spin an irregular retreat at the time of oviposition. Some of the species that live under stones make a silken sac within which they live and in which egg-sac is made.

Key to the Genera of the Family GNAPHOSIDAE

1. Inner margin of cheliceral fang furrow with a keeled lamina. 2
- Inner margin of cheliceral fang furrow smooth or with one or more distinct teeth or denticles. 3

2. Inner margin of chelicera with a wide serrated lamina. Posterior row of eyes much larger than the anterior with the medians nearer to each other than to the laterals. *Gnaphosa* Latreille
- Inner margin of chelicera with a broad kneel or a narrow lamina. Posterior median eyes oval in shape. *Callilepis* Westring
3. Posterior row of eyes very strongly procurved as nearly semicircular. 4
- Posterior row of eyes not strongly procurved. 5
4. Inner margin of furrow of chelicera with one tooth. Bulb of palpus of male with a stout median apophysis. *Scopodes* Chamberlin
5. Eyes of posteiror row nearly equal in size and equidistant from each other. *Scotophaeus* Simon
- Eyes of posterior row not equal in size and not equidistant from each other. 6
6. Tibia IV with two or more median dorsal spines 7
- Tibia IV with a single median dorsal or with none. 8
7. Posterior median eyes much larger than the posterior laterals and closer to laterals than to each other. Inner margin or chelicera without tooth. *Liodrassus* Chamberlin
- Posterior median eyes not much larger than the posterior laterals. Eye row widely separated; Posterior median eyes much nearer to each other than to laterals. Inner margin of chellcerae with tooth *Drassodes* Westring
8. Upper margin of furrow of chelicera unarmed, or provided with a keel or with three teeth, rarely more, the lower margin unarmed or with but a single tooth, bulb of male palpus with no apophysis, at most with one or several small teeth near base of embolus. 9
- Upper margin of furrow of chelicera with three to six distinct teeth, the lower margin provided with two or three rarely with only one; bulb of male paplus with one or more apophysis. 12
9. Posterior row of eyes more or less recurved. 10
- Posterior row of eyes more or less procurved or straight. 11
10. Tibia III with a median dorsal spines, carapace without distinct median furrow. *Sergiolus* Simon
- Tibia III with no median dorsal spines, Carapace with a distinct median furrow. *Poecilochroa* Westring

11. Lower margin of furrow of chelicera smooth, without any tooth, anterior median eyes usually obviously smaller than the laterals. Posterior eyes slightly larger than the laterals.
.....*Nodocion* Chamberlin
- Lower margin of furrow of chelicera with one tooth or nodule; anterior median eye usually as or larger than the laterals. Posterior median eyes always well separated from each other and smaller than or at most as large as the laterals. *Herpyllus* Hentz
12. Upper margin of chelicera with three teeth, the lower margin provided with two, all well developed. Posterior median eyes large and oblique, typically close together but well separated from the laterals. *Haplodrassus* Chamberlin
- Upper margin of furrow of chelicera provided with four to six teeth, the lower margin provided with to three small teeth or nodules, or rarely the upper margin armed with only one. Posterior medians are different 13
13. Posterior row of eyes straight or slightly procurved; the eyes are equidistant; the posterior medians are small and slightly larger than the laterals. *Zelotes* Gistel
- Posterior median eyes are very close together or contiguous, larger than the laterals, usually much so, oblique. *Drassyllus* Chamberlin

Genus 1. *Gnaphosa* Latreille

1804. *Gnaphosa* Latreille, *Nouv. Dict. Hist. Nat.*, **24** : 134.

1977. *Gnaphosa* : Tikader & Gajbe, *Rec. zool. Surv. India*, **73**(1-4) : 43.

1982. *Gnaphosa* : Tikader, *Fauna of India, Spiders*, **2**(2) : 329.

Characters : Cephalothorax nearly oval and broader in front, not attenuated. Pattern of widening streaks diverging from short fovea. Anterior row of eyes procurved (as seen from in front), occupying one-third to one half width of head. Posterior row considerably longer than anterior and rather strongly recurved, medians irregular in outline, larger than laterals and farther from them than from each other. Sternum oval, pointed behind. Chelicerae not very strong, vertical bearing numerous long bristles which form a scopula on inner part of apical surface. Inner margin with a prominent chitinous ridge, whose edge is concave and serrated. Outer margin with two teeth. Maxillae and labium shorter than that of *Drassodes*. Legs uniform in colour as carapace. Tibiae I and II with one to two ventral spines, metatarsi I and II with two to four ventral spines. Abdomen black or deep brown, with generally six faint marks or impressions dorsally, Male palp with a strong single tibial apophysis.

Type-species : *Gnaphosa licifuga* (Walckenaer)

Distribution : Europe, Asia, Africa and America.

Key to species of the genus *Gnaphosa* Latreille

1. Cephalothorax provided with deep brown narrow line encircling almost the entire boarder but without V-Shaped brown marking. Posterior median eyes slightly closer to laterals than to each other. Abdomen posteriorly provided with a whitish chevrons.
..... *poonaensis* Tikader
- Cephalothorax provided with a V-shaped conspicuous brown marking starting from fovea. Posterior median eyes slightly closer to each other than to adjacent laterals. Abdomen without chevrons. 2
2. Anterior row of eyes equal in size. Abdomen provided with some round chalk-white spots.
..... *pauriensis* Tikader & Gajbe
- Anterior row of eyes not equal in size, anterior medians smaller than the laterals. Abdomen uniform in colour without chalk-white spots *jodhpurensis* Tikader & Gajbe

1. *Gnaphosa poonaensis* Tikader

1973. *Gnaphosa poonaensis* Tikader, *Proc. Indian Acad. Sci.*, **77**(5) : 188.

Specimen examined : 1 ♀, Kaladehi village on Jabalpur-Nagpur Road, Jabalpur district, Madhya Pradesh. Coll. U. A. Gajbe, 30.X.1985. 1 ♂, on the bank of Sipnanadi at Bhodia kund Forest village, Betul district, M.P. Coll. H. S. Sharma, 29.III.1990. (Reg. No. A/1717). 1 ♀, Pratappur village, Panna district, M.P. Coll. R. K. Singh, 15.11.1987 (Reg.No. A/1718), 1 ♀, Madla village, Panna district, M.P. Coll. R. K. Singh, 14.11.1987 (Reg. No. A/1719).

Distribution : India : Poona (Type-locality) Maharashtra, Andhra Pradesh, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Jabalpur, Betul, Panna districts of Madhya Pradesh.

2. *Gnaphosa pauriensis* Tikader & Gajbe

1977. *Gnaphosa pauriensis* Tikader & Gajbe, *Rec. zool. Surv. India*, **73**(1-4) : 44.

Specimen examined : 4 ♀♀, Tondabeda village near Orccha, Bastar district, Madhya Pradesh, Coll. U. A. Gajbe, 29.XII.1983. (Reg. No. A/1583), 1 ♂, University Guest House, Gwalior, M.P. Coll. P. D. Gupta, 25.VIII.1984. (Reg. No. A/1720). 1 ♀, Gupt Mahadev, Piparia Tahsil, Hoshangabad district, M.P. Coll. U. A. Gajbe, 5.1.1990 (Reg. No. A/1721).

Distribution : India : Bhagwan Shrinagar, Dist. Pauri (Type-locality) Uttar Pradesh, Bihar, Himachal Pradesh, Orissa, Punjab, Bastar, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

3. *Gnaphosa jodhpurensis* Tikader & Gajbe

(Figs. 1-2)

1977. *Gnaphosa jodhpurensis* Tikader & Gajbe, *Rec. zool. Surv. India*, 73(1-4) : 45.

Specimen examined : 1 ♂, Narayanganj, Dist. Mandla, M.P. India, Coll. U. A. Gajbe, 23.1.1985.

General : Cephalothorax and legs reddish-green, abdomen brown, Total length 7.90 mm. Carapace 3.40 mm. long, 2.30 mm. wide; abdomen 4.60 mm. long, 2.80 mm. wide.

Cephalothorax : Longer than wide, narrowing in front, slightly convex, posterior middle provided with a inconspicuous fovea and V-shaped brown patch starting from fovea, clothed with pubescence and some spines as in fig. 1. Eyes in two rows, anterior medians black, posterior row slightly longer than the anterior row. Anterior row of eyes slightly procurved (as seen from in front), medians smaller than the laterals and closer to laterals than to each other. Posterior row of eyes slightly recurved, posterior medians conspicuously silvery white in colour, oval, larger than the laterals and closer to each other than to adjacent laterals. Sternum heart-shaped, pointed behind, rebordered, clothed with fine hairs. Labium and maxillae longer than wide, anterior end provided with scopulae. Chelicerae vertical, inner margin provided with a chitinous ridge. Legs relatively long and strong, clothed with hairs and spines. Legs formula 4123. Male palp as in fig. 2.

Abdomen : Nearly elliptical, clothed with hairs, provided with three pairs of sagilla. Ventral side slightly lighter than the dorsal. Spinnerets very prominent, anterior spinnerets cylindrical, slightly longer and dark in colour than others.

Distribution : India, Rajasthan, Sardar Samand, dist. Jodhpur (Type-locality), Madhya Pradesh, Narayanganj, Dist. Mandla. Uttar Pradesh.

Remarks : The male specimen is described here for the first from India and the species is being reported here for the first time from Mandla district of Madhya Pradesh.

Genus 2. *Callilepis* Westring

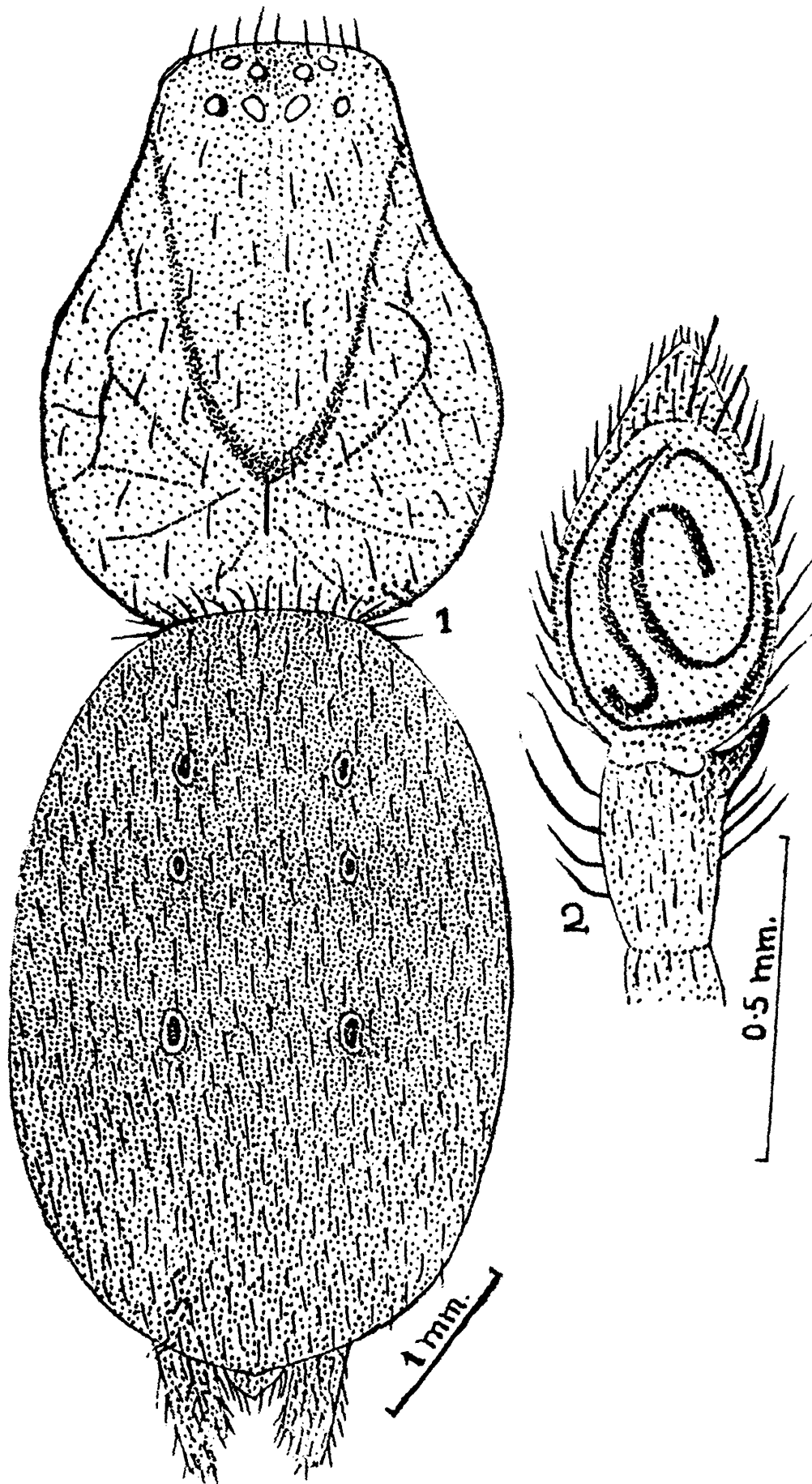
1874. *Callilepis* Westring, *Goteb. Kongl. Vet. Handl.*, 14 : 43.

1892. *Callilepis* : Simon, *Hist. Nat. Araign*, 1 : 383-384.

Characters : Posterior row of eyes a little longer than the anterior row and stright or only slightly recurved. The eyes nearly equidistant or the medians little farther from each other than from the laterals. The posterior lateral eyes fairly larger than the posterior median eyes. Sternum short, stout much wider than length of endites. The lower margin of the furrow of the chelicerae armed with a broad keel or a narrow lamina, without serrated edge.

Type-species : *Callilepis nocturna* (Linnaeus)

Distribution : Europe, Arabia, Ethiopia, Africa, Australia, America, India.



Figs. 1-2. : *Gnaphosa jodhpurensis* Tikader & Gajbe
1. Dorsal view of male, legs omitted; 2. Left male palp, Ventral view.

4. *Callilepis lambai* Tikader & Gajbe

1977. *Callilepis lambai* Tikader & Gajbe, *Rec. zool. Surv. India*, **73**(1-4) : 50.

1982. *Callilepis lambai* : Tikader, *Fauna of India, spiders*, **2**(2) : 352.

1988. *Callilepis lambai* : Gajbe, *Rec. zool. Surv. India*, **85**(1) : 65.

Specimen examined : 1 ♀♀, Hanumanghat, Balaghat district, Madhya Pradesh, Coll. U. A. Gajbe, 17.III.1983. (Reg. No. 1584.)

Distribution : India : Kudgiri (Type-locality) Dist. Shimoga, Karnataka, Jabalpur, Balaghat, Madhya Pradesh, Punjab.

Remarks : This species is being reported here for the first time from Balaghat district of Madhya Pradesh.

Genus 3. *Scopodes* Chamberlin

1922. *Scopodes* Chamberlin *Proc. biol. Soc. Wash.*, **35** : 156.

1940. *Scopodes* : Comstock, *The Spider Book*, New York : 328.

Characters : The cephalothorax is ovate and much narrower in front. The anterior row of eyes are close together in a procurved line, the anterior medians are larger than the anterior laterals. The posterior row of eyes are very strongly procurved in a semicircular line which is more or less equal or slightly longer than the anterior line. The chelicerae are of moderate size, the inner margin is armed with a single, minute tooth. The spinnerets are comparatively long. The bulb of the male palpus has a stout median apophysis.

Type-species : *Scopodes catharium* Chamberlin.

Distribution : Claremont, America, India.

5. *Scopodes maitraiae* Tikader & Gajbe

1977. *Scopodes maitraiae* Tikader & Gajbe, *Rec. zool. Surv. India*, **73**(1-4) : 14.

1982. *Scopodes maitraiae* : Tikader, *Fauna of India, Spiders*, **2**(2) : 365.

1988. *Scopodes maitraiae* : Gajbe, *Rec. zool. Surv. India*, **85**(1) : 65.

Specimen examined : 1 ♀, Narayanganj, Mandla district, Madhya Pradesh. Coll. U. A. Gajbe, 23.1.1985 (Reg. No. A/1592), 19 ♀♀, 3 ♂♂, Ganjtal village on Jabalpur-Katni road, Jabalpur district, Madhya Pradesh, Coll. D. S. Mathur, 4.ix.1985 (Reg. No. A/1737), 1 ♀, Hathital Colony, Jabalpur, Jabalpur District, Madhya Pradesh, Coll. P. D. Rane, 28.1.1986. 1 ♀, Shelter Caves, Hoshangabad, M.P. Coll. U. A. Gajbe 10.1.1990 (Reg. No. A/1736), 3 ♀♀, on the bank of Sanpna tank, Betul, M.P. Coll. H. S. Sharma, 27.III.1990. (Reg. No. A/1738).

Distribution : India : Kopargaon (Type-locality) Ahmednagar district, Poona Maharashtra, Gujarat, Jabalpur, Seoni, Mandla, Madhya Pradesh, Orissa.

Remarks : This species is being reported here for the first time from Mandla, Hoshangabad, Betul districts of Madhya Pradesh.

Genus 4. *Megamyrmecon* Reuss

1834. *Megamyrmecon* Reuss, *Zool. Miscell. Mus. Ar.*, : 217.

1893. *Megamyrmecon* : Simon, *Hist. Nat. Araign.* 1(2) : 369.

Characters : The cephalothorax is ovate and much narrow in front. The anterior row of eyes are close together in a strongly procurved line, the anterior medians are larger than the laterals. The posterior row of eyes are very strongly procurved in a semicircular line which is more or less equal or slightly longer than the anterior line. The chelicerae are of moderate size, with the inner margin of the furrow unarmed, and with two minute teeth on the outer margin. The spinnerets are comparatively long. Bulb of palpus of male simple, with no true apophysis.

Type-species : *Megamyrmecon caudatum* Reuss.

Distribution : Africa, America, India.

6. *Megamyrmecon ashae* Tikader & Gajbe

1977. *Megamyrmecon ashae* Tikader & Gajbe, *Rec. zool. Surv. India*, 73(1-4) : 16.

1982. *Megamyrmecon ashae* : Tikader, *Fauna of India, Spiders*, 2(2) : 372.

Specimen examined : 1 ♀, Mura village, Betul district, M.P. Coll. H. S. Sharma, 4.III.1990 (Reg. No. A/1739). 1 ♀, Singhpur village, Panna district, M.P. Coll. R. K. Singh, 16.II.1987. (Reg. No. A/1740).

Distribution : India : Range Hill, Poona (Type-locality), Maharashtra, Rajasthan, Khargone, Betul, Panna, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Betul and Panna districts of Madhya Pradesh.

Genus 5. *Scotophaeus* Simon

1893. *Scotophaeus* Simon, *Hist. Nat. Araign.* 1 : 371.

1951. *Scotophaeus* : Locket & Millidge, *British Spiders*, 1 : 104.

Characters : General appearance very similar with *Drassodes* Westring. Carapace narrower in front than the *Drassodes*, with a fovea. Eyes of anterior medians larger than the laterals, medians are circular and anterior lateral elliptical. Posterior row slightly longer than anterior, very slightly procurved, eyes equidistant and nearly equal, posterior medians elliptical in shape.

Type-species : *Scotophaeus quadripunctuatus* Latreille.

Distribution : Oriental and temperate regions of the world.

7. *Scotophaeus poonaensis* Tikader

1982. *Scotophaeus poonaensis* Tikader, *Fauna of India, Spiders*, 2(2) : 380.

Specimen examined : 1 ♀, Bargi village, Jabalpur district, Madhya Pradesh, Coll. U. A. Gajbe, 10.VI.1982 (Reg. No. A/1588). 1 ♀, Dokrikhera, Piparia. Tahsil, Hoshangabad, district, M.P. Coll. U. A. Gajbe, 4.1.1990. (Reg. No. A/1733).

Distribution : India : Aundh, Poona, (Type-locality), Maharashtra, Jabalpur and Hoshangabad district, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

Genus 6. *Geodrassus* Chamberlin

1922. *Geodrassus* Chamberlin, *Proc. biol. Soc. Wash.*, 35 : 159.

1940. *Geodrassus* : Comstock, *The Spider Book*, New York, : 325.

Characters : This genus is closely allied to *Drassodes*. The lower margin of the furrow of the chelicera is armed with a single small tooth. The eyes of the anterior row are subequal in size. The palpus of the male is very short, and the tibia completely lacks an apophysis.

Type-species : *Geodrassus gosiutus* (Chamberlin).

Distribution : Utah, America, India.

8. *Geodrassus sirmourensis* Tikader & Gajbe

1977. *Geodrassus sirmourensis* Tikader & Gajbe, *Rec. zool. Surv. India*, 73(1-4) : 71.

1982. *Geodrassus sirmourensis* : Tikader, *Fauna of India, Spiders*, 2(2) : 386.

Specimen examined : 1 ♀, Keshala village on Itarsi-Betul road, Hoshangabad district, M.P. Coll. U. A. Gajbe, 11.I.1990. (Reg. No. A/1732).

Remarks : This species is being reported here for the first time from Madhya Pradesh.

Genus 7. *Drassodes* Westring

1861. *Drassodes* Westring, *Göteborg, Kongl. Vet. Handl.*, 2 : 25.

1962. *Drassodes* : Tikader, *Proc. First. Cong.*, 2 : 570.

Characters : Cephalothorax flat, broad in front with fovea and covered with pubescence. Eyes of anterior row slightly procurved (as seen from in front), medians slightly larger than laterals and a little closer to the laterals than to each other. Posterior row longer, procurved, medians oval, slightly larger than laterals and much closer to each other than to adjacent laterals. Chelicerae strong, inner margin normally with two teeth and two on the outer margin. Sternum oval and pointed behind. Maxillae and labium longer than wide. Legs long and strong, tibiae I and II

sometimes bear one ventral spine on the apical half. Scopulae consists of closely set, short blunt little spines. Abdomen longer than wide, narrowing behind, covered with pubescence and with a 'mousy' appearance.

Type-species : *Drassodes lapidosus* (Walck).

Distribution : Oriental, sub-tropical and temperate regions of the world.

Key to species of the genus *Drassodes* Westring

1. Spiders of smaller size, upto 5 mm. 2
- Spiders of bigger size, more than 5 mm. 3
2. Carapace clothed with pubescence. Posterior median eyes larger than laterals and slightly closer to lateral than to each other. Abdomen provided with conspicuous long thick hairs *oppenheimeri* Tikader
- Carapace clothed with pubescence and some hairs. Posterior median eyes much larger than the laterals and very close to each other than to adjacent laterals. Abdomen clothed with hairs and three pairs of lighter spots. *sagarensis* Tikader
3. Carapace with conspicuous fovea. Inner and outer margin of chelicera provided with two small and two slightly bigger teeth each. Abdomen clothed with thick hairs, without black patch. *pashanensis* Tikader & Gajbe
- Carapace with inconspicuous fovea. Inner and outer margin of chelicera provided with two and three teeth respectively. Abdomen clothed with mousy hairs and provided with transverse black patch. *narayanpurensis* sp. nov.

9. *Drassodes oppenheimeri* Tikader

1973. *Drassodes oppenheimeri* Tikader, *Proc. Indian Acad. Sci.*, 77(5) : 186.

1982. *Drassodes oppenheimeri* : Tikader, *Fauna of India, Spiders*, 2(2) : 400.

Specimen examined : 1 ♀, Dhuma, Seoni district, Madhya Pradesh. Coll. U. A. Gajbe, 10.VIII.1982 (Reg. No. A/1575). 1 ♀, Karondi village, Jabalpur district, M.P. Coll. U. A. Gajbe, 6.II.1982 (Reg. No. A/1576). 1 ♀, Amkhas village, Jabalpur district, Madhya Pradesh. Coll. V. V. Rao, 4.VII.1969.

Distribution : India : Singhpur (Type-locality) Hooghly district, West Bengal, Gujarat, Orissa, Maharashtra, Seoni, Jabalpur district, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Seoni and Jabalpur districts of Madhya Pradesh.

10. *Drassodes sagarensis* Tikader

1982. *Drassodes sagarensis* Tikader, *Fauna of India, Spiders*, 2(2) : 402.

Specimen examined : 1 ♀, Jhansighat, Jabalpur district, Madhya Pradesh, Coll. U. A. Gajbe, 10.III.1983 (Reg. No. A/1582). 1 ♂, Parasia, Chhindwara district, Madhya Pradesh, Coll. Y. N. Gupta, 19.XI.1989. (Reg. No. 1726). 1 ♀, Tanhaigram, Panna district, M.P. Coll. R. K. Singh, 17.II.1987. (Reg. No. A/1727).

Distributions : Rest House compound, Sagar (Type-locality), Karanataka, Jabalpur, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

11. *Drassodes pashanensis* Tikader & Gajbe

1977. *Drassodes pashanensis* Tikader & Gajbe, *Rec. zool. Surv. India.*, 73(1-4) : 64.

1982. *Drassodes pashanensis* : Tikader, *Fauna of India, Spiders*, 2(2) : 429.

Specimen examined : 1 ♀, Hatkachora village near Jagdalpur, Bastar district, Madhya Pradesh. Coll. U. A. Gajbe, 5.I.1984. (Reg. No. A/1577). 3 ♀♀, 1 ♂, Karondi village, Jabalpur district, Madhya Pradesh, Coll. U. A. Gajbe, 6.II.1982 (Reg. No. A/1579). 1 ♀, Charama, Bastar district, Madhya Pradesh. Coll. U. A. Gajbe, 5.I.1984. (Reg. No. A/1578). 12 ♀♀, Shivpuri National park, Shivpuri district, Madhya Pradesh. Coll. P. D. Rane, 28.II.1982. (Reg. No. A/1580). 1 ♀, Porpa village near Jagdalpur, Madhya Pradesh Coll. U. A. Gajbe, 31.XII.1983. (Reg. No. A/1581). 1 ♀, on the bank of Nāla, 1 Km. West of Forest Rest House Katawadi, Betul district, M.P. Coll. H. S. Sharma, 22.III.1990 (Reg. No. A/1723). 1 ♀, Tawa River bridge on Hoshangabad-Piparia road, Hoshangabad district, M.P. Coll. U. A. Gajbe, 12.I.1990. (Reg. No. A/1724). 1 ♀, on the bank of Sanpana tank Betul, M.P. Coll. H. S. Sharma, 27.III.1990. (Reg. No. A/1725).

Distribution : India : Pashan, Poona (Type-locality) Maharashtra, Shivpuri, Bastar, Madhya Pradesh, Orissa, Pubjab, Bhutan.

