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**Zoological Survey of India
Calcutta
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DR. J. R. B. ALFRED

Director

Zoological Survey of India

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

RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA

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ASILIDAE (DIPTERA) FROM ANDHRA PRADESH, INDIA

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AND

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INTRODUCTION

Andhra Pradesh is one of the least explored states of India with regard to the robberfly fauna. Hence three intensive surveys were undertaken. A.N.T Joseph and Ramakrishna surveyed Khammam, Warangal, Karimnagar and Adilabad districts from 4th to 25th February 1985; P. Parui surveyed Kurnool, Nalgonda and Warangal Districts from 17th June to 7th July 1985; and A.N.T Joseph and P. Parui surveyed West Godavari, Visakhapatnam and Vizianagaram Districts from 12th February to 7th March 1986. Hyderabad and environs were also surveyed from time to time from 1984 to early 1987, where one of us, A.N.T Joseph, was posted during that period. This paper is the result of the study of these collections.

SYSTEMATIC ACCOUNT

Lobus Martin

1972. *Lobus* Martin, *J. Ent. Soc.* **45** : 8.

1 *Lobus martini* Joseph & Parui

1983. *Lobus martini* Joseph and Parui, *Bull. zool. Surv. India*, **5** (1) : 67.

Material 1 (F), Hyderabad Dist. Manjira Road, 18 km. away from Hyderabad, 14.viii.1985, Coll. A.N.T Joseph; 1 (M), 1 (F), West Godavari Dist. Eluru Nayam Palli, 14.ii.1986, Coll. A.N.T Joseph.

Remarks: The species was described from Kerala. This is the second record of the species and for the first time from Andhra Pradesh.

2. *Lobus pandai* n. sp. (Fig. 1)

A slender black fly with grey tomentum, pale yellow, yellowish-brown and black legs, a dorsal yellowish-brown marking on hind femur, light brown wings and black abdomen. Male length 8 mm, wing 5 mm.

Male Head black with greyish-white tomentum; gibbosity indistinct, mystax a transverse row of white bristles on mouth border; postcranium with sparse white hairs but for a few brown hairs adjoining to ocellar triangle. Antenna dark brown, scape slightly longer than half of pedicel, style about three-fourths the distance of first flagellomere. Palpus and proboscis black, the latter with sparse, white hairs.

Thorax black with grey tomentum; pronotum without hairs; scutum devoid of mediolongitudinal stripe, sides grey tomentose while the rest black; chaetotaxy 1 notopleural, 1 supra-alar; vestiture black but on sides white, bristles black or pale yellow; scutellum with grey tomentum, border with dense, long, black hairs, medially also with a few black hairs; pleura with dense greyish-white tomentum, anepisternum and katepisternum anterodorsally with dense, long, white hairs. Haltere pale yellow with the distal half of stalk white.

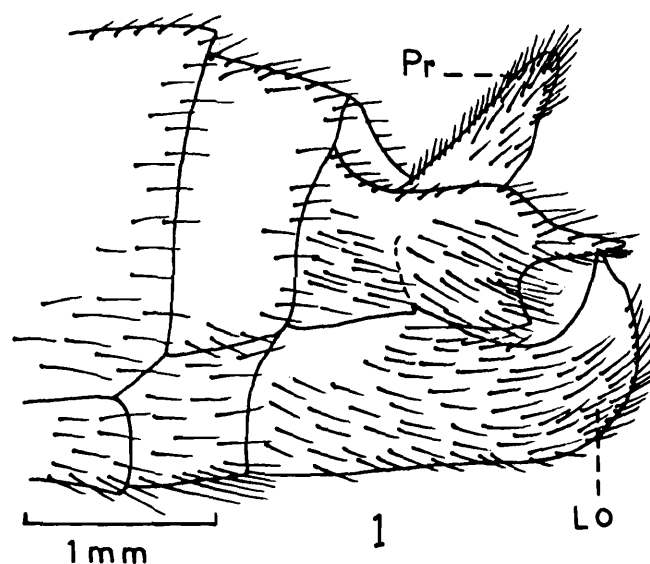


Fig. 1. *Lobus pandai* n.sp. lateral view of male genitalia.

Legs pale yellow, yellowish-brown and black, coxa and trochanter black, fore and mid femora and tibiae basally yellowish-brown while the rest dark brown, hind femur about one-third from base white, rest pale yellow with the middle of which with a yellowish-brown marking dorsally, hind tibia basal half pale yellow and distal half black, metatarsus in all legs white with black apex, remainder black, vestiture white but for a few black hairs, bristles white or black.

Wing light brown, but distally lighter coloured.

Abdomen black with grey marking on tergites both anteriorly and posteriorly, the grey marking gradually decreases on posterior tergites, terga 1 and 2 on sides with a few hairs. Male genitalia (Fig. 1) black with white hairs.

Material Holotype (M), Reg. No. 7496/H6, Warangal Dist. Pakhal Forest, 4.vii.1985, coll. P. Parui.

The genus *Lobus* Martin is represented in India by 5 species. *L. evenhuisi* Joseph & Parui,

L. himalayae Martin, *L. jairami* Joseph and Parui, *L. keralae* Martin and *L. martini* Joseph and Parui. Of these *L. pandai* n.sp. is similar to *L. evenhuisi* Joseph and Parui and *L. martini* Joseph & Parui differing from both in the pale yellow hind femur with a dorsal yellowish-brown marking and the differences in the shape of male genitalia. The species is named in honour of our colleague, Sri P. Panda.

Nusa Walker

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

3. *Nusa andhraensis* n. sp. (Fig. 2)

A very small black species with golden yellow pubescence, black and yellowish-brown legs, hind femur stout, hind border of tergites yellowish-brown, and distally fuscous wings. Male length 7 mm, wing 5 mm; female length 7-8 mm, wing 5-6 mm.

Male . Head broader than thorax, black with sparse grey tomentum; mystax white and pale yellow, fronto-orbital plate with white hairs, ocellar bristles brown, postcranium with sparse white hairs, postocular bristles pale yellow above and white below, postgena white haired. Antenna dark brown, scape with an elongate black or pale yellow ventral bristle, pedicel with a short, black, ventral bristle, pedicel slightly longer than scape, first flagellomere long. Palpus and proboscis black with white hairs.

Thorax black with golden yellow tomentum; pronotum black with a transverse row of black and pale yellow bristles, scutum without mediolongitudinal stripe; chaetotaxy 2 notopleurals, 4 supra-alars, 1 or 2 intra-alars; vestiture golden yellow, bristles pale yellow, scutellum with white hairs which are sparse posteriorly, hind border without bristles, pleura nearly bare, karatergite with white bristly hairs. Haltere yellowish-brown with lighter coloured knob.

Legs yellowish-brown and black, fore and mid femora black with basal and apical ends yellowish-brown while the remainder black, tibia basally yellowish-brown and the remainder black, tarsus almost wholly black, hind leg large with stout femur which ventrally bears a few microtuberculate hairs, the hairs anteroventrally arranged in a row, vestiture and hairs white, apex of hind tibia and tarsal segments with a mat of golden yellow hairs.

Wing basally hyaline and distally fuscous; R_s and M_1 united close to the border.

Abdomen black with yellowish-brown mark on hind border of terga, tergum 7 almost wholly yellowish-brown, terga 2-5 posterolaterally with 1-4 white bristles, vestiture white. Male genitalia (Fig. 2A) yellowish-brown with white hairs.

Females Similar but with the following differences comparatively darker coloured; pleura sparsely or densely grey tomentose; chaetotaxy in one paratype 3 notopleurals; the ventral microtuberculate bristly hairs on hind femur may or may not be arranged in an anteroventral row; abdomen with lesser area of yellowish-brown colouration so much so

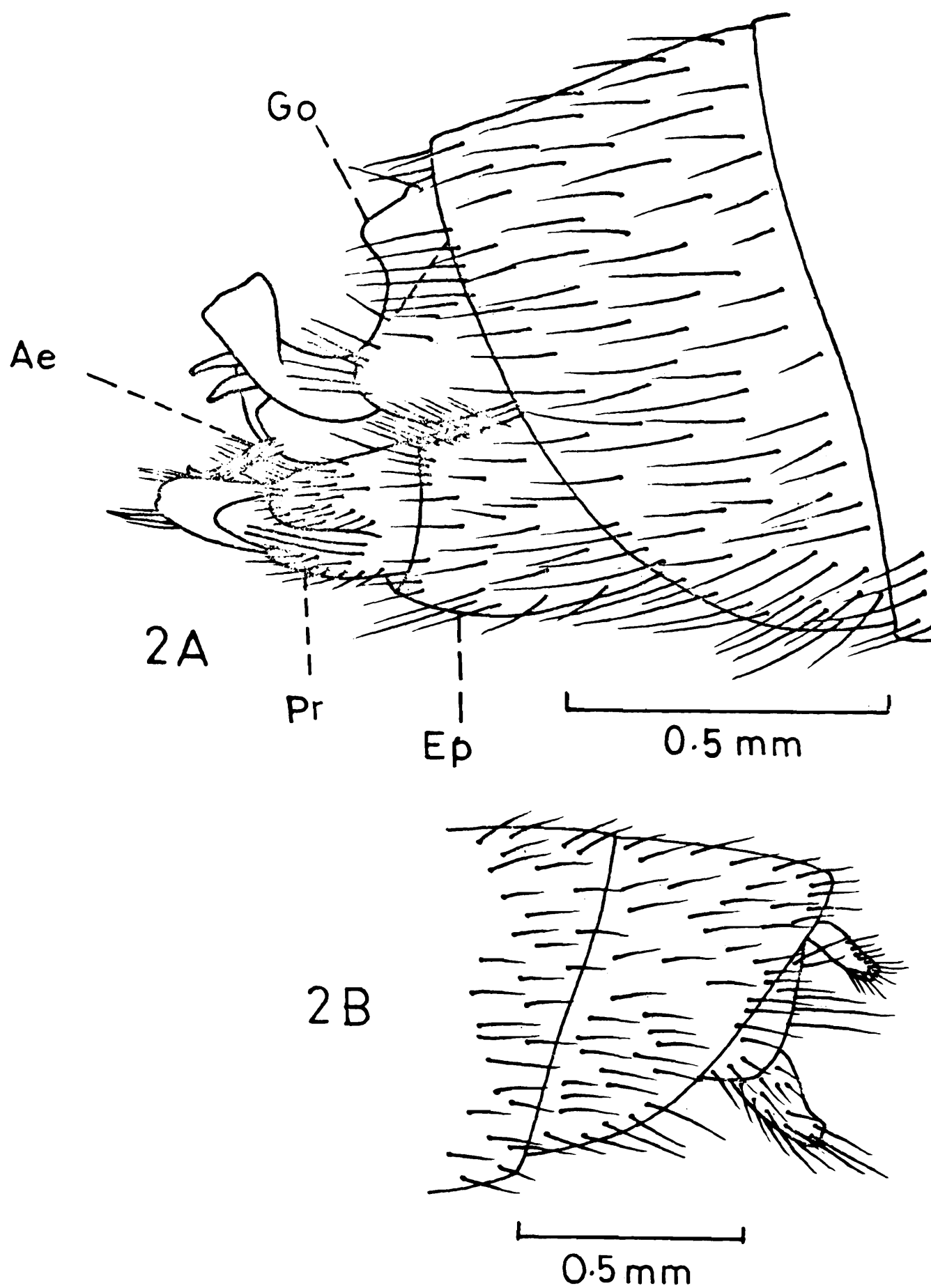


Fig. 2. *Nusa andhracnsis* n.sp., A. lateral view of male genitalia; B. lateral view of female genitalia.

tergum 7 black with yellowish brown hind border. Female genitalia (Fig. 2B) illustrated.

Material Holotype (M), Reg. No. 7497/H6, India Kurnool District Nandyal Gajalpally Forest Rest House Mahananda Road, 22.vi.1985, Coll. P. Parui. Paratypes 1 (M) & 4 (F), Reg. Nos. 7498/H6 to 7502/H6, rest of data as in holotype.

It can be readily recognised from all the other known Indian species of the genus *Nusaby* the distinctive male genitalia, especially gonocoxite, together with the presence of microtuberculate hairs on hind femur.

4. *Nusa balraji* n. sp. (Fig. 3)

A rather black species with grey tomentum, black legs, fuscous wings and black and greyish-white abdomen. Male length 15-17 mm, wing 8-9 mm; female length 14 mm, wing 9 mm.

Male Head as broad as thorax, black with grey tomentum, mystax white or white with a few black bristles below, fronto-orbital bristles white, ocellar bristles black, postocular bristles black, pale yellow and white, postcranium white haired, postgena with dense white hairs. Antenna with scape and pedicel black, first flagellomere orange-brown with base black, scape with white bristles, scape and pedicel nearly equal in length, first flagellomere longer than scape and pedicel but not elongate. Palpus and proboscis black with white hairs.

Thorax black, grey tomentose; pronotum black with a transverse median row of black bristles, laterally white haired; scutum with a faint, black mediolongitudinal stripe extending the entire length, bristles and hairs black but for a few posterolateral pale yellow bristles; chaetotaxy 2-3 notopleurals, 2-4 supra-alars, 3 postalars, 1-2 intra-alars, 3-4 dorsocentrals; scutellum black haired with a row of pale yellow and black bristles; pleura with dense greyish-white tomentum; karatergite with long, pale yellow bristly hairs. Haltere yellowish-brown.

Legs black with apex of femur and base of tibia narrowly yellowish-brown; coxa anteriorly with dense white hairs and a few white bristly hairs, fore tibia with 3 long posteroventral bristles, vestiture and bristles white with a few black ones also, fore tibia at apex and basitarsus ventrally with a mat of golden yellow pubescence, similar pubescence present on basitarsus and tarsomere 2 of hind tibiae.

Wing fuscous; R_s and M_1 united well before the border.

Abdomen black with greyish-white tomentum, tergites 1-2 greyish-white tomentose with median black, terga 3-7 medially black and laterally and posteriorly greyish-white, tergum 8 black with sparse grey tomentum, terga mediolaterally with 1-4 white bristles. Male genitalia (Fig. 3A) black with black hairs and black bristly hairs.

Females Similar but with the following differences sparsely tomentose; mystax also with a few median black bristles; chaetotaxy 2 dorso-centrals; bristles on hind border of scutellum wholly black or pale yellow. Genitalia (Fig. 3B) figured.

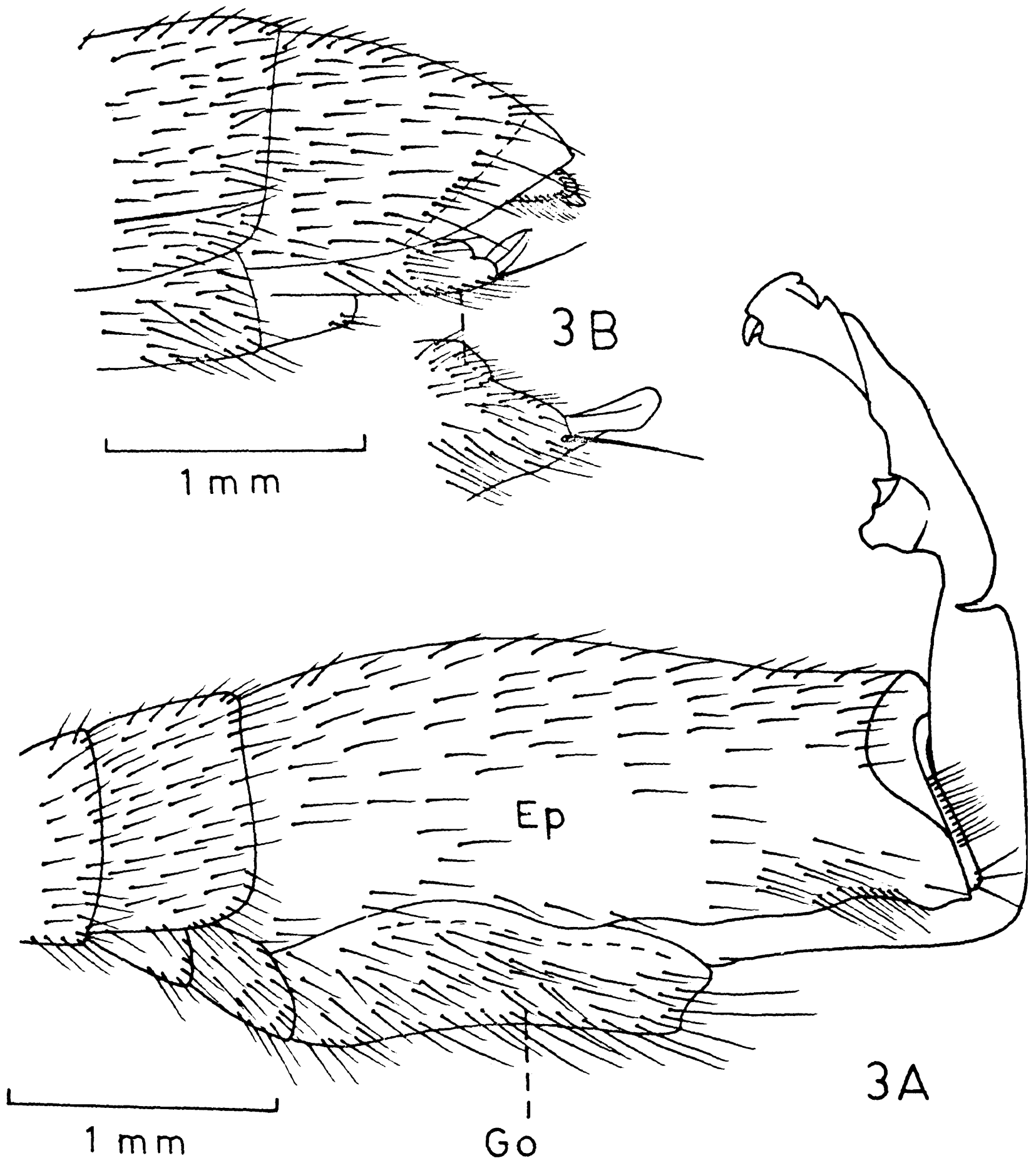


Fig. 3. *Nusa balraji* n.sp., A. lateral view of male genitalia; B. lateral view of female genitalia.

Material Holotype (M), Reg. No. 7503/H6, Kurnool District Nandyal Gajalpalli, 22.vi.1985, Coll. P. Parui and party. Paratypes 3(M), 1(F), Reg. Nos. 7504/H6 to 7507/H6, rest of data as in holotype, 1(F), Reg. No. 7508/H6, Warangal District . Pakhal Forest, 4.i.1985, Coll. P. Parui and party.

It superficially resembles *Nusa aequalis* Walker from which it differs in the black scape and orange brown first flagellomere, black tibia, and details of female genitalia (male *N. sequalis* Walker not yet recorded). Also it differs from all the other known species of the genus by the details of male genitalia, especially epandrium.

Oldroydia Hull

1956. *Oldroydia* Hull, , *Ann. Mag. nat. Hist.*, (12) 9: 398.

5. *Oldroydia costata* n. sp. (Fig. 4)

A small, black, grey tomentose species with black and white mane on scutum, black legs with yellowish-brown and black tibia, and light brown wings with the fore border dilated in male. Male length 13 mm, wing 7-8 mm; female length 13 mm, wing 6-8 mm.

Males *Head* as broad as thorax, black with grey tomentum; face slightly gibbous which extends from epistome to base of antennae, mystax with a few upper black bristles; fronto orbital hairs black, ocellar bristles black, postocular bristles white and curved forward, occipital hairs white, postgena with dense white hairs. Antenna (Fig. 4A) black, scape and

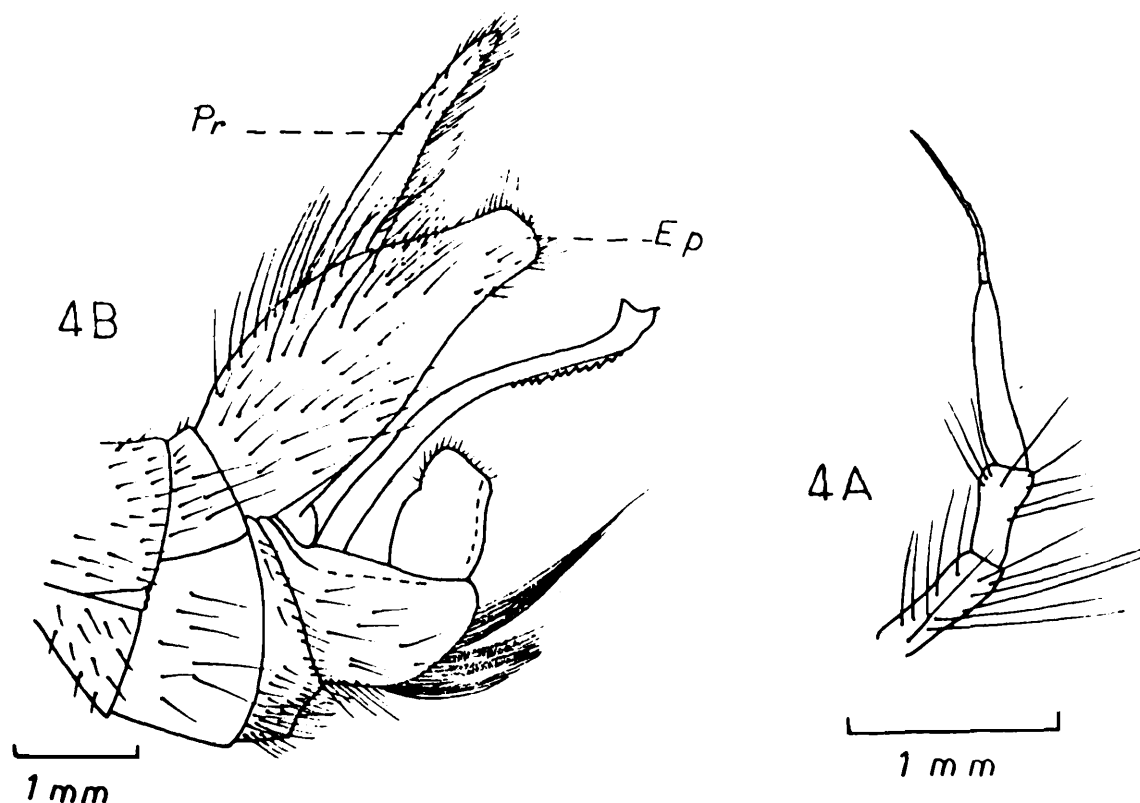


Fig. 4. *Oldroydia costata* n.sp. A, antenna; B, lateral view of male genitalia.

pedicel with black bristles, pedicel slightly shorter than scape, first flagellomere attenuate, longer than scape, arista long. Palpus and proboscis black with white hairs.

Thorax black, grey or greyish-yellow tomentose; pronotum white haired, hairs dense medially; scutum with a dense mane of black and white extending the entire length, the mane black for the anterior two-thirds and white for the posterior one-third, from the middle to hind border the mane bordered by a row of pale yellow and black bristles; chaetotaxy; 3-4 notopleural, 1 postalar, 1-2 supra-alar; vestiture black, bristles pale yellow, karatergite and meron with a few, long thin or bristly, white or pale yellow hairs; scutellum including border with dense, long, white hairs directed forward. Haltere with pale yellow stalk and yellowish-brown head.

Legs black with yellowish-brown and black tibia, mid and hind femora with an anteroventral row of pale yellow bristles, vestiture white but also with a few black hairs, bristles pale yellow with a few black ones also.

Wing light brown to brown, but medially almost hyaline, foreborder dilated.

Abdomen black with sparse grey or greyish-yellow tomentum; tergum 1 with well developed, dense white hairs, a few of which laterally form bristles, vestiture white. Male genitalia (Fig. 4B) black and yellowish-brown, hairs pale yellow and black.

Females Similar, but one paratype with dense grey tomentum; terga 2-7 posterolaterally with 2-4 white bristles. Female genitalia predominantly black with dark brown marking or vice versa, cercus almost rectangular, sternum 8 broadly pointed at apex.

Material · Holotype (M), Reg. No. 7509/H6, Hyderabad Himayat Sagar Chilkur Deer Park, 3.xii.1985, Coll. A.N.T Joseph. Paratypes 2 (M), 2 (F), Reg. Nos. 7510/H6 to 7513/H6, data as in holotype.

Oldroydia costata n. sp. is closely similar to *O. femorata* Joseph and Parui in the attenuated third antennal segment, closed marginal cell and in the absence of hamate anterior femur. The former can be distinguished from *O. femorata* Joseph and Parui by the particoloured black and yellowish-brown tibiae, by the dilated fore border of wing in males like that of *Clephydroneura* Becker, and by the details in the shape of male genitalia, especially epandrium.

***Scylaticus* Loew**

1858. *Scylaticus* Loew, *Ofvers. K. Svenska Vet. Akad. Forh.*, 14 : 346.

6. *Scylaticus godavariensis* n. sp. (Fig. 5)

A stout black species with black legs, infuscated wings and black abdomen banded with light brown or orange. Male length 11-13 mm, wing 9 mm.

Males Head as broad as thorax, black, sparsely grey tomentose, mystax white; fronto-

orbital hairs and ocellar bristles black, postcranium with dense black hairs, those above long and well developed and those below short. Antenna black, scape with black bristles and hairs, pedicel with black hairs, pedicel about half the length of scape, first flagellomere longer than double the combined length of scape and pedicel. Palpus and proboscis black, former black and white haired, while latter white haired.

Thorax black with sparse grey tomentum; pronotum medially black haired and laterally white haired, also with a median transverse row of black bristles; scutum with mediolongitudinal stripe indistinct, but a narrow, faint, short mediolongitudinal stripe discernible anteriorly, laterally with 2 large black spots; chaetotaxy: quite variable, 2-3 notopleural, 2-3 supra-alar, 2-3 postalar, about 5 dorsocentral anterior to scutoscuteellar suture; vestiture black with rather dense white hairs anterolaterally, bristles black; pleura sparsely grey tomentose; karatergite with a transverse row of long, pale yellow, hairs. Haltere pale yellow.

Legs black, vestiture predominantly white, also with a few black hairs, fore tibia and tarsus with mat of golden yellow hairs anteriorly, hind tibia and tarsus with similar hairs posteriorly, bristles white or black.

Wing infuscated.

Abdomen black, terga banded with light brown or orange posteriorly which decrease gradually in posterior terga, tergum 1 laterally with a bunch of white hairs, a few of which well developed and form bristles, terga 2-3 also with white hairs laterally, vestiture white. Male genitalia (Fig. 5) black and pale yellow. with dense black hairs.

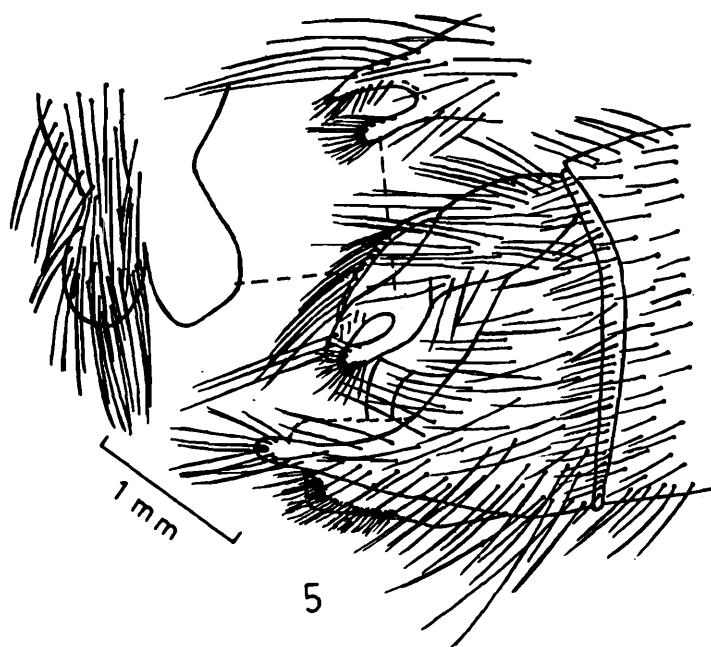


Fig. 5. *Scylaticus godavariensis* n.sp., lateral view of male genitalia.

Material· Holotype(M), Reg. No. 7514/H6, Godavari Dist.. Kannapuram Manchurulu, 21.ii.1986, Coll. A.N.T Joseph and Party. Paratype (M) (wings lost), Reg. No. 7515/H6, details as in holotype.

The genus *Scylaticus* is so far represented by a single species, *S. indicus* Bromley, from

India. *S. godavariensis* n.sp. differs from it in the large size, stout built, uniformly black mid and hind tibiae, and black and pale yellow genitalia.

7 *Scylaticus indicus* Bromley

1939. *Scylaticus indicus* Bromley, *Indian J. Agric. Sci.*, **8** (6) : 864.

Material 8 (M), 1 (F), Visakhapatnam Dist. Araku Valley Ananthagiri, 900 m, 1.iii.1986, Coll. A.N.T Joseph.

Remarks The species has been already recorded from Tamil Nadu and Kerala. Here it is recorded for the first time from Andhra Pradesh.

Stenopogon Loew

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

8. *Stenopogon kherai* Joseph & Parui

1976. *Stenopogon kherai* Joseph and Parui, *Ent. Scand.*, **7** : 105.

Material 4(F), Adilabad Dist. Riwazpet Forest, 24.ii.1985, Coll. A.N.T Joseph and Ramakrishna.

Remarks In India, the species has been so far recorded from Bihar and Kerala (Joseph and Parui 1990). Here it is reported for the first time from Andhra Pradesh. It has been also recorded from Nepal (Joseph and Parui, 1991).

9. *Stenopogon pradhani* Joseph & Parui

1976. *Stenopogon pradhani* Joseph and Parui, *Ent. Scand.*, **7** : 106.

Material 1(M), Khamam Dist., 13/30 mile stone on Kothagudem Yellandu Road, 8.ii.1985, Coll. Joseph and Ramakrishna; 1(M), 1(F), Adilabad Dist. Nirmal Forest, 22.ii.1985, Coll. A.N.T Joseph and Ramakrishna.

Remarks In India the species has so far been recorded from Jammu and Kashmir and Karnataka (Joseph & Parui, 1994). Here it is recorded for the first time from Andhra Pradesh. It has been recorded from Sri Lanka also by Joseph and Parui (1984a).

Damalis Fabricius

1805. *Damalis* Fabricius, *Systema antliatorum*, : 147.

10. *Damalis dattai* n. sp. (Fig.6)

Small black species with yellowish-brown and black mixed legs and hyaline wings. Male length 8 mm. wing 8 mm.

Male : *Head* broader than thorax, black, scarcely tomentose; mystax a transverse row of 4 pale yellow, elongate hairs; fronto-orbital plate bare, ocellar bristles weak, postcranium with sparse black and pale yellow hairs. Antenna black with the distal half of style white, scape and pedicel with pale yellow hairs, scape slightly shorter than pedicel. Palpus and proboscis black with pale yellow and white hairs.

Thorax black; pronotum white haired, hairs dense on sides; scutum black with the border on posterior half yellowish-brown, mediolongitudinal stripe absent, vestiture pale yellow and black; scutellar disc with a few, median, white hairs, border with long white hairs, pleura grey tomentose, metapleuron with long, pale yellow and white hairs. Haltere brown.

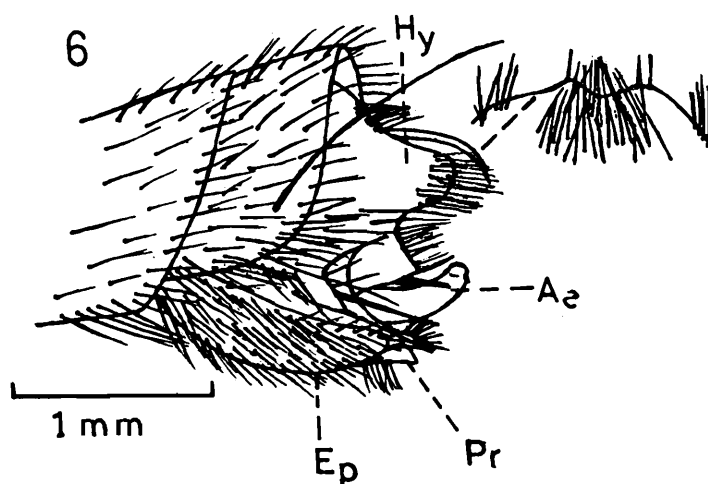


Fig. 6. *Damalis dattai* n.sp., lateral view of male genitalia.

Legs pale yellow, yellowish-brown and black; coxa and trochanter black, fore femur black with an apical yellowish-brown mark, mid femur similar, but area of yellowish-brown more, hind femur with basal and distal yellowish-brown and medially black; tibia yellowish-brown with black distally, the yellowish-brown increases from fore to hind tibia so much so only apex black in hind tibia, tarsus black, vestiture pale yellow with some black hairs also, bristles black; hind trochanter swollen distally and bears long pale yellow and black hairs, hind femur thickened slightly beyond base, distal half bearing anteroventral and posteroventral row of bristly spines.

Wing hyaline.

Abdomen black, sides of basal terga with long white hairs, vestiture white and pale yellow. Male genitalia (Fig. 6) yellowish-brown, hypandrium with a pair of black bristles at lower angle and another two on median projection.

Material · Holotype (M), Reg. No. 7516/H6, Warangal Dist. Pakhal Forest, 4.vii.1985, Coll. P. Parui.

It is generally similar to *Damalis mercaraensis* (Joseph and Parui) from which it differs in the absence of mediolongitudinal stripe and in the structural details of hypandrium. The fly is named in honour of Dr. M. Datta, in-charge of Diptera Section of the Zoological Survey of India, Calcutta.

11. *Damalis mercaraensis* (Joseph & Parui)

1984. *Xynomyza mercaraensis* Joseph and Parui, *Ent. Scand.*, **15** : 447.

Damalis mercaraensis (Joseph & Parui) New Comb.

Material 1(M), 1(F), Kurnool Dist. Nandyal Gajalpalli Forest Rest House, 22.vi.1985; 4(M), 4(F), Warangal Dist. Pakhal Forest, 3.vii.1985; 7 (M), 11(F), Pakhal Forest, 4.vii.1985; 14(M), 7(F), Pakhal Forest, 5.vii.1985; all Coll. P. Parui.

Stichopogon Loew

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

12. *Stichopogon gymnurus* Oldroyd

1948. *Stichopogon gymnurus* Oldroyd, *Ent. Month. Mag.*, **84** : 262.

Material 2(M), 4(F), Visakhapatnam Dist. : Lakhimpatti Rajupeta, 23.ii.1986; 1(M), 3(F), Palavaram Beach, 23.ii.1986; 7(M), 16 (F), Araku Valley : Ananthagiri, 900 m. 28.ii.1986; 2 (M), 3 (F), Vizianagram Dist. Thinnukarja Forest, 4.iii.1986, all Coll. A.N.T Joseph.

Remarks The species has so far been recorded from Tamil Nadu. Here it is reported for the first time from Andhra Pradesh. It has also been recorded from Sri Lanka.

13. *Stichopogon inaequalis* (Loew)

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

1948. *Stichopogon inaequalis* : Oldroyd, *Ent. Month. Mag.*, **84** : 262.

1983. *Stichopogon inaequalis* : Joseph and Parui, *Orient. Insacts*, **17** : 325.

Material 1(M), West Godavari Dist. Eluru Tamlaru River bed, 16.ii.1986; 6 (F), Visakhapatnam Dist. : Lakimpatti . Rajupeta, 23.ii.1986; 1(M), Araku Valley : Anathagiri, 900 m, 1 .iii.1986; 1(M), 1(F), Visakhapatnam Sea shore, 1 .iii.1986; 1(M), 1(F), Vizianagaram Dist. Bobbli Gurgi, 3.iii.1986; all Coll. A.N.T Joseph.

Remarks In India the species has been reported from Tamil Nadu and Bihar (Oldroyd, 1948). Z.S.I. possesses 3 specimens from Maharashtra. It is recorded for the first time from Andhra Pradesh. It has also been reported from Sri Lanka (Oldroyd, 1948).

14. *Stichopogon meridionalis* Oldroyd

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

Material 5(M), 19 (F), West Godavari Dist. Eluru Tamlaru River bed, 13-16.ii.1986; 1(M), Visakhapatnam Sea Shore, 1.iii. 1986; 7 (F), Vizianagaram Dist. Bobbli Gurgi,

3.iii.1986; 2(M), Parbatipuram Thinnukurja Forest, 4.iii.1986, all Coll. A.N.T Joseph.

Remarks The species is recorded for the first time from Andhra Pradesh. It has already been reported from Tamil Nadu, Karnataka and Bihar from India and from adjoining country Sri Lanka (Oldroyd, 1948).

15. *Stichopogon mahatoi* sp. n. (Fig. 7)

A small, orange and black species with legs wholly orange or mid and hind femora with black marking, and light brown wings; female lamella without hair tuft. Female length 7-8 mm, wing 5 mm.

Female : **Head** as broad as thorax, black, sparsely grey tomentose; mystax pale yellow; fronto-orbital plate bare, ocellar bristles pale yellow, postocular bristles pale yellow and confined to above, postcranium mostly bare but below white haired, postgena with dense white hairs. Antenna orange with style black, first flagellomere longer than combined length of scape and pedicel. Palpus dark brown and yellowish-brown mixed, proboscis black, both white haired.

Thorax orange with black marking, sparsely grey tomentose; pronotum with a transverse row of white bristly hairs; scutum with a broad incomplete mediolongitudinal black stripe, lateral black spots faintly marked; chaetotaxy 1 notopleural, 1 postalar, 1 supra-alar; vestiture sparse white hairs, bristles pale yellow; scutellar disc bare, hind border with hairs and 4 pale yellow bristles; pleura sparsely grey tomentose; karatergite with a transverse row of long, bristly white to pale yellow hairs. Haltere with pale yellow to orange head, and pale yellow to dark brown stalk.

Legs wholly orange or with black marking on mid and hind femora, the intensity and extent of black colour quite variable, vestiture and bristles white.

Wings light brown.

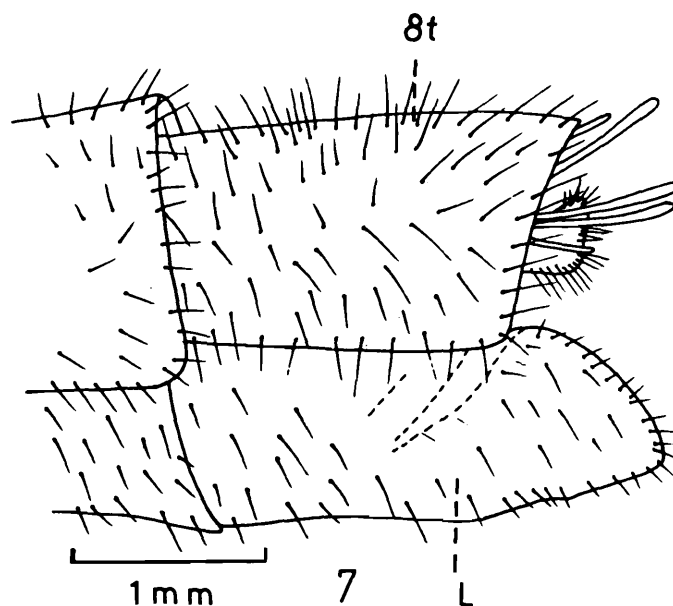


Fig. 7. *Stichopogon mahatoi* n.sp., lateral view of female genitalia.

Abdomen particoloured orange and black, tergum 1 black and orange to varying extent, terga 2-5 or rarely even upto 7 with large median, triangular shaped black marking and rest orange, remaining terga wholly black, tergum 1 laterally with a bunch of pale yellow hairs, a few of which form bristles, vestiture black and pale yellow. Female genitalia (Fig. 7) with tergum 8 bearing a circlet of 10 spines; lamella without hair tuft, not tomentose.

Material · Holotype (F), Reg. No. 7517/H6, Nalgonda Dist. Nagarjunkonda, 26.ix.1985, Coll. P. Parui. Paratypes 2 (F), Reg. Nos. 7518/H6, 7519/H6 details as in holotype; 2(F), Reg. Nos. 7520/H6, 7521/H6, Warangal Dist. Pakhal Forest Rest House, 4.vii.1985, Coll. P. Parui.

According to the key to the Indian species of *Stichopogon* Loew by Joseph and Parui (1988), *S. mahatoi* n. sp. runs to the couplet 3 and is closely similar to *S. tomentosus* Oldroyd from which it can be easily separated by the shape of lamella, which is also not tomentose. It is named after our colleague, Sri D. N. Mahato, who has collected many interesting robberflies.

16. *Stichopogon mukherjeei* n.sp. (Figs. 8)

A tiny black species with dense grey tomentum, pale yellow or pale yellow and black legs, and light brown tinged wings; female lamella without hair tuft. Male length 6 mm, wing 4-5 mm; female 6 mm, wing 4 mm.

Female *Head* broader than thorax, dense greyish-white tomentose; mystax straw coloured; fronto-orbital hairs and ocellar hairs white, postocular bristles white and confined to above, postcranium with sparse white hairs and also with a few pale yellow bristles above, postgena white haired. Antenna black, grey tomentose, distal half or more of pedicel with dense greyish-white tomentum, first flagellomere much longer than the combined length of scape and pedicel. Palpus and proboscis black with white hairs.

Thorax black with dense greyish-white or greyish-yellow tomentum; pronotum with a transverse row of white or pale yellow bristles; scutum with a narrow mediolongitudinal

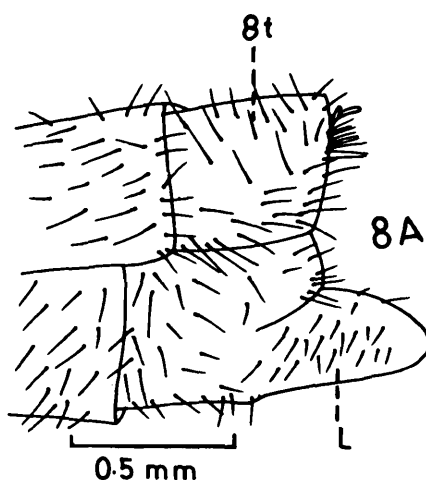


Fig. 8. A. *Stichopogon mukherjeei* n.sp., A, female genitalia

black stripe extending from anterior border to transverse suture, laterally with or without two, narrow, brown, short stripes; chaetotaxy 1 notopleural, 1 postalar, 1 supra-alar; vestiture and bristles white; scutellum on border with long, white hairs, and a row of long, white bristly hairs; karatergite with a transverse row of long white bristles; pleura with dense grey tomentum. Haltere white.

Legs pale yellow, in holotype hind tibia apically dark brown, and terminal tarsal segment in all legs black, in paratype femur basally and apically pale yellow while the rest black, apex of hind tibia dark brown, terminal tarsal segments in fore and mid legs and terminal and preceding 2 tarsal segments in hind leg black; vestiture and bristles white.

Wing light brown tinged, but basally still lighter coloured.

Abdomen black, grey tomentose, hind border of tergum narrowly white bordered, terga 1-3 laterally with long, white hairs, a few of which well developed and form bristly hairs on tergum 1, vestiture white. Female genitalia (Fig. 8A) illustrated, lamella pale yellow while rest black, tergum 8 bearing 4 spines; lamella without hair tuft.

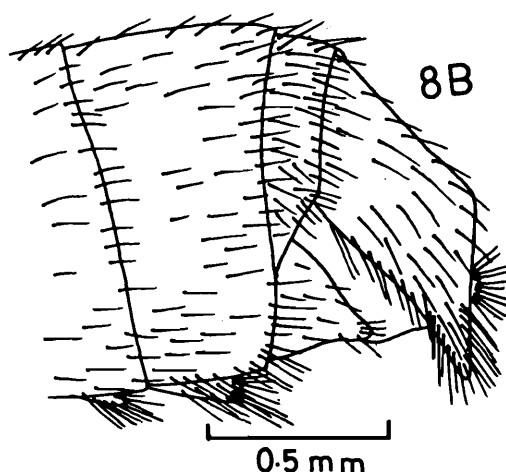


Fig. 8. B. lateral view of male genitalia.

Males: Similar but with the following differences comparatively darker coloured, in one paratype scutum with a broad mediolongitudinal black stripe but without lateral brown stripes, in the other vice versa; wing comparatively more brownish; leg colour like that of paratype male, terga 2-7 with median black marking to varying extent which in most cases triangular shaped. Male genitalia (Fig. 8B) illustrated.

Material: Holotype (F), Reg. No. 7522/H6, West Godavari Dist. Eluru Tamlaru River bed, 13.ii.1986, Coll. A.N.T Joseph and party. Paratypes 1(F), □Reg. No. 7523/H6, rest of details as in holotype; 1(F), 1(M), Reg. Nos. 7524/H6, 7525/H6, Visakhapatnam Dist. Sanivaram Forest, 29.ii.1986, Coll. A.N.T Joseph and party.

Of all the known Indian species of the genus *Stichopogon*, *S. mukherjeei* n.sp. is closer to *S. indicus* Joseph and Parui from which it differs in grey colouration, black antennae and

differences in the shape of female genitalia, especially lamella and tergum 8. It is named in honour of our colleague, Smt. Manu Mukherjee, in Diptera Section of the Zoological Survey of India, Calcutta.

17. *Stichopogon ramakrishnai* Joseph & Parui

1988. *Stichopogon ramakrishnai* Joseph and Parui, *Orient. Insects*, **22** : 92.

Material · 2(M), 2 (F), Vizianagram Dist. Bobbili Gurji, 3.iii.1986, Coll. A.N.T Joseph.

Remarks: The specimens were collected along with the type material, but was misplaced.

Michotamia Macquart

1938. *Michotamia* Macquart, *Dipt. Exot.*, **1** (2) : 72.

18. *Michotamia aurata* (Fabricius)

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

1975. *Michotamia aurata* : Oldroyd, *A Catalog of Diptera of the Oriental Region*, **2** : 130.

1983c. *Michotamia aurata* : Joseph and Parui, *Orient. Insects*, **17** : 327.

Material · 1(M), 5 (F), Hyderabad, 15.x.1985, Coll. Joseph and Ramkrishna; 1(M) 1 (F), West Godavari Dist. Eluru Tamlaru River bed, 13.ii.1986; 1(M), Eluru Vetluru, 16.ii.1986; 2(M), 2(F), Gopalpuram, 20.ii.1986; 2(M), 2(F), Dorarpalli, 20.ii.1986; 5 (M), 3 (F), Visakhapatnam Dist. Bondavidi, 26.ii.1986; 2(F), Vizianagram Dist. Bobbili Gurji, 3.iii.1986; all Coll. A.N.T Joseph.

Remarks It is widely distributed in India and is a cosmopolitan species.

19. *Michotamia fuscifemorata* Joseph & Parui

1984. *Michotamia fuscifemorata* Joseph and Parui, *Rec. zool. Surv. India*, Occ. Paper No. 66 : 26.

Material 1(M), Visakhapatnam Dist. Sanivaram Forest, 24.ii.1986, Coll. A.N.T Joseph.

Remarks In India it has been recorded from Andhra Pradesh, Karnataka and Kerala (Joseph and Parui, 1984b), and from outside India Bangladesh and Nepal (Joseph and Parui, 1994).

Ommatius Wiedemann

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

20. *Ommatius indicus* Joseph and Parui

1983. *Ommatius indicus* Joseph and Parui, *Eat. Scand.*, **14** : 86.

Material 1(M), Warangal dist. Pakhal Forest, 4.vii.1985, Coll. P. Parui.

Remarks · Here it is recorded for the first time from Andhra Pradesh. The earlier recorded localities are Karnataka, Tamil Nadu and Kerala (Joseph and Parui, 1983b).

21. *Ommatius pseudojabalpurensis* n.s.p. (Fig. 9)

A comparatively small black species with black and pale yellow legs, hind femur stout in males, and brown wings. Male length 9-11 mm, wing 7-8 mm; female length 9-11 mm, wing 7-8 mm.

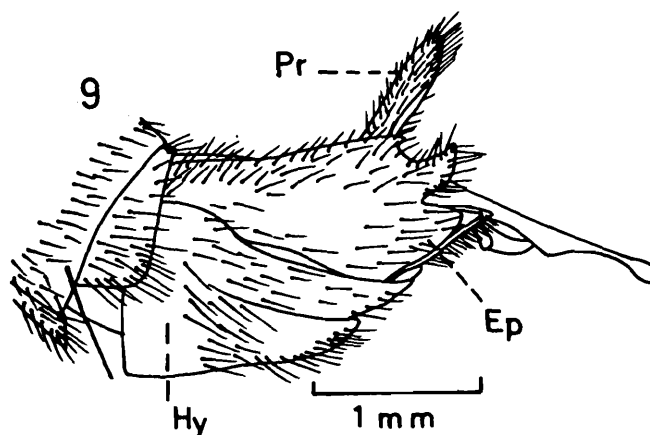


Fig. 9. *Ommatius pseudojabalpurensis* n.sp., lateral view of male genitalia.

Males Head black with dense greyish-yellow or greyish-white tomentum; mystax pale yellow with a few black bristles above, fronto-orbital hairs black, ocellar bristles black, postocular bristles mostly black but 2 or 3 pale yellow below, postcranium and postgena white haired. Antenna black, scape and pedicel with black hairs, former also with 1 or 2 black bristles, pedicel about two-thirds length of scape or slightly more, first flagellomere equal to or longer than scape. Palpus and proboscis black, former white and pale yellow haired, latter white haired.

Thorax black with greyish-yellow and greyish-white tomentum; pronotum white haired, medially with a transverse row of 4 pale yellow or black bristles; scutum with a mediolongitudinal black stripe extending from anterior border to middle of transverse suture and hind border, the stripe divided by a median, narrow, greyish-yellow stripe laterally with 2 large black spots on each side; chaetotaxy 2 notopleural, 1 postalar, 1 supra-alar, 3-5 dorsocentral anterior to scutoscutellar suture; vestiture black but on sides white, bristles black; scutellar disc with sparse white hairs and border with 2 black bristles; karatergite with a transverse row of pale yellow or black or mixed bristles, anepimeron with 1 black bristle. Haltere pale yellow to yellowish-brown.

Legs black and pale yellow with stout hind femur; coxa and trochanter black, fore femur apically pale yellow and remainder black, mid and hind femora black, tibia pale yellow but hind tibia apically dark brown, tarsus pale yellow with apex of tarsomeres black; fore and mid femora ventrally with dense white hairs, hind femur with an anteroventral row of short, spiny bristles, similar bristles present more or less in a row posteriorly, and about another 5 in a row

anteriorly; vestiture black, pale yellow and white, bristles black and pale yellow.

Wing brown, but medially lighter coloured.

Abdomen black, tergum 1 laterally with a bunch of white or pale yellow hairs, a few of which form bristles, tergum 2 with some long, pale yellow hairs posterolaterally, vestiture pale yellow. Male genitalia (Fig. 9) black, with black and pale yellow hairs.

Females: Similar but with the following differences hind femur not thickened; femur and tibia pale yellow except hind tibia apically dark brown. Female genitalia black, sternum 8 ending in very short, one median and two lateral projections; tergum 8 with 2 black bristles on each side, cercus broadly obtuse with pale yellow hairs.

Material Holotype (M), Reg. No. 7526/H6, Hyderabad Manjira Barage, 6.viii.1986, Coll. A.N.T Joseph. Paratypes 9 (M), 9 (F), Reg. Nos. 7527/H6 to 7544/H6, rest of data as in holotype; 1(M), 1(F), Reg. Nos. 7545/H6, 7546/H6, Hyderabad Chilkur Deer Park, 4.iv.1986, Coll. A.N.T Joseph.

It is closely allied to *Ommatius jabalpurensis* Joseph and Parui from which it differs in the comparatively stout hind femur and shape of aedeagus.

22. *Ommatius ramakrishnai* n. sp. (Fig. 10)

A small black species with black and pale yellow to yellowish-brown legs, light brown tinged wings and distinctive epandrium. Male length 5-6 mm, wing 4 mm; female 6 mm, wing 5mm.

Males *Head* black infuscated with grey tomentum; mystax white below and black above with their extent quite variable, fronto-orbital hairs and ocellar bristles black; postcranium sparsely grey tomentose medially and densely grey tomentose laterally, postocular bristles black above and white below. Antenna black, scape and pedicel with black bristles, scape slightly shorter than pedicel, first flagellomere subequal to pedicel. Palpus and proboscis black with white hairs.

Thorax black with sparse grey or greyish-yellow tomentum; pronotum white haired and with 1 or 2 pale yellow or pale yellow and black bristles on each side; scutum with the

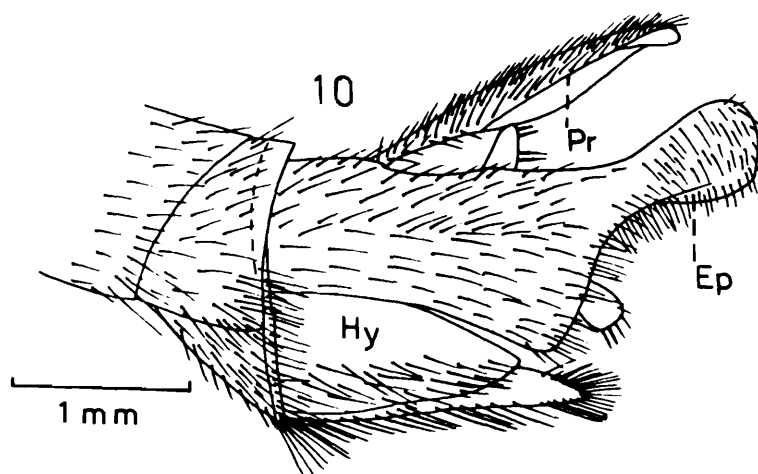


Fig. 10. *Ommatius ramakrishnai* n.sp., lateral view of male genitalia.

mediolongitudinal stripe faintly marked from anterior border to beyond middle of transverse suture and hind border, laterally with three faint black spots in a longitudinal row, scutum comparatively with more tomentum on sides; chaetotaxy 2 notopleural, 1 postalar, 1 supra-alar, 2-3 dorsocentral anterior to scutoscutellar suture; vestiture and bristles black and white; scutellar border with a pair of white bristles, disc with sparse white to pale yellow hairs; karatergite with a few long, white to pale yellow bristly hairs, 2-3 similar hairs also present on meron. Haltere pale yellow.

Legs black and pale yellow to yellowish-brown; coxa, trochanter and femur black, tibia pale yellow to yellowish-brown, in some cases apex dark brown, basitarsus pale yellow to yellowish-brown with apex dark brown, rest of tarsus dark brown, vestiture white and black, bristles predominantly black with a few white ones also.

Wing light brown tinged, but basally hyaline.

Abdomen black, tergum 1 laterally with a bunch of long, white hairs, 3-4 of which form bristly hairs, vestiture black and white. Male genitalia (Fig. 10) black with black hairs, epandrium distinctive.

Females Similar but with the following differences : first flagellomere slightly longer than pedicel; bristles of scutellar border pale yellow in one paratype. Female genitalia black with black and a few pale yellow hairs, eighth sternite apically wavy and with a pair of well developed bristles postero-laterally, cercus broadly obtuse at apex with pale yellow and black hairs.

Material : Holotype (M), Reg. No. 7547/H6, Warangal Dist. Pakhal Forest Rest House Compound, 4.vii.1985, Coll. P. Parui and party. Paratypes 2(M), 4 (F), Reg. Nos. 7548/H6 to 7553/H6, details as in holotype; 1(M), Reg. No. 7554/H6, Visakhapatnam Dist. Sanivaram Forest, 24.ii.1986, Coll. A.N.T Joseph.

It can be distinguished from all the other known Oriental species by the distinctive male genitalia, especially epandrium, together with black femora. It is named in honour of our colleague Dr. Ramakrishna, Scientist-B, Zoological Survey of India, Hyderabad, who collected many interesting robberflies from Andhra Pradesh.

***Clephydroneura* Becker**

1925. *Clephydroneura* Becker, *Ent. Mitt.*, **14** : 68.

23. *Clephydroneura brevipennis* Oldroyd

1938. *Clephydroneura brevipennis* Oldroyd, *Ann. Mag. nat. Hist.*, (11) **1** : 469.

Material: 1(M), 1(F), Visakhapatnam Dist. Chintapalli, 25.ii.1986. Coll. A.N.T Joseph.

Remarks The species was described from Kerala. The present authors subsequently recorded it again from Kerala (1979). It is the third record of the species and for the first time from Andhra Pradesh.

24. *Clephydroneura pulla* Oldroyd

1938. *Clephydroneura pulla* Oldroyd, *Ann. Mag. nat. Hist.*, (11) 1, 467.

Material 4(M), 2(F), Hyderabad Bodouppal, 24.ix. 1985, Coll. A.N.T Joseph and Ramakrishna.

Remarks The species was described from Andhra Pradesh. Later it was recorded from Tamil Nadu and Karnataka (Joseph and Parui, 1979, 1984b).

25. *Clephydroneura singhi* n. sp. (Fig. 11)

A medium yellowish-brown and black species with wings hyaline and dilated at foreborder, and pale yellow legs with dark brown marking. Male length 17 mm, wing 10-11 mm; female length 16-17 mm, wing 10-11 mm.

Males *Head* as broad as thorax, black with grey tomentum; mystax white, fronto-orbital plate with white bristles, ocellar bristles white. Antenna with scape and pedicel pale yellow, first flagellomere and scape dark brown, scape with white and black bristles, pedicel with black bristles only, pedicel slightly less than half of the length of scape, first flagellomere slightly shorter than scape. Palpus and proboscis black with white hairs.

Thorax yellowish-brown with black marking; pronotum white haired; scutum with a black mediolongitudinal stripe extending from anterior border to midway between transverse suture and hind border, the stripe broadly divided by yellowish-brown, sides with 3 black spots in a longitudinal row; chaetotaxy : 2 notopleural, but in one male an additional seta present on one side, 1 postalar, 2 supra-alar, 2-3 prescutellar dorsocentral; vestiture and bristles black, also with a few white hairs laterally, anepisternum, katepisternum and meron with black marking in holotype but indistinct in paratypes, scutellum with a pair of black bristles (but only 1 in holotype) on border. Haltere pale yellow with dark knob.

Legs pale yellow with dark brown marking, coxa and trochanter pale yellow, femur pale yellow with dorsoapical dark brown mark, the area and intensity of which increase from fore

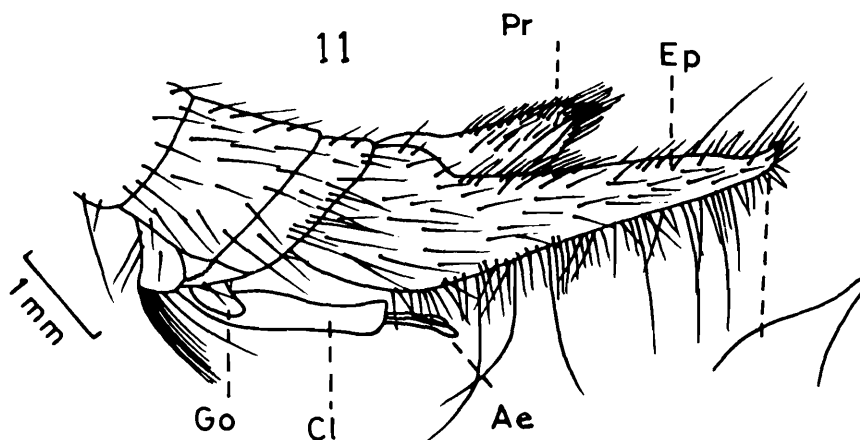


Fig. 11. *Clephydroneura singhi* n.sp., lateral view of male genitalia.

to hind femur, tibia pale yellow with apical dark brown, tarsus pale yellow with dark brown apex, the latter colour dominant in hind tarsus, mid and hind femora with an anteroventral row of black bristles, vestiture white with a few black hairs also, bristles black.

Wing hyaline, foreborder dilated, discal cell strongly constricted.

Abdomen black with pale yellow laterally, grey tomentose, varying number of terga with median and lateral elongate, dark brown spots extending from base to three-fourths distance, one paratype greasy and the marking not discernible, tergum 1 with a bunch of hairs laterally, succeeding tergites with a pair of white bristles posterolaterally. Male genitalia (Fig. 11) black, white haired, epandrium elongate.

Females : Similar but with the following differences chaetotaxy in one paratype only 1 supra-alar; dark brown marking of femur comparatively lighter coloured; abdominal marking very faint. Genitalia black, elongate, eighth sternite apically ending as semicircular lobes, cercus with long, yellow hairs distally.

Material Holotype (M), Reg. No. 7555/H6, West Godavari dist. Kannapuram Munchurulu, 18.ii.1986, Coll. A.N.T Joseph and Party. Paratypes 2(M), 1(F), Reg. Nos. 7556/H6 to 7558/H6, details similar to holotype except date of collection 21.ii.1986; 1(M), Reg. No. 7559/H6, details as in holotype.

It is closely similar to *Clephydroneura gravelyi* Joseph and Parui differing from which in the colouration of femur and the elongate and rather pointed epandrium. In male genitalia *C. singhi* n.sp. resembles to *C. bannerghattaensis* Joseph and Parui, but otherwise a quite distinct species. It is named in honour of Dr. Asket Singh, Joint Director-in-Charge, Zoological Survey of India, Calcutta, for the various favours shown to us.

26. *Clephydroneura wilcoxi* Joseph and Parui

1979. *Clephydroneura wilcoxi* Joseph and Parui, *Ent. Scand.*, **10** : 35.

Material 2(M), 2(F), Hyderabad Uppal, 20.ix.1984, Coll. A.N.T Joseph; 3 (M), 1(F), Kurnool Dist. : Nandyal Gajalpalli Forest Rest House compound, 22.vi.1985, Coll. P. Parui; 3 (M), 2 (F), Warangal Dist. Pakhal Forest House compound, 4.vii.1985, Coll. A.N.T Joseph.

Remarks . This species has so far been reported from Andhra Pradesh, Karnataka and Tamil Nadu (Joseph and Parui, 1984b). It is the second report from Andhra Pradesh.

Philodicus Loew

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

27. *Philodicus femoralis* Ricardo

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

Material 6 (M), 7 (F), Vizianagaram Dist. Bobbli Gurji, 3.iii.1986, Coll. A.N.T Joseph.

Remarks The species has been reported from Assam, Arunachal Pradesh, Bihar, Himachal Pradesh, Karnataka, Tamil Nadu, Uttar Pradesh and West Bengal (Joseph and Parui, 1994b). It was described from Burma.

28. *Philodicus jagannathi* Ramchandra Rao

1969. *Philodicus jagannathi* Ramchandra Rao, *Current Science* : 196.

Material 5 (M), 2 (F), Vizianagaram Dist. Polavaram Beach, 23.ii.1986, Coll. A.N.T Joseph.

Remarks The species was described from Orissa based on single female. It is the second report of the species, and the male is reported here for the first time. It is the first record from Andhra Pradesh.

29. *Philodicus pruthii* Bromley

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

Material 7 (M), 2 (F), West Godavari Dist. Eluru Nayan Pally, 14.ii.1986; 1(M), Eluru Palasgudam, 15.ii.1986; 1(M), Kanna Puram Munchurulu, 18.ii.1986, all Coll. A.N.T Joseph.

Remarks So far it is only recorded from Southern India Andhra Pradesh, Karnataka and Tamil Nadu; and from neighbouring country Sri Lanka (Joseph and Parui, 1994b).

Promachus Loew

1848. *Promachus* Loew, *Linn. Ent.*, 3 : 190.

30. *Promachus duvaucelii* (Macquart)

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

1983c. *Promachus duvaucelii* : Joseph and Parui, *Orient. Insects*, 17 : 366.

Material : 21(M), 16 (F), Hyderabad Himayat Sagar Chilkur Deer Park, 16.x.1985, Coll. A.N.T Joseph and Ramakrishna; 1(M), 2(F), Chilkur Deer Park, 3.xii.1985; 1(M), 1(F), Hyderabad Narapalli, 15.xii.1985, all Coll. A.N.T Joseph; 2(M), 1(F), Hyderabad Bodouppal, 4.ix.1986, Coll. Satyarani; 2(M), 2 (F), Shameerpet Deer Park, 12.ix.1986, Coll. Satyarani.

Remarks It is one of the widely distributed species of India and is recorded from most of the states of India.

31. *Promachus maculatus* (Fabricius)

1775. *Asilus maculatus* Fabricius, *Syst. Ent.* : 794.
 1838. *Trupanea flavibarbis* Macquart, *Dipt. Exot.*, 1 (2) : 96.
 1849. *Asilus copilus* Walker, *List Dipt. Colln. Br. Mus.*, 2 : 389.
 1975. *Promachus maculatus* : Oldroyd, *A Catalog of Diptera of the Oriental Region*, 2 : 153.
 1983c. *Promachus maculatus* : Joseph and Parui, *Orient. Insects*, 17 : 367.

Material 1(M), West Godavari Dist. Eluru Gopalapuram, 20.ii.1986; 3(M), 5(F), Visakhapatnam Dist. Sanivaram Forest 24.ii.1986, all Coll. A.N.T Joseph.

Remarks In India it has been recorded from Bihar, Orissa, Karnataka, Tamil Nadu and Uttar Pradesh. Here it is recorded for the first time from Andhra Pradesh. From outside India, it is reported from Sri Lanka, Indonesia and Europe.

32. *Promachus yerburiensis* Ricardo

1920. *Promachus yerburiensis* Ricardo, *Ann. Mag. nat. Hist.*, (9) 5 : 220.
 1960. *Bactria yerburiensis* : Rattan Lal, *Catalogue of Indian Insects*, Part 19-Asilidae : Diptera : 22.
 1975. *Promachus yerburiensis* : Oldroyd, *A Catalog of Diptera of the Oriental Region*, 2 : 155.
 1983c. *Promachus yerburiensis* : Joseph and Parui, *Orient. Insects*, 17 : 370.

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Remarks The species has so far been reported from Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Orissa and Assam.

SUMMARY

This paper reports 32 species of Asilidae from Andhra Pradesh. Of these 11 species are new, viz. *Lobus pandai*, *Nusa andhraensis*, *Nusa balraji*, *Oldroydia costata*, *Scylaticus*

godavariensis, *Damalis dattai*, *Stichopogon mahatoi*, *Stichopogon mukherjeei*, *Ommatius pseudojabalpurensis*. *Ommatius ramakrishnai* and *Clephydroneura singhi*, and male of *Philodicus jagannathi* Rao is recorded here for the first time.

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ABBREVIATIONS

Ae, aedeagus; Cl, clasper; Ep, epandrium; Go, gonocoxite; Hy, hypandrium; L, lamella; Lo, lobos; Pr, proctiger; 8t, eighth tergite.

