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NEMATODES FROM WEST BENGAL (INDIA)
I. ON THE VARIATIONS IN TWO SPECIES OF
DORYLAIMIDAE AND REDESCRIPTION OF
BELONDIRA NEORTHA SIDDIQI, 1964
(BELONDIRIDAE).

By

KAISER H. BAQRI AND S. KHERA

Zoological Survey of India, Calcutta

(With 3 Text-figures)

INTRODUCTION

During November-December, 1975 a survey was made to collect the soil samples from around roots of fruit trees, paddy and tea in the following three districts of West Bengal, viz. Cooch Behar, Jalpaiguri and Darjeeling. The analysis of these samples showed a wide variety of tylenchid, dorylaimid, mononchid and other soil inhabiting nematodes.

In this first paper on the series "Nematodes from West Bengal (India)", *Thornenema cavalcantii* (Lordello, 1955) Andrassy, 1959 and *Oriverutus sundarus* (Williams, 1964) Siddiqi, 1971 belonging to the family Dorylaimidae have been redescribed in detail and intraspecific variations have been noted. In one population of *Thornenema cavalcantii* the abnormal development of anterior sexual branch has also been reported. Since the original description of *Belondira neortha* Siddiqi, 1964 belonging to the family Belondiridae is based on a single female and a male, it was considered necessary to redescribe this species in detail.

For the sake of study of variations, three specimens of *Thornenema cavalcantii* from Sikkim (India) have also been included in the present study.

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

Thornenema cavalcantii (Lordello, 1955) Andr ssy, 1959
(Text-fig. 1)

1955. *Dorylaimus cavalcantii* : Lordello, *Rev. Bras. Biol.*, **15** : 216

1964. *Thornenema cavalcantii* : Loof, *Nematologica*, **10** : 266

1965. *Thornenema cavalcantii* : Siddiqi, *Labdev J. Sci. Tech.*, **3** : 131

Measurements :

Matigrah population : Normal ♀ ♀ (4) : $L = 0.99-1.12$ mm; $a = 27-32$; $b = 4.0-4.6$; $c = 11-12$; $V = 1.0-1.5$ 41 — 45¹¹⁻¹².

Abnormal ♀ ♀ (2) : $L = 1.00-1.10$ mm; $a = 29-30$; $b = 4.2$; $c = 12$; $V = 6.5-7.5$ 46 — 48¹².

Reang Testa population : ♀ ♀ (5) : $L = 0.92-1.09$ mm; $a = 24-30$; $b = 4.0-4.6$; $c = 11-15$; $V = 1.2-1.8$ 43 — 45¹³⁻¹⁶.

Lebong population : ♀ (1) : $L = 1.16$ mm; $a = 28$; $b = 4.5$; $c = 12$; $V = 1.8$ 44¹³.

Sikkim population : ♀ ♀ (3) : $L = 0.99-1.09$ mm; $a = 31-33$; $b = 3.9-4.3$; $c = 11-16$; $V = 1.3-2.1$ 43 — 46¹¹⁻¹⁴.

Description : Body slightly ventrally curved upon fixation, tapering somewhat towards both extremities. Cuticle finely striated transversely; its thickness 2 μ m in mid-body and 4-5 μ m at tail. Lateral chords granular, 1/7th — 1/5th of the body-width near middle. In some specimens the lateral glandular organs distinct, 14 — 22 in number, irregularly spaced, starting before base of oesophagus up to anus. Ventral, dorsal and lateral body pores not distinct.

Lip region usually marked with slight depression (Text-fig. 1, B), sclerotized, rounded, lips amalgamated; appears slightly offset when the specimen is in subdorso-lateral position (Text-fig. 1, C); continuous with body in Sikkim population (Text-fig. 1, D); 1/3.6 — 1/3.0 of body-width at base of oesophagus. Amphids stirrup-shaped; apertures occupying 4 — 5 μ m or 40-45% of the corresponding body-width and 4-5 μ m from anterior extremity. Sensillar pouches 16-17 μ m from amphidial apertures.

Odontostyle 11-13 μ m or 1.1 — 1.2 lip region-width long; thickness about equal to corresponding body cuticle; aperture 4-5 μ m or 35-42% of odontostyle length. Guiding ring 7-8 μ m or 0.6-0.8 lip region-width from anterior extremity. Odontophore 15-18 μ m or 1.2 — 1.5 times the odontostyle length. The anterior slender part of oesophagus gradually expands to form the basal expanded portion. The basal expanded portion of oesophagus occupying 46-49% of the neck region. The nuclei of first subventral pair of oesophageal glands are indistinct. Locations of oesophageal gland nuclei and their orifices as follows :

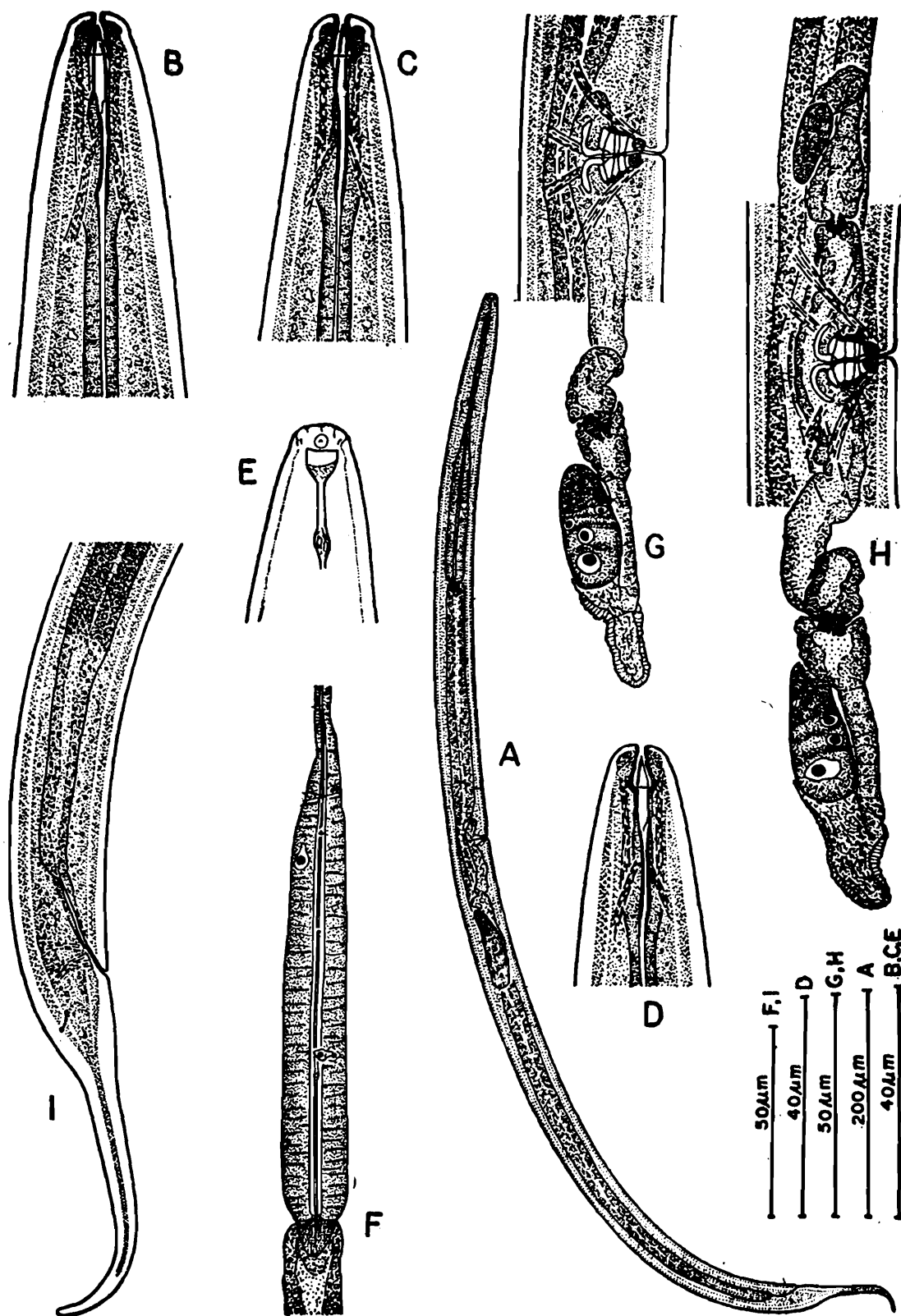
DO = 56.7—59.4

 $S_1O_1 = 68-72$ $S_2N = 81-82$

DN = 60.0—62.8

 $S_2O = 83-84$

DO—DN = 2.8—3.4



Text-fig. 1. *Thornenema cavalcantii*. A. Entire female. B. Anterior end in lateral view. C. Anterior end in subdorsolateral view. D. Anterior end in lateral view (Sikkim Population). E. Surface view of anterior end. F. Basal expanded part of oesophagus, oesophageal gland nuclei and their orifices. G. Normal female gonad. H. Abnormal development of anterior gonad. I. Posterior region.

Nerve ring 92-98 μm or 38-40 % of neck region from anterior end. Cardia conoid with rounded tip, 8-11 μm long, enveloped by intestinal tissue. Prerectum 43-78 μm or 2.1-3.4 anal body-width long. Rectum 21-29 μm or 1.0—1.4 anal body-width long.

Vulva a transverse slit. Vagina extending inward 16-18 μm or about 1/2 of corresponding body-width, surrounded by sphincter, with moderately sclerotized distal region. Normally mono-opisthodelphic gonad. Anterior uterine sac rudimentary, 13-21 μm or about 1/3rd—2/3rd of corresponding body-width. Uterus and oviduct separated by sphincter; oöcytes arranged in a single row, except at growth region. Two abnormal specimens in Matigarh population are amphidelphic in which anterior sexual branch is also typical but reduced in size and length (Te. t-fig. 1, H). Sperm not seen. Egg 87-91 $\times$ 27-31 μm .

Tail elongate-conoid, posterior third bent dorsally with rounded terminus, 66-102 μm or 3.1—5.0 anal body-width long, with two caudal pores on each side.

Male: Not found.

Localities and habitats: Matigarh population: From soil around roots of Banana at Matigarh, 6 km from Siliguri on Siliguri-Darjeeling Road, District Darjeeling, West Bengal. Reang Testa population : From soil around roots of Banana at Reang Testa, District Darjeeling, West Bengal. Lebong population : From soil around roots of Banana at Lebong, District Darjeeling, West Bengal. Sikkim population: From soil around roots of Maize at Suntali, on the road to Singtom, Sikkim.

Remarks : Lordello (1955) originally described this species as *Dorylaimus cavalcantii* on a single female from Brazil. Andrassy (1959) transferred this species under his newly proposed genus *Thornenema* because of its amalgamated lip region, mono-opisthodelphic gonad and long tail. Loof (1964) reported two females from Venezuela and noted the following variations: longer and slender body ($L = 1.15 - 1.25$ mm against 0.99 mm and $a = 35-36$ against 26 in former), slightly offset lip region and not wholly rounded, wider lateral chords with the glands bulging less strongly and the absence of a constriction between oviduct and uterus. These differences were regarded by Loof (l.c.) as intra-specific variations. Siddiqi (1965) reported three females from India having more resemblance with the specimens from Venezuela except for the rounded and continuous lip region, thinner lateral chords (1/8th of body-width against 1/6th) and a constriction between uterus and oviduct.

The present study which is based on a larger number of specimens from 4 different localities reveals that the lip region is smoothly rounded, usually marked from the body by a slight depression or rarely continuous with body. The depression appears slightly deeper when the

specimen lies in subdorso-lateral position. The body length varies from 0.92—1.16 mm. The lateral chords vary from 1/7th—1/5th of body-width near middle, sometimes bearing irregularly spaced distinct lateral glandular organs. The uterus and oviduct are always separated by a well developed sphincter. Vagina is always moderately sclerotized distally, such sclerotization has hitherto not been described. The excretory pore, as reported by Loof (1964), could not be seen.

The amphidelphic condition of gonads in Matigarh population is being treated as an abnormality which does not warrant an emendation of diagnosis of the genus *Thornenema*.

***Oriverutus sundarus* (Williams, 1964) Siddiqi, 1971**
(Text-fig. 2)

1964. *Eudorylaimus sundarus* : Williams, *Nematologica*, 10 : 319

Measurements : ♀♀ (3) : L = 0.88—0.98 mm; a = 24—28; b = 3.4—3.5; c = 19—21; V = 0.839 — 41¹²⁻¹⁶.