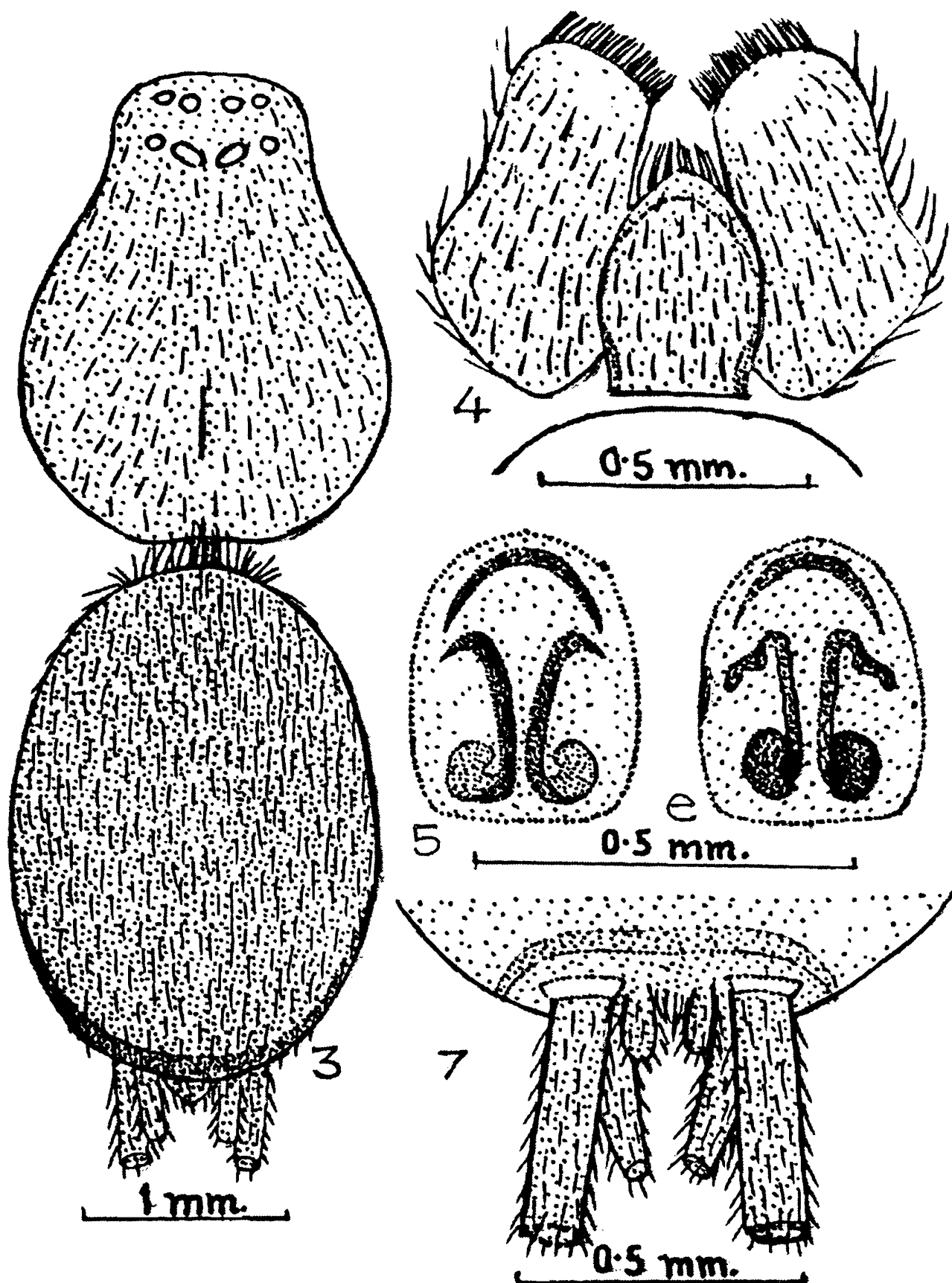
Remarks : This species is being reported here for the first time from Madhya Pradesh.

12. *Drassodes narayanpurensis* sp. nov.

(Figs. 3-7)

General : Cephalothorax and legs light reddish-green, abdomen brown. Total length 5.20 mm. Carapace 2.30 mm. long, 1.90 mm. wide; abdomen 2.70 mm. long, 1.90 mm. wide.

Cephalothorax : Longer than wide, flat, cephalic region slightly high and wide with fine pubescence and some hairs, posterior middle provided with a short incon-spicious longitudinal fovea. Eyes pearly white except anterior medians, posterior row of eyes slightly longer than the



Figs. 3-7. : *Drassodes narayanpurensis* sp. nov.

3. Dorsal view of female, legs omitted; 4. Labium and maxillae;

5. Epigyne; 6. Internal genitalia; 7. Spinnerets.

anterior row. Anterior row of eyes slightly procurved (as seen from in front), medians, black, larger than the laterals which are oval and closer to adjacent laterals than to each other. Posterior row of eyes strongly procurved, medians oval, larger than the laterals and closer to each other than to adjacent laterals. Median ocular quadrangle longer than broad and wider in front than behind. Clypeus provided with a short and long spines, clypeal height is greater than the diameter of anterior median eye. Chelicerae vertical, strong, inner margin provided with two teeth and outer margin with three dissimilar teeth. Sternum oval, pointed behind, clothed with fine hairs. Labium and maxillae longer than wide, yellow in colour, clothed with hairs and anterior end provided with scopulae as in fig. 4. Legs long and strong, clothed with hairs and some spines. Metatarsi and tarsi I and II provided ventrally with conspicuous scopulae and tarsi with two claws and claw tufts. Leg formula 4123.

Abdomen : Longer than wide, nearly elliptical, clothed with mousy hairs, anterior end of abdomen provided with very long hairs and posterior end with transverse black patch as in fig. 3. Ventral side lighter than the dorsal. Epigyne as in fig. 5. Internal genitalis as in fig. 6. Spinnerets as in fig. 7.

Type-specimen : *Holotype* ♀, in spirit, other details as above. Registration No. 5448/18.

Type-locality : India : Madhya Pradesh, Dhaurai village Narayanpur Tahsil, Bastar district, Coll. U. A. Gajbe, 24.XII.1983.

Remarks : This species closely resemble *Drassodes himalayensis* Tikader and Gajbe but can be separated as follows : (1) Outer margin of chelicera provided with three teeth but in *D. himalayensis* outer margin with two teeth. (ii) Abdomen dorsally provided with transverse black patch but in *D. himalayensis* abdomen without patch. (iii) Epigyne and internal genitalis also structurally different.

13. *Drassodes himalayensis* Tikader & Gajbe

1975. *Drassodes himalayensis* Tikader & Gajbe, *Oriental Ins.*, 9(3) : 274.

1982. *Drassodes himalayensis* : Tikader, *Fauna of India, Spiders*, 2(2) : 427.

Specimen examined : 1 ♀, 1 ♂, On the bank of Sanpna tank Betul, Betul district, Madhya Pradesh. Coll. H. S. Sharma, 27.III.1990 (Reg. No. A/1722)

Distribution : India : Harsil, Dist. Uttarkashi, (Type-locality), Uttar Pradesh, Assam, Himachal Pradesh, Jammu and Kashmir, Arunachal Pradesh, Madhya Pradesh, Meghalaya, Orissa, Rajasthan, West Bengal.

Remarks : This species is only known from Seoni and Sarguja districts and first time reported here from Betul district of Madhya Pradesh.

14. *Drassodes meghalayaensis* Tikader & Gajbe

1977. *Drassodes meghalayaensis* Tikader & Gajbe, *Rec. zool. Surv. India*, **73**(1-4) : 66.

Specimen examined : 1 ♀, On the bank of Sanpna tank, Betul, Betul district; Coll. H. S. Sharma, 27.III.1990. (Reg. No. A/1728)

Distribution : India : Degrangiri, Garo Hills, Meghalaya (Type-locality), Betul district, Madhya Pradesh.

Remarks : This species is being reported here for the first time Madhya Pradesh.

Genus 8. *Sosticus* Chamberlin

1922. *Sosticus* Chamberlin, *Proc. biol. Soc. Wash.*, **35** : 160.⁴

1940. *Sosticus* : Comstock, *The Spider Book*, New York, : 329.

Characters : Eye rows distinctly separated, posterior row of eyes is in a straight line. The anterior median eyes are slightly smaller than the anterior lateral eyes. The median ocular quadrangle is somewhat longer than broad, and the front eyes are as large as or longer than the posterior median eyes. The inner margin of the furrow of the chelicera is armed ordinary with-two teeth, but three are some times present. Two spines are present on the dorsal surface of the fourth tibia.

Type-species : *Sosticus insularis* (Banks).

Distribution : America, India.

15. *Sosticus poonaensis* Tikader

1982. *Sosticus poonaensis* Tikader, *Fauna of India, Spiders*, **2**(2) : 440.

Specimen examined : 1 ♀, On the bank of Chuharinala, Kanha National Park, Kanha, M.P. Coll. R. K. Singh, 28.XI.1986. (Reg. No. A/1734)

Distribution : India : Mukund Nagar, Poona (Type-locality) Maharashtra, Kanha National Park, Kanha, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

16. *Sosticus dherikanalensis* Gajbe

1979. *Sosticus dherikanalensis* Gajbe, *Bull. zool. Surv. India*, **2**(1) : 71.

1982. *Sosticus dherikanalensis* : Tikader, *Fauna of India, Spiders*, **2**(2) : 434.

Specimen examined : 1 ♀, Ganjtal village, Jabalpur district, M.P. Coll. D. S. Mathur, 4.IX.1985. (Reg. No. A/1735).

Distribution : India : Tikarpara, Dist. Dherikanal, (Type-locality), Orissa, Jabalpur, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

Genus 9. *Sergiolus* Simon

1891. *Sergiolus* Simon, *Proc. zool. Soc. London*, : 573.

1922. *Sergiolus* : Chamberlin, *Proc. biol. Soc. Wash.*, **35** : 151.

Characters : These spiders are brightly coloured. Both rows of eyes straight or slightly recurved, posterior median eyes round and median ocular area longer than wide and wider behind than in front. Inner margin of chelicera with one small tooth or unarmed. Tibia III provided with a median dorsal spine.

Type-species : *Sergiolus variegatus* (Hentz).

Distribution : America, India.

17. *Sergiolus singhi* Tikader & Gajbe

1976. *Sergiolus singhi* Tikader & Gajbe, *Proc. Indian Acad. Sci.*, **84**(5) : 189.

1982. *Sergiolus singhi* : Tikader, *Fauna of India, Spiders*, **2**(2) : 445.

1988. *Sergiolus singhi* : Gajbe, *Rec. zool. Surv, India*, **85**(1) : 70.

Specimen examined : 2 ♀♀, On the bank of Gajana Nalla, near Bargi village, Jabalpur district, Madhya Pradesh, Coll. U. A. Gajbe, 30.XI.1985. 1 ♀, Bhilkhurva village on Jabalpur Katangi road, Jabalpur district, M.P. Coll. U. A. Gajbe, 5.XII.1985. (Reg. No. A/1729). 1 ♀, Katav village near Katangi, Jabalpur district, M.P. Coll. U. A. Gajbe, 5.XII.1985. (Reg. No. A/1730).

Distribution : India : Forest Lodge compound, Bellara (Type-locality), Sira Tahsil, Tumkur district, Karnataka, Bhandara, Madharashtra, Jabalpur district, Madhya Pradesh.

Remarks : This species is being reported here for the first time from the localities mentioned above from Madhya Pradesh.

18. *Sergiolus poonaensis* Tikader & Gajbe

1976. *Sergiolus poonaensis* Tikader & Gajbe, *Proc. Indian Acad. Sci.*, **84**(5) : 186.

1982. *Sergiolus poonaensis* : Tikader, *Fauna of India, Spiders*, **2**(2) : 447.

Specimen examined : 1 ♀, 1 ♂, Borla village, Kawardha Tahsil, Rajnandgaon district, Madhya Pradesh, Coll. U. A. Gajbe, 7.I.1984 (Reg. No. A/1574) 1 ♀, 1 ♂, Shikara village, Lakharadon Tahsil, Seoni district, M.P. Coll. U. A. Gajbe, 26.XI.1986. (Reg. No. A/1731).

Genus 10. *Herpyllus* Hentz

1832. *Herpyllus* Hentz, *Silliman Soum. Sci. a. Arts*, **21** : 102.

1922. *Herpyllus* : Chamberlin, *Proc. biol. Soc. Wash.*, **35** : 146.

Characters : The two rows of eyes are nearly straight and widely separated, the eyes of each row are quite evenly spaced. The anterior median eyes are round, a little smaller than the posterior

lateral eyes. Height of clypeus is not more than the diameter of an anterior median eyes. Lower margin of furrow of chelicera is armed with one tooth or nodule.

Type-species : *Herpyllus ecclesiasticus* Hentz.

Distribution : United States of America, India.

19. *Herpyllus goaensis* Tikader

1982. *Herpyllus goaensis* Tikader, *Fauna of India, Spiders*, 2(2) : 460.

Specimen examined : 2 ♀♀, Narayanganj, Mandla district, Madhya Pradesh, Coll. U. A. Gajbe, 23.I.1985 (Reg. No. 1590). 1 ♀, Haratickeri village near Ambikapur, Sarguja district, Madhya Pradesh. Coll. H. Khajuria, 4.1.1975 (Reg. No. A/1601). 1 ♀, on the bank of Gajana Nalla, near Bargi, Jabalpur district, Madhya Pradesh. Coll. U. A. Gajbe, 30.XI.1985.

Distribution : India : Caranzalem (Type-locality), Goa, Jabalpur, Mandla, Sarguja districts of Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

Genus 11. *Haplodrassus* Chamberlin

1922. *Haplodrassus* Chamberlin, *Proc. biol. Soc. Wash.*, 35 : 151.

1940. *Haplodrassus* : Comstock, *The Spider Book*, New York, : 326.

1982. *Haplodrassus* : Tikader, *Fauna of India, Spiders*, 2(2) : 462.

Characters : Carapace flat, ocular area narrowed, thoracic region with thin erect black setae, cephalic area not elevated. Anterior row of eyes slightly procurved (as seen from in front), and posterior row of eyes procurved. Eyes of the anterior row round. Posterior medians larger than others, and close together, well away from the posterior laterals, Median ocular area wide behind than in front. Height of the clypeus greater than the diameter of anterior medians. Inner margin of cheliceral furrow bears two teeth and outer margin with two or three teeth. Leg formula 4123. Fourth tibia without spines on dorsal side. Anterior spinnerets widely separated than median or posterior spinnerets widely separated than median or posterior spinnerets. Epigyne with large paired chitinous processes separated by median septum.

Type-species : *Haplodrassus hiemalis* (Emerton).

Distribution : America, India.

20. *Haplodrassus sataraensis* Tikader & Gajbe

1977. *Haplodrassus sataraensis* Tikader & Gajbe, *Rec. zool. Surv. India*, 73(1-4) : 70.

1982. *Haplodrassus sataraensis* : Tikader, *Fauna of India, Spiders*, 2(2) : 466.

Specimen examined : 1 ♂, Garhbengal village near Narayanpur, Bastar district, Madhya Pradesh. Coll. U. A. Gajbe, 30.XII.1983 (Reg. No. 1585). 1 ♂, Chitrakote, Bastar district, Madhya Pradesh,

Coll. U. A. Gajbe, 1.1.1984. (Reg. No. A/1586). 1 ♀, Shantinagar Colony, Rajnandgaon, Rajnandgaon district, Madhya Pradesh, Coll. U. A. Gajbe, 22.XII.1983 (Reg. No. A/1587), 1 ♀, Sind Bag Village, Baihar Tahsil, Balaghat district, M.P. Coll. U. A. Gajbe, 19.XII.1983 (Reg. No. A/1741). 1 ♀, Gupt Mahadev, Piparia Tahsil, Hoshangabad district, M.P. Coll. U. A. Gajbe, 5.I.1990. (Reg. No. A/1742). 2 ♀, 2 ♂, Keshala village on Itarsi-Betul Road, Hoshangabad district, M.P. Coll. U. A. Gajbe, 11.1.1990 (Reg. No. A/1743).

Distribution : India : Ambanali village near Mahabaleshwar (Type-locality), Satara district, Maharashtra, Himachal Pradesh, Sarguja, Bastar, Rajnandgaon, Balaghat, Hoshangabad districts of Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, Punjab.

Remarks : This species is being reported here for the first time from Rajnandgaon, Balaghat, Hoshangabad & Bastar districts of Madhya Pradesh.

Genus 12. *Zelotes* Gistel

1848. *Zelotes* : Gistel, *Nat. Thierr* : 11.

1982. *Zelotes* : Tikader, *Fauna of India, Spiders*, 2(2) : 470.

Characters : Cephalothorax oval, narrowed markedly in front, covered with fine hairs. Generally the pattern of widening streaks diverging from short foveae. Eyes rather closely grouped, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes more or less procurved (as seen from in front), lateral eyes larger than medians. Posterior row of eyes straight, medians often irregular in shape, sometimes larger than laterals and farther from adjacent laterals than from each other or equally spaced. Chelicerae not very strong, vertical, with a number of hairs on inner part of anterior surface. Sternum oval, pointed behind. Legs relatively long, tibia and metatarsi III & IV may bear ventral spines. Scopulae reach between mid-point and base of metatarsi I and II and to apices of metatarsi III and IV. Abdomen dark black covered with fine hairs. Dorsally there may occur three pairs of spots or impressions.

Type-species : *Zelotes subterranea* (Koch).

Distribution : Oriental and temperate region of the world.

Key to species of the genus *Zelotes* Gistel

1. Spiders of smaller size, upto 6 mm. 2
- Spiders of bigger size, above 6 mm. 4
2. Carapace provided with U-Shaped deep brown markings. Abdomen clothed with pubescence and some hairs. *viveki* sp. Nov
- Carapace not provided with U-shaped deep brown markings. Abdomen clothed with fine hairs but not with pubescence. 3

3. Inner and outer margin of chelicera provided with one and three teeth respectively.
 *mandae* Tikader & Gajbe
- Inner and outer margin of chelicera provided with two and four teeth respectively.
 *yogeshi* sp. nov.
4. Abdomes clothed with pubescence and provided with three pairs of sagilla.
 *bharatae* sp. nov.
- Abdomen clothed with fine hairs and not provided with sagilla
 *sataraisensis* Tikader & Gajbe

21. *Zelotes viveki* sp. nov.

(Figs. 8-12)

General : Cephalothorax and legs deep brown, abdomen black. Total length 5.50 mm. Carapace 2.30 mm. long, 1.90 mm. wide ; abdomen 3.30 mm. long, 2.10 mm. wide.

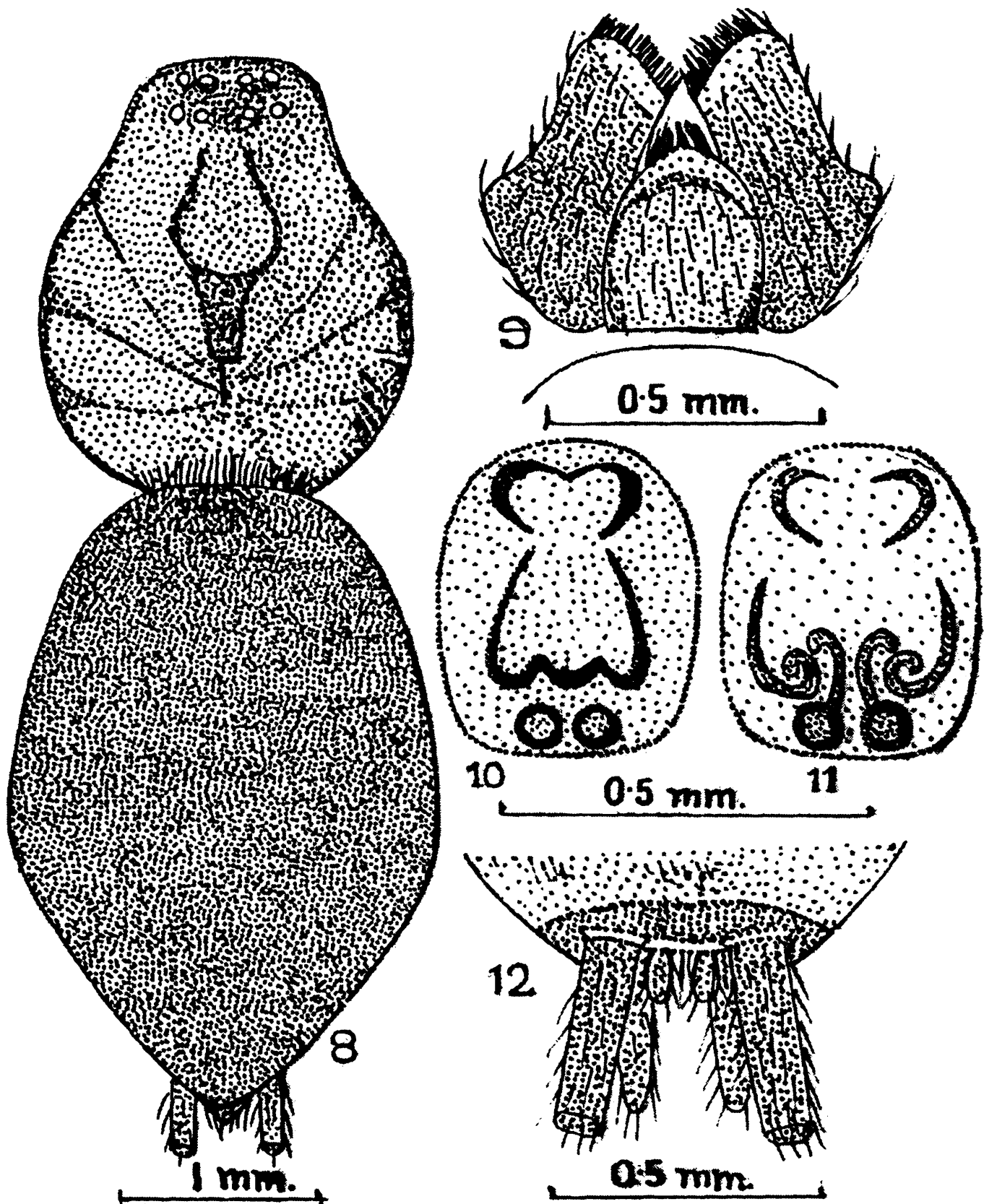
Cephalothorax : Longer than wide, narrow in front, slightly convex, clothed with pubescence, posterior middle provided with a conspicuous short fovea, just above the fovea there is a U-shaped deep brown marking. Pattern of radiating streaks diverge from fovea to lateral sides as in fig. 8. Eyes closely grouped, silvery white except anterior medians, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes slightly procurved (as seen from in front), median slightly smaller than the laterals and closer to adjacent laterals than to each other. Posterior row of eyes nearly straight, medians, oval, smaller than the laterals and closer to adjacent laterals than to each other. Median ocular area longer than wide and wider behind than in front. Clypeal height greater than the diameter of anterior median eye and clypeus provided with two spines. Sternum heart-shaped, pointed behind, rebordered, clothed with long spine like hairs. Labium and maxillae reddish-green, clothed with spine like hairs, anterior end provided with scopulae, shape as in fig. 9. Chelicerae moderately strong, vertical, inner and outer margin provided with three small and bigger teeth respectively. Legs relatively long and strong, clothed with hairs and spines. Tibiae III and IV provided with three pairs of ventral spines. Scopulae reach upto the base of metatarsi I and II and upto apices of metatarsi III & IV. Legs Formula 4123.

Abdomen : Longer than wide, nearly elliptical, widest behind the middle, clothed with pubescence and some hairs, anterior end provided with long spine like hairs. Ventral side slightly lighter than the dorsal. Epigyne as in Fig. 10 Internal genitalia as in fig 11. Spinnerets as in fig. 12.

Type-specimen : Holotype ♀, in spirit, other details as above. Registration No. 5449/18.

Type-locality : India, Madhya Pradesh, Porpa-village near Jagdalpur, Baster district, Coll. U. A. Gajbe, 31.XII.1983.

Remarks : This species resembles *Zelotes ashae* Tikader & Gajbe, but differs from it as follows :
 (1) Cephalothorax and legs deep brown but in *Z. ashae* cephalothorax and legs reddish-brown.



Figs. 8-12. : *Zelotes viveki* sp. nov.

8. Dorsal view of female, legs omitted; 9. Labium and maxillae;

10. Epigyne; 11. Internal genitalia; 12. Spinnerets.

(ii) Abdomen black but in *Z. ashae* abdomen uniform deep brown. (iii) Inner and outer margin of chelicerae provided with three teeth but in *Z. ashae* inner and outer margin provided with two and four teeth respectively. (iv) Epigyne and internal genitalia also structurally different.

22. *Zelotes mandae* Tikader & Gajbe

1979. *Zelotes mandae* Tikader & Gajbe, *Bull. zool. Surv. India*, 2(2) : 87.

1982. *Zelotes mandae* : Tikader, *Fauna of India, Spiders*, 2(2) : 492.

Specimen examined : 1 ♀, 1 ♂, Kaladehi village, Jabalpur district, Madhya Pradesh, Coll. U. A. Gajbe, 20.IV.1982. (Reg. No. A/1589). 1 ♀ on the bank of Megha river, 7 km. from Forest Rest House, Kukru, Betul district, Coll. H. S. Sharma, 1.IV.1990. (Reg. No. A/1745).

23. *Zelotes yogeshi* sp. nov.

(Figs. 13-17)

General : Cephalothorax and legs deep brown, abdomen brown. Total length 4.90 mm. Carapace 1.90 mm. long, 1.50 mm. wide; abdomen 2.90 mm. long, 2.00 mm. wide.

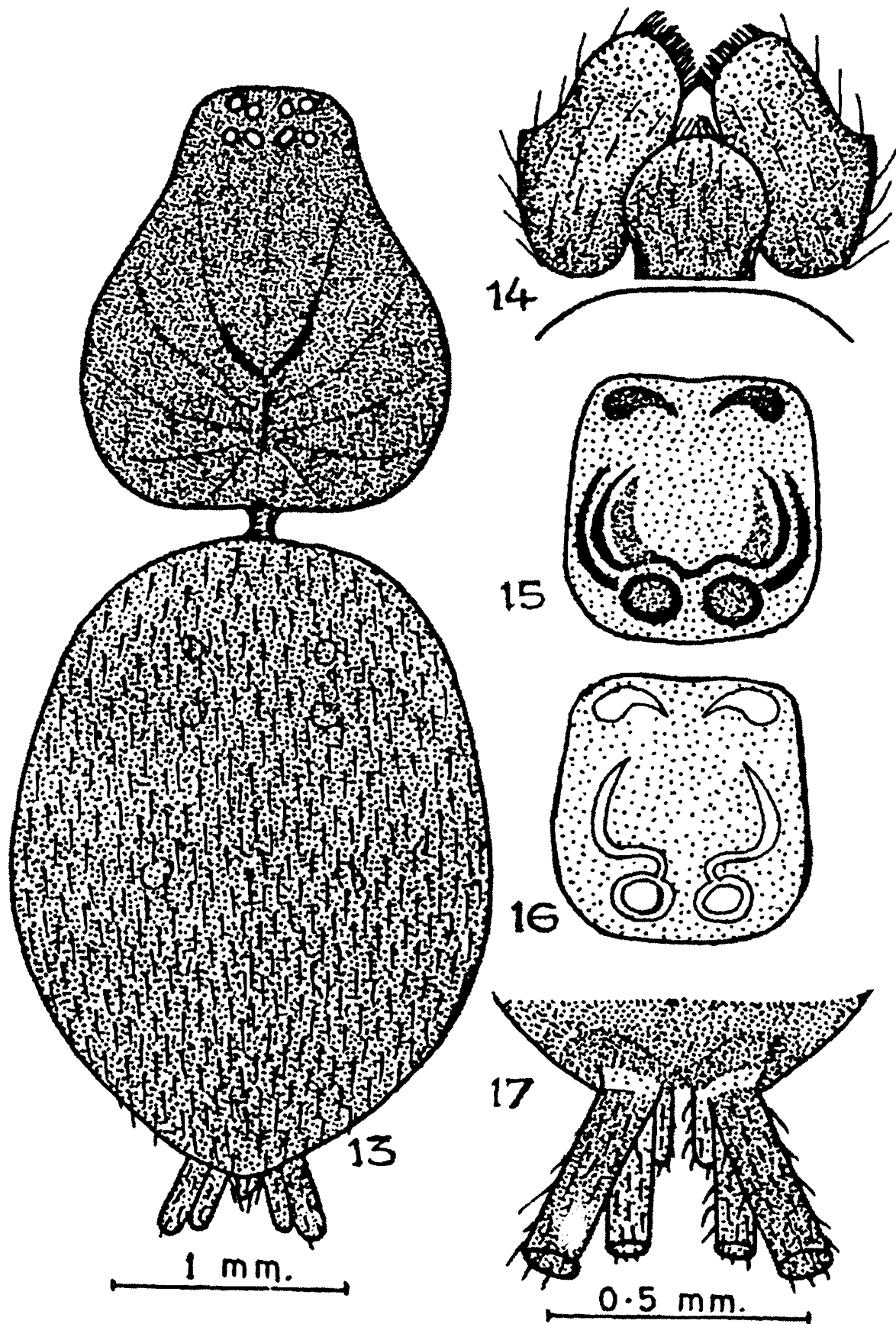
Cephalothorax : Longer than wide, narrow in front, clothed with pubescence, posterior middle provided with a conspicuous short fovea, radiating streaks diverge from short fovea to lateral sides of cephalothorax. Eyes closely grouped, silvery white except anterior medians which are black, posterior row of eyes same in length as anterior row. Anterior row of eyes slightly procurved (as seen from in front), median smaller than the laterals and closer to adjacent laterals than to each other. Posterior row of eyes straight, irregular in shape, slightly larger than the laterals and equally spaced as in fig. 13. Sternum oval, pointed behind, clothed with long black spine like hairs. Labium and maxillae longer than wide, anteriorly with scopulae, shape as in fig. 14. Chelicerae moderately strong, vertical, inner margin provided with two small teeth and outer margin with four dissimilar teeth. Legs relatively long and strong, clothed with hairs and spines. Tibia III and IV provided with three pairs of ventral spines. Scopulae reach upto base of metatarsi I and II and upto apices of metatarsi III and IV. Legs formula 4123.