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BLOOD PARASITISM IN WILD INDIAN BIRDS

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INTRODUCTION

During the course of different surveys conducted over the period of 1973-1988, data pertaining to parasitism of avian haematozoa from various parts of India were gathered (Nandi, 1976; 1986a, 1989; Nandi and Bennett, 1994; Nandi and Mandal, 1977, 1978, 1980, 1984, 1985; Nandi, Mandal and Choudhury, 1984; Nandi, Ray and Banerjee, 1984). The present paper analyses these mass of information about the levels of blood parasitism in wild avian populations in India as a whole and also at the State level.

Though there are a number of papers on blood parasites of Indian avifauna (Nandi, 1984; Nandi and Bennett, 1997), these are either limited to a localised region or deal with taxonomic aspects of one or a few parasites. The single largest survey carried out so far is the Haematozoa in the birds of eastern and southern Asia including India, conducted under the Migratory Animal Pathological Survey (MAPS) by Mc Clure *et al.* (1978). The result of the above paper is discussed in relevance to the present report.

MATERIALS AND METHODS

A total of 1242 wild birds comprising 342 species representing 66 families and subfamilies and 15 orders were examined for the blood parasites. These birds were collected from 11 States of India. The distribution and the relative frequencies of the different parasitic genera have been analysed from State to State, as well as from avian family to family, especially in case where more than 10 birds were sampled. Thin smears were prepared from the peripheral blood, air dried, fixed in 100% menthanol, stained with Giemsa's or Wright's stain and examined under microscope (100 X, 400 X and 1000 X) for about 15 minutes before declaring them negative or otherwise for the parasites.

RESULT AND DISCUSSION

The data about the prevalence and distribution of avian blood parasites, those observed in 1242 wild birds belonging to 342 species of 66 avian families/subfamilies collected during the year 1973-1988 from 11 States *viz.*, West Bengal, Orissa, Goa, Maharashtra, Andhra Pradesh, Jammu and Kashmir, Tripura, Assam, Arunachal Pradesh, Himachal Pradesh and Andaman & Nicobar Islands, indicate the presence of parasites in 304 birds of 122 species

TABLE-1
Blood parasitism in wild birds from different parts of India.

States	Total birds		Number of birds infected with					
	Examined	Infected	Tryp.	Leuc.	Haem.	Plasm.	Lank.	Micro.
West Bengal	426	130	6	2	116	15	4	24
Per cent		30.5	1.4	0.46	27.2	3.5	0.93	5.6
Orissa	171	18	—	—	15	3	—	—
Per cent		10.5	—	—	8.7	1.7	—	—
Assam	41	13	—	1	11	1	—	3
Per cent		31.7	—	2.4	26.8	2.4	—	7.3
Himachal Pradesh	6	1	—	—	1	—	—	—
Per cent		16.1	—	—	16.1	—	—	—
Arunachal Pradesh	61	19	—	—	5	—	—	14
Per cent		31.1	—	—	8.1	—	—	22.9
Tripura	18	0	—	—	—	—	—	—
Per cent		—	—	—	—	—	—	—
Andaman & Nicobar Is.	8	2	—	—	1	—	—	1
Per cent		25.0	—	—	25.5	—	—	12.5
Goa	156	50	6	11	30	—	—	24
Per cent		32.0	3.8	7.0	19.2	—	—	15.3
Andhra Pradesh	146	30	1	3	14	—	—	14
Per cent		20.5	0.68	2.0	9.5	—	—	9.5
Maharashtra	142	23	—	—	23	2	—	—
Per cent		16.1	—	—	16.1	1.4	—	—
Jammu & Kashmir	67	18	1	6	10	1	—	7
Per cent		26.8	1.4	8.9	14.9	1.4	—	10.4
Total	1242	304	14	23	226	22	4	87
Per cent		24.9	1.1	1.8	18.1	1.7	0.32	7.0

Abbreviation : Tryp. = *Trypanosoma*; Leuc. = *Leucocytozoon*;
 Haem. = *Haemoproteus*; Plasm. = *Plasmodium*;
 Lank. = *Lankestrella*; Micro = *Microfilaria*

TABLE-2
Blood parasitism in different species of wild Indian birds

Family and species	Total birds		Number of birds infected with					
	Exam.	Inf.	Leuc.	Haem.	Plasm.	Tryp.	Micro	Lank
1	2	3	4	5	6	7	8	9
ACCIPITRIDAE (11 species)	27	5	3	2	—	—	2	—
<i>Accipiter badius</i>	7	1	1	—	—	—	1	—
<i>Accipiter trivirgatus</i>	1	1	—	—	—	—	1	—
<i>Buteo vulpinus</i>	1	1	—	1	—	—	—	—
<i>Elanus caeruleus</i>	3	1	1	—	—	—	—	—
<i>Spizaetus cirrhatus</i>	4	1	1	1	—	—	—	—
ALAUDIDAE (5 species)	13	1	—	—	—	—	1	—
<i>Gallerida malabarica</i>	5	1	—	—	—	—	1	—
ALCEDINIDAE (4 species)	25	1	—	1	—	—	—	—
<i>Halcyon smyrnensis</i>	16	1	—	1	—	—	—	—
ANATIDAE (7 species)	24	1	—	1	—	—	—	—
<i>Nettapus coromandelianus</i>	2	1	—	1	—	—	—	—
ANHINGIDAE (1 species)	1	0	—	—	—	—	—	—
APODIDAE (1 species)	9	0	—	—	—	—	—	—
ARDEIDAE (5 species)	28	0	—	—	—	—	—	—
ARTAMIDAE (1 species)	1	0	—	—	—	—	—	—
BUCEROTIDAE (5 species)	16	4	3	—	—	1	4	—
<i>Ptilolaemus tickelli</i>	2	1	—	—	—	—	1	—
<i>Tockus griseus</i>	6	3	3	—	—	1	3	—
BURHINIDAE (1 species)	1	0	—	—	—	—	—	—
CAMPEPHAGIDAE (4 species)	16	1	—	1	—	—	—	—
<i>Coracina novaehollandiae</i>	6	1	—	1	—	—	—	—
CAPITONIDAE (7 species)	27	10	—	10	1	—	1	—
<i>Megalaima asiatica</i>	4	4	—	4	—	—	—	—
<i>Megalaima haemacephala</i>	8	1	—	1	1	—	1	—
<i>Megalaima viridis</i>	1	1	—	1	—	—	—	—
<i>Megalaima zeylanica</i>	9	4	—	4	—	—	—	—
CAPRIMULGIDAE (3 species)	8	0	—	—	—	—	—	—
CHARADRIIDAE (5 species)	26	0	—	—	—	—	—	—
CINCONIDAE (1 species)	2	0	—	—	—	—	—	—
CINCLIDAE (1 species)	1	0	—	—	—	—	—	—

Table-2 contd.

1	2	3	4	5	6	7	8	9
COLUMBIDAE (13 species)	112	32	—	27	1	1	5	—
<i>Columba livia</i>	25	21	—	21	1	—	—	—
<i>Streptopelia chinensis</i>	29	6	—	5	—	1	1	—
<i>Chalcophaps indica</i>	5	2	—	—	—	—	2	—
<i>Treron phoenicoptera</i>	37	1	—	—	—	—	1	—
<i>Treron pompadora</i>	1	1	—	—	—	—	1	—
<i>Treron bicincta</i>	1	1	—	1	—	—	—	—
CORACIIDAE (1 species)	15	6	—	6	—	—	—	—
<i>Coracias bengalensis</i>	15	6	—	6	—	—	—	—
CORVIDAE (8 species)	61	15	3	8	4	2	10	—
<i>Cissa chinensis</i>	4	3	—	—	—	—	3	—
<i>Corvus splendens</i>	14	1	—	1	1	—	—	—
<i>Dendrocitta frontalis</i>	3	2	—	—	—	—	2	—
<i>Dendrocitta vagabunda</i>	24	7	3	6	3	2	4	—
<i>Corvus macrorhynchos</i>	13	1	—	—	—	—	1	—
<i>Garrulus lanceolatus</i>	1	1	—	1	—	—	—	—
CUCULIDAE (8 species)	21	3	—	2	—	—	1	—
<i>Centropus sinensis</i>	7	1	—	1	—	—	—	—
<i>Cuculus varius</i>	1	1	—	—	—	—	1	—
<i>Centropus toulou</i>	1	1	—	1	—	—	—	—
DICAEIDAE (1 species)	1	0	—	—	—	—	—	—
DICRURIDAE (6 species)	41	10	—	6	—	2	5	—
<i>Dicrurus adsimilis</i>	24	7	—	6	—	2	2	—
<i>Dicrurus paradiseus</i>	7	3	—	—	—	—	3	—
ESTRILDIDAE (3 species)	31	9	—	9	—	3	—	—
POEPHILINAE (3 species)	31	9	—	9	—	3	—	—
<i>Lonchura malabarica</i>	25	6	—	6	—	3	—	—
<i>Lonchura punctulata</i>	4	3	—	3	—	—	—	—
EMBERIZIDAE (1 species)	1	0	—	—	—	—	—	—
EURLAIMIDAE (1 species)	3	1	—	1	—	—	—	—
<i>Serilophus lunatus</i>	3	1	—	1	—	—	—	—
FALCONIDAE (1 species)	1	1	—	1	—	—	—	—
<i>Falco tinnunculus</i>	1	1	—	1	—	—	—	—
FRINGILLIDAE (4 species)	5	3	3	—	—	—	3	—
CARDUELINAE (4 species)	5	3	3	—	—	—	3	—
<i>Carpodacus erythrinus</i>	2	2	2	—	—	—	2	—
<i>Mycerobas affinis</i>	1	1	1	—	—	—	1	—

Table-2 contd.

1	2	3	4	5	6	7	8	9
GLAREOLIDAE (2 species)	2	0	—	—	—	—	—	—
HIRUNDINIDAE (2 species)	16	0	—	—	—	—	—	—
IRENIDAE (4 species)	13	5	—	3	—	—	2	—
<i>Aegithina tiphia</i>	5	4	—	2	—	—	2	—
<i>Chloropsis aurifrons</i>	5	1	—	1	—	—	—	—
LANIIDAE (4 species)	17	2	—	1	—	—	1	—
<i>Lanius schiach</i>	10	2	—	1	—	—	1	—
LARIDAE (5 species)	6	0	—	—	—	—	—	—
MEGAPODIDAE (1 species)	1	1	—	1	—	—	—	—
<i>Megapodius freycinet</i>	1	1	—	1	—	—	—	—
MEROPIDAE (4 species)	39	7	1	6	—	—	1	—
<i>Merops orientalis</i>	31	6	—	6	—	—	1	—
<i>Nyctyornis athertoni</i>	3	1	1	—	—	—	—	—
MOTACILLIDAE (6 species)	14	3	—	2	—	—	1	—
<i>Anthus hodgsoni</i>	2	1	—	—	—	—	1	—
<i>Dendronanthus indicus</i>	1	1	—	1	—	—	—	—
<i>Motacilla alba</i>	1	1	—	1	—	—	—	—
MUSCICAPIDAE	174	33	1	21	2	3	13	—
MONARCHINAE (2 species)	10	2	—	1	1	—	1	—
<i>Terpsiphone paradisi</i>	5	2	—	1	1	—	1	—
MUSCICAPINAE (5 species)	24	4	—	3	1	—	—	—
<i>Myiophonus caeruleus</i>	2	2	—	2	—	—	—	—
<i>Muscicapa parva</i>	16	1	—	1	—	—	—	—
<i>Muscicapa thalassina</i>	2	1	—	—	1	—	—	—
RHIPIDURINAE (1 species)	1	1	—	—	—	—	1	—
<i>Rhipidura aureola</i>	1	1	—	—	—	—	1	—
SYLVIINAE (10 species)	42	5	—	3	—	2	2	—
<i>Acrocephalus dumetorum</i>	9	3	—	3	—	2	—	—
<i>Seicercus affinis</i>	2	1	—	—	—	—	1	—
TIMALIINAE (14 species)	32	7	1	4	—	—	5	—
<i>Garrulax lineatus</i>	2	1	—	—	—	—	1	—
<i>Garrulax squamatus</i>	3	1	—	—	—	—	1	—
<i>Turdoides striatus</i>	13	4	1	4	—	—	2	—
<i>Yuhina bakeri</i>	2	1	—	—	—	—	1	—

Table-2 contd.

1	2	3	4	5	6	7	8	9
TURDINAE (15 species)	65	14	—	10	—	1	4	—
<i>Copsychus saularis</i>	22	11	—	9	—	1	2	—
<i>Enicurus immaculatus</i>	1	1	—	1	—	—	—	—
<i>Erithacus svecicus</i>	16	1	—	—	—	—	1	—
<i>Saxicoloides fulicata</i>	1	1	—	—	—	—	1	—
NECTARINIDAE (3 species)	5	0	—	—	—	—	—	—
ORIOLOIDAE (2 species)	14	4	—	—	—	—	4	—
<i>Oriolus xanthornus</i>	10	4	—	—	—	—	4	—
PARADOXORNITHIDAE (12 species)	2	0	—	—	—	—	—	—
PARIDAE (1 species)	3	0	—	—	—	—	—	—
PASSERIDAE (1 species)	36	7	—	3	—	—	5	2
<i>Passer domesticus</i>	36	7	—	3	—	—	5	2
PHASIANIDAE (8 species)	18	3	2	1	—	—	—	—
PHASIANINAE (7 species)	17	3	2	1	—	—	—	—
<i>Arborophila rufogularis</i>	1	1	—	1	—	—	—	—
<i>Gallus gallus</i>	9	2	2	—	—	—	—	—
TETRAONINAE (1 species)	1	0	—	—	—	—	—	—
<i>Bonasa umbellus</i>	1	0	—	—	—	—	—	—
PICIDAE (16 species)	33	9	1	6	2	—	4	—
<i>Jynx torquilla</i>	1	1	—	1	—	—	1	—
<i>Dendrocopos mahrattenhsis</i>	7	2	—	2	1	—	—	—
<i>Dinopium benghalense</i>	5	1	—	—	—	—	1	—
<i>Picus canus</i>	1	1	—	1	—	—	—	—
<i>Picus chlorophus</i>	1	1	—	1	1	—	1	—
<i>Picus flavinucha</i>	3	2	—	2	—	—	1	—
<i>Picus squamatus</i>	4	1	1	—	—	—	—	—
PITIIDAE (1 species)	2	1	—	—	—	—	1	—
<i>Pitta nipanensis</i>	2	1	—	—	—	—	1	—
PLOCEIDAE (3 species)	87	70	—	67	7	—	9	—
<i>Ploceus philippinus</i>	82	70	—	67	7	—	9	—
PSITTACIDAE (7 species)	44	0	—	—	—	—	—	—
PTEROCLIDAE (1 species)	1	0	—	—	—	—	—	—
PYCNONOTIDAE (8 species)	30	9	4	5	—	1	1	—
<i>Criniger flaveolus</i>	1	1	—	1	—	—	—	—
<i>Pycnonotus cafer</i>	13	3	2	1	—	—	1	—

Table-2 contd.

1	2	3	4	5	6	7	8	9
<i>Pycnonotus leucogenys</i>	2	1	1	—	—	—	—	—
<i>Pycnonotus jocosus</i>	3	1	1	—	—	1	—	—
<i>Hypsipetes indicus</i>	5	3	—	3	—	—	—	—
RALLIDAE (3 species)	11	0	—	—	—	—	—	—
RECURVIROSTRIDAE (7 species)	1	0	—	—	—	—	—	—
ROSTRATULIDAE (1 species)	1	0	—	—	—	—	—	—
SCOLOPACIDAE (10 species)	27	2	—	1	—	—	1	—
<i>Philomachus pugnax</i>	3	1	—	1	—	—	—	—
<i>Scolopax rusticola</i>	1	1	—	—	—	—	1	—
SITTIDAE (1 species)	3	0	—	—	—	—	—	—
STRIGIDAE (species)	27	13	2	11	1	1	2	—
<i>Athene brama</i>	10	3	1	1	—	—	1	—
<i>Bubo zeylonensis</i>	1	1	—	1	—	—	—	—
<i>Glaucidium cuculoides</i>	3	2	1	2	—	1	1	—
<i>Glaucidium radiatum</i>	2	1	—	1	—	—	—	—
<i>Otus scops</i>	1	1	—	1	1	—	—	—
<i>Strix aluco</i>	3	1	—	1	—	—	—	—
<i>Otus bakkamoena</i>	5	4	—	4	—	—	—	—
STURNIDAE (8 species)	80	29	—	20	4	—	9	1
<i>Acridotheres fuscus</i>	8	3	—	1	—	—	2	—
<i>Acridotheres tristis</i>	21	4	—	3	1	—	1	—
<i>Gracula religiosa</i>	3	1	—	—	—	—	1	—
<i>Sturnus contra</i>	22	12	—	8	2	—	4	—
<i>Sturnus pagodarum</i>	13	3	—	3	—	—	—	—
<i>Sturnus malabaricus</i>	11	6	—	5	1	—	1	1
THRESKIORNITHIDAE (1 species)	1	1	—	1	—	—	—	—
<i>Pseudibis papillosa</i>	1	1	—	1	—	—	—	—
TROGONIDAE (1 species)	1	1	—	1	—	—	—	—
<i>Harpactes fasciatus</i>	1	1	—	1	—	—	—	—
TURNICIDAE (1 species)	8	0	—	—	—	—	—	—
UPUPIDAE (1 species)	4	1	—	—	—	—	1	—
<i>Upupa epops</i>	4	1	—	—	—	—	1	—
ZOSTEROPIDAE (1 species)	3	0	—	—	—	—	—	—
Total -	1242	304	23	226	22	14	87	4

Abbreviations : As in Table 1

Negative birds (numbers examined in parantheses) :

ACCIPITRIDAE- *Accipiter nisus* (1), *Butastur teesa* (2), *Haliastur indus* (2), *Milvas migrans* (2), *Neophron perenopterus* (3), *Spilornis cheela* (1).

ALAUDIDAE-*Ammomanes phoenicurus* (3), *Mirafrass assamica* (1), *M. erythroptera* (2), *Alauda gulgula* (2).

ALCEDINIDAE- *Alcedo atthis* (7), *Pelargopsis capensis* (1), *A. hercules* (1).

ANADIDAE - *Anas poecilorhyncha* (12), *Dendrocygna javanica* (3), *Tadorna ferruginea* (2), *Anas acuta* (2), *Aythya fuligula* (2), *Mergus merganser* (1).

ANHINGIDAE- *Anhinga rufa* (1)

APODIDAE-*Apus affinis* (9)

ARDEIDAE-*Ardeola grayi* (21), *Ardeola bacchus* (1), *Bubulcus ibis* (2), *Butorides striatus* (1), *Egretta intermedia* (3)

ARTAMIDAE- *Artamus fuscus* (1)

BUCEROTIDAE- *Anthraceros malabaricus* (1), *Buceros bicornis* (1) *Tockus birostris* (6)

BURHINIDAE-*Burhinus oedicnemus* (1)

CAMPEPHAGIDAE-*Coracina melanoptera* (1), *Pericrocotus cinnamomeus* (5), *P. flameus* (4)

CAPITONIDAE-*Blythipicus pyrrhotis* (1), *Megalaima lineatus* (3), *M. virens* (1).

CAPRIMULGIDAE-*Caprimulgus asiaticus* (3), *C. indicus* (3), *C. macrurus* (2)

CHARADRIIDAE-*Charadrius alexandrinus* (1), *C. mongolus* (1), *Pluvialis dominica* (3), *Vanellus indicus* (18), *V. malabaricus* (3)

CICONIDAE-*Anastomus oscitans* (2)

CINCLIDAE-*Cinclus palasii* (1)

COLUMBIDAE-*Columba hodgsonii* (1), *Ducula aenea* (7), *Macropygia rufipennis* (1), *M. unchall* (1), *Streptopelia decaocto* (2), *S. senegalensis* (1), *Treron curvirostris* (1)

CORVIDAE- *Cissa flavirostris* (1), *Dendrocitta formosae* (1)

CUCULIDAE-*Cacomantis marulinus* (1), *Cuculus poliocephalus* (1), *Eudynamis scolopacea* (7), *Rhopodytes tristis* (2), *Chalcites maculatus* (1)

DICAEIDAE-*Dicaeum cruentalum* (1)

DICRURIDAE- *Dicrurus aeneus* (4), *D. caerulescens* (4), *D. hottentottus* (1), *D. remifer* (1)

EMBERIZIDAE-*Emberiza cia* (1)

ESTGRILDIDAE :POEPHILINAE-*Lonchura striata* (2)

FRINGILLIDAE-CARDUELINAE-*Carpodacus pulcherrimus* (1), *Leucosticte nemoricola* (1)

GLAREOLIDAE-*Cursorius coromandelicus* (1), *Glareola lactea* (1)

HIRUNDINIDAE-*Hirundo daurica* (15), *H. smithi* (1)

IRENIDAE-*Chloropsis cochinchinensis* (2), *C. hardwickii* (1)

LANIIDAE-*Lanius cristatus* (2), *L. tephronotus* (2), *L. vittatus* (3)

LARIDAE-*Geochelidon nilotica* (1), *Sterna albifrons* (1), *S. aurantia* (1), *S. bengalensis* (1), *S. hirundo* (2)

MEROPIDAE-*Merops leschenaulti* (4), *M. philippinus* (1)

MOTACILLIDAE-*Anthus novaeseelandiae* (7), *A. trivialis* (1), *Motacila indica* (2)

MUSCICAPIDAE: MONARCHINAE-*Monarcha azurea* (5); MUSCICAPINAE-*Muscicapa latirostris* (1), *Niltava tickelliae* (3), SYLVIINAE-*Acrocephalus agericola* (5), *A. stentoreus* (8), *Megalurus palustris* (1), *Orthotomus sutorius* (1), *Phylloscopus collybita* (6), *P. subaffinis* (1), *Prinia flaviventris* (1), TIMALINAE-*Actinodura egertoni* (2), *Chrysomma sinense* (2), *Garrulax striatus* (1), *G. pectoralis* (1), *Pomatorhinus erythrogenys* (1), *P. ochraceiceps* (1), *Sphenocichla humei* (1), *Stachyris nigriceps* (1), *S. ruficeps* (1), *Turdoides caudatus* (1); TURDINAE-*Erithacus calliope* (8), *Monticola cinclorhynchus* (1), *M. solitorius* (1), *Phoenicurus ochruros* (1), *Saxicola caprata* (1), *S. ferrea* (1), *S. torquata* (4), *Turdus dissimilis* (1), *T. unicolor* (3), *Zoothera citrina* (3), *Z. dauma* (1).

NECTARINIDAE-*Arachnothera longirostris* (1), *Nectarina asiatica* (3), *N. zeylanica* (1)

ORIOLOIDAE-*Oriolus oriolus* (4)

PARADOXORNITHIDAE-*Paradoxornis atrosuperciliaris* (2)

PARIDAE-*Parus major* (3)

PHASIANIDAE :PHASIANINAE-*Arborophila atrogularis* (1), *A. torqueola* (1), *Gallus sonneratii* (2), *Perdica asiatica* (2), *Polypectron bicalcaratum* (1); TETRAONINAE-*Bonasa umbellus* (1).

PICIDAE-*Chrysocolaptes festivus* (1), *C. lucidas* (2), *Dendrocopos nanus* (1), *Hemicircus canente* (1), *Micropternus brachyurus* (1), *Picoides himalayensis* (2), *P. macei* (1), *Picumnus innominatus* (1), *Sasia ochracea* (1).

PLOCEIDAE-*Ploceus benghalensis* (2), *P. megarhynchus* (3)

PSITTACIDAE-*Psittacula alexandri* (2), *Psittacula columboides* (2), *P. cyanocephala* (12), *P. eupatria* (8), *P. krameri* (18), *P. longicauda* (1), *Loriculus vernalis* (1)

PTEROCLIDAE-*Pterocles indicus* (1)

PYCNONOTIDAE-*P. melanichterus* (2), *P. striatus* (1), *Hypsipetes flavalus* (3)

RALLIDAE-*Amauornis phoenicurus* (6), *Fulica atra* (3), *Gallinula chloropus* (2)

RECURVIROSTRIDAE-*Himantopus himantopus* (1)

ROSTRATULIDAE-*Rostratula benghalensis* (1)

SCOLOPACIDAE-*Arenaria interpres* (3), *Calidris testacea* (1), *Tringa glareola* (3), *T. hypoleucos* (2), *T. nebularia* (4), *T. stagnatilis* (1), *Capella gallinago* (6), *C. stenura* (3).

SITTIDAE-*Salpornis spilonotus* (3)

STRIGIDAE-*Asio flameus* (1), *Glaucidium brodiei* (1)

STURNIDAE-*Aplonis panayensis* (1), *Mino coronatus* (1)

TURNICIDAE-*Turnix suscitator* (8)

ZOSTEROPIDAE-*Zosterops palpebrosa* (3)

TABLE-3

Blood parasitism in wild birds from different avian families/subfamilies in India

Family and species	Total birds		Number of birds infected with					
	Exam.	Inf.	Leuc.	Haem.	Plasm.	Tryp.	Micro	Lank
ACCIPITRIDAE (11 Species)	27	5 (18.5%)	3	2	—	—	2	—
ALAUDIDAE (5 Species)	13	1 (17.6%)	—	—	—	—	1	—
ALCEDINIDAE (4 Species)	25	1 (4.0%)	—	1	—	—	—	—
ANATIDAE (7 Species)	24	1 (4.1%)	—	1	—	—	—	—
ANHINGIDAE (1 Species)	1	0	—	—	—	—	—	—
APODIDAE (1 Species)	9	0	—	—	—	—	—	—
ARDEIDAE (5 Species)	28	0	—	—	—	—	—	—
ARTAMIDAE (1 Species)	1	0	—	—	—	—	—	—
BUCEROTIDAE (5 Species)	16	4 (25.0%)	3	—	—	1	4	—
BURHINIDAE (1 Species)	1	0	—	—	—	—	—	—
CAMPEPHAGIDAE (4 Species)	16	1 (6.2%)	—	1	—	—	—	—
CAPITONIDAE (7 Species)	17	10 (37.0%)	—	10	1	—	1	—
CAPRIMULGIDAE (3 Species)	8	0	—	—	—	—	—	—
CHARADRIIDAE (5 Species)	26	0	—	—	—	—	—	—
CICONIDAE (1 Species)	2	0	—	—	—	—	—	—
CINCLIDAE (1 Species)	1	0	—	—	—	—	—	—
COLUMBIDAE (13 Species)	112	32 (28.5%)	—	27	1	1	5	—
CORACIIDAE (1 Species)	15	6 (40.0%)	—	6	—	—	—	—
CORVIDAE (8 Species)	61	15 (24.5%)	3	8	4	2	10	—
CUCULIDAE (8 Species)	21	3 (14.2%)	—	2	—	—	1	—
DICAEIDAE (1 Species)	1	0	—	—	—	—	—	—
DICRURIDAE (6 Species)	41	10 (24.3%)	—	6	—	2	5	—
ESTRILDIDAE (3 Species)	31	9 (29.0%)	—	9	—	3	—	—
POEPHILINAE (3 Species)	31	9 (29.0%)	—	9	—	3	—	—
EMBERIZIDAE (1 Species)	1	0	—	—	—	—	—	—
EURLAIMIDAE (1 Species)	3	1	—	1	—	—	—	—
FALCONIDAE (1 Species)	1	1	—	1	—	—	—	—
FRINGILLIDAE (4 Species)	5	3	3	—	—	—	3	—
CARDUELINAE (4 Species)	5	3	3	—	—	—	3	—
GLAREOLIDAE (2 Species)	2	0	—	—	—	—	—	—
HIRUNDINIDAE (2 Species)	16	0	—	—	—	—	—	—
IRENIDAE (4 Species)	13	5 (38.4%)	—	3	—	—	—	—
LANIIDAE (4 Species)	17	2 (11.7%)	—	1	—	—	—	—
LARIDAE (5 Species)	6	0	—	—	—	—	—	—
MEGAPODIDAE (1 Species)	1	1	—	1	—	—	—	—
MEROPIDAE (4 Species)	39	7 (17.9%)	1	6	—	—	—	—
MOTACILLIDAE (6 Species)	14	3 (21.4%)	—	2	—	—	—	—

Table-3 contd.

Family and species	Total birds		Number of birds infected with					
	Exam.	Inf.	Leuc.	Haem.	Plasm.	Tryp.	Micro	Lank
MUSCICAPIDAE	174	33 (18.9%)	1	21	2	3	13	—
MONARCHINAE (2 Species)	10	2 (20.0%)	—	1	1	—	1	—
MUSCICAPINAE (5 Species)	24	4 (16.6%)	—	3	1	—	—	—
RHIPIDURINAE (1 Species)	1	1	—	—	—	—	1	—
SYLVIINAE (10 Species)	42	5 (11.9%)	—	3	—	2	2	—
TIMALIINAE (14 Species)	32	7 (21.8%)	1	4	—	—	5	—
TURDINAE (15 Species)	65	14 (21.5%)	—	10	—	1	4	—
NECTARINIDAE (3 Species)	5	0	—	—	—	—	—	—
ORIOLIDAE (2 Species)	14	4 (28.5%)	—	—	—	—	4	—
PARADOXORNITHIDAE (1 Species)	2	0	—	—	—	—	—	—
PARIDAE (1 Species)	3	0	—	—	—	—	—	—
PASSERIDAE (1 Species)	36	7 (19.4%)	—	3	—	—	5	2
PHASIANIDAE (7 Species)	18	3 (16.6%)	2	1	—	—	—	—
PHASIANINAE (7 Species)	17	3 (17.6%)	2	1	—	—	—	—
TETRAONINAE (1 Species)	1	0	—	—	—	—	—	—
PICIDAE (16 Species)	33	9 (27.2%)	1	6	2	—	4	—
PITIIDAE (1 Species)	2	1	—	—	—	—	1	—
PLOCEIDAE (3 Species)	87	70 (80.4%)	—	67	7	—	9	—
PSITTACIDAE (7 Species)	44	0	—	—	—	—	—	—
PTEROCLIDAE (1 Species)	1	0	—	—	—	—	—	—
PYCNONOTIDAE (8 Species)	30	9 (30.0%)	4	5	—	1	1	—
RALLIDAE (3 Species)	11	0	—	—	—	—	—	—
RECURVIROSTRIDAE (7 Species)	1	0	—	—	—	—	—	—
ROSTRATULIDAE (1 Species)	1	0	—	—	—	—	—	—
SCOLOPACIDAE (10 Species)	27	2 (7.4%)	—	1	—	—	1	—
SITTIDAE (1 Species)	3	0	—	—	—	—	—	—
STRIGIDAE (9 Species)	27	13 (48.1%)	2	11	1	1	2	—
STURNIDAE (8 Species)	80	29 (36.2%)	—	20	4	—	9	1
THRESKIORNITHIDAE (1 Species)	1	1	—	1	—	—	—	—
TROGONIDAE (1 Species)	1	1	—	1	—	—	—	—
TURNICIDAE (1 Species)	8	0	—	—	—	—	—	—
UPUPIDAE (1 Species)	4	1	—	—	—	—	1	—
ZOSTEROPIDAE (1 Species)	3	0	—	—	—	—	—	—

Abbreviation : Tryp. = *Trypanosoma*; Leuc. = *Leucocytozoon*;
Haem. = *Haemoproteus*; Plasm. = *Plasmodium*;
Lank. = *Lankestrella*; Micro = *Microfilaria*

under 40 families/subfamilies (Tables 1-3). Infections with species of *Trypanosoma* (1.1% in 14 birds of 9 species), *Leucocytozoon* (1.8%, in 23 birds of 16 species), *Haemoproteus* (18.1%, in 226 birds of 63 species), *Plasmodium* (1.7%, in 22 birds of 13 species), *Lankesterella* (0.32%, in 4 birds of 3 species), and *Microfilaria* (7.0%, in 87 birds of 52 species) were encountered. Double and multiple infections were recorded in 64 birds of 31 species i.e., in 21.0% of the infected birds (Table-2). Two species of *Trypanosoma* viz., *T. avium* and *T. corvi* (see Nandi and Bennett, 1994); ten species of *Leucocytozoon* viz., *L. brimonti*, *L. dubreuli*, *L. cambournaci*, *L. majoris*, *L. nyctornis*, *L. macleani*, *L. sakharoffi*, *L. squamatus*, *L. toddi* and *L. ziemanni*; 28 species of *Haemoproteus* viz., *H. aegithinae*, *H. bennetti*, *H. borgesii*, *H. certropi*, *H. columbae*, *H. coraciae*, *H. cornuata*, *H. danilewskyi*, *H. dicruri*, *H. fallisi*, *H. fringillae*, *H. halcyonis*, *H. lanii*, *H. megapodius*, *H. meropis*, *H. noctuae*, *H. orizivora*, *H. passeris*, *H. pastoris*, *H. plataleae*, *H. sacharovi*, *H. sanguinis*, *H. syrniai*, *H. tephrodornis*, *H. thereicerycis*, *H. tinnunculi*, *H. velans*, and *H. xantholaemae* and 4 species of *Plasmodium* viz., *P. circumflexum*, *P. nucleophilum*, *P. relictum* and *P. vaughani* were observed. Five species of *Haemoproteus* viz., *H. celli*, *H. garnhami*, *H. glaucidii*, *H. morneti* and *H. sturni* reported earlier (Nandi and Mandal, 1977, 1978, 1985; Nandi et al., 1984) are considered herein synonymous with *H. noctuae* in partim/*H. syrniai* in partim, *H. orizivora*, again *H. noctuae* in partim/*H. syrniai* in partim, *H. pastoris* and again *H. pastoris* respectively (see Bishop and Bennett, 1992). Similarly *Leucocytozoon danilewskyi* in *Glaucidium cuculoides* from Jammu and Kashmir (Nandi and Mandal, 1978), *L. fringillinarum* in *Carpodacus erythrinus* (see Nandi and Mandal, 1978) and *L. sabrazesi* from the Jungle fowl, *Gallus gallus* (see Nandi et al., 1984), are considered as synonyms of *L. ziemanni*, *L. cambournaci* and *L. macleani* respectively (Bishop and Bennett, loc. cit., Bennett et al., 1991). However, some haemoprotozoan parasites and larval nematodes could not be specifically identified.

An analysis of the results reveals that there exists a marked variation in the prevalence of blood parasites from state to state, as well as in relative frequencies of the different parasite-genera (Table-1). A comparison of this prevalence of blood parasites from various states of India is not conclusive since the avian population in each state studied differs in diversity of species and in the number of birds sampled. Thus, the differences are likely to be the result of host difference rather than of geography or habitat diversity.

The overall prevalence of the various parasitic genera also varied markedly from family to family (Table-2), as reported by Nandi and Bennett (1997) in the birds of India and adjacent countries. However, this variation is very much reduced in the families viz., Columbidae and Muscicapidae in which more than 100 birds are sampled. It is worth mentioning that Nandi and Bennett's study (loc. cit.) covers all survey reports including specific and fragmentary study programmes carried out by various investigators. While the present paper analyses the survey reports made by the present author and his co-workers only and that too considering all the blood parasites. Thus, it reasonably reflects the true prevalence of parasites especially for those families in which the sample size was 100 or more comparable to the study of McClure et al. (1978) from eastern and southern Asia.

Of the 11 States surveyed from India, the overall prevalence of haematozoa was found to be void in Tripura, lowest (10.5%) in Orissa and highest in Goa (32.0%). It has been observed that all the haemoprotozoan genera and the microfilariae have not been represented from all the States in India so far surveyed. Only the species of *Haemoproteus* are represented from all the States except Tripura from where a small sample of 18 birds was examined. Among the haematozoa the species of *Haemoproteus* and *Plasmodium* only were recorded from Orissa and Maharashtra. Infections with *Haemoproteus* were predominant over others in all these regions and the prevalences were more or less similar in all the States except in West Bengal. The highest prevalence of *Haemoproteus* in West Bengal was due to 100% infection in *Columba livia intermedia* and for 88% infection in *Ploceus philippinus* (cf Nandi *et al.*, 1984). The greater portion of the total infection was due to *Haemoproteus*. This suggests a greater ceratopogonid and hippoboscid vector potential for haemoproteids in this subcontinent.

The overall prevalences of *Plasmodium* (1.7%), *Leucocytozoon* (1.8%), *Trypanosoma* (1.1%) and *Microfilaria* (7.8%) were considerably low in comparison to *Haemoproteus* (18.1%). The infection with species of *Leucocytozoon* is appreciable from Goa (7.0%) and Jammu and Kashmir (8.9%) (Nandi and Mandal, 1978, 1985). The species of *Leucocytozoon* are transmitted by simuliid vectors having narrow breeding requirements i.e. fast flowing hill streams. While the parasites belonging to *Trypanosoma*, *Plasmodium* and microfilaria require improved method of diagnosis and are not readily detectable by thin film technique. These parasites are transmitted by a variety of dipteran vectors, including simuliids, ceratopogonids and culicids (Greiner *et al.*, 1975), and probably for this reason the prevalences of these parasites varied from State to State. The relatively high prevalence of infection with *Haemoproteus* and low prevalences with other parasites have also been reported from eastern and southern Asia (Mc Clure *et al.*, 1978.).

The distribution and frequency of occurrence of different blood parasites for avian families in which the sample size was 10 individuals or more (Table-2), indicate that the prevalence of haemoparasites differs markedly from family to family, as did the relative frequencies of the different parasite genera. Of the 36 families and subfamilies represented by more than 10 birds, 5 families viz., Ardeidae, Charadriidae, Hirundinidae, Psittacidae and Rallidae were found to be negative for the haematozoan infection. Among the rest 31 families and subfamilies, 2 families viz., Columbidae and Muscicapidae were represented by more than 100 birds, while 3 families viz., Corvidae, Ploceidae and Sturnidae were represented by more than 50 but less than 100 birds. The highest prevalence, however, was recorded in Ploceidae (80.4%) and lowest in family Alcedinidae (4%). The highest prevalence of parasitism in ploceids is due to occurrence of infection in 70 (85.3%) out of 82 *Ploceus philippinus* sampled (see Nandi, 1989; Nandi and Mandal, 1977, 1984; Nandi *et al.*, 1984). It is apparent that many families have limited number of parasite representative (Table-3) and certain families viz., Alcedinidae, Anatidae and Coraciidae showed only infection with *Haemoproteus*. The absence of haemoparasites from certain families may not suggest that there is physiological block to infection (Nandi, 1984; Bishop and Bennett, 1992). The

variation in the prevalence and distribution of haematozoa from family to family may be due to host-parasite-vector-environment interactions.

SUMMARY

1 Out of a total of 1242 wild birds representing 342 species of 66 families/subfamilies from 11 States of India examined; only 304 (24.7%) birds of 122 species belonging to 40 families and subfamilies harboured blood parasites.

2. Infections of *Haemoproteus* (18.1%) were the most commonly encountered parasites, followed by microfilariae (7.0%), *Leucocytozoon* (1.8%), *Plasmodium* (1.7%), *Trypanosoma* (1.1%) and *Lankesterella* (0.32%).

3. The relatively high prevalence of infections with *Haemoproteus* and the marked variation in the prevalence of blood parasitism in birds obtained from different States as well as in the relative frequencies of the different parasites have been discussed.

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OBSERVATIONS ON A COLLECTION OF POLYCHAETES FROM GODAVARI ESTUARY, ANDHRA PRADESH

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INTRODUCTION

Studies on the ecology and fauna of the estuaries has been the important area of research as estuaries are recognised as nursery grounds for a variety of invertebrate animals as well as fishes. The estuarine fauna assumes significance due to the dynamic nature of estuarine environment with a wide variety of habitats viz. mud-flats, swamps and mangrove infested river banks/creeks etc. at the river mouths. Estuarine sediments made of mixture of sand/silt and clay harbour wide variety of benthic organisms of which polychaeta constitutes the major group. Faunal studies on the estuarine environment of Indian coasts resulted in the report of several new and hitherto un-recorded species, (1-10). Godavari estuary was taken up for detailed studies for its fauna and ecology during 1993-95 and a large number of polychaetes were collected from estuarine areas of the three branches of Godavari river near Kakinada, Narsapur and Amalapuram. Though more than 30 species of polychaetes were collected during this study, present report deals with the occurrence of some uncommon and rarely reported species.

Family PILARGIDAE

Telehsapia annandalei Fauvel, 1932

Very long, narrow and rounded worms in brick-red colour; everted Proboscis with four cirri on either side. Prostomium without antennae, Palps, tentacles or eyes. Parapodia uniramous with a ventral setigerous lobe. Dorsal ramus reduced with only a small aciculum. Capillary setae only.

Habitat Six specimens from the sand-mud sediments near mouth and other estuarine areas of Godavari river at Narsapur.

Remarks : This is the first record of occurrence of this species from Godavari Estuary.

Family : PHYLLODOCIDAE

Phyllodoce (Anaitides) tenuissima Grube. 1878

Long and slightly broad worm of 8 cm. dark brown in colour on preservation; Two large eyes; occipital papillae small. Proboscis with 12 longitudinal rows of papillae at the base and a dorsal median row of three brown papillae. Dorsal cirri broad and lanceolate.

Habitat One specimen collected from muddy coast of Godavari river near Narsapur.

Remarks Earlier reported by Radhakrishna & Ganapari (1969) from Kakinada Bay.

Family: NEREIDAE

***Dendronereides zululandica* Dary 1951**

Specimens of 6-8 cm. in length; Proboscis with soft Papillae; Anterior segments with three notopodial lobes, a dorsal cirrus and a single neuropodial lobe. Between 8-20th segments, branchiae formed by the four pinnate divisions of the superior lobe of the notopodia. Setae spinigers and falcigers.

Habitat . 15 specimens from muddy intertidal areas of Godavari estuary near yanam, Kakinada.

Remarks Earlier reported by Srinivasa Rao & Rama Sarma, (1982), from Narsapur area of this estuary.

***Namalycastis fauveli* Rao, 1981**

Slender worms reaching 4-5 cm. Knob-like paired antennae and four pairs of small tentacular cirri. Feet uniramous; Dorsal cirri small and not much expanded posteriorly. Ventral rami with spinigers and falcigers. One limb of the lower piece of the falciger very long and nearly equal to the length of the upper piece.

Habitat Three specimens from sand/mud sediments from the intertidal coast of Godavari river about 7 Km. away from its mouth, Narsapur.

Remarks This is the first record of occurrence from this area.

***Tylonereis bogoyawlenskyi* Fauvel, 1911**

Slightly broad specimens of about 4 cm. in length. Proboscis with soft Paragnaths only. Feet biramous with only spinigers; Dorsal ligule of the notopodia leaf-like; ventral rami with three ligules in the anterior feet and two lobes in the posterior feet.

Habitat 10 specimens from the intertidal muddy areas at Godavari river mouth, Antervedi, Narsapur.

Remarks This is the first record of occurrence from this area.

***Nereis (Nereis) lamellosa* Ehlers 1968**

Tentacular cirri short; Proboscis with group-I = 1-3, II = many in two rows, III = several in two rows. IV = a group of 10, V-1, VI = 10-12, VII-VIII = several in three rows. Anterior feet with three notopodial ligules and a short dorsal cirrus. In the posterior feet the superior lobe of the notopodia expanded and lamellose with short dorsal cirri at its terminal notch;

Spinigers and few falcigers in some feet.

Habitat 30 specimens from intertidal muddy banks and mangrove areas at Godavari river mouth, Narsapur.

Remarks This is the first record of occurrence from Indian coast.

Family EUNICIDAE

Arabella irricobr (Montagu, 1804)

Round and long specimens of about 15 cms. and white in colour on preservation. Eyes not very clear. Prostomium blunt and oval. Dorsal cirri and branchiae absent. Only capillary setae; Parapodial lobes short and slightly elongated.

Habitat 10 examples from sand-mud intertidal areas at Godavari river mouth, Antervedi, Narsapur.

Remarks This is the first record of occurrence from this area.

Marphysa sanguinea (Montagu, 1815)

Broad and very long specimen of more than 30 cm. Prostomium rounded with bulbous plaps and five tentacles; Gills begin from 15-16th segment, branched and present upto the posterior end of the body. Dorsal setae capillary, ventral setae compound and knife-like. Acicular setae and comb setae present.

Habitat :One example burrowing in the muddy/sandy sediments at Godavari river mouth, Vodalarevu, Amalapuram.

Remarks This is the first report of occurrence from this area.

Family GLYCERIDAE

Glycera rouxii Audouin & M. Edwards. 1833

Narrow and cylindrical worms of 6-8 cm. Prostomium Pointed. Parapodia with two lobes in each rami. Posterior lobes un-equal. Branchiae simple and retractile into the anterior side of the foot.

Habitat 13 examples from Godavari river mouth near Yanam, Kakinada.

Remarks This is the first report of occurrence from this area.

Family : ORBINIDAE

Scholoplos marsupialis Southern, 1921

Slightly Broad worms of 5-6 cm. in length. Body divided into a flat thorax of 16-17 segments and a long cylindrical abdomen. Proboscis sac-like with several lobes. Lanceolate

gills from 15-16th segment and continue till the Posterior end; Dorsal serrated capillaries, ventral capillary setae and hooks. A membranous pocket-like structure in between each foot from 17th segment.

Habitat 74 examples from sandy-muddy intertidal coasts of Godavari river mouth at Antervedi, Narsapur.

Remarks This is the first record of occurrence from Andhra Pradesh coast.

DISCUSSION

Among the ten species reported here *N(N) lamellosa*, and *D. zululandica* are considered to be endemic to African coasts. However *D. zululandica* has been reported once from Indian waters, Godavari Estuary, (Rao & Rama Sarma, 1982) while *N(N) lamellosa* is another new record to our coastal waters. *T. annadalei* once reported as a rare species in our estuarine waters (Soota & Rao, 1977) was reported later from the estuaries of Ganges, Mahanadi and Chilka Lagoon. The present report of this species shows that its distribution might extend to other estuarine areas of this coast. *N. fauveli* and *S. marsupialis* are not commonly encountered species in our estuarine waters and hitherto reported from Mahanadi estuary, Chilka lagoon and vellar estuary only. Along with the above two species, the other viz. *P(A) tenuissima*, *T. bogoyawlenskyi*, *G. rouxii*, *M. sanguinea* and *A. irricolor* are reported for the first time from this locality, thus adding new records to this area.

SUMMARY

More than 30 species of polychaetes found to occur in the Godavari estuarine areas during this study. This paper reports the occurrence of ten species of which one is a new record to our coastal waters, while the remaining are new reports from this area.

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SEX-LINKED INHERITANCE (FATHER TO SON) IN THE HOUSE RAT, *RATTUS RATTUS ARBOREUS* (HORSFIELD) IN INDIA

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INTRODUCTION

The authors studied some aspect of ecology of the House Rat, *Rattus rattus arboreus* (Horsfield) at Apurbapur village of Singur, 34 km northwest of Calcutta in Hugly District, West Bengal. During this study, out of a total of 540 (M) and 661 (F) specimens examined, they came across 23 male specimens of the house rat in which the anal aperture was deviated towards the right side of the ventral aspect of the tail. The immediate effect of this abnormal position of the anal aperture was on the scrotal sac in which the right testicle had shifted somewhat upwards and the entire scrotal sac towards the left side.

Developmental anomaly in limbs, teeth, hair, colour and mammae are not very uncommon among rodents particularly among murids (rats and mice) in India (Ghosh, 1981; Chaturvedi, 1966; Chakraborty and Ghosal, 1971; Khajuria, 1951; Bhattacharyya 1973; Mandal and Ghosh, 1980). To ascertain whether the anomaly in the position of the anal aperture in the male house rats is sex-linked, the following experiment was performed in captivity.

Two pairs (young and aged, comprising of male with abnormal anal aperture and normal female) of this rat were kept in wire cages (58 cm x 33 cm x 48 cm) separately, with food and water at adlibitum for breeding. The younger pair bred successfully and gave birth to three ratlings after 49 days of captive-life. The older pair did not breed till 147 days of captive-life. One morning it was a great surprise to see that the adult rats were eating one of the ratlings (M) which was about two months old (62 days). The brain of the victim including a small portion of the abdomen was devoured. Subsequently, the anterior portion of other two ratlings (2 F) were also devoured by the adult rats. The body of the ratlings (1 M, 2 F) were examined. It was found that the anal aperture of the male ratling (62 days old) was shifted towards the right side of the tail. However, the subsequent distorted nature of scrotum and testicles could not be observed as the same were undeveloped. In case of both female ratlings, the anal aperture was in normal position, situated at the midventral position of the tail. Moreover, out of 661 (M) specimens examined from the same area, not a single female specimen showed this type of abnormality of the anal aperture. Since, the F_1 ratlings (1 M, 2 F) were devoured

by adult rats, the authors had no scope of studying the F_2 generation of these rats.

However, from the above experiment it may be concluded that the abnormal position of anal aperture in males is 'Y' linked and hence, it goes from father to son only. There is no report of the 'Y' sex-chromosome linked inheritance in Indian murine rodents (Dr. Ishwar Prakash, personal communication). Hence, it was thought worthwhile to report it here. This type of inheritance is known in human beings where hypertrichosis on the pinna is a 'Y' chromosome linked Character (Winchester, 1967) which goes from father to son.

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THE SCARABAEIDAE (INSECTA : COLEOPTERA) OF ANDAMAN AND NICOBAR ISLANDS, WITH DESCRIPTION OF A NEW SPECIES

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INTRODUCTION

Arrow in his monographic works on Fauna of British India series (1910, 1917, 1931) recorded 37 species of scarab beetles from Andaman and Nicobar groups of Islands. Since then no further report is available to us for members of 4 subfamilies dealt with in this work. The present paper deals with materials collected by various survey parties of Zoological Survey of India during last several years from the Andaman and Nicobar Islands. Earlier materials which were already incorporated in National Zoological collections from Andaman and Nicobar Islands have also been studied. In order to ascertain the range of variation of individual species, wherever available, extralimital specimens of the species recorded here have also been studied. New distributional data thus obtained have been incorporated under appropriate species. Biological informations, whenever available, have also been included. One species, *Onthophagus nicobaricus* has been described as new to Science and six more species have been recorded for the first time from these areas. Altogether 43 species belonging to 22 genera and 4 subfamilies are recorded here. Types will be deposited in Zoological Survey of India, Calcutta.

SYSTEMATIC LIST

FAMILY SCARABAEIDAE

SUB-FAMILY 1 CETONIINAE

Genus 1 *Macronota* Hoffmansegg

- 1 *M. regia* (Fabricius)

Genus 2. *Diceros* Lacordaire

2. *D. roepstorffi* Wood-Mason

Genus 3. *Glycyphana* Burmeister

3. *G. torquata* (Fabricius)
4. *G. nicobarica* Janson
5. *G. andamanensis* Janson

Genus 4. ***Glycosia*** Schoch

6. *G. biplagiata* Arrow

Genus 5. ***Protaetia*** Burmeister

7. *P. andamanarum* Janson
8. *P. bidentipes* Arrow
9. *P. fusca* (Herbst)
10. *P. acuminata* (Fabricius)

Genus 6. ***Agestrata*** Eschscholtz

11. *A. orichalcea* (Linnaeus)

Genus 7. ***Thaumastopeus*** Kraatz

12. *T. pullus* (Billberg)
13. *T. nicobaricus* (Janson)

Genus 8. ***Dasyvalgus*** Kolbe

14. *D. insularis* Arrow

Genus 9. ***Charitovalgus*** Kolbe

15. *C. andamanicus* Kolbe

SUB FAMILY II. DYNASTINAE

Genus 10. ***Oryctes*** Illiger

16. *O. rhinoceros* (Linnaeus)

Genus 11. ***Eophileurus*** Arrow

17. *E. planatus* (Wiedmann)

Genus 12. ***Clyster*** Arrow

18. *C. retusus* Arrow

Genus 13. ***Heteronychus*** Burmeister

19. *H. lioderes* Redtenbacher

Genus 14. ***Alissonotum*** Arrow

20. *A. elongatum* Arrow

SUB FAMILY III RUTELINAE

Genus 15. ***Parastasia*** Westwood

21. *P. andamanica* Ohaus
22. *P. confluens* Westwood

- 23. *P. heterocera* Ohaus
- 24. *P. bimaculata* Guerine
- 25. *P. luteola* (Westwood)

Genus 16. ***Popillia*** Serville

- 26. *P. marginicollis* Hope
- 27. *P. andamanica* Kraatz

Genus 17 ***Anomala*** Samovelle

- 28. *A. dorsalis* (Fabricius)
- 29. *A. andamanica* Arrow
- 30. *A. decorata* Kirsch
- 31. *A. shanica* Arrow
- 32. *A. chloronota* Arrow
- 33. *A. desiccata* Arrow
- 34. *A. rhodomela* Arrow
- 35. *A. isolata* Arrow

Genus 18. ***Adoretus*** Castelnau

- 36. *A. costopilosus* Ohaus
- 37. *A. vulpeculus* Arrow
- 38. *A. versutus* Harold

SUB FAMILY IV COPRINAE

Genus 19. ***Catharsius*** Hope

- 39. *C. molossus* (Linnaeus)

Genus 20. ***Copris*** Geoffroy

- 40. *C. spinator* Harold

Genus 21 ***Onthophagus*** Latreille

- 41. *O. cervus* (Fabricius)
- 42. *O. nicobaricus* sp. nov.

Genus 22. *Paraphytus* Harold43. *P. andamanus* Arrow

SYSTEMATIC ACCOUNT

I. *Macronota* Hoffmansegg1 *Macronota regia* (Fabricius)

1801. *Cetonia regia*, Fabricius, *Syst. Eleut.*, 2 : 159

1910. *Macronota regia*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 1: 46-47

Material examined 13 exs.

Diagnostic characters Pronotum gradually narrowed in front, base lobed in the middle; decorated with three pale longitudinal lines. Elytra excised at outer margins. Sexual dimorphism is not well marked. Length 15-17 mm; Breadth 8 mm.

Distribution The species has been recorded from Indonesia; Malay peninsula; Burma; Bangladesh; Chittagong (Rangamati) and Andaman Islands.

Remarks Of the thirteen specimens examined, four are from Andaman. Specimens from Andaman are a little larger in size and markings on dorsal surface are more strongly marked. The species was not earlier known from Bangladesh, Rangamati Chittagong is a new locality record.

II. *Diceros* Lacordaire2. *Diceros roepstorffi* Wood-Mason

1876. *Diceros roepstorffi* Wood-Mason, *Jour. Asiat. Soc. Beng.*, (2) : 52

1910. *Diceros roepstorffi*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 1 : 74

Material examined 2 exs.

Diagnostic characters Black and shining with a yellow patch on each elytron a little before middle. Hind angles of pronotum a little produced, scutellum short, sides sinuate and apex blunt. Clypeus unarmed with a single median lobe. Length 17 mm; Breadth 8 mm.

Distribution The species is known only from the Andaman Islands.

III. *Glycyphana* Burmister3. *Glycyphana torquata* (Fabricius)

1801 *Cetonia torquata* Fabricius, *Syst. Eleut.*, 2 : 157

1881 *Glycyphana subcineta* Janson, *Cist. Ent.*, 2 : 607

1894. *Glycyphana bimacula* Kraatz, *Deutsche Ent. Zeitschr.*, 294 p.

1910. *Glycyphana torquata*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.) 1 : 124

Material examined 1 ex.

Diagnostic character Elongate, depressed and feebly narrowed behind. Black, except front of the head, opaque above, shining below. Pronotum broadly bordered with red, red markings interrupted before scutellum and terminate before front angles. Clypeal margin sinuate behind. Hind angles of pronotum obtuse, scutellum blunt. Elytral markings dull, not spinose at apical angles. Mesosternal epimera yellow. Length 17 mm; Breadth 8.5 mm

Distribution The species has been recorded from Andaman Islands and Singapore.

Remarks · Fabrician type had Java as the locality. Arrow (1910) thought that the author was ignorant of the type locality, and Java was subsequently erroneously added to the type. This is the first time the species is recorded from Singapore based on a single specimen present in the collection of Zoological Survey of India, Calcutta.

4. *Glycyphana nicobarica* Janson

1877. *Glycyphana nicobarica* Janson, *Cist. Ent.*, 2 : 144

1910. *Glycyphana nicobarica*, Arrow *Fauna Brit. India* (Coleopt. Lamell), 1 : 124-125

Material examined 3 exs.

Diagnostic characters : Elongate, feebly narrowed behind, depressed and almost parallel-sided. Dorsal surface deep green, lower surface, head and legs olivaceous, pygidium brick red; decorated with pale yellow markings. Clypeus sinuate in front, hind angles of pronotum obtuse, scutellum blunt. Elytra strongly sinuated behind shoulders, sharply angular but not spinose at apical angles. Pygidium concentrically striated.

Distribution The species has been recorded from Nicobar Islands and Burma.

Remarks : The species was so far known only from the Nicobar Islands. During the present study two specimens have been studied from Burma (One from Rangoon and another from Tavoy).

5. *Glycyphana andamanensis* Janson

1877. *Glycyphana andamanensis* Janson *Cist. Ent.* 2 : 143

1910. *Glycyphana andamanensis* Arrow, *Fauna. Brit. India* (Coleopt. Lamell.), 1 : 127-128

Material examined 6 exs.

Diagnostic characters Moderately elongate and depressed. Dark green or olive in male, black in female, head, legs and lower surface castaneous or blackish; decorated with whitish markings. Clypeus sinuate in front margin. Hind angles of pronotum obtuse, not abruptly excised behind. Scutellum blunt, tarsi compact. Elytra spinose at apical angles, all spots minute. Length 13-14 mm; Breadth 6.5-7 mm.

Distribution The species has been recorded only from Andaman Islands.

Remarks The species shows sexual dimorphism in colouration. The male is olive green or brown above with the lower surface green and broadly bordered with yellow. Female is black with small yellowish spots only at the sides of abdomen.

IV *Glycosia* Schoch6. *Glycosia biplagiata* Arrow

1907. *Glycosia biplagiata* Arrow. *Ann. Mag. nat. Hist.*, (7) **19** : 351

1910. *Glycosia biplagiata* Arrow, *Fauna Brit. India* (Coleopt. Lamell.), **1** : 130-131

Material examined No material was available to us for study.

Diagnostic characters Elongate oval and depressed, broad at shoulders. Shining black, elytra opaque and shorty with a lemon yellow patch, beyond the middle of each elytron. The patch broad at outer margin, narrowing towards inner margin.

Pronotal base inclined at sides and excised in front of scutellum. Sternal process vertical in front, hind tibia not digitate.

Distribution The species is known from Burma and Andaman Islands.

Remarks Above description is given from literature.

V *Protaetia* Burmister7 *Protaetia andamanarum* Janson

1877. *Protaetia andamanarum* Janson, *Cist. Ent.*, **2** : 145

1910. *Protaetia andamanarum* Arrow, *Fauna Brit. India* (Coleopt. Lamell.), **1** : 148

Material examined 6 exs.

Diagnostic characters Compact and moderately convex. Black; vertex, pronotum, scutellum and elytra opaque and shooty, elytra decorated with irregular orange spots, reduced in male. Clypeus broad, finely punctured, slightly notched and feebly reflexed in front. Pronotum with sides sinuated, posterior angles well marked, base deeply but narrowly excised in the middle, sparsely punctured. Length 20-24 mm; Breadth 11-12.5 mm

Distribution The species has been recorded only from the Andaman Islands.

Remarks Sexes vary in number of characters. Besides of reduction of colour pattern in male it has apices of elytra sharply spinose, uppermost tooth of front tibia reduced, abdomen a little arched and spurs of the hind tibia sharp. Apical angles of the elytra blunt and last ventral segment closely punctured in female.

8. *Protaetia bidentipes* Arrow

1907. *Protaetia bidentipes* Arrow, 1907, *Ann. Nat. Hist.*, (7) **19** : 351

1910. *Protaetia bidentipes*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.) **1** : 153

Material examined No material was available to us for study.

Remarks The species is definitely known from Nicobar Islands and doubtfully referred to Burma (Rangoon). Nothing is known regarding its biology.

The species is with an opaque bloom on upper surface, mesosternum transverse before coxae, front tibiae bidentate in both sexes and clypeus deeply notched in front. Length 18mm; Breadth 10mm

9. *Protaetia fusca* (Herbst)

1790. *Cetonia fusca* Herbst, *Natursyst. Kafer*, Part III : 257 p. 32, fig 4.

1801. *Cetonia mandarina* Weber, *Obs. Ent.*, 168

1801. *Cetonia atomaria* Fabricius, *Syst. Eleuth.*, part II : 153.

1830. *Cetonia fictilis* Newman, *Ent. Mag.*, part V : 169

1910. *Protaetia fusca*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 1 : 154

Material examined 1 ex.

Diagnostic characters · Upper surface decorated with an indefinite grey or yellow tracery, opaque. Scutellum very short and blunt, apical angles thinly spinose. Hind tibiae covered with yellow hairs at the inner side. Length 14-16 mm; Breadth 7-9 mm

Distribution This species is known from Mauritius; N. Queensland; S. China; Malay Archipelago; Malay Peninsula; Tenasserim; Siam, Burman and India. In India the species is known from Andaman Island, West Bengal (Calcutta) and Assam (Cachar).

Biology It has been reported that the larvae are very destructive to the roots of Canna and other cultivated plants in Singapore. In Queensland the beetles have been found to attack the nests of the stingless bees, *Trigona* sp. for honey.

Remarks: It is one of the most widely distributed species among the Cetoniinae. The single specimen studied is from Burma and it agrees well with the description given by Arrow (1910).

10. *Protaetia acuminata* (Fabricius)

1775. *Cetonia acuminata* Fabricius, *Syst. Ent.*, p. 50

1801. *Cetonia marmorata* Fabricius, *Syst. Eleut.* 2 : 154

1910. *Protaetia acuminata*, Arrow, *Fauna Brit. India* (Coleopt. Lamell), 1 : 155

Material examined 13 exs.

Diagnostic characters Upper surface partly shining and partly covered with opaque bloom, clothed with yellow setae at the sides. Head bearing a longitudinal carina. Front tibiae tridentate. Mesosternum transverse before the coxae. Length 14-19 mm; Breadth 7-10 mm

Distribution : The species is known from Malay peninsula Java; Sumatra; Borneo; Burma and Nicobar and Andaman Islands.

Biology · The species occurs in large numbers in Andaman Islands but nothing is known about its habit.

Remarks Specimen from Andaman differ from typical form by larger size, more evenly distributed pale markings and less distinct median line.

VI. *Agestrata* Eachscholtz

11 *Agestrata orichalcea* (Linnaeus)

1769. *Scarabaeus orichalceus* Linnaeus, *Amoen. Acad.*, 7 : 507
 1775. *Cetonia chinensis* Fabricius, *Syst. Ent.*, p. 42
 1776. *Scarabaeus oblongus* Brown, *Illustr. Zool.*, : 122 pl. 49 fig. 4.
 1833. *Agestrata chinensis* Gory and Percheron, *Monogr. Cet.*, : 305 pl. 59 fig. 2.
 1910. *Agestrata orichalcea*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 1 : 192-194

Material examined 21 exs.

Diagnostic characters Size large; shape elongate, narrow, parallel-sided and rather depressed. Colour bluish green purplish or black with the coxae, femora, meso-epimeral sides of sternum and abdomen orange red. Antennal club long. Scutellum extremely sharp. Elytra smooth and gently sinuated behind the shoulders. Apex of clypeus sharply biangulate and spinose. Length 36-46mm. Breadth 15-22mm.

Distribution The species is known from Burma, Malay-peninsula; Sumatra, Borneo, China, Srilanka, Bangladesh and India. In India the species was recorded from Tamil Nadu, Maharashtra and Andaman Island.

Biology The beetle appears to be common in Andaman Island species.

Remarks This is monotypic genus. Club of the antenna in *A. orichalcea* -male is larger than female, last abdominal segment is deeply emerginate in the middle.

VII. *Thaumastopeus* Kraatz

12. *Thaumastopeus pullus* (Billberg)

1817. *Cetonia pulla* Billberg, *Schönh. Syn. Insect.* (1) 3 : 46
 1898. *Thaemastopeus simillimus* Schoch, 1898, *Mitth. Schweiz. ent. Ges.*, 10 : 157
 1910. *Thaumastopeus pullus*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 1 : 195-196

Material examined 1 ex.

Diagnostic characters Moderate, flat, shape long and taper from shoulder to apex, pronotum strigose at the sides but unpunctured at the middle, metasternum and abdomen smooth in the middle but laterally smooth.

Distribution : The species is known from Malay Peninsula, Java, Burma, Srilanka and India. In India the species was recorded from west Bengal, Punjab, Assam, Sikkim, Bhutan and Andaman Island.

Remarks : Sexes are indistinguishable but hind tarsi of male a little longer and tibial spurs are sharper than female.

13. *Thaumastopeus nicobaricus* Janson

1877. *Thaumastopeus nicobaricus* Janson, *Cist. Ent.* 2 : 249

1910. *Thaumastopeus nicobaricus*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.) 1 : 196

The species was described by Janson from Nicobar Island. Type should be in Janson collection. No material was available to us.

Distribution : Nicobar Island.

VIII. *Dasyvalgus* Kolbe

14. *Dasyvalgus insularis* Arrow

1910. *Dasyvalgus insularis* Arrow, *Fauna Brit. India* (Coleopt. Lamell), 1 : 240-241

Material examined No material was available to us for study.

Diagnostic characters The species may be recognised by pygidium being convex in both sexes, absence of caudal appendages in female. Front tarsi tridentate, hind tarsi simple and slender, 1st segment much longer than the second, pygidium covered with prominent erect setae and feebly elevated terminal spiracles.

Distribution : The species is known only from Andaman Islands.

Biology Nothing is known about its biology.

Remarks : Of the genera of Valgini genus *Dasyvalgus* Kolbe is having the largest number of species in Indian region (17 spp.). Only one species *D. insularis* Arrow has so far been recorded from Andaman.

IX. *Charitovalgus* Kolbe

15. *Charitovalgus andamanicus* Kolbe

1904. *Charitovalgus andamanicus* Kolbe, *Stellin ent. Zeit.* p. 22

1910. *Charitovalgus andamanicus*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 1 : 248

Material Examined , 3 exs.

Diagnostic characters : Size small. Front tibiae short, scutellum small. Pygidium flat and as long as broad. Female with caudal appendage. Length 5-6 mm; Breadth 2.5.-3mm.

Distribution The species is known only from Andaman Island.

Biology : Nothing is known.

Remarks Three specimens present in collection of Zoological Survey of India were submerged in flood water and colouration has changed considerably one of these, a male, bears the specific name by Arrow's own hand writing. The other two females agrees well with the description.