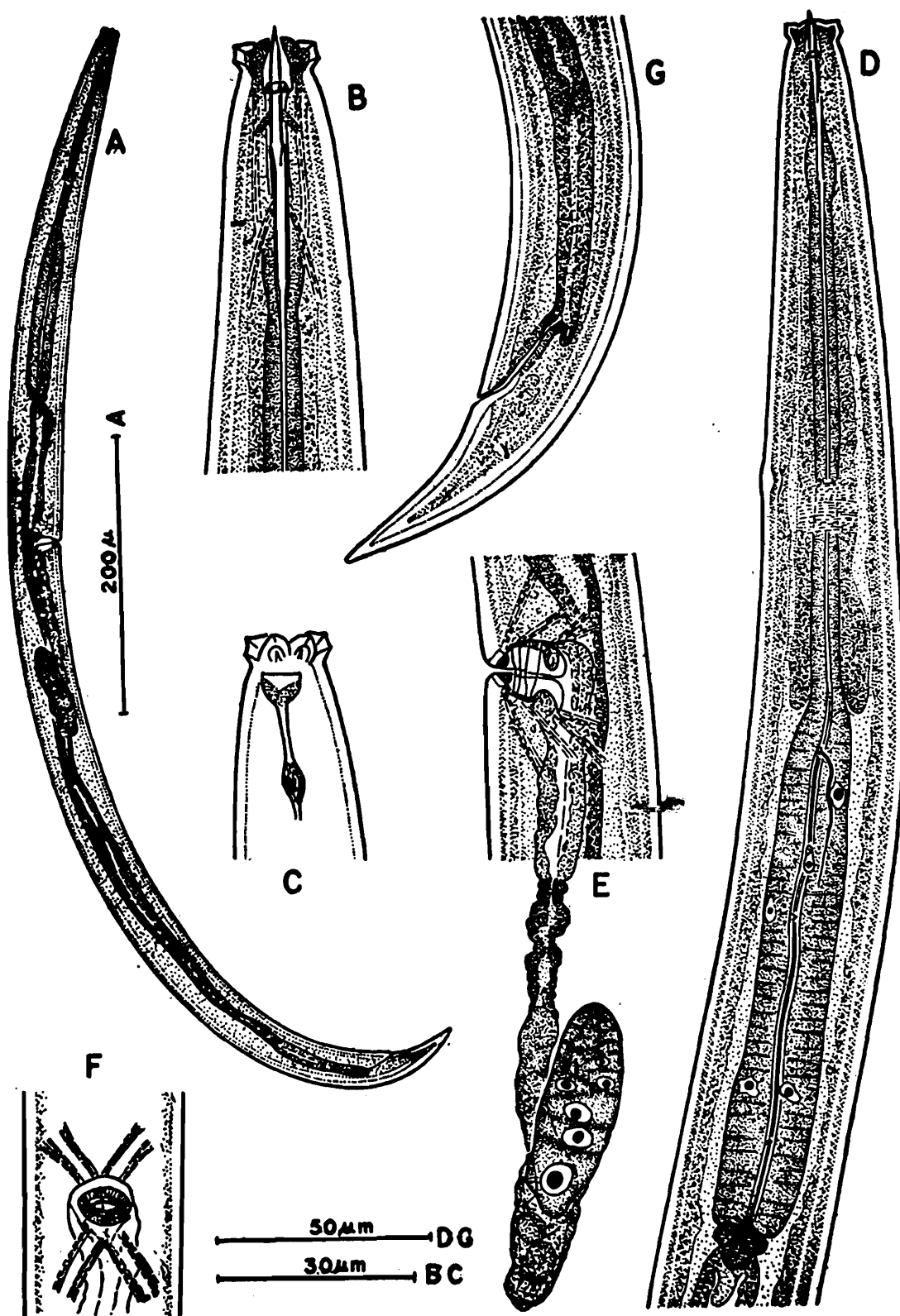
Description: Body ventrally curved in posterior half upon fixation, tapering gradually towards both extremities. Cuticle finely striated transversely; its thickness 2-3 μ m in mid-body and 4-6 μ m at tail. Lateral chords 1/9th—1/8th of body-width near middle. Ventral, dorsal and lateral body pores not distinct.

Lip region wider than adjoining body, marked by a distinct constriction from body, about 1/3rd of body-width at base of oesophagus; lip distinct, large, subangular. Amphids stirrup-shaped; apertures occupying 5-6 μ m or 45-50% of the corresponding body-width, 5-6 μ m from anterior extremity. Sensillar pouches 15-16 μ m from amphidial apertures.

Odontostyle cylindrical, 16-17 μ m or 1.4—1.5 lip region-width long, thickness slightly less than corresponding cuticle-width; aperture about 3 μ m or 17-19% of odontostyle length. Guiding ring about 7 μ m or 0.6 lip region-width from anterior extremity. Odontophore 19-21 μ m or about 1.2—1.4 times the odontostyle length. The basal expanded part of oesophagus occupying 42-44% of neck region. Locations of oesophageal gland nuclei and their orifices as follows:

DO = 57.8—60.1	S ₁ N ₁ = 68—70	S ₂ N = 88—91
DN = 61.7—64.1	S ₁ N ₂ = 73—75	S ₂ O = 90—93
DO—DN = 3.9—4.0		
K = 54—59		K' = 65-70

Distinct hemizonid present at 35-38% of neck region from anterior end. Nerve ring 102-106 μ m or 35-41% of neck region from anterior end. Cardia with three lobes, enveloped by intestinal tissue. Prerectum 51-62 μ m or 2.5—3.3 anal body-width long, with a lobe extending



Text-fig. 2. *Oriverutus sundarus*. A. Entire female. B. Anterior end. C. Surface view of anterior end. D. Neck region. E. Female gonad. F. Vulva in ventral view. G. Posterior region.

behind prerectum-rectum junction. Rectum 20-23 μm or 1.0—1.2 anal body-width long.

Vulva a transverse slit. Vagina extending inward 16-17 μm or slightly less than 1/2 of the corresponding body-width, moderately sclerotized distally. Mono-opisthodelphic gonad. Uterus and oviduct

separated by sphincter; oöcytes arranged first in single row, then in double rows and in multiple rows at growth region. Sperm not seen.

Tail ventrally curved, conoid, horn-shaped in profile with narrow blunt terminus, 47-48 μm or 2.3—2.5 anal body-width long with one caudal pore on each side.

Male: Not found.

Locality and habitat: From soil around roots of Tea at Mohargaon Tea Estate, District Darjeeling, West Bengal.

Remarks: The present specimens closely resemble with the original description of *O. sundarus* (Williams, 1964) except in having lips without prominent teat-like papillae, narrow and differently shaped amphids, distinct hemizonid, and tail with blunt terminus and not dorsally curved slightly near terminus. After Williams (1964) : Lips with prominent teat-like papillae, amphids occupying more than half (55% in Text-fig. 1, C) of corresponding body-width and are deeper, hemizonid not reported, and tail with sharply pointed terminus and slightly bent dorsally near terminus. Williams (l.c.) illustrated and described the position of guiding ring slightly less than one lip region-width from anterior end but Siddiqi (1971) illustrated the position of guiding ring from one of the paratypes at 0.65 lip region-width from anterior end. It is, therefore, evident that the position of guiding ring is also variable in the type specimens. The tail in the present population seems very similar in shape to that of type specimens except in the absence of a slight dorsal bent near the terminus which also does not appear to be prominent.

Except the shape of amphids and the lips without prominent teat-like papillae, the other characters are always variable within the species. Since there is no other justification to describe our specimens as new species, we prefer to consider all these differences as intraspecific variations.

Siddiqi (1971), while proposing the genus *Oriverutus*, stated that amphids are abnormally large and nucleus of dorsal oesophageal gland is comparatively smaller in size in all the species of this genus. Since amphidial apertures are about 50% of the corresponding body-width and the nucleus of dorsal oesophageal gland is of normal size in the present population of *O. sundarus*, Siddiqi's statement in the diagnosis of the genus *Oriverutus* may be emended.

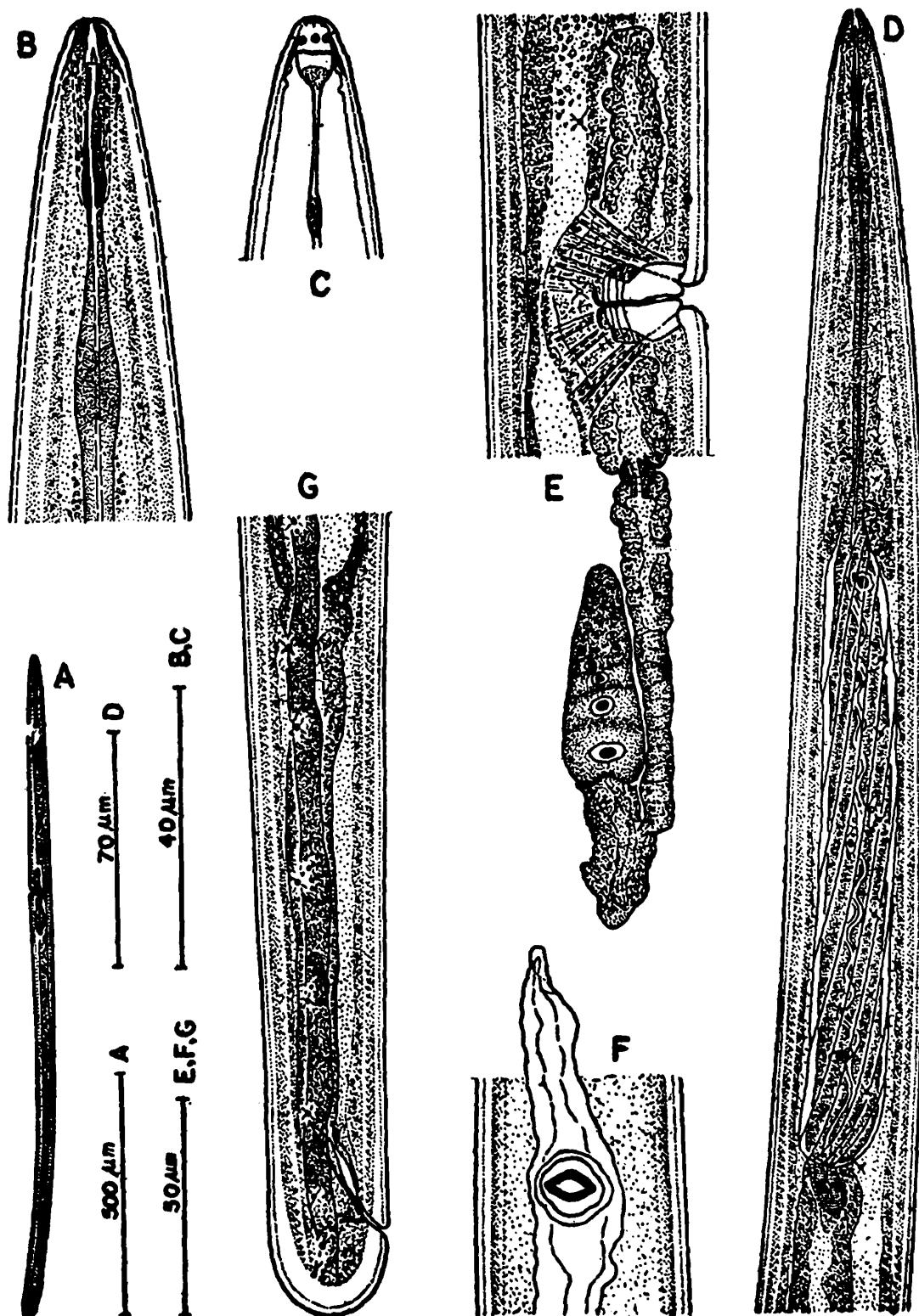
This species is reported for the first time from India.

***Belondira neortha* Siddiqi, 1964**
(Text-fig. 3)

Measurements :

Matigarh population: ♀♀ (8) : $L = 1.36-1.51$ mm; $a = 27-33$; $b = 4.0-4.3$; $c = 68-78$; $V = 3.4-4.2$ $35-38^{8-10}$.

Dagapur population: ♀♀ (3) : $L = 1.22-1.39$ mm; $a = 26-34$; $b = 3.8-4.0$; $c = 70-72$; $V = 3.4-4.0$ $36-39^{10-11}$.



Text-fig. 3. *Belondira neortha*. A. Entire female. B. Anterior end. C. Surface view of anterior end. D. Neck region. E. Female gonads. F. Vulva in ventral view. G. Posterior region.

Description: Body nearly straight or curved slightly ventrally upon fixation, tapering rapidly at anterior end while gradually towards posterior end. Cuticle marked with fine striae transversely; its thickness 2-3 μm in mid-body and 5-7 μm at tail tip (thickest). Cuticle forming two pairs of prominent notches in odontostyle region. Lateral chords narrow in middle, 1/17th — 1/12th of body-width near middle. Prominent irregularly spaced lateral glandular organs distinct in posterior fourth of body but these are less distinct in the rest of body; one lateral body pore present at each lateral glandular organ. Lateral body pores 43-52 in number of which 10-13 in oesophageal region, 24-31 in intestine region, 5-7 in prerectum-rectum region, and 2 in tail region. Dorsal and ventral body pores not distinct.

Lip region rounded with amalgamated lips, narrower than body, 1/5.5-1/6.5 of body-width at base of oesophagus. Amphids stirrup-shaped; apertures occupying 4-5 μm or 52-57% of corresponding body-width, 4-5 μm from anterior extremity. Sensillar pouches 19-21 μm from amphidial apertures.