Abdomen : Longer than wide, clothed with fine hairs and three pairs of sagitta. Ventral side slightly lighter than the dorsal. Epigyne as in fig. 15. Internal genitalia as in fig. 16. Spinnerets very prominent, anterior spinnerets cylindrical, larger and darker in colour than others as in fig. 17.

Type-specimen : *Holotype*, female in spirit, other details as above. Registration No. 5450/18.

Type locality : Tappa village, District Rajnandgaon, Madhya Pradesh, India, Coll. U. A. Gajbe, 22.XII.1983.

Remarks : This species closely resembles *Zelotes ashae* Tikader and Gajbe but differs from it as follows : (i) Cephalothorax and legs deep brown but in *Z. ashae* cephalothorax and legs reddish brown. (ii) Chelicerae provided with dissimilar teeth but in *Z. ashae* chelicerae with similar teeth (iii) Epigyne and internal genitalia also structurally different.



Figs. 13-17. : *Zelotes yogeshi* sp. nov.

13. Dorsal view of female, legs omitted; 14. Labium and maxillae;

15. Epigyne; 16. Internal genitalia; 17. Spinnerets.

24. *Zelotes bharatae* sp. nov.

(Figs. 18-22)

General : Cephalothorax reddish-brown, legs deep brown, abdomen uniform glossy black. Total length 7.00 mm. Carapace 2.70 mm, long, 2.00 mm. wide; abdomen 4.40 mm. long, 2.40 mm. wide.

Cephalothorax : Longer than wide, narrow in front, convex, clothed with pubescence, posterior middle provided with a conspicuous short fovea. Pattern of radiating streaks diverge from short fovea to lateral sides. Eyes closely grouped, silvery white except anterior medians which are black, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes slightly procurved (as seen from in front), medians slightly smaller than the laterals and closer to adjacent laterals than to each other. Posterior row of eyes nearly straight, medians irregular in shape, smaller than the laterals and closer to adjacent laterals than to each other. Median ocular quadrangle longer than wide and wider behind than in front. Clypeal height greater than the diameter of anterior median eyes. Sternum oval, pointed behind, rebordered, clothed with fine hairs, labium and maxillae longer than wide, clothed with hairs, anterior end provided with conspicuous scopulae, shape as in fig. 19. Chelicerae moderately strong, long, vertical. Inner margin provided with one small tooth and outer margin with two bigger teeth. Legs relatively long and strong, clothed with hairs and spines. Tibia III and IV provided with three pairs of ventral spines. Scopulae reach upto base of metatarsi I and II and apices of metatarsi III and IV. Legs formula 4123.

Abdomen : Longer than wide, nearly elliptical, widest behind the middle, clothed with pubescence and provided with three pairs of sagitta as in fig. 18. Ventral side much lighter than the dorsal. Epigyne as in fig. 20. Internal genitalia as in fig. 21. Spinnerets very prominent, anterior spinnerets cylindrical than others as in fig. 22.

Type-specimen : *Holotype* ♀, in spirit, other details as above. Registration No. 5452/18.

Type-locality : India : Madhya Pradesh, Sikara village, Lakhanadown Taluka, Seoni district, Coll. U. A. Gajbe, 19.XI.1981.

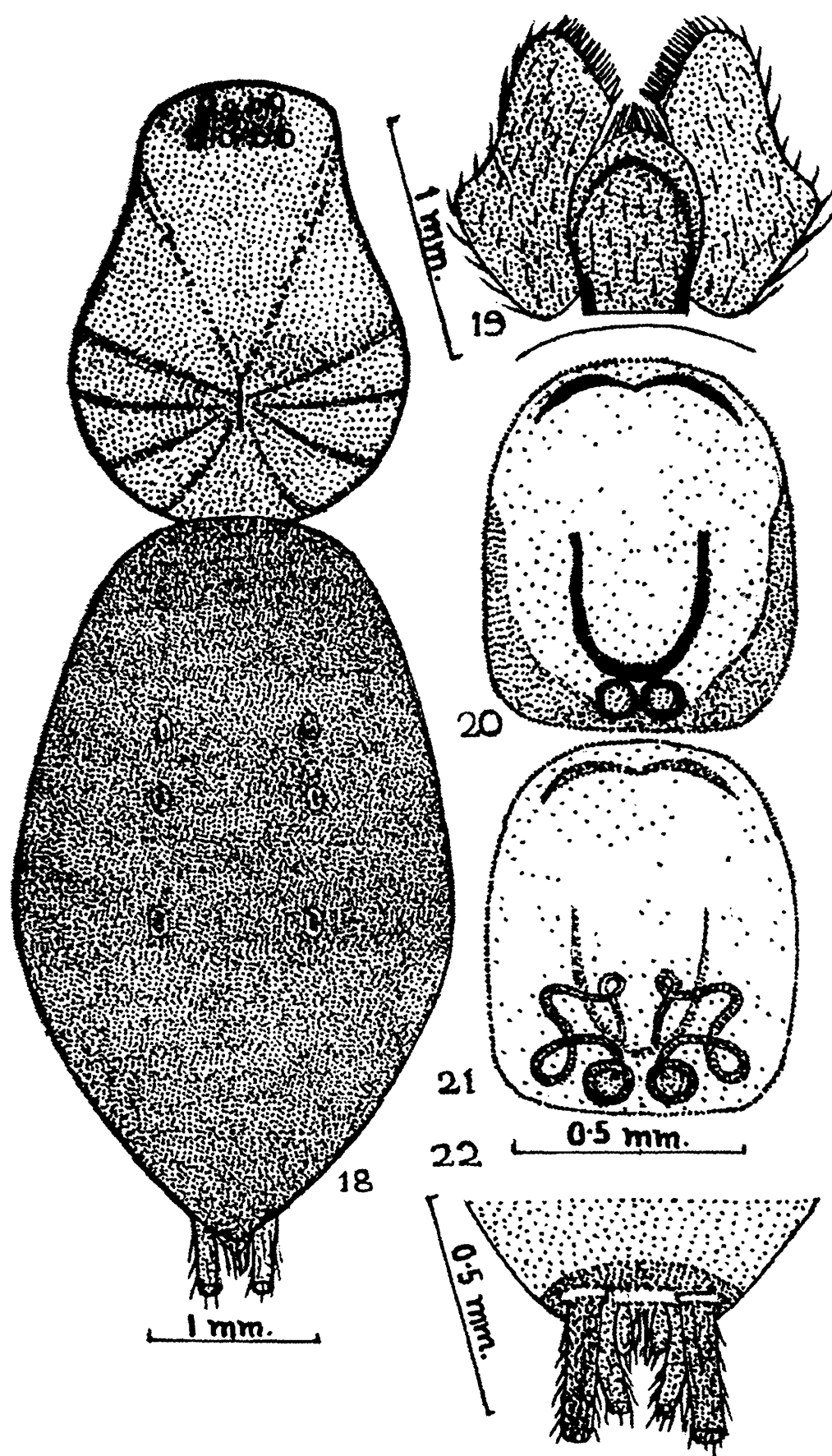
Remarks : This species resembles *Zelotes nasikensis* Tikader and Gajbe, but differs from it as follows : (i) Cephalothorax reddish brown but in *Z. nasikensis* cephalothorax deep brown. (ii) Abdomen dorsally provided with three pairs of sagitta but in *Z. nasikensis* abdomen without sagitta. (iii) Epigyne and internal genitalia also structurally different.

25. *Zelotes sataransis* Tikader & Gajbe

1979. *Zelotes sataransis* Tikader & Gajbe, *Bull. zool. Surv. India*, 2(1) : 87.

1982. *Zelotes sataransis* : Tikader, *Fauna of India, Spiders*, 2(2) : 504.

1988. *Zelotes sataransis* : Gajbe, *Rec. zool. Surv. India*, 85(1) : 72.



Figs. 18-22. : *Zelotes bharatae* sp. nov.

18. Dorsal view of female, legs omitted; 19. Labium and maxillae;
20. Epigyne; 21. Internal genitalia; 22. Spinnerets.

Specimen examined : 1 ♀, Sikara village, Lakhanadown Tahsil, Seoni district, Madhya Pradesh. Coll. U. A. Gajbe, 19.X.1981, 1 ♀, Chhotedonger village, Narayanpur Tahsil, Bastar district, Madhya Pradesh. Coll. U. A. Gajbe, 26.XII.1983. (Reg. No. A/1593).

Distribution : Pratapgarh near Mahabaleshwar (Type-locality), Satara district, Maharashtra, Andhra Pradesh, Himachal Pradesh, Karnataka, Rajasthan, Uttar Pradesh, Seoni, Jabalpur, Bastar, Madhya Pradesh.

Remarks : This species is being reported for the first time from Bastar district of Madhya Pradesh.

26. *Zelotes ashae* Tikader & Gajbe

1976. *Zelotes ashae* Tikader & Gajbe, *Proc. Indian Acad. Sci.*, **83**(3) : 111.

1982. *Zelotes ashae* : Tikader, *Fauna of India, Spiders*, **2**(2) : 502.

Specimen examined : 3 ♀♀, Gupt Mahadev, Piparia Tahasil, Hoshangabad district, M.P. Coll. U. A. Gajbe, 5.1.1990. (Reg. No. A/1746).

Distribution : Range Hill, Poona (Type-locality), Jodhpur, Rajasthan, Hoshangabad, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

27. *Zelotes shantae* Tikader

1982. *Zelotes shantae* Tikader, *Fauna of India, Spiders*, **2**(2) : 483.

Specimen examined : 1 ♀, Mura village, Betul district, M.P. Coll. H. S. Sharma, 24.III.1990. (Reg. No. A/1744).

Distribution : Katraj near Khed Shivapur, Dist. Poona (Type-locality), Maharashtra, Betul district, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

Genus 13. *Drassyllus* Chamberlin

1922. *Drassyllus* Chamberlin, *Proc. biol. Soc. Wash.*, **35** : 166.

1976. *Drassyllus* : Tikader & Gajbe, *Oriental Insects*, **10**(3) : 431.

1982. *Drassyllus* : Tikader, *Fauna of India, Spiders*, **2**(2) : 509.

Characters : The posterior row of eyes procurved, the posterior median eyes large, oval, oblique, and much closer to each other than to the posterior lateral eyes. The outer margin of the cheliceral fang furrow provided with three to six teeth, the inner margin from two to four. The species are all much alike in general appearance. The colours vary from orange to dark brown on the cephalothorax and grey to black on the abdomen. There are no markings, though in males there is a very

conspicuous orange or brown scutum on the abdomen which covers from less than one-third to almost one-half of the dorsum. Epigynum without prominent sclerotized ridges on each side ending freely in front.

Type-species : *Drassyllus fallens* Chamberlin.

Distribution : America, India.

28. *Drassyllus mahabalei* Tikader

1982. *Drassyllus mahabalei* Tikader, *Fauna of India, Spiders*, 2(2) : 510.

Specimen examined : 1 ♀, Narayanganj, Mandla district, Madhya Pradesh. Coll. U. A. Gajbe, 23.I.1985. (Reg. No. A/1590).

Distribution : India : Sindhi Colony, Poona (Type-locality), Maharashtra, Mandla, district, Madhya Pradesh.

Remarks : This species is being reported here for the first time from Madhya Pradesh.

29. *Drassyllus jabalpurensis* sp. nov.

(Figs. 23-27)

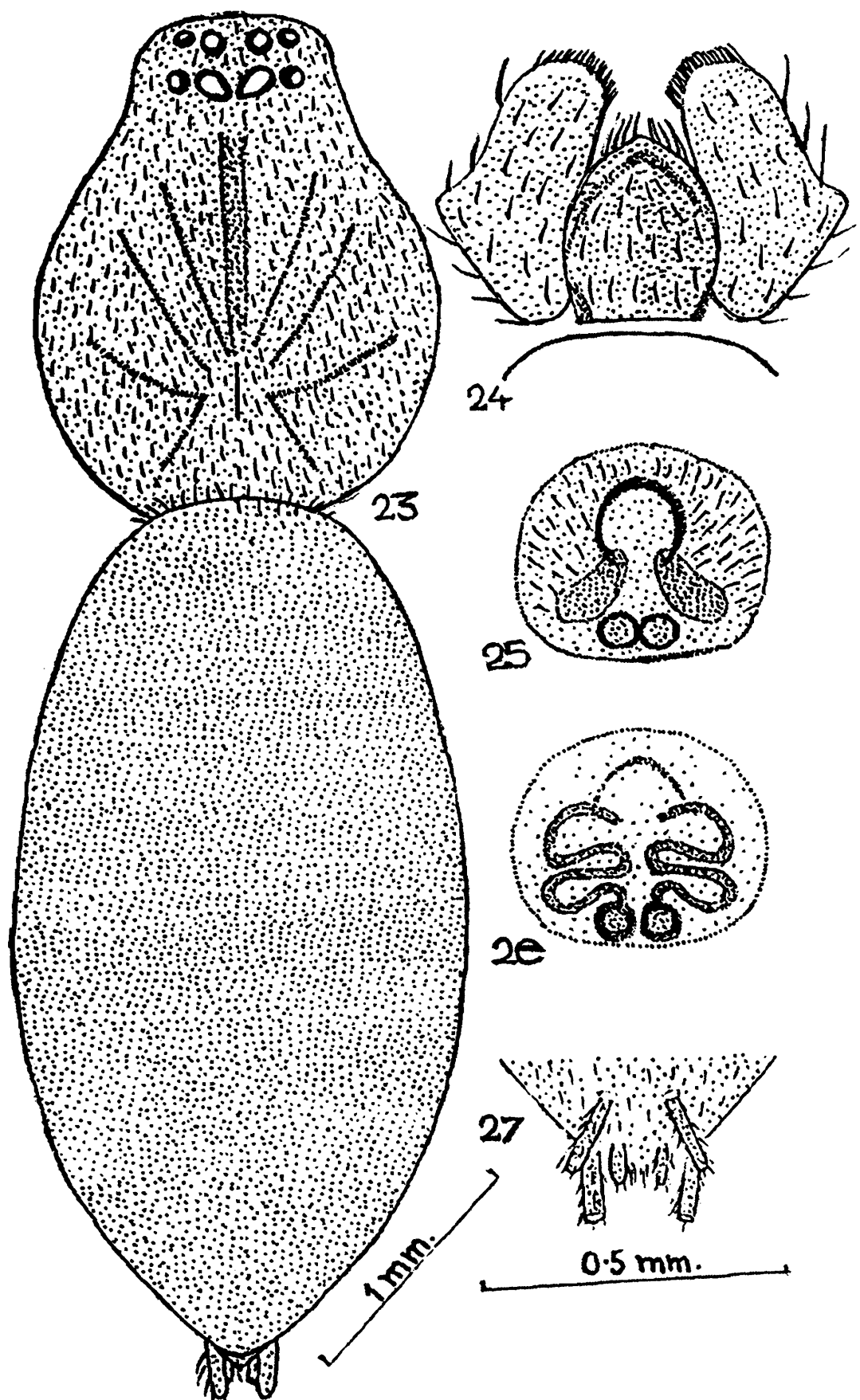
General : Cephalothorax light reddish-green, legs reddish green, abdomen brownish-green. Total length 5.60 mm. Carapace 2.10 mm. long, 1.60 mm. wide; abdomen 3.50 mm. long, 1.90 mm. wide.

Cephalothorax : Longer than wide, narrow in front, slightly convex, posterior middle of thorax provided with an inconspicuous short fovea, clothed with very short spine like hairs. Eyes silvery white in colour except anterior medians which are black and all eyes situated in a compact area, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes procurved (as seen from in front), medians slightly larger than laterals and closer to adjacent laterals than to each other. Posterior row of eyes slightly procurved, medians large, oval, oblique and closer to each other than to adjacent laterals as in fig. 23. Sternum oval, pointed behind, rebordered, clothed with long spine like hairs. Labium and maxillae light yellowish-green, clothed with spine like hairs, anterior end provided with scopulae as in fig. 24. Chelicerae long, not very strong, vertical, inner margin with one minute tooth and outer margin with four moderate teeth. Legs relatively long and strong, clothed with hairs and spines. Legs formula 4123.

Abdomen : Nearly elliptical, clothed with pubescence and anterior portion provided with some spine like, hairs. Ventral side lighter than the dorsal. Epigyne as in fig. 25. Internal genitalia as in fig. 26. Spinnerets as in fig. 27.

Type-specimen : Holotype 1 ♀, in spirit, other details as above. Registration No. 5452/18.

Type-locality : India : Madhya Pradesh, Bhirki village on Jabalpur-Chargawa road, Jabalpur district. Coll. D. K. Ghosal, 24.XI.1970.



Figs. 23-27. : *Drassyllus jabalpurensis* sp. nov.

23. Dorsal view of female, legs omitted; 24. Labium and maxillae;
25. Epigyne; 26. Internal genitalia; 27. Spinnerets.

Remarks : This species closely resembles *Drassyllus khajuriae* Tikader & Gajbe, but differs from it as follows : (i) Cephalothorax light reddish-green and legs reddish-green but in *D. khajuriae* cephalothorax and legs light-green. (ii) Outer margin of chelicerae provided with four teeth but in *D. khajuriae* outer margin of chelicerae with two teeth. (iii) Abdomen brownish-green and without sigilla but in *D. khajuriae* abdomen deep brown and provided with three pairs of sigilla (iv) Epigyne and internal genitalia also structurally different.

SUMMARY

This paper deals with 29 species under 13 genera of the family Gnaphosidae out of which 5 species are described as new to science.

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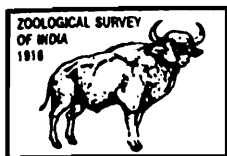
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Rec. zool. Surv. India : 105 (Part 3–4) : 141-168, 2005

COCCID INSECTS IN THE WESTERN SHIVALIK HIMALAYA AND ADJACENT AREAS (INSECTA : HEMIPTERA : COCCOIDEA)

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INTRODUCTION

Among the sucking insects, aphids and coccids cause maximum havoc, as they reproduce profusely, disperse easily and infest variety of plants, many of which are of considerable economic importance. Some of these insects act as vectors of certain diseases in plants.

Coccid insects, generally known as the scale insects and mealybugs, are quite common in gardens, fruit orchards and on valuable crops like sugarcane, mango and tea. There is no account available at present on these insects occurring in the Shivalik Himalaya. Hence, an attempt has been made here to point out those species of coccids, which have been reported from Himachal Pradesh, Punjab and part of Jammu & Kashmir states. The 'distribution' records shown below, however, have been restricted to India only, although many of the species occur in other countries also.

San Jose scale (*Quadraspidiotus perniciosus*) invited earliest attention in this region. It was studied in Jammu & Kashmir, but was and still is common in Himachal Pradesh as well, on such valuable plants as the apple, peach, plum, pear, almond, apricot, cherry, walnut and oak. Green (1916) described coccids of pine trees. Ansari (1942, 1945) dealt with the then Punjab coccids. Coccid fruit pests of NW India were reported by Pruthi & Batra (1960). Species from Himachal Pradesh have been enlisted by Sharma & Bhalla (1964), Mishra & Bhalla (1975) and recently Ghosh *et al.*, (in press). From some nearer areas, recently Coccids of Western Himalaya-Uttar Pradesh (Varshney, 1995), Coccids of Indian Thar desert (Varshney, 1996) and Coccids of Delhi (Varshney, 1997) have been reported.

Khan & Ansari (1941) reported those scale insects of the then Punjab and NWFP (now in Pakistan) which were mistaken for the San Jose scale. Rao & Chatterjee (1950) also reported on the same subject. Varshney (1984a) counted a total of 16 species only from NW Himalaya. In the present

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paper, 27 species (plus 5 more mentioned in 'Remarks') in 22 genera and 7 families are included. It may be mentioned that from the Eastern Shivalik Himalaya, covering the States of Uttaranchal and Uttar Pradesh, a total of 25 species, belonging to 19 genera and 8 families are known.

Two genera, *Humococcus* Ferris and *Drepanococcus* Williams & Watson, are reported for the first time here in the Indian literature on coccids. A key to separate the families is given by Varshney (1985).

SYSTEMATIC ACCOUNT

Superfamily COCCOIDEA

Family 1. MONOPHLEBIDAE

Subfamily MONOPHLEBINAE

Tribe ICERYINI

Genus *Icerya* Signoret

1875. *Icerya* Signoret, *Anls. Soc. Ent. France*, (5)4 : 258.

Type species : *Coccus sacchari* Guerin-Meneville.

1. *Icerya purchasi* Maskell. Cottony Cushion scale.

(Fig. 1)

1879. *Icerya purchasi* Maskell, *Trans. Proc. New Zealand Instt.*, 11(1878) : 221.

1930. *Icerya purchasi* : Ayyar, *Bull. Imp. Instt. Agr. Res., Pusa*, 197(1929) : 71.

1950. *Icerya purchasi* : Rao, *Indian J. Ent.*, 12 : 34.

Distribution : Almost cosmopolitan. In India recorded widely including from Maharashtra, Orissa, Karnataka, Kerala, Tamil Nadu etc. (Varshney, 1992).

Host plants : On many plant species of *Acacia*, *Berberis*, *Casuarina*, *Ficus*, *Leucas*, *Malus*, *Prunus*, *Pyrus*, *Rhamnus* etc.

Remarks : Ghosh *et al.*, (in press) have reported it from W. Himalaya (H.P.). Another species, *Icerya pilosa* Green, is reported from areas closer to Shivaliks, like Haryana : Karnal; Delhi and U.P. : Meerut etc.

Tribe DROSICHINI

Genus *Drosicha* Walker

1858. *Drosicha* Walker, *List Spec. Hom. Ins. Coll. Br. Mus. Supl.* : 306.

Type species : *Drosicha contrahens* Walker.

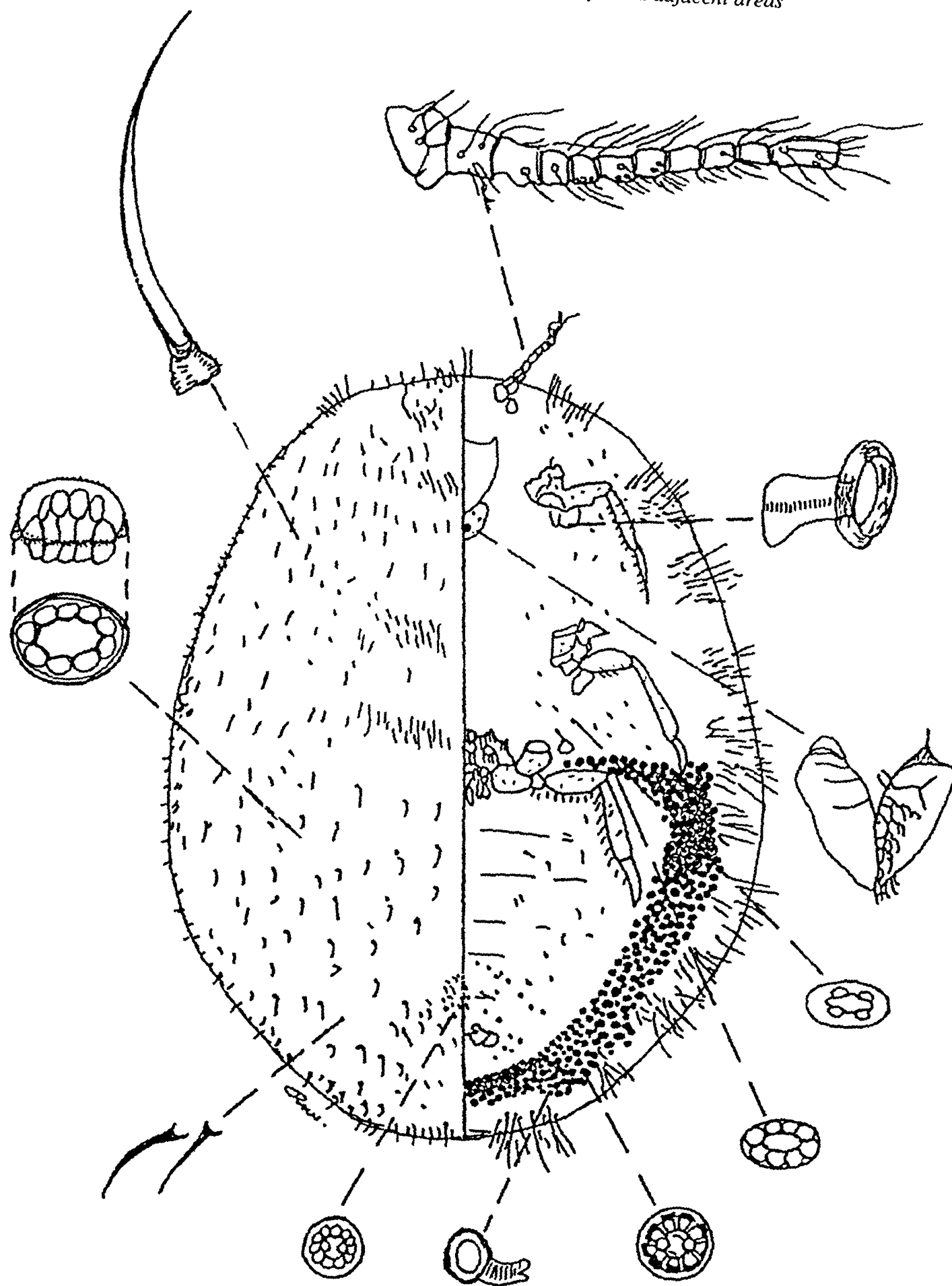


Fig. 1. : *Icerya purchasi* Maskell.

2. *Drosicha* sp.

1992. *Drosicha* spp. : Varshney, Rec. zool. Surv. India, Occ. Paper, 139 : 17.

Material examined : Two ex., one young one and another adult female; from C.P.W.D. Guest House garden, Madhopur, Dist. Gurdaspur, Punjab; Coll. R. K. Varshney, Aug., 2002.

Distribution : Genus is distributed widely in India, including H.P., Punjab, Uttaranchal, U.P., Bihar, M.P., etc.

Host plants : Jamun (*Syzygium cumini*) and *Hibiscus rosasinensis* of the above material.

Remarks : The collection spot was by the side of a big canal of the Ravi river, where a barrage has been built in 1954.

3. *Drosicha dalbergiae* (Green)

1903. *Monophlebus dalbergiae* Green, Indian Mus. Notes, 5(3) : 101.

1921. *Monophlebus dalbergiae* : Ayyar, Proc. 4th Ent. Mtg. Pusa : 337.

1945. *Drosicha dalbergiae* : Pruthi & Mani, Imp. Agr. Res. Instt. Monogr., 16 : 7.

1970. *Drosicha dalbergiae* : Ali, Indian Mus. Bull., 5(1) : 75.

Distribution : Mostly in India, including Punjab, Uttaranchal and North Bihar.

Host plants : *Dalbergia sissoo*, *Artocarpus integrifolia*, *Annona squamosa*, *Citrus* spp., *Punica granatum*, *Mangifera indica* etc.

Remarks : Recorded from the Sutlej Valley in Punjab (Pruthi & Mani, 1945).

4. *Drosicha stebbingi* (Green)

1902. *Monophlebus stebbingii* Green, in Stebbing, Dept. Notes Insects affect. Forestry, 1 : 135.

1921. *Monophlebus stebbingi* : Ayyar, Proc. 4th Ent. Mtg. Pusa : 337.