X. *Oryctes* Illiger

16. *Oryctes rhinoceros* (Linnaeus)

1758. *Scarabaeus rhinoceros* Linnaeus, *Syst. Nat.*, 1: 346

1910. *Oryctes rhinoceros*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 1 : 278-281.

Material examined 15 exs.

Diagnostic characters · Large beetle, cylindrical in shape. Black or pitchy in colour. Head with an backwardly directed horn, larger in male. Length 39-47 mm; Breadth 18-22 mm.

Distribution : The species is widely distributed and has been recorded from Burma; Siam; Annam; Singapore; Pahang; Sumatra; Java; Celebes; Ceram; Ambyona Philippines Is., Formasa Korea; Hongkong; Srilanka and India. In India the species was known from Tamil Nadu, Maharashtra, West Bengal and Andaman Islands.

Biology · This is a serious pest of coconut and considerable literature exists on its biology. The species has developed a specific taste to the coconut tree. It attacks the tree from the top and works its way downwards, causing considerable damage to the tree. In fact, it is one of the greatest enemies of the coconut cultivation. The larvae also develop in decaying vegetable detritus.

Remarks : Beeson (1962) pointed out that up to 1885 the species did not reach the Andaman Island. This is the first time the species is being recorded from Andaman Island. As the Islands are famous for coconut there is an immediate need for the study of this pest in the island.

XI. *Eophileurus* Arrow

17. *Eophileurus planatus* (Wiedmann)

1823. *Geotrupes planatus* Wiedmann, *Zool. Mag.*, 2 (1) : 5

1910. *Eophileurus planatus*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 1 : 288-289

Material examined 2 exs.

Diagnostic characters : Large, long, narrow and parallel sided, rather depressed. Black and shining., Male with a short and simple cephalic horn, anterior part of pronotum depressed. Pygidium convex and shining; strongly but sparsely punctured. Female with a faint longitudinal pronotal furrow. Pygidium with feebly flattened near base with a little prominence before apex; rugosely punctured. Length 22-25 mm; Breadth 9.5-11 mm.

Distribution The species is known from Burma, Bangladesh and India. In India the species has been recorded from Uttar Pradesh; Sikkim; Nagaland; Manipur and Andaman and Nicobar Islands.

Biology · Specimens were collected during the month of March; nothing more is known.

Remarks : Specimens examined agree well with the description given by Arrow (1910).

XII. *Clyster* Arrow

18. *Clyster retusus* Arrow

1908. *Clyster retusus*, Arrow, *Trans. Ent. Soc. Lond.*, p. 330

Material examined 2 exs.

Diagnostic characters Large, elongate and convex. Black or piceous. Male with short erect cephalic horn. Pronotum with prominent anterior declivity, dorsal margin of declivity sharp, some times little projecting. In female declivity smaller, upper margin with two tubercles.

Distribution The species is known from Burma, Penang and India. In India the species has been recorded from only Andaman Island.

Biology · Both specimens have been collected during the month of March.

Remarks · In one of the specimens, the declivity is not sharply defined into three parts and the central part is not recorded punctured.

XIII. *Heteronychus* Burmeister

19. *Heteronychus lioderes* Redtenbacher

1867. *Heteronychus lioderes* Redtenbacher, *Reise der Novara, Zool.* 2 : 75

Material examined 2 exs.

Diagnostic characters Size medium, elongate oval and moderately convex. Upper surface black, reddish brown beneath. Male with front tarsus thick and dilated into a plate and feebly cleft.

Distribution : The species is known from Burma; Malay-Peninsula, Java; Celebes; Nepal; Bangladesh from West Bengal, Bihar, Orissa and Andaman Island.

Biology · This is reported to be a common species and attracted to light during Nov. and December (Arrow 1910). In Andaman it has been collected during the month of March and July.

Remarks : This is the first time the species is being recorded from Andaman.

XIV *Alissonotum* Arrow

20. *Alissonotum elongatum* Arrow

1910. *Alissonotum elongatum* Arrow, *Fauna. Brit. India* (Coleopt. Lamell.), 1 : 299-300

Material examined 9 exs.

Diagnostic characters Size medium; elongate and convex. Black, smooth and shining. The inner claw of the front tarsus thickened and strongly bent.

Distribution The species was known from Bangladesh and India. In India the species was recorded from only Patkai mountains and Andaman Islands.

Biology Specimens were collected from the tunnels of the dead branches of the Cashewnut trees, and have been obtained from January-April.

Remarks First time, the species is being recorded from the Andaman Islands.

XV *Parastasia* Westwood

21 *Parastasia andamanica* Ohaus

1898. *Parastasia andamanica* Ohaus, *Stettin Ent. Zeit.*, p 13

1917. *Parastasia andamanica*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 2 : 40-41

Material examined 4 exs.

Diagnostic characters Size moderate; cylindrical and convex. Black or deep brown with a characteristic shoulder spots consisting of an oblique bar adjoining the scutellum and a curved lobe extending from the middle of the bar to near the outer margin. Clypeus strongly bidentate. Pronotum strongly punctured and not longitudinally impressed. Pygidium densely sculptured. Length 12-13 mm; Breadth 7.5-8mm.

Distribution The species is endemic to Andaman Islands.

Biology Specimens were collected during the period from March to May.

Remarks The specimens agree well to the description given by Arrow (1917).

22. *Parastasia confluens* Westwood

1841. *Parastasia confluens* Westwood, *Ann. Mag. nat. Hist.*, 8 : 304

1917. *Parastasia confluens*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 2 : 41

Material examined : 1 ex.

Diagnostic characters Size moderate; cylindrical and convex. Light mahogany in male, deep brown in female with an irregular shaped lighter patch before the middle of each elytron. Clypeus strongly bidentate, pronotum strongly punctured and with a median longitudinal impressed line. Pygidium densely punctured.

Distribution The species is known from Malay Peninsula; Sumatra; Java; Borneo; Celebes; Timor; Burma; Philippine Island and India. In India the species was recorded only from Nicobar Islands.

Biology Larvas have been collected from a dead tree trunk in Andaman Island but nothing is known about its adult biology.

Remarks The species closely resembles *P. andamanica* but may be easily separated by the characteristic elytral pattern and pronotum being longitudinally impressed.

23. *Parastasia heterocera* Ohaus

1898. *Parastasia heterocera* Ohaus, 1898, *Stettin Ent. Zeit.*, p. 27

1917. *Parastasia heterocera*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 2 : 41-42

Material examined Nil.

Diagnostic characters · Size small to medium, short and broad, slightly depressed. Black, elytra fully or partly bloodred clypeus labrum not visible from above. Posterior tibiae not spinose at their outer edges. Pygidium irregularly sculptured.

Male with clypeal teeth very strong and sharp, pronotum rugose at sides, hind angles sharp. Female with an additional clypeal tooth on each side.

Distribution : The species was known from Burma and India. In India the species was recorded only from Andaman and Nicobar Islands.

Biology : Nothing is known.

24. *Parastasia bimaculata* Guerin

1843. *Parastasia bimaculata* Guerin, *Delessert's Voyage*, 2 : 41 pl.11. fig. 2

1917. *Parastasia bimaculata*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.) 2 : 42-43

Material examined 8 exs.

Diagnostic characters : Size medium; short, subglobose and very convex. Reddish testaceous, elytra mottled with darker shades, a pair of black spots near the hind margin of pronotum. Clypeus strongly bidentate in front. Pygidium irregularly densely sculptured. Length 13-16 mm; Breadth 8-9 mm.

Distribution The species was known from Burma; Malay Peninsula; Sumatra; Borneo; Celebes; Gilolo; Ternate; Ceram; Newguinea; Solomon Is. and India. In India, the species was recorded from the Andaman and Nicobar Islands.

25. *Parastasia luteola* (Westwood)

1875. *Lutera luteola* Westwood, *Trans. Ent. Soc. Lond.*, p. 236

1917. *Parastasia luteola*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 2 : 45-46.

Material examined : Nil.

Diagnostic characters Size medium; short and broad, moderately convex. Yellowish with black or brown markings. Clypeal margin bluntly bilobed and elytra punctured in straight lines.

Distribution The species was known from Malay peninsula; Siam; Borneo and India. In India the species was recorded from Nicobar Islands. Ohaus's record from the Himalay has been doubted by Arrow.

Biology Nothing is known.

XVI. *Popillia* Serveille

26. *Popillia marginicollis* Hope

1831. *Popillia marginicollis* Hope, *Gray's Zool. Miscell.*, P. 23

Material examined · Size medium; short and broad not very convex above. Major part of the head, pronotum and scutellum green, rest reddish. Pronotum without hair, elytra with 5 equidistant dorsal striae, interval moderately convex. Meosternum produced, abdominal sternite with double rows of hairs. Length 11-13mm; Breadth 6-7mm.

Distribution The species was known from Nepal, Bangladesh and India. In India the species was recorded from Assam. This is the first time the species is being recorded from Andaman Islands.

Biology : Nothing is known.

Remarks As things stands now the species is very varriable and has been divided into several varieties. Specimens from Andaman are smaller in size. It may prove to belong to an undescribed species.

27. *Popillia andamanica* Kraatz

1892. *Popilli andamanica* Kraatz, 1892, *Deutsche Ent. Zeits.*, p. 279.

Material examined 3 exs.

Diagnostic characters : Size small; rhomboidal and depressed. Larger part of head and pronotum green, sides brownish, elytra dark with an antero-median pale patch enclosing a black spot. Length 8-9 mm; Breadth 5-5.5mm.

Distribution The species is known only from Andaman and Nicobar Islands.

Biology : Nothing is known.

Remarks The species is close to *P. marginicollis* Hope, but can be separated by having without prolongation of mesosternal process and colour pattern. Two specimens present in Z.S.I. collection are much smaller in size and having difference in colouration. These may belong to an undescribed species, however for time being refered here due to lack of more materials.

XVII. *Anomala* Samouelle

28. *Anomala dorsalis* (Fabricious)

1775. *Melolontha dorsalis* Fabricious, *Syst. Ent.*, p. 35

1844. *Anomala dorsalis* Burmister *Handb. Ent.* 4 (1) : 232

Material examined 20 exs.

Diagnostic characters Size medium; moderately elongate-and convex. Colour variable, vertex black, usually reddish or testaceous with elytral suture black. Clypeus and fore head densely and pronotum minutely punctured. Metasternum feebly punctured ventral lobe with a row of hairs. Pygidium thinly and minutely punctured.

Distribution The species is known from almost throughout Indian mainland and Andaman Island.

Biology Nothing is known.

Remarks The species can be distinguished by its larger size, tridentate foretibiae and clypeus of male with a sharp front angle and elytra of the female angularly dilated.

29. *Anomala andamanica* Arrow

1917. *Anomala andamanica* Arrow, *Fauna Brit. India* (Coleopt. Lamell), 2 : 165

Material examined 9 exs.

Diagnostic characters Size moderate; elongated and parallel sided rather depressed. Testaceous, vertex, two spots on the middle of front margin of pronotum, a spot on humeral callus and extreme margin of the elytra black. Tarsi and extremities of tibiae deep brown. Clypeus small, sides round, head strongly and closely punctured. Pronotum with basal margin. Length 13-15 mm; Breadth 6.5-7.5mm.

Distribution The species is known from Andaman and Nicobar Islands.

Biology The species have been collected during the month of March-May.

Remarks The species is very close to *A. communis* Burm. But can be easily separated by the presence of black spot or spots on pronotum.

30. *Anomala decorata* Kirsch

1878. *Anomala decorata* Kirsch, 1878, *Mitth. Mus. Dresden*, 1 : 78

Material examined 1 ex.

Diagnostic characters Size medium; oval, rather depressed. Brownish, with pronotum a greenish tinge and longitudinal dark band along the elytral suture. Head strongly punctured rather rugosely. Clypeus broad with margin rounded. Pronotum strongly and closely punctured. Elytra with close set rows of large punctures.

Distribution The species was previously recorded from Burma and Malay peninsula. This is the first time the species is being recorded from south Andaman (Chidiatapu).

Biology The single specimen was collected during the month of May.

31 *Anomala shanica* Arrow

1917. *Anomala shanica* Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 2 : 218-219

Material examined 30 exs.

Diagnostic characters Size moderate; oval, convex coppery, with dull green tinge. Head strongly rugosely puncture, clypeus short and regularly semicircular Pronotum closely and uniformly punctured.

Distribution The species was so far known from Burma. This is the first time the species is being recorded from Andaman Island.

Biology Specimens were attracted to light and collected in the month of April.

Remarks: The specimens under study agrees with the description but differ in being a little smaller in size and duller in colour.

32. *Anomala rhodomela* Arrow

1917. *Anomala rhodomela* Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 2 : 235

Material examined 14 exs.

Diagnostic characters: Size large; oval and convex, smooth and shining above. Olivaceous green with a rosy red suffussion above. Clypeus rather broad, rugosely punctured. Pronotum finely in the middle and strongly punctured on lateral line. Pygidium granular. Length 23-28mm; Breadth 13.5-17 mm.

Distribution The species is known from Andaman Island.

Biology. The specimens have been collected during March and April.

Remarks The species can be identified by the large size and its typical colouration.

33. *Anomala desiccata* Arrow

1917. *Anomala desiccata* Arrow, *Fauna Brit. India* (Coleopt. Lamell.), 2 : 226-227

Material examined 7 exs.

Diagnostic characters Size large; shortly oval, convex. Olivaceous green not shining. Clypeus broad, straight in front, densely punctured, forehead a little less strongly punctured. Pronotum strongly punctured at sides, little less strongly at middle. Front angles of pronotum acute, hind angles distinct but obtuse. Pygidium strongly punctured; with pale erect setae and granular at apex.

Distribution The species is endemic to Nicobar Islands.

Biology Specimens have been collected during the month of May.

Remarks The species resembles *A. rhodomela* but may be easily separated by its smaller size, dull colour and absence of any rosy tinge.

34. *Anomala isolata* Arrow

1917. *Anomala isolata* Arrow, *Fauna Brit. India* (Coleopt. Lamell), 2 : 260

Material examined 1 ex.

Diagnostic character Size medium; broadly oval, convex and compact. Green, clypeus short, broad, rounded at the sides, rugosely punctured, forehead strongly but not rugosely punctured. Pronotum with front angle acute, hind angle obtuse base not margined in the middle; strongly and evenly punctured. Mesosternum produced in front. Pygidium strongly punctured. Length 16 mm; Breadth 9 mm.

Distribution The species is known only from Andaman Island.

Biology Nothing is known.

Remarks The species may be easily recognised by its colour, size, shape and prosternal process.

35. *Anomala chloronota* Arrow

1911. *Anomala chloronota* Arrow, 1911, *Ann. Mag. nat. Hist.*, 8 (8) : 358

Material examined 4 exs.

Diagnostic characters Size moderate to large; oval and convex. Green turning to olivaceous upon the elytra; lateral margins of pronotum and lower surface pale, clypeus broad, nearly straight in the middle, densely punctured. Pronotum finely punctured in the middle and strongly at sides. Pygidium rugosely punctured and with scanty setae. Length 15-20 mm; Breadth 9-11.5 mm.

Distribution The species was known from Srilanka. This is the first time it is being recorded from Andaman Island.

Biology Specimens have been collected during the month of October.

XVIII. *Adoretus* Castelnau

36. *Adoretus costopilosus* Ohaus

1914. *Adoretus costopilosus* Ohaus, 1914, *Deutsche Ent. Zeits.*, P. 506, fig. 42.

Material examined 12 exs.

Diagnostic characters Size medium; parallel sided, elongate and not convex. Dark brown, antennae and tibiae little pale. Clypeus semicircular, antennae 10 jointed. Elytra with prominent costae, moderately closely covered with decumbent white setae, outer edge of the front tibia serrated at its basal half, Length 10-11 mm; Breadth 4.5 mm.

Distribution . The species was known from India, Bangladesh and Burma. In India the species was recorded from Andaman Islands, Sikkim; Uttar Pradesh (Dehradun) and Punjab (Kangra valley).

Biology The species has been collected from Andaman in the month of March from Uttar Pradesh in September-October and in July from Punjab.

Remarks The species shows geographic-variation both morphology and in aedeagus.

37. *Adoretus vulpeculus* Arrow

1917. *Adoretus vulpeculus* Arrow, 1917, *Fauna Birt. India*. (Coleopt. Lamell.), 2 : 327.

Arrow described the species from Andaman Island. No material was available to us for study.

Distribution The species is known only from Andaman Island.

38. *Adoretus versutus* Harold

1869. *Adoretus versutus* Harold, 1869, *Col. Heftu*, 5 : 124

Material examined 14 exs.

Diagnostic characters Size small to medium; moderately broad and convex; redish with forehead and clypeus dark. Clypeus semicircular in female, transverse in male, rugosely punctured. Pronotum strongly but unevenly punctured, less closely in the middle. Tibiae armed with three teeth, not serrated above. Elytra strongly and closely punctured, with distinct but narrow costae. Pygidium moderately closely punctured and covered with hair.

Distribution The species was known from India, Srilanka, Malay peninsula; Java; Fiji Is. Samoa; Tongatabu; Mauritius; Saycheles; and St. Helena. In India the species was recorded from Uttar Pradesh (Ranikhet); Bihar (Pusa, Darbhanga); West Bengal (Sundarbans, Calcutta, Murshidabad); Madhya Pradesh (Jabalpur) ; Tamil Nadu (Coimbatore, Bellary, Seruguppa, Trichinepoli) and Andaman Islands.

Biology : The species occurs in large numbers. Like most of its congeners it feeds at night and bides during the day. It attacks a number of cultivated crops. Serious damages have been recorded for Roses, Cannas, Cacao Vines, Oats and Apple.

XIX. *Catharsius* Hope

39. *Catharsius molossus* (Linnaeus)

1758. *Scarabaeus molossus* Linnaeus, 1758, *Syst. Net.*, 10 : 347

1801. *Copris ursus* Fabricius, *Syst. Eleuth.*, 1 : 43

1931. *Catharsius molossus*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.) 3 : 94-95

Material examined 5 exs.

Diagnostic characters Size large; highly convex and broadly oval. Black sparingly covered with reddish hair beneath. Head with a small smooth area adjoining each eye, pronotum covered with granules, hind angles obtuse. Elytra entirely opaque. Metasternal shield fringed; mesometasternal line angular.

Distribution : The species has been recorded from India; Bangladesh and Srilanka. In India the species is known from Andaman Islands; Kerala; Karnataka; Maharastra; Uttar Pradesh; Himachal Pradesh and Meghalaya.

Biology : This is one of the commonest scarab species in India and found both in hills and plains. It is found both in dung of herbivorous animal and in human faeces. This beetle prefers sandy or muddy soil and excavate almost vertical tunnel. It is found throughout the year though in lesser numbers in winter months.

Remarks The species closely resemble *C. granulatus* Sharp and *C. sagax* (Quens) but may be separated from both by the presence of a smooth shining area adjoining each eye.

XX. *Copris* Geoffroy

40. *Copris spinator* Harold.

1881. *Copris spinator* Harold, *Mitth. Munch. Ent. Ver.*, **5** : 89

1886. *Copris haroldi* Lansberge, *Tijds. Ent.*, **29** : 15

1931. *Copris spinator*, Arrow, *Fauna Brit. India* (Coleopt. Lamell.), **3** : 113-114.

No material has been seen either in the Zoological Survey of India's old collection or in the material collected during the recent surveys. Arrow (1931) however, reported the species from Andaman.

The species may be distinguished by the following characters.

Remarks : Body broadly oval and very convex, black and shining, antennae, mouth organs with scanty hairs upon the legs and lower surface reddish. Head semicircular, clypeus smooth, front margin feebly notched in the middle. Elytra strongly striate, striae finely punctured length.

XXI. *Onthophagus* Latreille

41 *Onthophagus cervus* (Fabricius).

1798. *Copris corvus* Fabricius, *Ent. Syst.*, P. 31

1877. *Onthophagus ceylonicus* Harold, 1877, *Ann. Mus. Civ. Geneva*, **10** : 61

1931. *Onthophagus cervus* Arrow, 1931. *Fauna Brit. India* (Coleopt. Lamell.), **3** : 348-350.

Material examined : 18 exs.

Size small (Length 6-7 mm; Breadth 3.5-4.5 mm) shape moderately convex and oval. Colour variable, usually black and on elytra decorated with orange. Antennae, mouth organs, femora and pygidium usually yellow. Pronotum unevenly covered with simple punctures. Upper surface covered with minute yellow setae. Pygidium pale with a basal ridge, *clypeus* not pointed.

Distribution The species is widely distributed in India; West Bengal, Uttar Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, North Andaman Islands, Srilanka.

Biology This is one of the most abundant species in India. Coprinae are found in plain as well as in hills. Nothing is recorded about its food and feeding habit.

42. *Onthophagus nicobaricus* sp. nov.

Black, sides of clypsus, elytra, femora, tibiae and tarsi, specially those of middle and hind legs pale. Elongate oval and not very convex.

Clypeus rounded at sides, deeply emerginate in front lobes, reflexed, head strongly punctured, rugosely in front, clypeofrontal carina indistinct. Vertex with a feeble carina, sides of which tuberculate.

Pronotum uniformly strongly and rugosely punctured sides feebly rounded in front, strongly behind front angles blunt, base broadly rounded and margined.

Elytra feebly striate, striae punctured, elytral interval feebly convex, interval covered with setigerous asperate punctures. Pygidium margined at base uniformly and moderately strongly punctured.

Length 6 mm; Breadth 4 mm

Holotype female. Campbell Bay. 13.III. 1968, A. Danial Coll.

The species comes close to *Onthophagus metallicus* Arrow, but differs in having (1) Clypeofrontal carina indistinct, (2) Head without posterior projection, (3) Elytral interval with setigerous asperate punctures and (4) Pygidium uniformly and moderately strongly punctured.

XXII. *Paraphytus* Harold**43. *Paraphytus andamanus* Arrow**

Species was described by Arrow on the basis of a single specimen. No material has been collected during the present survey. Unique type is in the collection of British Museum.

SUMMARY

The Present paper deals with 43 species belonging to 22 genera under 4 subfamilies. One species *Onthophagus nicobaricus* has been described as new to science and six species namely *Oryctes rhinoceros* (Linnaeus), *Heteronychus lioderes* Redtenbacher, *Alissonotum elongatum* Arrow, *Popillia marginicollis* Hope, *Anomala decorata* Kirsch, *Anomala shanica* Arrow have been recorded for the first time from Andaman Islands. Selected synonymies, distributional data and diagnostic characters of each species have also been provided.

ACKNOWLEDGEMENTS

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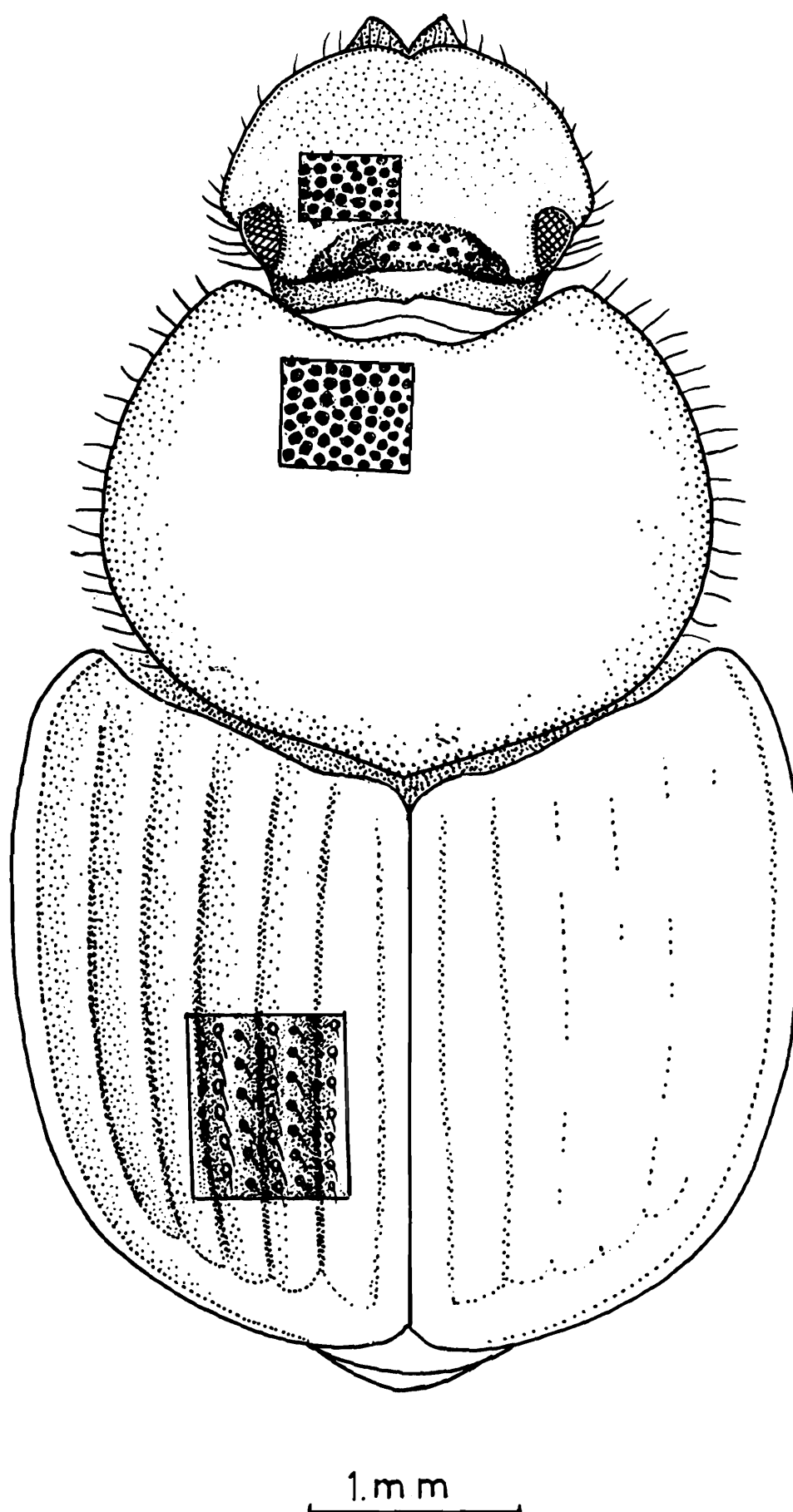


Fig. 1. Dorsal View of *Onthophagus nicobaricus* sp. nov.

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ON THE HIGHER CLASSIFICATION OF ANISOLABIDIDAE (INSECTA : DERMAPTERA) WITH A CHECK-LIST OF GENERA AND SPECIES

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INTRODUCTION

Sakai (1982) pointed out that family name Anisolabi(di)dae Verhoeff, 1902 has priority over Carcinophoridae Popham, 1965. Similarly the sub family Anisolabi(di)nae Zacher, 1911 has priority over Carcinophorinae Hincks, 1954. Accordingly the former are used in the present work.

A key for the discrimination of various subfamilies is given. The distinctive characters are based on various morphological character, mainly, on the body shape, shape of thoracic tergites, sternites and the male genitalia.

It is proposed to erect a new subfamily Placolabidinae for the reception of *Placolabis* Bey-Bienko, 1959 as its type genus. This genus is very distinct from all the known genera of Anisolabidinae in having the median posterior prolongation of 8th sternite in males.

Isolaboidinae has been placed under this family by Srivastava (1996) which was transferred under Spongiphoridae (=Labidae) by Steinmann (1990).

An attempt is made here to streamline the taxonomic status of various genera of Anisolabidinae by providing a key for their separation. The main criteria for their discrimination is based on the relative length of parameres besides its overall shape. The definition of various genera has been enlarged.

The genera based on the shape of distal lobes and its associated structures such as chitinous accessory plates, shape and size of virga and the arrangement of teeth on chitinous pad may not prove to be stable characters since these vary intraspecifically.

Burr's (1915) arrangement of various genera based upon on the male genitalia which provided a useful basis for their separation, needs modification in the light of present knowledge.

Epilandex Hebard, was mainly characterised in having long parameres, a little over ten times longer than its width and somewhat broader at base, narrowing apically with tip thread like, often turned externally. The parameres in *Capralabis* Brindle, are well over ten times longer than board. Accordingly, it is treated as synonym of *Epilandex* Hebard.

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Heterolabis Borelli and *Euborellia* Burr possess identical parameres. For this reason former is treated as synonym.

Mongolabis Zacher, is redefined to include those species which possess parameres roughly one and half times longer than broad, rectangular in shape, sometimes with inner margin oblique. Besides, in most cases, the external apical angle is projecting and tip is pointed or anteriorly produced to form a sort of snout. Genera included as synonym are *Gelotolabis* Zacher, *Cerolabis* Bey - Bienko and *Paraflexiolabis* Steinmann, since the species included under them fit well within the said definition of *Mangolabis*.

The parameres in *Anisolabella* Zacher, are broadly oval, narrowing apically with external margin regularly convex and basal margin feebly obliquely convex and inner margin sigmoid. Somehow, it was kept isolated because of very characteristic shape of parameres. But it does not hold good in view of the shape of parameres in *Paralabis* Burr and *Horridolabis* Zacher. In these genera parameres may not be equally broad but are narrowed apically with external margin regularly convex. Accordingly these two genera are treated as synonym under *Anisolabella*.

Burr placed too much emphasis on the greatest width of hind abdominal tergites while recognising his genus *Gonolabis*. Steinmann (1981) although rightly questioned the validity of this character, treated *Gonolabis* in much broader sense to include several species ignoring the totally diverse parameres. Besides, his reliance, on the extent of cleavage of pro-parameres appears doubtful. It has been observed to vary intraspecifically if a series of genitalic mounts are examined. The shape of parameres in *Gonolabis* and *Epilabis* Burr are identical in being of uniform width throughout with external apical angle convex. In the former these are comparatively broader, i.e. about twice as long as broad whereas in latter slightly narrower in being two and half times longer than broad. As a result *Epilabis* is proposed to be synonymised under *Gonolabis*.

Steinmann (1981a) erected *Foramenolabis* with *Epilabis sisera* (Burr) as the type, characterising mainly by the presence of a deep oval concavity on the head of males. It has been observed in a large series of the said species to be variable in depth and occasionally almost obliterated. As such this genus is also treated as synonym of *Gonolabis*.

In the category of genera having the parameres three times longer than broad with tip produced into a point or acuminate, *Apolabis* Burr, 1915 is treated as valid. *Eulabis* Zacher, 1911 (name preoccupied by Eschscholtz, 1929 in Coleoptera and *Zacheria* Steinmann, 1975 as its new name) are considered as synonyms. *Thekalabis* Kapoor, has parameres three times longer than broad with apex although not ending into a sharp point, it is strongly narrowed in apical half. This genus has been rightly placed as synonym of *Apolabis* by Srivastava (1986).

Carcinophora Scudder and *Anisolabis* Fieber, both possess parameres more than five times longer than broad but in the former sides are convex with tip pointed whereas obtuse in the latter.

Under *Carcinophora*, genera *Spandex* Scudder, *Notolabis* Hincks, *Metalabis* Burr, *Mandex* Burr, *Psalis* Serville and *Neolabis* Brindle are treated as synonym.

Steinmann (1989) has wrongly placed *Homoeolabis* Borelli, 1911 as synonym under *Anisolabis*. In fact it is synonym of *Titanolabis* Burr, 1911 under Titanolabidinae.

Indolabis Steinmann, appears to be close to *Titanolabis* on the basis of male genitalia. Since the shape of thoracic sternites is not described in detail, only mentioned as 'Typical' in the original description, it is not possible to comment further. For this reason it is treated as valid pending examination of the type.

Similarly, *Flexiolabis* Steinmann is also treated as valid which is not sufficiently characterised. Perhaps when specimens the two species, included under the genus, are available for examination, it would be possible to evaluate the characters.

Key to the subfamilies (on males only)

- 1 (2) Body strongly flattened, i.e. dorsoventrally compressed.....Platylabiinae
- 2 (1) Body not strongly flattened, head and abdominal tergites often convex or weakly convex or flattened
- 3 (4) Prosternum gradually attenuate posteriorly.....Gonolabiinae
- 4 (3) Prosternum with slight constriction in posterior one third, afterwards gently widened with hind margin truncate
- 5 (6) Metasternum with hind margin convex, more or less tongue shaped.....Titanolabidinae
- 6 (5) Metasternum with hind margin truncate, generally widened in basal half and narrowed between hind coxae
- 7(12) Mesosternum with hind margin convex
- 8 (9) Eyes absent, parameres vestigial or reduced.....Anophthalmolabidinae
- 9 (8) Eyes and parameres well developed
- 10(11) Eighth sternite in middle with a median elongated lobe, directed posteriorly.....Placolabidinae **Subfam. nov.**
- 11(10) Eighth sternite without such lobe.....Anisolabidinae
- 12 (7) Mesosternum with hind margin truncate
- 13(16) First antennal segment longer than the distance between antennal bases
- 14(15) Mesonotum laterally with a sharp ridge or convexity along its whole length, often dying out in posterior half.....Brachylabidinae
- 15(14) Mesonotum laterally without a ridge or convexity.....Isolabidinae

- 16(13) First antennal segment shorter or about as long as the distance between antennal bases
- 17(18) Proparameres united all along its length.....*Antisolabidinae*
- 18(17) Proparameres of both side separated, or partially separated apically
- 19(22) Distal lobes of both sides functional
- 20(21) Both distal lobes generally of same size.....*Parisolabidinae*
- 21(20) One of the distal lobes shorter in length (somewhat of carcinophorid type).....
.....*Isolopsalidinae*
- 22(19) Right distal lobe atrophied, left distal lobe generally enlarged (genitalia appears to be of Labiid type but proparameres paired).....*Isolaboidinae*

Key to genera of *Anisolabidinae* (on males only)

- 1 (2) Parameres long, over 10 times longer than broad, narrow, sometimes broader at base.....*Epilandex* Hebard
(=*Capralabis* Brindle **Syn.nov.**)
- 2 (1) Parameres less than 10 times longer than broad
- 3 (9) Parameres excised apically or armed along the internal or external margin
- 4 (5) Parameres excised apically in middle.....*Ornatolabis* Steinmann
- 5 (4) Parameres not excised apically
- 6 (7) Parameres armed on external margin with a broad recurved flange.....
.....*Canarilabis* Steinmann
- 7 (6) Parameres armed internally at base or middle with a tooth.....
.....*Aborolabis* Srivastava
- 9 (3) Parameres entire, neither excised apically nor armed internally or externally
- 10(17) Parameres about as long as broad to two and half times longer than broad, generally broad and flattened
- 11(12) Parameres about as long as broad or slightly longer than broad and flattened.....
.....*Euborellia* Burr
(=*Heterolabis* Borelli)
- 12(11) Parameres about one and half times to two and half times longer than broad
- 13(16) Parameres about one and half times longer than broad, broadened in middle, narrowed apically

- 14(15) Parameres somewhat square or sometimes with inner margin oblique, narrowed towards apex forming a sort of snout, external apical angle generally projecting or spiniform.....*Mongolabis* Zacher
 (= *Gelotolabis* Zacher)
 (= *Cerolabis* Bey-Bienko)
 (= *Paraflexiolabis* Steinmann **Syn.nov.**)
- 15(14) Parameres oval or squarish, narrowed apically but not forming a snout, tip may be pointed or obtuse, external margin forming a continuous arch or semicircular.....*Anisolabella* Zacher
 (= *Horridolabis* Zacher)
 (= *Paralabis* Burr)
- 16(13) Parameres about two and half times longer than broad, almost of uniform width throughout.....*Gonolabis* Burr
 (= *Epilabis* Burr)
 (= *Foramenolabis* Steinman **Syn.nov.**)
- 17(10) Parameres three to seven times longer than broad, generally narrower
- 18(19) Parameres with tip strongly recurved apically*Flexiolabis* Steinmann
- 19(18) Parameres not recurved apically
- 20(21) Parameres with tip bifid and both distal lobes long.....*Indolabis* Steinmann
- 21(20) Parameres with tip entire, one of the distal lobes short
- 22(23) Parameres three times longer than broad or slightly less, broadened at base externally with tip acuminate.....*Apolabis* Burr
 (= *Eulabis* Zacher)
 (= *Thekalabis* Kapoor)
 (= *Zacheria* Steinmann)
- 23(22) Parameres more than four to seven times longer than broad, tip not as above, acute or obtuse
- 24(25) Parameres with tip obtuse, often slightly broadened in middle.....*Anisolabis* Fieber
 (= *Forcinella* Dohrn)
 (= *Labidurodes* Dubrony)
 (= *Logicolabis* Zacher)
 (= *Spondox* Burr)

- 25(24) Parameres with tip acute, generally external and internal margin convex or with faint sinuation.....*Carcinophora* Scudder
- (= *Psalis* Serville)
 (= *Metalabis* Burr)
 (= *Mandex* Burr)
 (= *Spandex* Burr)
 (= *Notolabis* Hincks)
 (= *Neolabis* Brindle **Syn.nov.**).

LIST OF GENERA AND SPECIES

PLATYLABIINAE Burr, 1911

Type-genus *Platylabia* Dohrn, 1867

***Platylabia* Dohrn, 1867**

(= *Labidophora* Scudder, 1876)

(= *Palex* Burr, 1910)

Type-species *Platylabia major* Dohrn, 1867

List of species

<i>brindlei</i> Srivastava, 1981	—	India : Meghalaya
<i>major</i> Dohrn, 1867	—	Myanmar, Thailand, Laos,
(= <i>Platylabia sparattoides</i> Bormans, 1900)		Vietnam, Java Sumatra and Celebes
<i>nathani</i> Srivastava, 1981	—	India Tamil Nadu

GONOLABIINAE Verhoeff, 1902

Type-genus *Gonolabina* Verhoeff, 1902

***Gonolabina* Verhoeff, 1902**

Type-species *Forficula spectabilis* Philippi, 1863
 (= *Gonolabina kuhlkatzi* Verhoeff, 1902)

List of species

<i>binodosa</i> Brindle, 1967 (= <i>b. f. binodosa</i> Brindle, 1967) (= <i>b. f. llanguena</i> Brindle, 1967)	—	South America Peru (Zaráte Hda Llanguen)
<i>spectabilis</i> (Philippi, 1863) (= <i>G. kuhlitzii</i> Verhoeff, 1902)	—	South America Chile
<i>trinodosa</i> Brindle, 1967	—	South America :Peru

TITANOLABIDINAE, Srivastava, 1982

Type-genus *Titanolabis* Burr, 1910***Paratitanolabis***, Srivastava, 1982Type-species *Paratitanolabis bormansi* Srivastava, 1982*List of species*

<i>bormansi</i> Srivastava, 1982	—	Myanmar
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Titanolabis Burr, 1910(= *Homoeolabis* Boralli, 1911)Type species *Forcinella colossea* Dohrn, 1864*List of species*

<i>bormansi</i> Srivastava, 1982 (= <i>T. gigas</i> Steinmann, 1988 Syn.nov.)	—	Australia (N. South Wales)
<i>centaurea</i> Steinmann, 1985	—	Australia
<i>colossea</i> (Dohrn, 1864)	—	Australia, New Caledonia, New Hebrides & Fiji
<i>maindroni</i> (Borelli, 1911)	—	Sri Lanka & South India
<i>orientalis</i> (Ramamurthi, 1986)	—	India (South)

ANOPHTHALMOLABIDIAE Steinmann, 1975

Type-Genus *Anophthalmolabis* Brindle, 1968

***Anophthalmolabis* Brindle, 1968**

Type-species : *Anophthalmolabis leleupi* Brindle, 1968

<i>caeca</i> (Borelli, 1902)	—	Argentina
<i>leleupi</i> Brindle, 1968	—	Galapagos Island Santa Cruz

PLACOLABIDINAE Subfam.nov.

Type-genus *Placolabis* Bey-Bienko, 1959

***Placolabis* Bey-Bienko, 1959**

Type-species *Placolabis mira* Bey-Bienko, 1959

List of species

<i>mira</i> Bey-Bienko, 1959	—	China Yunnan
<i>thailandensis</i> Ramamurthi, 1973	—	Thailand

ANISOLABIDINAE, Verhoeff, 1902

Type-genus *Anisolabis* Fieber, 1853

***Epilandex*, Hebard, 1927**

(= *Capralabis* Brindle, 1981-Syn.nov.)

Type-species *Landex burri* Borelli, 1921

List of species

<i>ashmolei</i> (Brindle, 1981)	—	Ecuador
<i>bazyluki</i> Steinmann, 1979	—	Sri Lanka
<i>borellii</i> Nom.nov.*		
(= <i>Psalis burri</i> Borelli, 1905)		
(= <i>Psalis compacta</i> Hebard, 1919)	—	Paraguay & Columbia
<i>burri</i> (Borelli, 1921)	—	Thailand, Sumatra, Java & Sri Lanka
(= <i>E. undulata</i> Ramamurthi, 1963)		
<i>gresitti</i> Srivastava, 1976	—	Philippine Is Mindanao
<i>handschini</i> Hincks, 1954	—	West Sumba

* (This new name is proposed for *Psalis burri* Borelli, 1905)

<i>nigra</i> (Caudell, 1907)	—	West Indies
<i>peterseni</i> Ramamurthi, 1967	—	Philippine Is and Bismarck Is.
<i>serrata</i> Srivastava, 1976	—	Philippine Is Luzon
<i>solomonensis</i> Brindle, 1970	—	Solomon Guadalcanal and Papua New Guinea
<i>srivastavai</i> (Brindle, 1981)	—	Panama
<i>steinmanni</i> (Brindle, 1981)	—	Panama

***Ornatolabis* Steinmann, 1988**

Type-species *Ornatolabis externa* (Bey-Bienko, 1959)

List of Species

<i>externa</i> (Bey-Bienko, 1959)	—	China Yunnan
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***Canarilabis* Steinmann, 1985**

Type-species *Forficula (Forficesila) maxima* Brullé, 1838
in Webb & Berthelot

List of species

<i>maxima</i> (Brullé, 1838 in Webb & Berthelot)	—	Canary Isls, Maderia
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***Aborolabis* Srivastava, 1969**

Type-species *Anisolabis pervicina* Burr, 1913

List of species

<i>angulifera</i> (Dohrn, 1864)	—	From Spain to São Thombe
<i>cerrobarjai</i> Steinmann, 1979	—	Spain
<i>emarginata</i> Srivastava, 1974	—	India (Arunachal Pradesh & Meghalaya)
<i>kalaktangensis</i> Srivastava, 1972	—	India (Arunachal Pradesh & Sikkim)
<i>martensi</i> Brindle, 1987	—	Nepal

<i>mauritana</i> (Lucas, 1846)	—	Mauritania, Morocco, Algeria and Tunisia
<i>mordax</i> Steinmann, 1978	—	Tunisia, Spain
<i>nepalensis</i> (Brindle, 1974)	—	Nepal
<i>nigrescens</i> Brindle, 1987	—	Nepal
<i>pervicina</i> (Burr, 1913)	—	India (Arunachal Pradesh, Himachal Pradesh, West Bengal & Assam), Bhutan and Nepal
<i>rufocapitata</i> Steinmann, 1984	—	Algeria
<i>tanzanica</i> Steinmann, 1981	—	Tanzania
<i>vicina</i> (Burr, 1911)	—	Ethiopia

***Euborellia*, Burr, 1910**

(= *Borellia* Burr, 1909)

(= *Heterolabis* Borelli, 1912) — **Syn.nov.**

(= *Landex* Burr, 1915)

Type-species *Forficisila moesta* Gené, 1829

List of species

<i>abbreviata</i> Srivastava, 1977	—	India (Arunachal Pradesh)
<i>andreinii</i> (Borelli, 1908)	—	Ethiopia
<i>annandalei</i> (Burr, 1906)	—	India (W.B.)
<i>annulipes</i> (Lucas, 1837)	—	World wide
<i>aporonoma</i> (Borelli, 1909)	—	Hawaii
<i>armata</i> (Borelli, 1906)	—	Costa Rica & Brazil
<i>boliviana</i> Brindle, 1971	—	Bolivia
<i>brasiliensis</i> (Borelli, 1912)	—	Brazil
<i>burmensis</i> Srivastava, 1984	—	Myanmar (not Thailand), Rangoon
<i>cavaleriei</i> (Borelli, 1921)	—	South China
<i>caraibea</i> Hebard, 1921	—	Bahamas, Greater and Lesser Antilles

<i>cinticollis</i> (Gerstaecker, 1883)	—	West Africa & California
<i>compressa</i> (Borelli, 1907)	—	Mozambique, Uganda, South Rhodesia, Zaire, Congo Republic, India & Pakistan
<i>dattai</i> Srivastava, 1977	—	India Rajasthan
<i>dimitata</i> Brindle, 1978	—	Zaire
<i>eteronoma</i> (Borelli, 1909)	—	Hawaii
<i>feae</i> (Borelli, 1907)	—	West Africa
<i>femoralis</i> (Dohrn, 1863)	—	Oriental Region, U.S.A., Madagascar, New Guinea & Micronesia
<i>flavohumeralis</i> Brindle, 1978	—	Ivory Coast
<i>formosae</i> (Borelli, 1927)	—	Taiwan
<i>fulviceps</i> Borelli, 1921	—	Congo Republic, Zaire
<i>hispanica</i> Steinmann, 1981	—	Spain
<i>insulana</i> (Borelli, 1912)	—	Comoro Isls.
<i>ituriensis</i> Brindle, 1978	—	Zaire
<i>janeirensis</i> (Dohrn, 1864)	—	South America
<i>jeekeli</i> Srivastava, 1985	—	Australia Victoria
<i>kuekenthali</i> (Zacher, 1911)	—	Malaysia
<i>malgacha</i> Brindle, 1966	—	Madagascar
<i>manipurensis</i> Srivastava, 1979	—	India (Manipur)
<i>mexicana</i> Brindle, 1971	—	Mexico
<i>mindanoensis</i> Nom. n.* (= <i>Heterolabis punctata</i> Srivastava, 1978)		
(= <i>Epilabis</i> (<i>Epilabis</i>) <i>harlequin</i> Steinmann, 1979) - Syn.nov.	—	Philippine Isls. Mindanao
<i>moesta</i> (Gené, 1837)	—	South Europe to Central Africa
<i>mystica</i> (Steinmann, 1979)	—	Vietnam
<i>nitens</i> (Brindle, 1978)	—	Cameroon
<i>philippinensis</i> Srivastava, 1979	—	Philippine Isls.
<i>plebeja</i> (Dohrn, 1863) (= <i>E. kiangsuensis</i> Hincks, 1937)	—	World Wide

* New name for *Heterolabis punctata* Srivastava, 1978

<i>punctata</i> Borelli, 1927	—	China Nanking and Hong Kong
<i>rajasthanensis</i> Srivastava, 1977	—	India Rajasthan
<i>sakaii</i> Steinmann, 1978	—	Afghanistan
<i>sechuana</i> (Bey-Bienko, 1934)	—	China
<i>silvestrii</i> (Borelli, 1914)	—	Nigeria
(= <i>Gonolabis fiesta</i> Steinmann, 1989) - Syn. nov.		
<i>stali</i> (Dohrn, 1864)	—	World wide
<i>tellini</i> (Borelli, 1908)	—	Ethiopia
<i>truncata</i> Brindle, 1978	—	Uganda
<i>ugandana</i> Brindle, 1978	—	Uganda
<i>vanderbildti</i> Rehn, 1936	—	Guinea, Cameroon, Congo Republic, Zaire

Uncertain species

<i>ambigua</i> (Borelli, 1906)	—	USA, Cuba, Haiti, Dominica, Jamaica, Trinidad and Costa Rica
<i>flava</i> Steinmann, 1981	—	South Africa
<i>flavipes</i> Moreira, 1931	—	Brazil
<i>inermis</i> Moreira, 1931	—	Brazil
<i>maxima</i> Moreira, 1932	—	Brazil
(= <i>Euborellia tropica</i> Steinmann, 1989)		
<i>nigropicea</i> (Borelli, 1924)	—	Buru
<i>nitida</i> Moreira, 1932	—	Brazil
<i>peregrina</i> (Mjöberg, 1904)	—	Brazil & Guyanas
<i>tatei</i> Hebard, 1924	—	Ecuador

Mongolabis Zacher, 1911

(= *Gelotolabis* Zacher, 1911, p. 385)

(= *Cerolabis* Bey - Bienko, 1959)

(= *Paraflexiolabis* Steinmann, 1988)

Type-species *Gonolabis woodwardi* Burr, 1906 (Designated by Burr, 1911, *Genera Insect.*, **122** 34)

List of species

<i>affinis</i> Ramamurthi, 1973	—	Thailand
<i>bidens</i> (Steinmann, 1981)	—	New Guinea
<i>brunneri</i> (Dohrn, 1864)	—	Australia & Tasmania
<i>blanchardi</i> (Guillon, 1941)	—	Polynesia
<i>distincta</i> (Nishikawa, 1969)	—	Oiknawa
<i>fallax</i> (Bey-Bienko, 1959)	—	China Yunnan
<i>forcipata</i> (Burr, 1908)	—	West Australia
<i>gilesi</i> (Steinmann, 1981)	—	Australia
<i>hwangi</i> (Bey-Bienko, 1959)	—	China Yunnan
<i>infelix</i> (Burr, 1907)	—	Zambia, Malawi, North Mozambique, Tanzania
<i>insidiata</i> (Steinmann, 1979)	—	Vietnam
<i>magna</i> (Bey-Bienko, 1959)	—	China Yunnan
<i>ornata</i> (Steinmann, 1989)	—	Hawaii
<i>pacifica</i> (Erichson, 1842) (= <i>Anisolabis perkinsi</i> Kirby, 1910)	—	Australia, Polynesia, Sandwich Islands, Hawaii
<i>panfilovi</i> (Bey-Bienko, 1959)	—	China Yunnan
<i>punctulata</i> (Brindle, 1978)	—	Zaire
<i>quarens</i> (Burr, 1915)	—	Congo Republic, Cameroon, Togo, Nigeria, Equatorial Guinea
<i>scorpio</i> (Steinmann, 1985)	—	New Guinea
<i>straeleni</i> (Hincks, 1955)	—	Congo Republic, Zaire
<i>tanganyikae</i> (Brindle, 1964)	—	Tanzania
<i>tasmanica</i> (Bormans, 1880)	—	Tasmania and South Australia
<i>undata</i> (Bey-Bienko, 1959)	—	China Yunnan and Szechwan
<i>uruguayensis</i> (Brindle, 1971)	—	Uruguay & Chile
<i>vallakadaiensis</i> (Ramamurthi and David, 1973)	—	South India
<i>woodwardi</i> (Burr, 1908)	—	West Australia & Japan

Anisolabella Zacher, 1911

(= *Horridolabis* Zacher, 1911)

(= *Paralabis* Burr, 1915)

Type-species *Anisolabella braueri* Zacher, 1911

List of species

<i>acutiventr</i> (Hincks, 1954)	—	Guinea, Sierra Leone, Ivory Coast
<i>antoni</i> (Dohrn, 1864)	—	Central South America
<i>bintumanensis</i> (Brindle, 1971)	—	Sierra Leone
<i>braueri</i> Zacher, 1911	—	North East Africa
<i>brindlei</i> (Capra, 1978)	—	Perim Island (Red Sea)
<i>burri</i> (Zacher, 1911)	—	Ethiopia, Egypt, Somalia
<i>carinatus</i> (Srivastava, 1987)	—	India N.E.
<i>cristata</i> (Hincks, 1954)	—	Guinea
<i>denticulatus</i> (Srivastava, 1987)	—	India Arunachal Pradesh
<i>deserta</i> Steinmann, 1981	—	Tanzania
<i>dohrni</i> (Kirby, 1891)	—	Sri Lanka and India
(= <i>Psalis lefroyi</i> Burr, 1910)		
(= <i>Paralabis antennata</i> Ramamurthi & David, 1973)		
<i>incisa</i> (Borelli, 1914)	—	Guinea, Liberia, Sierra Leone, Mauritania
<i>incisoides</i> (Brindle, 1978)	—	Zaire
<i>felix felix</i> (Burr, 1907)	—	Tanzania
<i>felix chyluensis</i> (Brindle, 1978)	—	Kenya
<i>felix elgonensis</i> (Brindle, 1978)	—	Uganda
<i>felix meruensis</i> (Brindle, 1978)	—	Tanzania
<i>greeni</i> (Burr, 1899)	—	Sri Lanka and India
<i>hincksi</i> (Brindle, 1964)	—	Kenya
<i>laevigata</i> (Brindle, 1978)	—	Guinea

<i>lamottei</i> (Brindle, 1971)	—	Sierra Leone
<i>marginalis</i> (Dohrn, 1864)	—	East Asia, Japan to Java
<i>montshadskii</i> (Bey-Bienko, 1959)	—	China (South) & India
<i>nandii</i> (Srivastava, 1987)	—	India (South)
<i>nigeriensis</i> (Brindle, 1978)	—	Nigeria
<i>oweni</i> (Burr, 1911)	—	West Africa
<i>paradoxura</i> (Zacher, 1911)	—	Kenya
<i>porrectella</i> (Brindle, 1978)	—	Zaire
<i>puella</i> (Steinmann, 1978)	—	Ghana
<i>purpurea</i> (Borelli, 1921)	—	Congo Republic, Zaire
<i>quadricollis</i> (Hincks, 1954)	—	Guinea, Liberia, Sierra Leone, Togo, Ghana
<i>royi</i> (Brindle, 1971)	—	Sierra Leone
<i>rugosa</i> (Brindle, 1971)	—	Sierra Leone
<i>ryukyuensis</i> (Nishikawa, 1969)	—	Okinawa
<i>sinuata</i> (Brindle, 1978)	—	Zaire
<i>splendida</i> (Steinmann, 1978)	—	Congo Republic
<i>transversalis</i> (Brindle, 1978)	—	Cameroon
<i>umbrosa</i> (Brindle, 1964)	—	Tanzania

***Gonolabis* Burr, 1900**

(= *Epilabis* Burr, 1915)

(= *Foramenolabis* Steinmann, 1981)

Type-species *Anisolabis javana* Bormans, 1883

List of species

<i>acuta</i> Boeseman, 1954	—	Java and Bali
<i>afghana</i> (Steinmann, 1981)	—	Afghanistan
<i>analis</i> (Ramamurthi & David, 1973)	—	South India
<i>burri</i> (Srivastava, 1970)	—	India (Maharashtra)

<i>darevskyi</i> Bey-Bienko, 1965	—	South China
<i>dentata</i> Steinmann, 1981	—	Australia
<i>electa</i> Burr, 1910	—	Sri Lanka; Adventive in Africa
<i>emarginata</i> (Ramamurthi & David, 1973)	—	South India
<i>insulana</i> (Brindle, 1972)	—	Caroline Islands
<i>javana</i> (Bormans, 1883) (= <i>Gonolabis sumatrana</i> Bormans, 1900)	—	Malaysia, Indonesia and New Guinea
<i>nilgiriensis</i> (Srivastava, 1978)	—	South India
<i>penicellata</i> (Borelli, 1911)	—	South India
<i>punctata</i> (Srivastava, 1978)	—	South India
<i>sisera</i> (Burr, 1910)	—	South India

Uncertain species

<i>minor</i> Borelli, 1926	—	Malabar, Java, Sunda Isls & Philippines Islands
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Flexiolabis Steinmann, 1988

Type-species *Anisolabis uncinata* Brindle, 1978

List of species

<i>hamata</i> (Brindle, 1978)	—	Ethiopia
<i>uncinata</i> (Brindle, 1978)	—	Zaire

Indolabis Steinmann, 1988

Type-species *Indolabis papua* Steinmann, 1988

List of species

<i>papua</i> Steinmann, 1988	—	Papua, New Guinea
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Apolabis Burr, 1915

(= *Eulabis* Zacher, 1911)

(= *Thekalabis* Kapoor, 1967)

(= *Zacheria* Steinmann, 1975)

Type-species : *Forcinella hottentota* Dohrn, 1867

List of species

<i>aborensis</i> (Burr, 1913)	—	N.E. India
<i>bifida</i> (Brindle, 1970)	—	Soloman Islands
<i>castetsi</i> (Bormans, 1897)	—	South India
<i>cunicula</i> Brindle, 1978	—	Nigeria
<i>dentata</i> (Burr, 1908)	—	West Australia
<i>picea</i> (Borelli, 1907) (= <i>Anisolabis duplicata</i> Steinmann, 1988)	—	Ethiopia, Uganda and Cameroon
<i>elongata</i> (Brindle, 1978)	—	Cameroon
<i>genitalis</i> (Kapoor, 1967)	—	South India
<i>hottentota</i> (Dohrn, 1867)	—	West and South Africa
<i>percheroni</i> (Guérin & Percheron, 1838)	—	South and Central America, U.S.A. Massachusetts)
<i>peruviana</i> (Bormans, 1880)	—	Peru
<i>polita</i> (Zacher, 1911)	—	Unknown
<i>ramachandrai</i> (Ramamurthi & David, 1973)—		South India
<i>spatula</i> (Brindle, 1978)	—	Cameroon
<i>spitzi</i> (Menozzi, 1932)	—	Brazil and Suriname
<i>tumida</i> (Borelli, 1907)	—	Equatorial Guinea Bioko; Cameroon; Gango Republic

Anisolabis Fieber, 1853

(= *Forcinella* Dohrn, 1862)

(= *Labidurodes* Dubrony, 1879)

(= *Logicolabis* Zacher, 1911)

(= *Spondox* Burr, 1914)

Type-species *Forficula maritima* Bonelli in Gené, 1832- (Designated by Scudder, 1876, *Proc. Boston Soc. nat. Hist.*, **18** 289)

List of species

<i>americana</i> (Palisot de Beauvois, 1817)	—	West Indies, Cuba, Jamaica, Dominica, Haiti, Puerto Rico, Hispaniola, Guatemala, Nicaragua, Costa Rica, Panama, Ecuador, Venezuela, Colombia & Peru (? Canada)
<i>australis</i> Tindale, 1923	—	South Australia
<i>balogahi</i> Steinmann, 1979	—	New Guinea
<i>brasiliensis</i> (Brindle, 1979)	—	Brazil
<i>caesarea</i> (Zacher, 1911)	—	Tanzania
<i>canaca</i> Brindle, 1976	—	New Caledonia
<i>carinata</i> (Brindle, 1968)	—	Suriname
<i>ecarinata</i> (Brindle, 1968)	—	Suriname
<i>excisa</i> Bey-Bienko, 1959	—	China Yunnan
<i>horvathi</i> Burr, 1912	—	New Guinea
<i>kristenseni</i> Burr, 1911	—	Ethiopia
<i>kudagae</i> Burr, 1901	—	Sri Lanka & ? India
<i>littorea</i> (White, 1846)	—	New Zealand, Tasmania, Sandwich Islands, Great Barrier Reef
<i>maritima</i> (Bonelli, 1832)	—	World-wide
<i>minutissima</i> Brindle, 1972	—	West Caroline Islands
<i>modesta</i> Steinmann, 1979	—	New Guinea
<i>neavei</i> Brindle, 1978	—	Tanzania
<i>nigrofusca</i> Steinmann, 1979	—	Australia New South Wales
<i>nimbaensis</i> Hincks, 1954	—	Guinea, Ivory Coast and Liberia
<i>perissa</i> Günther, 1929	—	New Guinea
<i>pilosa</i> Steinmann, 1979	—	New Guinea
<i>robusta</i> (Dubrony, 1879)	—	Mayanmar & New Guinea

(= *Labidurodes egregius* Günther, 1929)

<i>rostrata</i> Brindle, 1978	—	Zaire
<i>rougemonti</i> Brindle, 1978	—	Ethiopia
<i>rubella</i> Brindle, 1977	—	Sri Lanka
<i>rufescens</i> Kirby, 1891	—	West Africa
<i>saramaccensis</i> (Zacher, 1911)	—	Panama, Trinidad and Suriname
<i>sarasini</i> (Burr, 1914)	—	New Calendonia
<i>scotti</i> Brindle, 1978	—	Ethiopia
<i>silvestrii</i> Borelli, 1914	—	Nigeria
(= <i>Gonolabis fiesta</i> Steinmann, 1989)		
<i>simiensis</i> Brindle, 1978	—	Ethiopia
<i>turgida</i> Burr, 1911	—	Cameroon
<i>verhoeffi</i> Zacher, 1911	—	Bismarck Archipelago, New Hebrides
<i>vosseleri</i> Burr, 1907	—	Tanzania
<i>westralica</i> Burr, 1906	—	West Australia
<i>whellani</i> Brindle, 1978	—	Malawi

Uncertain species

<i>atra</i> Borelli, 1907	—	West Africa
<i>deplanata</i> Rehn, 1932	—	Guyanas and Brazil
<i>dubronyi</i> Kirby, 1888	—	Myanmar
(= <i>Anisolabis laeta</i> Bormans, 1888)		
<i>flavocapitata</i> Steinmann, 1979	—	Australia
<i>gaudens</i> Burr, 1904	—	India and Bhutan
<i>gestri</i> Borelli, 1907	—	Cameroon
<i>pectoralis</i> (Eschscholtz, 1822)	—	U.S.S.R. Kamchatka
<i>penetrans</i> Burr, 1912	—	Indonesia Comoro Islands
<i>pluto</i> Rehn, 1906	—	Liberia
<i>recurva</i> Borelli, 1915	—	Phillippine Islands Luzon
<i>subarmata</i> (Kirby, 1900)	—	Christmas Islands

<i>tegminata</i> Caudell, 1927	—	Fiji
<i>vitalisi</i> Burr, 1917	—	Vietnam and South China

***Carcinophora* Scudder, 1876**

(= *Psalis* Serville, 1831)
 (= *Metalabis* Burr, 1915)
 (= *Mandex* Burr, 1915)
 (= *Spandex* Burr, 1915)
 (= *Notolabis* Hincks, 1954)
 (= *Neolabis* Brindle, 1981)

Type-species *Chelidura robusta* Scudder, 1869

List of species

<i>brasiliensis</i> (Brindle, 1979)	—	Brazil
<i>campbelli</i> (Brindle, 1981)	—	Ecuador
<i>festae</i> (Borelli, 1904)	—	Ecuador
<i>gagatina</i> (Klug, 1838)	—	South and Central America
<i>isomorpha</i> (Borelli, 1907)	—	Gambia, Guinea-Bissau, Liberia, Togo, Cameroon
<i>jeanneli</i> (Menozzi, 1938)	—	East Africa
<i>kawakamii</i> (Shiraki, 1928)	—	Taiwan
<i>kirbyi</i> (Burr, 1897)	—	Java
<i>occidentalis</i> (Kirby, 1896)	—	West Australia
<i>rosenbergi</i> (Burr, 1899)	—	Ecuador and Colombia
<i>venezuelica</i> Brindle, 1968	—	Venezuela
<i>venusta</i> Steinmann, 1989	—	Australia

Uncertain species

<i>apolinari</i> (Hebard, 1919)	—	Colombia
<i>boesemani</i> Steinmann, 1981	—	Suriname
<i>brasiliensis</i> (Moreira, 1931)	—	Brazil
<i>haenschi</i> (Burr, 1912)	—	Ecuador
<i>minima</i> (Moreira, 1931)	—	Brazil

<i>scudderi</i> (Bormans, 1900)	—	Paraguay, Brazil, Peru, Bolivia and Guyanas
<i>waddyi</i> Burr, 1904	—	Martinique

BRACHYLABIDINAE Burr, 1908

Type-genus *Brachylabia* Dohrn, 1864*Metisolabis* Burr, 1910Type-species *Brachylabis voltzkowi* Burr, 1908, (Designated by Kirby, 1891, *J. Linn. Soc. (Zool)*, **23** 518).