Odontostyle 6-7 μm or 0.8—1.0 lip region-width long, its thickness slightly less than corresponding cuticle-width; aperture about 3 μm or 42-46% of odontostyle length. Guiding ring 5-6 μm or 0.7—0.8 lip region-width from anterior end. Odontophore 12-15 μm or about 1.9—2.2 times the odontostyle length. A typical swelling present in the anterior part of oesophagus a little behind its commencement. Anterior slender part of oesophagus non-muscular while enlarged part with strong musculature like that of *Axonchium*. Basal expanded portion of oesophagus occupying 51-57% of the neck region, enveloped by a sheath of dextral spiral muscle bundles. Locations of all oesophageal gland and their orifices distinct only in two specimens as follows:

$$\begin{array}{lll} \text{DO} = 44.5-46.8 & \text{S}_1\text{N}_1 = 69-74 & \text{S}_2\text{N} = 90-91 \\ \text{DN} = 46.5-49.6 & \text{S}_1\text{N}_2 = 72-76 & \text{S}_2\text{O} = 91-92 \\ \text{DO-DN} = 2.0-2.8 & & \\ \text{K} = 87-98 & & \text{K}' = 89-98 \end{array}$$

Nerve ring 92-100 μm or 26-29% of neck region from anterior end. Cardia 11-12 μm or 1/4th-1/3rd of corresponding body-width long, tongue-shaped, enveloped by intestinal tissue. Prerectum offset by a constriction from intestine, 92-129 μm or 3.6—5.0 times the anal body-width.

Vulva transverse and oval, situated in a deep depression. Vagina extending inward 17-23 μm or about 1/3-1/2 of the corresponding body-width. Anterior sexual branch rudimentary, 38-58 μm or 1.0—1.4 as long as corresponding body-width. Posterior sexual branch

normal, typical. Uterus and oviduct separated by a sphincter; oöcytes arranged in a single row except at growth region. Sperm not seen.

Tail hemispherical without expansion of outer cuticle, 17-21 μm or 0.7—0.8 anal body-width long, with two caudal pores on each side.

Male : Not found.

Localities and habitats: Matigarh population : From soil around roots of Banana at Matigarh, 6 km from Siliguri on Siliguri-Darjeeling Road, District Darjeeling, West Bengal. Dagapur population: From soil around roots of Tea at Dagapur Tea Estate on Siliguri-Darjeeling Road, District Darjeeling, West Bengal.

Remarks: Siddiqi (1964) described this species on a single female and a male from Kathmandu, Nepal. Now we have got two populations with eleven females. It was, therefore, considered necessary to give a detailed description of females. Unfortunately, males were not available to be included in the present study.

Our specimens fit well with the original description of *B. neortha* except that the body length and anterior rudimentary sexual branch are longer (after Siddiqi, (1964) : $L = 1.17\text{ mm}$; anterior rudimentary sexual branch less than one vulvar body-width long). Siddiqi (l. c.) did not mention the presence of distinct cuticular notches in odontostyle region, the arrangement of spiral muscle bundle at basal expanded part of oesophagus, location of oesophageal gland nuclei and their orifices, and the constriction between intestine-prerectum junction.

This species is reported for the first time from India.

SUMMARY

Variations have been noted in *Thornenema cavalcantii* (Lordello, 1955) Andrassy, 1959 and *Oriverutus sundarus* (Williams, 1964) Siddiqi, 1971 belonging to the family Dorylaimidae. The abnormal development of anterior sexual branch in *Thornenema cavalcantii* has also been reported. *Belondira neortha* Siddiqi, 1964 belonging to the family Belondiridae has been redescribed in detail, since the original description is based on a single female and male. *Oriverutus sundarus* and *Belondira neortha* have been reported for the first time from India.

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STUDIES ON SOME SPIDERS OF THE GENERA
SCOPODES CHAMBERLIN, *MEGAMYRMECION*
REUSS, *SCOTOPHAEUS* SIMON AND
LIODRASSUS CHAMBERLIN (FAMILY :
GNAPHOSIDAE) FROM INDIA

By

B. K. TIKADER and U. A. GAJBE

Western Regional Station, Zoological Survey of India, Poona

(With 4 Text-figures)

INTRODUCTION

The spiders of the family Gnaphosidae are very little known in the Indian fauna. Even the classical work of Pocock (1900) on Indian spiders contains no reference to this family. Recently Tikader (1962, 1964, 1966 and 1973) has published a few papers on this group of spiders and he has reported only two species of the genus *Scotophaeus* Simon. The other genera are being recorded here for the first time from India.

While examining spider collections received from the Northern Regional Station, Dehra Dun, the High Altitude Zoology Field Station, Solan and the Western Regional Station, Poona, of the Zoological Survey of India, we came across a new species each of the genera *Scopodes*, *Megamyrmecon*, *Scotophaeus* and *Liodrassus* which are described in this paper. A key to the four genera is given.

All type specimens will in due course be deposited in the National Zoological Collections, Zoological Survey of India, Calcutta.

KEY TO THE GENERA

1. Posterior row of eyes strongly procurved. 2
Posterior row of eyes not strongly procurved. 3
2. Inner margin of furrow of chelicera with one tooth. Bulb of male palpus with a stout median apophysis..... *Scopodes* Chamberlin

Inner margin of furrow of chelicera without tooth. Bulb of male palpus simple, with no true apophysis . . . *Megamyrmecon* Reuss.

3. Eyes of posterior row nearly equal in size and equidistant from each other. Inner margin of furrow of chelicera with teeth. . . *Scotophaeus* Simon
 Eyes of posterior row not equal in size, posterior medians much larger than the laterals and closer to laterals than to each other. Inner margin of furrow of chelicera without tooth. . . *Liodrassus* Chamberlin.

Genus 1. Scopodes Chamberlin

1922. *Scopodes* : Chamberlin, *Proc. Biol. Soc. Washington*, 35 : 156.

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

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

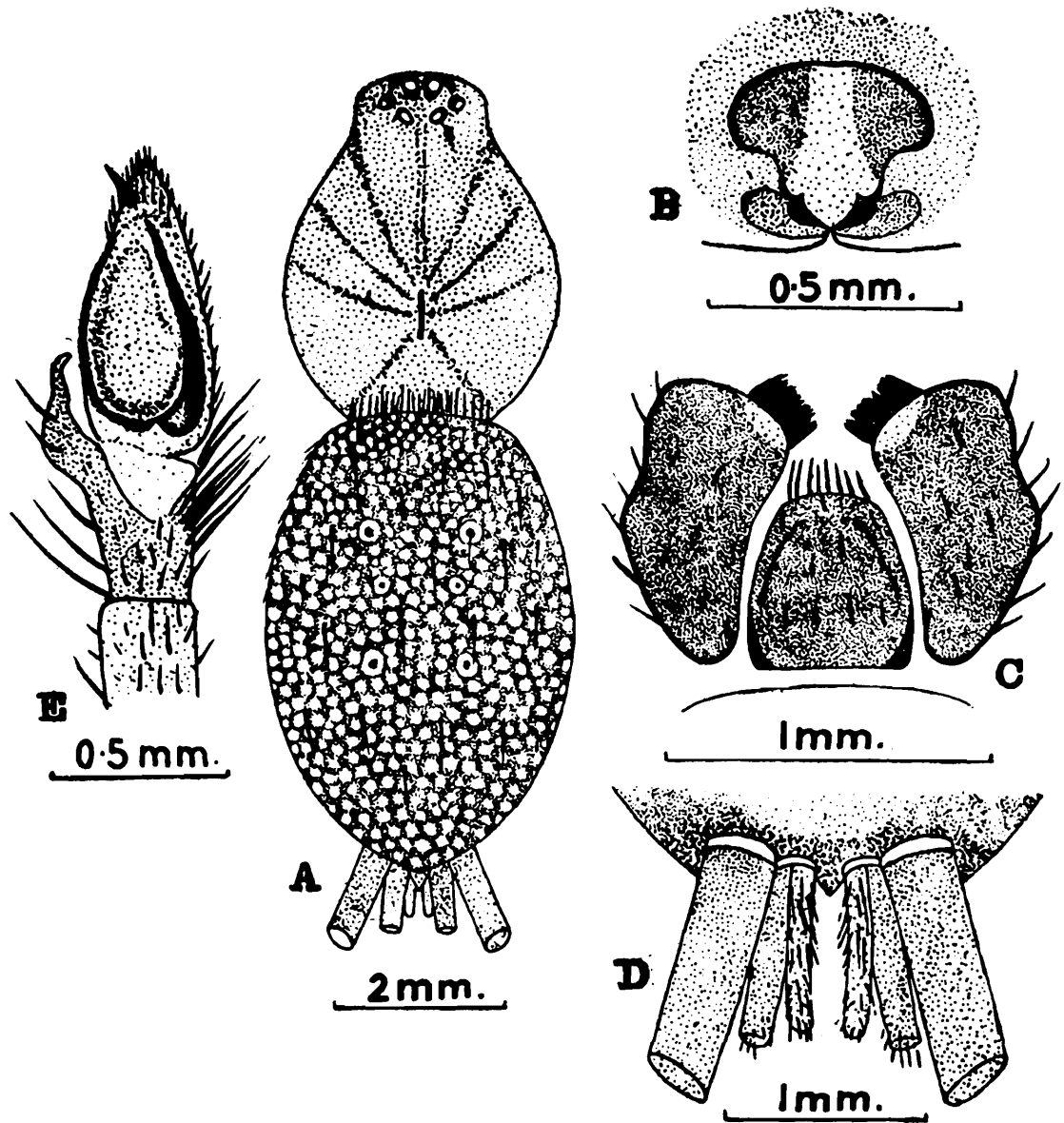
Type-species : *Scopodes catharius* Chamberlin.

Distribution : Claremont, America.

1. *Scopodes maitraiae* n. sp.

General : Cephalothorax and legs reddish green, abdomen brown. Total length 9.80 mm. Carapace 4.20 mm. long, 3.20 mm. wide; abdomen 5.80 mm. long, 3.80 mm. wide.

Cephalothorax : Longer than wide, convex, narrow in front, cephalic region slightly high, posterior middle provided with a conspicuous fovea and clothed with fine hairs. Eyes of anterior row slightly procurved, anterior medians circular, black and much larger than laterals. Posterior row of eyes slightly longer than the anterior row, procurved, more or less equal and equidistant from each other, posterior medians silvery white, elliptical in shape. Clypeus narrow. Sternum oval, pointed behind and clothed with hairs. Labium longer than wide, not contiguous with the maxillae. Anterior margin of maxillae provided with conspicuous scopulae as in text-fig. 1c. Chelicerae vertical, inner margin with one tooth and outer margin with three small teeth. Legs relatively long and strong, clothed with spines and hairs, legs IV longer than others, scopulae extend upto the base of metatarsi I and II. The colour and size of male almost like female, male palp as in text-fig. 1E.



Text-fig. 1 *Scopodes maitraiae* n. sp. A. Dorsal view of female, legs omitted; B. Epigyne; C. Maxillae and labium; D. Spinnerets; E. Right male palp, ventral view.

Abdomen : Longer than wide, slightly narrowed behind, clothed with fine and some long hairs and provided with small whitish spots as in text-fig. 1A. Ventral side lighter than the dorsal. Epigyne as in text-fig. 1B. Spinnerets very prominent, anterior spinnerets cylindrical and longer than others as in text-fig. 1D.

Holotype female, **paratype** seven females, **allotype** six males in spirit.

Type-locality : Kopargaon, **Dist.** Ahmednagar, Maharashtra, India. Coll. Dr. M. Babu Rao, 9-10-73. **Paratype** : N.C.L. Colony, **Dist.** Poona, Maharashtra, India. Coll. D. B. Bastawde, 20-10-1973.

Allotype : Mukund Nagar, Poona, Maharashtra, India. Coll. U. A. Gajbe, 27-7-1975.

This species resembles *Scopodes catharius* Chamberlin but differs from it as follows : (i) Cephalothorax and legs reddish green, abdomen brown but in *S. catharius* cephalothorax and legs light brownish yellow, abdomen grey. (ii) Epigyne and male palp also structurally different.

Genus 2. *Megamyrmecon* Reuss

1834. *Megamyrmecon* Reuss, *Zool. Miscell. Mus. Ar.*, p. 217.
 1893. *Megamyrmecon* : Simon, *Hist. Nat. Araign.*, 1 : 369.
 1922. *Megamyrmecon* : Chamberlin, *Proc. Biol. Soc. Wash.*, 35 : 155.
 1940. *Megamyrmecon* : Comstock, *The Spider Book*, New York, 327.