1970. *Drosicha stebbingi* : Ali, Indian Mus. Bull., 5(1) : 78.

1992. *Drosicha stebbingii* : Varshney, Rec. zool. Surv. India, Occ. Paper, 139 : 18.

Distribution : Widely in India, including H.P., Haryana, Uttaranchal, U.P., Bihar, W. Bengal, M.P., Rajasthan etc.

Host plants : On many plants including *Shorea robusta*, *Mangifera indica*, *Tamarindus indica*, *Ficus* spp., *Butea monosperma*, *Pyrus malus*, *Prunus cerasus*, *Eugenia jambolana* etc.

Remarks : This species is reported from Shimla Division (Himachal Pradesh) on Sal trees (Stebbing, 1903).

Family 2. TACHARDIIDAE

Subfamily TACHARDIINAE

Genus *Kerria* Targioni-Tozzetti

1884. *Kerria* Targioni-Tozzetti, Ann. di Agr. 1884, Min. di Agr. Indus. e Com., Italy : 410.

Type species : *Coccus lacca* Kerr.

5. *Kerria fici fici* (Green). Ficus Lac insect.

(Fig. 2)

1903. *Tachardia fici* Green, *Indian Mus. Notes*, 5(3) : 97.1923. *Lakshadia ficii* : Mahdihassan, *J. Sci. Asso. Maharajah's College, Vizianagaram*, 1(2-3) : 57.1925. *Laccifer fici* : Chamberlin, *Bull. Ent. Res.*, 16(1) : 36.1977. *Kerria fici fici* : Varshney, *Oriental Ins. Suppl.*, 5(1976) : 34.*Distribution* : India : J. & K., Delhi, Rajasthan, U.P., Bihar, W. Bengal, M.P. and Tamil Nadu.*Host plants* : On species of *Ficus*, *Samanea*, *Ziziphus*, *Butea* and *Litchi*.*Remarks* : One of the two commonest lac insects in India. It is recorded from Jammu in the J. & K. state (Mahdihassan, 1937).

Family 3. KERMESIDAE

Genus *Kermes* Boitard1828. *Kermes* Boitard, *Les Gallinsectes. In : Man. d'Ent. Hist. Nat. Ins.*, 2 : 171.*Type species* : *Coccus variegatus* Gmelin.6. *Kermes himalayensis* Green1909. *Kermes himalayensis* Green, *Ent. mon. Mag.*, 45 : 10.1921. *Kermes himalayensis* : Ayyar, *Proc. 4th Ent. Mtg. Pusa* : 343.1992. *Kermes himalayensis* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 36.*Distribution* : Known from its original record only. It is endemic in North-West Himalaya. Exact locality of occurrence not known.*Host plants* : Oak trees, *Quercus incana* and *Q. dilatata*.*Remarks* : It is a domed-scale, 2–3 mm, living on foliage and branchlets of *Quercus dilatata* (Beeson, 1961).

Family 4. DACTYLOPIIDAE

Genus *Dactylopius* Costa1835. *Dactylopius* O. G. Costa, *Fauna del Regno di Napoli, Fam. de Cocc. Gallins. Emi. Napoli*, 2 : 15.*Type species* : *Coccus adonidum* Linn.7. *Dactylopius indicus* (Green)

(Fig. 3)

1908. *Coccus indicus* Green, *Mem. Dept. Agr. India, (Ent.)*, 2(2) : 28.1930. *Dactylopius indicus* : Ayyar, *Bull. Imp. Inst. Agr. Res. Pusa*, 197(1929) : 56.

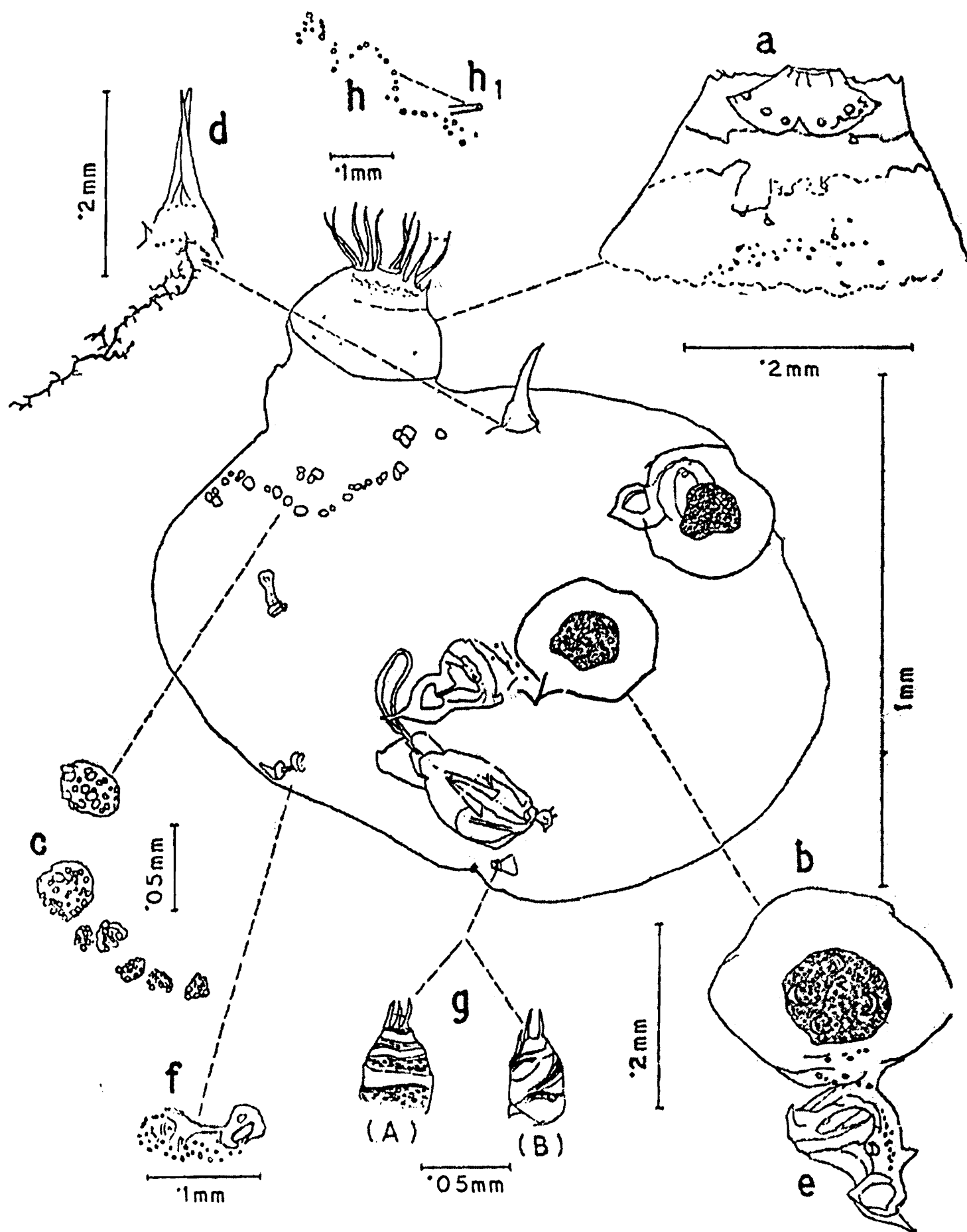


Fig. 2. : *Kerria fici fici* (Green).

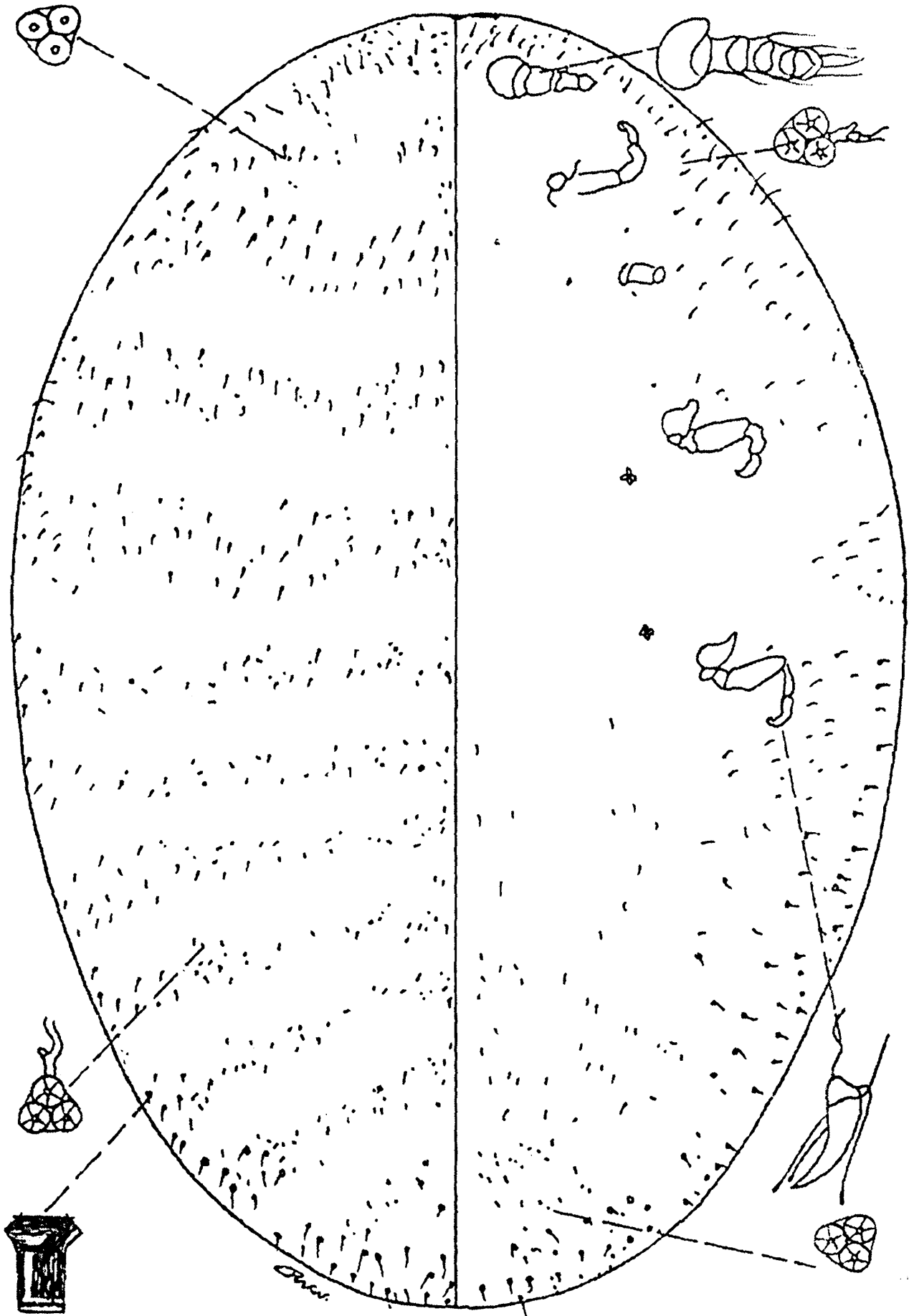


Fig. 3. : *Dactylopius indicus* (Green).

1970. *Dactylopius indicus* : Ali, *Indian Mus. Bull.*, 5(2) : 74.

1992. *Dactylopius indicus* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 37.

Distribution : H.P., Bihar, W. Bengal, Orissa, Andhra Pradesh and Tamil Nadu.

Host plants : *Opuntia monocantha*, *Opuntia* sp.

Remarks : Recorded from 'Kangra in the Punjab' on *Opuntia dillenii* (Green, 1908). Ayyar (1930) stated that this insect has been so far found on *O. monocantha* only and does not infest *O. dilleniae*.

Family 5. PSEUDOCOCCIDAE

Subfamily PSEUDOCOCCINAE

Tribe PHENACOCCINI

Genus *Nipaecoccus* Sulc

1945. *Nipaecoccus* Sulc, *Acta Soc. Sci. Nat. Morav.*, 17(3) (Sign. F177) : 1.

Type species : *Dactylopius nipae* Maskell.

8. *Nipaecoccus viridis* (Newstead)

(Fig. 4)

1894. *Dactylopius viridis* Newstead, *Indian Mus. Notes*, 3(5) : 25.

1921. *Pseudococcus (Dactylopius) viridis* : Ayyar, *Proc. 4th Ent. Mtg. Pusa* : 343.

1930. *Pseudococcus filamentosus* var. *corymbatus* : Ayyar, *Bull. Imp. Instt. Agr. Res. Pusa*, 197(1929) : 59.

1957. *Pseudococcus vastator* : Ali, *Indian J. Ent.*, 18(4) (1956) : 469.

1970. *Nipaecoccus viridis* : Ali, *Indian Mus. Bull.*, 5(2) : 113.

1992. *Nipaecoccus viridis* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 43.

Distribution : Very widely in India, including Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Orissa, Goa, Maharashtra, Delhi, Himachal Pradesh, U.P., Bihar, W. Bengal and NE. India.

Host plants : On many plants including *Abrus*, *Abelmoschus*, *Artocarpus*, *Citrus*, *Casuarina*, *Dalbergia*, *Emblica*, *Euphorbia*, *Ixora*, *Morus*, *Nerium*, *Opuntia*, *Psidium*, *Solanum*, *Tephrosia*, *Ziziphus* etc.

Remarks : It was collected from Joginder Nagar and Mandi in H.P., by Dr. M. Hayat in 1967, from unidentified hosts (Ali, 1970).

Nipaecoccus sp. collected from Nabha and Patiala in Punjab (Varshney, 1992). One immature specimen of another pseudococcid species, *Maconellicoccus hirsutus* (Green), collected on the cotton plant, was reported from Ludhiana (Punjab) for the first time (Varshney, 1984b).

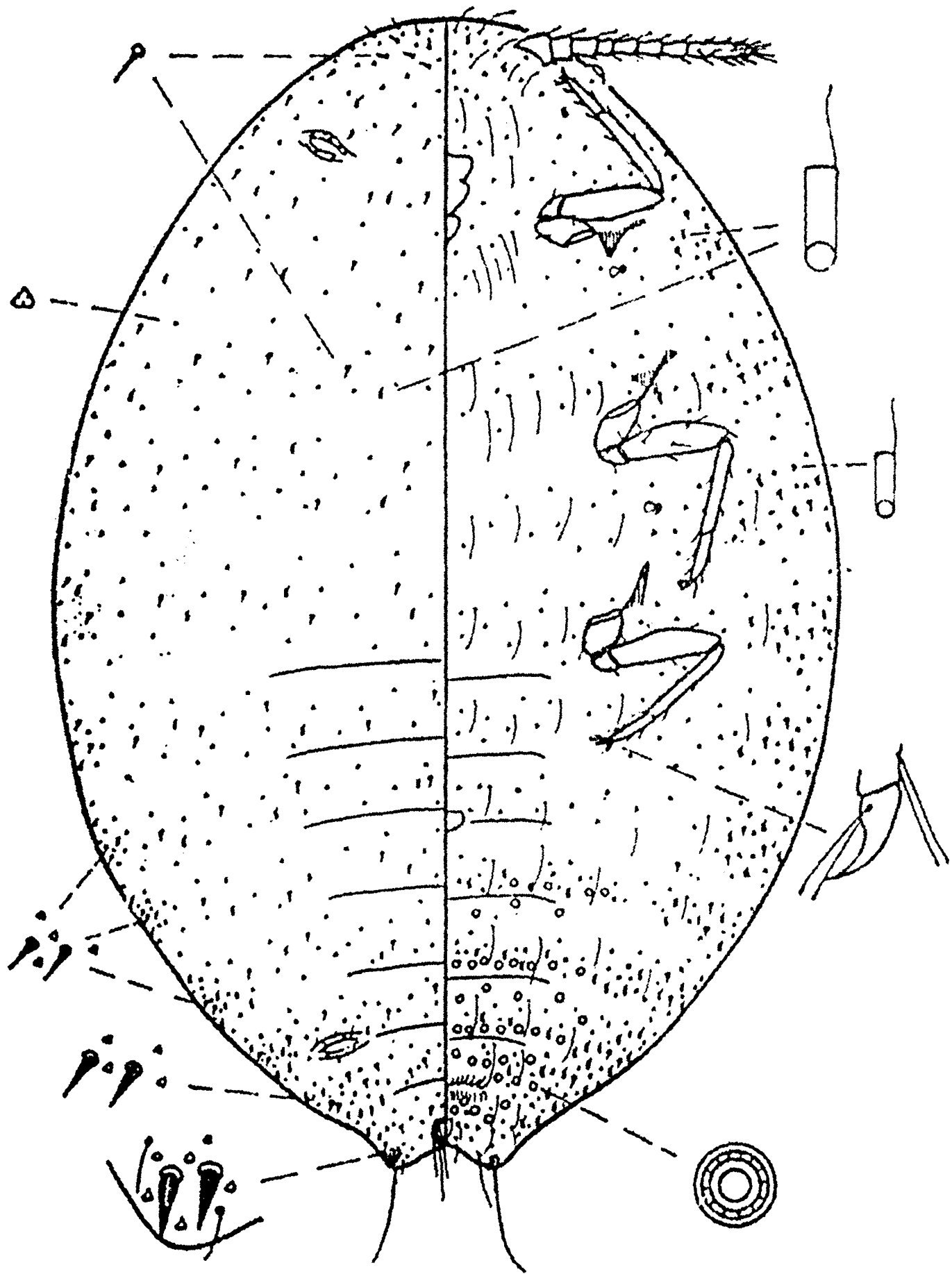


Fig. 4. : *Nipaecoccus viridis* (Newstead).

Genus *Humococcus* Ferris

1953. *Humococcus* Ferris, *Atlas of Scale Ins. N. America*, 6 : 370.

Type species : *Ripersia hilariae* Ferris.

9. *Humococcus resinophila* (Green)

1916. *Ripersia resinophila* Green, *Bull. Ent. Res.*, 6 : 395.

1921. *Ripersia resinophila* : Ayyar, *Proc. 4th Ent. Mtg. Pusa* : 345.

1970. *Ripersia resinophila* : Ali, *Indian Mus. Bull.*, 5(2) : 121.

1992. *Ripersia resinophila* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 48.

Distribution : Known from its original record only. Occurs in NW. Himalaya in Himachal Pradesh, J. & K. and Uttaranchal.

Host plants : *Pinus longifolia* and *P. excelsa*.

Remarks : Fletcher (1919) reported it from Kumaon and Kashmir under 'Kamraj Division' (Ali, 1970). Varshney (1992) recorded it from Kangra in Himachal Pradesh.

Recently Matile-Ferrero & Ben-Dov (1995) have placed it in the genus *Humococcus*, on the basis of the examination of 'Types' by Dr. D. J. Williams. This genus is reported here for the first time in Indian literature.

Family 6. COCCIDAE

Subfamily FILIPPINAE

Genus *Drepanococcus* Williams & Watson

1990. *Drepanococcus* Williams & Watson, *Scale Ins. Trop. S. Pacific Reg.*, Pt. 3 : 102.

Type species : *Eriochiton cajani* Maskell.

10. *Drepanococcus cajani* (Maskell)

1891. *Eriochiton cajani* Maskell, *Indian Mus. Notes*, 2(1) : 61.

1908. *Ceroplastodes cajani* : Green, *Mem. Dept. Agr. India, (Ent.)*, 2(2) : 32.

1921. *Ceroplastodes cajani* : Ayyar, *Proc. 4th Ent. Mtg. Pusa* : 346.

1974. *Ceroplastodes cajani* : Ali, *Indian Mus. Bull.*, 6(2) (1971) : 53.

1992. *Ceroplastodes cajani* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 106.

Distribution : Widely in India, including H.P., Punjab, Gujarat, Bihar, W. Bengal, Orissa, A.P., Tamil Nadu and Kerala.

Host plants : On *Cajanus cajan* (= *Cajanus indicus*), *Ziziphus mauritiana*, *Ocimum sanctum*, *Coleus* sp., *Ficus* spp., *Abrus precatorius* etc.

Remarks : Recorded from Mandi in Himachal Pradesh and Phillaur in Punjab (Varshney, 1992).

Recently Williams & Watson (1990) have created a new genus *Drepanococcus* to accommodate this group of species. This genus is reported here for the first time in the Indian literature.

11. *Drepanococcus chiton* (Green)

1909. *Ceroplastodes chiton* Green, *Coccidae of Ceylon*, Pt. 4 : 287.
 1921. *Ceroplastodes chiton* : Ayyar, *Proc. 4th Ent. Mtg. Pusa* : 346.
 1974. *Ceroplastodes chiton* : Ali, *Indian Mus. Bull.*, 6(2) (1971) : 53.
 1992. *Ceroplastodes chiton* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 107.

Distribution : Widely in India, including H.P., Uttaranchal, W. Bengal, N. E. India and Andaman Islands.

Host plants : *Cassia* sp., *Cajanus cajan*, *Ficus* spp., *Ziziphus mauritiana*, *Morus alba*, *Carica papaya*, *Citrus aurantifolia*, *Theobroma cacao*, *Solanum melongena* etc.

Remarks : Collected from Kulu in Himachal Pradesh, on *Ficus* sp., by Dr. M. Hayat in 1967 (Ali, 1974).

Though originally proposed in *Ceroplastodes* by Green (1908, 1909), this species is now included in genus *Drepanococcus* (Ben-Dov, 1993). This genus is recorded here for the first time in Indian literature.

Subfamily COCCINAE

Tribe COCCINI

Genus *Akermes* Cockerell

1902. *Akermes* Cockerell, *Can. Ent.*, 34 : 89.

Type species : *Akermes bruneri* Cockerell.

12. *Akermes montanus* (Green)

1908. *Lecanium montanum* Green, *Mem. Dept. Agr. India, (Ent.)*, 2(2) : 30.
 1909. *Akermes montanum* : Sanders, *U. S. Dept. Agr., Bur. Ent., (Tech.)*, 16(3) : 46.
 1921. *Lecanium (Akermes) montanus* : Ayyar, *Proc. 4th Ent. Mtg. Pusa* : 350.
 1974. *Akermes montanus* : Ali, *Indian Mus. Bull.*, 6(2) (1971) : 19.
 1992. *Akermes montanus* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 81.

Distribution : Endemic to Himalaya. Known from its original record only, in Himalaya.

Host plants : On an undetermined shrub.

Remarks : This species was described from a locality called 'Janusai', which is probably in Himachal Pradesh.

Genus *Coccus* Linnaeus

1758. *Coccus* Linnaeus, *Syst. Nat.*, ed. 10 : 455.

Type species : *Coccus hesperidum* Linn.

13. *Coccus ramakrishnai* (Ayyar)

1919. *Lecanium ramakrishnae* Green in Ayyar, *Bull. Imp. Agr. Res. Instt. Pusa*, **87** : 35.
 1930. *Lecanium ramakrishnae* : Ayyar, *Bull. Imp. Agr. Res. Instt. Pusa*, **197**(1929) : 47.
 1985. *Coccus ramakrishnai* : Varshney, *Oriental Ins.*, **19** : 26.
 1992. *Coccus ramakrishnae* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, **139** : 87.

Distribution : Endemic to India. Reported from Andhra Pradesh and Himachal Pradesh only.

Host plants : *Ficus bengalensis* and the pear (*Pyrus communis*).

Remarks : This species was originally identified by Green, but first published by Ayyar (1919, 1930) as a 'MS' (manuscript name). He however, provided brief description and also illustration, which made the name and species available in terms of International Code of Zoological Nomenclature (Ben-Dov, 1993). This species is not included in the Oriental catalogue by Ali (1974).

Another very common species, *Coccus hesperidum* Linn., the brown soft scale, (Fig. 5), was recorded for the first time from Jammu & Kashmir State : Srinagar, on *Lonicera* plant, by Varshney (1984b).

Genus *Eulecanium* Cockerell

1893. *Eulecanium* Cockerell, *Trans. Amer. Ent. Soc.*, **20** : 54.

Type species : *Lecanium tiliae* Linnaeus, Thorn scale.

14. *Eulecanium* sp. (near *tiliae* Linnaeus)

(Fig. 6)

1758. *Coccus tiliae* Linnaeus, *Syst. Nat.*, ed. **10** : 456.
 1758. *Coccus coryli* Linnaeus, *Syst. Nat.*, ed. **10** : 456.
 1767. *Coccus capreae* Linnaeus, *Syst. Nat.*, ed. **12** : 741.
 1974. *Eulecanium capreae* : Ali, *Indian Mus. Bull.*, **6**(2) (1971) : 31.
 1992. *Eulecanium* sp. (nr. *tiliae*) : Varshney, *Rec. zool. Surv. India, Occ. Paper*, **139** : 90.

Distribution : Genus *Eulecanium* is recorded from Jammu & Kashmir, Himachal Pradesh and Uttaranchal, in India.

Host plants : Apple (*Malus pumila*), peach (*Prunus persica*), almond (*Prunus amygdalus*), apricot (*Prunus armeniaca*), plum (*Prunus domestica*) etc.

Remarks : This record is from Saproon Valley and Kotta-ka-Nala in Himachal Pradesh (Mishra & Bhalla, 1975; Varshney, 1992). *E. capreae* is recorded from Srinagar and Taliskar in Kashmir (Ali, 1974) and *E. coryli* has also been recorded from J. & K.

The name *Coccus coryli* Linn. was rejected by Opinion No. 1303 of the I.C.Z.N. *Coccus capreae* was synonymized with *tiliae*, by Lindinger in 1912 (Ben-Dov, 1993). *E. tiliae* and *E. coryli* have not been included in the Oriental catalogue by Ali (1974).

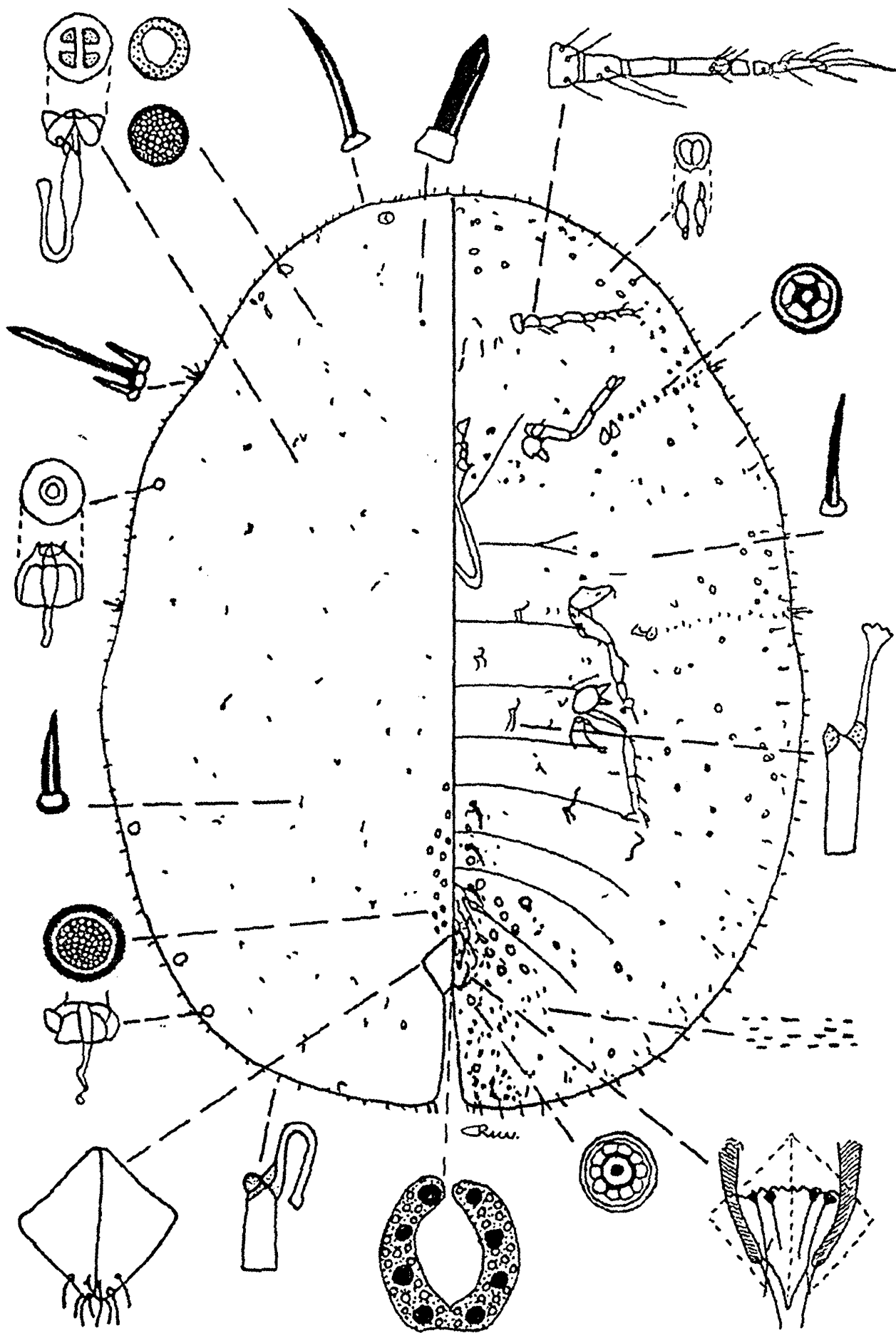


Fig. 5. : *Coccus hesperidum* Linnaeus.