List of species

<i>bifoveolata</i> (Bolivar, 1897)	—	India (South)
<i>caudelli</i> (Burr, 1908) (= <i>Ctenisolabis aciculata</i> Steinmann 1983) (= <i>Ctenisolabis loebli</i> Steinmann, 1983)	—	India W.B. (Darjeeling dist.) and Meghalaya (Shillong)
<i>fulgens</i> Steinmann, 1988	—	Myanmar
<i>malgacha</i> (Burr, 1904)	—	Madagascar
<i>milloti</i> (Hincks, 1953)	—	Madagascar
<i>punctata</i> (Dubrony, 1879)	—	Oriental Region
<i>submetallica</i> (Brindle, 1966)	—	Zaire, Zambia, Burundi and Rhodesia
<i>voltzkowi</i> (Burr, 1908)	—	Madagascar

Ctenisolabis Verhoeff, 1902Type-species : *Ctenisolabis togoensis* Verhoeff, 1902

List of species

<i>fletcheri</i> Burr, 1910	—	India (South) and Sri Lanka
<i>mahunkai</i> Steinmann, 1978	—	Paraguay
<i>montana</i> (Borelli, 1909)	—	Costa Rica
<i>nigra</i> (Scudder, 1876)	—	Costa Rica, Guatemala, Paraguay, Bolivia and Brazil
<i>pusilla</i> Steinmann, 1978	—	South Africa

<i>ruficollis</i> (Hincks, 1957)	—	South Africa
<i>togoensis</i> Verhoeff, 1902	—	South Africa and ? French Guinea, Togo
<i>traegaordhi</i> (Burr, 1913)	—	Natal

***Brachylabis* Dohrn, 1864**

(= *Nannisolabis* Burr, 1910)

Type-species *Forficula chilensis* Blanchard, 1851

List of species

<i>canaca</i> Burr, 1914	—	New Caledonia
<i>carinata</i> (Brindle, 1978)	—	Rhodesia
<i>collinsi</i> Brindle, 1980	—	Borneo
<i>coriacea</i> Burr, 1910	—	Brazil
<i>fuscula</i> Brindle, 1970	—	Gabon
<i>hincksi</i> (Srivastava, 1981)	—	Myanmar
<i>lenkoi</i> Brindle, 1968	—	Brazil
<i>manawatawhi</i> Giles, 1958	—	New Zealand
<i>philetas</i> Burr, 1901	—	Sri Lanka
<i>punctulata</i> (Moreira, 1931)	—	Brazil
<i>willeyi</i> (Burr, 1910)	—	Sri Lanka
<i>yaloma</i> Ramamurthi, 1967	—	Bismark Islands

ISOLABIDINAE Verhoeff, 1902

Type-genus *Isolabis* Verhoeff, 1902

***Pterolabis* Steinmann, 1989**

Type-species *Pseudovostox villiersi* Brindle, 1968

List of species

<i>villiersi</i> (Brindle, 1968)	—	Congo Republic, Gabon
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***Isolabis* Verhoeff, 1902**

(= *Leptisolabis* Verhoeff, 1902)

(= *Verhoeffia* Burr, 1908)

(= *Arlex* Burr, 1910)

Type-species *Isolabis braueri* Verhoeff, 1902

List of species

<i>attenuata</i> Brindle, 1978	—	Nigeria
<i>bicolor</i> (Brindle, 1975)	—	Tanzania
<i>braueri</i> Verhoeff, 1902	—	West Africa
<i>cavagnaroi</i> Brindle, 1987	—	Australia New South Wales
<i>coiffaiti</i> (Brindle, 1970)	—	Gabon
<i>frater</i> Steinmann, 1986	—	Venezuela
<i>grandicollis</i> (Hincks, 1954)	—	West Africa
<i>ocellata</i> Srivastava, 1978	—	Myanmar
<i>pauliani</i> (Hincks, 1953)	—	Madagascar
<i>proxima</i> (Brindle, 1966)	—	Ruanda-Burundi, Tanzania, Zaire
<i>quadrata</i> (Brindle, 1966)	—	Zaire
<i>rufa</i> (Brindle, 1966)	—	Tanzania
<i>schoutedeni</i> Hicks, 1954	—	Zaire & Congo Republic
<i>transversa</i> Brindle, 1978	—	Zaire
<i>unicolor</i> (Brindle, 1975)	—	East Africa
<i>usumbarana</i> (Verheoff, 1902)	—	Tanzania, Kenya, Angola, Zaire

Uncertain species

<i>howardi</i> (Burr, 1907)	—	Costa Rica, Guatemala, Panama
<i>sjoestedti</i> (Borg, 1904)	—	Cameroon, Equatorial Guinea

***Geracodes*, Hebard, 1917**Type-species *Geracodes litus* Hebard, 1917**List of species**

<i>aptera</i> Brindle, 1978	—	New Guinea
<i>laboides</i> Hincks, 1952	—	West Africa
<i>litus</i> Hebard, 1917	—	Panama
<i>paraguayensis</i> Borelli, 1932	—	Paraguay

***Africolabis*, Brindle, 1978**Type-species *Africolabis pseudohumicola* Brindle, 1978**List of species**

<i>humicola</i> (Brindle, 1966)	—	Zaire
<i>pseudohumicola</i> Brindle, 1978	—	Zaire

ANTISOLABIDINAE, Brindle, 1978Type-genus *Antisolabis* Burr, 1911***Antisolabis*, Burr, 1911**Type-species *Antisolabis myrmecoides* Burr, 1911**List of species**

<i>allardi</i> (Brindle, 1971)	—	Hispaniola
<i>arripiens</i> Burr, 1914	—	New Caledonia
<i>ceylonica</i> (Brindle, 1977)	—	Sri Lanka
<i>forficula</i> (Burr, 1914)	—	New Caledonia
<i>fusca</i> (Brindle, 1966)	—	Tanzania
<i>gisleni</i> (Hincks, 1954)	—	West Australia
<i>greensladei</i> (Brindle, 1970)	—	Soloman Islands
<i>kelangi</i> (Brindle, 1969)	—	From Sri Lanka to West Malaysia
<i>meridionalis</i> (Brindle, 1978)	—	Cape Province

<i>minima</i> (Brindle, 1966)	—	Tanzania
<i>myrmecoides</i> Burr, 1911	—	South Africa
<i>neuter</i> Steinmann, 1987	—	Venezuela
<i>notabilis</i> Steinmann, 1981	—	New Zealand
<i>notonoma</i> Hincks, 1952	—	Australia New South Wales
<i>rouxi</i> Burr, 1914	—	New Caledonia
<i>rouxioides</i> (Brindle, 1976)	—	New Caledonia
<i>rugosa</i> (Brindle, 1966)	—	Tanzania
<i>scotti</i> (Burr, 1910)	—	Seychelles
<i>seychellensis</i> (Brindle, 1976)	—	Seychelles
<i>solitaria</i> Steinmann, 1988	—	New Guinea
<i>sulcatipes</i> (Burr, 1911)	—	South Africa
<i>transiens</i> Burr, 1914	—	New Caledonia

Uncertain species

<i>camerunensis</i> (Borelli, 1914)	—	Cameroon
<i>cordata</i> (Brindle, 1976)	—	New Hebrides
<i>dammermani</i> (Borelli, 1926)	—	Java
<i>fijica</i> Steinmann, 1988	—	Fiji
<i>formicoides</i> (Burr, 1911)	—	South India
<i>geniculata</i> (Montrouzier, 1864)	—	New Calendoncia
<i>holdhausi</i> (Burr, 1910)	—	Australia Queensland
<i>javana</i> (Boeseman, 1954)	—	Java
<i>tongaica</i> Steinmann, 1988	—	Tonga
<i>venusta</i> Steinmann, 1988	—	New Guinea

PARISOLABIDINAE, Verhoeff, 1904

Type-genus *Parisolabis* Verhoeff, 1904

***Parisolabis* Verhoeff, 1904**

(= *Pseudisolabis* Burr, 1908)

Type-species *Parisolabis novaezeelandiae* Verhoeff, 1904

List of species

<i>boulderensis</i> Hudson, 1973	—	New Zealand
<i>forsteri</i> Hudson, 1973	—	New Zealand
<i>iti</i> Hudson, 1973	—	New Zealand
<i>johnsi</i> Hudson, 1973	—	New Zealand
<i>nelsonensis</i> Hudson, 1973	—	New Zealand
<i>novaezeelandiae</i> Verhoeff, 1904	—	New Zealand
<i>renschii</i> (Günther, 1932)	—	Java
<i>setosa</i> Hudson, 1973	—	New Zealand
<i>tapanuiensis</i> Hudson, 1973	—	New Zealand

***Parisopsalis*, Burr, 1914**

Type-species *Parisopsalis spryi* Burr, 1914

List of species

<i>spryi</i> Burr, 1914	—	Australia
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IDOLOPSALIDINAE, Steinmann, 1975

Type-genus *Idolopsalis* Borelli, 1910

***Idolopsalis*, Borelli, 1910**

Type-species *Idolopsalis riveti* Borelli, 1910

List of species

<i>andeana</i> Burr, 1914	—	Ecuador
<i>azteca</i> (Dohrn, 1862)	—	From Mexico to Peru and Paraguay
<i>boargmeieri</i> Menozzsi, 1932	—	Brazil
<i>curta</i> Brindle, 1971	—	Ecuador

<i>gracilis</i> Brindle, 1966	—	Ecuador
<i>incerta</i> (Bormans, in Burr, 1903)	—	Ecuador
<i>koepcke</i> Brindle, 1966	—	Peru
<i>nigrita</i> Brindle, 1971	—	Brazil
<i>parva</i> Brindle, 1971	—	Brazil
<i>riveti</i> Borelli, 1910	—	Ecuador and Peru
<i>whymperi</i> Burr, 1914	—	Ecuador

ISOLABOIDINAE Brindle, 1978

Type-genus *Isolaboides* Hincks, 1958

Isolaboides Hincks, 1958

(= *Paralaboides* Steinmann, 1990)

Type-species *Pseudisolabis kosswigi* Burr, 1947

List of species

<i>burri</i> (Borelli, 1909)	—	India (Kashmir) & Pakistan (Mountain Region)
<i>immsi</i> (Burr, 1913)	—	India (Himachal Pradesh)
(= <i>Pseudisolabis jonathani</i> Kapoor & Katiyar, 1971)		
(= <i>Pseudisolabis santokhi</i> Kapoor & Katiyar, 1971)		
<i>rimosus</i> Steinmann, 1983	—	India (Garhwal Hills)

Uncertain species

<i>elegans</i> (Hebard, 1917)	—	India (Himachal Pradesh)
<i>tenera</i> (Burr, 1910)	—	Pakistan (Punjab Muree)

SUMMARY

The higher classification of Anisolabididae alongwith a key to subfamilies and a check-list of species is given. Besides, a key to various genera of Anisolabidinae is also provided. A new subfamily Placolabidinae is proposed for *Placolabis* Bey-Bienko. Several genera and

species, namely, *Capralabis* Brindle, *Neolabis* Brindle, *Foramenolabis* Steinmann, *Paraflexiolabis* Steinmann and *Heterolabis* Borelli and *Epilabis harlequin* Steinmann and *Gonolabis fiesta* Steinmann are synonymised. *Epilandex borellii* and *Euborellia mindanoensis* are proposed as new names for *Psalis burri* Borelli, 1905 and *Heterolabis punctata* Srivastava, 1978.

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BATS OF THE SIJU CAVE, SOUTH GARO HILLS DISTRICT, MEGHALAYA, INDIA : TAXONOMY AND BIONOMICS

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INTRODUCTION

The Siju Cave, in Meghalaya, is situated in a cliff on the right bank of the Someswari river, between the villages of upper and lower Siju (25°21'N and 90°41'E). The exact area of the cave is yet to be ascertained. It is about 25.9 metres above the level of the river, in dry season and approximately 289.7 metres above the mean sea-level. A good description of the topography of the Siju cave is available (Kemp 1924 a).

The entrance of the cave measures 106.7 m long, 8.5 to 10.7 m broad and 6.7 to 7.6 m in height. The floor is nearly horizontal with an underground water-course running through it. Day-light enters about 45.7 m inside. Between 45.7 m to 106.7 m inside is the region of twilight, and beyond 106.7 m is total darkness. A cavern, the habitat of the fruit bats begins at the end of the entrance. Unavailability of necessary equipments did not allow any further entry inside.

Three species of bats from the Siju cave, viz. *Cynopterus sphinx gangeticus* Andersen, *Rhinolophus subbadius* Blyth and *Hipposideros lankadiva* Kelaart have already been reported (Kemp 1924 b, Kurup 1968).

During November, 1990, June-July and October, 1991, February, June and August, 1992, 413 examples comprising six species of bats (including suckling young ones) were collected from the Siju cave and a nearby garden.

The following species of bats were collected :-

Rousettus l. leschenaulti (Desmarest), *Eonycteris spelaea* (Dobson), *Cynopterus s. sphinx* (Vahl), *Hipposideros lankadiva* Kelaart, *Myotis longipes* Dobson, *Miniopterus schreibersi fuliginosus* (Hodgson).

Cynopterus s. sphinx was collected only from the garden, while other species were netted from the cave itself. Additional species of bats collected by others from the Siju Cave have also been incorporated. Name of the collector for specimens collected by the author has not been given.

Rhinolophus subbadius Blyth, *Rhinolophus pusillus blythi* Andersen and *Kerivoula hardwickei* (Horsfield) were not found in and around the cave, but noted here on the basis of a single specimen of *Kerivoula hardwickei* available in ERS., Shillong and one each of *Rhinolophus blythi* and *Rhinolophus subbadius* studied in ZSI., Calcutta.

In the present paper, taxonomy and distribution of the above nine species of bats from the Siju Cave and environs were studied. Also bionomics of the six species of bats collected has been discussed. A key to identification, diagnosis, distribution, bio-taxonomic observation of each species and a general discussion have been provided. All measurements are taken in millimetres and the figures in parentheses refer to arithmetic mean values.

The following abbreviations have been used in the text :

<i>ad.</i>	Adult.
<i>App.</i>	Approximate.
$c-m^1$ or $c-m^2$ or $c-m^3$	Length of upper tooth row.
$c-m_2$ or $c-m_3$	Length of lower tooth row.
<i>CR.</i>	Length of cranial rostrum.
<i>cw.</i>	Width of brain case.
<i>db.</i>	Depth of brain case
<i>E.</i>	Length of ear.
<i>ERS.</i>	Eastern Regional Station, Zoological Survey of India.
<i>ex.</i>	Example
<i>f.</i>	Length of forearm.
<i>ft.</i>	Length of foot including claws.
<i>HB.</i>	Length of head and body.
<i>hbc.</i>	Height of brain-case.
<i>iof.</i>	Infraorbital foramen
<i>iow.</i>	Interorbital width.
<i>hm.</i>	Height of muzzle.
<i>l</i>	Total length of skull.
<i>ml.</i>	: Length of mandible
m^1-m^1	Maxillary width in fruit bats. Rostral width in <i>Hipposideros</i>
m^3-m^3	Maxillary width in insectivorous bats.
<i>mw.</i>	Mastoid width.
<i>pen.</i>	: Length of penis.
<i>Subad.</i>	Subadult
<i>Suck. y.</i>	Suckling young

<i>t.</i>	Length of tibia
<i>Tl.</i>	: Length of tail
<i>Tr.</i>	Length of tragus
<i>ws.</i>	Wing span
<i>ww.</i>	Width of wings.
<i>ZSI, Cal</i>	Zoological Survey of India, Calcutta.
<i>zw.</i>	: Zygomatic width.
<i>III'</i>	: First phalanx of third finger.
<i>IIF</i>	Second phalanx of third finger.

KEY TO THE BATS OF THE SIJU CAVE AND ENVIRONS

1. Tragus and nose-leaf both absent.....2
 Either tragus or nose-leaf absent.....4
2. Second finger without claw.....*Eonycteris spelaea*
 Second finger with claw.....3
3. Margin of ear white.....*Cynopterus sphinx sphinx*
 Margin of ear not white.....*Rousettus l. leschenaulti*
4. Nose-leaf present, tragus absent.....5
 Nose-leaf absent, tragus present.....7
5. Larger (forearm more than 80.0 mm).....*Hipposideros lankadiva*
 Smaller (forearm less than 42.0 mm).....6
6. Upper tooth-row less than 6.0 mm.....*Rhinolophus pusillus blythi*
 Upper tooth-row more than 6.0 mm.....*Rhinolophus subbadius*
7. Ear funnel-shaped*Kerivoula hardwickei*
 Ear not funnel-shaped..... 8
8. Second phalanx of third finger nearly three times as long as first.....
*Miniopterus schreibersi fuliginosus*
 Second phalanx of third finger not elongated.....*Myotis longipes*

TAXONOMY AND BIONOMICS

Suborder MEGACHIROPTERA

Family I. PTEROPODIDAE

Genus (1) *Rousettus* Gray1 *Rousettus leachenaulti leachenaulti* (Desmarest)

1820. *Pteropus leachenaulti* Desmarest, *Encycl. Meth Mammal.*, 1 : 110 (Environments of Pondichery, India)

Common name Indian Fulvous Fruit Bat (English).

Material examined: 11 (Ms) (*ad.*), 2 (Ms) (*Subad.*), 1 (M) (*Suck.y.*), 20 (Fs) (*ad.*), 16-19 Feb 1992; 1 (F) (*ad.*), G. M. Yazdani, 21 Feb 1971; 3 (Ms) (*ad.*), 7 (Fs) (*ad.*), A. s. Rajgopal, 5 Mar 1965; 1 (F) (*ad.*), C. B. Srivastava, May 1961; 4 (Ms) (*ad.*), 1 (M) (*Suck.y.*), 14 (Fs) (*ad.*), 2 (Fs) (*Suck.y.*), 3-5 Jun 1992; 3 (Ms) (*ad.*), 3 (Fs) (*ad.*), 27-28 Jun 1991, 7 (Ms) (*ad.*), 21 (Ms) (*Suck.y.*), 41 (Fs) (*ad.*), 14 (Fs) (*Suck.y.*), 7-9 Aug 1992; 11 (Ms) (*ad.*), 4 (Ms) (*Subad.*), 1 (M) (*Suck.y.*), 16 (Fs) (*ad.*), 1 (F) (*Subad.*), 23-26 Oct 1991; 2 (Ms) (*ad.*), 4 (Ms) (*Subad.*), 1 (M) (*Suck.y.*), 1 (F) (*ad.*), 1 (F) (*Subad.*), 1 (M) (*Suck.y.*), 20-23 Nov. 1990.

Measurements External 39 (Ms) (*ad.*) *HB.* 100.0-130.0 (118.0); *E.* 19.0-21.0 (20.0); *TL.* 13.0-21.0 (17.1); *f.* 77.0-90.0 (85.2); *t.* 33.0-43.0 (39.2); *ft.* 17.0-24.0 (21.0); *ws.* 420.0-500.0 (455.0); *ww.* 90.0-117.0 (105.0). 105 (Fs) (*ad.*) *HB.* 95.0-135.0 (110.0); *E.* 17.0-21.0 (20.0); *TL.* 11.0-18.0 (15.0); *f.* 68.0-85.0 (80.0); *t.* 29.0-39.0 (35.0); *ft.* 15.0-24.0 (20.0); *ws.* 410.0-490.0 (435.0); *ww.* 87.0-113.0 (98.0). Skull 5 (Ms) (*ad.*) *l.* 36.0-38.0 (37.4); *zw.* 22.5-24.0 (23.2); *cw.* 15.5-16.5 (15.9); *m'-m'* 11.5-12.0 (11.9); *c-m'* 14.0-14.5 (14.3); *c-m*, 15.0-16.0 (15.6); *ml.* 28.5-30.0 (29.1). 6 (Fs) *l.* 36.5-38.0 (36.9); *zw.* 22.0-23.0 (22.4); *cw.* 15.0-16.0 (15.4); *m'-m'* 10.5-11.4 (10.9); *c-m'* 13.3-14.0 (13.7); *c-m*, 14.7-16.5 (15.3); *ml.* 28.5-30.0 (28.0).

Diagnosis: Size medium (forearm 68.9-90.0), muzzle long and eyes large; tail very small (length 11.0-21.0) and rod-like, ear with a notch at the lower edge; last lower molar elliptical.

Dental formula $i \frac{2}{2}, c \frac{1}{1}, pm \frac{3}{3}, m \frac{2}{3} = 34.$

Distribution INDIA Jammu and Kashmir (Chakraborty, 1983), Himachal Pradesh, Sikkim, Meghalaya, Nagaland, Assam, Arunachal Pradesh, Tripura, West Bengal, Bihar, Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Goa, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Orissa. PAKISTAN, SRI LANKA, NEPAL, BHUTAN, MYANMAR (=BURMA), SOUTHERN CHINA including Tibet, HONGKONG, THAILAND, LAOS, possibly CAMBODIA, VIETNAM.

Remarks: In one of the specimens the lower portion of wing membrane between the third and fourth digits is completely white like the condition observed by Sinha (1994) in one specimen of *Miniopterus achreibersi fuliginosus* (Hodgson) from the same cave.

Females are smaller than males as reported by Khajuria (1979) for Madhya Pradesh population and by Sinha (1980, 1986) for Rajasthan and Bihar populations respectively.

The collection of the present species consists of individuals of different age groups. Possession of scrotal testes was considered as adult hood for male while the female was diagnosed as adult on the basis of discernible teats. Adult males collected in February, have forearm length 77.0 to 85.0 and females 72.0 to 80.0, in March, males have 82.0 to 83.0 and females 76.0 to 81.0, in May, male has 83.0 and females 71.0 to 80.0, in June, males have 79.0 to 89.0 and females 78.0 to 84.0, in August, males have 81.0 to 85.0 and females 72.0 to 80.0, in October, males have 80.0-90.0 and females 68.0 to 83.0 and in November, males have 77.0 to 81.0 and females 69.0 to 85.0.

Biology : Adult males collected in February, March, May, June, August, October and November had enlarged testes, scrotal in position and the glans penis exposed. Copulating pairs were observed during all these months. Males became aggressively possessive of females roosting near them. After copulation, males flew away for a few seconds and came back to the same cluster and copulated with some other female. Young adult females were found involved with older males also. Multiparous specimens had well developed teats whereas the primiparae possessed only spot in lieu of the usual teat. One young is born at a time.

Females in February had embryos (size 3.0 to 32.0) in the left horn of uterus, while in March, in the right horn (size 28.0 to 30.0), in May, in right horn (size 30.0), in June either in left or in right horn (size ranging from 21.0 to 32.0). Suckling youngs were collected in June and August (forearm 42.0 to 66.0). All of them had coagulated milk in their gut. The sex ratio of young ones in the collection was found to be 60% males and 40% females. All the females collected in November were subadult having only a spot in lieu of a teat. Suckling youngs were found in almost all the visiting months. Sinha (1981) found suckling young in September in Gujarat and Brosset (1962a) in March, April, May and August in central and western India.

It would, therefore, appear that copulation takes place in *R. l. leschenaulti* in the Siju Cave throughout the year. Gopalakrishna (1969) reported a gestation period of 125 days in the Aurangabad population. This indicates that the peak of copulation is probably in last week of December (maximum number of births was found in the first week of August).

The habit of cluster formation of the Indian Fulvous Fruit Bat was observed in the ceiling at the entrance of the Siju Cave during each visit from 6.00 to 11.00 hours.

Most of the Fulvous Fruit Bats were seen hanging from the branches and twigs of large trees near the entrance after the foraging and prior to entering the cave. The trees were sal (*Shorea robusta*), Kachnar (*Bahonia barrigata*), Shirish (*Albizza sp.*), *Eucalyptus sp.* and *Amaltas*.

Flying bats were found with the help of electric torch during the night among the Bair (*Zygyphus* sp.) trees, flowering *Musa* sp., wild *Ficus* sp. and Betal Nut (*Areca* sp.) grove.

These bats, after mastication, consume only the juice of fruits and other plant material, discarding the substance. Feeding on flowers and being covered with pollen were reported for *Rousettus* sp. (Start, 1972). Examination of the gut contents of five specimens disclosed unidentifiable gray liquid material. Arthropod fragments were detected in the stomach contents by Lim (1973). *Rousettus asgyptiacus* consumes leaves and fruits of *Ficus religiosa* (Lewis and Harrison 1962).

Genus (2) *Eonycteris* Dobson

2. *Eonycteris spelaea* (Dobson)

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

Common name Dobson's Long-tongued Fruit Bat (English).

Material examined: 9 (Ms) (*ad.*), 3 (Fs) (*ad.*), 18-19 Feb 1992; 1 (M) (*Suck.y.*), 4 Jun 1992; 1 (M) (*ad.*), 1 (M) (*subad.*), 27-28 Jun 1991, 1 (M) (*ad.*), 9 (Ms) (*subad.*), 3 (Fs) (*ad.*), 7-9 Aug 1992; 2 (Ms) (*ad.*), 4 (Ms) (*subad.*), 1 (M) (*Suck.y.*), 13 (Fs) (*ad.*), 23-26 Oct 1991; 3 (Ms) (*ad.*), 13 (Ms) (*subad.*), 2 (Fs) (*ad.*), 14 (Fs) (*subad.*), 21-23 Nov. 1990.

Measurements External 16 (Ms) (*ad.*) *HB.* 91.0-126.0 (106.0); *E.* 16.5-22.0 (20.0); *TL.* 8.6-19.0 (14.7); *f.* 68.0-75.0 (72.0); *t.* 29.0-37.0 (32.0); *ft.* 17.0-27.0 (19.8); *ws.* 340.0-440.0 (380.0); *ww.* 78.0-90.0 (83.3), 21 (Fs) (*ad.*) *HB.* 86.0-123.0 (100.0); *E.* 16.0-20.0 (18.0); *TL.* 8.0-17.0 (14.5); *f.* 65.0-78.0 (69.5); *t.* 27.0-34.0 (32.0); *ft.* 16.0-20.0 (18.7); *ws.* 370.0-420.0 (394.0); *ww.* 72.0-83.0 (78.3). Skull 4 (Ms) (*ad.*) *l.* 35.2-36.0 (35.7); *zw.* 20.0-22.0 (21.0); *cw.* 15.0-16.0 (15.4); *m'-m'* 9.0-10.0 (9.5); *c-m'* 12.0-13.0 (12.5); *c-m₃* 13.7-14.0 (13.9); *ml.* 26.5-28.0 (27.0). 6 (Fs) (*ad.*) *l.* 33.0-35.5 (34.5) *zw.* 19.0-20.0 (19.2); *cw.* 14.0-15.0 (14.4); *m'-m'* 8.3-9.2 (8.8); *c-m'* 12.0-13.0 (12.3); *c-m₃* 13.0-13.6 (13.3); *ml.* 25.0-27.0 (26.2).

Diagnosis Externally very similar to *Rousettus leachenaulti* (Desmarest) except that its muzzle is more elongate; index finger without a claw; tail and calcar well developed; and tongue sharply pointed and much extensible. Skull also very much similar to *R. leachensulti* except the occipital region which is more deflected; molars and incisors smaller in size; mandible less heavy and upper surface of its symphysis parallel with alveolar line. Dental formula as in *Roussttus*.

Distribution INDIA Meghalaya (Sinha, 1990), Nagaland (Sinha 1994c), Manipur (Sinha 1994c), Assam, Uttar Pradesh, Karnataka and Andaman Islands. MYANMAR (BURMA), THAILAND, LAOS, VIETNAM, CAMBODIA, MALAYSIA, INDONESIA and the PHILIPPINES.

Remarks All adult females (*f.* 68.0-75.0) have large genitals, projecting fleshy kidney-shaped para-anal glands and discernable mammae. Neonate females (*f.* 55.0-58.0) have small

genitals, para-anal glands and mammae not discernible and juveniles (*subad.*) (*f.* 57-64) have flat and dry kidney-shaped para-anal glands and mammae not discernible. All adult males (*f.* 68.0-75.0) have large testes (scrotal) para-anal glands projecting and fleshy, juveniles (*subad.*) (*f.* 56.0-67.0) have small testes (abdominal); para-anal glands flat and dry and neonates (young) (*f.* 55-58) have small testes (abdominal); para-anal glands flat and dry and neonates (young) (*f.* 55.0-58.0) have small testes (abdominal) and para-anal glands discernible. Neonates have clotted milk in the stomach.

Like *Rousettus l. leschenaulti*, females become adults earlier than the males. The forearm of adult females are ranges from 65-78 and that of males 68-75.

Biology Females collected in February and August were pregnant. Each female had an embryo either in left or right horn of uterus. Size of embryo was 3.0 in February and 27.0 to 35.0 in August.

Suckling young (coagulated milk was present in the gut) were found in June and October Neonates and subadults were found in June, August, October and November.

It can be concluded from these observations that the gestation period in this bat is about 5 months with two litters, one in May and other in November. Bhat *et.al.* (1980) mention that this species breeds throughout the year. From my observation made during different months, it is supposed that there is no definite rutting season in this bat like *Rousettus l. leschenaulti*.

Stomach contents of five specimens were examined. It had only half digested pollen grains and brown undigested liquids. Medway (1969) mentions that the diet of this species consists chiefly of pollen and nectar.

Genus (3): *Cynopterus* Cuvier

3. *Cynopterus sphinx sphinx* (Vahl)

1797. *Vespertilio sphinx* Vahl. *Skr. nat. selsk. Copenhagen.* 4 (1) : 123 (Tranquebar, S. India).

Common name Shortnosed Fruit Bat (English).

Material examined : 2 (Ms) (ad.), 3(Ms) (subad.), 1(M) (suck.y.). 7 (Fs) (ad.), 2(Fs) (subad.), 26-29 Jun 1991

Measurements: External 2(Ms): *HB.* 70.0, 79.0; *E.* 19.0, 22.0; *TL.* 7.0, 14.0; *f.* 66.0, 73.0; *t.* 24.0, 29.0; *ft.* 14.0, 18.0; *ws.* 360.0, 440.0; *ww.* 80.0, 85.0. 7 (Fs) *HB.* 75.0-97.0 (85.9); *E.* 19.0-23.0 (21.0); *TL.* 9.0-17.0 (12.6); *f.* 65.0-76.0 (69.1); *t.* 24.0-30.0 (26.5); *ft.* 14.0-17.0 (15.9); *ws.* 340.0-420.0 (378.0); *ww.* 81.0-86.0 (84.0). Skull 2 (Fs) *l.* 30.5, 33.2; *zw.* 18.0, 20.5; *cw.* 13.0, 14.0; *m'-m'* 9.5, 10.0; *c-m'* 11.0, 11.5; *c-m₂* 12.0, 12.5; *CR.* 7.0, 8.0; *ml.* 23.5, 25.0, 5(Fs) : *l.* 30.0-33.0 (31.6); *zw.* 18.0-21.0 (19.7); *cw.* 13.0-14.0 (13.8); *m'-m'* 9.5 10.0 (9.9); *c-m'* 11.0 (in all); *c-m₂* 12.0-12.5 (12.3); *CR.* 7.5-8.0 (7.8); *ml.* 23.5-25.0 (24.0).

Diagnosis Smaller than *Rousettus leschenaulti*, forearm 65.0 to 76.0, ear margin white, metacarpals and phalanges whitish; nostril divergent with deep inter-narial groove. Skull

smaller than *R. leschenaulti*. Dental formula $i \frac{2}{2}, c \frac{1}{1}, pm \frac{3}{3}, m \frac{1}{2} = 30$.

Distribution INDIA Jammu & Kashmit (Chakraborty, 1983), Arunachal Pradesh, Meghalaya, Tripura, Manipur, Nagaland, Sikkim, West Bengal, Bihar, Uttar Pradesh, Rajssthan, Madhya Pradesh, Gujarat, Maharashtra, Orissa, Andhra Pradesh, Tamil Nadu, Karnataka, Goa, Kerala, Andaman Island. PAKISTAN (Anderson, 1881), SRI LANKA, NEPAL (Fry, 1925), BANGLADESH AND MYANMAR (=BURMA).

Remarks The newly pregnant females have only spots in place of mammae. The grown up females which became pregnant more than once have well developed teats. The subadult males have testes inguinal in position while grown up males have well developed testes scrotal in position.

Biology: Females collected in June near Siju cave were pregnant, (size of embryo ranging from 14.0 to 17.0), except one which had a suckling young (f. 59.0) clinging to the right teat and attached ventro-ventrally between right arm and abdomen. Sinha (1986) found suckling youngs (f. 60-80% of the mother) in April, May and July in Bihar. Gopalakrishna (1969) mentions that it breeds throughout the year and its gestation period is 115 to 125 days.

The gut contents of five specimens collected in the morning, show only blackish liquid material, which could not be identified. Lim (1970), after examining the stomach contents of a large series of *Cynopterus brachyctis*, determined that the fruit and floral parts constituted a major part of their diet, although some insect parts were also observed.

On the basis of collection made from different foraging grounds near the Siju cave, its favourite food can be determined as follows.

The bat was collected between 26 to 29 June, 1991 in the mist-nets set outside the Siju cave in the flowering garden containing Jack fruit (*Artocarpus integrifolia*), Rose (*Rosa* sp.), Plantains (*Musa* sp.), Lantana plant (*Lantana aculeata*), Indian Oleander (*Nerium* sp.) Bair (*Zygyphus* sp.), China-rose (*Hibiscus mutabilis*) etc. Most of the specimens were collected in the mist-nets set up near the flowering china-rose bushes.

Family II. RHINOLOPHIDAE

Genus (4) *Rhinolophus* Lacepède

4. *Rhinolophus subbadius* Blyth

1844. *Rhinolophus subbadius* Blyth, *J. Asiat. Soc. Beng.*, **13** : 486. (Nepal).

1872. *Rhinolophus garoensis* Dobson, *J. Asiat. Soc. Beng.*, **41** : 337. (Garo Hills, Meghalaya).

Common name Nepal Horse-shoe Bat (English).

Material examined 1(F), Siju cave, coll. S. W Kemp & B. N. Chopra, 1921 and 1(F)

(Holotype of *R. garoensis*, in spirit) Meghalaya Garo Hills present in *Z.S.I. Cal.*

Measurements External 2(Fs): *f.* 34.0, 37.3; *tl* (1) 16.0; *t.* 12.6, 13.5; *ft.* 6.5, 7.0. Skull : 2 (Fs): *l.* 14.0, 15.9; *zw.* (1) 7.3; *cw.* (1) 6.5; m^3-m^3 5.6 (2); $c-m^3$ 5.3, 5.6; $c-m_3$ 5.9, 6.1

Diagnosis : This is the smallest form among Indian species of *Rhinolophus*. Its forearm length ranges from 34.0-37.9 and total length of skull 14.0-15.2.

Distribution INDIA Meghalaya, Uttar Pradesh. NEPAL, MYANMAR (Hill, 1962), VIETNAM.

Remarks This bat was not observed by me in the Siju Caves. It is mentioned here on the basis of Kemp (1924b). According to Kemp (1924 b) this bat is rare in the Siju Cave and solitary in habit. He obtained one specimen which was shot at dusk at the entrance. Nothing is known about its ecology.

5. *Rhinolophus pusillus blythi* Andersen

1918. *Rhinolophus blythi* Andersen, *Ann. Mag. nat. Hist.* 2 : 376, 377 (Almora, 5,500, Kumaon, Northern India-Almora c, 676m, Almora district, Uttar Pradesh, India).

Common name : Least Horse-shoe Bat (English).

Material examined : 1 (unsexed, *ZSI. Cal.*) · Meghalaya : Garo Hills : Siju Cave (no date).

Measurements External *f.* 40.0; *Tl.* 19.0; *t.* 16.0; *ft.* 6.5.

Diagnosis : Size small, forearm 35.0-40.0; tibia short, 16.0 or less in length; horizontal base of sella arched and equal in width to vertical part; connecting process triangular in lateral view.

Distribution INDIA Assam, Meghalaya, West Bengal, Uttar Pradesh, NEPAL, MYANMAR (=BURMA), THAILAND and SOUTHERN CHINA, including Tibet.

Genus (5) *Hipposideros* Gray

6. *Hipposideros lankadiva* Kelaart

1850. *Hipposideros lankadiva* Kelaart, *J. Ceylon Brch R. Asiat. Soc.*, 2 : 216. (Kandy, Ceylon (=Sri Lanka).

Common name : Sri Lanka Gigantic Leaf-nosed Bat or Kelaart's Leaf-nosed Bat (English).

Material examined : 10 (Ms) (*ad.*), 3 (Fs) (*ad.*) A.S. Rajagopal, 6-7 Mar 1965; 1 (M) (*ad.*), J.R.B. Alfred, 23 Feb 1991, 10 (Ms) (*ad.*), 28(Fs) (*ad.*), 3-5 Jun 1992; 4(Ms) (*ad.*), 1(M) (*suck.y.*), 8 (Fs) (*ad.*), 1(F) (*suck.y.*), 26-29 Jun 1991; 1(F) (*ad.*), 7 Aug 1992.

Measurements External 26(Ms) (*ad.*) *HB.* 85.0-100.0 (92.0); *E.* 23.0-30.0 (26.2); *Tl.* 40.0-54.0 (48.7); *f.* 83.6-92.0 (88.2); *t.* 32.0-37.0 (34.5); *ft.* 15.0-19.0 (16.4); *ws.* 440.0-470.0 (460.0); *ww.* 95.0-100.0 (97.1). 39(Fs) (*ad.*) *HB.* 90.5-95.0 (92.4); *E.* 24.0-30.0 (27.0); *Tl.* 42.5-54.0 (49.2); *f.* 79.5-91.0 (88.0); *t.* 30.0-36.0 (34.2); *ft.* 15.0-18.0 (16.6); *ws.* 420.0-460.0 (450.0); *ww.* 95.0-100.0 (97.0). Skull 6(Ms) (*ad.*): *l.* 31.3-32.8 (32.0); *zw.* 20.0-20.6 (20.1); *cw.* 13.2-14.1 (13.8); m^3-m^3 12.8-13.3 (13.0); m^1-m^1 10.9-11.2 (11.0); $c-m^3$ 14.0-14.5 (14.1);

c-m, 15.2-16.0 (15.8); *ml*, 24.0-25.5 (24.7); *mw*, 15.0-15.2 (15.1); *iow*, 3.6-4.0 (3.9); *iof*, 3.0-3.7 (3.4). 2(Fs) (*ad.*) 1.30.1, 31.8; *zw*, 19.0, 20.0; *cw*, 13.0, 13.7; *m*¹-*m*³ 13.0, 13.1; *m*¹-*m*¹ 11.0, 11.0; *c-m*³ 13.2, 14.1, *c-m*, 14.5, 15.0; *ml*, 23.2, 25.0; *mw*, 15.0, 15.2; *iow*, 3.8, 4.0; *iof*, 3.0, 3.5.

Diagnosis In size, this bat is very much similar to that of *H. armiger* (Hodgson); forearm 79.0-92.0 vs. 87.5-91.5 (4 exs.) and length of skull 30.1-33.0 vs. 29.1-31.0. Marginal leaflets prominently seen in three numbers and the fourth one is very minute or rudimentary and in some it is not seen, also mentioned by Hill (1963). Some male specimens have reduced frontal sac in the form of pore behind the posterior nose-leaf but most of them have no frontal sac. Females have no sign of frontal sac. One male specimen from Puri, Orissa (*ZSI. Cal. Reg. No. 9195*) has well developed frontal sac without tuft of hairs. Wroughton (1918), Brosset (1962 *b*) and Hill (*loc. cit.*) have not mentioned about frontal sac in this species. Posterior nose-leaf broader than horse-shoe in all specimens as mentioned by Wroughton (*loc. cit.*). Anterior leaf has no median emargination; its internarial septum not inflated; and the narial lappets well developed. The intermediate part of noseleaf expanded, its central part flattened and swollen but not forming median ridge. Posterior leaf high and broad, its upper margin semicircular with a swollen median projection, flanked by narrow notches and supported by three well-defined septa enclosing small cells, which are four in number.

Rostral region of skull well flattened (width 7.8-9.3) but narrower than *H. armiger* (width 8.8-10.4). Zygoma (18.1-20.6) and palate (6.3) broad; sagittal crest high; interorbital region compressed. Infraorbital foramina very large and closed; length of slender bar is about 4.0.

Distribution INDIA Meghalaya, West Bengal, Madhya Pradesh, Orissa, Maharashtra, Karnataka. SRI LANKA.

Biology The bat was collected in the mist-net along with *Rousettus l. leschenaulti*, *Eonyctaris spelaea* and *Miniopterus schreibersi fuliginosus*. Mature female collected in the month of March and June had well developed (a pair of) pectoral and inguinal teats. Males had well developed testes, scrotal in position. None of the females collected was pregnant. In last week of June one male and one female suckling young and in first week of August one subadult male were collected.

The sex ratio was, as per collection made, 10(Ms), 3 (Fs) in March, 14(Ms), 36(Fs) in June and 4(Ms), 1(F) in September. Among 91 specimens captured by Brosset (1962b) in Mandu, Madhya Pradesh in the month of March, only 19 were females. As per above observation in the Siju Cave females outnumbered males in the breeding season in June and males outnumbered females in March and September as also observed by Brosset (*loc. cit.*). Since suckling young were found in the last week of June, it can be concluded that birth of a young takes place in the month of June. Brosset (*loc. cit.*) also found young in Gersoppa, Karnataka in the middle of June. Bhat and Sreenivasan (1981) found pregnant females with an embryo each in the month of February and the neonates during the latter half of May and earlier half

of June in Karnataka. According to Sapkal and Bhandarkar (1984) copulation occurs in this species in the latter half of August. The early development of embryo is usually slow nearly two months. Even the post-implantation development is also considered retarded until the limb-bud stage of development. Consequently, the gestation of this bat lasts for about 260 to 270 days.

Carnivorous tendency of this bat was observed on 5th June, 1992. To collect the bats trapped in mist-nets we entered the Siju Cave at about 14.00 hours. As we entered we saw a headless *Minopterus schreibersi fuliginosus* on the ground below the net and a living *Hipposideros lankadiva* moving slowly near it with some portions of mist-net attached to its body. It was also observed that this bat is more furious than *Megaderma lyra*. During an earlier visit, while handling this bat, it buried its canine very deep in my index finger piercing the nail. Therefore, this bat may be considered occasional predator of other bats.

Gut contents of three specimens of this bat, collected in the last week of June were examined. Among gut contents about 50 antennal parts and muscular portions of carabid beetle (Coleoptera) had been observed. It shows that bat feeds heavily on beetles particularly during the rainy season (June) when a large number of nocturnal flying carabid beetles are available.

Family III. VESPERTILIONIDAE

Genus (6) *Myotis* Kaup

7 *Myotis longipes* Dobson

1854. *Vespertilio macropus* Dobson, 1872, *Proc. Asiat Soc. Beng.*, **209**. Not of Gould, 1854. Type-loc. (Caves of Bhima Devi, 6,000 ft., Kashmir).

1873. *Vespertilio longipes* Dobson, *Proc. Asiat. Soc. Beng.*, **110**. (Renaming of *macropus*, preoccupied).

Common name : Kashmir Cave Bat (English).

Material examined. 2(Fs), 17 Feb 1992; 3(Ms), 2(Fs), 5 Jun 1992.

Measurements External 3 (Ms) *HB*. 42.0-44.0 (43.5); *E*. 10.0-11.0 (10.7); *Tr*. 7.0-8.0 (7.6); *Tl*. 32.0-36.0 (34.5); *f*. 34.5-35.5 (34.8); *t*. 15.0-17.0 (15.6); *ft*. 10.0-11.0 (10.6); *ws*. 180.0-200.0 (190.0). 4(Fs): *HB*. 43.0-46.0 (44.5); *E*. 13.0 (in all); *Tr*. 6.0-8.0 (7.3); *Tl*. 32.0-40.0 (35.5); *f*. 36.0-38.0 (36.9); *t*. 15.0-17.0 (16.3); *ft*. 10.0-11.0 (10.6); *ws*. 210.0-230.0 (220). Skull 1(M), 1(F) *l*. 13.0, 13.0; *zw*. 8.0, 9.0; *cw*. 8.0, 7.0; *m*³-*m*³ 6.0, 6.0; *c*-*m*³ 5.5, 6.0; *c*-*m*₃ 6.0, 6.5; *ml*. 10.0, 11.0.

Diagnosis Check teeth six in number, on each side above and below; forearm 34.5-38.0; dorsal colour pale, ventral silvery; skull length 13.0-14.0.

Distribution INDIA Kashmir, Meghalaya (Sinha, 1994a). AFGHANISTAN.

Remarks Males observed were newly turned adults having smaller body size than females and also tender phalanges.

Biology This bat is a crevice dweller and came from the outside of the cave and entangled in the mist-net set inside the cave at about 18.00 hours. In collection, females outnumbered the males. Gut contents were examined but found nothing except unrecognisable parts of insects. There were plenty of small and big fishes, crustaceans, molluscs and micro dipteran flies in the water and surrounding environments of the cave. Brosset (1966) and Brosset and Deboutville (1966) mentions that *Myotis daubentonii* does feed naturally to some extent upon small fish.

Genus (7) *Miniopterus* Bonaparte

8. *Miniopterus Schreibersi fuliginosus* Hodgson

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

Common name Indian Long-winged Bat (English).

Material examined 2(Ms) (ad.), 22 Nov 1990; 15 (Ms) (ad.), 6(Fs) (ad.) 26-30 Jun 1991; 8(Ms) (ad.), 11 (Fs) (ad.), 23-26 Oct 1991, 4(Ms) (ad.), 17 Feb 1992; 2(Ms) (ad.), 2 (Fs) (ad.), 3 Jun 1992; 2(Ms) (ad.), 4 (Fs) (ad.), 7-9 Aug 1992.

Measurement: External 33 (Ms) (ad.); *HB*. 50.0-63.0 (56.5); *E*. 11.0-14.5 (12.1); *Tr*. 5.0-7.0 (5.5); *TI*. 55.0-67.0 (61.5); *f*. 49.0-52.0 (51.1); *III*¹ 11.0-14.1 (12.2); *III*² 35.0-43.0 (39.0); *t*. 20.0-23.0 (22.1); *ft*. 10.0-12.0 (11.6); *ws*. 300.0-350.0 (330.0); *ww*. 52.0-61.0 (57.0); *Pen*. 9.0-15.0 (12.1). 23 (Fs) (ad.) *HB* 54.0-58.0 (57.0); *E*. 11.0-12.0 (11.7); *Tr*. 5.0-7.0 (6.1); *TI*. 56.0-64.0 (58.2); *f*. 47.0-53.0 (50.5); *III*¹ 10.8-13.0 (12.1); *III*² 37.0-41.0 (40.2); *t*. 21.0-22.2 (21.6); *ft*. 10.0-11.0 (10.6); *ws*. 310.0-340.0 (330.0); *ww*. 55.0-59.0 (57.0). Skull 5 (Ms) (ad.) *l* 16.6-17.7 (17.1); *zw*. 9.5-10.0 (9.9); *cw*. 8.0-8.7 (8.4); *m*¹-*m*¹ 7.3-8.0 (7.6); *c-m*¹ 7.0 (in all); *c-m*₃ 7.3-7.6 (7.4); *ml*. 12.7-13.5 (13.1); *hbc*. 9.0-10.0 (9.7); *hm*. 5.5-6.2 (5.9), 5 (Fs) (ad.) *i*. 16.5-17.1 (16.9); *zw*. 9.4-10.0 (9.8); *cw*. 8.2-9.0 (8.6); *m*¹-*m*¹ 7.5-8.3 (7.8); *c-m*¹ 6.9-7.1 (7.0); *c-m*₃ 7.1-7.3 (7.2); *ml*. 12.1-12.5 (12.3); *hbc*. 9.0-10.5 (9.7); *hm*. 5.0-6.1 (5.7).

Diagnosis: Nostrils not elongated; ears not funnel shaped; second phalanx of third finger nearly three times as long as first; size larger, forearm above 45.0; hair not extending on to inter femoral membrane.

Distribution : INDIA Meghalaya (Sinha, 1994b), West Bengal (Allen, 1908), Uttar Pradesh, Maharashtra and Karnataka. SRI LANKA and NEPAL.

Remarks The tip of the right tragus in one specimen and that of both tragi in other specimen are found abnormally white. Colour blackish brown throughout. In one specimen partial albinism is observed in right wing between lower portion of the third and fourth finger.

Biology · It was observed that the colony fluctuates seasonally. Only male was observed and collected in February (4 exs) and November (2 exs) while both sexes were abundant in June and October. The males outnumbered the females.

The ecological condition of the Siju Cave with a subterranean river rushing through it, is an ideal habitat for this bat. A similar observation was made by Brosset (1962b) for Robber's cave which constituted a "mother house" with another cave at Panchgani within a radius of 70km which served as secondary habitat for the bat. However, I did not get the opportunity to find out secondary habitat.

The Long-winged Bat was observed together with *Eoncyteris spelaea* (Dobson), *Rousettus l. leachenaulti* (Desmarest) and *Hipposideros lankadiva* Kalaart at the time of their emergence and collected altogether in the mist-nets in June and only with *E. spelaea* (Dobson) and *R. l. leachenaulti* (Desmarest) in November and February. This type of association has not been mentioned by Brosset (1962b) in Robber's cave near Mahabaleshwar in Maharashtra.

Miniopterus s. fuliginosus was the first to emerge from the cave in the evening. The Long-winged Bat was found to emerge from the cave 5 minutes after sun-set in October, 8-10 minutes in November, 25 minutes in February and 12-15 minutes in June. It emerges early in the evening in October and November and late in the evening in February and June. It was not found hanging from ceiling near the entrance of the cave prior to emergence but it suddenly dispersed in all directions among trees which formed its hunting territory. While flying, individuals of this bat keep close to each other in many rows. It was observed living in big crevices in the side wall of the cave in many places.

The gut contents of this species contained small wings of dipterans and portions of small coleopteren, isopteran and hymenopteran insects. The dentition is sharp but weak for bigger insects. Huge quantity of very small dipteran flies were observed in and around the cave.

All the females collected in the first and last week of June had well developed teats, although none was found pregnant or with young. Brosset (1962b) observed that the birth of young takes place in June but the females did not carry them in flight. Instead, the young ones were put together in an enormous group.

Genus (8) **Kerivoula** Gray

9. **Kerivoula hardwickei** (Horsfield)

1824. *Vespartilio hardwickii* Horsfield, *Zool. Res. Java* (unpaginated Java).

Common name Hardwicke's Bat (English).

Material examined 1(F), A.S. Rajagopal, 18 Feb. 1982.

Measurements External 1(F). *E.* 13.0; *f.* 34.5; *t.* 16.7; *ft.* 7.4; *ws.* 210.0; *ww.* 54.0. Skull 1(F) *l.* 14.0; *zw.* 8.7; *cw.* 6.9; *db.* 5.5; *m¹-m³* 5.4; *c-m¹* 5.6; *c-m₃* 5.9; *ml.* 9.9.

Diagnosis Nostrils not elongated; ears funnel shaped;; structurally very similar to *Kerivoula picta*; size smaller, forearm 35.0 or less; ear larger, length 11-13; skull length 13.0-14.0.

Distribution INDIA Assam, Jammu & Kashmir, Meghalaya, Nagaland, West Bengal and Karnataka. MYANMAR (=BURMA).

Remarks The specimen from the Siju cave has been identified by me as *Kerivoula hardwickei* Horsfield. But according to Ellerman and Morrison-Scott (1951) and Agrawal *et.al.* (1992) three subspecies are found in India as follows

K. h. hardwickei (Horsfield) INDIA West Bengal, MALAYASIA, BORNEO, JAVA, BALI and CELEBES.

K. h. dapressa Miller-INDIA Assam, West Bengal, Jammu & Kashmir (Chakraborty 1983), Meghalaya, Nagaland (Khajuria 1953). MYANMAR (=BURMA), Southern CHINA, VIETNAM, CAMBODIA and Western THAILAND.

K. h. crypta Wroughton & Ryley-INDIA Karnataka. Range includes MYANMAR (=BURMA).

Biology Gut contents show only rudiments of unidentifiable soft insect parts.

The bat could not be seen in and around cave. Therefore, ecological observation on this bat was not possible. Nothing is known about its breeding and feeding habits. This bat is rare.

GENERAL DISCUSSION AND CONCLUSION

Of the nine species and subspecies, recorded so far, from the Siju Cave and its adjoining areas, three belong to each the families Pteropodidae, Rhinolophidae and Vespertilionidae.

Family Pteropodidae comprises three species, *Rousettus l. leschenaulti*, *Eonycteris spelaea* and *Cynopterus s. sphinx*. *Rousettus l. leschenaulti* and *Eonycteris spelaea* are cave dwellers, and gregarious, and form a large colony during the day, *Cynopterus s. sphinx* could not be detected inside the cave. *C. s. gangeticus* (= *C. s. sphinx*) has been reported to inhabit in the cavern and in a very large number. A single specimen of this species of bat could not be collected using the mist-nets set inside the cave. However, this species was found hanging from the ceiling of the discarded buildings in Bihar (Sinha, 1986). Initially this bat was reported as a tree dweller and found modifying its roost according to the available environment (Kunz, 1982).

Among the three species of Rhinolophidae *Rhinolophus subbadius* was reported solitary in the cave by Kemp (1924b). Whereas, this habit of *R. pusillus blythi* could not be detected in the present study. *Hipposideros lankaidiva* was found inside the cave in a large number, hanging from various points implying its gregarious habit.

Of the three species of the family Vespertilionidae, *Myotis longipes* appeared crevices dweller, because in a small group of 2 to 5, this species was trapped from outside the cave in the mistnet. *Kerivoula hardwickei* was collected singly, in the mist-net. *Miniopterus schreibersi fuliginosus* was found inside the cave in a large group confirming its nature of cave dwelling and gregarious habit.

The present study indicates that *Rhinolophus subbadius*, *R. pusillus blythi* and *Kerivoula hardwickei* are rare in this area and their ecology is yet to be clearly known. Therefore, much precaution deserves to be taken for the conservation of three species. *Myotis longipes* is found outside the cave and in large numbers.

The enumeration of different species inside the cave is extremely difficult because they emerge simultaneously in the evening in swarms. One early evening at the mouth of the cave attempting to enumerate the different species and their emergence time were baffled because of a pungent odour of the bats emanated from inside the cave, ultimately became intolerable, as the bats came close to the observation spot.

The first bat to emerge was *Miniopterus schreibersi fuliginosus*, identified by its smaller size. The next ones were *Rousettus l. leschenaulti* and *Eonycteris spelaea*. *Hipposideros lankadiva* was seen in the mist-net very late in the evening.

The size of the colony of four species found in the cave is very difficult to ascertain. *Hipposideros lankadiva* was reported by Kemp (1924b). in great numbers, nearly covering the entire surfaces of the wall and roof (Kemp, 1924b). The present study indicated the approximate size of the colony and the ratio of the above noted four species fluctuated in different seasons. Among 379 specimens comprising four species, collected throughout the year in February, June, August, October and November (see Table I.) the ratio of *Rousettus l. leschenaulti*, *Eonycteris spelaea*, *Hipposideros lankadiva* and *Miniopterus schreibersi fuliginosus* is 67.30%, 23.07%, 1.92% and 6.79% in February; 26.23%, 2.80%, 48.59% and 23.36% in June, 71.55%, 11.20%, 0.86% and 16.37% in August; 55.93%, 33.98%, 0.00%, 10.16%, in October and 22.72%, 72.72%, 0.00%, 4.54% in November, respectively.

The data of Tables 1 and 2 indicate that a maximum number of *Rousettus l. leschenaulti* was found in the cave in August (71.55%) when all the females have suckling young in their arm, of *Eonycteris spelaea* in November (72.72%) when all the young separated from mother.

Among insectivorous bats, *Hipposideros lankadiva* is found in large number in June (48.59%) when the insect population became maximum (51.87%) than the other months of the year as in February (13.01%), in August (11.67%), in October (9.38%) and in November (14.04%). This bat species could not be captured in the mist-nets in October and November, when the insect population was found reduced appreciably, i.e., 9.38% and 14.07% respectively. A maximum number of *Miniopterus schreibersi fuliginosus* was also found in June (23.36%) and least in November (4.54%). The contents of *M. s. fuliginosus* consisted

of parts of dipteran, coleopteran, isopteran and hymenopteran insects.

Fruit bats had been collected from different groves or from the same foraging ground. Ripe fruits constituted their main meal however, occasionally they were found to consume, floral parts, soft unripe fruits. When fruits were not readily available they were found to thrive on soft leaves, twigs, etc., of the different trees and plants. They were found to carry fruits with them to different parts of their habitat where they consume the juice and discard the seeds, helping dispersal.

The insectivorous bats consumed various types of insects (Table 2). Their teeth are adapted for both soft or hard insect meal. Apart from the insects, occasionally the food of the large insectivorous bats comprised small animals like snail, prawn, fish, frog and even smaller bats and other small mammals (Hill and Smith, 1984; Sinha, 1986; Rasweiler, 1977).

Rousettus l. leschenaulti and *Eonycteris spelaea* were always found in the rut. The present study disclosed that they breed throughout the year. This supports the earlier observations of Bhat *et.al.* (1980) and Gopalakrishna (1969). In these species, the first lactation cycle overlaps the early pregnancy of second cycle. Each litter yielded one offspring. Months of May-June appeared to be the breeding season of *Hipposideros lankadiva* in the Siju cave. Bhat and Sreenivasan (1981) observed embryos in February and the neonates during the later half of May and earlier half of June. This suggested a gestation period of about 150 days for this species of bat.

Cluster formation till 11.00 hours of *Rousettus l. leschenaulti* and *Eonycteris spelaea* near the entrance of the cave had been observed. Prior to clustering the sequence of events were found to be (a) completion of foraging (b) hanging from the thin branches and twigs of big trees near entrance (c) subsequent entry inside the cave for safe day roosting making clusters in the ceiling.

Inter-relation of cave dwelling bats with the surrounding fauna: In month of February and October, a troups of monkey, *Macaca assamensis* M'Clelland, on the top branches of trees, above the entrance of the cave and Hoolock Gibbons *Hylobates hoolock* Harlan in deep forest, near the Siju cave were observed. Tree shrews, *Tupaia glis* Diard jumping on the branches of Jack fruit trees in February were also seen. These fruit eating mammals were the food competitor of the fruit bats. Domestic cats and dogs and Mongoose (*Herpestes* sp.) were also found inside the cave. Occasionally they captured young bats, falling on the floor and their mothers while coming to the rescue of their off springs. Inside the cave, tribal people were also seen consuming roast bats (generally fruit bats) and enjoying.

Nocturnal birds like owls (*Bubo* sp. and *Otus* sp.), Himalayan Jungle Night Jar (*Caprimulgus* sp.), lizard Hawk or Blyth's Baza (*Aviceda* sp.), Sparrow-Hawk (*Accipiter* sp.), Collared Scope Owl (*Otus* sp.) and Hodgson's Frogmouth (*Batrachestomus* sp.) were seen on the trees near the cave. These nocturnal birds appeared be the predator of cave bats.

Some reptiles Banded Krait (*Bungurus facicatu* Schneider), Black Krait (*Bungurus niger* Wall), Rat-snake (*Ptyas korros* Schlegel), Garden Lizzard (*Calotes* sp.), Skink (*Sphenomorphus* sp.), Gecko (*Hemidactylus franatus* Schlegel), etc. were collected from the vicinity of the cave in October. In the morning of 16th February 1992, a medium sized *Varanus* sp. was seen moving towards the entrance of the cave from a big hole in the outer wall of the cave. These reptiles were the likely opportunistic predators on the bats.

Frogs were seen on the wall of the cave in the same manner as the bats clinging on the wall and caused confusion for the bat. Various other types of amphibians were also observed and collected from inside and outside the cave. These were *Rana cyanophlyctis*, *R. limnocharis* and *Bufo melanostictus*.

A variety of fishes such as *Labeo* sp., *Berilius* sp., *Puntias* sp., *Osteobrama* sp., *Hateropneustea* sp. were observed and collected from the running water of the cave.

Insects, such as cockroaches (*Periplanata* sp.) and Harvarter ants (*Pheidole smythiesi*) were seen in a large number in the cave. A dead bat was seen on the surface of the ground, covered entirely with ants, implying food chain relationship of bat and ant.

SUMMARY

The taxonomy and bionomics of nine species and subspecies of bats, found in and around the Siju cave have been given. They comprised three fruit bats of the family Pteropodidae, and six insectivorous bats, three each of the family Rhinolophidae and the Vespertilionidae.

A synoptic key to these nine species for easy identification has been prepared and synonyms, common names, diagnosis and geographical distribution have been given.

Feeding and breeding habits of *Rousettus l. leschenaulti*, *Eonycteris spelaea*, *Cynopterus s. sphinx*, *Hipposideres lankadiva* and *Miniopterus schreibersi fuliginosus* have been given in detail.

The inter-relationships of these bats with the surrounding fauna and flora have been discussed.

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TABLE 1.
Fluctuation of bats population among total collections of 379 specimens
made during different months of the year in the Siji Cave.

	February	June	August	October	November
All the four species	12.94%	26.87%	28.86%	14.68%	10.95%
<i>R. l. leschenaulti</i>	67.30%	26.23%	71.55%	55.93%	22.72%
<i>Eonycteris spelaea</i>	23.07%	2.80%	11.20%	33.98%	72.72%
<i>Hipposideros lankadiva</i>	1.92%	48.59%	0.86%	0.00%	0.00%
<i>Miniopterus schreibersi fuliginosus</i>	6.79%	33.36%	16.37%	10.16%	4.54%

TABLE 2.

Fluctuation of insect population among total collections of 1045 specimens made during different months of the year near the Siju Cave.

	February	June	August	October	November
Total insects	13.01%	51.87%	11.67%	9.38%	14.07%
Odonata	7.35%	8.49%	15.57%	10.20%	8.84%
Orthoptera	0.00%	2.77%	18.03%	10.20%	20.41%
Grylloidea	5.88%	4.43%	0.00%	0.00%	0.00%
Phasmida	0.00%	1.85%	0.81%	0.00%	0.00%
Dermaptera	3.68%	7.56%	1.64%	0.00%	0.00%
Dictyoptera	0.00%	1.66%	2.46%	1.00%	8.40%
Isoptera	66.18%	0.00%	0.00%	0.00%	6.30%
Hemiptera	0.00%	4.05%	18.03%	41.84%	8.16%
Neuroptera	0.00%	0.18%	0.00%	0.00%	0.68%
Coleoptera	5.88%	16.24%	5.74%	3.06%	8.84%
Diptera	0.00%	4.98%	0.00%	1.02%	0.00%
Lepidoptera	11.03%	20.48%	18.03%	32.65%	15.65%
Hymenoptera	9.35%	27.31%	21.31%	1.02%	34.69%

A NEW CRYPTOSTIGMATID MITE (ACARI : ORIBATEI) AND A FEW NEW RECORDS OF CRYPTOSTIGMATID FAUNA FROM FOREST AND TEA SOILS IN JALPAIGURI DISTRICT, WEST BENGAL, INDIA

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INTRODUCTION

Jalpaiguri district is a virgin territory almost unexplored in the field of Oribatidology. But the topography, climatic conditions and vegetations of Jalpaiguri seemed to harbour an enriched faunal treasure of these soil microarthropods. A survey programme was therefore, undertaken to explore the soil oribatid fauna of forest and tea soils in the district of Jalpaiguri, West Bengal, India since April, 1996. Examination of a part of the collected specimens reveals the occurrence of a new species, *Parahypozetes orientalis* and eighteen known species distributed over nineteen genera under fifteen families.

All the species listed here are new records for Jalpaiguri district. The genus *Parahypozetes* is reported here for the first time from India.

The types of the new species and the specimens of the known species are deposited in the laboratory of the Department of Zoology, Ananda Chandra College, Jalpaiguri-735 101, India. All measurements are in micrometers(μm).

Parahypozetes Hammer, 1967

1967. *Parahypozetes* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 15 (4) : 10.

The genus *Parahypozetes* was established by Hammer (1967) with *Parahypozetes grandis* as the type-species from New Zealand. She (*op. cit.*) also contributed 7 other new species from the same continent. While creating this genus, Hammer (1967) only mentioned that the new genus *Parahypozetes* belongs to the superfamily Ceratozetoidea. Balogh (1972) in his catalogue "The Oribatid Genera of the World", however, placed the genus *Parahypozetes* under the family Ceratozetidae Jacot, 1925 of the superfamily Ceratozetoidea as well as under the family Achipteriidae Thor, 1929 of the superfamily Oribatelloidea. Balogh and Balogh (1983) created 3 more new species, *lobatus*, *bidactylus* and *brevisetia* under the genus *Parahypozetes* from Australia. Thus from the above account, 11 species are known under the genus *Parahypozetes*, of which Hammer alone reported 8 species. The genus *Parahypozetes*

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is being reported here for the first time from India with the description of a new species, *Parahypozetes orientalis*.

***Parahypozetes orientalis* sp. nov.**

(Figs. 1-5)

Female Colour dark brown; length of the body 588-600; width of the body 365-373.

Prodorsum more or less twice broader than long; rostrum conical; rostral setae outwardly barbed, bent inward with pointed tips, inserted rather far posteriorly on the lateral sides of rostrum, 88-91 long; lamellae very long, longer than prodorsum and covered most of the prodorsum; cuspids broadly rounded, leaf-like, anterior portion of the interior borders more or less touching each other; middle portion of the lamellae fused with each other to form synlamellata, lamellae with cuspids, 240-243 long; lamellar setae smooth, with incurved pointed tips, extended beyond the tip of cuspid and rostral setae, 80-85 long, inserted at the anterior border of the cuspis, basal 2/3rd covered by cuspis; interlamellar setae, smooth, very long, 140-143 in length, inserted at the base of the prodorsum close to the lamellae and extended beyond the tip of the rostrum, 2 times longer than their mutual distance; bothridium cup-shaped, 30-32 long; sensillus with a basal stalk and fusiform aciculated head, 88-92 long, directed anteriorad.

Notogaster with prominently arched dorsosejugal suture, finely and densely punctate; pteromorphae well-developed with lateral and downward directed angle, immovable, with a long, acute, projecting appendage, lateral border with radiating stripes; notogastral setae 10 pairs, smooth, 14-48 long; setae *ta* situated inner side of the pteromorph, a little postero-lateral to the bothridium; setae *te* located far postero-lateral to setae *ta* on pteromorph; setae *ti* situated in between the two, on the inner side of notogaster; distance $ti-ti < distance\ ta-ta < distance\ te-te$; setae *ti*, *ms*, *r*₃ remain more or less in a row on the lateral side of notogaster, setae *r*₁, *p*₁, *p*₂ and *p*₃ postero-marginal, setae *ms* being the longest, *p*₁ the shortest; sacculi (*Sa*) distinct and located at the antero-lateral side of the insertion of *ti* setae on notogaster; fissure *im* also distinct and situated a little below the postero-lateral side of the insertion of *ti* setae on notogaster.

Surface of the ventral plate finely and densely punctate; each anal plate more or less twice as long as broad, 2 glabrous, nearly equal setae, with pointed tips, 28-32 long; setae *an*₁ inserted postero-medial and *an*₂ located antero-medial part of the anal plate; adanal setae 3 pairs, smooth, with pointed tips, 26-28 long; setae *ad*₁ postero-medial, *ad*₂ medio-lateral and *ad*₃ a little below the antero-lateral to the anal field; distance $ad_2-ad_2 = ad_3-ad_3 > distance\ ad_1-ad_1$, *iad* small, elongated, close to the antero-lateral border of the anal plate; distance between anal and genital apertures 2 times as long as the latter; each genital plate less than twice as long as its maximum width, 6 simple setae, with pointed tips, 40-48 long, 2 of which situated

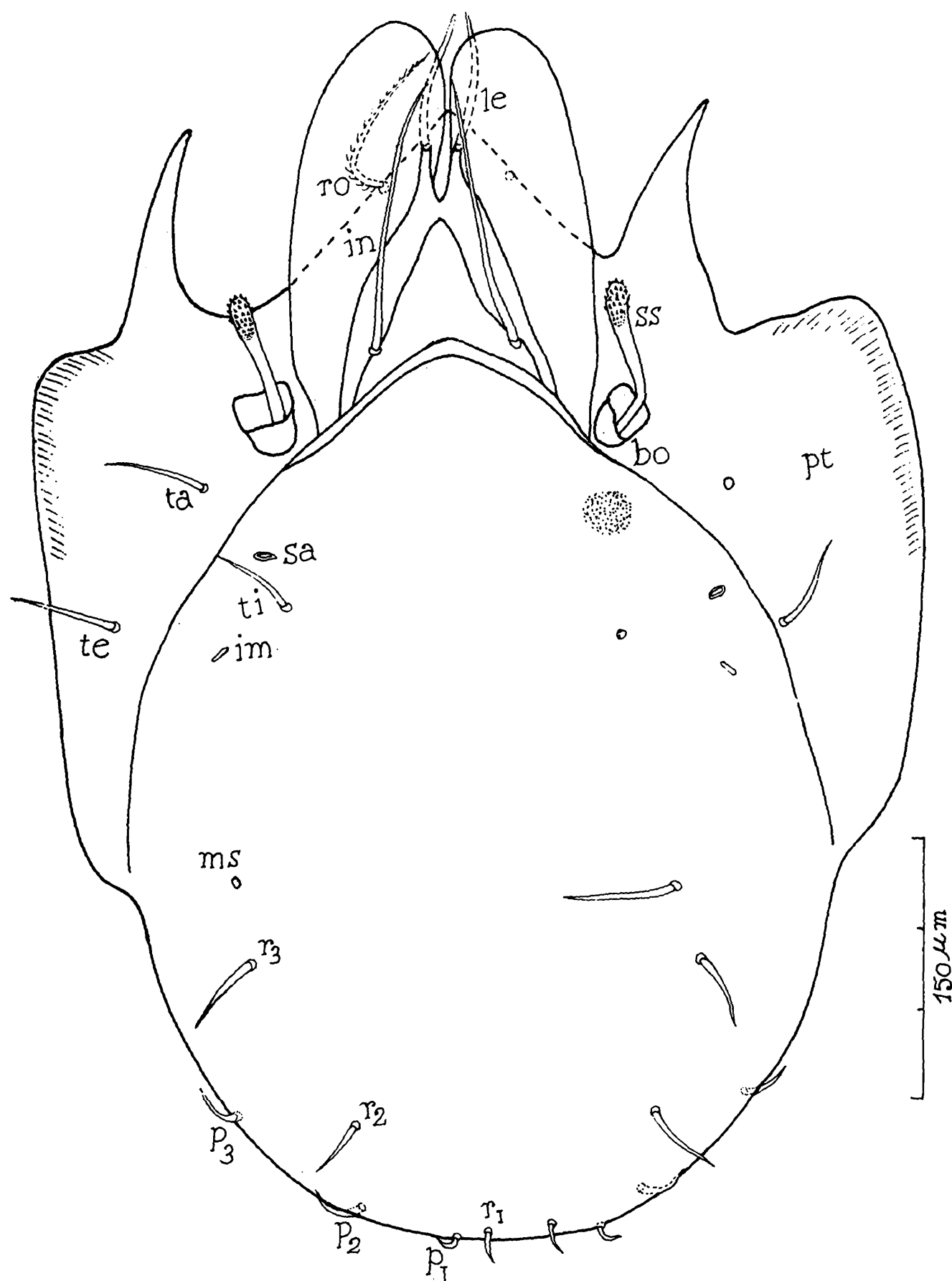


Fig. 1. *Parahypozetes orientalis* sp. nov. (Dorsal view), ro = rostral seta, lc = lamellar seta, in = interlamellar seta, bo = bothridium, ss = sensillus, pt = pteromorph; ta, te, ti, ms, r₁, r₂, r₃, p₁, p₂, p₃ = notogastral setae, sa = sacculi, im = dorsal lyrifissure.

in transverse antero-marginal rows and remaining 4 situated medially from anterior to posterior end to the genital plate; aggenital setae one pair (only follicles found, simple in paratypes), their mutual distance nearly twice the maximum width of the genital plates.