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

Type-species : *Megamyrmecon caudatum* Reuss

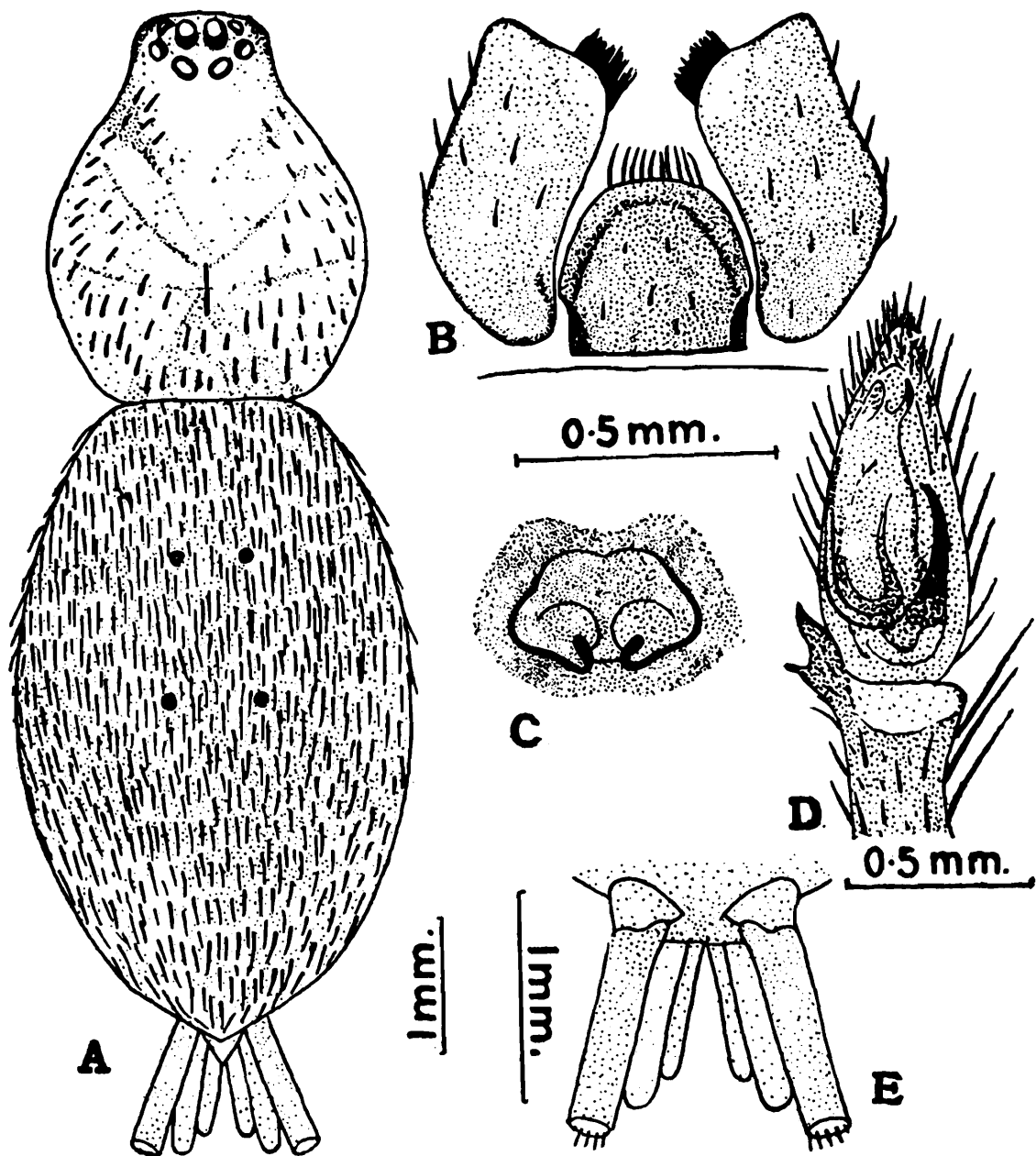
Distribution : Africa, America, India.

2. *Megamyrmecon ashae* n.sp.

General : Cephalothorax, abdomen and legs light brownish-green. Total length 7.80 mm. Carapace 3.00 mm. long, 2.40 mm. wide; abdomen 5.00 mm. long, 3.00 mm. wide.

Cephalothorax : Longer than wide, convex, narrow in front, cephalic region slightly high, posterior middle provided with a conspicuous fovea and clothed with fine hairs as in text-fig. 6. Eyes of anterior row procurved, anterior medians circular, black and larger than laterals, laterals elliptical in shape. Posterior row of eyes slightly longer than the anterior row, strongly procurved, more or less equal and equidistant from each other, posterior medians silvery white, elliptical in shape. Clypeus narrow. Sternum oval, pointed behind and clothed with fine hairs. Labium longer than wide and not contiguous with the maxillae. Anterior margin of maxillae provided with conspicuous scopulae as in text-fig. 2B. Chelicerae vertical, inner margin without tooth but outer margin with two small teeth. Legs relatively long and strong, clothed with spines and hairs, legs IV longer than others and scopulae

extend upto the base of metatarsi I and II. The colour and size of male almost like female, male palp as in text-fig. 2D.



Text-fig. 2 *Megamyrmecon ashae* n. sp. A. Dorsal view of female, legs omitted; B. Maxillae and labium; C. Epigyne; D. Right male palp, ventral view; E. Spinnerets.

Abdomen : More or less elliptical in shape, narrowed behind, clothed with pubescence. Ventral side lighter in colour than dorsal. Epigyne as in text-fig. 2C. Spinnerets very prominent, anterior spinnerets cylindrical and longer than others as in text-fig. 2E.

Holotype female, *paratype* two females, *allotype*, one male in spirit.

Type-locality : Range Hill, Poona, Maharashtra, India. Coll. U. A. Gajbe, 3-11-1974. *Allotype* : Range Hill, Poona, Maharashtra, India. Coll. U. A. Gajbe, 12-3-1975.

This species resembles *Megamyrmecon californicum* Simon but differs from it as follows : (i) Cephalothorax and legs light reddish green, abdomen deep brown but in *M. californicum* it is pale yellow or greyish in colour. (ii) Epigyne and male palp also structurally different.

Genus 3. *Scotophaeus* Simon

1893. *Scotophaeus* Simon, *Hist. Nat. Araign.*, **1** : 371.
 1951. *Scotophaeus* : Locket & Millidge, *British Spiders*, **1** : 104.
 1962. *Scotophaeus* : Tikader, *Proc. First All India Cong., Zoology*, **2** : 571.
 1966. *Scotophaeus* : Tikader, *Rec. Indian Mus.*, **59** (4) : 440.

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

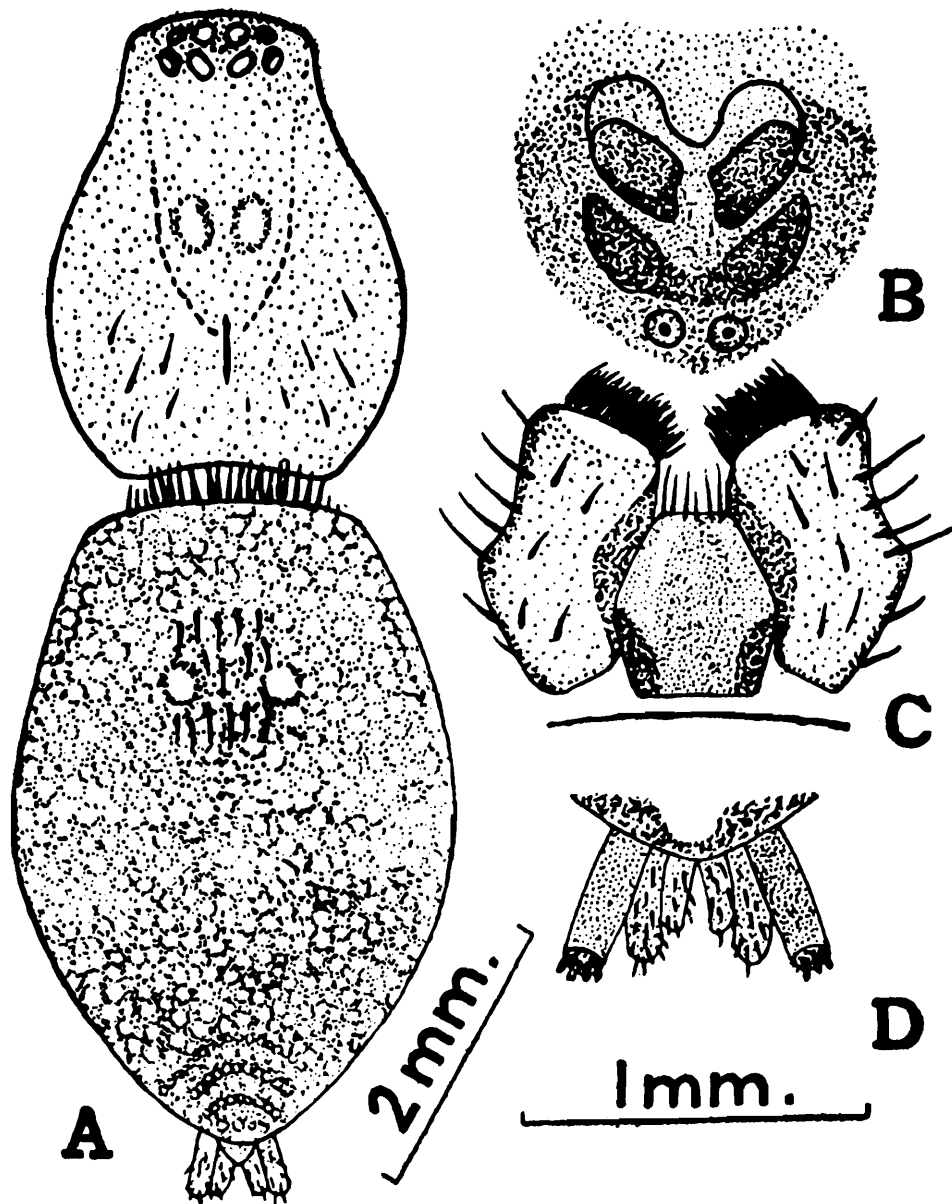
Type-species : *Scotophaeus quadripunctatus* Latreille.

Distribution : Oriental and Temperate regions of the world.

3. *Scotophaeus madalasae* n. sp.

General : Cephalothorax and legs reddish green, abdomen brown. Total length 8.00 mm. Carapace 3.10 mm. long, 2.50 mm. wide; abdomen 4.80 mm. long, 3.10 mm. wide.

Cephalothorax : Longer than wide, convex, narrow in front; cephalic region slightly high, centre provided with a conspicuous fovea and clothed with fine hairs. Eyes of anterior row slightly procurved (as seen from in front), anterior medians circular, black and slightly larger than laterals. Posterior row of eyes slightly longer than the anterior row procurved, more or less equal and equidistant from each other. Posterior medians silvery white; elliptical in shape. Clypeus narrow. Sternum oval slightly pointed behind, clothed with hairs. Labium nearly triangular and almost contiguous with the maxillae. Anterior margin of maxillae provided with conspicuous scopulae as in text-fig. 3C. Chelicerae vertical, inner and outer margin with three small teeth each. Legs strong, clothed with spines and hairs, legs IV longer than others, scopulae extend upto the base of metatarsi I and II.



Text-fig. 3. *Scotophaeus madalasae* n. sp. A. Dorsal view of female, legs omitted; B. Epigyne; C. Maxillae and labium; D. Spinnerets.

Abdomen : More or less elliptical, slightly narrowed behind, clothed with pubescence. Ventral side lighter than the dorsal. Epigyne as in text-fig. 3B. Spinnerets very prominent as in text-fig. 3.

Holotype female, **paratype** one female in spirit.

Type-locality : Harsil, Dist. Uttarkashi, U. P., India. Coll. *Asket Singh*, 7-11-1973. **Paratype :** Vill. Rajchalli Chamba, Dist. Tehri, U. P., India. Coll. *J. C. Tripathi*, 8-2-1972.

This species resembles *Scotophaeus domesticus* Tikader from West Bengal but differs as follows : (i) Eyes equidistant whereas in *S. domesticus* the eyes are not equidistant. (ii) Posterior median eyes elliptical in shape but in *S. domesticus* posterior median eyes irregular in shape. (iii) Labium contiguous with maxillae but in *S. domesticus* labium not contiguous with maxillae. (iv) Epigyne also structurally different.

Genus. 4. *Liodrassus* Chamberlin

1936. *Liodrassus* Chamberlin, *Amer. Mus. Novit.*, 841 : 4.

1940. *Liodrassus* : Comstock, *The spider Book*, New York, 333.

Characters : The cephalothorax is oval and much narrow in front. The anterior row of eyes slightly procurved, the anterior medians are larger than the laterals. The posterior row of eyes slightly procurved, close together, the medians are much larger than the laterals. The inner margin of the furrow of the chelicera is completely devoid of teeth.

Type-species : *Liodrassus arizonicus* Chamberlin

Distribution : America.

4. *Liodrassus mandae* n. sp.

General : Cephalothorax and legs light reddish green, abdomen deep brown. Total length 4.30 mm. Carapace 1.60 mm. long, 1.50 mm. wide; abdomen 2.60 mm. long, 1.50 mm. wide.