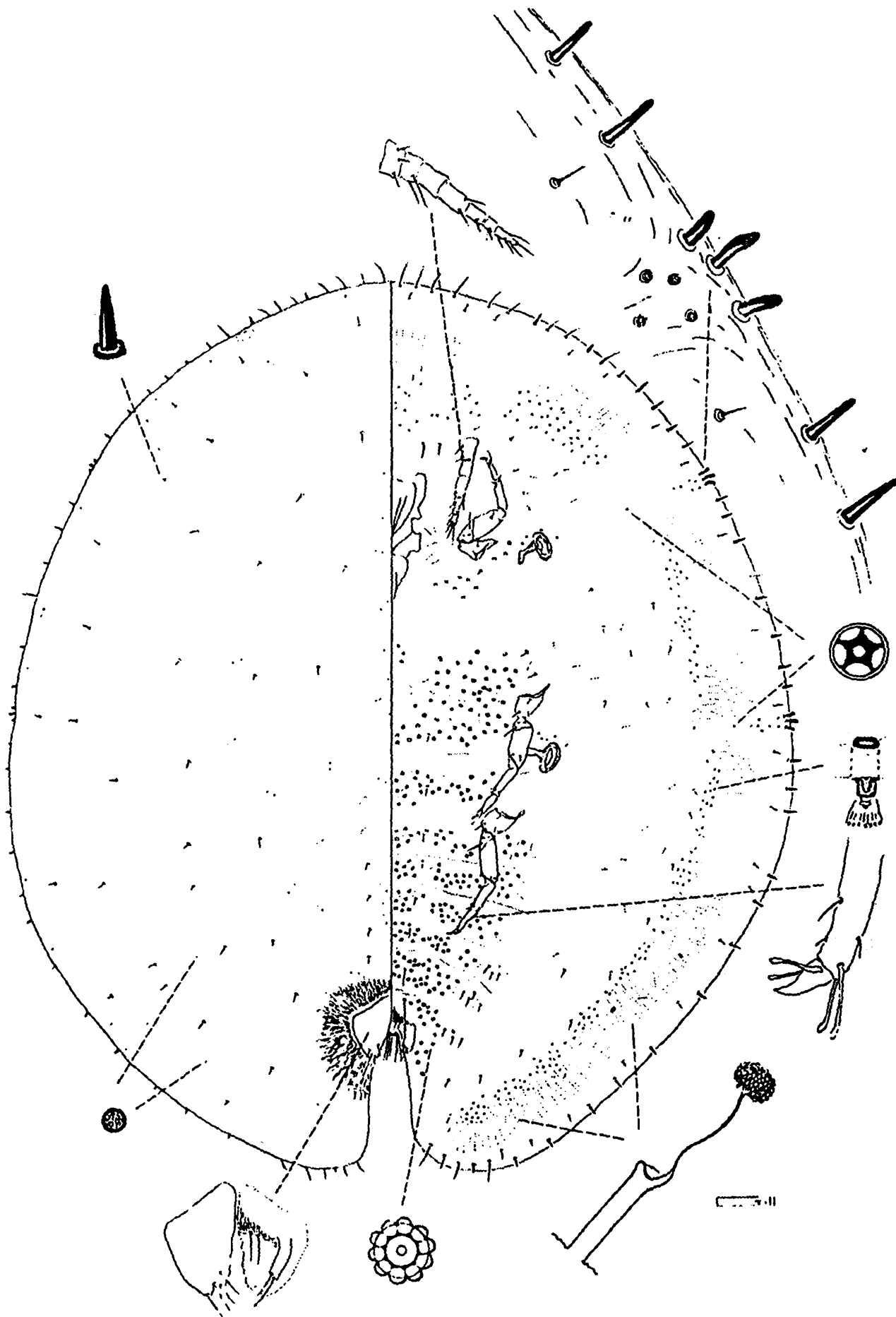


Fig. 6. : *Eulecanium tiliae* (Linnaeus).

Genus *Parthenolecanium* Sulc

1908. *Parthenolecanium* Sulc, *Ent. mon. Mag.*, 44 : 36.

Type species : *Lecanium coryli* Sulc nec Linn. (= *Lecanium corni* Bouche).

15. *Parthenolecanium persicae* (Fabr.). European Peach scale.

(Fig. 7)

1776. *Chermes persicae* Fabricius, *Gen. Ins.*, : 304.

1908. *Lecanium persicae* : Green, *Mem. Dept. Agr. India*, (Ent.), 2(2) : 31.

1921. *Lecanium persicae* : Ayyar, *Proc. 4th Ent. Mtg. Pusa* : 350.

1974. *Parthenolecanium persicae* : Ali, *Indian Mus. Bull.*, 6(2) (1971) : 41.

1992. *Parthenolecanium persicae* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 96.

Distribution : India (Punjab). *Elsewhere* : Widely in the Palaearctic Region.

Host plants : *Morus indica*, *M. alba*, *Prunus amygdalus* and *P. bokhariensis*.

Remarks : Recorded from Changa Manga in Punjab (Varshney, 1992). Earlier Ayyar (1921) recorded it from 'Jhelum, Punjab'

Subfamily CEROPLASTINAE

Genus *Ceroplastes* Gray

1828. *Coccus* (*Ceroplastes*) Gray, *Spicilegia Zool.*, : 7.

Type species : *Coccus* (*Ceroplastes*) *janeirensis* Gray.

16. *Ceroplastes ajmerensis* (Avasthi & Shafee)

1979. *Cerostegia ajmerensis* Avasthi & Shafee, *Curr. Sci.*, 48(1) : 36.

1988. *Ceroplastes neoceriferus* Yousuf & Shafee, *Indian J. Syst. Ent.*, 5 : 61.

1991. *Paracerostegia ajmerensis* : Tang, *Coccidae of China* : 304.

1992. *Ceroplastes ajmerensis* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 78.

Distribution : Endemic to North India. Recorded from Rajasthan and Himachal Pradesh.

Host plants : *Cassia fistula*, *Psidium guajava* and *Citrus* sp.

Remarks : Originally known from Ajmer (Rajasthan), and as such recorded from there only. *C. neoceriferus* was recorded from Solan (H. P.), on *Citrus* sp. (Yousuf & Shafee, 1988).

17. *Ceroplastes ceriferus* (Fabr.). Indian White Wax scale.

(Fig. 8)

1798. *Coccus ceriferus* Fabricius, *Suppl. Ent. Syst.* : 546.

1921. *Ceroplastes ceriferus* : Ayyar, *Proc. 4th Ent. Mtg. Pusa* : 346.

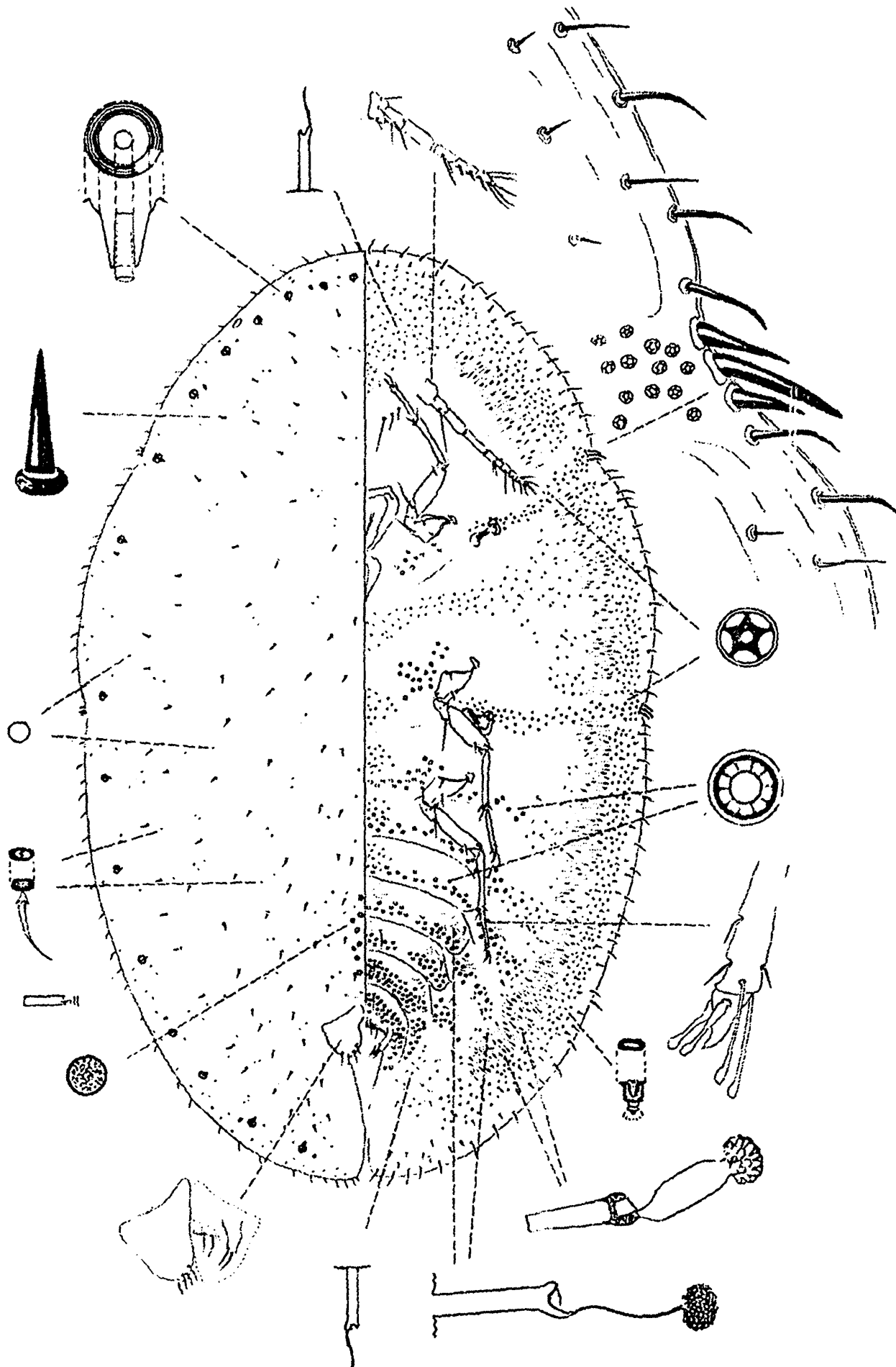


Fig. 7. : *Parthenolecanium persicae* (Fabricius).

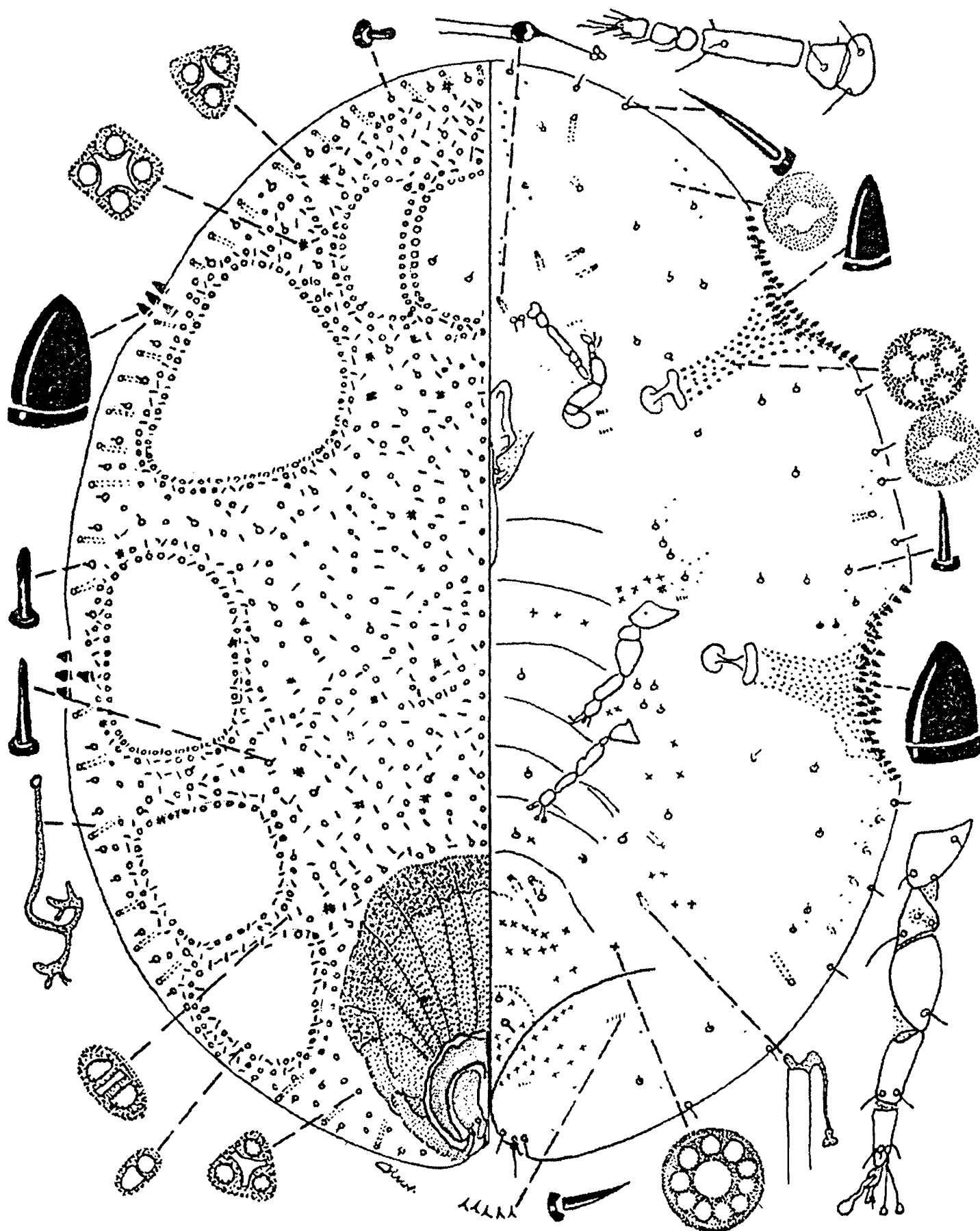


Fig. 8. : *Ceroplastes ceriferus* (Fabricius).

1974. *Ceroplastes ceriferus* : Ali, *Indian Mus. Bull.*, 6(2) (1971) : 16.

1992. *Ceroplastes ceriferus* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 139 : 78.

Distribution : Very widely in India, including H.P., Uttaranchal, M.P., Maharashtra, Jharkhand, W. Bengal, Assam and Tamil Nadu.

Host plants : Polyphagous. Reported on several plants including *Celastrus ceriferus*, *Asclepiadron* sp., *Lawsonia inermis*, *Terminalia* sp., *Citrus* spp., *Ficus* spp., *Carissa spinarium*, *Morus indica* etc.

Remarks : Reported from the Kangra Valley in Himachal Pradesh on tea plant (Atkinson, 1890), and from Kalka in H.P., collected by Dr. M. Hayat in 1967 on *Carissa spinarium* (Ali, 1974).

Family 7. DIASPIDIDAE

Subfamily PARLATORIINAE

Tribe LEUCASPIDINI

Genus *Suturaspis* Lindinger

1906. *Suturaspis* Lindinger, *Jahrb. Hamburg Wiss. Anst.*, (1905), 23(3) : 26.

Type species : *Leucaspis pistaciae* Lindinger.

18. *Suturaspis indiaeorientalis* (Lindinger)

1911. *Leucodiaspis indiae-orientalis* Lindinger, *Zeit. f. Wiss. Insektenbiol.*, 7(4) : 127.

1921. *Suturaspis indiae-orientalis* : MacGillivray, *Coccidae* : 268.

1970. *Suturaspis indiaeorientalis* : Ali, *Indian Mus. Bull.*, 5(1) : 28.

2002. *Suturaspis indiaeorientalis* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 191 : 4.

Distribution : Known by its original record only. Endemic to India, particularly Himachal Pradesh.

Host plants : *Pinus khasya*.

Remarks : Recorded from Shimla in Himachal Pradesh originally.

Tribe PARLATORIINI

Genus *Cryptoparlatoarea* Lindinger

1905. *Cryptoparlatoarea* Lindinger, *Insekten Borse*, 22 : 132.

Type species : *Cryptoparlatoarea leucaspis* Lindinger.

19. *Cryptoparlatoarea pini* Takahashi

1938. *Cryptoparlatoarea pini* Takahashi, *Proc. R. ent. Soc. Lond.*, (B)7 : 271.

1966. *Cryptoparlatoarea pini* : Borchsenius, *Catalogue Arm. Scale Ins. of World* : 204.

1970. *Cryptoparlatoresia pini* : Ali, *Indian Mus. Bull.*, 5(1) : 14.

2002. *Cryptoparlatoresia pini* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 191 : 5.

Distribution : Known by its original record only, from India : Himachal Pradesh.

Host plant : *Pinus* sp.

Remarks : Originally recorded from 'Manali, The Punjab'

Subfamily ASPIDIOTINAE

Tribe ASPIDIOTINI

Note : Ayyar (1921) recorded *Aspidiotus theae* Maskell (which is now *Pseudaonidia rhododendri thearum* Cockerell) on tea plant, from 'Kangra, Punjab' This was however, not accepted by Ali (1970), because "tea is not and has never been in the Kangra Valley (grown)" Hence, this species is not included here. *Aspidiotus destructor* Sign. reported from Punjab by Ansari (1942) was perhaps from present day Pakistan.

Genus *Aonidiella* Berlese & Leonardi

1895. *Aonidiella* Berlese & Leonardi, *In Berlese, Riv. di Patol. Veg.*, (1896) 4 : 77, 83.

Type species : *Aspidiotus aurantii* Maskell.

20. *Aonidiella aurantii* (Maskell). Red scale or Orange scale.

(Fig. 9)

1879. *Aspidiotus aurantii* Maskell, *Trans. Proc. New Zealand Instt.*, 11(1878) : 199.

1966. *Aonidiella aurantii* : Borchsenius, *Catalogue Arm. Scale Ins. of World* : 292.

1970. *Aonidiella aurantii* : Ali, *Indian Mus. Bull.*, 5(1) : 33.

2002. *Aonidiella aurantii* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 191 : 20.

Distribution : Common all over India. Recorded from H. P., Punjab, Delhi, Bihar, W. Bengal, Assam, Tripura, Orissa and all southern states.

Host plants : Polyphagous. A pest of *Citrus* spp. Also recorded on mulberry, rose, guava, *Nerium*, *Jasminum*, *Pyrus*, *Prunus*, *Tamarix*, *Aegle*, *Annona*, *Cycas*, *Eugenia* etc.

Remarks : Recorded from various places in the country as well as abroad, this damaging species is known from Delhi, Punjab and Himachal Pradesh. Varshney (1984b) reported it from Sarol in Chamba Dist. (H.P.) and Salem Tabri in Ludhiana (Punjab).

Another similarly damaging sister species, *Aonidiella orientalis* (Newstead), the Oriental scale, is also known from Punjab.

Genus *Quadraspidotus* MacGillivray

1921. *Quadraspidotus* MacGillivray, *Coccidae* : 388.

Type species : *Aspidiotus ostreaeformis* Curtis.

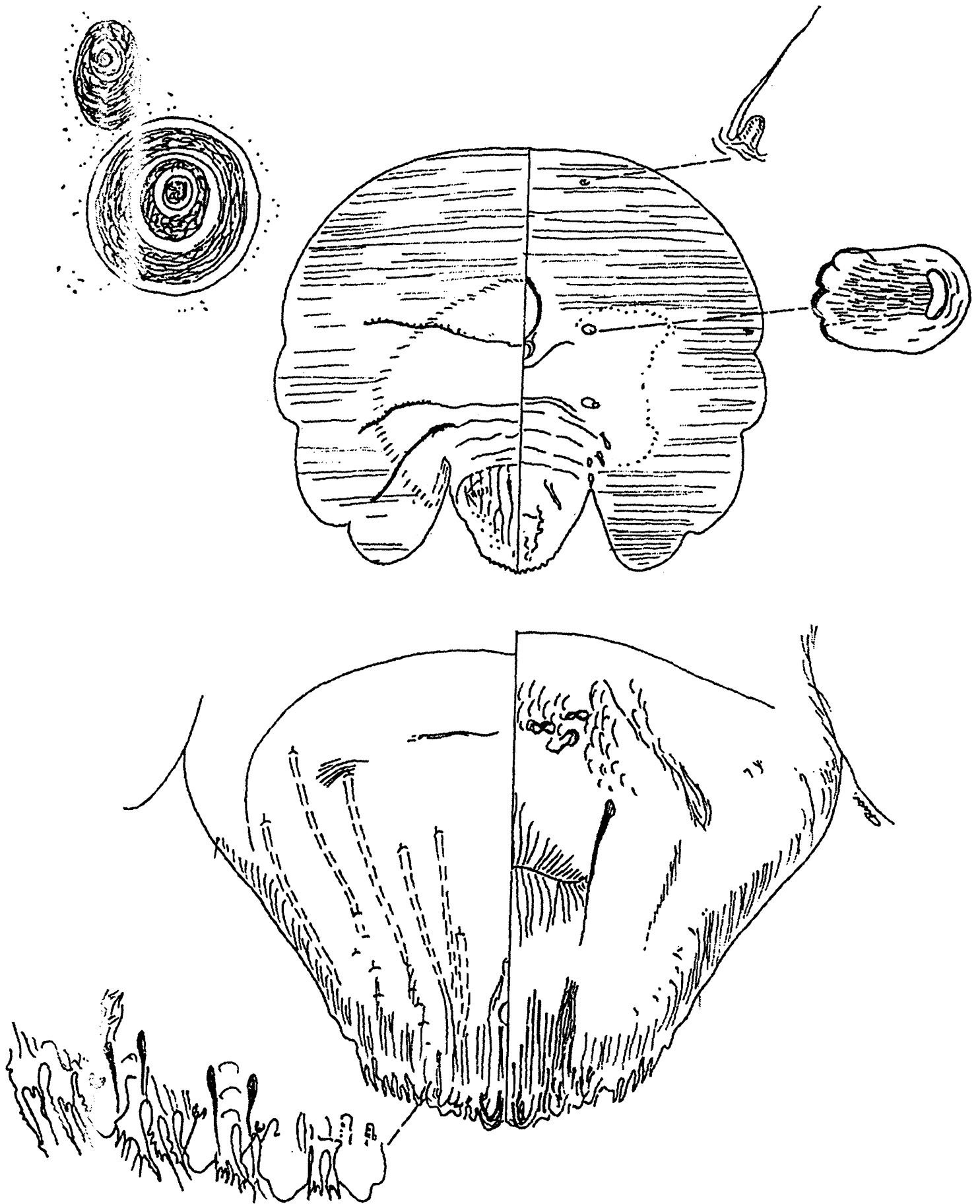


Fig. 9. : *Aonidiella aurantii* (Maskell).

21. *Quadraspidiotus perniciosus* (Comstock). San Jose scale.

(Fig. 10)

1881. *Aspidiotus perniciosus* Comstock, U.S. Dept. Agr. Rept., 1880 : 304.
 1966. *Quadraspidiotus perniciosus* : Borchsenius, Catalogue Arm. Scale Ins. of World : 336.
 1970. *Quadraspidiotus perniciosus* : Ali, Indian Mus. Bull., 5(1) : 53.
 2002. *Quadraspidiotus perniciosus* : Varshney, Rec. zool. Surv. India, Occ. Paper, 191 : 38.

Distribution : Mostly dispersed with the fresh furits or fruit plants, widely in India, right in the north from J. & K., H. P., Uttaranchal, U. P., Sikkim, W. Bengal, Meghalaya, Orissa, Maharashtra, to the down south in Karnataka and Tamil Nadu.

Host plants : On apple, peach, pear, plum, almond, apricot, cherry, grape vine, birch, beech, poplar, currant, chestnut, mulberry, oak, eucalyptus, walnut, rose and other fruit plants, forest trees and bushes.

Remarks : Occurs on twigs, leaves and fruits, causing formation of pink colour patches at the places of attachment. Reported from Kashmir as well as Shimla, Craignano and Kullu in H. P., and from Punjab (Ali, 1970).

Subfamily DIASPIDINAE

Tribe DIASPIDINI

Genus *Aulacaspis* Cockerell

1893. *Aulacaspis* Cockerell, Instt. Jamaica J., 1 : 180.

Type species : *Aspidiotus rosae* Bouche.

22. *Aulacaspis vitis* (Green)

1896. *Chionaspis vitis* Green, Indian Mus. Notes, 4 : 3.
 1966. *Phenacaspis vitis* : Borchsenius, Catalogue Arm. Scale Ins. of World : 127.
 1969. *Phenacaspis vitis* : Ali, Indian Mus. Bull., 4(2) : 72.
 2002. *Aulacaspis vitis* : Varshney, Rec. zool. Surv. India, Occ. Paper, 191 : 58.

Distribution : Occurs in India in H. P., Bihar, Assam, Orissa, Karnataka and Tamil Nadu.

Host plants : On leaves of mango, *Elaeagnus latifolia*, *Loranthus* sp., *Vitis lanceolaria*, *Mallotus* sp., *Grewia* sp., *Artocarpus* sp. etc.

Remarks : Recorded from Kangra in Himachal Pradesh (Varshney, 2002).

Genus *Chionaspis* Signoret

1869. *Chionaspis* Signoret, Ann. Soc. Ent. de France, (4)8 : 844.

Type species : *Coccus salicis* Linnaeus.