The apodemata sejugal_{sj} located far behind the anterior border of the genital plate; epimera I and II distinctly separated, epimera III and IV fused; epimeral setae simple, 20-48 long, setae 4a being longest and 4b being shortest; epimeral setal formula 1-1-1-2.

All tarsi tridactylous; claws curved, middle one strongest and much stronger than lateral ones.

Holotype Adult (F), INDIA W Bengal Jalpaiguri District, Kalchini Tea Estate (from loose soil with humus, litter and rotten leaves of *Camellia sinensis*), 2.vi.1996 (B. K. Mondal coll.); **paratype** 1 adult (F), INDIA W Bengal Jalpaiguri District, Karala Valley Tea Estate (from litter of *Camellia sinensis*), 28.iv.1996 (B. K. Mondal coll.); **paratype** 1 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Moraghat range, Moraghat block (from loose humus under *Terminalia arjuna*), 16.viii.1996 (B. G. Kundu coll.); **paratype** 1 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Chalsa range, North Indong block (from soil under *Dalbergia sissoo*), 29.vii.1996 (B. K. Mondal coll.).

8 *Parahypozetes* species of New Zealand and 2 species, viz., *breviseta* and *bidactylus* of Australia do not possess true rounded cuspis. Broadly rounded cuspis found only in *Parahypozetes lobatus* Balogh and Balogh (1983). The new species *Parahypozetes orientalis* also conforms with *P. lobatus* Balogh and Balogh, 1983 in the nature of broadly rounded cuspis and the type of sensillus. It however, differs mainly from *lobatus* Balogh and Balogh (1983) in the very long size of interlamellar setae and in the arrangement of genital setae, but from all the established species by the nature of pteromorph.

In the genus *Parahypozetes*, the authors came across with 2 species having same name, viz., *P. lobatus*, one established by Hammer in the year 1967 from New Zealand and another by Balogh and Balogh, 1983 from Australia. However, the two species of the same name from different continents characteristically differ from each other mainly in the prodorsal region and especially in the nature of lamellae and length of interlamellar setae. Therefore, they should be treated as separate species. So, for the law of priority, the species name *P. lobatus* of Balogh and Balogh, 1983 should be changed.

***Hoplophthiracarus tropicus* Mondal and Kundu, 1988**

1988. *Hoplophthiracarus tropicus* Mondal and Kundu, *Rec. zool. Surv. India*, **85** (1) : 112.

Material examined 2 adult (F), INDIA W Bengal Jalpaiguri District, Raja Tea Estate (from loose litter of *Camellia sinensis*), 29.iv.1996 (B. K. Mondal coll.), 1 adult (F), INDIA W Bengal Jalpaiguri District, Banarhat Tea Estate (from soil under a tea plant, *Camellia sinensis*), 18. viii.1996 (B. G. Kundu coll.).

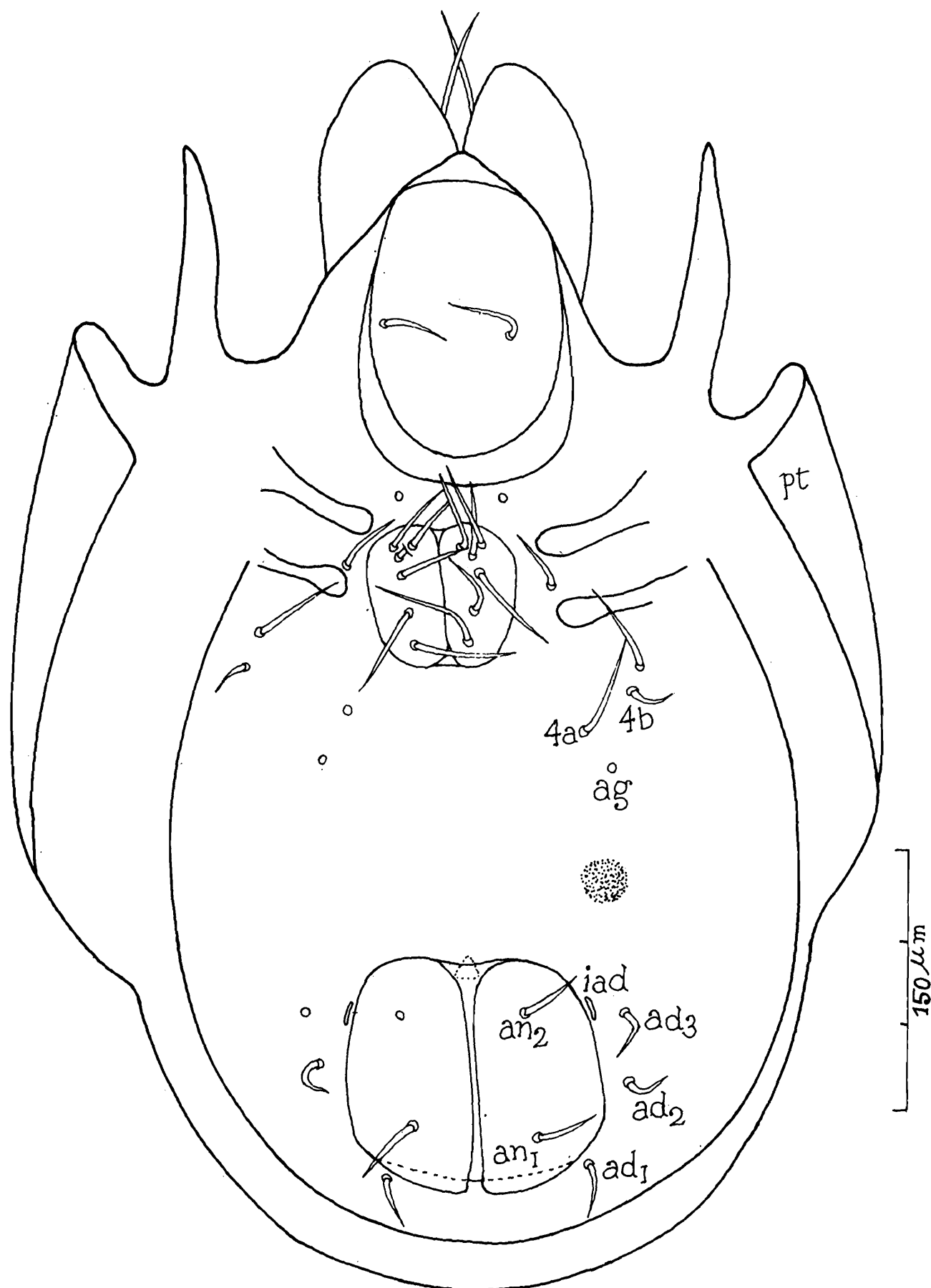


Fig. 2. *Parahypozetes orientalis* sp. nov. (Ventral view), an_1 , an_2 = anal setae, ad_1 , ad_2 , ad_3 = adanal setae, iad = adanal fissure, ag = aggenital seta, $4a$, $4b$ = epimeral setae, pt = pteromorph.

***Haplacarus foliatus* Wallwork, 1962**

1962. *Haplacarus foliatus* Wallwork, *Acarologia*, **4** (3) : 466.

Material examined: 1 adult (F), INDIA W Bengal Jalpaiguri District, Jainti Tea Estate (from loose soil under *Camellia sinensis*), 21.vii.1996 (B. K. Mondal coll.).

***Nanhermannia thaiensis* Aoki, 1965**

1965. *Nanhermannia thaiensis* Aoki, *Nat. Life Southeast Asia*, **4** : 149.

Material examined 1 adult (F), INDIA W Bengal Jalpaiguri District, CoochBehar Tea Estate (from decomposed leaves of *Camellia sinensis*), 9.vi.1996 (B. K. Mondal coll.); 1 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Dalgaon range, Dalgaon block (from loose soil with litter under *Tectona grandis*), 17.viii.1996 (B. G. Kundu coll.).

***Masthermannia mamillaris* Berlese, 1913**

1913. *Masthermannia mamillaris* Berlese, *Redia*, **9** : 100.

Material examined 1 adult (F), INDIA W Bengal Jalpaiguri District, Birpara Tea Garden (from humus), 23.vi.1996 (B. K. Mondal coll.).

***Phyllhermannia berlesei* Mondal, 1984**

1984. *Phyllhermannia berlesei* Mondal, *Rec. zool. Surv. India*, **81** (3 & 4) : 175.

Material examined 3 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Lataguri range, Sursuti block (from soil with litter under *Acacia auriculiformis*), 4.viii.1996 (B. K. Mondal coll.); 2 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Moraghat range, North Moraghat block (from soil under *Swietenia mahagoni*), 16.viii.1996 (B.G. Kundu coll.).

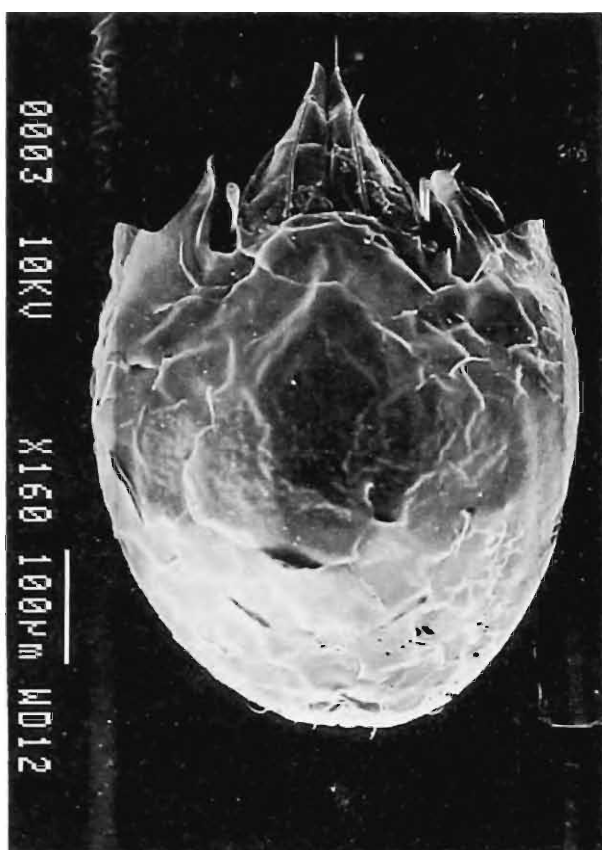
***Metabelba obtusa* Hammer, 1966**

1966. *Metabelba obtusa* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **15** (2) : 45.

Material examined 1 adult (F), INDIA W Bengal Jalpaiguri District, Indong Tea Estate (from litter of *Camellia sinensis*), 1.v.1996 (B. K. Mondal coll.); 1 adult (F), INDIA W Bengal Jalpaiguri District, Banarhat Tea Estate (from decaying leaves of *Camellia sinensis*), 18.viii.1996 (B. G. Kundu coll.).

***Microtegeus reticulatus* Aoki, 1965**

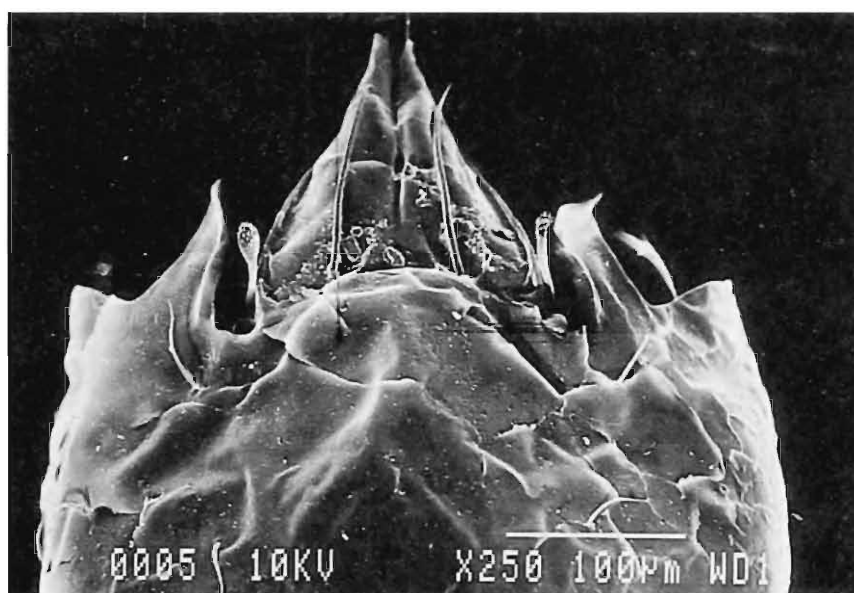
1965. *Microtegeus reticulatus* Aoki, *Nat. Life Southeast Asia*, **4** : 156.



3



4



5

Figs. 3-5. *Parahypozetes orientalis* sp. nov. (Scanning Electron Micrographs) : 3. Dorsal view, 4. Sensillus, 5. Details of prodorsum and anterior portion of notogaster.

Material examined: 2 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Nathua range, Jaldacha block (from decomposed leaves of *Melia azedarach*), 15.viii.1996 (B. K. Mondal coll.).

***Heterobelba rostrata* Mondal and Kundu, 1984**

1984. *Heterobelba rostrata* Mondal and Kundu, *Bull. zool. Surv. India*, **6** (1-3) : 223.

Material examined 3 adult (F), INDIA W Bengal Jalpaiguri District, Atiabari Tea Estate (from litter of *Camellia sinensis*), 12.v.1996 (B. K. Mondal coll.); 1 adult (F), INDIA : W Bengal Jalpaiguri District, Binaguri Tea Estate (from humus), 16.viii. 1996 (B. G. Kundu coll.).

***Leobodes mirabilis* Aoki, 1965**

1965. *Leobodes mirabilis* Aoki, *Nat. Life Southeast Asia*, **4** : 167.

Material examined: 1 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Ramsai range, Lower Tundu block (from soil under *Anthocephalus cadamba*), 18.viii.1996 (B. K. Mondal coll.).

***Oppia cryptomeriae* Mondal and Kundu, 1985**

1985. *Oppia cryptomeriae* Mondal and Kundu, *Bull. zool. Surv. India*, **7** (2-3) : 305.

Material examined 1 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Dalgaon range, Dalgaon block (from soil under *Tectona grandis*), 11.viii.1996 (B. K. Mondal coll.); 1 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Banarhat range, Rethi block (from soil under *Eucalyptus globulus*), 18.viii.1996 (B. G. Kundu coll.).

***Flagrosuctobelba flabella* Mondal, 1984**

1984. *Flagrosuctobelba flabella* Mondal, *Rec. zool. Surv. India*, **81** (3 & 4) : 153.

Material examined 1 adult (F), INDIA W Bengal Jalpaiguri District, Binaguri Tea Estate (from compost heap), 28.v.1996 (B. K. Mondal coll.).

***Zygoribatula tortilis* Hammer, 1977**

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

Material examined: 2 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div., Banarhat range, Rethi block (from decomposed leaves of *Albizia lebbeck*), 25.viii.1996 (B. K. Mondal coll.).

***Scheloribates huancayensis* Hammer, 1961**

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

Material examined 2 adult (F), INDIA W Bengal Jalpaiguri District, Patkapara Tea Estate (from rotten leaves of *Camellia sinensis*), 16.vi.1996 (*B. K. Mondal* coll.); 1 adult (F), INDIA W Bengal Jalpaiguri District, Birpara Tea Garden (from humus), 15.viii.1996 (*B. G. Kundu* coll.); 1 adult (F), INDIA W Bengal Jalpaiguri District, Gairkhata Tea Estate (from compost heap), 14.vii.1996, (*B. K. Mondal* coll.).

***Peloribates intermedius* Mondal, 1984**

1984. *Peloribates intermedius* Mondal, *Rec. zool. Surv. India*, **81** (3&4) : 156.

Material examined 4 adult (F), INDIA W Bengal Jalpaiguri District, Karala Valley Tea Estate (from soil under a tea plant, *Camellia sinensis*), 28.iv.1996 (*B. K. Mondal* coll.).

***Rostrozetes ovulum* (Berlese, 1908)**

1908. *Tachyoribates ovulum* Berlese, *Redia*, **5** : 3.

1925. *Rostrozetes foveolatus* Sellnick, *Suppl. Ent., Berlin*, **11** : 85.

1989. *Rostrozetes ovulum* (Berlese, 1908) : Norton and Kethley, *Redia*, **72** (2) : 472.

Material examined: 3 adult (F), INDIA : W Bengal Jalpaiguri District, Jalpaiguri forest Div., Lataguri range, Sursuti block (from decomposed leaves of *Alstonia scholaris*), 4.viii.1996 (*B. K. Mondal* coll.); 2 adult (F), INDIA W Bengal Jalpaiguri District, Jalpaiguri forest Div. Nathua range, Jaldacha block (from loose soil under *Terminalia chebula*), 17.viii.1996 (*B. G. Kundu* coll.); 1 adult (F), INDIA W Bengal Jalpaiguri District, Jainti Tea Estate (from litter of *Camellia sinensis*), 21.vii.1996 (*B. K. Mondal* coll.).

***Ceratozetes gracilis* (Michael, 1884)**

1884. *Oribata gracilis* Michael, *Ray. Soc.*, **61** : 225.

1928. *Ceratozetes gracilis* (Michael, 1884) : Sellnick, *Tierw. Mitteleur. Leipzig.*, **3** (4/9) : 13.

Material examined 2 adult (F), INDIA W Bengal Jalpaiguri District, Kalchini Tea Estate (from soil with rotten leaves of *Camellia sinensis*), 2.vi.1996 (*B. K. Mondal* coll.); 1 adult (F), INDIA W Bengal Jalpaiguri District, Birpara Tea Garden (from humus), 15.viii.1996 (*B. G. Kundu* coll.).

***Lamellobates palustris* Hammer 1958**

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

Material examined 2 adult (F), INDIA W Bengal Jalpaiguri District, Atiabari Tea Estate (from decaying leaves of *Camellia sinensis*), 12.v.1996 (*B. K. Mondal* coll.); 2 adult

(F), INDIA : W Bengal Jalpaiguri District, Jalpaiguri forest Div., Moraghat range, North Moraghat block (from rotten leaves of *Dalbergia sissoo*), 16.viii.1996 (B. G. Kundu coll.).

***Oribatella meridionalis* Berlese, 1908**

1908. *Oribatella meridionalis* Berlese, *Redia*, 5 : 5.

Material examined: 1 adult (F), INDIA W Bengal : Jalpaiguri District, Jalpaiguri forest Div., Lataguri range, Sursuti block (from decomposed leaves of *Ricinus communis*), 4.viii.1996 (B. K. Mondal coll.).

SUMMARY

This paper deals with nineteen species of soil oribatid fauna (Acari) distributed over nineteen genera under fifteen families. Out of the nineteen species one new species, viz., *Parahypozetes orientalis* is described here. All the other eighteen species mentioned here are first time reported from Jalpaiguri district. The genus *Parahypozetes* is recorded here for the first time from India.

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A NEW ORIBATID MITE (ACARI) AND FOUR NEW RECORDS OF ORIBATID FROM INDIAN SOILS

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INTRODUCTION

The topography, climatic conditions, altitudinal modulations and vegetations of the district of Darjeeling, West Bengal harbour the enriched faunal treasure of soil micro-arthropods, especially oribatid mites that live in forest and tea soils of Darjeeling. As oribatid mites are one of the predominating soil micro-arthropod groups among the inhabitants of soil litter in Darjeeling forest and tea fields, a survey programme was undertaken to investigate on the oribatid fauna since 1988. Taxonomic studies of a part of the collected material reveal the occurrence of a new species, *Oxyamerus himalayensis* and four known species distributed over five genera under five families. All the species listed here are new records for India. The genera *Oxyamerus* and *Podopterotegaeus* are recorded here for the first time from India.

The types of the new species and the material of the known species are deposited in the laboratory of the Department of Zoology, Ananda Chandra College, Jalpaiguri-735 101, India. All measurements are in micrometers (μm).

Oxyamerus Aoki, 1965

Oxyamerus Aoki, 1965 : 161.

The genus *Oxyamerus* was established by Aoki (1965) with type-species *Oxyamerus spathulatus* from Thailand. Balogh (1968) contributed 2 more new species, *O. aokii* and *O. latirostris* from New Guinea. Hammer (1979) created another two new species, *O. hyalinus* and *O. truncatus* from Java. One more new species, *O. hauserorum* was established by Mahunka (1987) from Sabah, East Malaysia. Thus total 6 species are known to occur under the genus *Oxyamerus*. The *Oxyamerus* is a new member in India and same is being reported here with a new species, *Oxyamerus himalayensis*.

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***Oxyamerus himalayensis* sp. nov.**

(Figs. 1-7)

Female : Colour brownish yellow; length of the body : 430-442; width of the body : 210-218.

Prodorsum more or less as long as broad; elongated rostrum with broader end possessing a small gap at its anterior apex; rostral setae (*ro*) phylliform, thick, hyaline with slightly pointed tips, directed upward, not overlapping each other, originating from lateral side of rostrum, 23-25 long and 7-9 broad; lamellar setae (*le*) simple, very thin with pointed tips, 22-26 long, situated a far behind the rostral tips; interlamellar setae (*in*) short, thick, 11-12 long, located between the pseudostigmata; sensillus (*ss*) thick, thread-shaped, slightly thin gradually at its anterior with terminal pointed end and half of sensillus unilaterally barbed distally, 102-105 long; bothridium (*bo*) as long as broad, partly closed by a lid; exobothridial setae (*ex*) absent.

Notogaster only a little longer than broad; anterior notogastral split or latero-anterior keel moderate, ending a little beyond the insertion points of setae *te*; dark band on anterior border of notogaster prominent and well defined, with very prominent anterior undulated end which connects both the pseudostigmata; notogastral setae 10 pairs, but setae *ta* very short and hardly visible, others are simple and moderately with pointed ends, 20-40 long; setae p_1 - p_3 directed forwards over the ventral plate and can only be observed in a ventral view; distance $ms-ms > ti-ti > te-te$; distance $r_1-r_1 < r_2-r_2 < r_3-r_3$.

Length of anal aperture as long as its maximum width (or each anal plate twice as long as broad), with 2 small, glabrous, nearly equal setae, 7-8 long; adanal setae 2 pairs, setae ad_2 absent, ad_1 and ad_3 short and simple, 12-14 long; ad_3 antero-lateral and ad_1 posterior to anal plate; distance $ad_3-ad_3 > ad_1-ad_1$, *iad* small, obliquely placed medio-laterally to anal field; distance between genital and anal apertures 2 times as long as the latter; each genital plate more than twice as long as its maximum width, with 6 simple setae, 16-20 long, 3 of which situated anteriorly and remaining 3 situated postero-laterally to the genital plate; the anterior extreme genital setae (*gen₆*) longer and thicker than others; aggenital setae one pair, simple with pointed tips, 18-20 long, their mutual distance exactly half the distance between anal and genital apertures.

Epimera I and II separated, III and IV fused; epimeral setae simple, 6-40 long, setae *3a* longest; epimeral setal formula 2-1-1-3.

All tarsi monodactylous, claws strongly curved.

Holotype Adult (F), INDIA W Bengal Darjeeling, Chandmari Tea Estate (from soil under a decaying tea plant, *Camellia sinensis*), 117 m., 6.vii.1988 (B. K. Mondal coll.); paratype 1 adult (F), INDIA W Bengal Darjeeling, East Sevoke forest block (from soil under the decomposed leaves of *Dalbergia sisoo*), 160 m., 3.ix.1989 (B. G. Kundu coll.); paratypes 2 adult (F), INDIA W Bengal Darjeeling, Sukna forest block (from soil under

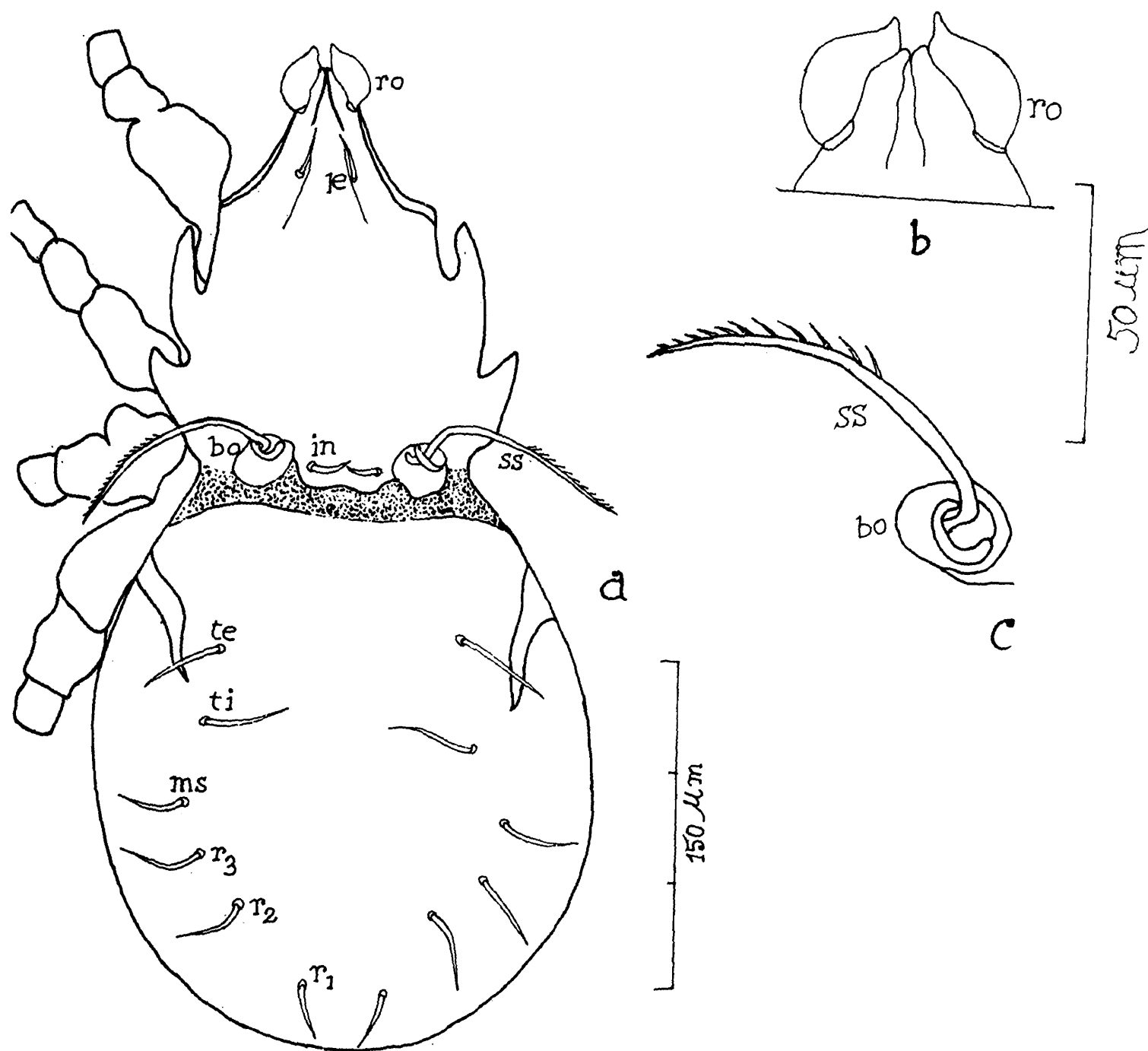


Fig. 1. (a-c). *Oxyamerus himalayensis* sp. nov. a. *O. himalayensis* (Dorsal view). - b. The anterior distal portion of prodorsum. - c. Bothridium and sensillus : *ro* = rostral seta, *lc* = lamellar seta, *in* = interlamellar seta, *bo* = bothridium, *ss* = sensillus, *ta*, *ti*, *ms*, *r₁*, *r₂*, *r₃* = notogastral setae.

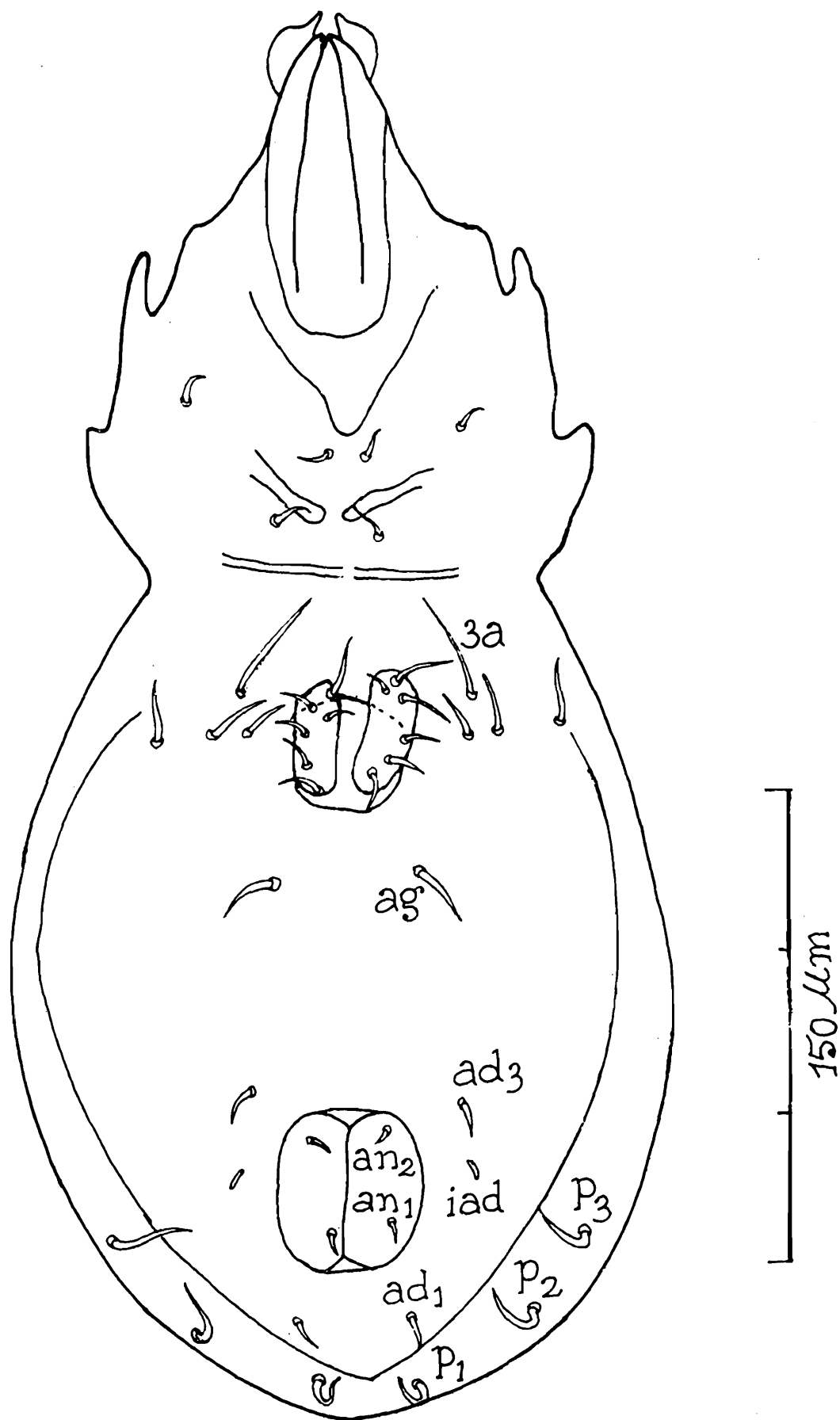


Fig. 2.

Oxyamerus himalayensis sp. nov. (Ventral view), an_1 , an_2 = anal setae, ad_1 , ad_2 = adanal setae, iad = adanal fissure, ag = aggenital seta, $3a$ = epimeral seta; p_1 , p_2 , p_3 = notogastral setae.

the rotten leaves of *Shorea robusta*, 170 m., 24.vii.1989 (B. K. Mondal coll.); paratype 1 adult (F), INDIA : W Bengal : Darjeeling, New Chumta Tea Estate (soil from loose humus), 128 m., 26.vii.1989 (B. K. Mondal coll.).

The new species is closely related to *Oxyamerus spathulatus* Aoki, 1965 in the appearance of notogastral, ventral and partly prodorsal characters. It also resembles with the Javanese species, *O. hyalinus* and *O. truncatus* Hammer, 1979 in the dark band on anterior border of notogaster. The new species however, differs from *spathulatus* by the nature of rostral setae, notogastral setae, rostrum, absence of exobothridial setae and presence of dark band on anterior border of notogaster. It also differs from both the Javanese species by the nature of dark band at the anterior border of notogaster, notogastral setae, rostrum, rostral setae and absence of exobothridial setae.

***Podopterotegaeus tectus* Aoki, 1969**

Podopterotegaeus tectus Aoki, 1969 : 132.

Material examined 1 adult (F), INDIA W Bengal Darjeeling, Lepchajagat forest block (from loose soil with litter under *Cryptomeria japonica* and *Quercus* sp.), 2000 m., 28.vii.1989 (B. K. Mondal coll.); 1 adult (F), INDIA W Bengal Darjeeling, Sonada forest block (from humus with loose litter), 2100 m., 5.ix.1989 (B. G. Kundu coll.).

Remarks : The Indian specimens accord well with the type species *Podopterotegaeus tectus* Aoki, 1969, except in having a slightly smaller body size.

***Microtegeus sabahnus* Mahunka, 1987**

Microtegeus sabahnus Mahunka, 1987 : 789.

Material examined 5 adult (F), INDIA W Bengal Darjeeling, Matigara Tea Estate (from decomposed leaves of *Camellia sinensis*), 117 m., 3.vii.1988 (B. K. Mondal coll.); 4 adult (F), INDIA W Bengal Darjeeling, Balasun Tea Estate (from compost heap), 600 m., 1.ix.1989 (B. G. Kundu coll.)

Remarks · The Indian specimens agree with *Microtegeus sabahnus* Mahunka, 1987 in all respects, but slightly greater in length and width than that of Malaysian species.

***Eupelops foveolatus* Engelbrecht, 1975**

Eupelops foveolatus Engelbrecht, 1975 : 89.

Material examined 2 adult (F), INDIA W Bengal Darjeeling, Makaibari Tea Estate (from litter of *Camellia sinensis*), 960 m., 18.viii.1988 (B. K. Mondal coll.); 1 adult

(F), INDIA : W. Bengal : Darjeeling, Lohagarh Tea Estate (from humus), 350 m., 7.ix.1989 (B. G. Kundu coll.).

Remarks : The Indian specimens resemble with *Eupelops foveolatus* Engelbrecht, 1975 in almost all the essential features except in having different nature of barbation of notogastral setae.

***Carabodes kusseri* Balogh et Balogh, 1983**

Carabodes kusseri Balogh et Balogh, 1983 : 307.

Material examined : 2 adult (F), INDIA : W. Bengal : Darjeeling, Merry view Tea Estate (from litter of *Camellia sinensis*), 117 m., 12.viii.1988 (B. K. Mondal coll.); 1 adult (F), INDIA : W. Bengal : Darjeeling, Sukna forest block (from decomposed leaves of *Shorea robusta*), 170 m., 4.ix.1989 (B. G. Kundu coll.).

Remarks : The Indian specimens are in conformity with *Carabodes kusseri* Balogh et Balogh, 1983 except for difference in slightly nature of sensillus.

SUMMARY

This paper reports five species of soil oribatid mites (Acari) under five genera from forest and tea fields in the district of Darjeeling, West Bengal, India. Out of the five species one, viz., *Oxyamerus himalayensis* is new to science. The genera *Oxyamerus* and *Podopterotegaeus* and the remaining four species are reported here for the first time from India.

ACKNOWLEDGEMENT

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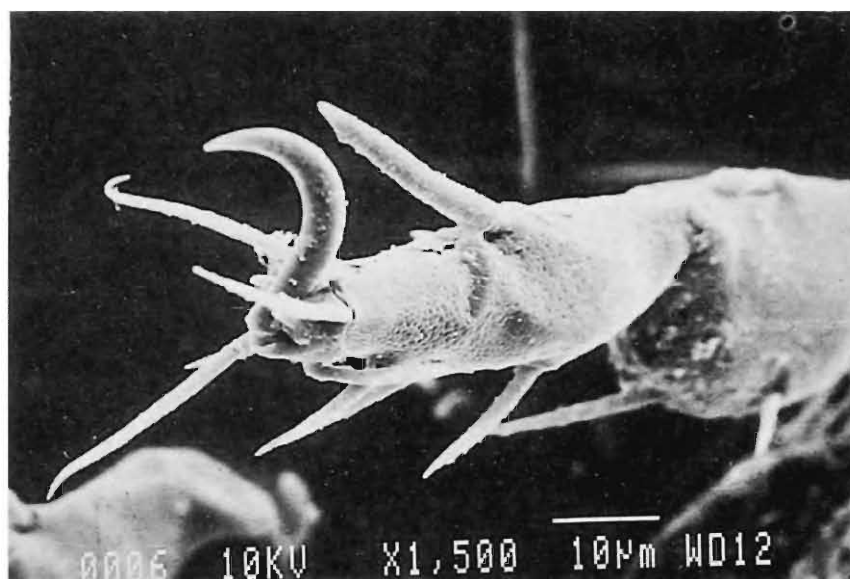
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3



4



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Figs. 3-5. *Oxyamerus himalayensis* sp. nov. (Scanning Electron Micrographs) : 3. Ventral view, 4. Epimeral and genital regions on ventral side, 5. Leg-IV.



6



7

Figs. 6-7. *Oxyamerus himalayensis* sp. nov. (Scanning Electron Micrographs) : 6. Genital plates and genital setae, 7. Anal plates and minute anal setae.

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ON A COLLECTION OF FISHES FROM SUBANSIRI AND SIANG DISTRICTS OF ARUNACHAL PRADESH

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INTRODUCTION

The present paper is based on a collection made by the author during February, 1996 covering Upper and Lower Subansiri, East and West Siang districts. Altogether 952 specimens of fishes belonging to 52 species under 11 families and 4 orders were collected.

The areas under survey are mostly mountainous except for a thin strip of flat land most of which adjoin Assam. The turbulent rivers like Subansiri, Siang and innumerable streams draining the whole region. The varied altitudinal and climatic conditions have given rise to a wide spectrum of faunal elements which are yet to be explored properly.

The fish specimens were mainly collected from the tributaries of the main rivers with rocky, sandy or muddy bottom at different places, surrounded either by thick forests or paddy fields.

The occurrence of pipefish (*Microphis deocata* (Hamilton-Buchanan)) from Siang district of Arunachal Pradesh is of interest which was reported earlier from Lower Assam of N.E India (Sehgal, 1955; Sen, 1980). From other states of this region it is not reported till today.

The general classification is followed after Talwar and Jhingran (1991) with some changes. Talwar and Jhingran (op.cit.) placed the genera "*Aborichthys*" and "*Nemacheilus*" under the family "Balitoridae" but revisionary studies of Menon (1987) placed them under family "Homalopteridae" which has been followed in the present study. Likewise, the species *Lepidocephalus goalparensis* (Pillai & Yazdani) (Talwar & Jhingran (op.cit.)) is synonymous to *L. menoni* Pillai & Yazdani (Menon, 1992).

A district wise list of collected species is as follows.

Name of the species	Distribution			
	Upper Subansiri	Lower Subansiri	East Siang	West Siang

CYPRINIFORMES CYPRINIDAE

- | | | | | |
|---------------------------------------|---|---|---|--|
| 1. <i>Cyprinus carpio</i> Linnaeus | | + | | |
| 2. <i>Labeo dero</i> (Ham.Buch.) | | | + | |
| 3. <i>Labeo pangusia</i> (Ham. Buch.) | + | | | |

Name of the species	Distribution			
	Upper Subansiri	Lower Subansiri	East Siang	West Siang
4. <i>Neolissocheilus hexagonolepis</i> (McCl.)	+	+		+
5. <i>Puntius chola</i> (Ham. Buch.)			+	
6. <i>Puntius conchoni</i> (Ham. Buch.)			+	
7. <i>Puntius guganio</i> (Ham. Buch.)			+	
8. <i>Puntius sophore</i> (Ham. Buch.)	+			+
9. <i>Puntius terio</i> (Ham. Buch.)		+		
10. <i>Puntius ticto</i> (Ham. Buch.)		+	+	
11. <i>Tor putitora</i> (Ham. Buch.)		+		+
12. <i>Aspidoparia jaya</i> (Ham. Buch.)			+	
13. <i>Barilius barna</i> (Ham. Buch.)	+		+	+
14. <i>Barilius bendelisis</i> (Ham. Buch.)	+		+	+
15. <i>Barilius dogarsinghi</i> Hora			+	
16. <i>Barilius shacra</i> (Ham. Buch.)			+	
17. <i>Barilius vagra</i> (Ham. Buch.)	+			
18. <i>Brachydanio rerio</i> (Ham. Buch.)	+	+	+	+
19. <i>Danio aequipinnatus</i> (Ham. Buch.)	+	+	+	+
20. <i>Danio devario</i> (Ham. Buch.)			+	
21. <i>Rasbora rasbora</i> (Ham. Buch.)			+	
22. <i>Schizopygopsis stoliczkae</i> Steind.	+			
23. <i>Schizothoraichthys esocinus</i> (Heckel)	+			
24. <i>Schizothoraichthys progastus</i> (McCL.)	+	+		+
25. <i>Schizothorax richardsonii</i> (Gray)	+			
26. <i>Crossocheilus latius latius</i> (Ham. Buch.)	+			
27. <i>Garra annandalei</i> Hora	+			+
28. <i>Garra kempfi</i> Hora	+			
29. <i>Garra lamta</i> (Ham. Buch.)			+	

Name of the species	Distribution			
	Upper Subansiri	Lower Subansiri	East Siang	West Siang
CYPRINIFORMES PSILORHYNCHIDAE				
30. <i>Psilorhynchus balitora</i> (Ham. Buch.)			+	
31. <i>Psilorhynchus homaloptera</i> Hora & Mukh.	+			
32. <i>Psilorhynchus sucatio</i> (Ham. Buch.)			+	
CYPRINIFORMES HOMALOPTERIDAE				
33. <i>Aborichthys kempi</i> Choudhury			+	+
34. <i>Noemacheilus arunachalensis</i> Menon				+
35. <i>Noemacheilus botia</i> (Ham. Buch.)	+		+	+
36. <i>Noemacheilus devdevi</i> Hora	+			
37. <i>Noemacheilus kangjupkhulensis</i> Hora				+
38. <i>Noemacheilus nagaensis</i> (Menon)				+
39. <i>Noemacheilus sikmaiensis</i> Hora	+			
CYPRINIFORMES : COBITIDAE				
40. <i>Lepidocephalus annandalei</i> (Choudhury)			+	
41. <i>Lepidocephalus menoni</i> (Pill. & Yazd.)			+	
42. <i>Lepidocephalus guntea</i> (Ham. Buch.)			+	+
SILURIFORMES : BAGRIDAE				
43. <i>Mystus montanus</i> (Jerdon)			+	
44. <i>Rama chandramara</i> (Ham. Buch.)			+	
SILURIFORMES SILURIDAE				
45. <i>Ompok pabda</i> (Ham. Buch.)			+	
SILURIFORMES Sisoridae				
46. <i>Conta conta</i> (Ham. Buch.)			+	
47. <i>Laguvia ribeiroi</i> Hora			+	
SYNGNATHIFORMES SYNGNATHIDAE				
48. <i>Microphis deocata</i> (Ham. Buch.)			+	

Name of the species	Distribution			
	Upper Subansiri	Lower Subansiri	East Siang	West Siang
PERCIFORMES NANDIDAE				
49. <i>Badis badis</i> (Ham. Buch.)			+	
PERCIFORMES BELONTIIDAE				
50. <i>Colisa fasciatus</i> (Schn.)			+	
PERCIFORMES CHANNIDAE				
51. <i>Channa punctata</i> (Bl.)			+	
52. <i>Channa stewartii</i> (Playfair)			+	

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THE ICHTHYOFAUNA OF DHARMAPURI DISTRICT, TAMIL NADU

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INTRODUCTION

Dharmapuri District, covering a total area of 9,615.89 sq. km. (Map 1) is situated on the extreme northwest part of Tamil Nadu between latitudes 11°54'N and 12°54'N and longitudes 77°25'E and 78°42'E. The district consists of scarcely wooded undulating plateau, dense jungles and river basins. The mean temperature is 37.8°C and the average rainfall is 680 mm. The two important rivers which flow through the district are the Chinnar and the Cauvery. The major reservoirs are Chinnar dam, Krishnagiri dam and Pambar dam.

The paper deals with the fish collections made by the Zoological Survey of India, Southern Regional Station, during Apr.-Mar. 1985-86 by Dr Koshy Mathew and party and during Sept.-Oct. 1996 by the second author. A total of 575 specimens belonging to 39 species have been identified, registered and incorporated in the Reserve Collections of SRS. The list includes 10 additional species (of the 22 species) identified from Krishnagiri Reservoir for Ms. Ponmozhi Gokulanathan, Lecturer, Bharati Woman's College, Madras. A total of 49 species are thus reported here. Under systematic account are included the first reference, material examined and distribution. Classification follows Menon, 1993 (in Press).

Earlier studies in this area include those of Jayaram et. al (1982), who listed 27 species from Hogenakal, of which 8 species are not represented in the present collections.

LIST OF SPECIES

(*Reported for the first time from this District)

Order OSTEOGLOSSIFORMES

Family NOTOPTERIDAE

1 *Notopterus notopterus* (Pallas)

Order CYPRINIFORMES

Family . CYPRINIDAE

Subfamily CULTRINAE

2. *Salmostoma clupeoides* (Bloch)

Subfamily RASBORINAE

- * 3. *Amblypharyngodon microlepis* (Bleeker)
- 4. *Danio aequipinnatus* (McClelland)
- * 5. *Esomus thermoicos* (Valenciennes)
- * 6. *Rasbora daniconius* (Hamilton)

Subfamily CYPRININAE

- 7. *Barbodes carnaticus* (Jerdon)
- 8. *Barbodes sarana subnasutus* (Valenciennes)
- * 9. *Catla catla* (Hamilton)
- * 10. *Cirrhinus mrigala* (Hamilton)
- 11. *Cirrhinus reba* (Hamilton)
- 12. *Hypselobarbus dubius* (Day)
- 13. *Labeo calbasu* (Hamilton)
- * 14. *Labeo dero* (Hamilton)
- * 15. *Labeo pangusia* (Hamilton)
- 16. *Labeo rohita* (Hamilton)
- * 17. *Osteochilichthys brevidorsalis* (Day)
- * 18. *Puntius amphibius* (Valenciennes)
- * 19. *Puntius bimaculatus* (Bleeker)
- 20. *Puntius chola* (Hamilton)
- 21. *Puntius conchoni* (Hamilton)
- 22. *Puntius dorsalis* (Jerdon)
- 23. *Puntius filamentosus* (Valenciennes)
- * 24. *Puntius mudumalaiensis* Menon and Rema Devi
- 25. *Puntius sophore* (Hamilton)
- 26. *Puntius ticto* (Hamilton)
- * 27. *Puntius vittatus* Day
- * 28. *Tor khudree* (Sykes)

Subfamily GARRINAE

- * 29. *Garra mullya* (Sykes)

Family COBITIDAE

- * 30. *Lepidocephalus thermalis* (Valenciennes)

Family : BALITORIDAE

Subfamily : NOEMACHEILINAE

- * 31 *Noemacheilus denisoni denisoni* Day

Order . SILURIFORMES

Family : BAGRIDAE

- * 32. *Mystus bleekeri* (Day)

33. *Mystus cavasius* (Hamilton)

- * 34. *Mystus vittatus* (Bloch)

Family : SILURIDAE

- * 35. *Ompok bimaculatus* (Bloch)

- * 36. *Silurus wynaadensis* Day

- * 37. *Wallago attu* (Schneider)

Order . CYPRINODONTIFORMES

Family ORYZIIDAE

- * 38. *Oryzias melastigma* (McClelland)

Family POECILIDAE

- * 39. *Gambusia affinis* (Baird and Girard)

Order : PERCIFORMES

Suborder PERCOIDEI

Family AMBASSIDAE

- * 40. *Chanda nama* Hamilton

Family CICHLIDAE

- * 41 *Etroplus maculatus* (Bloch)

- * 42. *Oreochromis mossambica* (Peters)

Suborder GOBIOIDEI

Family GOBIIDAE

- * 43. *Glossogobius giuris* (Hamilton)

Suborder MUGILOIDEI

Family MUGILIDAE

44. *Rhinomugil corsula* (Hamilton)

Suborder CHANNOIDEI

Family : CHANNIDAE

45. *Channa marulius* (Hamilton)

- * 46. *Channa orientalis* Bloch and Schneider

- * 47. *Channa punctatus* (Bloch)

Order : MASTACEMBELIFORMES

Family MASTACEMBELIDAE

- * 48. *Macrogathus aral* (Bloch and Schneider)

49. *Mastacembelus armatus* (Lacepede)

SYSTEMATIC ACCOUNT

Order OSTEOGLOSSIFORMES

Family NOTOPTERIDAE

1 *Notopterus notopterus* (Pallas)

1769. *Gymnotus notopterus* Pallas, *Spicil. Zool.*, 7 : 40, pl. 6, fig. 2 (Type locality : Indian Ocean).

Material · 1 ex., 186.0 mm SL, Hogenakal, 20.9.96, F.5106; 1 ex., 180.0 mm SL, Chinnar Dam, 29.9.96, F. 5231; 1 ex, 196.0 mm SL, Krishnagiri Reservoir, March '92.

Distribution Pakistan, India, Nepal, Bangladesh, Burma, Thailand, Malaya and Indonesia.

Order CYPRINIFORMES

Family CYPRINIDAE

Subfamily CULTRINAE

2. *Salmostoma clupeioides* (Bloch)

1782. *Cyprinus clupeioides* Bloch, *Naturges ausland. Fische*, 12 : 49, pl. 408, fig. 2 (Type locality : Tranquebar).

Material · 21 exs., 20.0-33.0 mm SL, Vaniyar, near Harur Town, 24.9.96, F.5142; 3 exs., 105.0 mm SL, Chinnar dam, 29.9.96, F. 5232; 1 ex., 124.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution : India : Peninsular India, Gujarat, Maharashtra, Karnataka, Tamil Nadu and Madhya Pradesh (Narmadha, Godavary, Krishna and Cauvery).

Subfamily RASBORINAE

3. *Amblypharyngodon microlepis* (Bleeker)

1853. *Leuciscus microlepis* Bleeker, *Verh. batav. Genoot. Kunst. wet*, **25** : 141 (Type locality : Bengal).

Material : 1 ex., 48.0 mm SL, Palakode, 22.9.'96, F.5128; 1 ex., 40.0 mm SL, Pelarhalli, 22.9.96, F. 5130; 1 ex., 30.0 mm SL, Aulukanatham, 28.9.96.

Distribution : India : Bengal through Chota-Nagpur to Peninsular India, except the west face of the Western Ghats.

4. *Danio aequipinnatus* (McClelland)

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

Material 4 exs., 48.0-58.0 mm SL, Thopur, 21.9.96, F.5120; 4 exs., 14.0-35.5 mm SL, Vaniyar near Harur Town, F. 5143.

Remarks D.3/10-11; A.3/13-15; L.1 40-41; predorsal 16-18. Though Jayaram (1991) distinguished *D. malabaricus* (Jerdon) from *D. aequipinnatus* (McCl.) by the greater number of branched rays in dorsal and anal and greater number of L.I. scales the present specimens could be only tentatively placed under *D. aequipinnatus*, owing to the overlapping of these characters.

Distribution Throughout India, Nepal, Bangladesh, Burma and Thailand.

5. *Esomus thermoicos* (Valenciennes)

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

Material : 1 ex., 74.0 mm SL, Hogenakal, 20.9.96, F. 5107; 8 exs., 38.0-86.0 mm SL, Thopur, 21.9.96, F. 5122; 3 exs., 21.0-25.0 mm SL, Aulukanatham, 28.9.96; 52 exs., 23.0-58.0 mm SL Veppalapalli River, 3.10.96, F. 5239.

Remarks P.1/11-12; pd. 17-20; L.1.35 complete; the anterior rays of the pectoral are prolonged in the specimens from Veppalapalli River and in specimens from Thopur this feature is observed in smaller specimens; also the maxillary barbels extend to tip of pectoral in smaller specimens and with increase in length of fish the barbels extend only upto middle or anterior third of pectoral; in the specimen from Hogenakal the scales above the anal are tuberculate.

Distribution Sri Lanka, Peninsular India.

6. *Rasbora daniconius* (Hamilton)

1822. *Cyprinus daniconius* Hamilton, *Fish. Ganges*, 327, pl. 15, fig. 89. (Type locality : Rivers of Southern Bengal).

Material: 7 exs., 44.0-45.0 mm SL, Thopur, 21.9.96, F.5123; 1 ex., 23.5 mm SL, Vaniyar, near Harur Town, 24.9.96; 4 exs., 19.0-44.0 mm SL, Veppalapalli River, F.5240; 1 ex., 20.0mm. SL, Anchetty near Dhalla, 14.4.85, F. 3383.

Remarks : Predorsal scales 14-16; post dorsal distance just falls before posterior border of eye; numerous, minute granulations on head were observed in some specimens from Thopur.

Distribution : Throughout India, Sri Lanka, Pakistan, Nepal, Bangladesh, Burma and Thailand.

Subfamily : CYPRININAE

7. *Barbodes carnaticus* (Jerdon)

1849. *Barbus carnaticus* Jerdon, *Madras J. Lit. Sci.*, 15 : 311 (Type locality : Cauvery River).

Material : 1 ex., 126.0 mm SL, Hogenakal, 20.9.'96, F. 5109.

Distribution : Peninsular India : Cauvery River System.

8. *Barbodes sarana subnasutus* (Valenciennes)

1842. *Barbus subnasutus* Valenciennes, *Hist. nat. Poiss.*, 16 : 154. (Type locality : Pondicherry).

Material: 1 ex., 188.0 mm SL, Hogenakal, 20.9.'96, F. 5110; 1 ex., 44.0 mm SL, Vaniyar near Harur town, 24.9.96, F5144; 3 exs., 100.0-132.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution : India : Peninsular : Krishna River and South.

9. *Catla catla* (Hamilton)

1822. *Cyprinus catla* Hamilton, *Fish. Ganges* : 287, 318, pl. 13, fig. 81 (Type locality : Rivers & tanks of Bengal.)

Material : 1ex., 155.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution : Pakistan, India : Northern India, Bangladesh, Nepal, Burma. Introduced into the rivers of Peninsular India and Sri Lanka.

10. *Cirrhinus mrigala* (Hamilton)

1822. *Cyprinus mrigala* Hamilton, *Fish. Ganges.* : 279, 389, pl. 6, fig. 79 (Type locality : Ponds and freshwater rivers of the Gangetic Provinces.)

Material : 1 ex., 138.0 mm SL, Krishnagiri Reservoir, Jan., '94.

Distribution : Pakistan, India : Northern India. Nepal, Bangladesh. Introduced into Peninsular India.

11 *Cirrhinus reba* (Hamilton)

1822. *Cyprinus reba* Hamilton, *Fish. Ganges.* : 280, 386. (Type locality : Rivers and Ponds of Bengal and Bihar).

Material : 1 ex., 110.0 mm SL, Hogenakal, 20.9.96, F. 5113; 1 ex., 140.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution : Pakistan, Throughout India, Nepal, Bangladesh, Burma.

12. *Hypselobarbus dubius* (Day)

1867. *Puntius (Barbodes) dubius* Day, *Proc. Zool. Soc. Lond.*, : 291. (Type locality : Bhavani River at the base of Nilgiri Hills).

Material : 1 ex., 128.0 mm SL, Hogenakal, 20.9.'96, F.5111

Distribution : India Tamil Nadu Bhavani, Cauvery and Manimuthar.

13. *Labeo calbasu* (Hamilton)

1822. *Cyprinus calbasu* Hamilton, *Fish Ganges.* : 297, 389, pl. 2, fig. 33 (Type locality : Bengal).

Material : 1 ex., 130.0 mm SL, Krishnagiri Reservoir, Jan. '94.

Distribution : Throughout India, Pakistan, Nepal, Bangladesh, Burma, Thailand. Also S.W. China.

14. *Labeo dero* (Hamilton)

1822. *Cyprinus dero* Hamilton, *Fish. Ganges* : 277, 331, 585, pl. 22, fig. 78. (Type locality : River Brahmaputra).

Material : 1 ex., 125.0 mm SL. Hogenakal, 20.9.96, F.5114.

Remarks : D.3/10; L.1.42; L.tr. $9\frac{1}{2}$ / $6\frac{1}{2}$; dorsal fin slightly higher than body depth; snout with small lateral lobes and with tubercles; lower lip fringed; eye 4 in HL; HL 4.3 in SL. Now found commonly in some reservoirs and river systems of Tamil Nadu.

Distribution: India : All along the Himalaya including Kashmir, Chota-Nagpur, Sathpura-Vindhya ranges, Deccan and south as far as the Tambraparni. Pakistan, Nepal, Bangladesh.

15. *Labeo pangusia* (Hamilton)

1822. *Cyprinus pangusia* Hamilton, *Fish. Ganges*, : 285, 386 (Type locality : River Kosi).

Material 1 ex., 125.0 mm SL, Krishnagiri Reservoir, Jan., '94.

Distribution India All along the Himalaya including Kashmir as also Chota-Nagpur, Vindhya-Satpura ranges, Deccan and South as far as the Tambraparni as introduced species. Pakistan, Nepal, Bangladesh.

16. *Labeo rohita* (Hamilton)

1822. *Cyprinus rohita* Hamilton, *Fish. Ganges*, : 301, 388, pl. 36, fig. 85. (Type locality : Gangetic Provinces)

Material 2 exs., 145.0 & 182.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution: India : Northern India. Pakistan, Nepal, Bangladesh, Burma. Introduced into Peninsular India and Sri Lanka.

17. *Osteochilichthys brevidorsalis* (Day)

1873. *Semiplotus brevidorsalis* Day, *Proc. Zool. Soc. Lond.* 239 (Type locality : Rivers below Neilgherry Hills).

Material 1 ex., 142.0 mm SL, Hogenalkal, 20.9.'96, F. 5108.

Distribution India : Rivers below Nilgiri Hills in South India.

18. *Puntius amphibius* (Valenciennes)

1842. *Capoeta amphibia* Valenciennes (in C & V), 16 : 282, pl. 478 (Type locality : Bombay)

Material 1 ex., 27.0 mm SL, Veppalapalli River, F. 5244.

Distribution India Peninsular India, Central India, Orissa. Sri Lanka.

19. *Puntius bimaculatus* (Bleeker)

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

Material 4 exs., 47.0-60.0 mm SL, Thopur, 21.9.96, F.5124; 2 exs., 16.5 & 17.0 mm SL, Aulukanatham, 28.9.96; 10 exs., 18.0-20.0 mm SL, Veppalapalli River, 3.10.'96, F. 5242; 3 exs., 20.0 mm SL, Anchetty Road to Dhalla, 14.4.'85, F. 3382.

Distribution India : Peninsular India. Sri Lanka.

20. *Puntius chola* (Hamilton)

1822. *Cyprinus chola* Hamilton, *Fish. Ganges.* : 312, 389. (Type locality : North eastern parts of Bengal).

Material : 1 ex., 30.0 mm SL, Vaniyar near Harur town, 24.9.96, F. 5145.

Distribution Throughout India, Pakistani, Nepal, Bangladesh, Burma and Sri Lanka.

21 *Puntius conchoni* (Hamilton)

1822. *Cyprinus conchoni* Hamilton, *Fish Ganges.* : 317, 389 (Type locality : Ponds of northeast Bengal).

Material: 3 exs. 59.0-60.0 mm SL, Krishnagiri dam, 2.10.96, F. 5102; 1 ex., 49.0 mm SL, Vaniyar near Harur Town, 24.9.96, F. 5148.

Distribution India Ganga, Brahmaputra, Mahanadi and Cauvery river systems. Afghanistan, Pakistan, Nepal, Bangladesh.

22. *Puntius dorsalis* (Jerdon)

1849. *Systemus dorsalis* Jerdon, *Madras J. Lit. Sci.*, 15 : 314 (Type locality : Tanks and rivers in neighbourhood of Madras).

Material : 11 exs., 55.0-99.0 mm SL, Thopur 21.9.96, F. 5121, 5 exs., 29.0-33.0 mm SL, Vaniyar near Harur Town, 24.9.96, F. 5146; 1 ex., 90.0 mm SL, Krishnagiri Reservoir, Jan., '94.

Distribution : India : Peninsular India . Cauvery, Krishna, Godavary, Mahanadi, Narmada river systems. Sri Lanka.

23. *Puntius filamentosus* (Valenciennes)

1844. *Leuciscus filamentosus* Valenciennes, *Hist. Nat. Poiss.*, 17 : 95, pl. 492 (Type locality : Alleppy).

Material : 1 ex., 87.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution Peninsular India : Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh. Sri Lanka.

24. *Puntius mudumalaiensis* Menon and Rema Devi

1992. *Puntius mudumalaiensis* Menon and Rema Devi, *J. Bombay nat. Hist. Soc.*, 89 (2) : 229-231. (Type locality : Kakkanhalla Road, Mudumalai, Tamil Nadu).

Material : 1 ex., 22.5 mm SL, Aulukanatham, 28.9.96, F.5159.

Remarks The single specimen has been tentatively identified as *P. mudumalaiensis*, characterized by a proportionately large head, deep body, a pair of minute maxillary barbel,

a weak dorsal spine, an incomplete lateral line (with 26 scale rows) and two blotches, one on dorsal base and another on caudal peduncle. This is the first report of the species from the Cauvery system after its description in 1992.

Distribution : India Tamil Nadu Western Ghats Cauvery System.

25. *Puntius sophore* (Hamilton)

1822. *Cyprinus sophore* Hamilton, *Fish. Ganges*. : 310, 389, pl. 19, fig. 86 (Type locality : Ponds and rivers in the Gangetic provinces).

Material : 3 exs., 26.0-31.0 mm SL, Vaniyar near Harur Town, 24.9.96, F.5147; 13 exs., 35.0-61.0 mm SL, Veppalapalli River, 3.10.96, F. 5241, 2 exs., 43.0-63.0 mm SL, Keesankuppam tank, 9.4.85, F.5252.

Distribution Throughout India, Pakistan, Bangladesh, Burma, Yunnan.

26. *Puntius ticto* (Hamilton)

1822. *Cyprinus ticto* Hamilton, *Fish. Ganges* : 314, 398, pl. 8, fig. 87. (Type locality : South eastern parts of Bengal).

Material 1 ex., 37.0 mm SL, Pelar Halli, 22.9.'96, F.5131, 1 ex., 28.0 mm SL, Thalli, 27.9.'96, F. 5157; 1 ex., 16.0 mm SL, Aulukanatham, 28.9.'96; 2 exs., 20.0 & 28.0 mm SL, Uthangarai tank, 1 10.'96; 25 exs., 15.0-40.0 mm SL, Veppalapalli River, 3.10.'96, F.5243.

Distribution : Throughout India, Pakistan, Bangladesh, Burma, Thailand & Sri Lanka.

27. *Puntius vittatus* Day

1865. *Puntius vittatus* Day, *Proc. Zool. Soc. Lond.*: 303 (Type locality : Madras).

Material 2 exs., 14.0 and 21.5 mm SL, Veppalapalli River, 3.10.'96, F. 5245.

Distribution India : Peninsular India Goa, Cutch, Karnataka, Kerala, Tamil Nadu. Sri Lanka.

28. *Tor khudree* (Sykes)

1838. *Barbus khudree* Sykes, *Proc. Zool. Soc. Lond.* : 159. (Type locality : Mulla Mutha River near Poona).

Material 1 ex., 165.0 mm SL, Hogenalkal, 20.9.96, F. 5112.

Remarks : D.3/9; L.1.26; L.tr. $4/2\frac{1}{2}$; predorsal 10; P.1/16; V 1/8; 2 pairs of well developed barbels; lips produced; HL equal to BD; BD 3.2 in SL; no tubercles on snout; gill rakers 11+4, the base thickened with knob like projections; dorsal and caudal edged black, fin bases yellow.

Distribution Peninsular India Deccan and the entire Peninsular. Sri Lanka.

Subfamily : GARRINAE

29. *Garra mullya* (Sykes)

1841. *Chondrostoma mullya* Sykes, *Trans. Zool. Soc. Lond.*, 2 : 359, Pl. 62, fig. 3 (Type locality : Bheema river at Daunde, near Poona).