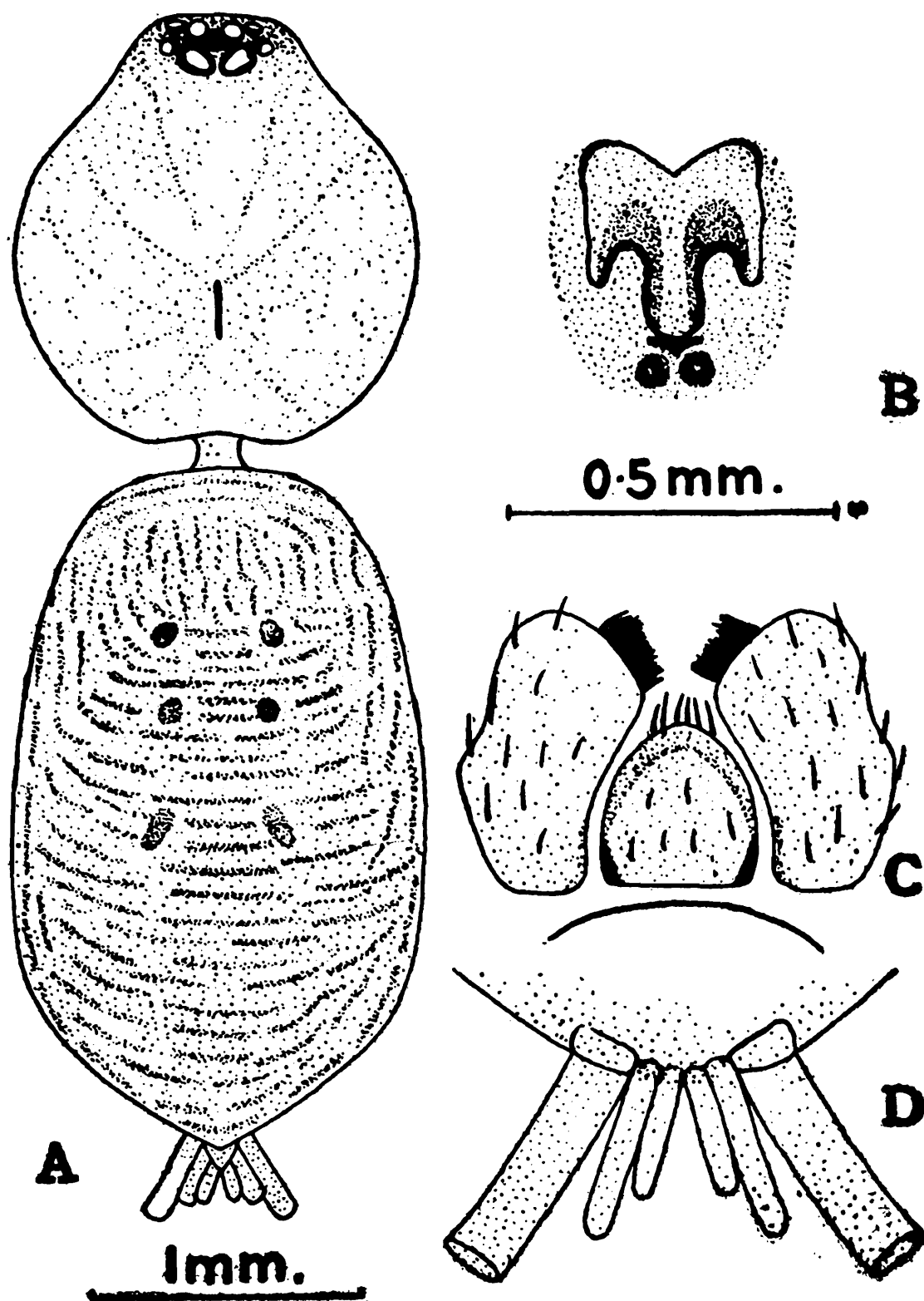
Cephalothorax: Slightly longer than wide, convex, narrow in front, cephalic region slightly high, posterior middle provided with an inconspicuous fovea and clothed with fine hairs. Eyes of anterior row slightly procurved, anterior medians circular, black and slightly larger than laterals, laterals elliptical in shape. Posterior row of eyes slightly longer than the anterior row and procurved. Posterior medians silvery white, elliptical in shape, much larger than the posterior laterals and closer to laterals than to each other. Clypeus narrow. Sternum oval, slightly narrowed behind and clothed with hairs. Labium triangular, not contiguous with maxillae. Anterior margin of maxillae provided with scopulae as in text-fig. 4C. Chelicerae vertical, inner margin without tooth but outer margin with four small teeth. Legs relatively long and strong, clothed with spines and hairs. Leg IV longer than the others, scopulae extend upto the base of metatarsi I and II.

Abdomen : More or less elliptical in shape, narrowed behind, with muscular corrugations and clothed with fine hairs as in text-fig. 4A. Ventral side lighter than the dorsal. Epigyne as in text-fig. 4B. Spinnerets very prominent, anterior spinnerets cylindrical and longer than others as in text-fig. 4D.

Holotype female in spirit.

Type-locality: Bherighat, Dist. Bilaspur, Himachal Pradesh, India. Coll. M. Chandra, 1-8-1972.

This species resembles *Liodrassus utus* Chamberlin but differs from it as follows: (i) Cephalothorax and legs light reddish green, abdomen



Text-fig. 4. *Liodrassus mandae* n. sp. A. Dorsal view of female, legs omitted; B. Epigyne; C. Maxillae and labium; D. Spinnerets.

deep brown but in *L. utus* it is pale in colour. (ii) Epigyne also structurally different.

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STUDIES ON INDIAN CRICKETS (ORTHOPTERA : INSECTA) WITH DESCRIPTIONS OF TWO NEW SPECIES

By

H. K. BHOWMIK

Zoological Survey of India, Calcutta

(With 3 Text-figures)

INTRODUCTION

The paper enlists faunistic informations in the form of new taxonomic characters, of zoogeographical ranges and records of 26 species (14 genera) distributed over 9 subfamilies of Indian crickets (Gryllidae). The material examined in this paper included the unnamed collections of the Zoological Survey of India, Calcutta, collected by different tour parties. Some of the material was also sent by private person or was purchased by the author.

All material studied hereinunder are deposited in the National Collection of the Zoological Survey of India.

All measurements used in the paper are in mm. The figures indicated for the ranges of measurements are based on a random choice of specimens that could be found in the available material. The number of specimens measured in each case is indicated, wherever measurements are given.

ACKNOWLEDGEMENTS

The writer owes his indebtedness to Dr. D. N. Raychaudhuri, Reader, Calcutta University, for enthusiastic guidance and to late Prof. L. Chopard of Paris and late Prof. G. J. Bey-Bienko of Leningrad for many liberal helps in many occasions.

SYSTEMATIC ACCOUNT

Subfamily GRYLLINAE

Genus (1) *Gymnogryllus* Saussure, 1877

1. *Gymnogryllus humeralis* (Walker)

1871. *Gryllus humeralis* Walker, *Cat. Derm. Salt. Br. Mus.*, 5, suppl., 5.

Material.—1 ♂, Nilgiris, Tamil Nadu, 2.x.1963, *S. K. Nath*; 3 ♂ ♂, 5 ♀ ♀, Chembra Peak area (1075 m.), Calicut Dist., Kerala, IV. 1970 (purchased).

Remarks.—The specimens at hand have the frontal rostrum twice the width of first antennal segment; clypeo frontal suture almost straight. Lateral field of elytra with six regularly spaced veins, mediastinal vein having two branches in male and one branch in females. Posterior femur with only one undefined brownish area on the external face. In India, so far, the species has a restricted distribution in South India only. Also recorded from Sri Lanka.

2. *Gymnogryllus kashmirensis* Bhowmik

1967. *Gymnogryllus kashmirensis* Bh., *Sci. Cult.*, 33 : 244-246.

Material.—1 ♂, 1 ♀, Mysore University campus, Karnatak, 1964, *S. Vasantha*; 2 ♀ ♀, Dehra Dun, Uttar Pradesh, 1964, *S. Lal*; 1 ♂, 2 ♀ ♀, Pilani, Rajasthan (at light), 19-20. ix. 1967, *H. L. Kundu*; 1 ♂, Penang Malay (at light), 9.ii. 1968, *H. T. Pagden* (B. M.).

Remarks.—The species was described from Jammu and Kashmir, The present localities are new records for the species.

Based on my study of specimens, deposited in the Nat. Hist. Mus., London, I am confident that the species, *G. minor* Chopard (1969), is a synonym of the present species.

3. *Gymnogryllus erythrocephalus* (Serville)

1839. *Gryllus erythrocephalus* Serville, *Ins. Orth.*, 339.

Material.—1 ♂, Rajasthan, x. 1941, *B.N. Chopra and M. L. Roonwal*.

Distribution.—Known from Bihar, Uttar Pradesh, Karnatak and Tamil Nadu. Also recorded from Pakistan and Sri Lanka.

Remarks.—The male specimen at hand (length 12.8 mm, elytra 9.3 mm) has the frontal rostrum about twice as wide as the first antennal segment; clypeo frontal suture feebly arched at the middle.

The species is recorded here for the first time from Rajasthan.

Genus (2) *Loxoblemmus* Saussure, 1877

4. *Loxoblemmus animae* Bhowmik

1967. *L. animae* Bh., *Sci. Cult.*, 33 : 244-245.

Material.—1 ♂, 1 ♀, Rohtak Road, Dist. Rohtak, 12. ix. 1963 and 1 ♂, Kurukshetra, Dist. Karnal, 16. ix. 1963, Hariyana—all by R. K. Bhatnagar.

Remarks.—Since the species was described from Jammu and Kashmir, the present localities of occurrence extend the distributional ranges of the species.

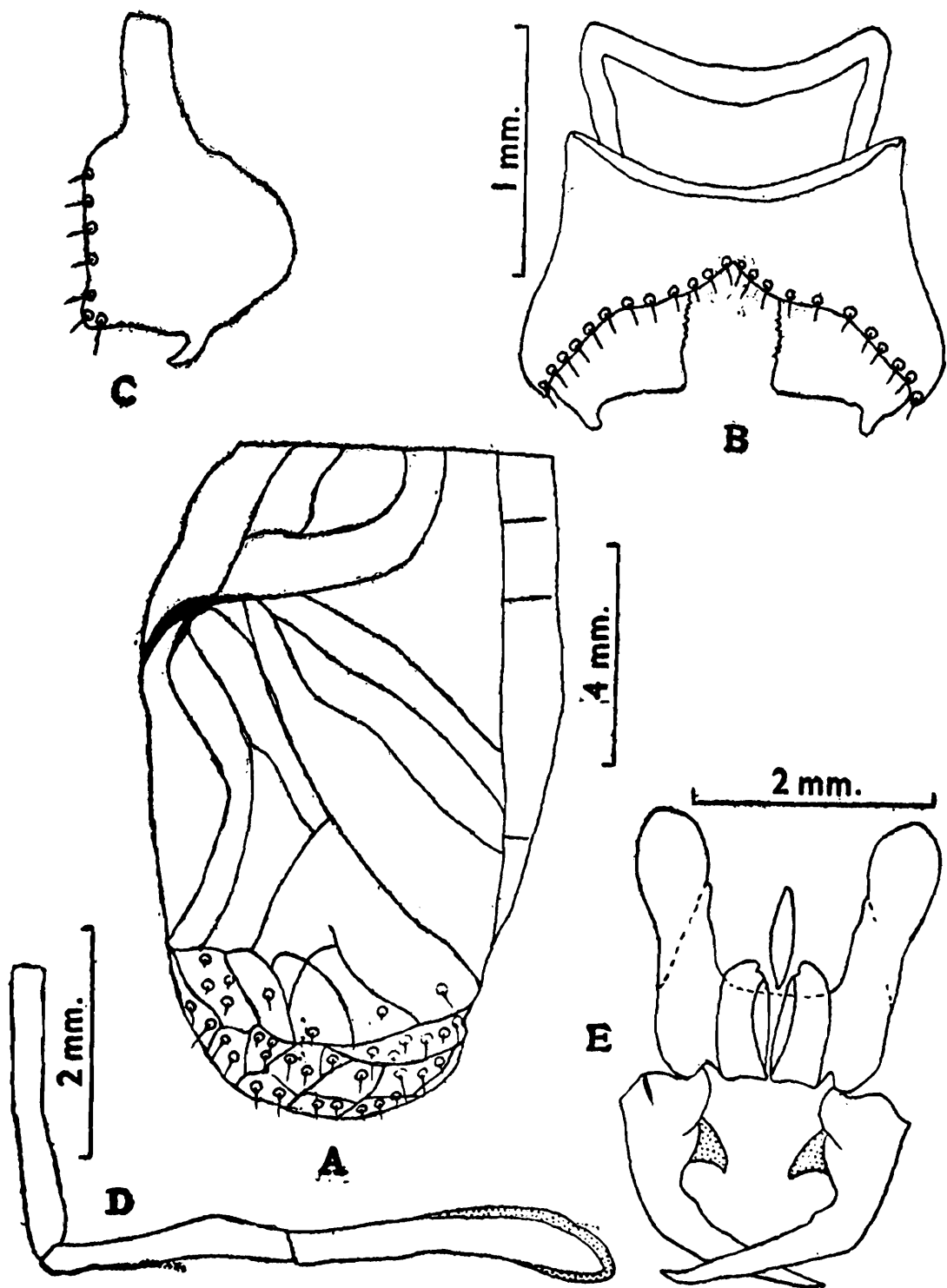
Loxoblemmus hamulifer Chopard (1969) seems to be a synonym of the species.