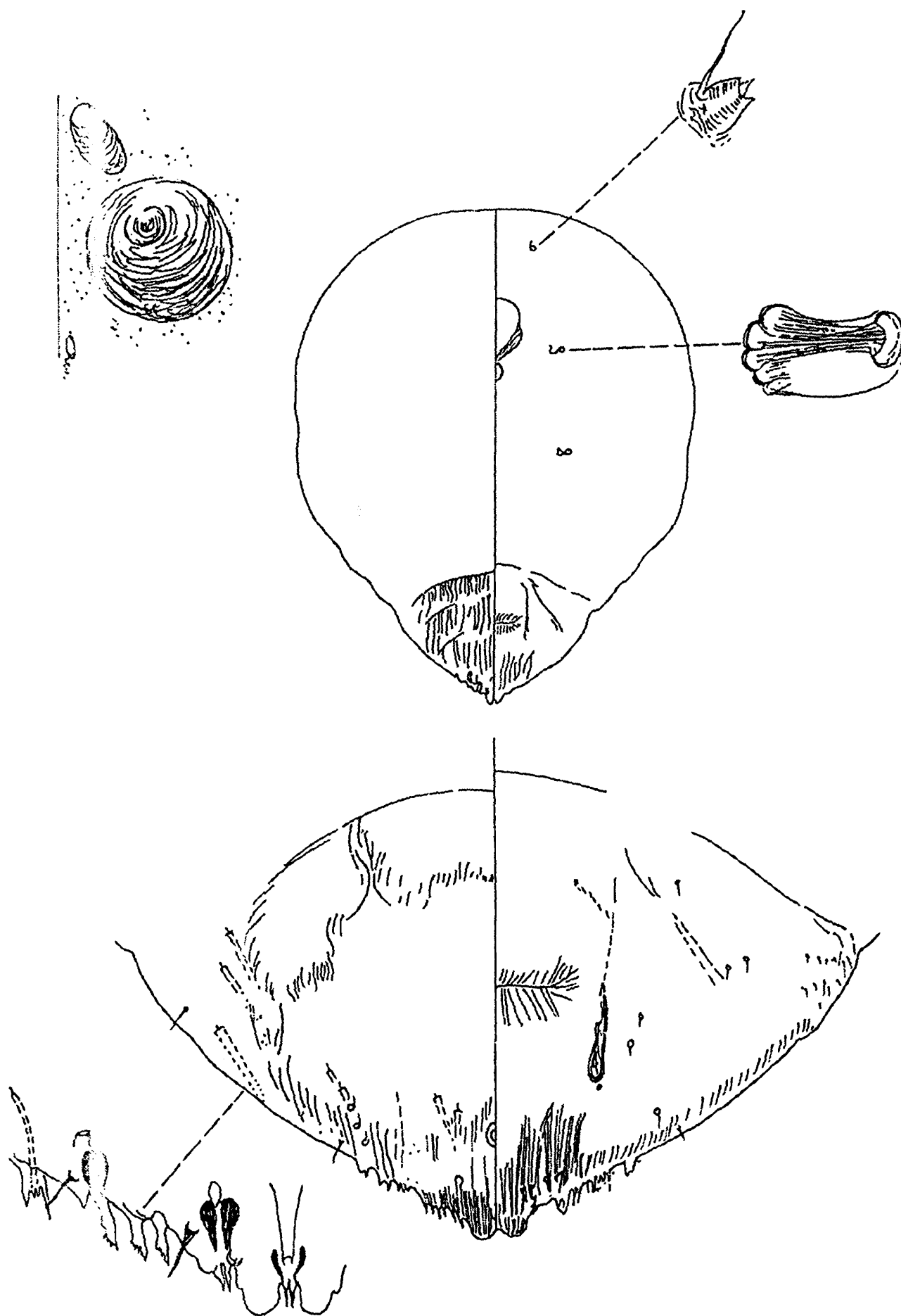


Fig. 10. : *Quadraspidiotus perniciosus* (Comstock).

23. *Chionaspis himalaica* Takagi

(Fig. 11)

1985. *Chionaspis himalaica* Takagi, *Ins. matsum.*, (n.s.), **33** : 16.2002. *Chionaspis himalaica* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, **191** : 59.

Distribution : Known from its original record only. Reported from Himachal Pradesh only in India, besides Nepal.

Host plant : *Quercus semecarpifolia*.

Remarks : Originally collected from Kufri (2500 m) in Himachal Pradesh, by Prof. Dr. S. Takagi, who surveyed NW. Himalaya alongwith the author, in 1978.

Genus *Duplachionaspis* MacGillivray1921. *Duplachionaspis* MacGillivray, *Coccidae* : 307.

Type species : *Chionaspis graminis* Green.

24. *Duplachionaspis divergens* (Green)1899. *Chionaspis graminis* var. *divergens* Green, *Coccidae of Ceylon*, Pt. **2** : 123.1908. *Chionaspis graminis* var. *divergens* : Green, *Mem. Dept. Agr. India*, (Ent.). **2**(2) : 37.1921. *Duplachionaspis divergens* : MacGillivray, *Coccidae* : 334.1930. *Chionaspis graminis* : Ayyar, *Bull. Imp. Instt. Agr. Res. Pusa*, **197**(1929) : 16.1966. *Greenaspis divergens* : Borchsenius, *Catalogue Arm. Scale Ins. of World* : 108.1985. *Duplachionaspis divergens* : Varshney, *Oriental Ins.*, **19** : 38.2002. *Duplachionaspis divergens* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, **191** : 63.

Distribution : Discontinuously recorded in India from Punjab in the north and Tamil Nadu and Kerala in the south.

Host plants : On grass, *Andropogon* spp., sugarcane, *Spinifex* sp. and undetermined plants.

Remarks : Originally collected from Bharwain in Hoshiarpur, Punjab, by I. H. Burkill, on *Andropogon* (Green, 1908).

Genus *Fiorinia* Targioni-Tozzetti1868. *Fiorinia* Targioni-Tozzetti, *Soc. Ital. di Sci. Nat. Atti*, **11** : 42.

Type species : *Fiorinia pellucida* Targioni-Tozzetti (= *Diaspis fioriniae* Targioni-Tozzetti).

25. *Fiorinia himalaica* Takagi

(Fig. 12)

1975. *Fiorinia himalaica* Takagi, *Ins. matsum.*, (n.s.) **6** : 26.1985. *Fiorinia himalaica* : Varshney, *Oriental Ins.*, **19** : 38.2002. *Fiorinia himalaica* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, **191** : 65.



Fig. 11. : *Chionaspis himalaica* Takagi.

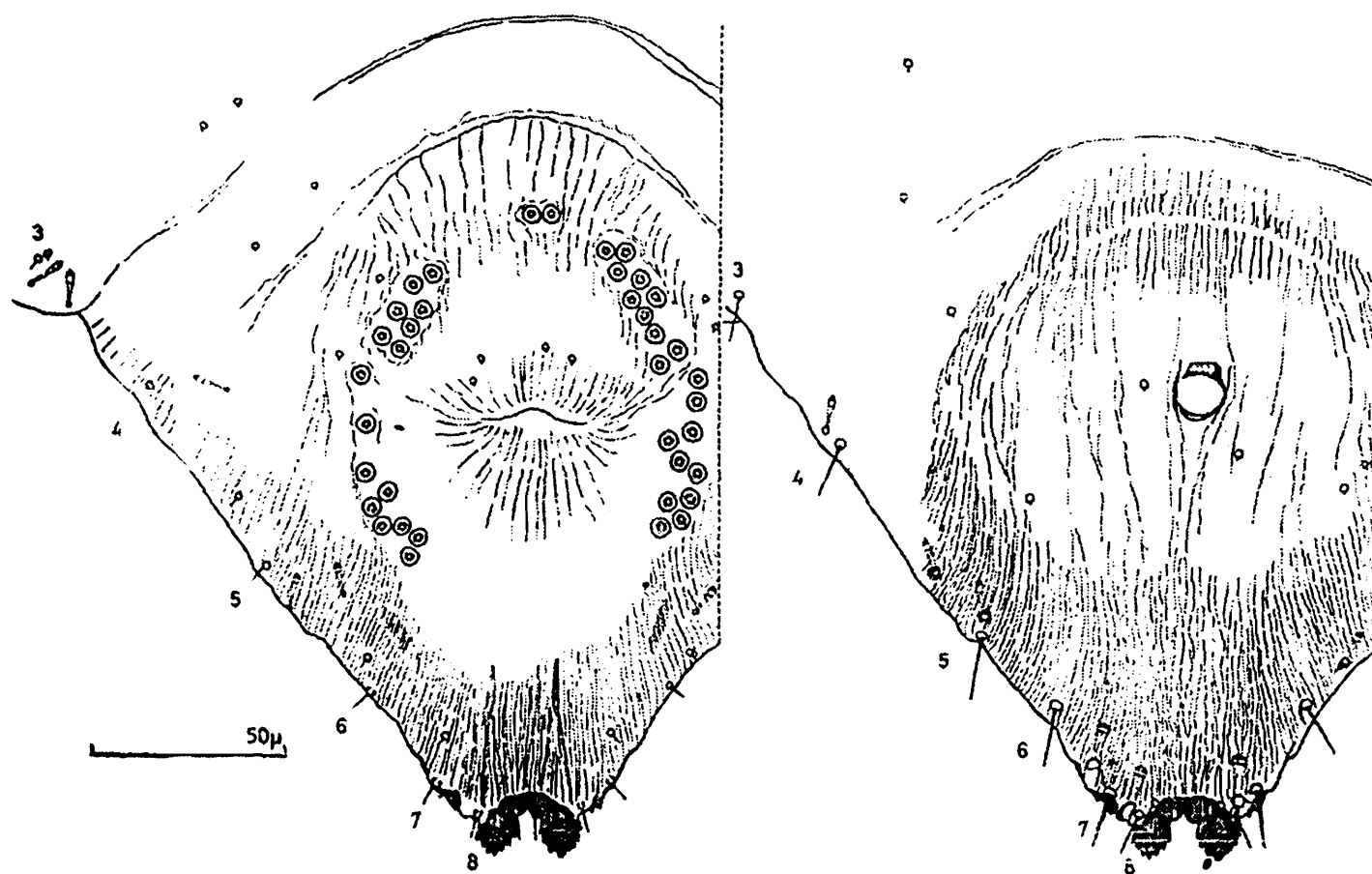


Fig. 12. : *Fiorinia himalaica* Takagi.

Distribution : Known from its original record only. Reported from Himachal Pradesh and Uttaranchal in India, besides Nepal.

Host plants : *Rhododendron arboreum*.

Remarks : Originally described from Nepal and then collected from Chail in H. P. and Mussoorie in Uttaranchal in India, by Prof. Dr. S. Takagi, when he surveyed the NW. Himalaya alongwith the author in 1978.

Genus *Pseudaulacaspis* MacGillivray

1921. *Pseudaulacaspis* MacGillivray, *Coccidae* : 305.

Type species : *Aulacaspis pentagona* Targioni-Tozzetti.

26. *Pseudaulacaspis manni* (Green)

1907. *Chionaspis manni* Green in Green & Mann, *Mem. Dept. Agr. India*, (Ent.) 1 : 344.

1908. *Chionaspis manni* : Green, *Mem. Dept. Agr. India*, (Ent.) 2(2) : 37.

1965. *Phenacaspis manni* : Varshney, *Proc. Ent. Soc. Washington*, 67(1) : 5.

1966. *Diaspis manni* : Borchsenius, *Catalogue Arm. Scale Ins. of World* : 172.

1969. *Phenacaspis manni* : Ali, *Indian Mus. Bull.*, 4(2) : 70.

2002. *Pseudaulacaspis manni* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 191 : 74.

Distribution : In India reported from Himachal Pradesh, West Bengal, Assam and Tamil Nadu.

Host plants : On tea plant (*Thea chinensis*), *Ficus* spp., *Solanum melongena* and *Citrus* sp.

Remarks : Originally recorded from Assam, collected by H. H. Mann, this species was soon after collected from Kangra Valley (H. P.) on *Ficus* sp., by I. H. Burkill (Green, 1908).

27. *Pseudaulacaspis venui* (Menon & Khan)

1961. *Chionaspis venui* Menon & Khan, *Proc. 48th Indian Sci. Congr.*, Pt. 3 : 425.

1969. *Chionaspis venui* : Ali, *Indian Mus. Bull.*, 4(2) : 40.

1985. *Chionaspis venui* : Varshney, *Oriental Ins.*, 19 : 37.

2002. *Pseudaulacaspis venui* : Varshney, *Rec. zool. Surv. India, Occ. Paper*, 191 :

Distribution : Known from its original record only. Endemic in Himachal Pradesh.

Host plant : *Ficus palmata*.

Remarks : Ali (1969) stated that this species was described from the collection of E. E. Green. Menon & Khan (1963) published a detailed description of it. Borchsenius (1966) erroneously named it as 'venni'. It is known from its original record of Palampur, Kangra (H. P.) only.

SUMMARY

Altogether 27 species (plus 5 mentioned in Remarks) belonging to 22 genera and 7 families, have been reported from Western part of the Shivalik Himalaya and adjacent areas in Northern India, covering the Indian States of Jammu & Kashmir, Himachal Pradesh and Punjab. Some taxonomic citations, distribution in India and host plants are mentioned in each case. San Jose scale (*Quadrastpidiotus perniciosus*) is the earliest known and prominent species. Nine species are known from their original records only, mostly from Himachal Pradesh. One species, *Aspidiotus theae*, though earlier claimed to occur in Kangra, is not included here, since its host plant (tea) does not occur in this region. Two genera, *Humococcus* and *Drepanococcus*, have been reported for the first time here in Indian coccid literature.

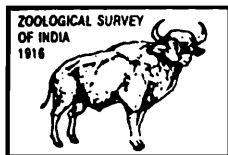
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The author is grateful to several coccidologists, who have very kindly sent coccid publications, particularly to Dr. D. R. Miller and Prof. M. Kosztarab (U.S.A.), Dr. D. J. Williams (England), Dr. Mrs. E. M. Danzig (Russia), Prof. S. Takagi (Japan), Prof. Tang Fang-Teh (China), Dr. Y. Ben-Dov (Israel), Dr. S. Mahdihassan (Pakistan) and Mr. S. M. Ali and Dr. R. K. Avasthi (India). Thanks are recorded to the Director, Zoological Survey of India, Kolkata, for providing facilities and encouragement. The author is obliged to Dr. H. S. Mehta, the Officer-in-charge, High Altitude Zoology Field Station, Zoological Survey of India, Solan (H. P.), for inviting the author to join this project and various other courtesies.

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Rec. zool. Surv. India : 105 (Part 3–4) : 169-188, 2005

OBSERVATION ON VERTEBRATE FAUNA OF D'ERING MEMORIAL WILDLIFE SANCTUARY, ARUNACHAL PRADESH

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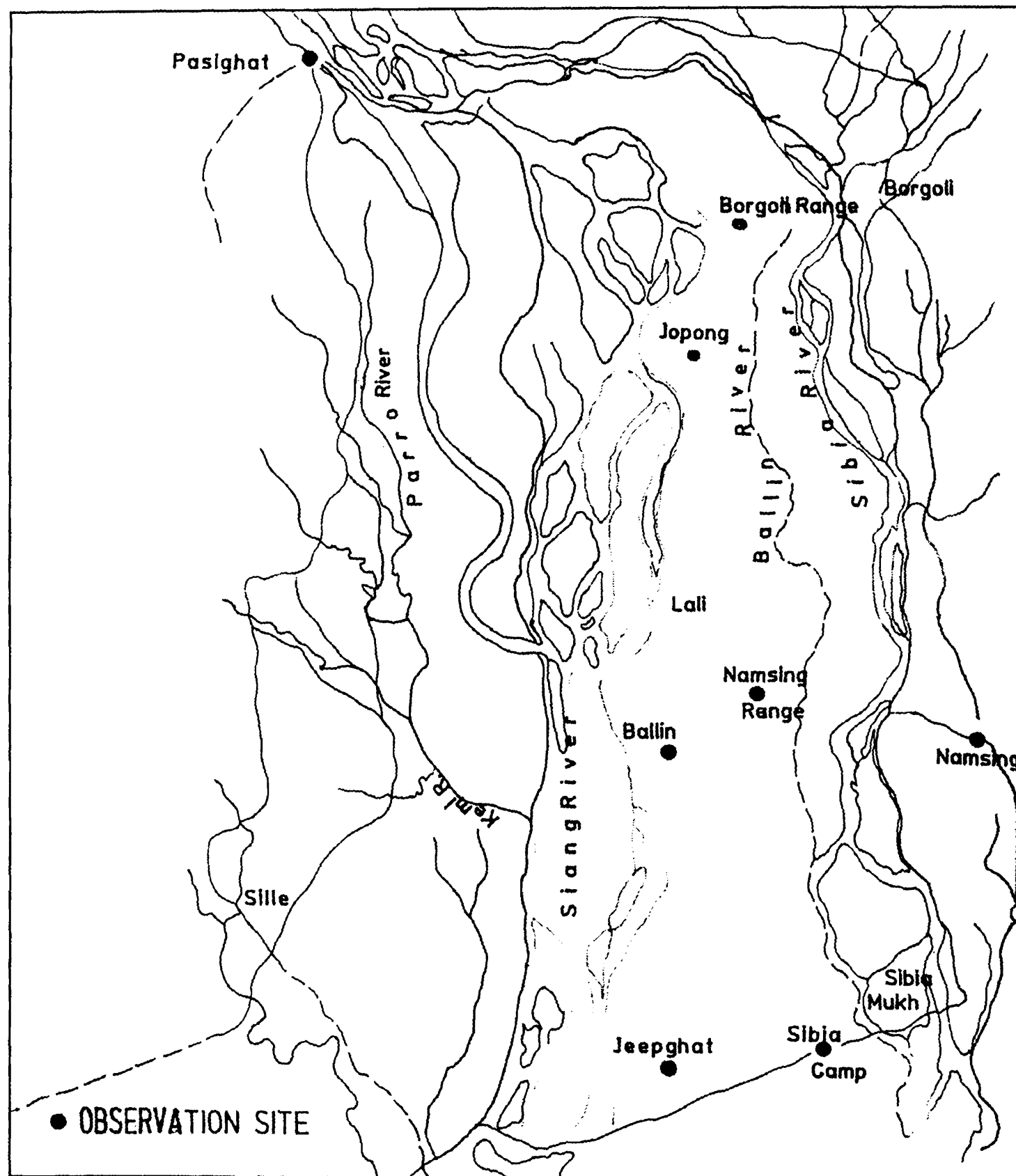
INTRODUCTION

The D'Ering Wildlife Sanctuary formerly known as Lali Sanctuary is located at Pasighat Forest Division, East Siang district, Arunachal Pradesh. It is one of the least faunistically explored area in India. So, special efforts were made to survey wildlife of the sanctuary during 2000-2001 and 2001-2002. The paper mainly deals with the vertebrate fauna *i.e.*, mammals, birds, reptiles, amphibians and fishes. Nevertheless special emphasis has been given on mammals and birds only. Very little information is available on some higher vertebrates of Arunachal Pradesh from the works of Jayaram and Majumder (1964), Ripley (1980), Saha (1982), Moll and Vijay (1986), and on faunal elements of Namdhapa Biosphere Reserve (Datta and Barman 1985, Sanyal and Gayen 1985, Saha 1985). In the present paper an attempt has been made to give an account of the vertebrate fauna with special reference to mammals and birds occurring in the D'Ering Wildlife Sanctuary area under report.

STUDY AREA

The D'Ering Wildlife Sanctuary of East Siang District, Arunachal Pradesh (Map 1) lies in between 95°15' to 95°30' east longitude and 27°50' to 28°50' to north latitude. It is bounded by Sibia river in the east, Siang river in the west, Central Wildlife Division of Ying Kiong in the north and North Lakhimpur district of Assam in the south. A large number of jheels, nullahs and waterbodies are present in and around the sanctuary. The total area of the sanctuary is 1,638.4 hectares. The sanctuary was damaged heavily by flood in 2000 resulting in the decline of wildlife population.

The divisional boundary of Pasighat Wildlife Division is bounded by Dibang Valley district in the east, West Siang district in the north and west and North-Lakhimpur district of Assam in the



**Map 1. : Map of D' Ering Memorial Wildlife Sanctuary, Divn. Pasighat,
(Arunachal Pradesh)**

Scale 1 : 50,000

south. The topography is characterised by the beautiful valley of Siang river with numerous streams, situated along the foot hills of eastern Himalaya. The climate of the terrain may be divided into four seasons (i) pre-monsoon from March to May, (ii) south-west monsoon confined to June to September, (iii) post monsoon, October and November, (iv) winter season mainly from December to February. The hottest months are July and August with the minimum temperature of 24°C and the maximum temperature of 33°C. The coldest months are December and January with the minimum temperature near about 12°C and maximum 22°C. The total annual rainfall of Pasighat Forest Division is 6508.5 mm. The maximum amount of rainfall is in the month of July *i.e.*, 1243 mm. and monsoon shower ends in September.

The soil of Pasighat Wildlife Division is of new alluvial type. The vegetation of this region are of mixed riverine and mixed moist deciduous type which include small and tall trees, shrub, bamboo-grasses, climbers, orchids *etc.* The thorny trees like Jujuba, *Zizyphus jujuba* Lamk are very common in the forest.

MATERIALS AND METHODS

During 2000-2001 and 2001-2002, two surveys were made on foot along the forest trail while along the river course country boat was used. The observations were carried out from early morning to sunset by using binocular, telescope for visual recording of higher vertebrates. The nocturnal observations were carried out by using headlight, spotlight and three-celled torch. Sometimes mist nets were used to capture small birds and release after identification. Hand-made drag net was used for collections of fish samples.

RESULTS AND DISCUSSION

The faunal resources belonging to higher vertebrates (mammals, birds, reptiles amphibians and fishes) are as follows :

Mammals (Figs. 1 and 2)

Twenty-three species of mammals belonging to 16 families have been recorded (Table 1) from this wildlife sanctuary. Out of 23 species of mammals 2 species namely Small clawed otter (*Amblonyx cinerea*) and Common otter (*Lutra lutra*) are rare and recorded along the Sibia river and its tributaries. The only aquatic mammal, the Gangetic Dolphin (*Platanista gangetica*) was recorded along the course of the Brahmaputra river. Only a few individual of this species was observed. According to Sinha *et al.*, (2003) a total of about 2000 dolphins have been estimated in the Ganga and the Brahmaputra river system. In the 19th century dolphins were plentiful in the entire distributional range. But their population is declined due to shrinkage of many smaller

tributaries in upper reaches of the Ganga where they were found earlier and nowadays killed both incidentally or directly. The IUCN recently change the status of the species from vulnerable to endangered (Baillie and Groombridge, 1996).

Table 1. : List of Mammals recorded in D'Ering Memorial Wildlife Sanctuary

Order	Family	Common name	Scientific name	Remarks
Scandentia	Tupaiaidae	Common Tree Shrew	<i>Tupaia belangeri</i>	Scarce
Chiroptera	Vespertilionidae	Indian Pipistrelle	<i>Pipistrellus babu</i>	Common
	"	Asiatic Greater Yellow Bat	<i>Scotophilus heathi</i>	Scarce
Primates	Cercopithecidae	Rhesus Macaque	<i>Macaca mulatta</i>	Scarce Sch-II
Carnivora	Canidae	Asiatic Jackal	<i>Canis aureus</i>	Scarce Sch-II
	Felidae	Tiger	<i>Panthera tigris</i>	Rare Sch-I
	Viverridae	Small Indian Civet	<i>Viverricula indica</i>	Rare Sch-II
		Masked Palm Civet	<i>Paguma larvata</i>	Rare Sch-II
	Herpestidae	Crab-eating Mongoose	<i>Herpestes urva</i>	Rare Sch-IV
	Mustelidae	Small Clawed Otter	<i>Amblonyx cinereus</i>	Rare
		Common Otter	<i>Lutra lutra</i>	Rare Sch-I
Cetacea	Platanistidae	Gangetic Dolphin	<i>Platanista gangetica</i>	Sch-I
Proboscidea	Elephantidae	Elephant	<i>Elephas maximus</i>	Non resident Sch-I
Artiodactyla	Suidae	Wild Boar	<i>Sus scrofa</i>	Rare Sch-I
	Cervidae	Barking Deer	<i>Muntiacus muntjak</i>	Scarce Sch-III
	"	Sambar	<i>Cervus unicolor</i>	Scarce Sch-III
	"	Spotted Deer	<i>Axis axis</i>	Scarce Sch-IV
	"	Hog Deer	<i>Axis porcinus</i>	Scarce Sch-III
	Bovidae	Wild Buffalo	<i>Bubalus bubalis</i>	Scarce Sch-I
Rodentia	Sciuridae	Orange-bellied Himalayan Squirrel	<i>Dremomys lokriah</i>	Scarce
	Muridae	Bush Rat	<i>Golunda ellioti</i>	Common Sch-IV
	Hystriidae	Indian Crested Porcupine	<i>Hystrix indica</i>	Scarce Sch-IV
Lagomorpha	Leporidae	Blacknaped Hare	<i>Lepus nigricollis</i>	Common Sch-IV

Sch = Scheduled of Indian Wildlife (Protection) Act.

Though the species, wild buffalo (*Bubalus bubalis*) has become very rare but it is common only a few protected areas of Assam *e.g.* Kaziranga, Manas and Dibru-Saikhowa and also recorded from Kachar district of southern Assam (Choudhury, 2002). Their population is under severe threat due to depletion of suitable swamp and grassland habitat, large scale poaching and communal hunting (Ranjit Singh *et al.*, 2002). Two herds of the species, one herd comprising of four adults and three juveniles and the other herd comprising of four adults have been recorded around the Sibia river bed. The tiger (*Panthera tigris*) population in this sanctuary is very low. The presence of tiger in this sanctuary could only be ascertained by a few recent spoor marks and few traces of recent hunting. In Arunachal Pradesh though there is excellent ever green vegetation and plenty of water, the tiger population is less due to limited number of prey animals (Sankhela, 1977). The invasion of elephant (*Elephas maximus*) is noted by the presence of their foot-prints and bolus. The personnel of Forest Department reported that in the month of May and June the herds of elephant about 15–20 in a group migrate to the sanctuary from adjacent Mohanbari and Sadia forest of Assam. They reside here for two to three months and again return to Mohanbari and Sadia forest of Assam in the month of September and October. This seasonal migration to Lali Sanctuary is due to scarcity of food in Mohanbari and Sadia forest for cultivation and abundance of food in Lali Sanctuary. The deer groups of the family Cervidae and the wild boar (*Sus scrofa*) of the family Suidae are less in population. The Wild Boar, Barking deer, Sambar *etc.* were once common in the sanctuary as stated by forest personnel. But at present their population became very low due to illegal killing of the animals for meat and skins. Chakraborty and Sen (1991) stated that in recent years wild animals came in close contact to the people who realised the commercial value of the forest products and this further encouraged them to the killing of animals.

Birds (Figs. 3–5)

While conducting the field survey during 2000-2001 and 2001-2002, 123 species of birds belonging to 39 families (Table 2) were recorded. The avifaunal components belong to both passerine as well as non passerine forms. In all 107 species are resident and 16 species are migratory. The wetland birds belonging to 13 families *i.e.*, Podicipedidae, Pelecanidae, Phalacrocoracidae, Ardeidae, Ciconiidae, Anatidae, Accipitridae, Rallidae, Glareolidae, Charadriidae, Laridae, Alcedinidae, Motacillidae, were recorded during the survey. The water birds were mostly observed along the Brahmaputra, Sibia and Siang rivers. Among the water birds two groups of Spot-billed Pelican (*Pelecanus philippensis*) were recorded, one group comprising of 41 in number in April 2001 and the other group comprising of 28 numbers in April 2002 along the course of Sibia river. The status and distribution of this species is globally threatened/vulnerable and over all population is declining (Alfred *et al.*, 2001). The Osprey (*Pandion haliaetus*) was also encountered during the survey. It is to be noted that this species belonging to schedule-I of the Indian Wildlife (Protection) Act. 1972 and its further amendments, is also listed as IBA species and enlisted in APPENDIX-I of the CITES.

Table 2. : List of Avifauna recorded in D'Ering Memorial Wildlife Sanctuary
(R : Resident bird, M : Migratory bird, S.L.M. : Subject to local migration)

Family & Species	Common Name	Remarks
PODICIPEDIDAE <i>Podiceps cristatus</i>	Great Crested Grebe	Common M
PELECANIDAE <i>Pelecanus philippensis</i>	Spottedbilled Pelican	Scarce M Sch-I
PHALACROCORACIDAE <i>Phalacrocorax carbo</i> <i>Phalacrocorax niger</i> <i>Phalacrocorax fuscicollis</i>	Large Cormorant Little Cormorant Shag	Common R Common R Rare R
ARDEIDAE <i>Egretta garzetta</i> <i>Egretta intermedia</i> <i>Ardeola striatus</i> <i>Ardeola grayii</i> <i>Ardea cinerea</i> <i>Ardea purpurea</i> <i>Ardea alba</i> <i>Nycticorax nycticorax</i> <i>Bubulcus ibis</i>	Little Egret Median Egret Little Green Heron Pond Heron Grey Heron Purple Heron Large egret Night Heron Cattle Egret	Common R Common R Rare R Common R Rare R Rare R Abundant R Rare R Common R
CICONIIDAE <i>Ciconia episcopus</i>	Whitenecked Stork	Scarce R S.L.M.
ANATIDAE <i>Tadorna ferruginea</i> <i>Anas poecilorhyncha</i> <i>Anas querquedula</i> <i>Anas acuta</i> <i>Anas strepera</i> <i>Anas penelope</i> <i>Cairina scutulata</i> <i>Dendrocygna javanica</i> <i>Aythya fuligula</i> <i>Aythya baeri</i>	Ruddy Shelduck Spotbill Duck Garganey Pintail Duck Gadwall Wigeon Whitewinged Wood Duck Lesser Whistling Teal Tufted Pochard Baer's Pochard	Common M Rare R Rare M Rare M Abundant M Abundant M Scarce R Sch-I Abundant R Abundant M Abundant M

Sch-I = Schedule 1 of Indian Wildlife (Protection) Act.