Material : 1 ex., 64.0 mm SL, Thopur, 21.9.96, F. 5125; 1 ex., 96.0 mm SL, Tumbalahalli Dam, 23.9.96, F.5140; 1 ex., 32.0 mm SL, Vaniyar near Harur town, 24.9.96, F.5149; 2 exs., 23.0 & 47.0 mm SL, Bommidi Gajakulam, 12.3.86, F. 3787; 1 ex., 112.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution Throughout Peninsular India.

Family : COBITIDAE

30. *Lepidocephalus thermalis* (Valenciennes)

1846. *Cobitis thermalis* Valenciennes, *Hist. Nat. Poiss.*, 18 : 78. (Type locality : Hot springs of Kanniya, E.P., Sri Lanka).

Material : 16 exs., 25.0-42.0 mm SL, Muduganappalli, 26.9.96, F.5105; 4 exs., 50.0-51.0 mm SL, Thopur, 21.9.96, F.5126; 1 ex., 17.0 mm SL, Vaniyar near Harur Town, 24.9.96; 22 exs., 24.0-38.0 mm SL, Thenkenikottai, 26.9.96, F. 5155; 1 ex., 38.0 mm SL, Thalli, 27.9.96, F. 5158; 14 exs., 25.0-43.0 mm SL, Uthangarai, 1.10.96; 70 exs., 22.0-47.0 mm SL, Veppalapalli River, 3.10.96, F.5238.

Distribution : Peninsular India, Sri Lanka.

Family : BALITORIDAE

Subfamily NOEMACHEILINAE

31. *Noemacheilus denisoni denisoni* (Day)

1867. *Nemachilus denisoni* Day, *Proc. Zool. Soc. Lond.*, 287. (Type locality : Bhawany river, base of Nilgiris).

Material 23 exs., 23.0-47.0 mm SL, Bommidi, Gajakulam, 12.3.'86, F. 3738.

Distribution : Peninsular India Rajasthan, Madhya Pradesh, Maharashtra, Karnataka, Kerala, Tamil Nadu.

Order : SILURIFORMES

Family BAGRIDAE

32. *Mystus bleekeri* (Day)

1846. *Bagrus keletius* (nec Valenciennes) Bleeker, *Nat. Gen. Arch. Ned. Ind.*, 3 (2) : 135 (Type locality : Bengal).

Material 1 ex., 100.0 mm SL, Krishnagiri Dam, 2.10.96, F.5103; 2 exs., 41.0 & 45.0 mm SL, Vaniyar near Harur Town, 24.9.96. F.5150.

Distribution Throughout India, Pakistan, Nepal, Bangladesh & Burma.

33. *Mystus cavasius* (Hamilton)

1822. *Pimelodus cavasius* Hamilton, *Fish. Ganges.* : 203, 379, pl. 11, fig. 67 (Type locality : Gangetic Provinces).

Material 1 ex., 142.0 mm SL, Hogenalkal, 20.9.96, F.5115; 1 ex., 120.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution India, Pakistan, Nepal, Bangladesh, Burma, Malaya, Thailand, Java, Borneo, Sumatra.

34. *Mystus vittatus* (Bloch)

1797. *Silurus vittatus* Bloch, *Ichth. Hist. Nat.*, 11 : 40, pl.371, fig. 2. (Type locality : Tranquebar, S. India).

Material 1 ex., 92.0 mm SL, Chinnar dam, 29.9.96, F.5233; 2 exs., 100.0 & 110.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution : Throughout India, Pakistan, Nepal, Bangladesh, Sri Lanka, Burma and Thailand.

Family : SILURIDAE

35. *Ompok bimaculatus* (Bloch)

1797. *Silurus bimaculatus* Bloch, *Ichth. Hist. Nat.*, 11 : 17, pl. 364 (Type locality : Malabar).

Material 1 ex., 215.0 mm SL, Hogenalkal, 20.9.96, F.5116; 1 ex., 165.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution Throughout India, Pakistan, Nepal, Bangladesh, Sri Lanka, Burma, Thailand, Java, Sumatra, Borneo and China.

36. *Silurus wynaadensis* Day

1868. *Silurus punctatus* Day, *Proc. Zool. Soc. Lond.* : 155 (Type locality : Wynaad, Kerala).

Material 1 ex., 240.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution Western Ghats Kerala Wynaad (Cauvery drainage); Tamil Nadu : Cauvery drainage; Karnataka; Jagger Valley (Thungabhadra drainage).

37. *Wallago attu* (Schneider)

1801. *Silurus attu* Schneider, *Syst. Ichth.* 378, pl. 75. (Type locality : Malabar).

Material : 1 ex., 200.0 mm SL, Hogenakal, 20.9.'96, F. 5117

Distribution : India, Sri Lanka, Afghanistan, Pakistan, Bangladesh, Burma, Thailand and Indonesia.

Order : CYPRINODONTIFORMES

Family . ORYZIIDAE

38. *Oryzias melastigma* (McClelland)

1838. *Aplocheilus melastigmus* McClelland, *Asiat. Res.*, 19 (2) : 301, 427, pl. 42, fig. 3, pl. 35, fig. 4 (Type locality : Calcutta).

Material : 1 ex., 21.0 mm SL, Uthangarai, 1.10.96, F.5236.

Distribution : Throughout India, Sri Lanka, Pakistan, Bangladesh, Burma, Malay Peninsula, Thailand.

Family : POECILIDAE

39. *Gambusia affinis* (Baird and Girard)

1853. *Heterandria affinis* Baird and Girard, *Proc. Acad. nat. Sci. Philad.*, 6 : 390 (Type locality : San Antonio river Drainage, Texas).

Material : 2 exs., 23.5 & 24.0 mm SL, Aulukanatham, 28.9.96, F. 5229; 42 exs., 15.0-34.0 mm SL, Veppalapalli River, 3.10.96, F. 5246; 21 exs., 15.0-23.0 mm SL, Anchetty Road to Dhalla, 14.4.85, F. 3381

Distribution : The Netherlands, Antilles, the Venezuelan Is., Trinidad and British Guiana; introduced into India.

Order PERCIFORMES

Suborder PERCOIDEI.

Family AMBASSIDAE

40. *Chanda nama* Hamilton

1822. *Chanda nama* Hamilton, *Fish Ganges.* : 109, 371, pl. 39, fig. 37. (Type locality : N.E. Bengal)

Material 1 ex., 40.0 mm SL, Palakode, 22.9.96 F.5129; 1 ex., 33.0 mm SL, Pelarhalli, 22.9.96, F.5132; 1 ex., 33.0 mm SL, Vaniyar near Harur Town, 24.9.96, F. 5151; 1 ex., 74.0 mm SL, Krishnagiri Reservoir, Jan., '94.

Distribution Throughout India, Pakistan, Bangladesh, Nepal, Burma.

Family CICHLIDAE

41 *Etroplus maculatus* (Bloch)

1785. *Chaetodon maculatus* Bloch, *Syst. Ichth.* : 427, fig. 2 (Type locality : not given).

Material 7 exs., 55.0-65.0 mm SL, Krishnagiri Dam, 2.10.96, F.5237; 1 ex., 36.0 mm SL, Veppalapalli River, 3.10.96, F.5247.

Distribution Peninsular India, Sri Lanka.

42. *Oreochromis mossambica* (Peters)

1852. *Chromis (Tilapia) mossambicus* Peters, *Montab. Akad. Wiss.*, Berlin : 681 (Type locality : Mozambique).

Material 1 ex., 65.0 mm SL, Hogenaikal, 20.9.'96, F.5118; 1 ex., 41.0 mm SL, Thopur, 21.9.'96, F. 5127; 6 exs., 51.0-70.0 mm SL, Nagondapalli, 25.9.'96, F. 5152; 55 exs., 25.0-102.0 mm SL, Thalli, 27.9.'96, F. 5156; 1 ex., 62.0 mm SL, Chinnar Dam, 29.9.'96, F.5235; 4 exs., 26.0-31.0 mm SL, Uthangarai, 1.10.'96; 10 exs., 13.0-40.0 mm SL, Veppalapalli River, 3.10.'96, F.5248; 1 ex., 135.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution : East Africa; an introduced species in India, Pakistan and Sri Lanka.

Suborder GOBIOIDEI

Family GOBIIDAE

43. *Glossogobius giuris* (Hamilton)

1822. *Gobius giuris* Hamilton, *Fish. Ganges* : 51, 366, pl. 33, fig. 15. (Type locality : Gangetic Provinces).

Material : 1 ex., 70.0mmSL, Tumbalahalli Dam, 23.9.'96, F.5141, 2 exs., 130.0 & 131.0mm SL, Chinnar Dam, 29.9.'96, F.5234; 1ex., 46.0mm SL, Uthangarai, 1.10.'96; 2 exs., 24.0 & 27.5mm SL, Veppalapalli River, 3.10.'96, F. 5249; 1ex., 145.0mm SL, Krishnagiri Reservoir, March'92.

Distribution : Indo-West Pacific.

Suborder : MUGILOIDEI

Family : MUGILIDAE

44. *Rhinomugil corsula* (Hamilton)

1822. *Mugil corsula* Hamilton, *Fish. Ganges* : 221, 381, pl. 9, fig. 97 (Type locality : Gangetic Provinces)

Material : 2 exs., 145.0 & 160.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution : India, Bangladesh, Nepal and Burma.

Suborder CHANNOIDEI

Family CHANNIDAE

45. *Channa marulius* (Hamilton)

1822. *Ophiocephalus marulius* Hamilton, *Fish. Ganges* : 65, 367, pl. 17, fig. 9. (Type locality : river Ganges).

Material : 1 ex., 37.5 cm SL, Chinnar Dam, 29.9.96, F.5101

Distribution : India, Pakistan, Sri Lanka, Bangladesh, Nepal, Burma, Thailand, Sumatra, Borneo and China.

46. *Channa orientalis* Bloch and Schneider

1801. *Channa orientalis* Bloch and Schneider, *Syst. Ichth.* 496, pl. 90, fig. 2. (Type locality : India).

Material : 10 exs., 18.5-34.0 mm SL, Muduganapalli, 26.9.'96, F.5153; 17 exs., 23.0-43.0 mm SL, Thenkenikottai, 26.9.'96, F.5154; 1 ex., 43.0 mm SL, Aulukanatham, 28.9.'96, F.5230; 1 ex., 29.0 mm SL, Veppalapalli River, 3.10.96, F.5250.

Distribution : Afghanistan, Pakistan, India, Sri Lanka, Nepal, Bangladesh, Burma and Yunnan.

47. *Channa punctatus* (Bloch)

1793. *Ophiocephalus punctatus* Bloch, *Naturges. Ausland. Fische*, 7 : 139 (Type locality : Coromandal Coast).

Material : 1 ex., 135.0 mm SL, Krishnagiri Reservoir, March '92.

Distribution : Afghanistan, Pakistan, India, Nepal, Sri Lanka, Bangladesh, Burma and Yunnan.

Order MASTACEMBELIFORMES

Family MASTACEMBELIDAE

48. *Macrognathus aral* (Bloch and Schneider)

1801. *Rhynchobdella aral* Bloch and Schneider, *Syst. Ichth.*, 478, pl. 89. (Type locality : Tranquebar, Tamil Nadu).

Material : 1 ex., 245.0 mm SL, Krishnagiri Reservoir, March, '92.

Distribution Pakistan, India, Sri Lanka, Bangladesh, Nepal and Burma.

49. *Mastacembelus armatus* (Lacepede)

1800. *Macrogathus armatus* Lacepede, *Hist. Nat. Poiss.*, 2 : 286. (Type locality : not known).

Material 1 ex., 250.0 mm SL, Chinnar Dam, 29.9.96, F.5104; 1 ex., 200.0 mm SL, Hogenaikal, 20.9.'96, F. 5119; 1 ex., 54.0 mm SL, Krishnagiri Dam, 2.10.'96, F.5251

Distribution : Pakistan, India, Sri Lanka, Nepal, Burma, Thailand, Malaya to China.

DISCUSSION

From the present study and from earlier reports (Jayaram et al, 1982), so far 57 species are known to occur in Dharmapuri District, Jayaram (op.cit.) listed 142 species from the Cauvery system of which 27 species were collected from Hogenaikal in Dharmapuri District. During the present survey 8 species listed by him could not be collected. Of these *Osteobrama cotio cotio* (Ham.) and *Labeo boggut* (Sykes) were reported by Jayaram (op.cit) only from Hogenaikal for the whole of the Cauvery sytem surveyed from its origin to the river mouth. The other species not collected during the recent surveys are *Salmostoma acinaces* (Val.), *Salmostoma untrahi* (Day), *Barilius bendelisis bendelisis* (Ham.), *Aorichthys aor* (Ham.), *Silonia childreni* Sykes and *Pangasius pangasius* (Ham). On the other hand, of the 14 species collected from Hogenaikal, 7 species viz. *Esomus thermoicos* (Val.), *Osteochilichthys brevidorsalis* (Day), *Tor khudree* (Sykes), *Labeo dero* (Ham.), *Ompok bimaçulatus* (Bloch), *Wallago attu* (Schneider) and *Oreochromis mossamibica* (Peters), are new reports from this area. The richest fish diversity is observed in Hogenaikal among all the collection sites surveyed, i.e., a total of 34 species are knqwn from this area alone. It is unfortunate that *O. mossambica* has been introduced here also. It remains to be seen how much of our fish diversity will be spared for the future by this exotic cichlid which is known for its hardiness and high reproductive potential supplemented by parental care and a wide food spectrum.

The species reported for the first time from the Cauvery system are *Labeo dero* (Ham.), *L. pangusia* (Ham.), *Puntius bimaçulatus* (Blkr.) *P. mudumalaiensis* Menon & Rema Devi and *Ompok bimaçulatus* (Bloch). Also *Silurus wynaadensis* Day is reported here for the first time from Tamil Nadu. *L. dero* (Ham.) and *L. pangusia* (Ham.) are new records to South India.

SUMMARY

From a study of the fish fauna collected from Dharmapuri District, and from earlier reports, so far 57 species are known from this part of Tamil Nadu. Of these 29 species are first

reports from this area, including 5 new additions to the Cauvery system of which three are new records from Tamil Nadu and two from South India.

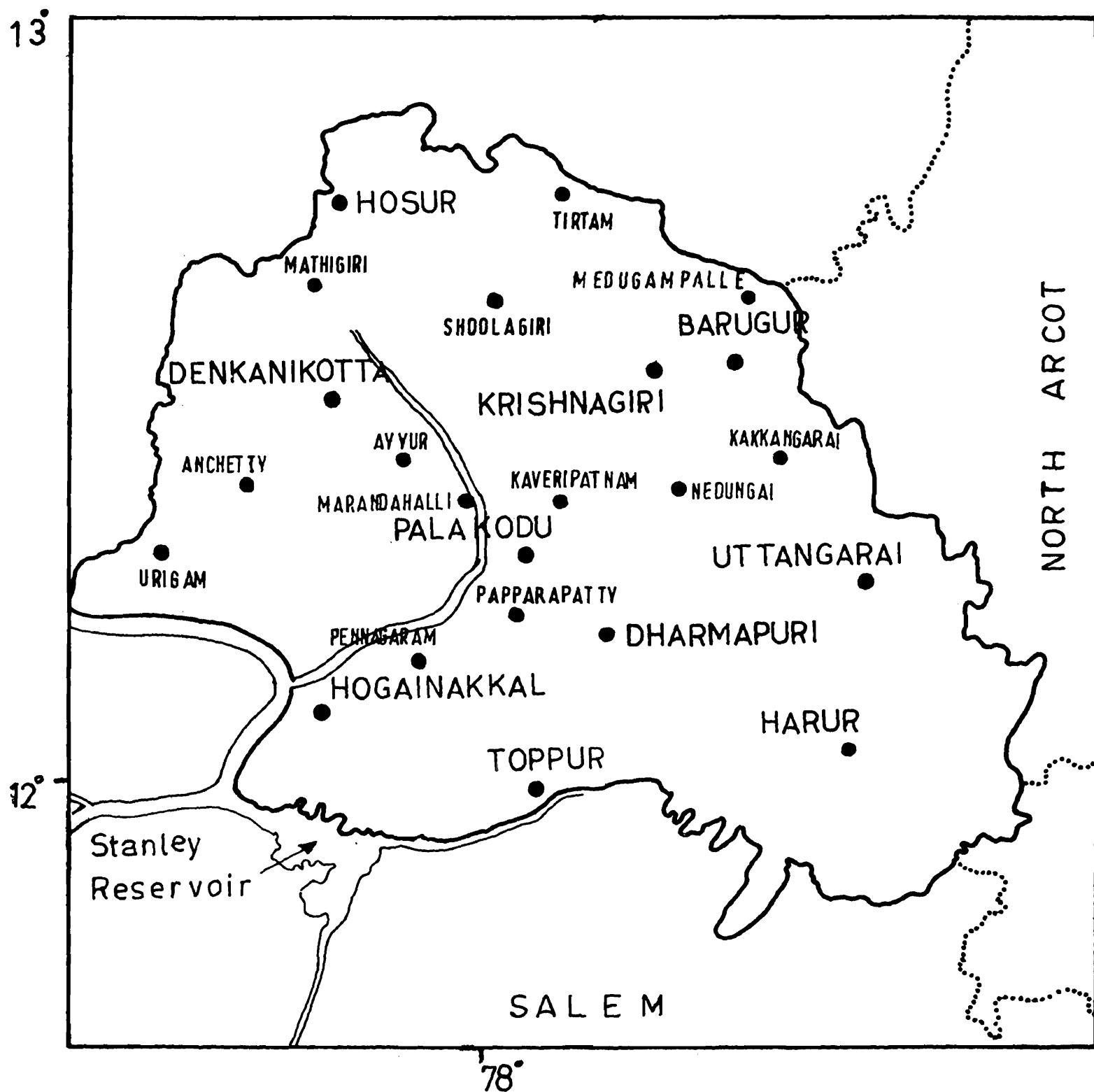
ACKNOWLEDGEMENTS

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DHARMAPURI DISTRICT



Map-1

REPORT ON THE ICHTHYOFAUNA OF NORTH ARCOT DISTRICT, TAMIL NADU

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INTRODUCTION

North Arcot District lies in the northeast of Tamil Nadu between latitudes 12° N and 13°2'N and longitudes 78° 24'E and 79° 45'E. The erstwhile North Arcot District has been recently bifurcated into Thiruvannamalai Sambuvarayar and North Arcot Ambedkar Districts with headquarters at Thiruvannamalai and Vellore respectively. A total of 27 localities were surveyed for faunistic studies (Map.1). Collection localities of significance include the Javadi (1166 M) and Yelagiri Hills (1000 M) and the Sathanur Dam. Collections could not be made in Palar, the main river which traverses North Arcot District, as it is dry for most part of the year and is flooded only during the monsoon. Besides, 250 of the 580 tanneries in Tamil Nadu are situated on the banks of this river in this district alone and empty their effluents along a major stretch of the river, polluting whatever water that flows through it (Mary Bai, 1990).

This paper deals with the Ichthyofaunal collections made during December, 1992 and March, 1994 under the leadership of Dr. K. Ramachandra Rao and the second author. A total of 1840 specimens belonging to 30 species were collected. A systematic account of the species is given which includes the first reference, material examined, habitat, size and distribution. The specimens have been registered and incorporated in the S.R.S. collections.

LIST OF SPECIES

Order OSTEOGLOSSIFORMES

Family NOTOPTERIDAE

- 1 *Notopterus notopterus* (Pallas)

Order CYPRINIFORMES

Family CYPRINIDAE

Subfamily RASBORINAE

2. *Amblypharyngodon microlepis* (Bleeker)
3. *Danio aequipinnatus* (McClelland)
4. *Esomus thermoicos* (Valenciennes)

5. *Rasbora caverii* (Jerdon)
6. *Rasbora daniconius* (Hamilton)

Subfamily CYPRININAE

7. *Barbodes sarana subnasutus* (Valenciennes)
8. *Catla catla* (Hamilton)
9. *Cirrhinus mrigala* (Hamilton)
10. *Labeo calbasu* (Hamilton)
11. *Labeo rohita* (Hamilton)
12. *Puntius amphibius* (Valenciennes)
13. *Puntius bimaculatus* (Bleeker)
14. *Puntius sophore* (Hamilton)
15. *Puntius ticto* (Hamilton)
16. *Puntius vittatus* Day

Subfamily : GARRINAE

17. *Garra mullya* (Sykes)

Subfamily : LEUCISCINAE

18. *Hypophthalmichthys molitrix* (Valenciennes)

Family COBITIDAE

19. *Lepidocephalus thermalis* (Valenciennes)

Order SILURIFORMES

Family BAGRIDAE

20. *Aorichthys seenghala* (Sykes)

Family HETEROPNEUSTIDAE

21. *Heteropneustes fossilis* (Bloch)

Order CYPRINODONTIFORMES

Family ORYZIATIDAE

22. *Oryzias melastigma* (Mc Clelland)

Family POECILIDAE

23. *Gambusia affinis* (Baird and Girard)
24. *Poecilia (Lebistes) reticulata* Peters

Order PERCIFORMES

Suborder PERCOIDEI

Family CICHLIDAE

25. *Oreochromis mossambica* (Peters)
26. *Oreochromis niloticus* (Hasselquist)

Suborder : GOBIOIDEI

Family GOBIIDAE

27. *Glossogobius giuris* (Hamilton)

Suborder CHANNOIDEI

Family CHANNIDAE

28. *Channa gachua* Hamilton
29. *Channa punctatus* (Bloch)
30. *Channa striatus* (Bloch)

SYSTEMATIC ACCOUNT

Order OSTEOGLOSSIFORMES

Family NOTOPTERIDAE

1 *Notopterus notopterus* (Pallas)

1769. *Gymnotus notopterus* Pallas, *Spicil. Zool.*, 7 : 40, Pl.6, fig.2

(Type locality ? Indian Ocean)

Material 2 exs., 195.0 and 225.0 mm SL, Sathanur dam, 12.3.94, F. 4142.

Habitat and size Rivers, swamps, canals and estuaries. Grows to 61 cm TL, usually much smaller, upto 25 cm.

Distribution Pakistan, India, Nepal, Bangladesh, Burma, Thailand, Malaya and Indonesia.

Order CYPRINIFORMES

Family CYPRINIDAE

Subfamily RASBORINAE

2. *Amblypharyngodon microlepis* (Bleeker)

1853. *Leuciscus microlepis* Bleeker, *Verh. batav. Genoot. Kunst. wet.*, 25 : 141.

(Type locality River Hooghly).

Material 13 exs., 15.0-23.0 mm. SL, Tamaraikulam, 14.3.94; 1 ex., 19.0 mm SL, Seduvalai, 19.3.94; 1 ex., 18.0 mm SL, Gudiyatham, 21.3.94; 14 exs., 26.0-37.0 mm SL, Arcot, 23.3.94, F 4130.

Habitat and Size Ponds, ditches, nullahs and slow moving streams, grows to 10 cm TL.

Distribution Bengal through Chota-Nagpur to Peninsular India, except the west face of Western Ghats.

3. *Danio aequipinnatus* (McClelland)

1839. *Perilampus aequipinnatus* McClelland, *Asiat. Res.* 19 (2) : 393, pl.60, fig.1.

(Type locality Assam)

Material 1 ex., 38.0 mm SL, Sathanur dam, 12.3.94, F. 4149.

Habitat and size Clear streams and rivulets at foot hills. Grows to 15 cm.

Remarks: D.3/10; A.3/14; L.1.38; predorsal scales 15; 2 pairs of small barbels; body depth 3 in SL, 4 in TL; head 3.5 in SL, 4.5 in TL; eye 3.3, snout 4.5 and interorbital width 2.5 in head.

Distribution Throughout India, Nepal, Bangladesh, Burma and Thailand.

4. *Esomus thermoicos* (Valenciennes)

1842. *Nuria thermoicos* Valenciennes, *Hist. nat. Poiss.*, 16 : 238, pl. 472.

(Type locality : Hot springs at Kanniya, Sri Lanka)

Material: 9 exs., 12.0-19.0 mm SL. Kavalur, Javadi Hills, 10.12.92; 65 exs., 22.0-51.0 mm

SL, Arcot, 22.3.94, F. 4128.

Habitat and size More common in muddy ditches, ponds and canals than in flowing waters. Grows to 12 cm TL.

Distribution Sri Lanka. Peninsular India.

5. *Rasbora caverii* (Jerdon)

1849. *Leuciscus caverii* Jerdon, *Madras J. Lit. Sci.*, 15 : 320

(Type locality Cauvery river, Southern India)

Material : 6 exs. 17.0-29.0 mm SL, in a pond southeast of Javadi Hills, 7.12.92, F. 3978; 10 exs., 40.0 - 58.0 mm SL, Elagiri hills, 15.3.94, F. 4146.

Remarks Juveniles difficult to tell apart from those of *R. daniconius*.

Habitat and size : Mountain streams to lowland forest streams and ponds. Grows to 14 cm TL.

Distribution Peninsular India. Sri Lanka.

6. *Rasbora daniconius* (Hamilton)

1822. *Cyprinus daniconius* Hamilton, *Fish. Ganges*, 327, pl. 15, fig. 89

(Type locality Rivers of Southern Bengal)

Material : 1 ex., 32.0 mm SL, Nilavur, 7 km. Southeast of Elagiri Hills, 8.12.92, F. 3958; 10 exs., 19.0-26.0 mm SL, a pond 2 km. Southeast of Elagiri hills Hotel, 8.12.92; 1 ex., 14.0 mm SL, Kavalur, Javadi hills, 10.12.92; 4 exs., 13.0-26.0 mm SL, Gudiyatham 21.3.94 and 71 exs., 21.0-35.0 mm SL, Arcot, 23.3.94, F.4129.

Remarks The juveniles are difficult to differentiate from those of *R. caverii* (Jerdon); predorsal 15, and the dorso-hypural distance when carried forward just falls on the posterior border of eye.

Habitat and size Clear and slow moving streams, pools and ditches in the plains chiefly with sandy substrate. Grows to 14 cm. TL.

Distribution Throughout India, Sri Lanka, Pakistan, Nepal, Bangladesh, Burma and Thailand.

7. *Barbodes sarana subnasutus* (Valenciennes)

1842. *Barbus subnasutus* Valenciennes, *Hist. nat. Poiss.* 16 : 154.

(Type locality Pondicherry).

Material 1 ex., 21.0 mm SL, Sathanur dam, 12.3.94, F. 4125.

Habitat and size: Rivers with medium current, tanks, ponds and reservoirs. Grows to 25.0 cm TL

Distribution India Peninsular Krishna River and South.

8. *Catla catla* (Hamilton)

1822. *Cyprinus catla* Hamilton, *Fish. Ganges* : 287, 318, Pl. 13, fig. 81

(Type locality Rivers and tanks of Bengal)

Material 1 ex., 180.0 mm SL, Vellore Fortmoat, 22.3.94, F. 4135.

Habitat and size Rivers, lakes and culture ponds. Grows to 120 cm. TL.

Distribution: Pakistan: Indus plains and adjoining hills; India: Northern India; Bangladesh; Nepal; Burma; introduced into the rivers of Peninsular India and Sri Lanka.

9. *Cirrhinus mrigala* (Hamilton)

1882. *Cyprinus mrigala* Hamilton, *Fish. Ganges* : 279, 386, pl. 6, fig. 79.

(Type locality Ponds and Freshwater rivers of Gangetic Provinces).

Material 1 ex., 220.0 mm SL, Vellore Fort moat, 22.3.94, F. 4137

Remarks D.2/12; L.I. 43; pores on snout, one pair of barbels.

Habitat and size Large rivers and ponds. Grows to 99 cm TL.

Distribution Pakistan Indus basin and adjacent hill areas. India Northern India from Punjab to West Bengal and Assam. Nepal and Bangladesh; Introduced into Peninsular India.

10. *Labeo calbasu* (Hamilton)

1822. *Cyprinus calbasu* Hamilton, *Fish. Ganges* : 297, 389, pl. 2, fig. 33.

(Type locality Bengal)

Material 1 ex., 220.0 mm SL, Sathanur dam, 12.3.94, F. 4126.

Remarks D.3/14; L. tr. $7\frac{1}{2} / 6\frac{1}{2}$, L. 1 37, snout tuberculated; 2 pairs of well developed barbels and lips conspicuously fringed.

Habitat and size Rivers and ponds. Grows to 90.0 cm TL.

Distribution Throughout India, Pakistan, Nepal, Bangladesh, Burma, Thailand. Also South east China.

11 *Labeo rohita* (Hamilton)

1822. *Cyprinus rohita* Hamilton, *Fish. Ganges* : 301, Pl. 36, fig. 85.

(Type locality Gangetic Provinces).

Material 1 ex., 180.0 mm SL, Vellore Fort moat, 22.3.94, F. 4138.

Habitat and size : Rivers and culture ponds. Grows to 91 cm. TL.

Distribution : Northern India, Pakistan, Nepal, Bangladesh, Burma. Introduced into Peninsular India and Sri Lanka.

12. *Puntius amphibius* (Valenciennes)

1842. *Capoeta amphibia* Valenciennes, *Hist. nat. Poiss.*, 16 : 282, pl. 478.

(Type locality Bombay)

Material 1 ex., 82.0 mm SL, Arakonam, 26.3.94, F. 4140.

Remarks The specimen resembles *P. arenatus* (Day) considered to be its junior synonym (Menon, 1998) in the absence of colour markings on the body; the anterior dorsal base is dark and scales have dark bases in the upper half of body and there is no blotch on the caudal peduncle.

Habitat and size Rivers with moderate currents in the plains. Grows to 11 cm. TL.

Distribution Peninsular India and Sri Lanka.

13. *Puntius bimaculatus* (Bleeker)

1844. *Gnathopogon bimaculatus* Bleeker, *Vert. Nat. Holl. Maatsch. Haarlem*, (2) 20 : 17, pl. 4, fig. 1.

(Type locality Ceylon)

Material 14 exs., 15.0-30.0 mm SL, Amathan Kollai Road, Jamanamarathur, 1 12.92, F. 3974; 15 exs., 18.0-25.0 mm SL, Jamanamarathur, (Arasavalli) from a nullah, 4.12.92, F. 3975; 14 exs., 12.0-18.0 mm SL, Kavalur, Javadi Hills, 10.12.92.

Remarks D. 2/7 in all the specimens studied. Can be easily distinguished from all other *Puntius* with spots, by its elongated body and the caudal spot on the penultimate scale of the body. This species was encountered only in the hilly regions in N. Arcot District.

Habitat and size Generally inhabits ponds and streams in plains and mountains. Grows to 6 cm TL.

Distribution Sri Lanka, India Peninsular India.

14. *Puntius sophore* (Hamilton)

1822. *Cyprinus sophore* Hamilton, *Fish. Ganges*; 310, 389, pl. 19, Fig. 86

Type locality Ponds and rivers of the Gangetic provinces)

Material 68 exs., 13.0-43.0 mm SL, Gudiyatham, 21.3.94, F.4153; 9 exs., 20.0-40.0 mm SL, Arcot, 23.3.94, F. 4133; 2 exs., 79.0-102.0 mm SL, F. 4141

Remarks: In fresh specimens the opercle is red in colour and has a red lateral streak; dorsal spot on the bases of 3rd-6th branched rays and a spot on caudal base; L.tr. $4\frac{1}{2}/4$; pd. 9; L.1.24. The juveniles, without a well formed L.1 resemble *P. vittatus*.

Habitat and size: Rivers, streams and ponds in the plains and submontaine regions. Grows to 13 cm TL.

Distribution Throughout India, Pakistan, Bangladesh, Burma, Yunan.

15. *Puntius ticto* (Hamilton)

1822. *Cyprinus ticto* Hamilton, *Fish. Ganges* : 314, 398, pl.8, fig. 87.

(Type locality South eastern parts of Bengal)

Material 2 exs., 24.0 & 40.0 mm SL, Gudiyatham, 21.3.94, F. 4154.

Habitat and size Rivers, streams and ponds. Grows to 20cm TL.

Distribution India Throughout India, Pakistan, Bangladesh, Burma; Thailand, Sri Lanka.

16. *Puntius vittatus* Day

1865. *Puntius vittatus* Day *Proc. Zool. Soc. Lond.*, : 303.

(Type locality Madras).

Material 35exs., 11.0-23.0 mm SL, Seduvalai, 19.3.94, F. 4147

Habitat and size Ponds, streams and lakes in the plains, among vegetation, common in paddy fields. Grows to 5 cm TL.

Distribution India Peninsular India, Sri Lanka

Subfamily GARRINAE

17. *Garra mullya* (Sykes)

1841. *Chondrostoma mullya* Sykes, *Trans. Zool. Soc. Lond.*, 2 : 359, pl.62, fig. 3.

(Type locality Bheema river at Daunde, nr. Poona).

Material 1 ex., 22.5 mm SL, Amattan Kollai Road, Jamanamarathur, 1 12.92

Habitat and size Hill streams. Attains a length of 17 cm TL.

Distribution Throughout Peninsular India

Subfamily : LEUCISCINAE

18. *Hypophthalmichthys molitrix* (Valenciennes)

1844. *Leuciscus molitrix* Valenciennes, *Hist. nat. Poiss.*, 17 : 360.

(Type locality : China)

Material 1 ex., 215.0 mm SL, Vellore Fort Moat, 22.3.94, F. 4134.

Habitat and size Rivers, tanks and ponds. Grows to a length of 82 cm TL.

Distribution China. Introduced into India.

Family COBITIDAE

19. *Lepidocephalus thermalis* (Valenciennes)

1846. *Cobitis thermalis* Valenciennes, *Hist. nat. Poiss.*, 18 : 78.

(Type locality Hot springs of Kanniya, E.P. Sri Lanka)

Material 7 exs., 23.0-26.0 mm SL, a pond 2 km. Southeast of Elagiri Hills hotel, 8.12.92; 1 ex., 24.0mm SL, Kavalur, Javadi hills, 10.12.92; 1 ex., 24.0 mm. SL, Gudiyatham, 21.3.94; 52 exs., 24.0-44.0 mm SL, Arcot, 23.3.94, F. 4127.

Habitat and size Clear slow streams and standing waters. Grows to 6 cm TL.

Distribution Peninsular India, Sri Lanka.

Order :SILURIFORMES

Family:BAGRIDAE

20. *Aorichthys seenghala* (Sykes)

1841. *Platystoma seenghala* Sykes, *Trans. Zool. Soc. Lond.*, 2 : 371. pl. 65, fig. 2.

(Type locality Mulla-Motha river, Poona).

Material 1 ex., 265.0 mm SL, Sathanur dam, 12.3.94, F. 4124, pl.65, fig.2.

Habitat and size Large rivers, canals, bheels and inundated fields. Grows to 1.5 m.

Distribution India Ganga, Yamuna, Brahmaputra, Krishna, Godavary, Cauvery river systems. Pakistan, Nepal, Bangladesh.

Family HETEROPNEUSTIDAE

21 *Heteropneustes fossilis* (Bloch)

1794. *Silurus fossilis* Bloch, *Naturgesch. ausl. Fische*, 8 : 46, pl. 370, fig. 2.

(Type locality Tranquebar, Tamil Nadu)

Material 2 exs., 185.0 & 210.0 mm SL, Arakonam, 26.3.94, F. 4139.

Habitat and size Ponds, ditches, bheels, swamps, marshes and muddy rivers. Grows to 30 cm TL.

Distribution India, Pakistan, Sri Lanka, Nepal, Bangladesh, Burma, Thailand, Laos.

Order CYPRINODONTIFORMES

Family ORYZIATIDAE

22. *Oryzias melastigma* (McClelland)

1839. *Aplocheilus melastigmus* McClelland, *Asiat. Res.*, 301, 427, pl. 42, fig. 3. and pl. 35, fig. 4.

(Type locality Calcutta).

Material 1 ex., 20.0 mm SL, Seduvalai, 19.3.94; 1 ex., 19.0 mm SL Gudiyatham, 21.3.94; 40 exs., 16.0-26.0 mm SL, Arcot, 23.3.94, F. 4131

Habitat and size Brackish waters and estuaries, usually found in shallow waters and swamps among vegetation along the margins of waters. Grows to 4 cm TL.

Distribution India, Bangladesh, Burma, Sri Lanka.

Family POECILIDAE

23. *Gambusia affinis* (Baird and Girard)

1853. *Heterandria affinis* Baird and Girard, *Proc. Acad. nat. Sci. Philad.*, 6 : 390.

(Type locality San Antonio river drainage, Texas).

Material 37 exs., 13.5-26.0 mm SL, Sathanur dam, 12.3.94, F. 4150; 15 exs., 13.0-26.0 mm SL, Peranampattu, 18.3.94, F. 4156; 1 ex., 23.0 mm SL, Gudiyatham, 21.3.94; 48 exs., 15.0-33.0 mm SL, Arcot, 23.3.94, F. 4132.

Habitat and size All types of inland water bodies. Grows to 6.5 cm TL.

Distribution South-eastern United States of America. Introduced into India.

24. *Poecilia (Lebistes) reticulata* Peters

1859. *Poecilia reticulata* Peters, *K. Preussischen Akad. Wiss.*, Berlin : 412.

(Type locality Venezuela)

Material : 3 exs., 15.0-20.0 mm SL, Elagiri Hills, 15.3.94; 715 exs., (410 (F), 240 (M), 65 fry), Alangayam, 16.3.94, F. 4155.

Habitat and size In all inland water bodies including stagnant waters. Male grows to 3 cm and female to 6 cm TL.

Distribution The Netherlands, Antilles, the Venezuelan islands, Trinidad and British Guiana, introduced into India.

Order : PERCIFORMES

Sub Order PERCOIDEI

Family CICHLIDAE

25. *Oreochromis mossambica* (Peters)

1852. *Chromis (Tilapia) mossambicus* Peters, *Montab. Akad. Wiss.*, Berlin : 681.

(Type locality Mozambique)

Material : 11 exs., 9.0-31.0 mm SL, Kavalur, Javadi Hills, 10.12.92; 1 ex., 19.0 mm SL, a pond 2 km. Southeast of Elagiri hills hotel, 8.12.92; 1 ex., 155.0 mm SL, Sathanur dam, 12.3.94, F. 4143; 6 exs., 19.0-82.0mm SL, Tamaraikulam, 14.3.94, F. 4148; 10 exs., 8.0-21.0mm SL, Alangayam, 16.3.94; 3 exs., 49.0-115.0 mm SL, Jolarpettai, 17.3.94, F. 4145; 15 exs., 8.0-20.0 mm SL, Peranampattu, 18.3.94 and 22 exs., 18.0-55.0 mm SL, Gudiyatham, 21.3.94, F. 4151

Habitat and size : Inhabits primarily brackish waters, also freshwaters. Grows to a length of 36 cm TL.

Distribution East Africa. Introduced into India, Pakistan, Sri Lanka, etc.

26. *Oreochromis niloticus* (Hasselquist)

(Fig. 1)

1757. *Labrus niloticus* Hasselquist, *Iter. Palae.t.*, : 346.

Material 1ex., 165.0 mm SL, Vellore Fort Moat, 22.3.94, F. 4136.

Distribution India : Ganga, Yamuna, Brahmaputra, Krishna, Godavary, Cauvery river systems. Pakistan, Nepal, Bangladesh.

Family HETEROPNEUSTIDAE

21 *Heteropneustes fossilis* (Bloch)

1794. *Silurus fossilis* Bloch, *Naturgesch. ausl. Fische*, 8 : 46, pl. 370, fig. 2.

(Type locality Tranquebar, Tamil Nadu)

Material 2 exs., 185.0 & 210.0 mm SL, Arakonam, 26.3.94, F. 4139.

Habitat and size Ponds, ditches, bheels, swamps, marshes and muddy rivers. Grows to 30 cm TL.

Distribution India, Pakistan, Sri Lanka, Nepal, Bangladesh, Burma, Thailand, Laos.

Order CYPRINODONTIFORMES

Family ORYZIATIDAE

22. *Oryzias melastigma* (McClelland)

1839. *Aplocheilus melastigmus* McClelland, *Asiat. Res.*, 301, 427, pl. 42, fig. 3. and pl. 35, fig. 4.

(Type locality : Calcutta).

Material 1 ex., 20.0 mm SL, Seduvalai, 19.3.94; 1 ex., 19.0 mm SL Gudiyatham, 21.3.94; 40 exs., 16.0-26.0 mm SL, Arcot, 23.3.94, F.4131

Habitat and size Brackish waters and estuaries, usually found in shallow waters and swamps among vegetation along the margins of waters. Grows to 4 cm TL.

Distribution India, Bangladesh, Burma, Sri Lanka.

Family POECILIDAE

23. *Gambusia affinis* (Baird and Girard)

1853. *Heterandria affinis* Baird and Girard, *Proc. Acad. nat. Sci. Philad.*, 6 : 390.

(Type locality San Antonio river drainage, Texas).

Material 37 exs., 13.5-26.0 mm SL, Sathanur dam, 12.3.94, F. 4150; 15 exs., 13.0-26.0 mm SL, Peranampattu, 18.3.94, F. 4156; 1 ex., 23.0 mm SL, Gudiyatham, 21.3.94; 48 exs., 15.0-33.0 mm SL, Arcot, 23.3.94, F.4132.

29. *Channa punctatus* (Bloch)

1793. *Ophiocephalus punctatus* Bloch, *Naturges. ausland. Fische*, (7) : 139, pl. 358.

(Type locality Rivers and lakes of Coromandal Coast).

Material 17 exs., 20.0-50.0 mm SL, Gudiyatham, 21.3.94, F. 4152.

Remarks: About 12 horizontal lines on body in addition to the irregular bands; dorsal, anal and caudal spotted.

Habitat and size: Inhabits large freshwater ponds and tanks, generally in the plains. Grows to 31 cm TL.

Distribution Afghanistan, Pakistan, India, Nepal, Sri Lanka, Bangladesh, Burma and Yunan.

30. *Channa striatus* (Bloch)

1793. *Ophiocephalus striatus* Bloch, *Naturges. ausland. Fische*, (7) : 141, pl. 359.

(Type locality : Malabar).

Material 3 exs., 98.0-120.0 mm SL, Jolarpettai, 17.3.94, F.4144.

Habitat and size: Inhabits freshwater ponds, streams and tanks of plains; prefers stagnant muddy waters and grassy tanks. Grows to 75 cm TL.

Distribution: India, Sri Lanka, Pakistan, Bangladesh, Nepal, Burma, Malay Archipelago, Thailand and South China.

DISCUSSION

Earlier reports on the Ichthyofauna of this area include those of Eastern Ghats (Misra, 1938) and Javadi Hills (Lazarus et al. 1988; Rema Devi, 1992). Thirty species are reported in the present collection including 5 exotic species of which *Oreochromis mossambica* (Peters) is very well established both in the hills and plains, posing a great threat to the indigenous species. One specimen of *O. niloticus* (Hasselquist) has been recorded from the Vellore Fort moat. This is the first record from India.

Fishes reported earlier, but not represented in the present collections are *Puntius dorsalis* (Jerdon) and *Cirrhinus fulungee* (Sykes) (Misra, 1938). Misra (1938) reported 37 species from Eastern Ghats of which 11 species are from localities in N. Arcot District. Lazarus et al 1988, reported 11 species of which *D. rerio* (Ham.) *P. chola* (Ham.), *Mystus armatus* (Day) and *Macrognathus aculeatus* (Bloch) are not recorded in the present collection. Also *Barilius bendelisis* (Hamilton), *Noemacheilus denisoni denisoni* Day and *Mystus montanus* (Jerdon)

(Rema Devi, 1992) are also not represented. Summing up all these reports 39 species are found in this part of Tamil Nadu.

It was observed that of the widely distributed *Puntius* and *Channa* species, *P. bimaculatus* and *C. gachua* were present only in the hilly regions.

SUMMARY

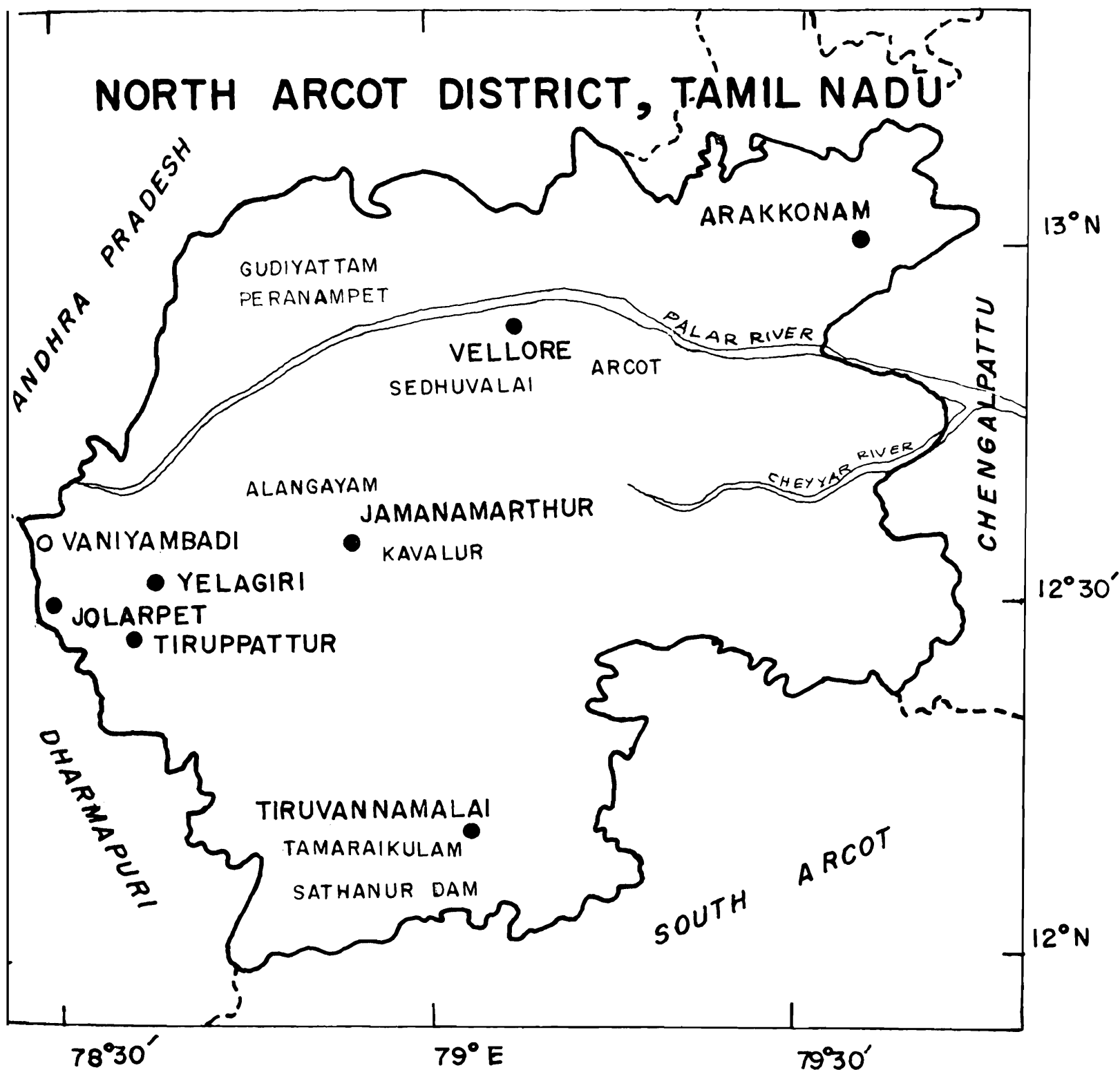
Studies on a collection of fish from North Arcot District has revealed 30 species including a new report of one exotic species. From earlier reports and the present study 39 species are known from this part of Tamil Nadu.

ACKNOWLEDGEMENTS

We wish to thank the Director, Zoological Survey of India, Dr. J.R.B. Alfred and the Officer in-Charge, Southern Regional Station, Zoological Survey of India, Dr. P. T. Cherian for providing necessary facilities. Our sincere thanks are due to Dr. A. G. K. Menon, Scientist Emeritus, and Dr. P.T. Cherian, Scientist 'SF' for going through the manuscript.

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Map-1



Fig. 1. Lateral view of *O. niloticus*, 165.0mmsl

A NEW SPECIES OF THE GENUS *EUROSTOCEPHEUS* (ACARI : ORIBATEI, OTOCEPHEIDAE) FROM DARJEELING, INDIA

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INTRODUCTION

A survey was undertaken to investigate on the soil oribatid mites from the forest and tea fields of Darjeeling, the northernmost district of the state of West Bengal, India since 1988. Taxonomic studies of a part of the collected material reveal the occurrence of one new species, *Eurostocepheus (Eurostocepheus) mahunkai* of Otocepheidae (Acari Oribatei).

The genus *Eurostocepheus* was established by Aoki (1965) with *Eurostocepheus aquilinus* as the type-species from North Thailand. J. Balogh (1970) contributed another new species *Eurostocepheus trisetosus* from Ceylon. Mahunka (1973) while reporting the same species *E. trisetosus* Balogh, 1970 from Ceylon erected a new subgenus *Cerostocepheus* under the genus *Eurostocepheus* with the type-species *Eurostocepheus (Cerostocepheus) trisetosus* Balogh, 1970. He (*op. cit.*) created this new subgenus principally by the presence of 3 pairs of genital setae and also the extraordinarily widened lamellae. Corpuz-Raros (1979) added another new species, viz., *Eurostocepheus (Eurostocepheus) sajisei* from Philippines to the list of the genus. Thus 2 subgenera and 3 species, viz., *E. (E.) aquilinus*, *E. (E.) sajisei* and *E. (C.) trisetosus* are known to occur under the genus *Eurostocepheus*.

The genus *Eurostocepheus* is being reported here for the first time from India. All measurements are in micrometers (μm).

Eurostocepheus Aoki, 1965

Generic diagnosis : Lateral lamelliform expansion (*spa.l*) distinct; tutorium (*tU*) may be present or absent; lamellae stout and weakly sigmoid or sometimes extraordinarily widened; dorsal bothridial plate (*tbd*) entirely covers bothridium; ventral bothridial plate (*tbv*) poorly or prominently developed; sensillus (*ss*) with fusiform head; interlamellar setae (*in*) short and fine or long and roughened; *co.pl* present; *co.pm* present or absent, pedotecta well-developed, especially the posterior part of *pd*. 2-3 strikingly conspicuous, projecting latero-posteriad like a wing; *co.nl* widely separated from each other; *co.nm* absent; 10 pairs of notogastral setae; marginal ridge (*vm*) present or absent; *gla* situated in the level of *ti*; 5 pairs of notogastral fissures; adanal fissure (*iad*) situated close to anal aperture; genital plates strongly wrinkled or smooth; *apo* 1, 2 and *sj* distinctly developed; sternal ridge present or

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absent; anal setae 2 pairs; adanal setae 3 pairs; genital setae 3 or 4 pairs; aggenital setae (*ag*) 1 pair; legs monodactylous; palps 5 segmented.

Key to the subgenera

- 1 (2) Lamellae not extraordinarily widening, in superior view not covering like an awning also lateral margin of prodorsum anteriorly to pedotecta I; surface of genital plates strongly wrinkled, emitting 4 pairs of setae.....*Eurostocephus* s.str.
- 2 (1) Lamellae extraordinarily widening, in superior view covering like an awning also lateral margin of prodorsum anterior to pedotecta I; surface of genital plates smooth, emitting 3 pairs of setae.....*Cerostocephus* Mahunka, 1973

Eurostocephus (Eurostocephus) mahunkai sp. nov.

(Figs. 1-16)

Female Colour yellowish brown; length of the body 1138-1162; width of the body : 546-558.

Prodorsum more or less as long as broad with densely punctate and laterally with irregular sculptures; lateral lamelliform expansion (*spa.l*) distinct, well-developed, extended anteriorly a little below the base of the insertion of rostral setae (*ro*), tutorium (*tU*) moderately developed; lamellae well-developed, more or less parallel but terminating by small arcuating end, 280-283 long, widely separated from each other; rostral and lamellar setae long, their *RLN*· 23.21-23.37; rostral setae (*ro*) densely barbed outwardly, incurved, inserted laterally on rostrum, 163-165 long; lamellar setae (*le*) distinctly barbed, procumbent, with pointed tips, originating from a little below the anterior inside end of lamellae, 163-165 long; interlamellar setae (*in*) roughened, straight, located inner and anterior to the bothridium, 172-175 long (*RLN*· 24.5-24.9), nearly twice as long as their mutual distance; bothridium (*bo*) cup-shaped, directed antero-laterad, ventral bothridial plate (*tbv*) more or less triangular, dorsal bothridial plate (*tbd*) completely covers bothridia; sensillus (*ss*) with thin, long stalk, with a slightly roughened fusiform head, 156-160 long, directed postero-laterad; interlamellar wrinkles (*rin*) weakly developed; 4 condyles on the posterior margin well-developed, lateral prodorsal condyles (*co.pl*) larger than median prodorsal condyles (*co.pm*), *co.pl* subrounded projecting over the anterior rim of lateral notogastral condyles (*co.nl*), *co.pm* distinct subrounded, fuse with each other.

Pedotecta I-IV (*pd. 1*~4) distinctly developed; pedotecta I (*pd. 1*) with distinct sculptures; subpedotectum (*spd*) distinct; pedotecta complex II-III (*pd. 2-3*) prominently developed specially in the posterior end, well projecting postero-laterad and forming a wing-like expansion, the posterior tip of which reaches almost the level of the anterior border of genital aperture; pedotecta IV (*pd. 4*) with rounded tip.

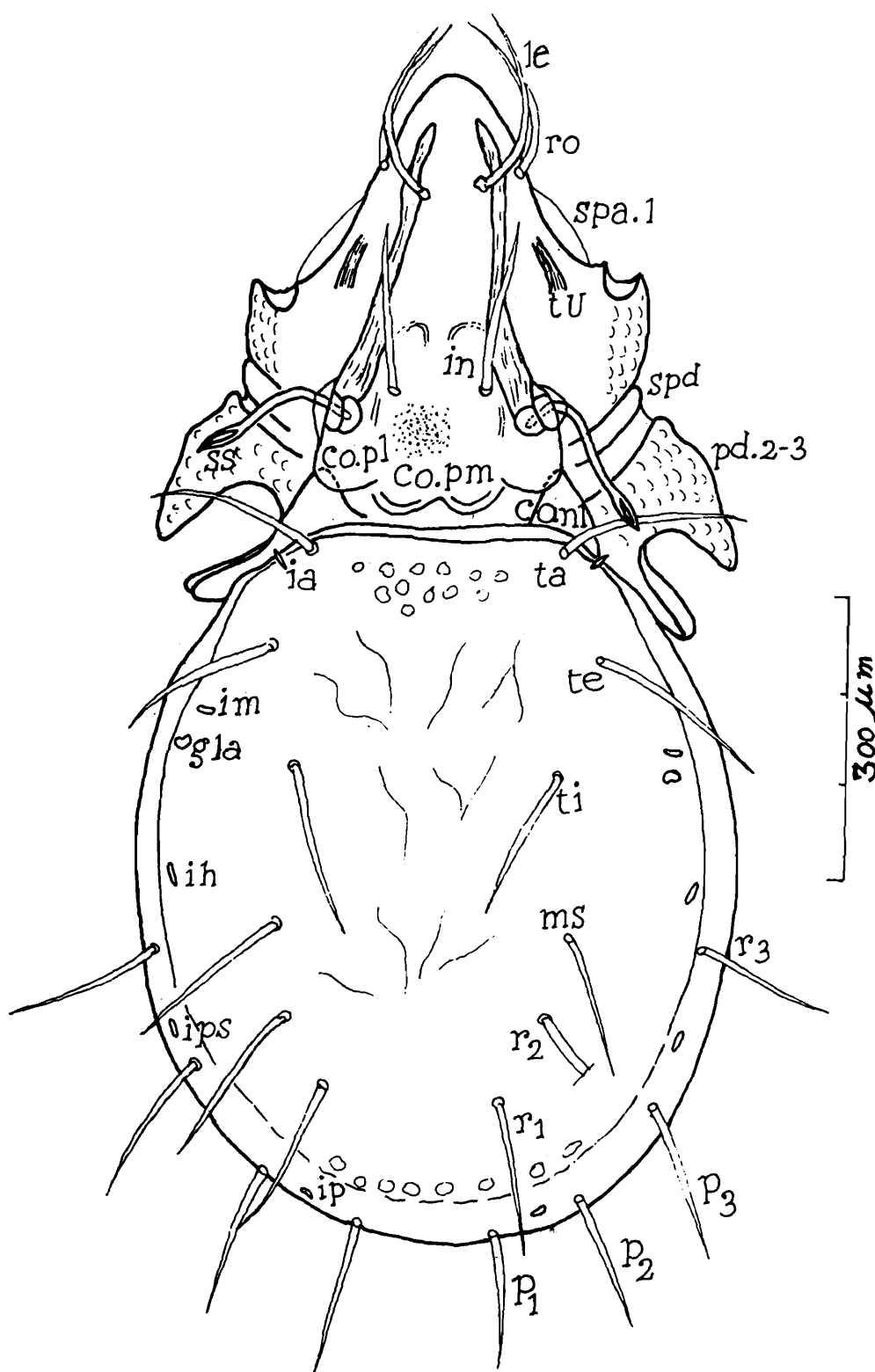


Fig. 1. *Eurostocepeus (Eurostocepeus) mahunkai* sp. nov. (Dorsal view), *ro* = rostral seta, *le* = lamellar seta, *in* = interlamellar seta, *spa.1* = lateral lamelliform expansion, *tU* = tutorium, *spd* = subpedotectum, *pd.2-3* = pedotecta complex II-III, *ss* = sensillus, *co.pm* = median prodorsal condyle, *co.pl* = lateral prodorsal condyle, *co.nl* = lateral notogastral condyle; *ta*, *te*, *ti*, *ms*, *r*₁, *r*₂, *r*₃, *p*₁, *p*₂, *p*₃ = notogastral setae; *ia*, *im*, *ih*, *ips*, *ip* = dorsal lyrifissures; *gla* = orifice of latero-abdominal gland.

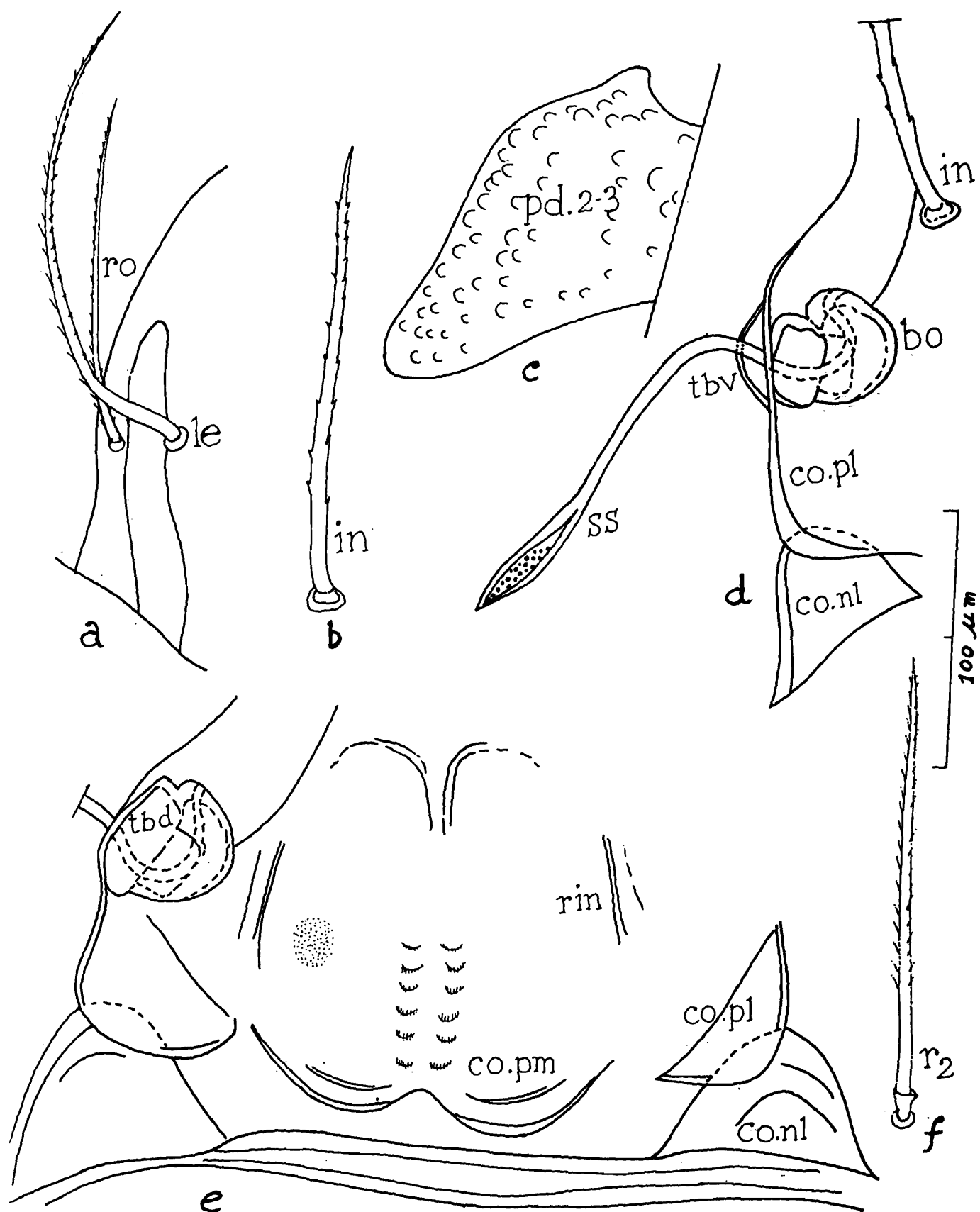


Fig. 2. (a-f). *Eurostocephus (Eurostocephus) mahunkai* sp. nov. -a. The anterior distal portion of prodorsum (left side). -b. Interlamellar seta. -c. Pedotecta complex II-III. -d. The posterior part of prodorsum and lateral notogastral condyle (left side). -e. The posterior part of prodorsum and the anterior part of notogaster. -f. Notogastral seta r_2 ; ro = rostral seta, le = lamellar seta, in = interlamellar seta, pd.2-3 = pedotecta complex II-III, bo = bothridium, tbv = dorsal bothridial plate, rin = interlamellar wrinkles, co.pm = median prodorsal condyle, r_2 = notogastral seta.

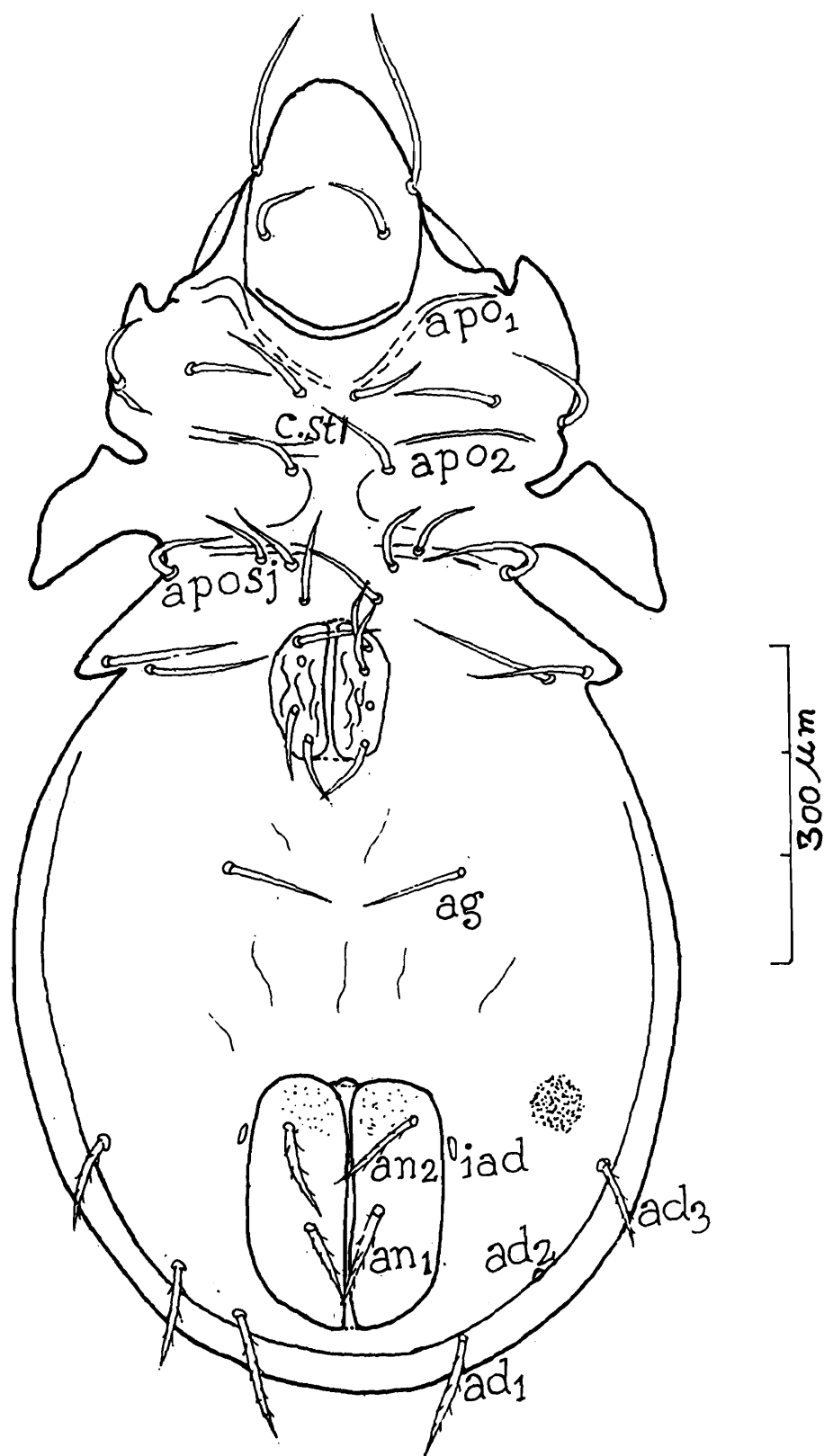


Fig. 3. *Eurostocepheus (Eurostocepheus) mahunkai* sp. nov. (Ventral view), *an₁*, *an₂* = anal setae, *ad₁*, *ad₂*, *ad₃* = adanal setae, *iad* = adanal fissure, *ag* = aggenital seta, *c.st* = sternal ridge, *apo₁* = apodemata 1, *apo₂* = apodemata 2, *ap_{osj}* = apodemata sj.