5. *Loxoblemmus beybienkoi* n. sp.

(Text-fig. 1, A)

Material.—Holotype: 1 ♂: Bir area, Dist. Hissar, Hariyana, 8. ix. 1963, R.K. Bhatnagar; Allotype: 1 ♀ : Same data as the holotype.

Description.—Male.—Size small, general colouration brownish. Head small, brown, glossy; lateral ocelli yellow, connected by a very thin rufous transverse line; frontal rostrum large, convex, thrice as wide as first antennal segment. Face concolourous with head except the post clypeus and mandibles which are yellowish, enlarged at the middle, oblique and moderately grooved longitudinally in the middle; clypeo-frontal suture straight; ante and postclypeus demarcated by a nearly straight suture which is, however, effaced at the middle. Antennae brownish, hairy and with smooth first segment. Pronotum concolourous with head, dull, and with scattered small yellowish areas, covered with dense fine pubescence, both anterior and posterior margins straight, a little widened at anterior end; disc convex with two coloured pyriform impressions and a longitudinal suture at the middle; lateral lobes concolourous with pronotum and with a distinct yellow space at the anterior angle which is rounded, posterior angle rounded and a little ascending. Legs densely hairy. Anterior and middle legs testaceous varied with brownish spots; posterior legs almost concolourous with head. Anterior tibia with a prominent external and a small internal tympanum in each. Posterior femora stout; each of the posterior tibia with five spines on each margin; supero-intermediate spurs a little longer than the supero-internal ones. Elytra brownish, shorter than the abdomen, truncated at apex; mirror large, longer than wide, distinctly triangular, undivided but a little overspread by the reticulation of apical field, connected with the first chord by a very oblique veinlet near at its anterior angle; three obliques, all originating nearly from the same point; diagonal short and straight; apical field reduced to a new indistinct arcolae, and covered with short silky hairs; lateral field much lighter in colour and with five regularly spaced curved veins; mediastinal vein unbranched. Wing as long as the tip of posterior tibiae.



Text-fig. 1 A. *Loxoblemmus beybienkoi*, male elytron; B. *Modicogryllus pallipes*, male genitalia, dorsal view; C. Ectoparamere (diagrammatic); D. *Homoeogryllus cincticornis*, male maxillary palpus; E. male genitalia, ventral view.

Female.—Differs from male in having six longitudinal yellowish lines on the occiput and vertex, with the most external line in continuation with the yellowish post ocular area; frontal rostrum flat, almost twice as wide as the first antennal segment. Facial parts flat and slightly oblique; clypeo frontal suture almost straight. Pronotum more varie-

gated with yellowish spaces; inferior half of lateral lobes yellowish and is clearly distinguished from its black superior half. Ovipositor rufous brown, short and with acute apical valves. Elytra brownish with five somewhat distinct oblique veins; mediastinal vein with a branch.

Measurements.—Length of body ♂ 11.0, ♀ 10.0; length of pronotum ♂ 2.4, ♀ 2.0; width of pronotum ♂ 3.5, ♀ 3.3; elytra ♂ 5.5, ♀ 7.2; wings ♂ 14, ♀ 14.3; posterior femora ♂ 7.2, ♀ 6.9; posterior tibiae ♂ 5.5, ♀ 5.1; ovipositor 5.0. (measured male holotype and female allotype).

Remarks.—Among the oriental species, the present species is close to *L. truncatus* Brunner (1893), for having three oblique veins but can be differentiated by its reduced elytra in male, with triangular mirror and reduced apical field, and colouration of head. The species is named in honour of late Prof. G. J. Bey-Bienko, Leningrad.

Genus (3) *Modicogryllus* Chopard, 1961

6. *Modicogryllus pallipes* (Chopard) (Text-fig. 1, B and C)

1925. *Gryllus pallipes* Ch., *Ann. Mag. nat. Hist.*, 15(9) : 510.

Material.—1 ♂, Chembra Peak area, Calicut Dist., Kerala, iv. 70 (purchased).

Remarks.—The species was described from Sri Lanka on a single female specimen. The male is described here for the first time.

Male (previously undescribed).—Colouration deep blackish brown with yellowish-rufous legs. Ocelli distinctly yellowish. Front slightly wider than the width of first antennal segment; clypeo-frontal suture straight. Anteriorly the pronotum is as wide as the head, distinctly widened behind; lateral lobes with rounded angles, concolourous with the pronotum except a yellowish patch on the antero-inferior angle. Elytra wide, testaceous hyaline, cover the abdomen; mirror prominent, obliquely disposed, longer than wider, divided in the middle by a curved vein; diagonal short, slightly curved; two chords, first united with mirror by a veinlet; 2 obliques; apical field short with 2 clear and 2 false veins, areolae irregular; lateral field with 5 regularly spaced veins, mediastinal having one branch. Genitalia as in figure. Posterior femora short, almost twice the length of posterior tibiae.

Measurements.—Length of body 11.3; elytra 10.5; pronotal length 2.0; maximum and minimum widths of pronotum 3.5 and 2.8

respectively; posterior femora 8.0; posterior tibia 5.0 (measured 1 male only).

Subfamily NEMOBIINAE

Genus (4) *Pteronemobius* Jacobson and Bianchi, 1904

7. *Pteronemobius fascipes* (Walker)

1869. *Eneoptera fascipes* Walker, *Cat. Derm. Salt. Br. Mus.*, 1: 67.

1962. *Pteronemobius fascipes* Uvarov, *Ann. Mag. nat. Hist.* 11 (9): 287; Chopard, 1932, *Ark. Zool.* 23A (9) : 5; Bey-Bienko, 1956, *Zool. Zh.* 35 (2) : 230.

Material.—7 ♂♂, 7 ♀♀, Jhajjar Nala, Udhampur, Jammu and Kashmir; 1 ♀, Teh Darmasala. Dist. Kangra and 1 ♂, 2 ♀♀, Mandikulu Road, 2 ♀♀, Guglikhud, Jagindrnagar, Dist. Mandi, Himachal Pradesh; 1 ♀, Hissar, Hariyana Pradesh; 2 ♂♂, 9 ♀♀, Rishikesh, 1 ♀, Dehra Dun and 1 ♂ Rajaji Game Sanctuary, Uttar Pradesh; 5 ♂♂, 2 ♀♀ Mysore University campus, Karnatak; 1 ♀, Muki Balaghat dist., Madhya Pradesh; 1 ♀, Chembra Peak area, Dist. Calicut, Kerala; numerous males and females from Calcutta (at light).

Remarks.—Male specimens from Calcutta have their pronotal disc concolourous with lateral lobes (dark black).

The species is recorded here for the first time from Jammu & Kashmir, Hariyana, Himachal Pradesh and Uttar Pradesh.

Measurements.—Length of body ♂♂ 4.8-5.0, ♀♀ 4.5-5.3; elytra ♂♂ 2.9-3.0, ♀♀ 2.2-2.3; posterior femora ♂♂ 3.5-3.8, ♀♀ 3.8-4.0; ovipositor 2.5-3.0. (measured 10 examples of both males and females).

8. *Pteronemobius csikii* (Bolivar)

*1901. *Nemobius csikii* Bolivar, *Zich. Zool. Ergebn.*, 2: 243.

1926. *Pteronemobius csikii* Uvarov, *Ann. Mag. nat. Hist.*, 11(9) : 285; Bey-Bienko, 1956. *Zool. Zh.*, 35 (2): 230.

Material.—2 ♂♂, 2 ♀♀ (and 1 ♂, 2 ♀♀ nymphs) Mysore University campus, Karnatak; 2 ♂♂, Pilani, Rajasthan (at light); 1 ♂, Kanhaur village., Dist. Rohtak, Hariyana; 1 ♂, Saharanpur, Uttar Pradesh.

Remarks.—In immature insects fifth segment of maxillary palpi completely brown, and band on head and on posterior femora lacking but the pronotum with strong brown setae.

The species is a new record for Rajasthan, Hariyana and Uttar Pradesh.

9. *Pteronemobius taprobanensis* (Walker)

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

Material.—2 ♂♂, Kosi Dam, Bihar; 4 ♂♂, 9 ♀♀ (at light), Calcutta, W. Bengal; 2 ♀♀, (at light) Pilani, (Rajasthan).

Remarks.—The species has been recorded from Rajasthan for the first time.

10. *Pteronemobius concolor* (Walker)

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

Material.—1 ♂, Barasat, 24-Parganas, 1 ♂, Krishnanagar and 1 ♂, 4 ♀♀, Calcutta, West Bengal; 5 ♂♂, 8 ♀♀, Manipur; 1 ♀, Rishikesh, 1 ♀, Chamba, Uttar Pradesh; 1 ♀, Mayurbang, Orissa; 2 ♂♂, 1 ♀, Mysore University campus, Karnatak; 2 ♀♀, Pilani, Rajasthan (at light); 1 ♂, Galathea Bay, Great Nicobar Island (Bay of Bengal).

Remarks.—It is one of the most common and wide spread species of Nemobiinae. In Calcutta, members of this species are often found to visit houses at light. They show variations in colouration depending on ecological factors and due to this fact were named differently by previous workers. The species is a new record for Manipur, Uttar Pradesh, Rajasthan, Karnatak and Great Nicobar Island.

11. *Pteronemobius bicolor* (Saussure)

1877. *Nemobius bicolor* Sauss., *Mem. Soc. phys. Hist. nat. Geneve* 25: 266.

Material.—2 ♀♀, Coimbatore, Tamil Nadu, iv. 1970 (purchased).

Remarks.—The specimens (6-6.3 mm) at hand have the antennae brownish throughout (not whitish at tips); fifth maxillary palpi longer than fourth and dilated.

The species has a wide distribution in India. Also reported from Burma and Sri Lanka.

Genus (5) *Paranemobius* Saussure, 1877

12. *Paranemobius pictus* (Saussure)

1877. *Pseudonemobius pictus* Saussure, *Mem. Soc. phys. Hist. nat. Geneva*, 25 : 235-236.

1906. *Paranemobius pictus* Kirby, *Syn. Cat. Orth.*, 2 : 13.

Material.—1 ♂, 2 ♀♀, Shandol, Madhya Pradesh, 10. vii. 1968, M. N. Saxena.

Distribution.—The species was described from Kashmir and is now known from Bombay and Nagpur (Maharashtra), Bihar, and also from Sri Lanka.

Remarks.—The specimens (8mm to 9mm) at hand show the clypeo frontal suture hardly arcuate. Frontal rostrum narrower than the width of first antennal segment and with a few strong, brown bristles.

13. *Paranemobius vicinus* Chopard

1928. *Paranemobius vicinus* Chopard, *Rec. Ind. Mus.*, 30:4.

Material.—1 ♀ (nymph) from Kellar stream, 25 miles North East of Trivandrum (Kerala), *Hora & Menon*, iii. 1950.

Distribution.—Kerala, Maharashtra, Karnatak.

Remarks.—The specimen examined was a nymph and hence the characters given here are those of the nymph. Elytra small, ill developed and completely cover the abdomen, variegated with yellow and brown, separated from one another by a gap which is nearly 1 mm in width. Clypeo frontal suture arcuate. Pronotum like that of *pictus* (Sauss.) and not angulated at posterior margin.

Measurements.—Length of body 5.5; length of pronotum 1.3; elytra 3.0; posterior femora 6.0; posterior tibiae 4.0; ovipositor 3.3. (measured 1 ♀ nymph).

Subfamily PHALANGOPSINAE

Genus (6) *Homoeogryllus* Gurein, 1847

14. *Homoeogryllus cincticornis* (Walker)
(Text-fig. 1, D & E)

1870. *Meloimorpha cincticornis* Walker, *Cat. Derm. Salt. Br. Mus.*, 3 : 469.

Material.—2 ♂♂, Dorsh, Chitral, North West Province (Pakisthan), June-Sept., 1929, *B. N. Chopra*.

Remarks.—The species was previously known from Bombay (Maharashtra) and Tamil Nadu only. The present record of the species from Pakisthan is, therefore, interesting from the point of zoogeographical distribution. The male specimens studied have the frontal rostrum less than half the width of first antennal segment; clypeo frontal suture feebly arched. Male genitalia as shown in figures. Elytra with five to six oblique veins; mediastinal vein with eighteen to twenty-one branches.

Measurements.—Length of body 14-19; length of pronotum 2-2.8; maximum width of pronotum at posterior end 4-4.5; elytra 15.5-17.5; posterior femora 11.2-14; posterior tibia 11-13.8. (measured 2 ♂♂).

Subfamily MOGOPLISTINAE

Genus (7) *Ornebius* Guerin, 1844

15. *Ornebius nigripalpis* Guerin

1844. *Ornebius nigripalpis* Guerin, *Icon. R. amin. Ins.*, 332.

Material.—1 ♂, Bindaban Forest Block, Noorpur Forest Range,

Dist. Gurdaspur (Punjab), 19, vi, 1963, *R. K. Bhatnagar*; 1 ♀, Narendra Nagar & environs (U. P.), 23. ii. 1965. *T. D. Soota*; 7 ♀ ♀, Molichur Forest Range, Dehra Dun, 25. ii. 1965, *T. D. Soota*.