Table 2. : (Cont'd.).

Family & Species	Common Name	Remarks
ACCIPITRIDAE		
<i>Gyps bengalensis</i>	Bengal Whitebacked Vulture	Rare R
<i>Gyps fulvus</i>	Indian Griffon Vulture	Rare R
<i>Hieraaetus pennatus</i>	Booted Hawk-Eagle	Rare R Sch-I
<i>Pandion haliaetus</i>	Osprey	Rare R Sch-I
<i>Elanus caeruleus</i>	Blackwinged Kite	Rare R
<i>Milvus migrans migrans</i>	Pariah Kite	Abundant R
<i>Ictinaetus malayensis</i>	Black Eagle	Rare R Sch-I
<i>Circus melanoleucos</i>	Pied Harrier	Rare M
<i>Pernis ptilorhynchus</i>	Honey Buzzard	Rare R Sch-I
<i>Buteo buteo</i>	Buzzard	Rare R
FALCONIDAE		
<i>Falco peregrinus</i>	Peregrine Falcon	Rare M Sch-I
PHASIANIDAE		
<i>Gallus gallus</i>	Red Junglefowl	Rare R
<i>Francolinus francolinus</i>	Black Partridge	Rare R
RALLIDAE		
<i>Amaurornis phoenicurus</i>	Whitebreasted Waterhen	Rare R
OTIDIDAE		
<i>Eupodotis bengalensis</i>	Bengal Florican	Rare R Sch-I
GLAREOLIDAE		
<i>Glareola lactea</i>	Small Indian Pratincole/ Swallow Plover	Scarec R
<i>Glareola pratincola</i>	Collard Pratincole	Abundant R
CHARADRIIDAE		
<i>Tringa hypoleucos</i>	Common Sandpiper	Rare R S.L.M.
<i>Tringa totanus</i>	Common Redshank	Rare R S.L.M.
<i>Tringa nebularia</i>	Green Shank	Rare R S.L.M.
<i>Calidris temminckii</i>	Temminek's Stint	Rare R S.L.M.
<i>Hoplopterus indicus</i>	Red Wattled Lapwing	Rare R S.L.M.
<i>Pluvialis dominica</i>	Eastern Golden Plover	Abundant M
<i>Gallinago minima</i>	Jack Snipe	Rare M
LARIDAE		
<i>Chlidonias hybrida</i>	Whiskered Tern	Rare R
<i>Sterna acuticauda</i>	Blackbellied Tern	Abundant R
<i>Sterna aurantia</i>	Indian River Tern	Abundant R
<i>Larus ichthyaetus</i>	Great Blackheaded Gull	Rare M

Table 2. : (Cont'd.).

Family & Species	Common Name	Remarks
COLUMBIDAE		
<i>Streptopelia tranquebarica</i>	Red Turtle Dove	Rare R
<i>Streptopelia decaocto</i>	Indian Ring Dove	Rare R
<i>Streptopelia senegalensis</i>	Little Brown Dove	Rare R
<i>Streptopelia chinensis</i>	Spotted Dove	Common R
<i>Treron bicincta</i>	Orangebreasted Green Pigeon	Rare R
<i>Treron sphenura</i>	Wedgetailed Green Pigeon	Rare R
PSITTACIDAE		
<i>Psittacula krameri</i>	Roseringed Parakeet	Rare R
<i>Psittacula alexandri</i>	Redbreasted Parakeet	Rare R
CUCULIDAE		
<i>Centropus toulou</i>	Lesser Coucal	Rare R
<i>Cuculus poliocephalus</i>	Small Cuckoo	Rare R
<i>Rhopodytes tristis</i>	Large Greenbilled Malkoha	Rare R
<i>Surniculus lugubris</i>	Drongo Cuckoo	Rare R S.L.M.
STRIGIDAE		
<i>Otus scops</i>	Scops Owl	Rare R
<i>Athene brama</i>	Spotted Owlet	Rare R
CAPRIMULGIDAE		
<i>Caprimulgus indicus</i>	Indian Jungle Nightjar	Rare R
<i>Caprimulgus asiaticus</i>	Common Indian Nightjar	Rare R
ALCEDINIDAE		
<i>Alcedo atthis</i>	Small Blue Kingfisher	Rare R
<i>Halcyon coromanda</i>	Ruddy Kingfisher	Rare R
<i>Ceryle rudis</i>	Lesser Pied Kingfisher	Scarce R
<i>Pelargopsis capensis</i>	Brownheaded Storkbilled Kingfisher	Scarce R
MEROPIIDAE		
<i>Merops orientalis</i>	Green Bee-Eater	Common R
<i>Merops leschenaulti</i>	Chestnut Headed Bee-Eater	Rare R
UPUPIDAE		
<i>Upupa epops</i>	Hoopoe	Rare R
CAPITONIDAE		
<i>Megalaima lineata</i>	Lineated Barbet	Rare R
<i>Megalaima virens</i>	Great Hill Barbet	Rare R
<i>Megalaima asiatica</i>	Bluethroated Barbet	Rare R

Table 2. : (Cont'd.).

Family & Species	Common Name	Remarks
PICIDAE		
<i>Dinopium javanense</i>	Indian Threetoed Goldenbacked Woodpecker	Rare R
<i>Dinopium benghalense</i>	Lesser Goldenbacked Woodpecker	Rare R
ALAUDIDAE		
<i>Mirafrassida assamica</i>	Bengal Bush Lark	Rare R
HIRUNDINIDAE		
<i>Hirundo rustica</i>	Common Swallow	Common R
<i>Hirundo daurica</i>	Redrumped Swallow	Rare R
<i>Delichon nipalensis</i>	Nepal House Martin	Common R S.L.M.
LANIIDAE		
<i>Lanius schach</i>	Rufousbacked Shrike	Rare R S.L.M.
ORIOOLIDAE		
<i>Oriolus chinensis</i>	Blacknaped Oriole	Rare R S.L.M.
<i>Oriolus traillii</i>	Maroon Oriole	Scarce R
DICRURIDAE		
<i>Dicrurus hottentottus</i>	Haircrested Drongo	Rare R
<i>Dicrurus adsimilis</i>	Black Drongo	Rare R
<i>Dicrurus aeneus</i>	Bronzed Drongo	Abundant R
STURNIDAE		
<i>Acridotheres fuscus</i>	Jungle Myna	Common R
<i>Acridotheres tristis</i>	Common Myna	Common R
<i>Sturnus malabaricus</i>	Greyheaded Myna	Rare R
CORVIDAE		
<i>Dendrocitta vagabunda</i>	Indian Treepie	Rare R
<i>Corvus macrorhynchos</i>	Jungle Crow	Common R
CAMPEPHAGIDAE		
<i>Coracina melaschistos</i>	Smaller Grey Cuckoo-Shrike	Common R S.L.M.
<i>Pericrocotus flammeus</i>	Scarlet Minivet	Rare R
<i>Pericrocotus brevirostris</i>	Shortbilled Minivet	Rare R
IRENIDAE		
<i>Aegithina tiphia</i>	Common Iora	Common R

Table 2. : (Cont'd.).

Family & Species	Common Name	Remarks
PYCNONOTIDAE		
<i>Pycnonotus cafer</i>	Redvented Bulbul	Common R
<i>Hypsipetes madagascariensis</i>	Black Bulbul	Rare R
MUSCICAPIDAE		
<i>Copsychus saularis</i>	Magpie-Robin	Rare R
<i>Culicicapa ceylonensis</i>	Greyheaded Flycatcher	Rare R
<i>Phylloscopus trochiloides</i>	Dull Green Leaf Warbler	Rare M
<i>Megalurus palustris</i>	Striated Marsh Warbler	Rare M
<i>Graminicola bengalensis</i>	Large Grass Warbler	Rare R
<i>Cisticola juncidis</i>	Streaked Fantail Warbler	Rare R
<i>Prinia socialis</i>	Ashy Wren Warbler	Rare R
<i>Phoenicurus ochruros</i>	Black Redstart	Rare R
<i>Saxicola torquata</i>	Collared Bushchat	Rare R S.L.M.
<i>Saxicola jerdoni</i>	Jerdon's Bushchat	Common R
<i>Orthotomus sutorius</i>	Tailor Bird	Rare R
<i>Garrulax leucolophus</i>	Whitecrested Laughing Thrush	Rare R
<i>Garrulax moniligerus</i>	Necklached Laughing Thrush	Rare R
<i>Macronous gularis</i>	Yellowbreasted Babbler	Rare R
MOTACILLIDAE		
<i>Motacilla alba</i>	White Wagtail	Common R
<i>Motacilla cinerea</i>	Grey Wagtail	Rare R
<i>Anthus novaeseelandiae</i>	Paddyfield Pipit	Rare R
NECTARINIIDAE		
<i>Nectarinia asiatica</i>	Purple Sunbird	Rare R
<i>Nectarinia zeylonica</i>	Purplerumped Sunbird	Rare R
ZOSTEROPIDAE		
<i>Zosterops palpebrosa</i>	White-Eye	Rare R
FRINGILLIDAE		
<i>Pyrrhoptes epauletta</i>	Goldheaded Black Finch	Rare R

Among the aquatic birds the ducks and geese (Anatidae) as stated by Alfred *et al.*, (2001) are the winter migrants to the Indian sub-continent. There are some species of water birds whose southernmost palaearctic breeding range extends into Indian boundaries in Ladakh, Kashmir (Ruddy Shelduck, Pintail and Barheaded goose) and sometimes in central and eastern Himalayas. Nevertheless they behave like a true winter migrant in spreading over northern peninsular India.

It has been noted that a good number of Collared Pratincole (*Glareola pratincola*) observed during the survey. It was also noted that they are crepuscular and forms unispecies foraging group while frisking on the surface of water and above. The families Ardeidae, Ciconiidae, Charadriidae, Rallidae, Motacillidae are the major components of the marsh birds, while marsh birds belonging to family Charadriidae are rare except the Eastern Golden Plover (*Pluvialis dominica*). The Large Egrets (*Ardea alba*) are abundant and thrive on benthic fauna. The Median Egret (*Egretta intermedia*), Pond Heron (*Ardeola grayii*), Cattle Egret (*Bubulcus ibis*), Temminck's Stint (*Caladris temminckii*) and Whitenecked Stork (*Ciconia episcopus*) were observed and recorded. As regards Whitenecked Stork only two individuals were observed in Sibia river during the survey. They are resident and locally migratory, and occur well-watered plains country, partial to water-logged ground and feeds on fishes, frogs, reptiles, crabs, molluscs and large insects *etc.* (Ali, 1996).

The Gulls and Terns belonging to the family Laridae prey mainly on fishes and allied aquatic forms. A good number of Blackbellied Tern (*Sterna acuticauda*) and Indian River Tern (*Sterna aurantia*) were abundant. The avian families associated with wetland were recorded such as Motacillidae and Alcedinidae. Among them the White Wagtail, (*Motacila alba*) were commonly found.

The passerine and non-passerine birds represent a good number. But the Bengal Whitebacked Vulture (*Gyps benghalensis*) and Indian Griffon Vulture (*Gyps fulvus*) are drastically declining in population at this sanctuary as well as throughout India due to outbreak of disease, chemical contamination and poisoning (Vulture population decline in India—A Pilot survey by Robert B. Groubh, Director Institute for Restoration of Natural Environment, Nagercoil, Tamil Nadu, India and V. S. Vijayan, Director, Salim Ali Centre for Ornithology and Natural History, Coimbatore, Tamil Nadu, India). The vulture was found to devour mainly on decaying bodies of the domestic animals inside the sanctuary. During the survey several such decaying bodies were noticed. The local herdsman informed that the enormous loss of livestock was caused by the consumption of Wild jujuba (*Zizyphus jujuba*). The Hoopoe (*Upupa epops*) under family Upupidae and the Bengal Florican, (*Eupodotis bengalensis*) under family Otidae are very rare in this sanctuary. During survey four Hoopoes and two Bengal Floricans were observed. The Bengal Florican which is an endemic species has undergone an alarming decline throughout its former range, as its grassland habitat has been lost due to cultivation or degraded by over grazing (Rahmani *et al.*, 1991). Its past distribution ranges from southern Uttaranchal to upper Assam, through the Nepal Terai, Bengal Duars and Brahmaputra river valley (Ali and Ripley, 1969; Rahmani *et al.*, 1991). The known population of less than 300–400 individuals is at serious risk from further habitat loss, warranting its inclusion in the IUCN list of endangered species (Baral *et al.*, 2002). As regards Black Bulbul (*Hypsipetes madagascariensis*), though this species is the resident bird in Arunachal Pradesh (Ripley, 1982), only three birds of this species were recorded during survey.

At dusk on March 21, 2002, during survey work it was observed that about 185 Pariah Kites (*Milvus migrans*) gathered on the top of 3–4 large trees behind Namsing camp. In the next morning there was no kite on those trees. Such incident was not observed throughout the rest period of the survey. This incident of gathering huge number of Pariah Kite at dusk and flying away the next morning is totally unknown. It may be related to local/seasonal migratory behaviour of the species.

Reptiles

Nine species of reptiles were recorded during the survey. Both poisonous Common Cobra (*Naja naja*), Himalayan Pitviper (*Aucestradon himalayana*) and non-poisonous snakes such as Rat Snake (*Ptyas mucosus*), Smooth Water Snake (*Enhydris enhydris*), Common Wolf Snake (*Lycodon aulicus*), etc. were recorded. The Garden Lizards (*Calotes versicolor*) were very common in the sanctuary. Only one common Indian Monitor (*Varanus benghalensis*) was observed. This species becomes rare due to killing for skin. Sharma (2002) stated that the common Indian Monitor at present is an endangered species as they are killed in large number for their skin and flesh. He also stated that its flesh is considered as a delicacy and consumed by many people and the eggs are also eaten in large number at various places. The population of Soft-shelled Turtle (*Trionyx leythi*) and Indian Roofed Turtle (*Kachuga tecta*) is very rich in the sanctuary. A large number of such turtle in 'Jheels' in Sibia river bed adjacent to Assam were observed. Their distribution has been reported from Assam and Khasia, Garo and Naga hills area of Bangladesh (Molle and Vijay, 1986).

Amphibia

Two species of frogs namely *Rana cyanophlyctis* and *Rana limnocharis* have been recorded. They are wetland dependent and occur abundantly along with their larvae. A huge congregation of tadpoles of these species in the rivulets, pools etc. was observed.

Fishes (Fig. 6)

A total of 19 species of freshwater fishes were recorded as common from 'Jheels' and 'Nullahs' of the Sibia and Siang river bed. The 'Nullahs' and 'Jheels' are found in the dry seasons and flooded by the river in rainy seasons. The species are — Grey featherback (*Notopterus notopterus*), Chapkhowari (*Chela laubuca*), Chela (*Salmostoma bacaila*), 4 species of genus *Puntius*, Zebra fish (*Danio aequipinnatus*), Rasbora (*Rasbora daniconius*), Tengra (*Mystus bleekeri*), Pabda (*Ompok pabda*), Magur (*Clarias batrachus*), Shingi (*Heteropneustes fossilis*), one species of genus *Xenentodon*, Lata (*Channa punctatus*), Cheng (*Channa orientalis*), Climbing fish (*Anabus testudineus*), Katkoi (*Badis badis*) etc.

In overall, diversity of wildlife species particularly higher vertebrates in D' Ering Memorial Wildlife Sanctuary (23 species of mammals and 123 species of birds) is less when compared to well known protected area like Manas Tiger Reserve, Assam (76 species of mammals and 300 species of birds *vide* Fauna of Conservation Area No. 8 : Fauna of Manas Tiger Reserve, 1995) and Namdapha Biosphere Reserve, Arunachal Pradesh (96 species of mammals and 233 species of birds *vide* Qualitative Analysis of Faunal Resources of proposed Namdapha Biosphere Reserve, Arunachal Pradesh, Ghose, 1987).

It is also evident that D' Ering Memorial Wildlife Sanctuary is inhabited by comparatively less number of Schedule-1 species of both mammals (6 species) and birds (8 species) under Wildlife (Protection) Act. 1972. The Schedule-1 species of mammals and birds of Manas Tiger Reserve, Assam; Balphakram National Park, Meghalaya (Alfred & Chattopadhyay, 1995) and Namdapha Biosphere Reserve, Arunachal Pradesh, however, represent 20 species of mammals, 38 species of birds, 10 species of mammals, 9 species of birds and 30 species of mammals, 18 species of birds respectively (Table 3).

Table 3. : Comparative representation of Schedule-1 species of mammals and birds occurring in D' Ering Memorial Wildlife Sanctuary, Manas Tiger Reserve, Balphakram National Park and Namdapha Biosphere Reserve. ('+' = Present, '-' = Absent).

List of Schedule-1 Species	D' Ering Wildlife Sanctuary	Manas Tiger Reserve	Balphakram National Park	Namdapha Biosphere Reserve
MAMMALS				
Binturong <i>Arctictis binturong</i>	-	+	-	+
Bharal <i>Pseudois nayaur</i>	-	-	-	+
Capped Langur <i>Presbytis pileatus</i>	-	+	-	+
Clouded Leopard <i>Neofelis nebulosa</i>	-	+	-	+
Chinese Pangolin <i>Manis pentadactyla</i>	-	+	+	+
Fishing Cat <i>Felis viverrinus</i>	-	+	-	+
Flying Squirrel <i>Hylopetes fimbriatus</i>	-	-	-	+
Common Otter <i>Lutra lutra</i>	+	-	-	-

Table 3. : (Cont'd.).

List of Schedule-1 Species	D' Ering Wildlife Sanctuary	Manas Tiger Reserve	Balphakram National Park	Namdapha Biosphere Reserve
Golden Langur <i>Presbytis geei khajuria</i>	—	+	—	—
Gour <i>Bos gaurus</i>	—	+	+	—
Goral <i>Nemorhaedus goral</i>	—	—	+	—
Golden Cat <i>Felis temmincki</i>	—	+	—	+
Gangetic Dolphin <i>Platanista gangetica</i>	+	+	—	—
Himalayan Thar <i>Hemitragus jemlahicus</i>	—	—	—	+
Hog-Badger <i>Arctonyx collaris</i>	—	—	+	+
Hispid Hare <i>Caprolagus hispidus</i>	—	+	—	—
Hoolock Gibbon <i>Hylobates hoolock</i>	—	—	+	+
Wild Boar <i>Sus scrofa</i>	+	+	—	+
Indian Elephant <i>Elephas maximus</i>	+	+	—	+
Indian Wolf <i>Canis lupus</i>	—	—	—	+
Indian Wild Dog <i>Cuon alpinus</i>	—	—	+	—
Leopard <i>Panthera pardus</i>	—	+	+	+
Leopard Cat <i>Felis bengalensis</i>	—	+	—	+
Lesser or Red Panda <i>Ailurus fulgens</i>	—	—	+	+
Indian Pangolin <i>Manis crassicaudata</i>	—	—	—	+

Table 3. : (Cont'd.).

List of Schedule-1 Species	D' Ering Wildlife Sanctuary	Manas Tiger Reserve	Balphakram National Park	Namdapha Biosphere Reserve
Malayan Sun Bear <i>Helarctos malayanus</i>	—	—	—	+
Mouse Deer <i>Tragulus meminna</i>	—	—	—	+
Musk Deer <i>Moschus moschifeus</i>	—	—	—	+
Marbeled Cat <i>Felis marmorata</i>	—	—	—	+
One-horned Rhinoceros <i>Rhinoceros unicornis</i>	—	+	—	—
Pig-tailed Macaque <i>Macaca nemestrina leonina</i>	—	—	+	—
Pigmy Hog <i>Sus salvinus</i>	—	+	—	—
Serow <i>Capricornis sumatraensis</i>	—	—	—	+
Swamp Deer <i>Cervus duvaucelii</i>	—	+	—	—
Sloth Bear <i>Melarsus ursinus</i>	—	—	—	+
Slow Loris <i>Nycticebus coucang</i>	—	+	—	+
Snow Leopard <i>Panthera uncia</i>	—	—	—	+
Spotted Lingsang <i>Prionodon pardicolor</i>	—	—	—	+
Takin <i>Budorcus taxicolor</i>	—	—	—	+
Tiger <i>Panthera tigris</i>	+	+	+	+
Wild Buffalo <i>Bubalus bubalis</i>	+	+	—	+

Table 3. : (Cont'd.).

List of Schedule-1 Species	D' Ering Wildlife Sanctuary	Manas Tiger Reserve	Balphakram National Park	Namdapha Biosphere Reserve
BIRDS				
Crested goshawk <i>Accipiter trivirgatus</i>	—	+	—	+
Gos hawk <i>Accpiter gentilis</i>	—	—	+	+
Sparrow hawk <i>Accipiter nisus</i>	—	+	+	+
Besra sparrow-hawk <i>Accpiter virgatus</i>	—	+	+	+
Long legged buzzard <i>Buteo rufinus</i>	—	+	—	—
White-eyed Buzzard Eagle <i>Butaster teesa</i>	—	+	+	—
Hodgson's Hawk-Eagle <i>Spizaetus nipalensis</i>	—	+	—	—
Changeable Hawk-Eagle <i>Spizaetus limnaeetus</i>	—	+	—	—
Rufousbellied Hawk-Eagle <i>Hieraaetus kienerii</i>	—	+	—	—
Twany Eagle <i>Aquila rapax</i>	—	+	—	—
Steppe Egale <i>Aquila koelzi</i>	—	+	—	—
Greater Spotted Eagle <i>Aquila clanga</i>	—	+	—	—
Lesser Spotted Eagle <i>Aquila pomarina</i>	—	+	—	—
Black Eagle <i>Ictinaetus malayansis</i>	+	+	—	—
Pallas's Fishing Eagle <i>Haliaeetus leucoryphus</i>	—	+	—	—
Greyheaded Fishing Eagle <i>Ichthyophaga ichthyaetus</i>	—	+	—	—

Table 3. : (Cont'd.).

List of Schedule-1 Species	D' Ering Wildlife Sanctuary	Manas Tiger Reserve	Balphakram National Park	Namdapha Biosphere Reserve
Himalayan Fishing Eagle <i>Ichthyophaga nana</i>	—	+	—	—
Black-crested Buza <i>Aviceda leuphotes</i>	—	+	—	+
Lanner Falcon <i>Falco biarmicus</i>	—	+	—	+
Perigrine Falcon <i>Falco peregrinus</i>	+	+	+	—
Assam Bamboo Partridge <i>Bambusicola fytchii</i>	—	—	—	+
Great Pied Hornbill <i>Buceros bicornis</i>	—	+	—	+
Malabar Pied Hornbill <i>Anthracoceros malabaricus</i>	—	+	—	+
Whitethroated Brown Hornbill <i>Ptilolaemus tickelli</i>	—	—	—	+
Rufousnecked Hornbill <i>Aceros nipalensis</i>	—	+	—	+
Wreathed Hornbill <i>Rhyticeros undulatus</i>	—	+	—	+
Bengal Florican <i>Eupodotis bengalensis</i>	+	+	—	—
Indian Peafowl <i>Pavo cristatus</i>	—	+	—	—
Large Whistling Teal <i>Dendrocygna bicolor</i>	—	+	—	—
Spoonbill <i>Platalea leucorodia</i>	—	+	—	—
Blyth's Baza <i>Aviceda jerdoni</i>	—	+	—	—
Honey Buzzard <i>Pernis ptilorhyncus</i>	+	+	—	—
Shikra <i>Accipiter badius</i>	—	+	+	—

Table 3. : (Cont'd.).

List of Schedule-1 Species	D' Ering Wildlife Sanctuary	Manas Tiger Reserve	Balphakram National Park	Namdapha Biosphere Reserve
Booted Hawk-Eagle <i>Hieraaetus pennatus</i>	+	—	—	—
Crested Serpent Eagle <i>Spilornis cheela</i>	—	+	—	—
Short-toed Eagle <i>Circaetus gallicus</i>	—	+	—	—
Kestrel <i>Falco tinnunculus</i>	—	—	+	—
Osprey <i>Pandion hallaetus</i>	+	+	—	—
Hen-Harrier <i>Circus cyaneus</i>	—	+	—	—
Pale Harrier <i>Circus macrourus</i>	—	+	—	—
Montagu's Harrier <i>Circus pygargus</i>	—	+	—	—
Pied Harrier <i>Circus melanoleucos</i>	—	+	—	—
Marsh Harrier <i>Circus aeruginosus</i>	—	+	—	—
Monal Pheasant <i>Lophophorus impejanus</i>	—	—	—	+
Peacock-Pheasant <i>Polyplectron bicalcaratum</i>	—	—	+	+
Crimson Tragopan <i>Tragopan satyra</i>	—	—	—	+
Blyth's Tragopan <i>Tragopan blythii</i>	—	—	+	+
Temminck's Tragopan <i>Tragopan temminckii</i>	—	—	—	+
Spot billed Pelican <i>Pelecanus philippensis</i>	+	—	—	—
Whitewinged Wood Duck <i>Cairina scutulata</i>	+	—	—	+

SUMMARY

The D' Ering Wildlife Sanctuary and its surrounding wetlands along Sibia and Brahmaputra rivers (associated part of the sanctuary) revealed a total of 23 species of mammals, 123 species of birds, 9 species of reptiles and 2 species of amphibians, while 19 species of freshwater fishes were recorded in various aquatic system in the area under report. As per Indian Wildlife (Protection) Act. 1972, 6 species of mammals and 8 species of birds belong to the Schedule-1 category.

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PLATE I



Fig. 1. : Wild Buffalo in the Sibia river.



Fig. 2. : Tiger spoor marks along the Siang river bank.

PLATE II



Fig. 3. : A congregation of Large Cormorant along with Large Egret amidst a sand bank in Sibia river.



Fig. 4. : Hoopoe near Sibia camp.

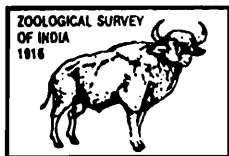
PLATE III



Fig. 5. : Flight of Purple Heron near Jeep ghat Camp.



Fig. 6. : A brief glimpse of fish biodiversity in the sanctuary.



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RECORD AND ABUNDANCE OF EARTHWORMS AT BETHUADAHARI WILDLIFE SANCTUARY, NADIA, WEST BENGAL

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INTRODUCTION

For the conservation of biological diversity, the idea of establishment of 'Conservation Areas', such as, Biosphere Reserve, National Parks, Wildlife Sanctuary, etc. has been conceptualized. Owing to the paucity of information on the fauna of Conservation Areas, Zoological Survey of India has taken up the faunal explorations of different Conservation Areas of our country. With a view to study the earthworm fauna of Bethuadahari Wildlife Sanctuary, Nadia, and also to study the effects of the devastating flood during September, 2000, three study tours were conducted during 2000-2002.

A devastating flood started on 18th September, 2000 and lasted for 7 days, *i.e.*, up to 24th September, 2000 with a maximum height of 8 to 9 feet of water. Most of the places of the sanctuary remained under water during this period. It was reported from the sanctuary people that several varieties of earthworms are usually seen in the area during rainy season. It was further reported that during last flood period the area remained under 8 to 9 feet of water for a period of about one week. During that time numerous earthworms were found crawling and ultimately died.

From the relevant literature (Halder, 1998; Julka, 1988; Stephenson, 1923) it appears that there is no published information on the earthworms fauna of Bethuadahari Wildlife Sanctuary, Nadia. Hence, the present authors made a sincere attempt to study and record the availability of the earthworms of Bethuadahari Wildlife Sanctuary, and also recorded the revival of the natural earthworm fauna of the sanctuary.