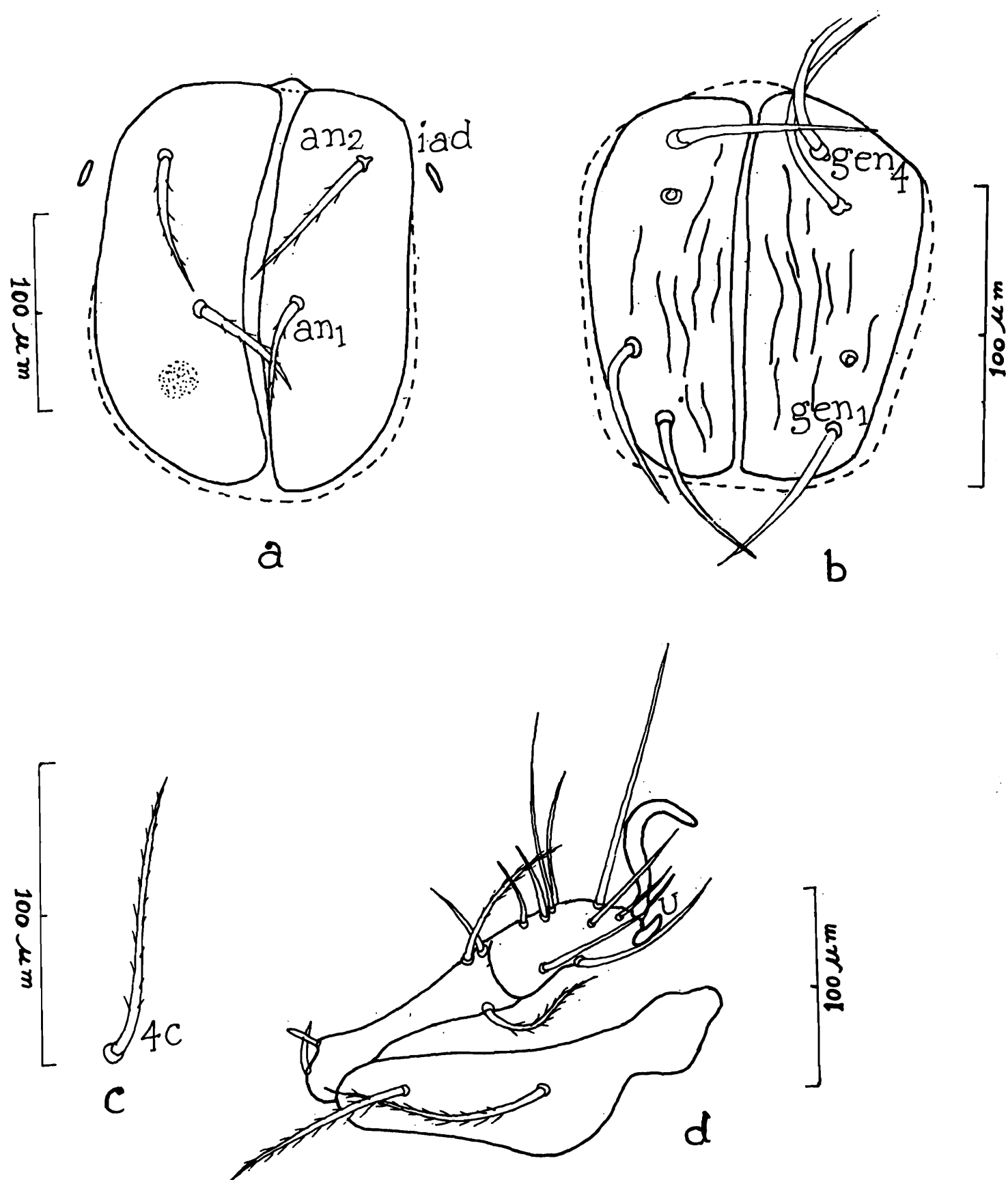
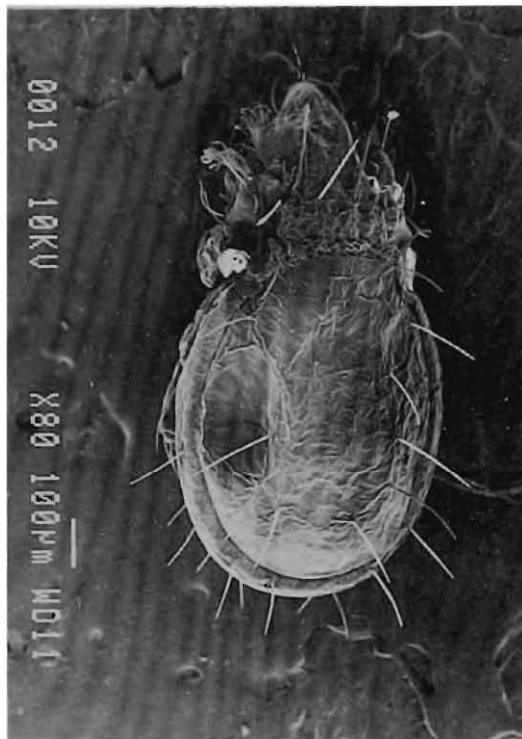
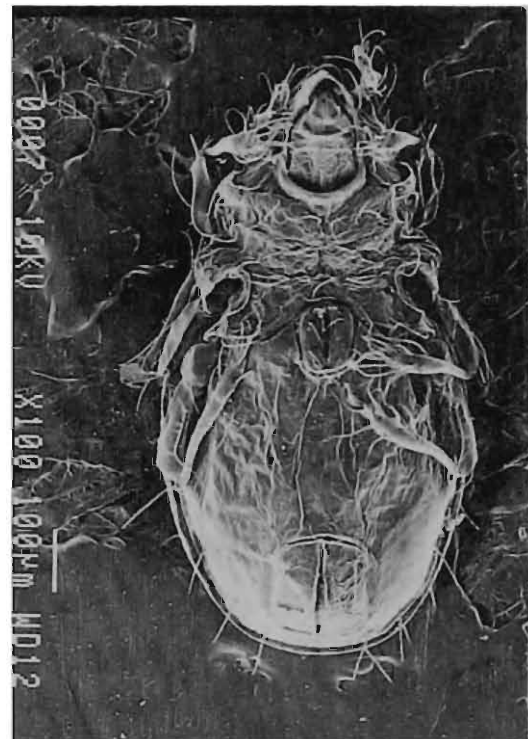


Fig. 4. (a-d). *Eurostocephus (Eurostocephus) mahunkai* sp. nov.-a. Anal plates and adanal fissures.-b. Genital plates. -c. Epimeral seta 4c. -d. Leg II : an_1, an_2 = anal setae, iad = adanal fissure, gen_1 - gen_4 = genital setae, $4c$ = epimeral seta, U = ultimate seta.



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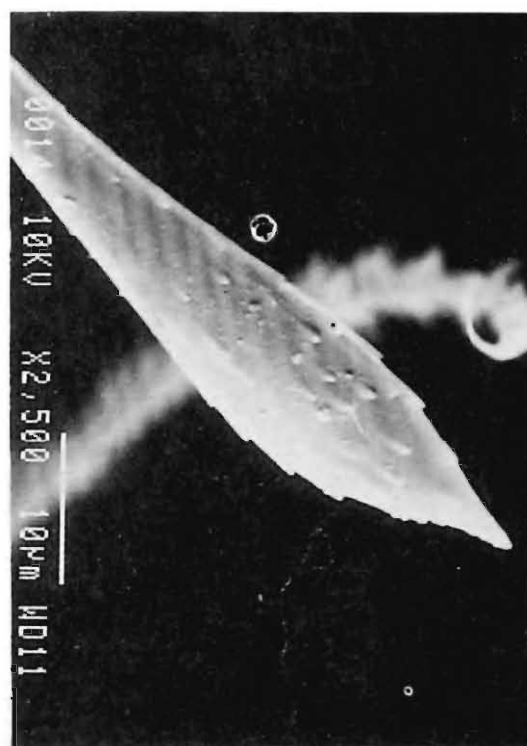


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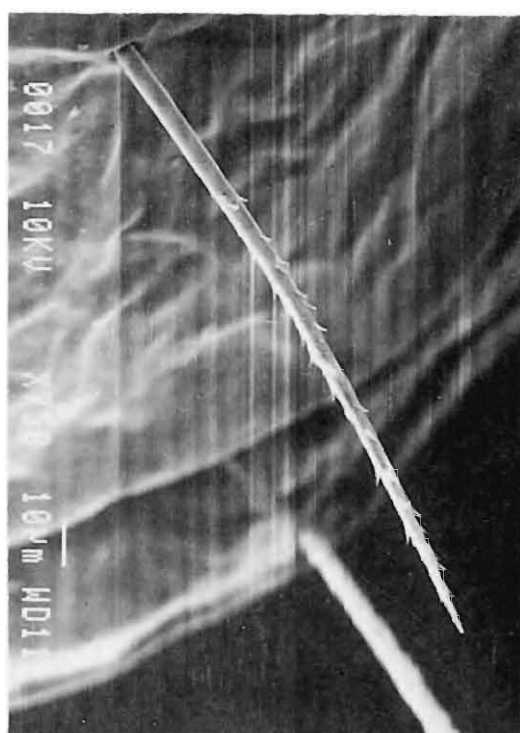
Figs. 5-8. *Eurostocephus (Eurostocephus) mahunkai* sp. nov. (Scanning Electron Micrographs) : 5. Dorsal view, 6. Ventral view, 7. Details of prodorsum and anterior part of notogaster, 8. Anterior distal portion of prodorsum.



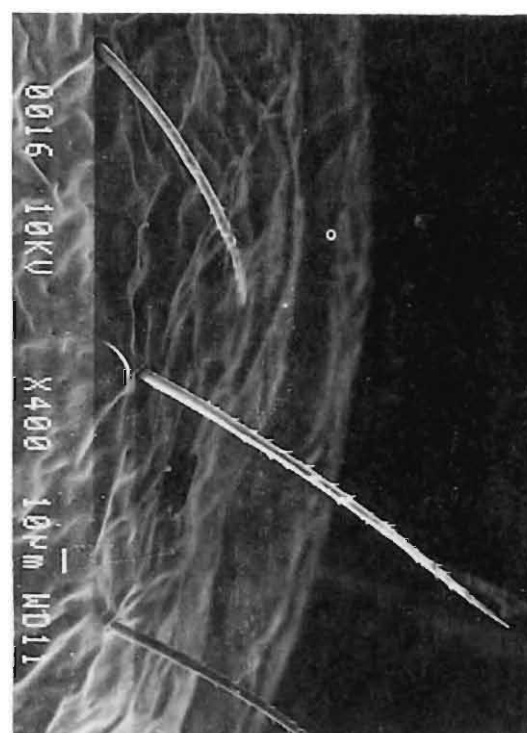
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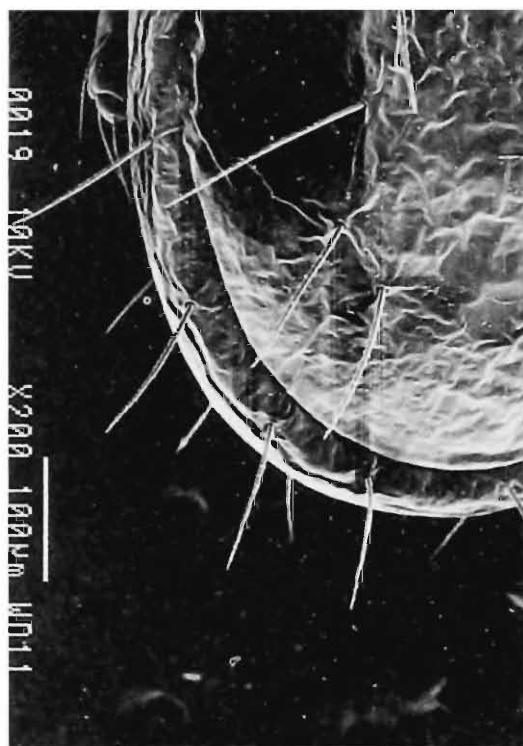


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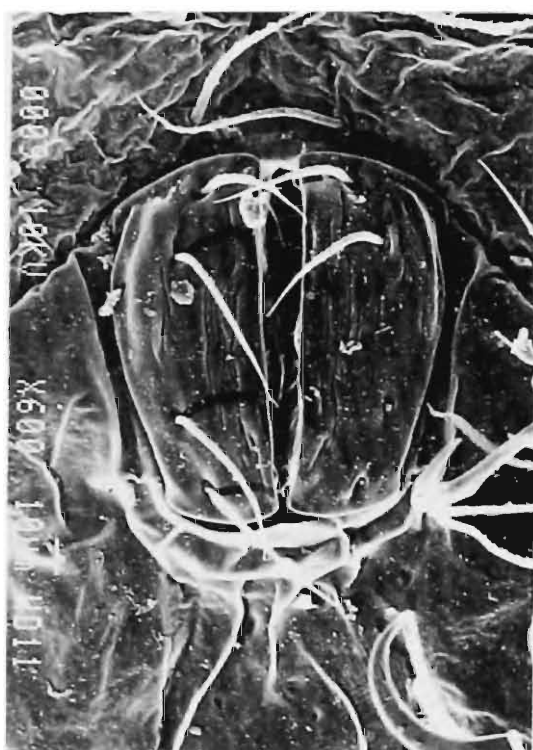
Figs. 9-12. *Eurostocephus (Eurostocephus) mahunkai* sp. nov. (Scanning Electron Micrographs) : 9. Sensillus and bothridium, 10. Head of sensillus, 11. Notogastral setae ms and r_1 , 12. Notogastral setae ti , ms and r_2 .



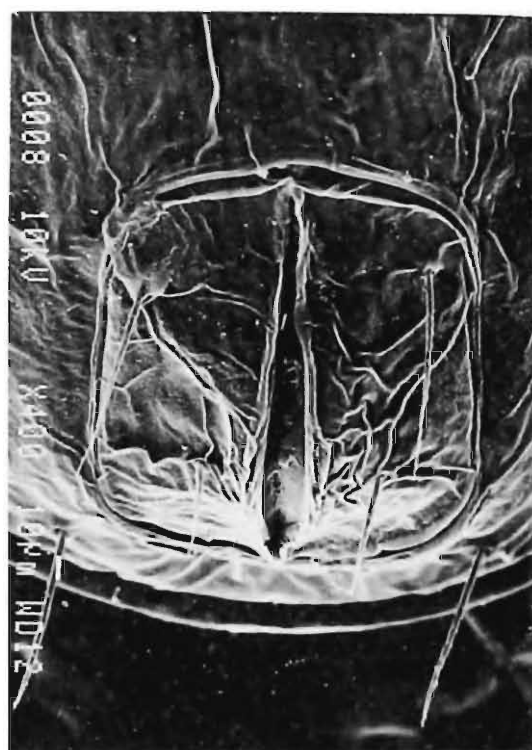
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Figs. 13-16. *Eurostocepheus* (*Eurostocepheus*) *mahunkai* sp. nov. (Scanning Electron Micrographs) : 13. Posterior portion of notogaster (left side), 14. Leg-I, 15. Genital plates and genital setae, 16. Anal plates, anal setae and setae ad_1 .

Notogaster oval, anterior border nearly straight, densely punctate, with irregular crack-lines and with a few foveoles anteriorly and posteriorly; lateral notogastral condyles (*co.nl*) highly developed, broad and triangular, not sharply pointed at tips, the distance between them 24.5 *RLN*; median notogastral condyles (*co.nm*) absent; marginal ridge (*vm*) not discernible; notogastral setae 10 pairs, long, distinctly barbed except basal 1/3rd or 1/4th, with pointed tip, 125-187 long, ranging from 17.8-26.6 *RLN*; setae *ta*, *te* antero-laterad; setae *ti*, *ms* medio-laterad; setae *r₁* postero-dorsal; setae *r₂* postero-lateral; setae *r₃* postero-marginal; setae *p₁*, *p₂*, *p₃* extreme postero-marginal; distance *ta-te* < distance *te-ti* < distance *ti-ms*; distance *ta-ta* < distance *ti-ti* < distance *ms-ms* < distance *te-te*; distance *r₁-r₁* < distance *r₂-r₂*; distance *p₁-p₂* < distance *p₂-p₃* < distance *p₃-r₃*, notogastral fissures 5 pairs, *ia* situated at the level of insertions of *ta* laterally, *im* above *gla*, *ih* far above the insertion of *r₃*, *ips* in between *p₃* and *r₃* and *ip* in between *p₁* and *p₂*, all laterally.

Each anal plate minutely punctate, nearly thrice as long as wide, with parallel lateral margin to each other, anal setae 2 pairs, weakly barbed, nearly equal, 70-78 long, *an₁* inserted close to the inner and posterior and *an₂* lateral and anterior part of the anal plate; adanal setae 3 pairs, slightly roughened, 47-109 long, *ad₁* > *ad₂* > *ad₃*, *ad₁* postero-lateral, *ad₂* lateral to the posterior margin of anal plate, *ad₃* widely lateral to the anterior border of anal plate; *iad* distinct, oblique and placed apart antero-lateral to the anal field; ventral plate also densely punctate with a few crack-lines; distance between anal and genital apertures 2½ times as long as the latter; genital plates with strong furrows, more darker than anal and ventral plates; each genital plate more than 2½ times as long as its maximum width; genital setae 4 pairs, glabrous (in microscopic observation, but minutely sparsely roughened in basal half under Scanning Electron Micrograph), with pointed tips, 47-54 long, 2 of which situated posteriorly and remaining 2 situated anterior to the genital plate; aggenital setae 1 pair, glabrous, 109-113 long, their mutual distance nearly twice the maximum width of the genital plates.

Epimera I and II separate, III and IV fuse; apodemata 1, 2 and *sj* (*apo₁*, *apo₂* and *apo_{sj}*) distinctly developed; *apo₁* markedly elevated medially but not touching each other medially; sternal ridge (*c.st*) developed in epimera I only; epimeral setae sparsely barbed, long 54-140 in length, setae 4b longest; epimeral setal formula 3-1-3-3.

All tarsi monodactylous, claws curved, sharply bent at distal 2/5th, all legs with ultimate setae of short blunt type (S-S-S-S).

Holotype Adult (F), INDIA W Bengal Darjeeling, Darjeeling forest Div., Tonglu forest range, Palmajua forest bungalow area (from rotten leaves of *Cryptomeria japonica*), 2300 m., 1.ix.1989 (B.K. Mondal coll.); paratype 1 adult (F), INDIA W Bengal Darjeeling, Darjeeling forest Div., Ghum-Simana forest range, Sukiapokhri forest block (from decomposed leaves of *Cryptomeria japonica*), 2100 m., 3.ix.1989 (B.K. Mondal coll.); paratype 1 adult (F), INDIA W Bengal Darjeeling, Teesta Valley Tea Estate (from humus under a tea plant, *Camellia sinensis*), 900 m., 28.viii.1989 (B. K. Mondal coll.); paratype 1 adult (F), INDIA W Bengal Darjeeling, Darjeeling forest Div., Teesta Valley forest

range, Pashok forest block (from soil under a plant, *Acacia catechu*), 700 m., 30.viii.1989 (*B. G. Kundu* coll.); paratype: 1 adult (F), INDIA W Bengal Darjeeling, Darjeeling forest Div., Senchal forest range, Sonada forest block (from soil under a plant, *Machilus edulis*), 2100 m., 30.vii.1989 (*B.K. Mondal* coll.); deposited in the laboratory of the Department of Zoology, Ananda Chandra College, Jalpaiguri-735 101, India.

This new species approaches close to the type-species of the genus *Eurostocephus* (*Eurostocephus*) *aquilinus* Aoki, 1965 described from North Thailand in a number of characters, but can be easily separated from Aoki's species in the nature and length of interlamellar setae, location of anterior end of *spa.l*, presence of *co.pm* and tutorium (*tU*), distinctly developed *tbv*, nature of sensillus being roughened fusiform head, absence of *vm*, nature of notogastral setae being distinctly barbed except basal 1/3rd or 1/4th, location of *ip*, absence of aggenital fissure, epimeral setal formula and untouched condition in the middle of apodemata I (*apo₁*). Hence it is considered to be a new species.

SUMMARY

The paper deals with the description of a new species of oribatid fauna (Acari), viz., *Eurostocephus* (*Eurostocephus*) *mahunkai* from forest and tea soils in the district of Darjeeling, West Bengal, India. The genus *Eurostocephus* is recorded here for the first time from India.

ACKNOWLEDGEMENT

The first author is grateful to the University Grants Commission, New Delhi, India, for providing minor research project to investigate on the soil oribatid fauna of Darjeeling, India.

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A NEW SPECIES OF *DOLICHEREMAEUS* (ACARI : ORIBATEI, OTOCEPHEIDAE) FROM DARJEELING, INDIA

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INTRODUCTION

A new species of the genus *Dolicheremaeus* Jacot (Acari Oribatei, Otocepheidae), viz., *D. russiae* is described from forest and tea soils in the district of Darjeeling, West Bengal, India.

Jacot (1938) created the genus *Dolicheremaeus* with the type-species *D. rubripedes* from Florida, U.S.A. J. Balogh (1965, 1972) and Aoki (1967) considered the genus *Tetracondyla* Newell, 1956 as a junior synonym of the genus *Dolicheremaeus*. J. Balogh (1972) also considered the genus *Dicondyla* Aoki, 1965 as a synonym of the genus *Dolicheremaeus*. 103 species and 7 subspecies have so far been described under the genus *Dolicheremaeus* from different parts of the globe. All measurements are in micrometers (μm).

Dolicheremaeus russiae sp. nov.

(Figs. 1-15)

Female: Colour yellowish brown; length of the body 540-560; width of the body 294-306.

Prodorsum nearly as long as broad, medially with small irregular foveoles and laterally with irregular sculptures; lateral lamelliform expansion (*spa.l*) moderately developed; tutorium (*tU*) well-developed; lamellae entirely straight, 132-134 long, widely separated from each other, prominently diverging toward anterior direction, distance between the lamellae proximally 52 and distally 64; lamellar apices slightly project beyond the margin of the body and the basal part of lamella strongly protruding laterad; rostral and lamellar setae long, their *RLN* 20.48-25; rostral setae (*ro*) onwardly barbed procumbent, with pointed tips, inserted at the anterior end of *spa.l*, laterally on rostrum, 68-70 long; lamellar setae (*le*) outwardly barbed basal 3/4th, procumbent, with pointed tips, inserted inner to the rostral setae a little above, 80-83 long; interlamellar setae (*in*) bilaterally roughened, inserted below a prominent, semicircular, chitinous ridge, 76-77 long (*RLN* 22.9-23.19) nearly 2 times as long as their mutual distance; bothridium (*bo*) cup-shaped, directed antero-laterad, ventral bothridial plate (*tbv*) prominently triangular and conspicuously protruding antero-laterad;

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sensillus (*ss*) with thin, long stalk, uniformly thick throughout and fusiform head, 97-100 long, directed postero-laterad; exobothridial setae (*ex*) 1 pair, minute, 14-15 long, intimate to the bothridial plate; 4 condyles on the posterior margin well-developed and clearly separated from one another, lateral prodorsal condyles (*co.pl*) larger than median prodorsal condyles (*co.pm*), *co.pl* more or less rounded, overlapping by the anterior rim of lateral notogastral condyles (*co.nl*), *co.pm* more or less rounded with small median blunt projection, the anterior extension of *co.pm* on outside forms a frame-like structure which surrounds the space between the base of interlamellar setae and *co.pm*.

Proportion of notogaster is large compared to small prodorsum; notogaster oval, finely punctate, with irregular crack-like lines and scattered incomplete foveoles posteriorly (notogastral surface deeply foveolated entirely under Scanning Electron Micrographs), 4 notogastral condyles markedly developed; lateral notogastral condyles (*co.nl*) large and triangular; median notogastral condyles (*co.nm*) specially clear-cut and almost rounded square; mutual distance of *co.nm* is twice the distance between *co.nm* and *co.nl*; notogastral setae 10 pairs, bilaterally roughened, with blunt tips and distinct setae base, 36-84 long, ranging from 10.84-25.3 *RLN*, setae *ta* antero-lateral; setae *te*, *ms* dorso-lateral, *ti* mid-dorsal, *r₁*, *r₂* postero-dorsal, *p₁*, *p₂*, *p₃* and *r₃* postero-marginal; distance *ta-te* < distance *te-ti* and nearly half the distance *te-ms*; distance *ti-ti* < *ta-ta* < *te-te* < *ms-ms*; distance *r₁-r₁* < *r₂-r₂*, distance *p₁-p₂* < *p₂-p₃* < *p₃-p₃*, notogastral fissures 5 pairs, *ia* located antero-lateral to the notogaster, a little below the outward to the follicle of *ta*, *im* aligned obliquely between *te* and *ms* laterally, *ih* a far above the insertion of *r₃*, *ips* between *r₃-p₃*, more closer to *r₃*, *ip* between *p₂-p₃*, nearer to *p₃*; *gla* rounded, placed just anterior to *im*.

Surface of ano-genital region finely punctate with scattered irregular foveoles (ventral surface also deeply foveolated under Scanning Electron Micrographs); each anal plate more than twice as long as broad, with 2 glabrous, nearly equal setae, with pointed tips, 28-32 long; *an₁* inserted close to the inner and posterior and *an₂* to median and anterior part of the anal plate; adanal setae 3 pairs, glabrous, nearly equal length with sharply pointed tips, 56-60 long, *ad₁* postero-lateral, *ad₂* medio-lateral and *ad₃* antero-lateral to the anal field, distance *ad₂-ad₂* > *ad₃-ad₃* > *ad₁-ad₁*, *iad* small, close to the antero-lateral border of the anal field, 5-6 long; distance between anal and genital apertures 2 times as long as the latter; each genital plate with striations, more than twice as long as its maximum width, with 4 simple setae, with tips, 20-24 long, 2 of which situated posteriorly and remaining 2 situated anteriorly to the genital plate; aggenital setae (*ag*) 1 pair, simple, with pointed tips, 49-51 long, their mutual distance nearly twice the maximum width of the genital plates.

Epimera I and II distinctly separated, epimera III and IV fused; epimeral setae simple, 16-60 long, setae *4b* longest, epimeral setal formula 3-1-3-3.

Claws monodactylous, curved; all legs with ultimate setae of flagelliform type (L-L-L-L).

Holotype Adult (F), INDIA West Bengal Darjeeling, Darjeeling forest Div., Ghum-Simana forest range, Ghum forest block (from humus with rotten leaves of *Gleichenia* sp.),

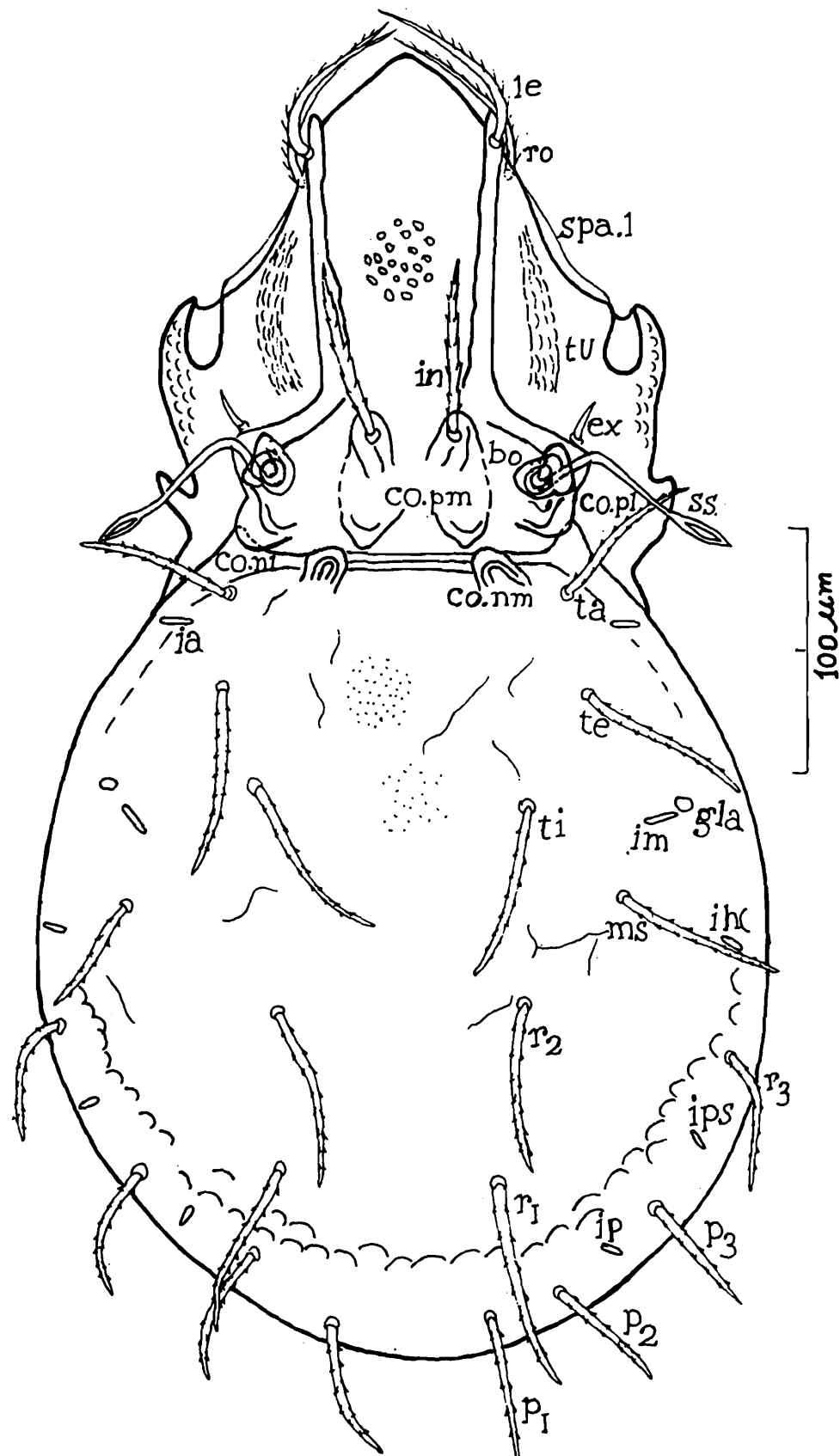


Fig. 1. *Dolicheremaeus russiae* sp. nov. (Dorsal view), ro = rostral seta, le = lamellar seta, in = interlamellar seta, spa.1 = lateral lamelliform expansion, tu = tutorium, bo = bothridium, ss = sensillus, ex = exobothridial seta, co.pm = median prodorsal condyle, co.pl = lateral prodorsal condyle, co.nm = median notogastral condyle, co.nl = lateral notogastral condyle; ta, te, ti, ms, r₁, r₂, r₃, p₁, p₂, p₃ = notogastral setae; ia, im, ih, ips, ip = dorsal lyrifissures, gla = orifice of latero-abdominal gland.

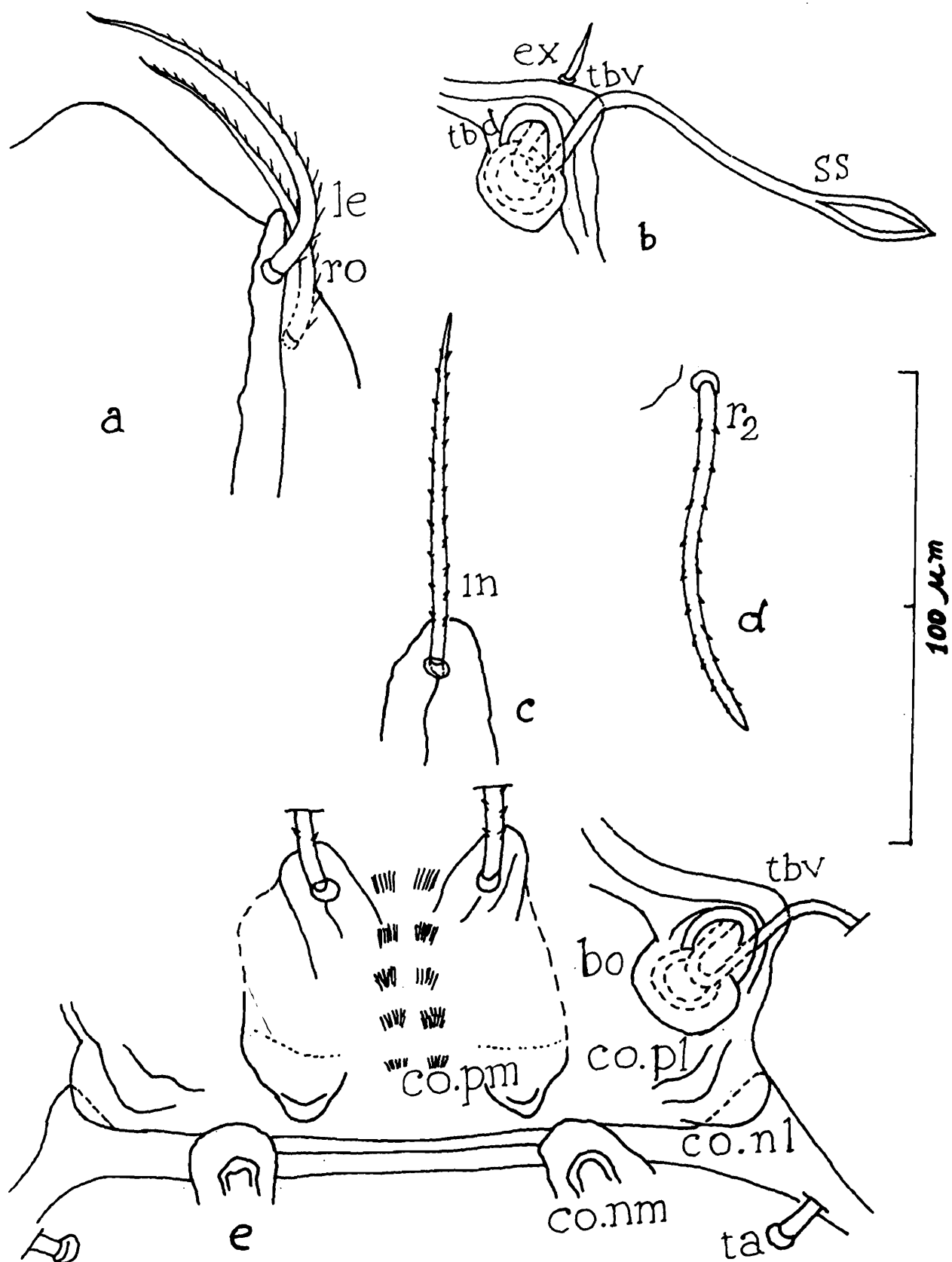


Fig. 2. (a-e) *Dolicheremaeus russiae* sp. nov. -a. The anterior distal portion of prodorsum (right side). -b. Bothridium, exobothridial seta, sensillus and their vicinity (right side). -c. Interlamellar seta on a semicircular ridge. -d. Notogastral seta r_2 . -e. The posterior part of prodorsum and the anterior part of notogaster: *ro* = rostral seta, *le* = lamellar seta, *in* = interlamellar seta, *tbv* = ventral bothridial plate, *tbd* = dorsal bothridial plate, *ex* = exobothridial seta, *ss* = sensillus, *bo* = bothridium, *co.pm* = median prodorsal condyle, *co.pl* = lateral prodorsal condyle, *co.nm* = median notogastral condyle, *co.nl* = lateral notogastral condyle; *ta*, r_2 = notogastral setae.

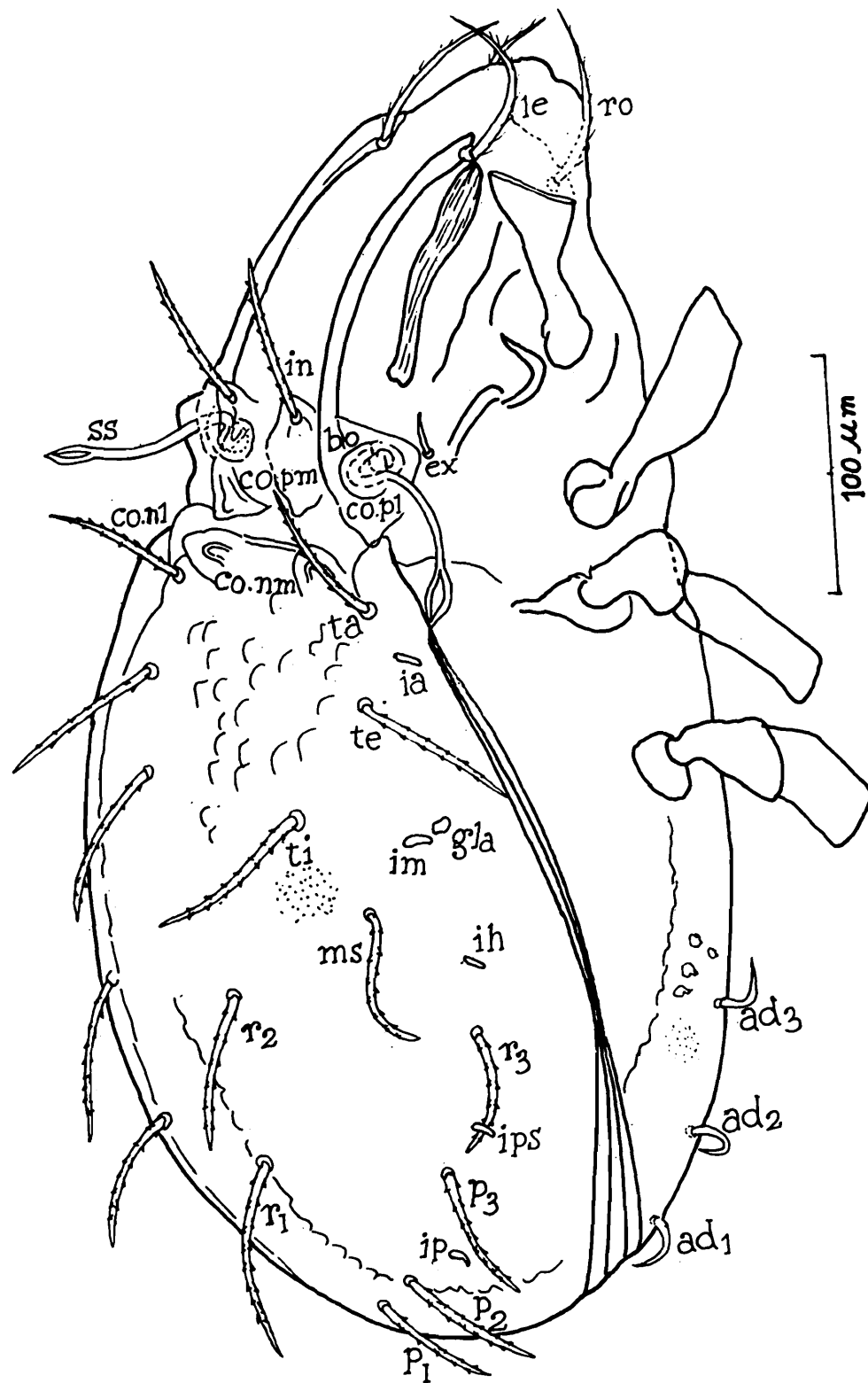


Fig. 3. *Dolicheremaeus russiae* sp. nov. (Lateral view), ro = rostral seta, le = lamellar seta, in = interlamellar seta, bo = bothridium, ex = exobothridial seta, ss = sensillus, co.pm = median prodorsal condyle, co.pl = lateral prodorsal condyle, co.nm = median notogastral condyle, co.nl = lateral notogastral condyle, ta, te, ti, ms, r₁, r₂, r₃, p₁, p₂, p₃ = notogastral setae; ia, im, ih, ips, ip = dorsal lyrifissures, gla = orifice of latero-abdominal gland; ad₁, ad₂, ad₃ = adanal setae.

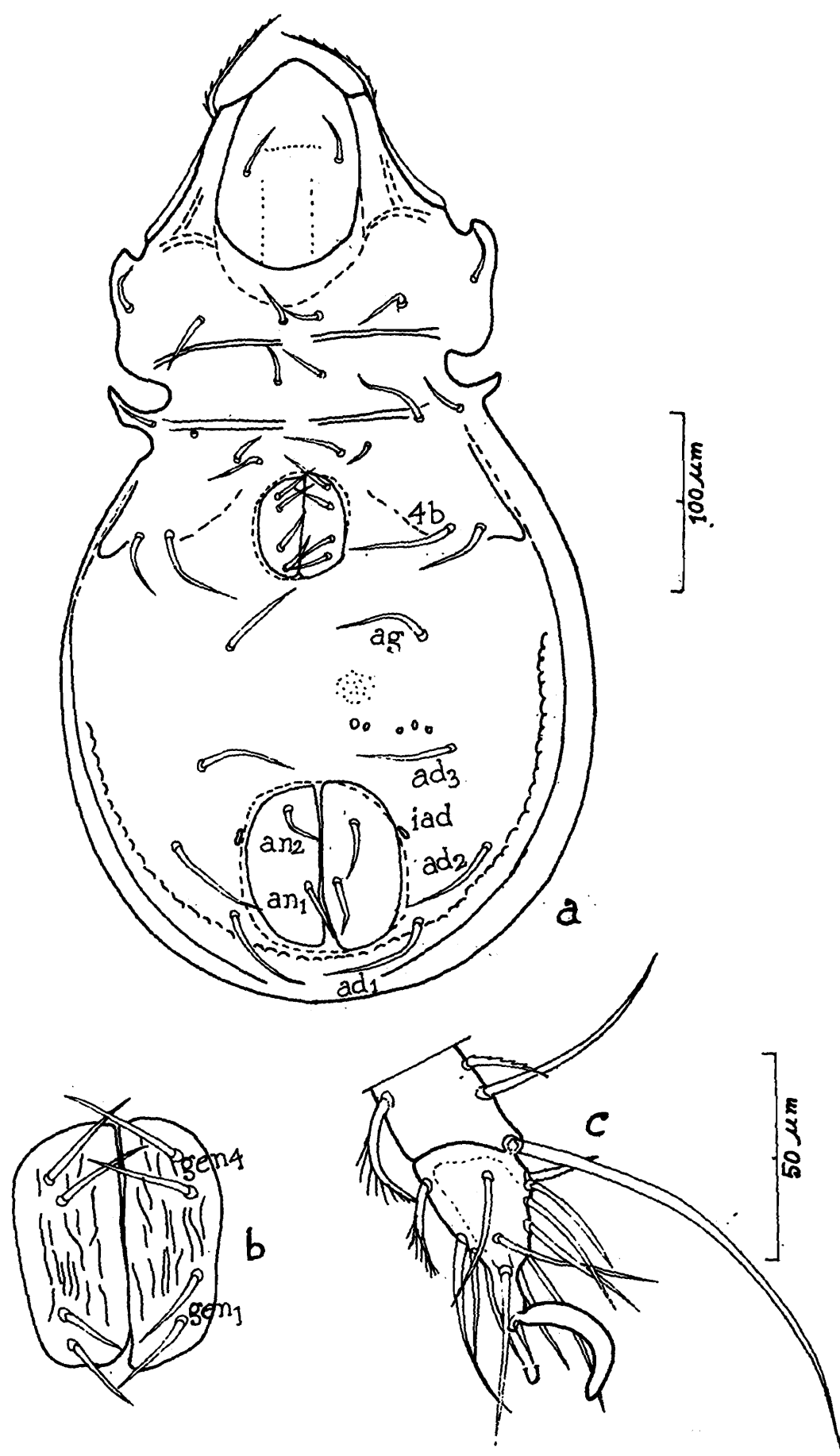
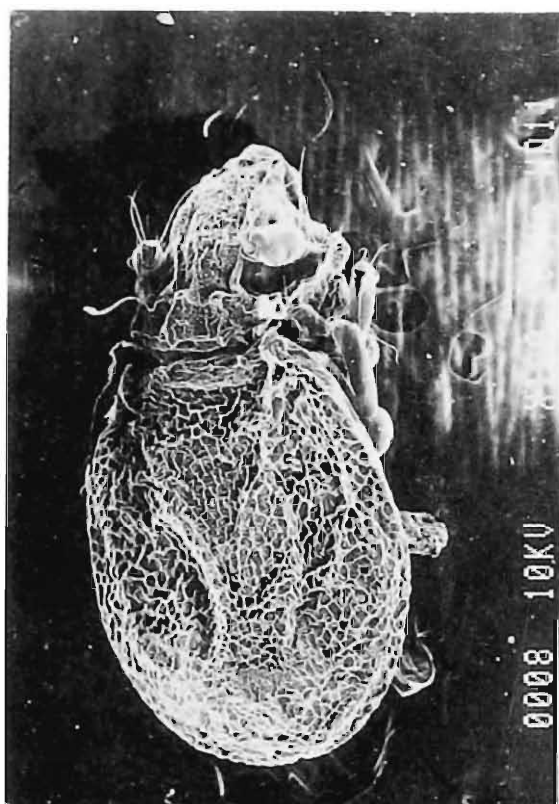
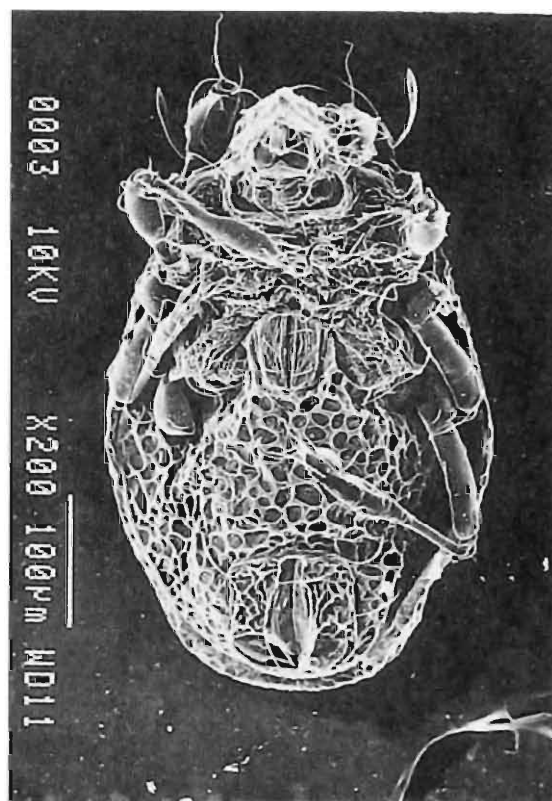


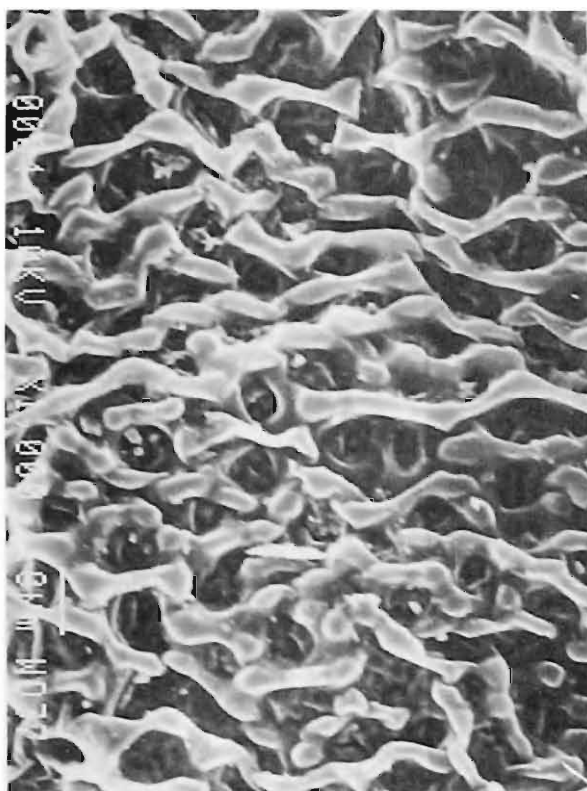
Fig. 4. (a-c). *Dolicheremaeus russiae* sp. nov. -a. *D. russiae* (Ventral view), -b. Genital plates. -c. Tarsus-I : an_1 , an_2 = anal setae, ad_1 , ad_2 , ad_3 = adanal setae, iad = adanal fissure, ag = aggenital seta, gen_1 - gen_4 = genital setae, $4b$ = epimeral seta, U = ultimate seta.



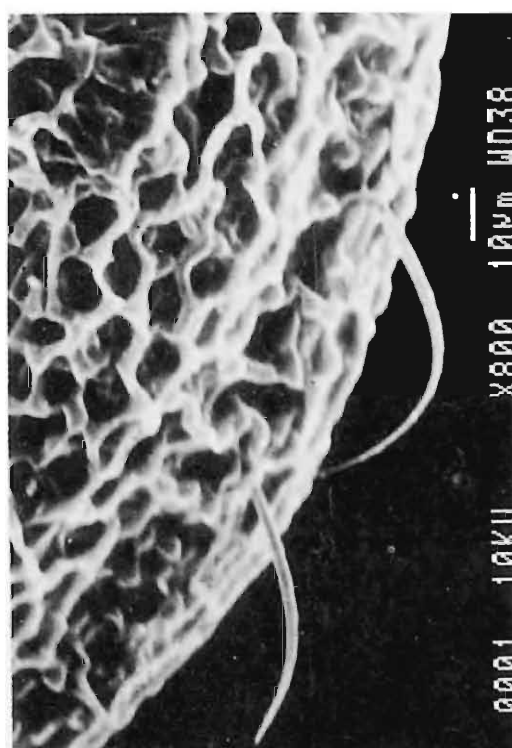
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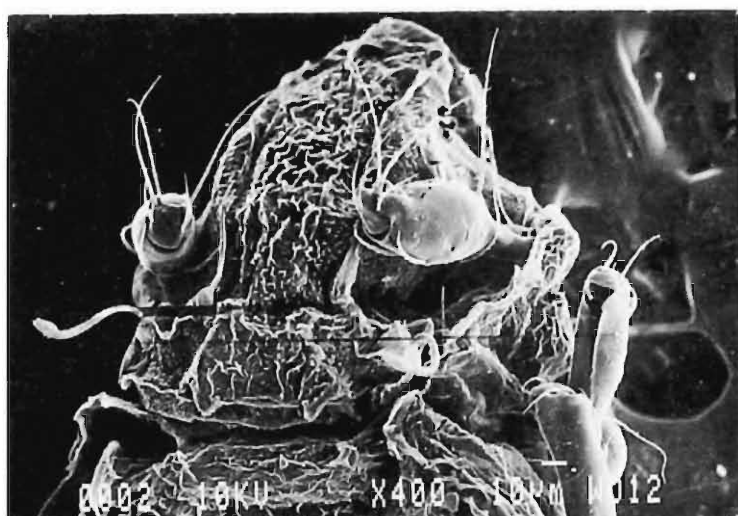


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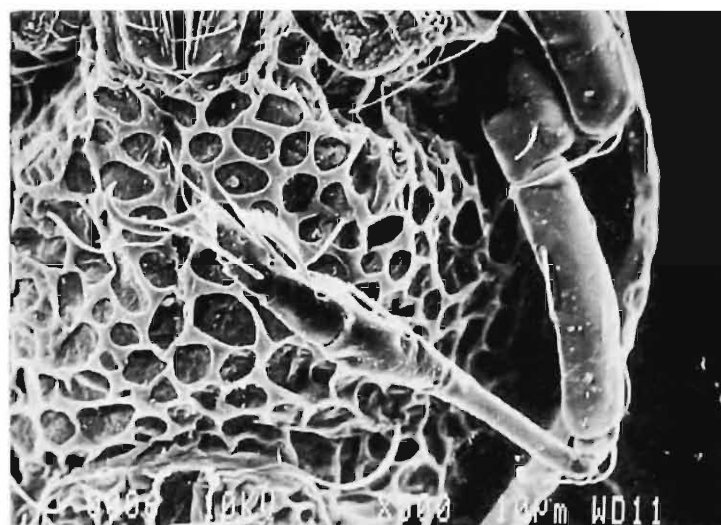


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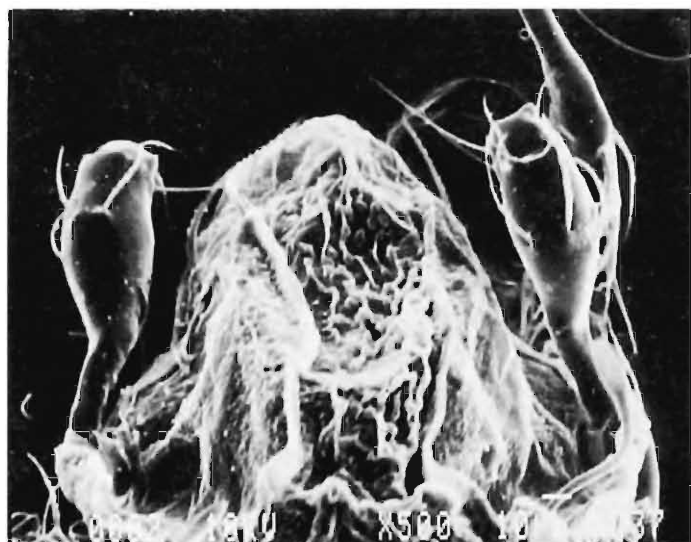
Figs. 5-8. *Dolicheremaeus russiae* sp. nov. (Scanning Electron Micrographs) : 5. Dorsal view, 6. Ventral view, 7. Foveolations on notogaster, 8. Notogastral setae r_1 and p_1 .



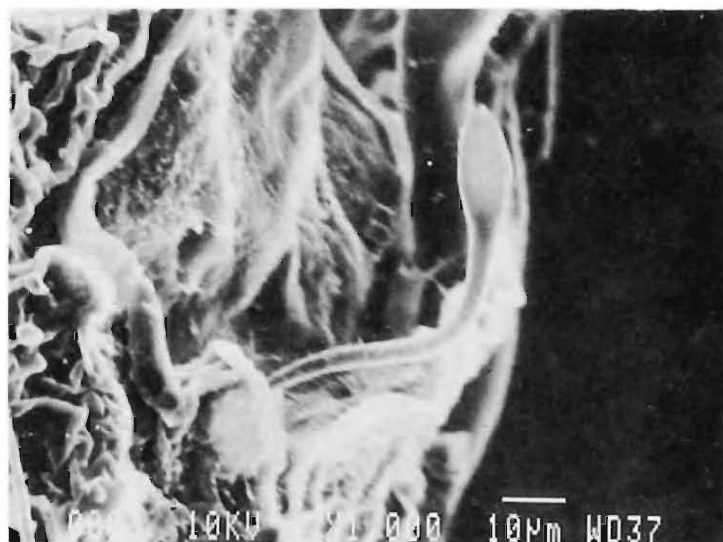
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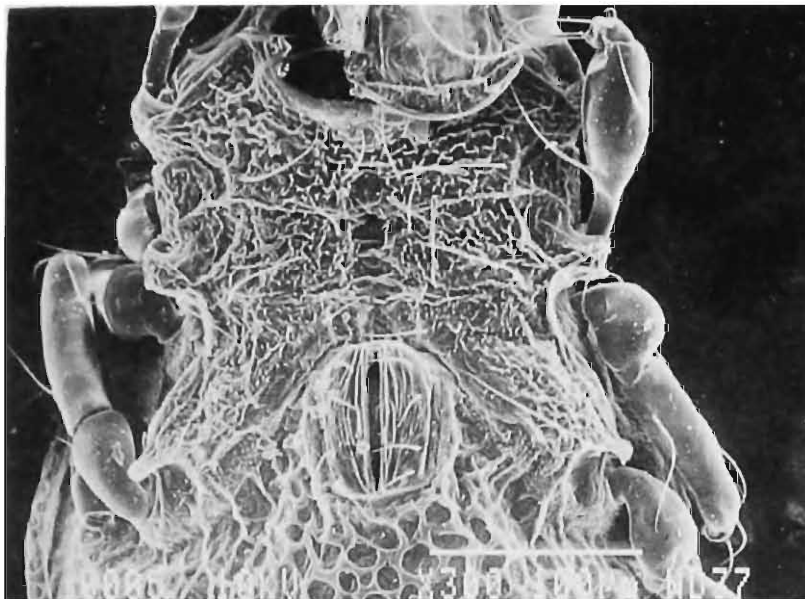


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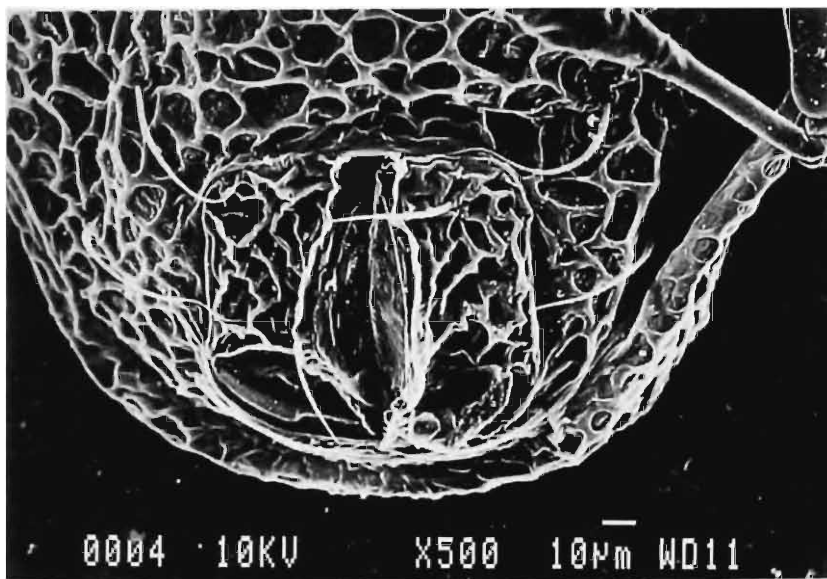
Figs. 9-12. *Dolichêremaeus russiae* sp. nov. (Scanning Electron Micrographs) 9. Details of prodorsum and anterior part of notogaster, 10. Leg-IV 11. Anterior portion of prodorsum, 12. Bothridium and sensillus.



13



14



15

Figs. 13-15. *Dolicheremaeus russiae* sp. nov. (Scanning Electron Micrographs): 13. Epimeral region and genital plates on ventral side, 14. Genital plates and genital setae, 15. Anal plates, anal setae and adanal setae.

2100 m., 28.vii.1989 (B. K. Mondal coll.); paratypes 2 adult (F), INDIA West Bengal Darjeeling, Darjeeling forest Div., Senchal forest range, Sonada forest block (from soil under a plant, *Machilus edulis*), 2100 m., 30.viii.1989 (B.G. Kundu coll.); paratypes 2 adult (F), INDIA West Bengal Darjeeling, Kurseong forest Div., Sukna forest range, Gulma forest block (from compost heaps under a tree, *Schima wallichii*), 155 m., 10.vii.1988 (B. K. Mondal coll.); paratype 1 adult (F), INDIA West Bengal Darjeeling, Mohurgong Tea Estate (from humus and rotten leaves of *Camellia sinensis*), 117 m., 7.viii.1988 (B.G. Kundu coll.); paratype 1 adult (F), INDIA West Bengal Darjeeling, Gulma Tea Estate (from humus and litter of *Camellia sinensis*), 117 m., 9.vii.1988 (B.K. Mondal coll.); paratype 1 adult (F), INDIA: West Bengal: Darjeeling, Sukna Tea Estate (from loose soil under a tea plant, *Camellia sinensis*), 135 m., 23.vii.1989 (B.K. Mondal coll.); deposited in the laboratory of the Department of Zoology, Ananda Chandra College, Jalpaiguri-735101, West Bengal, India.

Most of the *Dolicheremaeus* species have lamellae more or less bending and converging anteriorly. But the most characteristic feature of the new species is the straight lamellae which are widely separated from each other and prominently diverging anteriorly with lamellar apices slightly projected beyond the margin of the body. In this respect, this new species approaches close to *Dolicheremaeus distinctus* Aoki, 1982 described from South Japan and *D. markusi* Balogh, 1970 from Ceylon. It, however, deviates from the Japanese species in the absence of median prodorsal ridge, exobothridial setae and in having longer and bilaterally roughened notogastral setae, different sensilli, genital plate with striations, besides a few other characters. On the other hand the Ceylonese species differs from *D. russiae* in the lamellae situated more close to each other, the glabrous notogastral setae, the sensilli pointed apically and the larger body size (662 x 343).

SUMMARY

This paper deals with the description of one new species of the genus *Dolicheremaeus* Jacot (Acari Oribatei, Otocepheidae), viz., *D. russiae* from the soils of forest and tea fields in the district of Darjeeling, West Bengal, India.

ACKNOWLEDGEMENT

The first author is grateful to the University Grants Commission, New Delhi, India for giving some financial assistance to study the oribatid fauna of Darjeeling, India.

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EFFECT OF BIRD GUANA IN THE PLANKTON POPULATION OF FRESH WATER TANKS

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INTRODUCTION

The Indian countryside abounds with a large number of seasonal and perennial tanks which are differently used for irrigation, drinking and washing purposes. Most of the seasonal tanks retain water for a period of 3 to 10 months and harbour wild and uneconomic varieties of fishes. These waterbodies offer vast scope for fish culture and fishery development. A comprehensive knowledge of the fauna and flora of such freshwater systems is a prerequisite for any scientific fish culture programme.

Literature on the physico-chemical properties of fresh water systems is rather abundant. Michael (1962, 66, 68, 69 and 1970) studied the physico-chemical factors and zooplankton of certain freshwater fish ponds in Delhi and west Bengal. Sumithra (1969); Sreenivasan, (1964, 1966, 1972 and 1974), Prabhavathy and Sreenivasan (1977) studied the physico-chemical aspects of freshwater tanks in Tamil Nadu. David et. al. (1974) gave an account of the tanks in Karnataka.

The Vedanthangal bird sanctuary, established in 1790, is the oldest sanctuary in India (Fig. No. 1). Located at a distance of 80 Km. from Madras (Tamil Nadu) (12 N; 79E; 120 m), this is the temporary abode of more than 25,000 breeding and non-breeding migratory water birds, (Paulraj 1984, Annamalai 1985). Daily deposition of large amounts of droppings by these birds in this compact tank area of 30 ha makes the tank water turbid and the tank water is converted into a liquid guano in due course. When this guano-rich tank water is used for irrigating the fields, it enriches the soil with phosphates and nitrates. Much work has been done on the fertilizer property of this tank (Thangam 1956, Spillet 1966, Santharam 1984, Paulraj, 1988 and Arun Kumar and Mary Bai Krishnan 1991). The object of the present study is to find the impact of guano on the plankton population of this tank. Another fresh water tank, Chenglepat tank situated at about 20 Km North East of Vedanthangal, which is not a bird sanctuary, was selected for comparative studies.

MATERIAL AND METHODS

For a period of one year, composite water samples were collected every month from both the tanks (between 9-11 AM) with a water sampler. The physico-chemical parameters were analysed with the help of DREL-5 water analysis kit supplied by HACH & Co.,

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Belgium. Plankton samples were collected by filtering 10 liters of water through a conical net made of a bolting silk (No. 25) and the resulting filtered concentrate was preserved in 4% formaldehyde. The planktons were identified upto genus level and a quantitative count was made using a Hydrobios inverted plankton microscope.

RESULTS

The physiography and physico-chemical parameters of Vedanthangal and Chenglepat tanks were published in an earlier paper by Arun Kumar and Mary Bai Krishnan (1991).

Plankton of Vedanthangal Tank

The phytoplankton growth in Vedanthangal tank was dense althrough the year than in Chenglepat tank. The phyto-and zooplankton compositions were 24% and 76% respectively. The seasonal variation in phyto-and zooplankton is shown in Fig. 2. The Cyanophyceae dominates the phytoplankton. The phytoplankton concentration ranged from 200 u/l in August to 12499 u/l in May with an average of 6300 u/l. The annual maximum was during May in summer and December in winter. The groups represented were Cyanophyceae, Chlorophyceae and Bacillariophyceae.

Zooplankton Of the groups represented chief Protozoa, Rotifera, Copepoda and Cladocera which have been dealt here. The seasonal trends in the density of these groups are shown in Fig. 3.

Protozoa The concentration of protozoa varied from 260 units/l in January to 1840 units/l in July (average 1050 units/l). It was abundant during June, July and December. *Euglena*, *Volvox*, *Aulonia* and *Tintinnid* were the four genera encountered in this group.

Rotifera The concentration varied from 400 u/l in January to 9400 u/l in March (average 4900 u/l). The months of abundance were March (Summer) and December (winter). A feeble pulse (6200 u/l) was observed during October. Very few Rotifers were represented by the genera *Asplanchna*, *Filinia* and *Branchionus*.

Copepods The density of this group ranged from 200 u/l in January to 7800 u/l in May (average 4000 u/l). Copepods were abundant in summer and winter with a primary peak in May and secondary peak in December. January and February were lean months for Copepode population. This group was represented by *Diaptomus*, *Mesocyclops* and their nauplii stages.

Cladocera This group was dominant in Zooplankton with density varying from 200 u/l in February to 37,400 u/l in November with an average of 18,710 u/l. Cladocerans were abundant during summer months from March to June. A secondary peak was observed in November. *Ceriodaphnia*, *Moina* and *Cypris* represented this group.

Plankton of Chenglepat tank

The phytoplankton population was represented by 5 species of Cyanophyceae Viz *Microcystis*, *Oscillatoria*, *Merismopodia* and *Aphanizomenon*, 2 species of Chlorophyceae Viz, *Mougeotia* and *Zygnemia* and one species of *Bacillariophyceae* by *Navicula*. Cyanophyceae dominates the phytoplankton community in general. The phytoplankton concentration ranged from 380 to 4200 u/l from January to December (average 2240 u/l). The maximum number was recorded during May (summer) and December (winter). The seasonal variation of phyto-and zooplankton is shown in Figs. 4 & 5.

Of the zooplankton represented, Protozoa, Rotifera, Cladocera and Copepoda the chief groups that have been dealt. During the present studies 40% of the plankton population was represented by phyto and 60% by zooplanktons.

Protozoa The protozoans recorded were *Euglena*, *Volvox*, *Aulonia* and *Tintinnid*. They ranged from 200 u/l to 520 u/l with an average of 360 u/l. They were abundant during summer (June-July) and winter.

Rotifera This group was represented by a large variety of forms belonging to the genera *Asplanchna*, *Filinia* and *Branchionus*. The concentration varied from 280 u/l to 1400 u/l with an average of 840 u/l. Rotifers were abundant in summer and winter with primary peak in May and secondary peak in December. February and August were lean months for Rotifer populations.

Copepoda The copepods recorded were *Diaptomus*, *Mesocyclops* and their nauplii stages. The density of this group ranged from 150 u/l in January to 6800 u/l in June with an average of 3452 u/l. A primary peak was noticed in May and a secondary one in November. The group was poorly represented in January, February, July and September.