Remarks.—So far the species was known from Pondicherry and Tamil Nadu only. Its occurrence in the Punjab and Uttar Pradesh is interesting from the point of its distribution in India. Females have been described herewith for the first time.

Females (previously undescribed).—Apterous. Frontal rostrum slightly more than twice the width of first antennal segment; clypeo frontal suture distinct and straight; fourth and fifth segments of maxillary palpi subequal, third smaller than fourth. Pronotum with both anterior and posterior margins distinctly concave, the posterior being more strongly so. Ovipositor testaceous and straight with brownish apical valves which are acute apically.

Measurements.—Length of body ♂ 7.0, ♀♀ 8-9; length of pronotum ♂ 2.9, ♀♀ 2.7-2.8; width of pronotum ♂ 2.3, ♀♀ 2.3-2.5; posterior femora ♂ 5.3, ♀♀ 6-6.3; posterior tibiae ♂ 3.5, ♀♀ 3.6-3.9; ovipositor 7.5-8.0. (measured 1 ♂ and 8 ♀♀ specimens).

SUBFAMILY SCLEROPTERINAE

Genus (8) *Acanthoplistus* Saussure, 1877

16. *Acanthoplistus birmanus* Saussure

1877. *Acanthoplistus birmanus* Saussure, *Mem. Soc. phys. Hist. nat. Geneve*, 25 : 490.

Material.—1 ♂, Botanical Garden, F.R.I., Dehra Dun, Uttar Pradesh, 26. vii. 1961, *S. Lal*.

Remarks.—The female specimen (9.5 mm) has the frontal rostrum about two and half times as wide as the first antennal segment; Clypeo frontal suture somewhat straight.

In India the species was known from Tamil Nadu, Karnatak and Himachal Pradesh. Dehra Dun is a new distributional record for it.

Genus (9) *Scleropterus* Haan, 1842

17. *Scleropterus coriaceus* (Haan)

1842. *Gryllus (Scleropterus) coriaceus* Haan, *Temm. Verhandl. Orth.*, 232.

Material.—1 ♀ (at light), Kaziranga Game Sanctuary, Assam, 7. ix. 1961, *R. N. Katiyar*.

Distribution.—Kerala. Also recorded from Burma, Thailand, Malaya and Java.

Remarks.—The female specimen (length 8.6 mm, elytra 5.0 mm, ovipositor 4.2mm) has a densely punctate, fusiform body. Ocelli arranged along a feebly curved line; clypeo frontal suture indistinct, moderately arcuate.

The species is reported here for the first time from the eastern India.

18. *Scleropterus punctatus* Brunner

1893. *Scleropterus punctatus* Brunner, *Ann. Mus. Geneva*, 13(2) : 204; Chopard, 1932, *Ark. Zool.*, 23A, 9: 9-10.

Material.—1 ♀, Sonai-Rupai Forest, Missamari, Arunachal Pradesh, 29 iii. 1965; 1♀, Rajaji Sanctuary, Dist. Saharanpur (U. P.), 13. vii. 1963, *T. D. Soota*.

Distribution.—Karnatak, Assam (Iedo), Burma, Japan, Vietnam and Sumatra.

Remarks.—The two female specimens (length 9.5-9.6 mm, elytra 4.7-4.9 mm, ovipositor 5.2-5.6 mm) studied have the clypeo frontal suture slightly arcuate at the middle; pronotum not distinctly narrowed at anterior end and anterior margin clearly straight; ovipositor rather longer.

The species is a new record for Arunachal Pradesh and Uttar Pradesh.

Subfamily OECANTHINAE

Genus (10) *Oecanthus* Serville, 1831

19. *Oecanthus indicus* Saussure

1878. *Oecanthus indicus* Saussure, *Mem. Soc. phys. Hist. nat. Geneve*, 25 : 594.

Material.—2 ♀ ♀, Changland, Tirap Div., Arunachal Pradesh; 1♂, Tamil Nadu (purchased).

Distribution.—Bombay, Pusa, Kodaikanal, Nilgiris, Coimbatore, Port Blair. Also from Sri Lanka and S. E. Asian countries.

Remarks.—Head of one female specimen with a median velvety band on the vertex.

The species is reported here for the first time from the eastern India.

Measurements.—Length of body ♂ 11.5, ♀ ♀ 11.5-12; length of pronotum ♀ ♀ 1.9-2; elytra ♂ 12.0, ♀ ♀ 10.8-11.3; posterior femora ♂ 10.0, ♀ ♀ 8-8.3; posterior tibiae ♀ ♀ 8.0; ovipositor 8-8.5. (measured 1 male and 2 female specimens).

20. *Oecanthus bilineatus* Chopard

1937. *O. bilineatus* Ch., *Rec. Ind. Forest (N. S.)*, 3 (1): 26.

Material.—2 ♀ ♀, Pilani, Rajasthan, v. 1965, H. L. Kundu.

Distribution.—Tamil Nadu.

Remarks.—The female specimens have no black spot on first and second antennal segments.

The species is a new record from Rajasthan.

Measurements.—Length of body 10-10.5; length of pronotum 2.0; elytra 10.5-11; posterior femora 7.3; posterior tibiae 6.8-7; ovipositor 4.3. (measured 2 ♀ ♀ specimens).

Subfamily CACOPLISTINAE

Genus (11) *Cacoplistes* Brunner, 187321. *Cacoplistes rogenhoferi* (Saussure)
(Text-fig. 2, A-C)

1878. *Cachoplistus rogenhoferi* Saussure, *Mem. Soc. phys. Hist. nat. Geneve*, 25 : 497.

Material.—1 ♂, Kaziranga Game Sanctuary, Assam, 7.x. 1961, R. N. Katiyar.

Distribution.—Kashmir, West Bengal (Darjeeling), Assam (Gauhati).

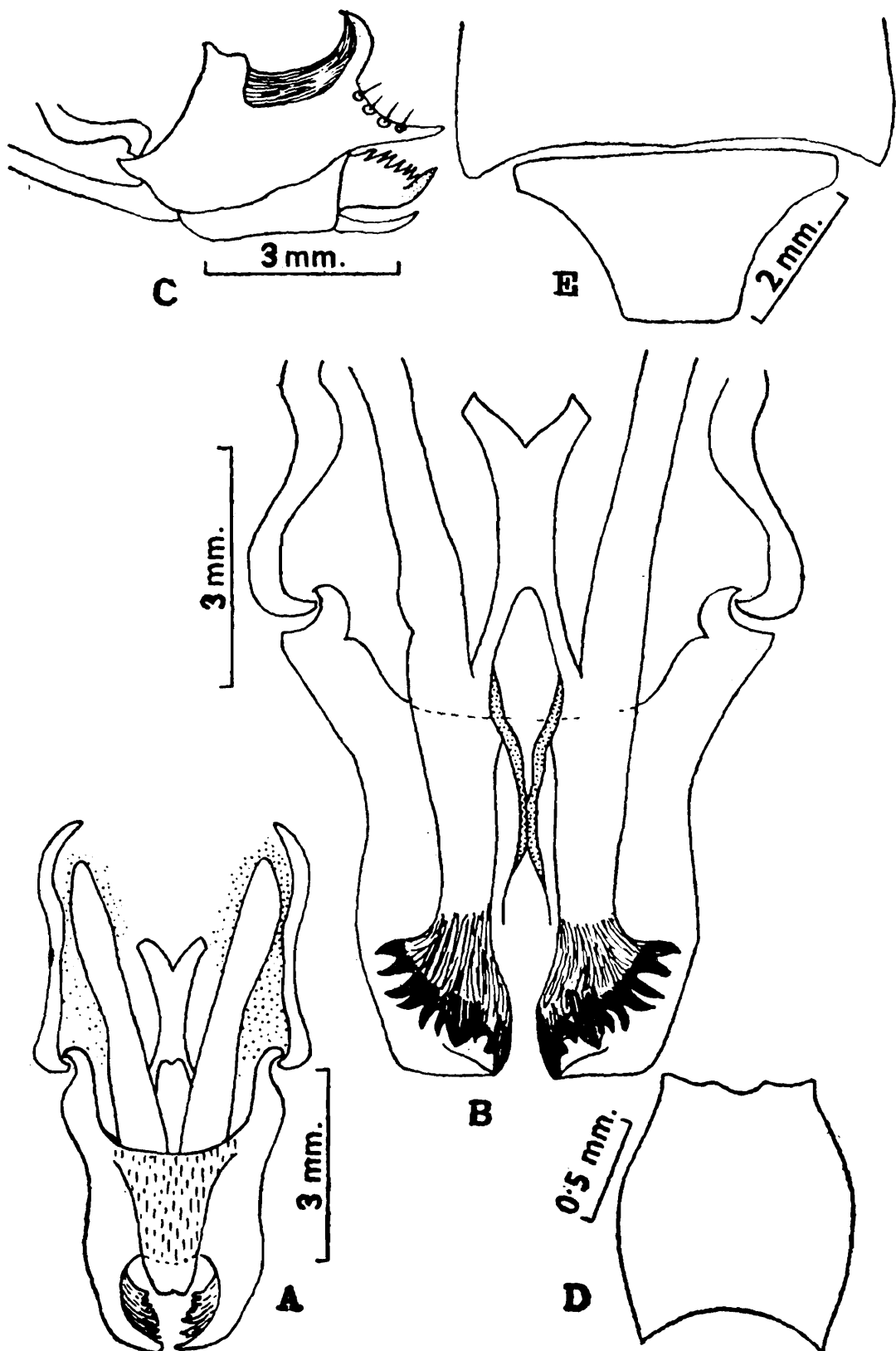
Remarks.—The male genitalia of the specimen was studied and described here for the first time.

Epiphallus more or less H-shaped; anterior margin broadly emarginate; posterior margin with three lobes, the apex of median lobe strongly curved dorsally, this curved end is united with the anterior emargination with a membranous structure. The apices of ectoparameres fan shaped and consist of nearly a dozen of teeth-like projections; from the middle of each ectoparamere come out two offshoots which ultimately unite to form a median dumb-ball shaped structure, perhaps the representative of virga as can be assumed from its position. The rami connect directly with the epiphallus by hook-like arrangements, there being no ramal plate.

Subfamily ITARINAE

Genus (12) *Itara* Walker, 186922. *Itara minor* Chopard

1925. *Itara minor* Ch., *Ann. Soc., ent. Fr.*; 94.: 312, figs 38, 39.



Text-fig. 2. A. *Cacoplistes rogenhoferi*, male genitalia, dorsal view; B. male genitalia, ventral view; C. male genitalia, lateral view; D. *Calyptotrypus roonwali* n. sp. subgenital plate, E. supraanal plate.

Material.—1 ♂, 1 ♀, Chembra Peak area, Calicut, Kerala, v. 1970 (purchased).

Distribution.—Darjeeling (West Bengal), Garo Hills (Meghalaya). Also from Malaya, Tonkin.

Remarks.—Clypeo frontal suture very feebly curved. Male elytra with 4 curved and irregularly spaced oblique veins; lateral field having 4 regularly spaced veins, mediastinal biramous.

The species is reported here for the first time from south India.

Subfamily PODOSCIRTINAE

Genus (13) *Calypotrypus* Saussure, 1878

23. *Calypotrypus bimaculatus* (Chopard)

1928. *Madasumma bimaculata* Ch., *Rec. Indian Mus.*, 30 : 32, figs. 49-51.

Material.—2 ♂♂, North Sikkim (Teng & Singhek) alt., 1515 m, viii. 1959, A. G. K. Menon; 1 ♂, Dirong Dzong, Kameng, Arunachal Pradesh, 7. viii. 61, S. Biswas.

Remarks.—This species was described from Bhutan. Its occurrence in Sikkim and Arunachal Pradesh exhibits its probable availability throughout the Eastern Himalayas.

In the three male specimens (17-18 mm) studied the number of oblique veins vary from 5 to 6 and the mediastinal veins bear 12 to 13 branches.

24. *Calypotrypus roonwali* n. sp.
(Text-figs. 2, D, E, & 3, A)

Material.—Holotype. 1 ♂ : Imphal valley, alt. 715 m., Manipur, India, 11.x.1945, Maj. M. L. Roonwal.