ABOUT THE SANCTUARY

The sanctuary, with a land area of 67.86 hectare, is only 140 km from Kolkata and only 25 km north of Krishnanagar, is situated by the side of N.H. 34, and is well connected by road and rail.

The Bethuadahari town and the Railway Stn. are barely half a kilometer away. Lalgola bound train can be availed from the Sealdah stn. Nearest Airport is Dumdum, Kolkata. Altogether 12 stations were selected for the present study purpose (Fig. 1).

In 1969, a pair of chital and a fawn were brought in from the Zoological Garden, Alipur. Thereafter 13 Chitals, 3 barking deers and 4 Sambars were introduced in 1970, from the Nandankanan Zoological Garden, Orissa. The current population of chital is around 290 to 300, whereas, other two species could not survive there.

Important plants and animals of the Sanctuary :

Trees observed :

Common Name	Scientific Name	Common Name	Scientific Name
1. Khair	<i>Acacia catechu</i>	8. Hijul	<i>Barringtonia acutangula</i>
2. Babla	<i>Acacia nilitica</i>	9. Amloki	<i>Embllica officinalis</i>
3. Bael	<i>Aegle marmelos</i>	10. Zeol	<i>Lannea indica</i>
4. Kala Siris	<i>Albizzia lebbek</i>	11. Jarul	<i>Lagerstroemia speciosa</i>
5. Sada Siris	<i>A. procera</i>	12. Sal	<i>Shorea robusta</i>
6. Atha	<i>Anona reticulata</i>	13. Segun	<i>Tectona grandis</i>
7. Kadam	<i>Anthocephalus kadamba</i>	14. Arjun	<i>Terminalia arjun</i>

GROUND VEGETATION

1. *Arum* spp.
2. *Calotropis gigantea*
3. *Colocasis* sp.
4. *Croton* sp.

THE FOLLOWING ANIMALS WERE OBSERVED/REPORTED

Birds : Blue throated Barbet [*Megalaima asiatica asiatica* (Latham)], Coppersmith [*Megalaima haemacephala indica* (Latham)], Crow Pheasant [(*Centropus sinensis sinensis* (Stephens))], White breasted King Fisher [*Halcyon smyrnensis fusca* (Boddaert)], Magpie Robin [*Copsychus saularis* (Linnaeus)], Red vented Bulbul [*Pycnonotus cafer bengalensis* Blyth], Crested Serpent Eagle [*Spilornis cheela* (Latham)], King Vulture [*Sarcogyps calvus* (Scopoli)], Indian Tree pie [*Dendrocitta vagabunda vagabunda* (Latham)], Golden Oriole [*Oriolus oriolus kundoo* Sykes], Common Myna

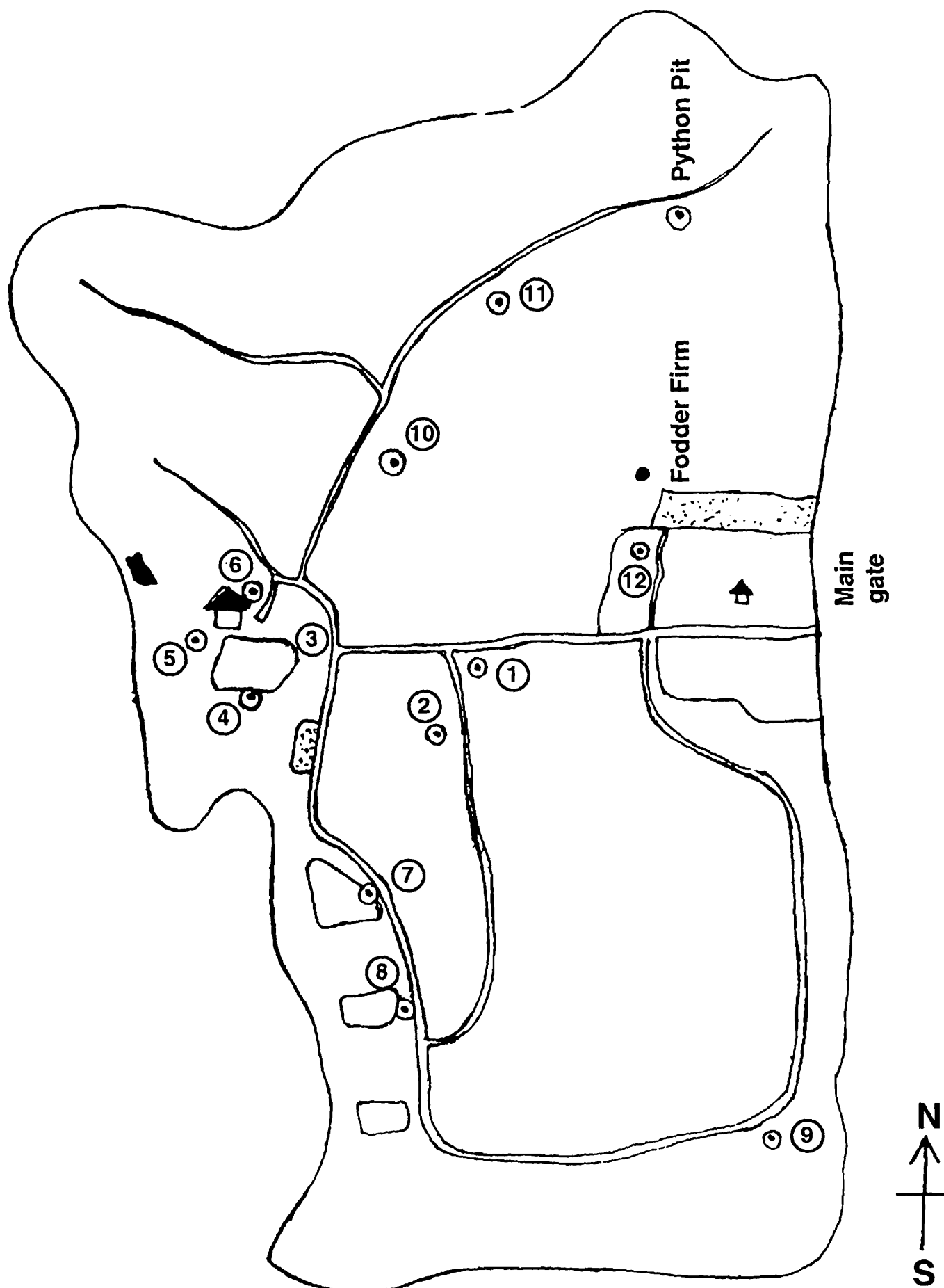


Fig. 1. : Map of Bethuadahari Wildlife Sanctuary, Nadia (Not to scale).
[○ indicates station]

[*Sturnus contra* Linnaeus], Black Drongo [*Dicrurus adsimilis* (Bechstein)], Roseringed Parakeet [*Psittacula krameri* (Scopoli)].

Reptiles : Monitor Lizard [*Varanus bengalensis* (Daudin)], Python [*Python molurus* (Linnaeus)], Cobra [*Naja naja* (Linnaeus)], Krait [*Baungarus fasciata* (Schneider)], Rat Snake [*Ptyas mucosus* (Linnaeus)], Riverine Turtle [*Lissemys punctata* Bonnaterre and *Kachuga kachuga* Gray].

Mammals : Chital [*Axix axis* (Erxleben)], Jungle cat [*Felis chaus* (Schreber)], Common Palm Civet Cat [*Paradoxurus hermaphroditus* (Pallas)], Asiatic Jackal [*Canis aureus* Linnaeus], Indian Crested Porcupine [*Hystrix indica* Kerr], Mongoose [*Herpestes edwardsii* (E. Geoffrey Saint-Hilaire)].

LIST OF SPECIES OF EARTHWORMS COLLECTED FROM BETHUADAHARI WILDLIFE SANCTUARY, NADIA

Class OLIGOCHAETA

Order MONILIGASTRIDA

Family MONILIGASTRIDAE

Genus *Drawida*

1. *D. nepalensis* Michaelsen

Order HAPLOTAXIDA

Family ALMIDAE

Genus *Glyphidrilus*

2. *G. tuberosus* Stephenson

Family OCTOCHAETIDAE

Genus *Eutyphoeus*

3. *E. incommodus* (Beddard)

4. *E. orientalis* (Beddard)

Genus *Ochtochaetona*

5. *O. beatrix* (Beddard)

Family MEGASCOLECIDAE

Genus *Amyntas*

6. *A. alexandri* (Beddard)

Genus *Lampito*

7. *L. mauritii* Kinberg

Genus *Metaphire*

8. *M. houlleti* (Perrier)
9. *M. posthuma* (Vaillant)

Genus *Perionyx*

10. *Perionyx excavatus* Perrier

Genus *Polypheretima*

11. *P. elongata* (Perrier)

**Key to the species of Earthworms collected from
Bethuadahari Wildlife Sanctuary**

1. Male pore paired in 10/11, and just in front of female pore, clitellum in IX to XIV; dorsal pores absent *Drawida nepalensis*
- Male pore behind 10/11, and behind female pore; dorsal pore either present or absent 2
2. Male pore inconspicuous, ventral to the lateral protruberance or wings in clitellar segments; inhabit submerged soil with high organic matter; dorsal pores absent
..... *Glyphidrilus tububerosus*
- Male pore on the ventral surface of the body behind female pore (behind 10/11), habitat otherwise; dorsal pores present 3
3. Seta lumbricine; prostate tubular 4
- Seta perichaetine; prostate racemose 6
4. Two pairs of prostate glands *Octochaetona beatrix*
- One pair of prostate gland 5
5. Clitellum on XIII to XVIII; penis absent *Eutyphoeus incommodus*
- Clitellum on XIV to XVII; penis present and short *E. orientalis*
6. Spermathecal pores 2 pairs (closely paired); penial seta present on XVIII; female pore single on XIV; colour purple dorsally and pale ventrally; holonephric *Perionyx excavatus*
- Spermathecal pores at least one pair (widely paired); female pore one pair or single on XIV segment; colour otherwise; meronephric 7
7. Male pore on XVIII; female pore paired; gizzard in V; penial seta present on XVIII
..... *Lampito mauritii*
- Male pore on XVIII; female pore single and median; gizzard in VIII; penial seta absent 8

8. Polythecal (spermatheca more than one pair per segment), spermathecal pores on 5/6–6/7; male pore on XVIII; copulatory papillae widely paired, 3–7 pairs on XIV and on successive posterior segments *Polypheretima elongata*
- Not polythecal; male pore on XVIII; copulatory papillae either lacking or present with their number and arrangement otherwise 9
9. Spermathecal pores 4 pairs, minute, superficial on 5/6 to 8/9; male pores minute, superficial on XVIII, each in a rather circular disc; copulatory pouches absent *Amyntus alexandari*
- Spermathecal pores 3 or 4 pairs; usually large transverse slits, between 4/5 to 9/10; male pore (combined with prostatic pores) paired within copulatory pouches on XVIII 10
10. Spermathecal pores 4 pairs; genital marking paired circular in setal circle slightly median to male pore line *Metaphire posthuma*
- Spermathecal pore 3 pairs; genital marking lacking externally or present in the vicinity of spermathecal pore *M. houlleti*

SYSTEMATIC ACCOUNT

Class OLIGOCHAETA

Order MONILIGASTRIDA

Family MONILIGASTRIDAE

Genus *Drawida*

1. *Drawida nepalensis* Michaelsen, 1907

1907. *Drawida nepalensis* Michaelsen, *Mitt. naturh. Mus. Hamb.*, 24 : 146.

Material : 1 ex., Stn. 1, 10.12.2000; 6 ex., Stn. 4, 11.10.2001; 3 ex., Stn. 3, 2.4.2002; 3 ex., Stn. 6. 3.4.2002.

Diagnosis : Clitellum in IX to XIV; setae lumbricine; dorsal pore absent; spermathecal pores one pair, transverse slits; male pores pairs in 10/11, and just in front of female pore (11/12); genital marking on small, circular, translucent area.

Remarks : Recorded during all the trips. However, their abundance is very poor.

Family ALMIDAE

Genus *Glyphidrilus*

2. *Glyphidrilus tuberosus* Stephenson, 1916

1916. *Glyphidrilus tuberosus* Stephenson, *Rec. Indian Mus.*, 12 : 349.

Material : 32 ex., Stn. 2, 11.10.2001.

Diagnosis : Clitellum annular on XIV, XV, XVI–XXVIII, XXIX with lateral longitudinal protuberant ridges; male pore inconspicuous; female pores paired, minute, pre-setal on XIV; spermathecal pores 2–4 on each side in 13/14/15; genital markings small rounded papillae postsetal, usually arranged in a set of 6 in a transverse row; gizzard in VII.

Remarks : Prefer moist soil only, and recorded abundantly during post monsoon season.

Family OCTOCHAETIDAE

Genus *Eutyphoeus*

3. *Eutyphoeus incommodus* (Beddard, 1901)

1901. *Typhoeus incommodus* Beddard, *Proc. zool. Soc. Lond.*, 1901 : 200.

Material : 2 ex., Stn. 5, 10.10.2001.

Diagnosis : Clitellum annular on XIII to XVIII; male pores within slight transversely placed fissures; female pores paired; spermathecal pores paired, small, transverse slits in 7/8; genital markings paired; penis absent.

Remarks : Rarely occurring, available only during post monsoon period.

4. *Eutyphoeus orientalis* (Beddard, 1833)

1833. *Typhoeus orientalis* Beddard, *Ann. Mag. nat. Hist. (ser. 5)*, 12 : 219.

Material : 14 ex., Stn. 5, 11.10.2001; 19 ex., Stn. 4, 10.10.2001.

Diagnosis : Clitellum on XIV–XVII; genital markings paired & post-setal; first dorsal pore at 11/12; spermathecal pores paired; female pore single on left side; penis short and annular; gizzard large.

Remarks : Most commonly occurring, however, recorded only during post monsoon season.

Genus *Octochaetona*

5. *Ochtochaetona beatrix* (Beddard, 1902)

1902. *Ochtochaetus beatrix* Beddard, *Ann. Mag. nat. Hist. (ser 7)*, 9 : 456.

Material : 1 ex., Stn. 8, 10.10.2001.

Diagnosis : Clitellum annular on XIII to XVIII; male pores minute; female pore paired; spermathecal pores paired, minute; genital markings absent; gizzard between septa 4/5 & 8/9; two pairs of prostate glands.

Remarks : This is very rare in occurrence in the sanctuary.

Family MEGASCOLECIDAE

Genus *Amyntas*6. *Amyntas alexandri* Beddard, 1900

1900. *Amyntas alexandri* Beddard, *Proc. zool. Soc. Lond.*, 1900 : 988.

Material : 7 ex., Stn. 5, 11.10.2001.

Diagnosis : Clitellum annular, XIV–XVI, occasionally reaching XVII; spermathecal pores 4 pairs, minute, superficial, in 5/6–8/9; male pores minute, superficial on XVIII, each in a rather circular disc; female pore single, mid-ventral, on XIV; genital markings absent.

Remarks : This is also a rare species, recorded for the first time from Nadia district.

Genus *Lampito*7. *Lampito mauritii* Kinberg, 1867

1867. *Lampito mauritii* Kinberg, *Ofvers. K. Vetens. Akad. Forhandl. Stockholm*, 23 : 103.

Material : 5 ex., Krishnanagar town near DFO Bungalow, 7.12.2000; 30 ex., Garden of DFO Bungalow, Krishnanagar, 8.12.2000; 1 ex., Stn. 4, 9.12.2000; 1 ex., Stn. 9, 10.12.2000; 1 ex., Stn. 3 and Stn. 10, 11.12.2000.

Diagnosis : Clitellum annular, XIV–XVII or XVIII; spermathecal pores 3 pairs, large, in EG, at 6/7, 7/8, 8/9; male pores in XVIII, at or lateral to B, un paired, circular, slightly raised porophores that extends from A into CE; female pores paired on XIV; genital markings absent.

Remarks : This species is recorded abundantly throughout the year within the sanctuary.

Genus *Metaphire*8. *Metaphire houlleti* (Perrier, 1872)

1872. *Perichaeta houlleti* Perrier, *Nouv. Arch. Mus. Hist. nat. Paris*, 8 : 99.

Material : 1 ex., Stn. 3, 10.12.2000; 4 ex., Stn. 11, 10.10.2001; 16 ex., Stn. 11, 11.10.2001; 2 ex., Stn. 12, 10.10.2001.

Diagnosis : Clitellum annular, XIV–XVI; seta perichaetine, often present on clitellar segments; spermathecal pores 3 pairs; male pores in XVIII, minute; female pore single, mid-ventral on XIV; genital markings lacking externally; pigment reddish brown; gizzard between septa 7/8 & 10/11.

Remarks : This is a common species, however, recorded mostly during post monsoon periods.

9. *Metaphire posthuma* (Vaillant, 1868)

1868. *Perichaeta posthuma* Vaillant, *Annl. Sci. Nat. (ser. 5)*, 10 : 288.

Material : 16 ex., Stn. 3, 9.12.2000; 11 ex., Stn. 4, 9.12.2000; 2 ex., Stn. 3, 10.12.2000; 36 ex., Stn. 5, 10.10.2001; 2 ex., Stn. 7, 3.4.2002.

Diagnosis : Clitellum annular on XIV-XVI; setae perichaetine; spermathecal pores 4 pairs, minute, in 5/6–8/9; male pores in XVIII, minute, each in a small disc on median wall near roof of a copulatory pouch; female pore single, mid-ventral, on XIV; genital markings paired, circular in setal circle slightly median to male pore line; pigment brown; gizzard between septa 7/8 and 8/9.

Remarks : Like *Lampito mauritii*, this is also a commonly occurring species within the sanctuary.

Genus *Perionyx*

10. *Perionyx excavatus* Perrier, 1872

1872. *Perionyx excavatus* Perrier, *Nouv. Arch. Mus. Hist. Nat. Paris*, 8 : 126.

Material : 2 ex., Krishnanagar town near DFO Bungalow, 7.12.2000; 2 ex., Garden of DFO Bungalow, Krishnanagar, 8.12.2000; 3 ex., Stn. 12, 9.12.2000; 1 ex., Stn. 5, 10.12.2000; 5 ex., Stn. 12, 10.10.2001; 23 ex., Stn. 12, 2.4.2002.

Diagnosis : Clitellum annular, XIII-XVII. Spermathecal pores 2 pairs, near mid-ventral line, in 7/8, 8/9; male pores in small transverse protuberances within a single male field, each protuberance with a slightly irregular transverse groove containing apertures of 4–9 perisetal follicles, on XVIII; female pore single, mid-ventral, on XIV; genital markings absent; nephridiopores inconspicuous, in one rather irregular longitudinal rank on each side near mL.

Remarks : This is recorded for the first time from Nadia district. The species is also very common within the sanctuary, however, restricted to the moist humus mixed soil near kitchen drainage.

Genus *Polypheretima*

11. *Polypheretima elongata* (Perrier, 1872)

1872. *Perichaeta elongata* Perrier, *Nouv. Arch. Mus. Hist. Nat. Paris*, 8 : 124.

Material : 3 ex., Stn. 1, 3.4.2002; 1 ex., Stn. 5, 8.4.2002; 2 ex., Stn. 4, 10.10.2001; 1 ex., Stn. 4, 11.10.2001.

Diagnosis : Genital markings transversely elliptical, presetal, on XIX and successive segments in line with or slightly ventral to male pores.

Remarks : This species is recorded for the first time from Nadia district, and recorded during pre-monsoon and post-monsoon periods.

DISCUSSION

The present attempt was made to study the earthworm fauna of Bethuadahari Wildlife Sanctuary, Nadia district, West Bengal, with the idea of getting a baseline information on the group. Moreover, it was also aimed to know the rate of revival of the earthworm fauna after the devastating flood in September, 2000.

The result of the first tour during December, 2000 shows that the population and the diversity of the worms was very poor, and only three species were recorded during that time. However, during the second tour the record of eleven species of earthworms reveals that revival of the earthworm fauna occurs within one year.

The first tour conducted during December, 2000 showed substantial damage of the earthworm fauna of the sanctuary. Only three species of earthworms, namely, *Metaphire posthuma*, *Lampito mauritii* and *Perionyx excavatus* were commonly observed during the first tour. While during the second tour on October, 2001, 11 species were encountered, which reveals the settlement of the earthworm fauna within a year after devastation during the flood in 2000. Of all the 11 species recorded, nine species, namely *M. posthuma*, *M. houlleti*, *L. mauritii*, *P. excavatus*, *E. orientalis*, *D. nepalensis*, *G. tuberosus*, *A. alexandri* and *P. elongata* were common, while two species, *E. incommodus* and *O. beatrix* were very rare. Four species, *P. excavatus*, *P. elongata*, *A. alexandri* and *M. houlleti* were recorded for the first time from the district Nadia. Only two species *Dichogaster modigliani* and *Eutyphoeus nicholsoni*, recorded earlier from Nadia district were not represented in the present sanctuary.

SUMMARY

The paper deals with eleven species of earthworms under nine genera and four families. In addition, a taxonomic key is also presented to facilitate identification for future workers. The gradual revival of earthworms species is also recorded.

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Short Communication

DESCRIPTION OF A NEW SPECIES OF GIANT CRAB-SPIDER (ARANEAE : HETEROPODIDAE) FROM INDIA

INTRODUCTION

The spider of the family Heteropodidae are large in size with crab like legs for which they are recognized as Giant crab-spiders. The study of this group of spiders are not remarkable still. But some information on Indian forms provided by the previous workers like Simon (1864), Thorell (1895), Pocock (1900), Gravely (1931), Tikader (1960-1975) and Sethi & Tikader (1988). But they did not emphasis the internal structure of the genitalia which is most important identifiable species character.

We are fortunate enough to study the type of Heteropodid spider after collecting the specimen which still unknown to the science. The new species of the genus *Heteropoda* (Family : Heteropodidae) is described in this paper.

The type is deposited in the National Collection of the Zoological Survey of India, Kolkata-700 053.

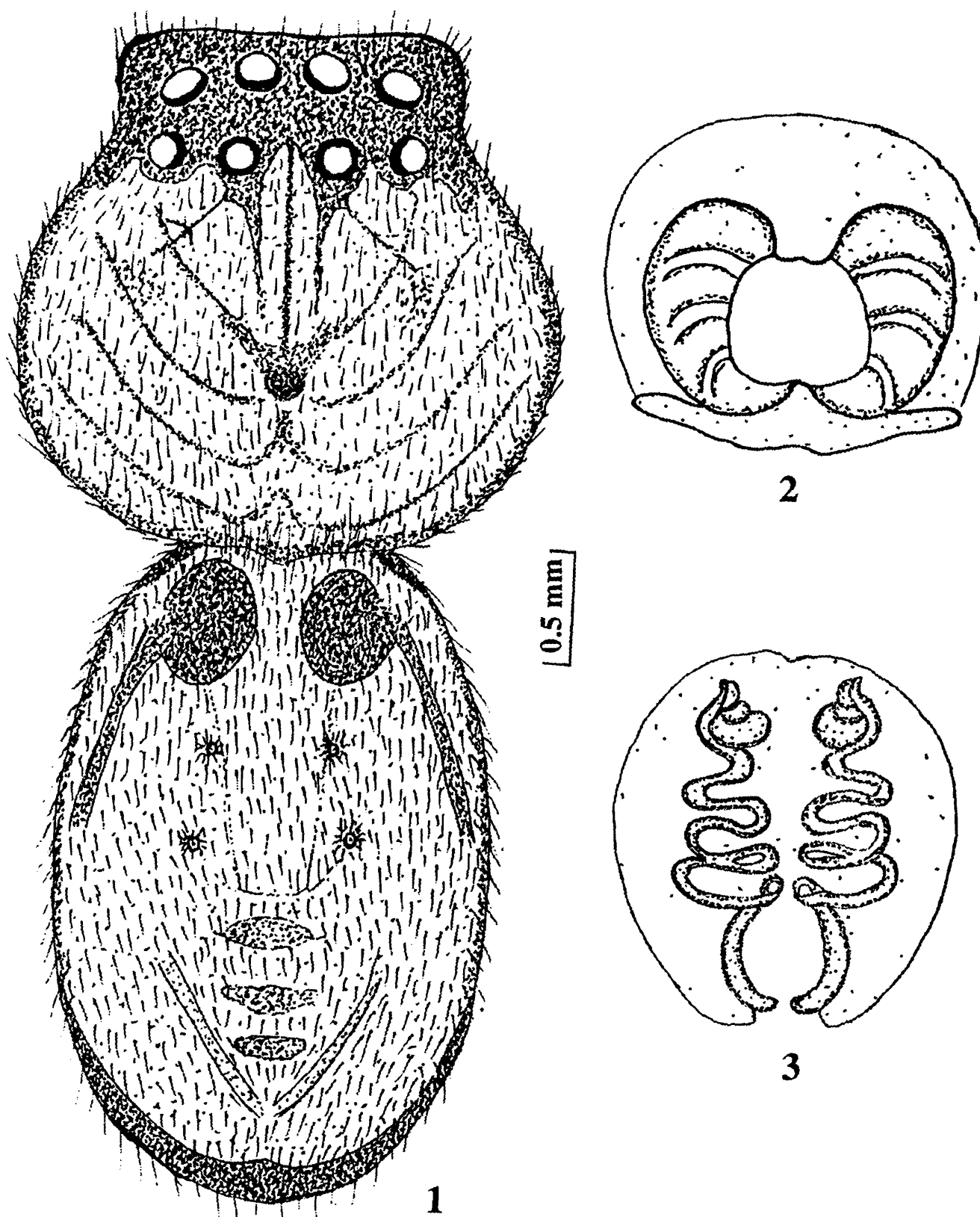
***Heteropoda debalae* sp. nov.**

(Figs. 1-3)

General : Cephalothorax velvet like ash, abdomen velvet yellow with dense hair in both. Total length 21.00 mm. Carapace 11.00 mm long, 9.00 mm wide; abdomen 11.00 mm long, 7.00 mm wide.

Cephalothorax : Cephalothorax giant in size, slightly longer than wide, cephalic region higher at the anterior end and elevated posteriorly. Two rows of distinct heterogenous eyes are present. Anterior row of eyes slightly procurved where as posterior slightly recurved in nature. Antero and postero median eyes are slightly longer than the laterals. There is distinct furrow originated from the posterior row of eyes to the base of fovea on the cephalic region. Chelicerae very strong, armed with two and four teeth on the outer and inner margins of fang furrow. Labium wider than long. Maxillae broad with thick scopulae. Sternum heart shaped, dark brown in colour. Legs long with alternative bands of yellow and black with hair. Leg formulae are 2143. Male unknown.

Abdomen : Elongated, tapering at the posterior end, clothed with dense hair. Dorsum with two black patches towards the anterior side and these continues upto posterior end of the dorsum through the margin of the abdomen. Two pairs of sigilla present. Extremely mature specimen with large shield shaped epigyne covered with dense hair (description based on living spider).



Figs. 1-3. : *Heteropoda debalae* sp. nov. 1. Dorsal view of female, Holotype (Legs are omitted); 2. Epigyne; 3. Internal genitalia.

Type specimen : Holotype female Paratype one female preserved in rectified spirit (70%).
Registration number are 5577/18 and 5581/18.

Type-locality : Behala near Debalay at night from the room, Kolkata, India, 28.ix.2004, coll. A. Banerjee and Sagar Island proper near Omkarnath Ashram, Dist. South 24-Parganas, West Bengal (Sunderban), India, 20.viii.2005, coll. Rakhi Roy.

Remarks : *Heteropoda debalae* sp. nov. is compared with *H. venatoria* (Linn.) which differs in the following characters (1) The colouration of both the species totally different (2) Dorsum of the abdomen provided with two longitudinally black patches laterally in *H. debalae* sp. nov. but there is no such in *H. venatoria* (3) Epigyne and internal genitalia are also structurally different.

Distribution : Kolkata : Behala, India (Type locality); New record, Sagar Island (Sunderban).

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