Cladocera *Ceriodaphnia*, *Moina* and *Cypris* were encountered in this group. Cladocera formed the dominant group in zooplankton with concentration ranging from 200 u/l in January to 11600 u/l in August. They were abundant in summer months, May to July after which the number decreased. A secondary peak was observed in November. Abundance of Cladocera was found to be responsible for the zooplankton peak in summer and winter.

DISCUSSION

Vedanthangal and Chenglepat tanks are two water bodies of eutrophic nature as revealed by permanent phytoplankton blooms (Prasadam 1977). Both phytoplankton and zooplankton were abundant in Vedanthangal tank than in the Chenglepat tank. This might be due to higher nutrient content because of the bird droppings as stated by Paulraj 1988. The zooplankton was found to be more than the phytoplankton during major part of the year. The zooplankton was observed to be abundant during summer and winter seasons in both

the tanks. The seasonal abundance is identical in general in both the tanks but for the slightly decrease in Chenglepat tank.

Numerical abundance of Phytoplankton.

In both the tanks the dominant group is blue green algae (Cyanophyceae). The dominance of blue green algae in both the tanks agrees with the observations of Palmer 1980 who also found the abundance of blue green algae in the fresh water systems containing more organic matter. According to Schindler (1971) blue green algae are assimilated by zooplankton with low efficiency. Keating (1977) has suggested that the excretory products from blue green algae would inhibit other algae. Welsh (1980) is of opinion that the enrichment of Nitrogen and phosphate depletes silica which is slow to regenerate and which in turn would limit Diatom growth leaving more nutrients for blue green algae.

The increase of phosphate and nitrate in Vedanthangal tank might be due to the droppings of birds which ultimately would have limited the phytoplankton population. Depletion of phytoplankton during August, September and October might be due to the dilution of water by rains in both the tanks. The occurrence of lesser amount of phytoplankton compared to zooplankton may be due to the rapid grazing behaviour of zooplankton such as cladocerans and copepods.

Numerical abundance of zooplankton

12 species of zooplankton were recorded in Vedanthangal and Chenglepat tanks.

Protozoa was found to be abundant in Vedanthangal tank than in Chengalpat tank with peaks during summer (July) and winter, (December and January). Abundance of Protozoa in this tank, where Blue green algae is dense suggests that, besides other factors, the latter form the pasture for Protozoans. A similar correlation was drawn by Michael (1969) in the case of ciliate protozoans.

Rotifers represented by *Asplanchna*, *Filinia* and *Branchionus* were found in both the tanks, though less abundant in Chengalpat tank. They were abundant during summer (May-June) and winter (November-December) as in a tropical pond reported by Michael (1969). Gray 1953 and Byars (1960) have also reported the abundance of rotifers during summer and winter months in Cambridgeshire and New Zealand respectively.

Copepoda represented by *Diaptomus* and *Mesocyclops* were abundant both during summer (May-June) and winter (November-December). Similar observations were recorded by Michael (1968) in Delhi. Nauplii were encountered throughout the year indicating that the reproduction of copepods takes place during all the seasons (Prasadam, 1977).

Plate-1



Fig. 1 Photograph of Vedanthangal tank with migratory birds.

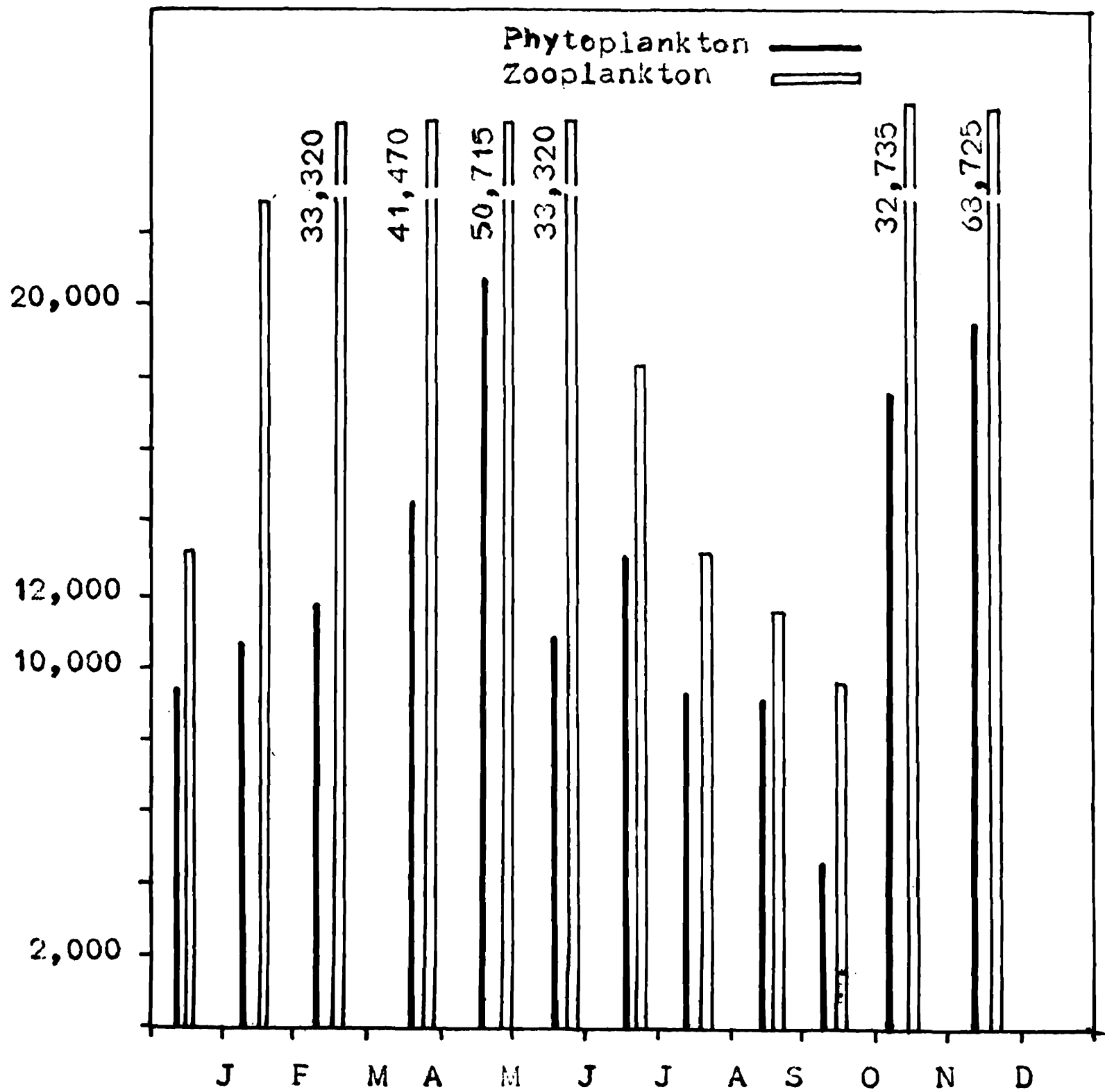


Fig. 2. Seasonal fluctuations in the density of Phyto and Zooplankton of Vedanthangal tank

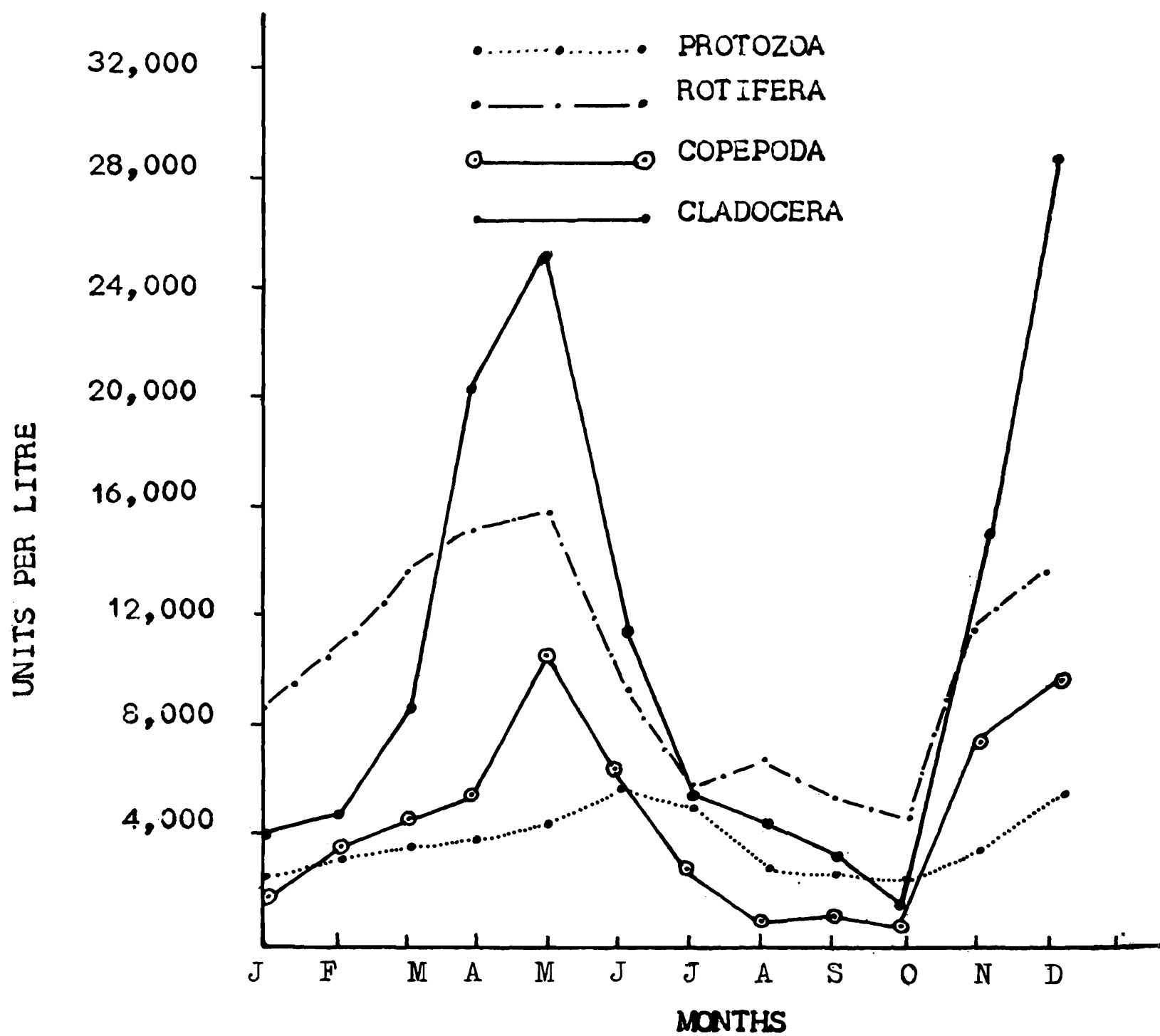


Fig. 3. Seasonal trends in the density of Protozoa, Rotifera, Copepoda and Cladocera in Vedanthangal tank

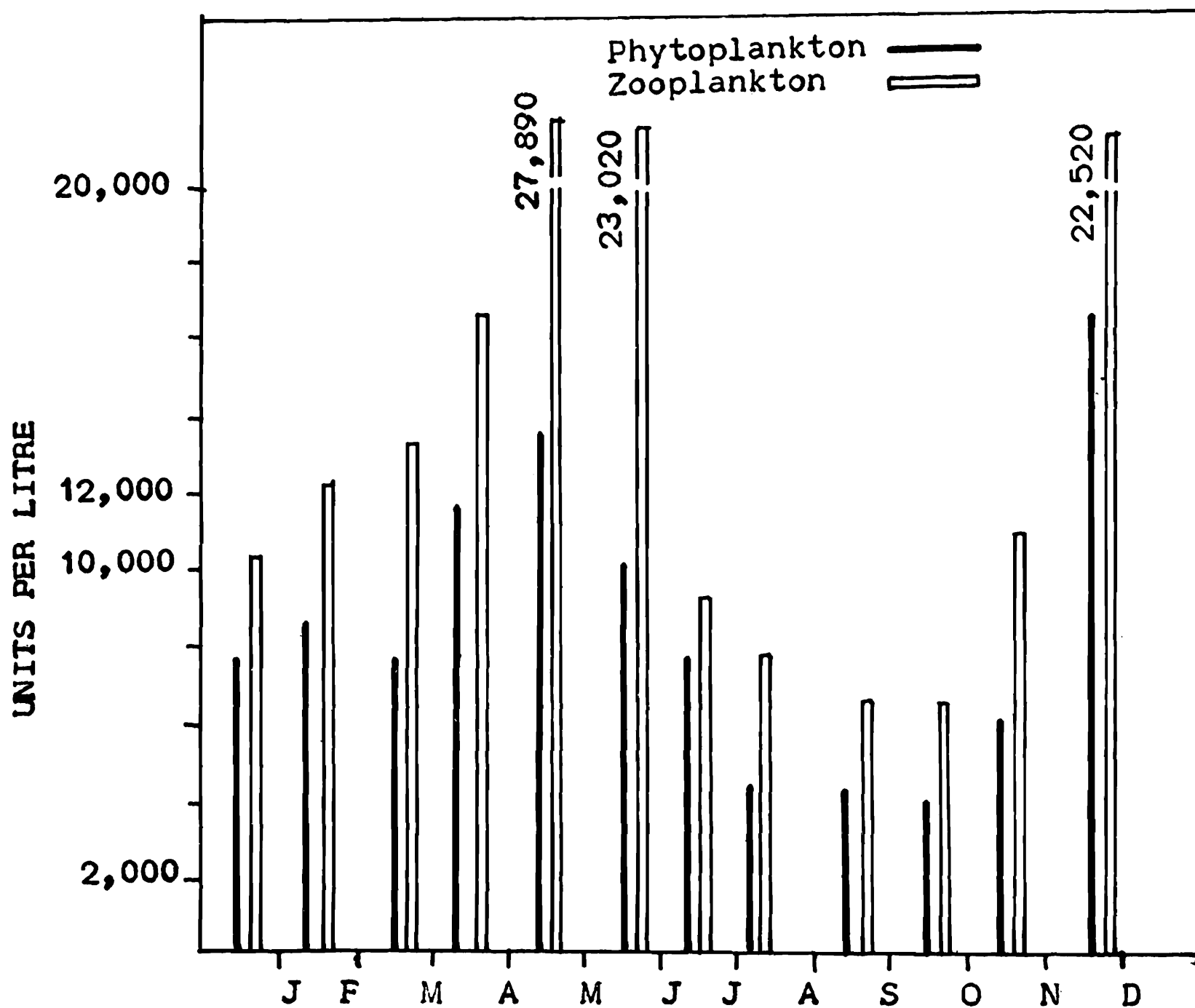


Fig. 4. Seasonal fluctuations in the density of Phyto and Zooplankton of Chenglepat tank.

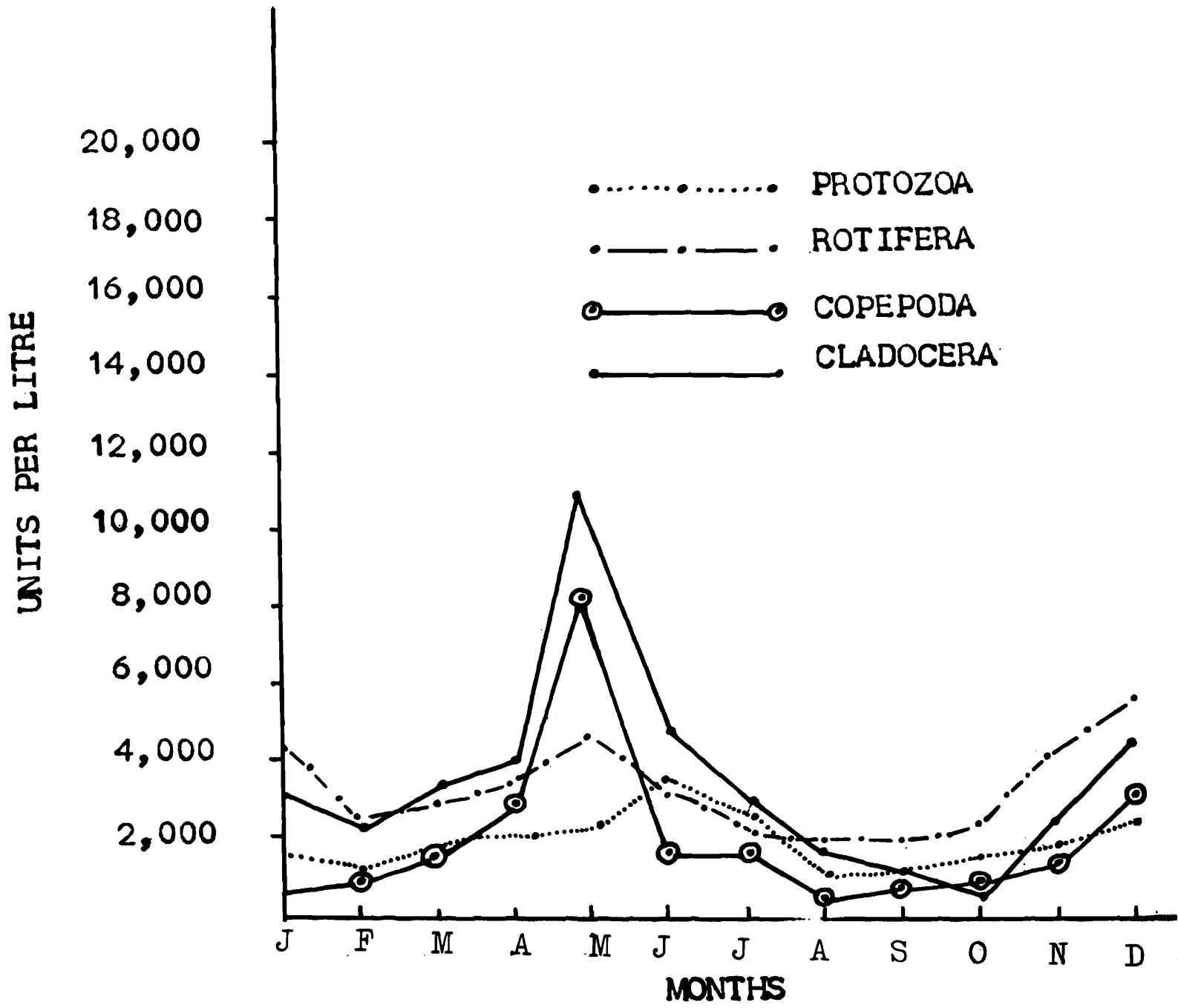


Fig. 5. Seasonal trends in the density of Protozoa, Rotifera, Copepoda and Cladocera in Chenglepat tank.

The Cladocera is represented by *Ceriodaphnia*, *Moina* and *Cypris*. These organisms also occurred in large numbers in summer (March-May) and winter (November-December). They were, however more in Vedanthangal tank which is rich in nutrients (Arnemo 1965).

The plankton in general, forms an important link in the food chain and any seasonal changes in its qualitative and quantitative composition is reflected in the growth and production of fish. The present study revealed that the phyto-and zooplankton densities in Vedanthangal and Chenglepat tanks indicate that the Vedanthangal tank has rich plankton populations attributed by the high nutrient content due to the bird droppings. The lesser plankton density in Chenglepat tank is mainly due to the presence of lesser amount of nutrients. The results of the present study, therefore suggest that both the tanks can be utilized for aquaculture and Vedanthangal tank may yield more fish than the Chenglepat tank.

SUMMARY

The phyto-and zooplankton populations of two freshwater tanks, viz, Vedanthangal tank which is used as a sanctuary by migratory birds and Chenglepat tank which is not so used is described. The higher content of nutrients in Vedanthangal tank due to the droppings of migratory birds increases the plankton population in it than in Chenglepat tank. The zooplankton was observed to be abundant during summer and winter seasons. Both the tanks can be utilized for aquaculture.

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OLDROYDIA HULL AND CYRTOPOGON LOEW (DIPTERA:ASILIDAE) FROM INDIA

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Zoological Survey of India, M-Block, New Alipore, Calcutta-700 053

INTRODUCTION

A new species of *Oldroydia* Hull viz. *O. josephi* is described and the male genitalia and wing of *Cyrtopogon ornatus* Oldroyd illustrated, the later species being the first record from India. Key to the species from India of both the genera are provided. The paper deals with the material collected by Shri D. K. Mondal of this department during Neora Valley Survey, 1982. Type specimens will be deposited to the National Zoological Collection of the Zoological Survey of India, Calcutta.

Genus *Oldroydia* Hull

1956. *Oldroydia* Hull, *Ann. Mag. nat. Hist.*, (12) 9 : 398. Type-species : *Oldroydia hamata* Hull.
1990. *Oldroydia* Hull : Joseph & Parui, *Rec. zool. Surv. India* Occ. paper No. 113 : 26.

Flies of *Oldroydia* are medium sized resembling *Cyrtopogon* Loew for its characteristically produced and round face which is fully covered with dense piles or bristles. The former can be readily distinguished by its dense mesonotal mane in both sexes, exceptionally long first flagellomere terminated by a spatulate or disciform plate with a small spine or a three segmented style with pointed apex and the generally presence of hamate anterior femur in male.

So far four species have been recorded from India and a new species is described here.

Key to the species

- 1 Fore femur with a hammar or chisel-like process in male.....2
Fore femur without such process.....4
2. First flagellomere ends in a spatulate or disciform plate with a small spine...*hamata* Hull
First flagellomere ends in three segmented style with pointed apex.....3

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3. Wing with three dark spots; leg black.....*josephi* n. sp.
 Wing with a black spot at apex, femur black; tibia red with black apex
*scatophagoides* (Walker)
4. Wing with dilated fore border; male genitalia black and yellowish brown
*costata* Joseph and Parui
- Fore border of wing not dilated; male genitalia black.....*femorata* Joseph and Parui

***Oldroydia josephi* n. sp.**

A black species with black and yellowish-brown bristles and light brown wing. Male length 11-12 mm., wing 10 mm.

Male Head black, yellowish tomentose; face entirely highly gibbous; mystax black; ocellar and postocular bristles black and long; postgena black bristly pilose. Antenna black, scape and pedicel with black bristles, proportional length of segments 2 : 1 : 6, style three segmented, as long as pedicel. Palpus and proboscis black with concolourous piles and bristles.

Thorax black, pronotum with dense golden yellow piles, scutum with a pair of golden yellow tomentose longitudinal stripes extending entire length, mane dense and composed of black bristles; chaetotaxy not distinguishable; pleura black, anepisternum and ketepisternum with black piles; epimeron with long golden-yellow piles; scutellar disc with mixed black and golden yellow piles, hind border with dense long black bristles. Haltere brownish-yellow.

Leg black, fore femur with a hamate process, all femora with dense black bristles ventrally; all tibiae laterally with some golden yellow bristly piles, fore tibia with mixed black and golden-yellow bristles, mid and hind tibiae with prominent golden yellow bristles and a few black ones.

Wing membrane as in *hamata* Hull, brownish with dark brown infuscation at apex anteriorly, at radial sector and at base of discal cell; all cells wide open; microtrichia evenly distributed over wing surface.

Abdomen black, terga 1-5 with dense black bristles dorsally and golden-yellow bristles laterally up to tergum 4; terga 5-7 laterally covered with golden-yellow scales, sterna with dense black bristles. Male genitalia (Fig.1) with eight sternite bearing a bunch of black bristles.

Holotype (M), India : West Bengal Darjeeling District Naora Valley, 10. ix. 1982, Coll. D. K. Mondal; Paratype (M) other details as in holotype.

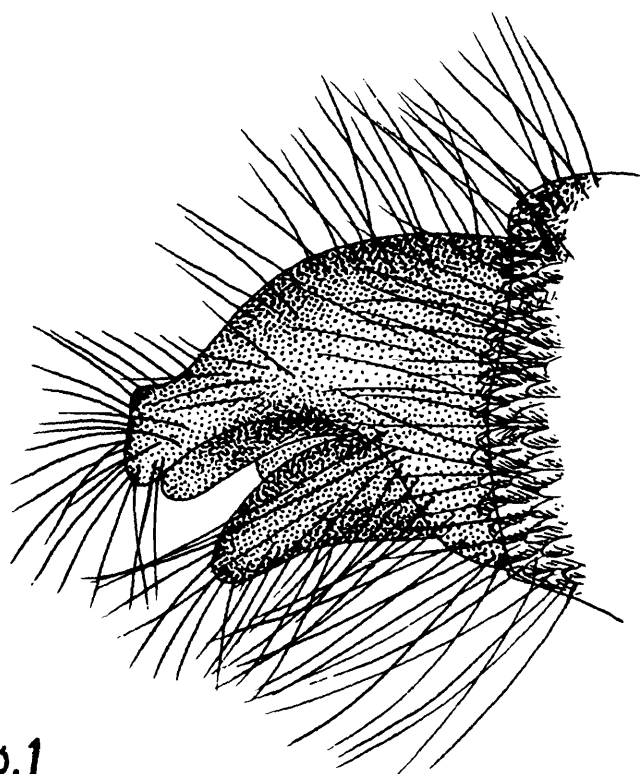


Fig.1

0.5mm.

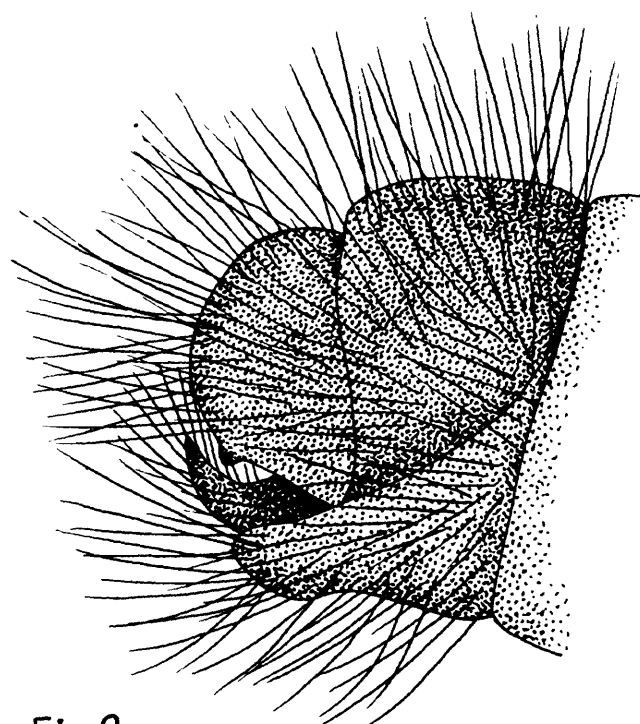
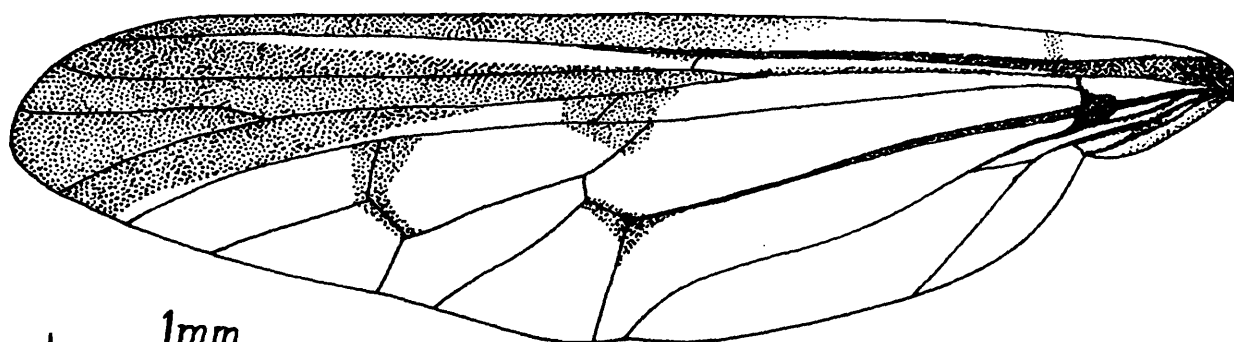


Fig.2

0.5mm.



1mm.

Fig.3

The present species superficially resembles to *O. hamata* Hull but differs from it in the shape of antennal style and in the details of male genitalia. As regards antennal style it is similar to *O. scatophagoides* (Walker) from Nepal, otherwise a distinct species. The species is named after Dr. A.N.T. Joseph, retired Jt. Director of the same institution who is an outstanding student of Indian Asilidae.

Genus *Cyrtopogon* Loew

1807. *Cyrtopogon* Loew, *Linn. Ent.*, 2 : 515. Type-species : *Asilus ruficornis* Fabricius.

1990. *Cyrtopogon* Loew : Joseph and Parui, 1990. *Rec. zool. Surv. India*, Occ. paper No. 110 : 23.

Medium sized flies with highly produced face; humeri with abundant long piles; marginal and all posterior cells widely open; epandrium of male genitalia obtuse, fully cleft; female with 5-6 pairs of spines on acanthophorites.

Key to the species

- 1 Leg wholly black; scutum without stripe or spot.....2
 Leg black except base of tibiae brownish; sutum with two median black longitudinal stripes and two lateral black spots on each side.....*khasiensis* Bromley
2. Wing hyaline or uniformly greyish or yellowish stained.....3
 Wing anteriorly brown stained with dark brown spots at base and apex of discal cell.....*ornatus* Oldroyd
3. Mystax consists of yellow bristles in the middle surrounded by black ones.
 *laphroides* Bromley
 Mystax consists of black bristles dorsally and yellow ventrally.....*laxenecera* Bromley

Cyrtopogon ornatus Oldroyd

1964. *Cyrtopogon ornatus* Oldroyd, *Bull. Brit. Mus. nat. Hist.*, 15 : 242.

Oldroyd (1964) described the species from Nepal and the description of it is fairly adequate but it lacks illustration of the genitalia. So, I take the opportunity of illustrating the male genitalia (Fig. 2) and the wing (Fig. 3). The species is recorded here for the first time from India. There is no marked difference in the character of the present specimen with the original description.

Material examined 1(M), India West Bengal Darjeeling District Neora Valley, 10.ix.1982, Coll. D. K. Mondal.

ACKNOWLEDGEMENTS

The author thanks to Dr. J. R. B. Alfred, Director, Zoological Survey of India for facilities. He is also thankful to Dr. M. Datta, Scientist-SE and Officer-in-charge, Diptera Section for encouragement and to Dr. A.N.T. Joseph, Scientist-SF (Retd.) for critical reading of the manuscript.

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SAROPOGON LOEW (DIPTERA : ASILIDAE) FROM INDIA AND NEPAL

P. PARUI

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INTRODUCTION

Through the courtesy of Dr. Gary F. Hevel, Collection Manager, Smithsonian Institution, Washington, D.C., I received a few interesting collection of robberflies from India and Nepal, the result of the study is dealt with in this paper which contains two new species- *Saropogon londti* and *S. meghalayensis*. The other two new species *S. tigris* and *S. nepalensis* are from the material present in the Zoological Survey of India, Calcutta.

Genus *Saropogon* Loew

1847 *Saropogon* Loew, Linn. Ent., 2 : 439

In Dasypogoninae, the oriental genera with fore tibial spur at apex are *Saropogon* Loew and *Dasypogon* Meigen. The former can be distinguished from the latter by the mystax being confined to epistomal region, presence of distinct acrostichal bristles, absence of a row of stout bristles on hind femur and drooping head and abdomen.

The genus *Saropogon* is common in temperate and tropical climate. Bigot (1876) described *S. scalaris* from "Indae Orient" and Joseph and Parui (1981) described *S. hulli* from Karnataka and Kerala. The genus is here recorded for the first time from Meghalaya and Uttar Pradesh.

Of the four new species described here. *S. tigris*, *S. londti*, *S. meghalayensis* and *S. nepalensis*, the genus is recorded here for the first time from Nepal.

Key to the species

- 1 Abdomen reddish, basal tergite with a transverse black band on each segment; mesonotum reddish with a median black spot extending anteriorly as a narrow line.....*scalaris* Bigot
Abdomen not reddish, basal tergite coloured otherwise.....2
2. Disc of scutellum with black hairs and border with 4-bristles; scutum with mediolongitudinal black stripe and two lateral spots.....*hulli* Joseph and Parui

- Disc of scutellum bare, its border with a pair of bristles; scutum otherwise.....3
3. Scutum uniformly black; femora yellow with a dorsal black stripe.....4
- Scutum coloured otherwise; femora without black stripe.....5
4. Mystax comprising of stout yellow bristles covering half of face; male genitalia black with profuse yellow piles.....*tigris* n. sp.
- Mystax comprising a single row of black bristles, male genitalia black with black bristles.....*nepalensis* n. sp.
5. Scutum with a single black patch gradually narrowing posteriorly; antenna uniformly black.....*londti* n. sp.
- Scutum with a black spot lateral to humerus and a pair of curved black stripes in the middle; antennal scape and pedicel yellowish-brown, first flagellomere dark-brown*meghalayensis* n. sp.

1 *Saropogon tigris* n. sp. (Fig.1)

A medium-sized black species with yellow antenna, yellow and black leg, infuscated wing and black abdomen with yellow pattern.

Male Body length 11 mm., wing-length 8 mm.

Male Head Face densely covered with golden yellow tomentum except at base of antenna; mystax consisting of uniformly stout yellow bristles covering half the face, facial tubercle moderately developed; vertex with a row of pale yellow pile; ocellarium pale yellow, pilose; upper occiput with a row of pale yellow bristles, postocular occiput with bristles of similar colour. Antenna yellow with concolourous bristles, proportional length of segments 1 1:2.5. Proboscis and palpi yellow-black with yellow pile.

Thorax Black with humeral callus and posterior margin yellow; pronotum black with a transverse row of yellow bristles and a bunch of long, yellow pile laterally; vestiture of scutum yellow; chaetotaxy: npl 2, spal 2, pa 2; pleura with golden-yellow tomentum; supraspiracular convexity with long, yellow pile; scutellar disc bare, border with a pair of yellow bristles.

Legs All yellow and black; femora yellow with a dorsal black stripe, stripe extending more extensive in posterior two pairs, fore and mid femora with ventral long yellow pile,

absent in hind pair, fore and hind tibiae with a black stripe, absent in mid tibia, tarsi yellow.

Wings Lightly infuscated, but infuscation deeper along veins, all cells open including anal cell.

Abdomen First segment wholly black, segments 2-4 with almost a rectangular yellow spot laterally, remaining segments with a yellow transverse stripe on posterior margin. Male genitalia (Fig. 1) black with profuse yellow bristly pile.

Material Holotype (M), ZSI, Reg. No. 9901/H₂, India Uttar Pradesh Kumaun; Bhim Tal, 1500 m., 2-10.v.1911 Coll. S. Kemp. MS name '*tigris*' attached to the specimen by Enrico Brunetti is used here in describing the species present in the National Zoological Collection housed in the Zoological Survey of India, Calcutta.

The species is close to *Saropogon nepalensis* n. sp., but differs from the latter in the colouration of mystax, humeral callus, the posterior margin of thorax and detailed structure of male genitalia.

2. *Saropogon nepalensis* n. sp. (Fig. 2)

A medium-sized black species with yellow and black leg and pale yellow wing. Male Body-length 10 mm, wing-length 7 mm.

Male Head in dorsal view broader than thorax; face densely covered with shiny white tomentum except base of antenna; frons golden-yellow tomentose with rows of black bristles; mystax consisting of a single row of black bristles above epistome; ocellarium with a few black bristles; upper occiput with black and yellow bristles, postocular occiput yellow pilose with a row of black bristles dorsally. Antenna lost. Proboscis and palpi with black pile, the former black with yellow apex.

Thorax : Black; pronotum with a transverse row of pale yellow bristles and lateral pile; mesonotum with yellowish-brown humeral callus; chaetotaxy: npl 2 exceptionally long and stout, spal 4, pal 2; pleura with a yellowish white tomentose stripe from the base of mid-leg to wing base.

Legs Femora brownish-yellow with a black stripe dorsally up to subapical region, tibiae yellow, posterior pair yellowish-brown, fore pair with black stripe anteriorly; tarsi dark brown.

Wings Pale yellow, all cells open, including anal cell.

Abdomen Uniformly black, clothing pile pale yellow. Male genitalia (Fig. 2) black with black bristles.

Material Holotype (M) (lacking antennae), ZSI Reg. No. 9900/H₂, Nepal Tarai : Kumdhik, 22.iii.1908, Coll. Mus. Coll. The species was named by E. Brunetti and kept in the ZSI type collection without describing it. I take the opportunity to describe it in the same name. Deposited in the ZSI collection.

The species resembles *Saropogon tigris* n. sp. but can be separated on characters as mentioned above.

3. *Saropogon londti* n. sp.

A medium-sized yellowish-brown and black species with distinct black colour pattern on scutum, yellow legs and wings. Male Body-length 9-10 mm, wing length 7-8 mm. Female Body-length 9-10 mm., wing 7-8 mm.

Male: Head as broad as thorax in dorsal view, black, yellowish-white tomentum covering a little away from the base of antenna to epistome; mystax pale yellow; frons from base of antenna to eye margin with sparse black pile; upper occiput with a pair of stout bristles on each side; postocular occiput bearing a row of weak, curved black bristles. Antenna black with black pile and bristles, proportional length of segments 1:0.4:2.6.

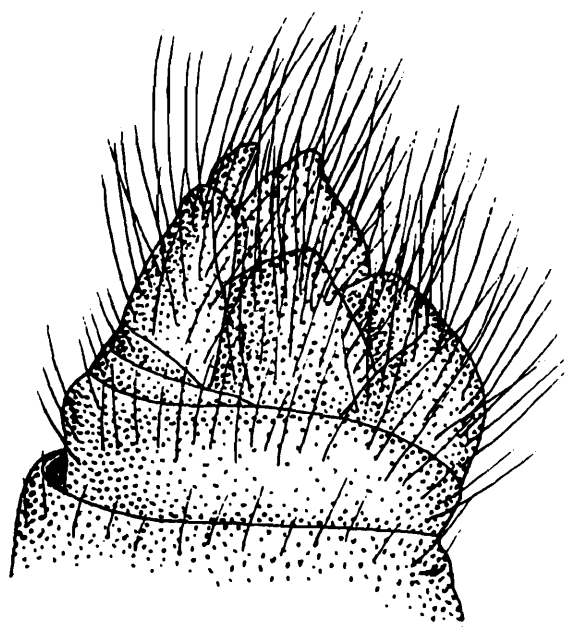
Thorax Yellowish-brown; pronotum with black pile and bristles; scutum with a black patch, gradually broadening to wing level followed by gradual narrowing, vestigule pale yellow; scutellum yellowish-brown with pale yellow pile laterally, border with a pair of black bristles and pale yellow pile; pleura bare.

Legs Yellow with dark brown tarsal segments; femora free from bristles, sparsely pilose; fore tibiae with a row of dorsal and a row of ventral bristles; mid tibia with a row of anterodorsal and a row of ventral bristles; hind tibiae with a row of dorsal, a row of anteroventral and a row of posteroventral bristles; basitarsi paler than remaining segments.

Wing greyish, distal half with full of microtrichia.

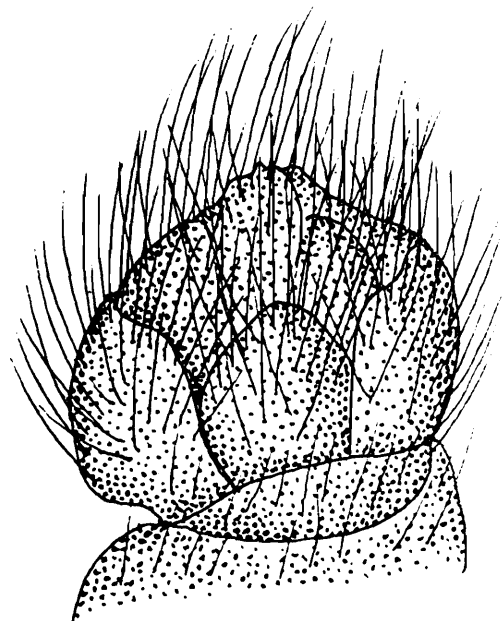
Abdomen Black and yellowish-brown, tergites 1-6 black, remaining tergites pale yellow. Male genitalia (Fig 3) yellowish-brown with profuse yellow pile.

Material Holotype (M), India: Kerala Nilgiri Hills Naduvatum, v. 1958, Coll. P.S. Nathan. Paratypes (M), Kerala Nilgiri Hills: Cherangode, 1665 m., v. 1950, Coll. P.S. Nathan; 15 (M), 6(F), details as in holotype. Holotype and 17 paratypes deposited in Smithsonian Institution, Washington, 4 paratypes in ZSI collection and 1 in Natal Museum.



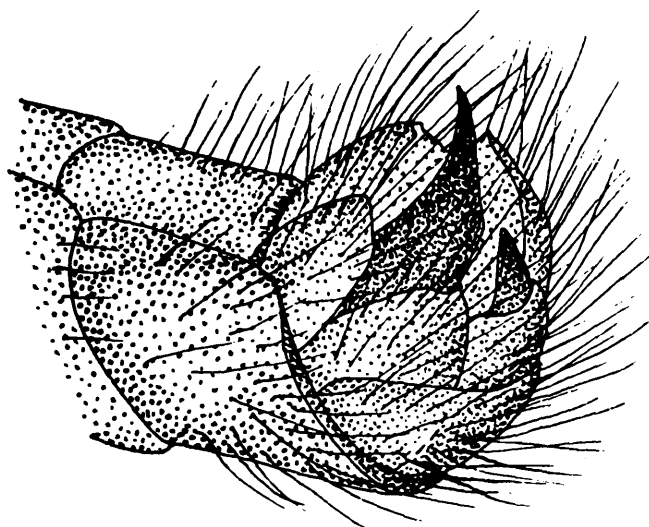
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Fig 1



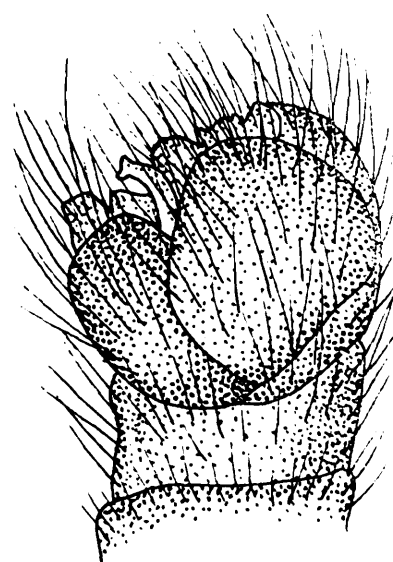
1mm

Fig 2



1mm

Fig, 3



1mm

Fig 4

The species differs from all other known Indian species i.e. *S. hulli* Joseph and Parui (1981), *S. tigris* n. sp. and *S. meghalayensis* n. sp. in the black colour markings of thorax and detailed structures of male genitalia. The shape of the antennal microsegment of this species differs from that in any other Indian species except *meghalayensis* n. sp. and the Nepalese species too. The species together with *meghalayensis* however, placed in this genus on the basis of other relevant characteristics.

4. *Saropogon meghalayensis* n. sp.

A medium-sized yellow and black species with distinct black scutal markings, yellow leg and lightly infuscated wing. Male Body-length 9 mm, wing-length 8 mm.

Male Head shiny black except for yellow from below antenna to epistome, yellow tomentum also covering back of head except postvertical region; mystax pale yellow; ocellarium free from bristles; upper occiput with a single bristle and a few pale yellow pile on each side; postocular occiput with a row of pale yellow pile. Antennal scape and pedicel yellowish-brown, first flagellomere dark brown, proportional length of segments 1:0.6:3.4.

Thorax Yellow with black markings; pronotum with a dorsal rectangular black spot and bristles and pile; scutum with an elliptical black spot lateral to humeral callus and a pair of slightly curved stripes in the middle almost reaching the base of scutellum; chaetotaxy: npl 2, dc 2, spal 4, pal 1., scutellum yellow with a pair of marginal bristles. Pleura yellow with brown infuscation on sternopleuron; suprspiracular convexity with a row of long, pale yellow bristles.

Legs Yellow; hind tibiae a little darker, bristles and pile concolourous with legs.

Wings Greyish, basal cells and the discal cell almost bare of microtrichia.

Abdomen Brownish-yellow with black markings on each segment, tergites 1-4 with rectangular black marks, remaining tergites black. Male genitalia (Fig. 4) with yellow pile.

Material: Holotype (M), India Meghalaya Nongpoh forest 25-28 iv. 1980. Coll. Amnon Friedberg. Deposited in the Smithsonian Institution, Washington.

The species resembles *Saropogon hulli* Joseph and Parui but differs in the colour pattern of thorax and with detailed structures of male genitalia.

ACKNOWLEDGEMENTS

I am indebted to Dr. A. K. Ghosh, Former Director, Zoological Survey of India, Calcutta, for permission accorded to study the material and for his keen interest in this study and to Dr. M. Datta, Scientist-SE of this department for his constant encouragement and various helps.

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THREE NEW SPECIES OF ASILIDAE (DIPTERA) FROM HIMACHAL PRADESH, INDIA

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INTRODUCTION

Through the courtesy of Dr. V. C. Kapoor, Professor of Zoology, Punjab Agricultural University, Ludhiana, I received a collection of robber-flies collected from Himachal Pradesh, India. The result of the study is reported here containing three new species under three genera. The types are deposited in the collection of the Zoological Survey of India, Calcutta.

Genus *Scylaticus* Loew

1858. *Scylaticus* Loew, *Ofvers. K. svenska Vet.-Akad. Forh.*, 14 : 346.

Type-species *Scylaticus zonatus* Loew.

The genus is allied to *Coonomyia* Londt (1992) but can be differentiated by the face with slight gibbosity, mystax confined to lower half of face, wing with m_3 widely open at margin, cubital cell never closed before wing margin, deeply incised epandrium and gonocoxite with finger-like lobe subapically.

So far only three species have been reported from India and here a new species is described.

Key to the species

- 1 Abdomen black.....2
- Abdomen yellowish, tergites 1-6 with black bands, tergite 7 with a very small black spot
.....*indicus* Bromley
- 2. All femora black.....3
- All femora yellowish-brown except basally pale yellow hind femur; antennal scape and pedicel yellowish-brown, first flagellomere dark brown.....*nagatomii* Joseph and Parui

*Deptt. of Zoology, Punjab Agricultural University, Ludhiana.

3. Scutum with a faint mediolongitudinal stripe and two large black spots laterally; antenna wholly black; male genitalia black and pale yellow with dense black piles*godavariensis* Joseph and Parui
- Scutum with a mediolongitudinal stripe but without lateral spots, antenna black except yellowish-brown pedicel; male genitalia yellowish-brown with pale-yellow piles*suranganiensis* sp. n.

***Scylaticus suranganiensis* n. sp.**

(Figs. 1-3)

A medium sized black species with white mystax, pale yellow wing and abdominal marks white tomentose. Male length 10 mm; wing 7 mm; Female length 10 mm; wing 7 mm.

Male : Head black; face white tomentose, mystax consists of a few white bristles above epistome; frons yellowish-grey tomentose, frontoorbital and ocellar bristles white; post vertex with white piles and bristles; postocellar pile white; postgena white pilose. Antenna black except yellowish-brown pedicel, proportional length of segments 1: 0.5 : 4. Palpi and proboscis black with white piles.

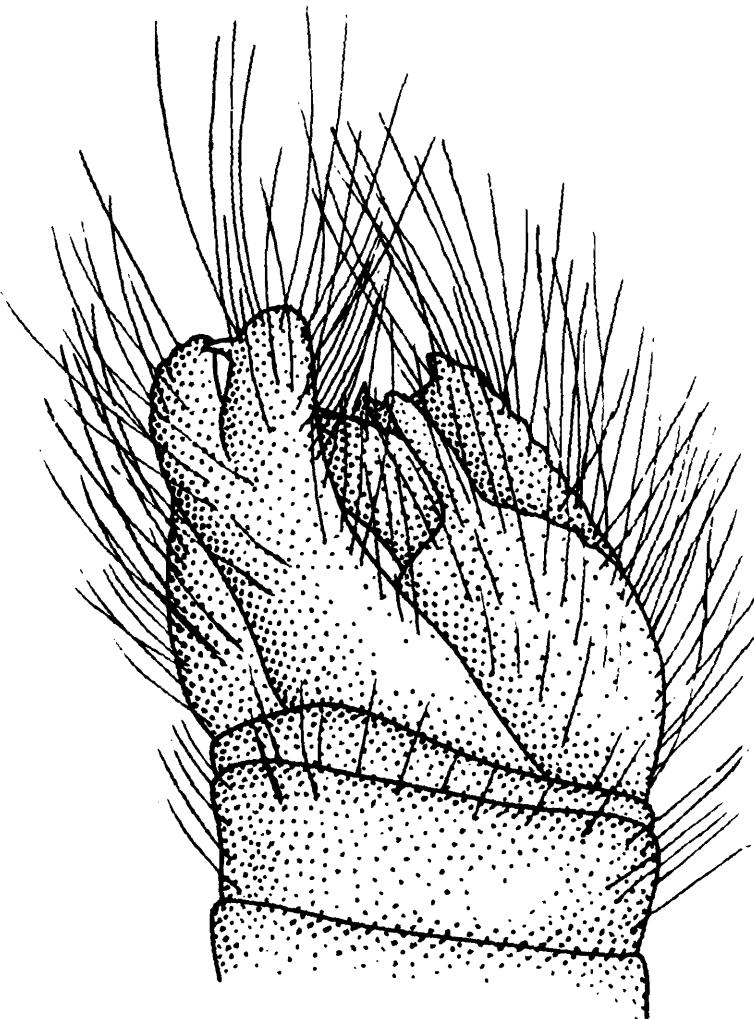
Thorax black, yellowish-grey tomentose, dense laterally; pronotum with dense white piles laterally and sparse dorsally; scutum with a mediolongitudinal dark grey stripe, vestiture white, lateral piles white; chaetotaxy: prst 4, sa 1, pa2, no distinct dorsal bristles; pleura yellowish-grey tomentose; scutellum with sparse white piles on the disc and border with a pair of pale yellow bristles and a few pale yellow piles.

Leg black except tibia at base pale yellow; fore femur bare of bristles, mid femur with 2 posterodorsal bristles, hind femur with 2 anterodorsal and 1 dorsoapical bristles; tibia yellow at base, the yellow colouration gradually increases from fore to hind tibia, bristles and piles of leg pale yellow.

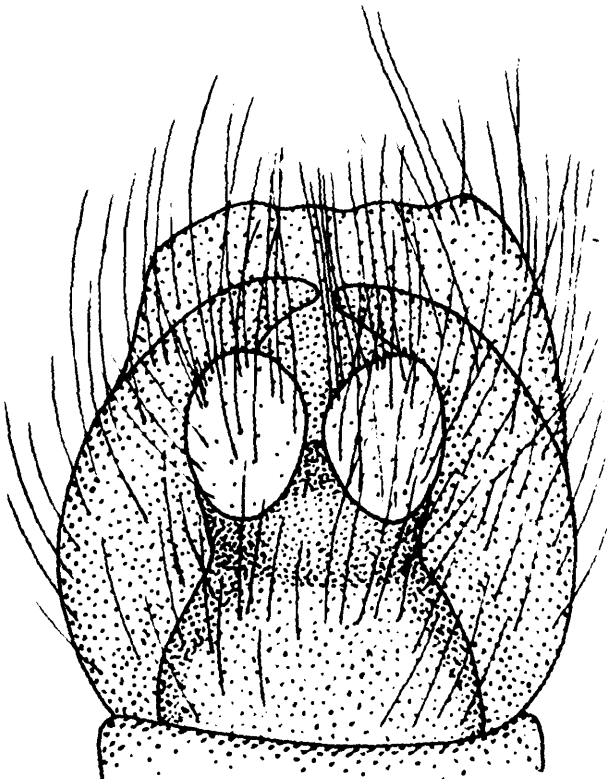
Wing pale yellow.

Abdomen black; lateral border of tergites with greyish-white tomentum which spreads towards middle in the shape of triangles; tergites 1-2 with lateral pale yellow piles. Male genitalia (Figs. 1 & 2) yellowish-brown with pale-yellow piles. In paratype male the tomentum totally absent on head, thorax and abdomen.

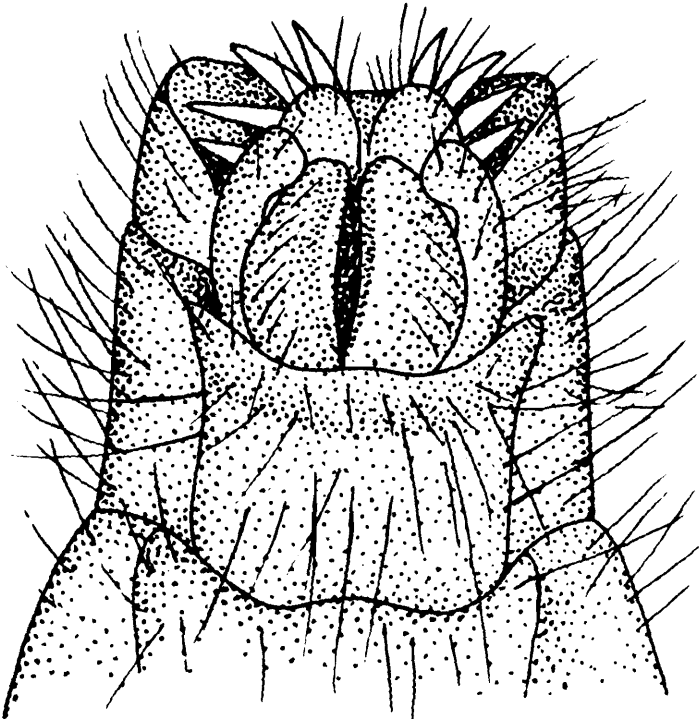
Paratype female is similar to males with the following differences : Tomentum on lateral borders of both thorax and abdomen brownish-yellow, scutellar disc bare and the border with only a pair of bristles; femora brownish-yellow and the yellow colouration of tibia



1



2



3

extends much more; female acanthophorites with a circlet of 10 spines (Fig. 3).

The species resembles to *Scylaticus indicus* Bromley (1938) but differs from the latter in the white mystax, almost wholly black legs and details of the male genitalia.

Holotype (M), India Himachal Pradesh Chamba dist., Surangani, 18.vi.1984, Coll. Ashwani Kumar. Paratypes 1(M), details as in holotype; 1 (F), Chamba dist. Surangani, 5.vi.1984, Coll. V.K. Kohli.

Genus *Neomochtherus* Osten Sacken

1878. *Neomochtherus* Osten Sacken, *Smithson. misc. Collns* 16 : 82, 235 (n. name for *Mochtherus* Loew 1849). Type-species : *Asilus pallipes* Meigen.

The genus is related to *Heligmoneura* Bigot and *Orophotus* Becker but can be distinguished mainly by the less developed and less complicated structures of male genitalia, long and laterally compressed female ovipositor, and absence of dorsocentral bristles before transverse suture.

So far only five species have been described from India and a new species is described here.

Key to the species

- 1 Leg wholly black.....2
- Leg otherwise coloured.....3
2. Epandrium invaginated at apex; antenna black except yellowish-brown pedicel*genitalis* n. sp.
- Epandrium entire at apex; antenna black.....*himalayensis* Joseph and Parui
3. Femur yellow with dark apex; mystax white.....*congedus* (Walker)
- Femur coloured otherwise; mystax mixed coloured.....4
4. Male genitalia black; fore tibia with reddish-yellow pile below.....*indianus* (Ricardo)
- Male genitalia otherwise coloured.....5.
5. Epandrium club-shaped; fore tibia with long black bristles ventrally....*trisignatus* (Ricardo)
- Epandrium bifid; fore tibia with long yellow bristles.....*gnavus* (van der wulp)

***Neomochtherus genitalis* n. sp.**

(Fig. 4)

A small sized black species with greyish-white tomentum, black legs and yellowish-grey wings. Male length 9 mm, wing 6 mm.

Male Head black, white tomentose; face white tomentose; mystax consists of a few white bristles; frons white tomentose and with fine white piles; ocellarium bears fine black and white piles; post vertex with a row of white bristles which extends up to half of postocular region, the remaining region with long, dense, white piles, postgena white pilose. Antenna black except yellowish-brown pedicel, proportional length of segments; 1 0.5 2, style longer than first flagellomere. Proboscis black and palpi yellowish-brown, both with white piles.

Thorax black, greyish-white tomentose; pronotum bears a dorsal row of white bristles; scutum with a pair of dark-brown longitudinal stripes; chaetotaxy npl 2, dc 3 (anterior one weak), sa 1, pa 2; scutellum greyish-white tomentose, disc bare, posterior border with a few weak bristles; pleura white tomentose, hypopleuron with a row of long, white bristles, metanotal slopes with pale yellow bristles. Haltere uniformly pale yellow.

Legs black, tibiae dark brown; fore femur with a row of bristles ventrally at base; mid femur with a row of bristle, anteroventrally; hind femur with a row of bristles anteroventrally and another row posteroventrally; fore tibia bears a row of bristles dorsally and a pair of exceptionally long bristles ventrally; mid tibia with four bristles dorsally; hind tibia with a row of bristles dorsally and two bristles in the middle anteroventrally.

Wing light yellowish-grey.

Abdomen black, white tomentose, segment 1 laterally with a few white piles among which with a stout bristles, segment 2 with a bunch of white piles laterally, segment 3 bare of lateral piles, segment 4 onwards dissected and mounted on slides. Male genitalia figured (Fig. 4).

Holotype (M), India Himachal Pradesh Lakarmandi, 8 km. W. of Dalhousie (Chamba), : Surangani, 12.vi.1984, coll. V. K. Kohli.

The speceis can be readily distinguished from all other Indian species-*Neomochtherus congedus* (Walker), *N. gnavus* (Wulp), *N. himalayensis* Joseph and Parui, *N. indianus* (Ricardo) and *N. trisignatus* (Ricardo) by the distinctive male genitalia especially by the presence of a series of curved spines mid dorsally on epandrium and a fan of bristles at the apex of gonocoxite.

Genus *Trichomachimus* Engel

1934. *Trichomachimus* Engel, Ark. Zool. (A) 25 (22) : 10. Type-species *Machimus pubescens* Ricardo, by original designation.

Similar to *Machimus* Loew but can be distinguished by the rather abundance of long, soft bristles and piles particularly on posterior half of scutum, on scutellum curving forward and the dense, coarse piles on most parts of abdomen. So far none has reported any structural distinction of male genitalia between these two genera.

Ten species has so far been reported from India and a new species is described here.

Key to the species

- 1 Tibiae and tarsi partly or wholly red.....2
- Tibiae entirely black, tarsi may be dull red.....6
2. Abdominal tergites with grey triangles laterally.....3
- Abdominal tergites without grey triangles laterally.....4
3. Abdomen with black pile except a few pale yellow on first and second tergites
.....*hirsutus* (Bromley)
- Abdomen covered with pale pile including genitalia.....*excelsus* Ricardo
4. Whole of abdomen covered with pale yellow or golden pile.....5
- Tergites 2-7 covered with golden yellow pile*basalis* Oldroyd
5. Scutellar disc with black bristly pile and some pale yellow pile, border with a row of
black bristles.....*omani* Joseph & Parui.
- Scutellar disc with long reddish pile, border with a fringe of black bristles
.....*opulentus* (Walker)
6. Body and leg covered with whitish or pale yellow pile, particularly covering the whole
of abdomen extending to the male genitalia.....7
- Pale yellow pile not covered all abdominal tergites; some portion of legs with black
pile, rest with pale yellow.....8
- 7 Eighth sternite well developed and ending in a thumb-like projection dorsally which
bears dense golden yellow pubescence.....*arnaudi* Joseph & Parui
- Eighth sternite slightly produced bearing a fringe of dense white
pubescence.....*pubescens* (Ricardo)
8. Basal part of abdomen covered with dense white pile.....9
- Basal part of abdomen covered with pile other than white.....10

9. Pile of posterior thorax, scutellum and abdomen pale yellow or red*kashmirensis* Oldroyd
- Pile of posterior thorax and scutellum white; tergites 2-4 with white pile, rest with short black pile.....*rubisetosus* Oldroyd
10. Tergites 1-3 with black pile; scutellum covered with white pile.....*himachali* n. sp.
- Tergites 1-4 with golden pile; scutellum covered with black pile.....*orientalis* (Ricardo)

***Trichomachimus himachali* n. sp.**

(Fig. 5)

A large black species with multicoloured piles and bristles and infuscated wing. Male length 19 mm; wing length 15 mm.

Male : Head black, greyish-yellow tomentose; mystax black reaching nearly to the base of antenna; frons black with concolourous bristly piles; frontoorbital and ocellar piles black; post vertex with black piles and bristles, postocular piles black; postgena dense white pilose. Antenna black with black piles and bristles, proportional length of segments 1 0.5 2.5. Palpi black with black piles; proboscis black with white piles ventrally.

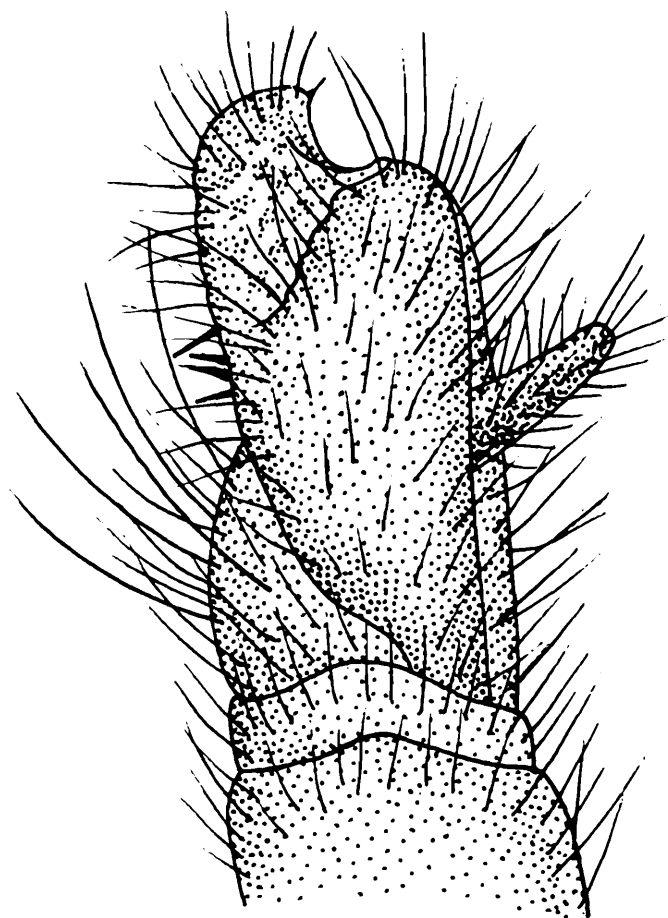
Thorax black; pronotum with black piles, a few of which yellow; humerus yellowish-brown tomentose, scutum unstriped, piles anteriorly black, moderately long, rather dense, posteriorly with dense, much longer white piles overlapping similar white piles of scutellum; chaetotaxy prst 3, sa 2, all yellow, notopleurals absent, dorsocentral not differentiable; pleura black pilose with a few white piles on propleuron and pteropleuron.

Legs black except dull red tarsi; fore coxa with dense, long white piles ventrally, remaining coxae with moderately long, black piles; fore femur with dense, long black piles which gradually reduces in number in the other femora, fore femur devoid of bristles, mid femur with 2 yellow bristles at apex, hind femur with a row of anterodorsal, anteroventral and posteroventral bristles; tibiae with yellow and black piles.

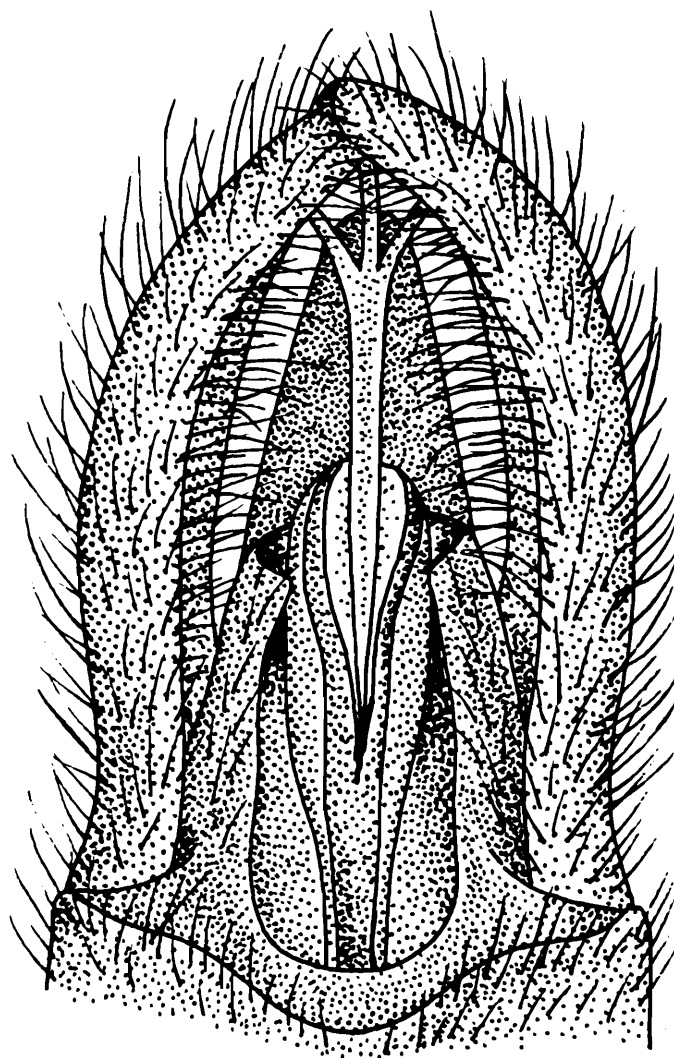
Wing light brown on basal third; rest with dark brown infuscation, the infuscation more on anterior half; squamal fringe black-brown and white.

Abdomen black, with dense long piles; terga 1-3 with black piles, the remaining terga with yellowish-red piles; piles of sternites dense, black. Genitalia (Fig. 5) black with sparse yellowish-red piles.

Holotype (M), India Himachal Pradesh Simla, 7.x.1992., coll. C. N. Meeta.



0.5mm 4



1mm 5

Of the two regional species-*Trichomachimus kashmirensis* Oldroyd (1964) and *T. omani* Joseph & Parui (1994), the present species is closely similar to the former but can be distinguished by the wholly black mystax, squamal fringe black-brown and white, terga 1-3 with black piles and the detailed structures of male genitalia.

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