Description.—Holotype: Large, testaceous brown; finely pubescent. Head rather big, pale brown, as wide as the pronotum in front; occiput moderately convex and ornamented with six fairly clear yellow stripes and an incomplete median stripe; frontal rostrum depressed, furrowed, darker than head, about one and half times as wide as the first antennal segment. Eyes prominent and adorned with longitudinal stripes; ocelli light brown. Face yellow; facial shield prominent, convex, broader than frontal rostrum, variegated with numerous brown dots. Fourth segment of the maxillary palpi slightly smaller than third; third, fourth and fifth widening at apex-fifth more distinctly so. Pronotum widened posteriorly, anterior margin distinctly concave, bordered with a light brown band, rest of the disc pale yellowish variegated with brownish spots, posterior margin very feebly convex, pronotal disc with a median black band; lateral lobes concolourous with head, posterior angles of lateral lobes rounded and feebly ascending. Legs ochraceous yellow, posterior femora with pale brown striations (post. tibiae wanting). Elytra covering the apex of abdomen, light yellowish hyaline, archet and humeral edges blackish brown; speculum about

one and a half times longer than wide, with rounded angles, divided by a curved vein, connected to the first chord by a long veinlet at the level of the antero-superior angle and also by a small veinlet in the proximity of antero-inferior angle; two more or less straight oblique veins present, and a short incomplete vein also present between the first oblique and the diagonal veins; two chords present; diagonal vein long, straight and bifurcated at base; apical field long, clearly reticulated in large areolae; mediastinal vein with fifteen parallel branches, the last branch bifurcated. Wings a little longer than the abdomen. Abdomen blackish brown; tenth tergite with irregular margins, postero-lateral angles convex and somewhat projecting, supra anal plate vertical, furrowed at apex; distal margin of the sub-genital plate with postero-lateral angles rounded, notched in the middle and projecting much beyond the supra anal plate. On the ventral view, the genitalia consists of a median structure which is bilobate distally—each lobe curved inwards apically, and, with a lateral denticle-like projection.

Measurements.—Length with elytra 30.8; elytra 22.6; length of pronotum 2.7; posterior femora 20.8. (measured the holotype).

Remarks.—The species can easily be separated by its ornamented head, shape of facial shield, elytral venation, viz., presence of two oblique veins, shape of tenth abdominal tergite, sub-genital plate and genitalia.

The species is named in honour of Dr. M. L. Roonwal, collector and Ex-Director, Zoological Survey of India, and one of the leading entomologists of India.

25. *Calypotrypus hofmanni* Saussure (Text-fig. 3 B-G)

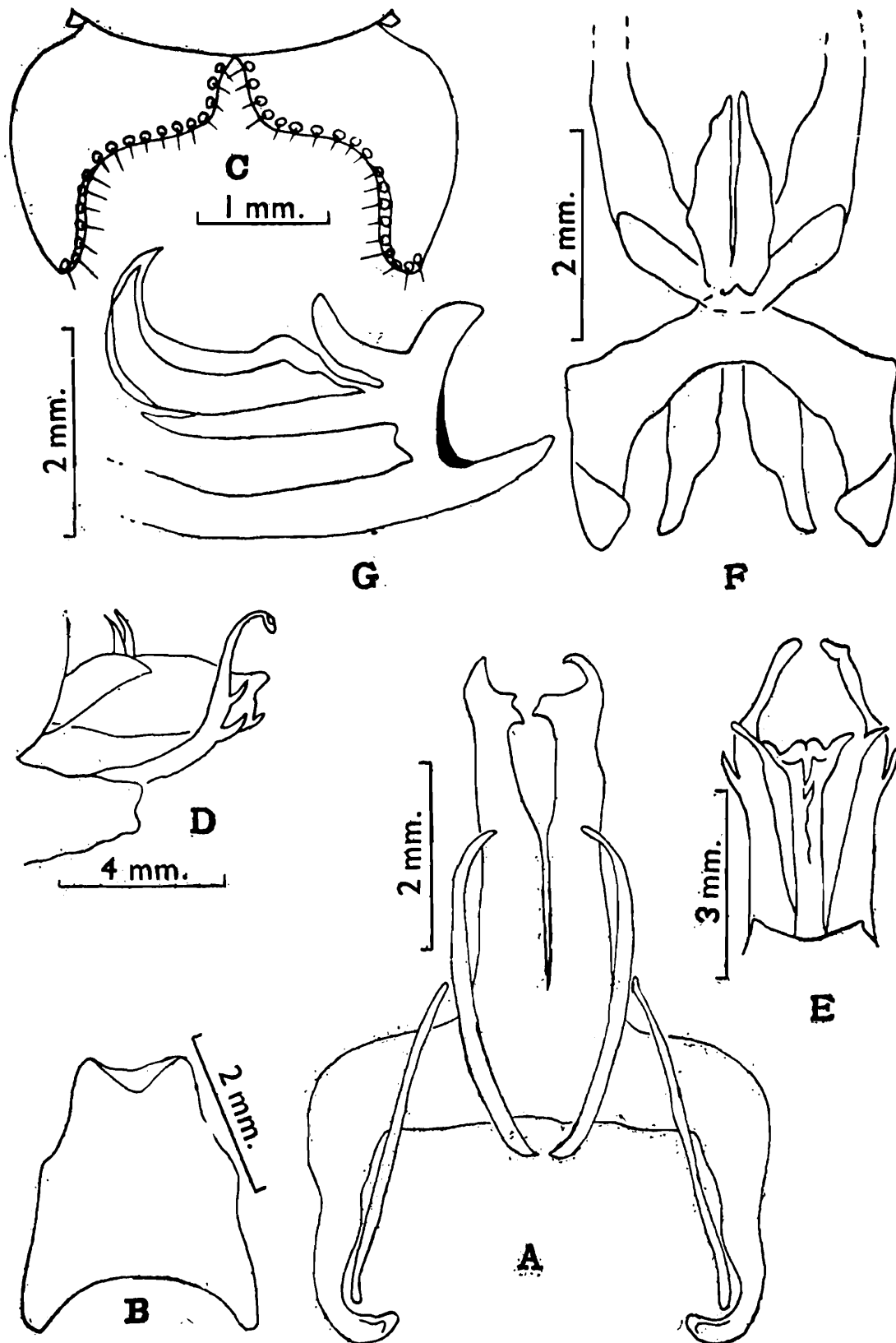
1878. *C. hofmanni* Sauss., *Mem. Soc. phys. Hist. nat. Geneve*, 25 : 569, Pl 189 figs. 2, 2a.

Material.—1 ♂, Pamir Bridge, Subansiri Div., (564m), Arunachal Pradesh, 8. v. 66; 1 ♂, Didi Camp, Chukm, Subansiri Div., (1128m) Arunachal Pradesh, 2. v. 1966.

Distribution.—Upper Burma, Java.

Remarks.—The species is reported here from the Indian region for the first time. The male genitalia is figured and described hereunder.

Sub-genital plate as in figure. The genitalia is characteristic in having a pair of incurved titulatory organs, each of which is with a pair of spines in the middle; a pair of slender processes, curved upwards through the notch of 10th tergite is also remarkable. In between the titulatory organs and ventral to the slender processes, there is a prominent com-



Text-fig. 3. A. *Calyptotrypus roonwali* n. sp. male genitalia ventral view; B. *Calyptotrypus hofmanni*, subgenital plate; C. Tenth abdominal tergite; D. Lateral view of male genitalia, (exposed); E. Ventral view of male genitalia (exposed), F. Dorsal view of male genitalia (internal); G. Lateral view of male genitalia (internal).

posite structure which having apically one denticle-like offshoot on each lateral corner. The internal genitalia, on dorsal view, shows those parts comparable to epiphallus giving off two compressed laterally

directed structures, ventral to this, there is also a pointed, compressed pair of processes (distal ends of ectoparameres).

Measurements.—Length of body 20-21; length of pronotum 4.5; maximum width of pronotum (posterior margin) 5.7; minimum width of pronotum (anterior margin) 4.0; length of elytra 24.0; maximum width of elytra 6-6.3; posterior femora 12.0; posterior tibiae 11.0. (measured 2 male specimens)

Genus (14) *Madasumma* Walker, 1869

26. *Madasumma saussureana* (Chopard)

1878. *Calyptotrypus marginipennis* Saussure, *Mem. Soc. phys. Hist. nat. Geneve*, 25 : 583 (Non Guerin)

Material.—1 ♂, Annamalai Hills, on Cinchona, Tamil Nadu, v. 1968 (purchased).

Distribution.—Sri Lanka.

Remarks.—The male specimen (19mm) at hand is the first record of its kind from the mainland of Indian region.

SUMMARY

The paper comprises of 26 species of Gryllidae of which *Loxoblemmus beybienkoi* and *Calyptotrypus roonwali* are new to science; *C. hofmanni* and *Madasumma saussureana* are new records for India; male of *Modicogryllus pallipes* and female of *Ornebius nigripalpis* are described for the first time, and the male genitalia of *Cacoplistes rogenhoferi* and of *Calyptotrypus hofmanni* are figured and described for the first time. Besides, a number of species has been recorded from new localities of India.

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A NEW LIZARD OF THE GENUS *RIOPA* GRAY (SCINCIDAE) FROM TAMIL NADU, INDIA.

By

R. C. SHARMA

*Desert Regional Station,
Zoological Survey of India, Jodhpur*

(with 1 Text-fig.)

While studying a collection of reptiles made by Dr. H. S. Pruthi during 1929 in Tamil Nadu, I came across this new species of skink (Reptilia : Sauria : Scincidae). All specimens, including the types are present in the National Zoological collections, Zoological Survey of India, Calcutta.

Genus *Riopa* Gray

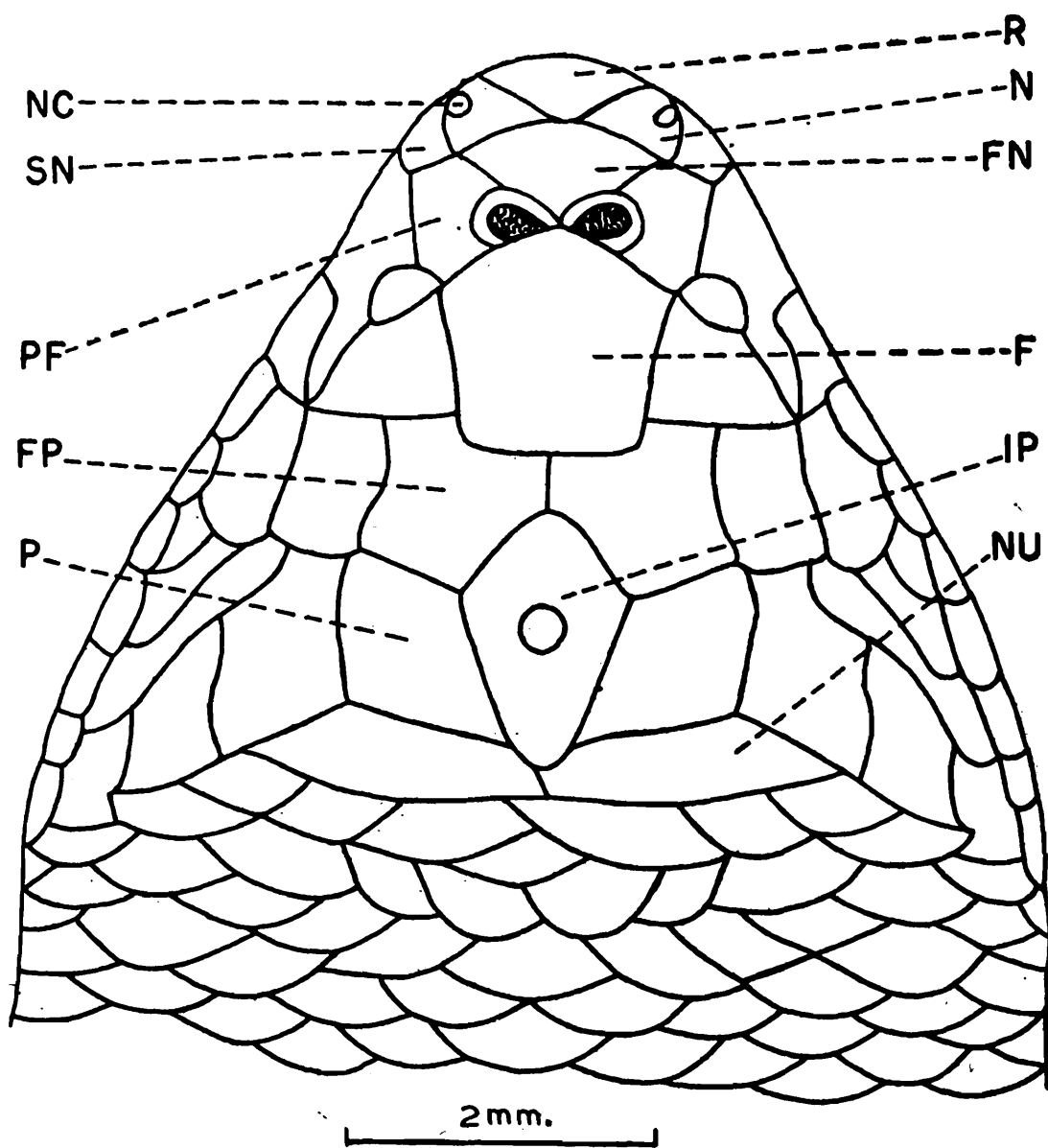
Riopa pruthi n. sp.

Dorsum deep brown, with black equidistant longitudinal lines; top of head with dark spots and longitudinal markings; whitish below; tail brownish.

Head small, snout obtuse; distance between the end of snout and forelimb contained $1\frac{1}{2}$ to $1\frac{3}{4}$ times in the distance between the axilla and groin; lower eye-lids scaly, with a large semitransparent scale in the centre; supranasals entire, in contact with one another behind the rostral; frontal shorter than the fronto-parietals and inter-parietal together; two pairs of nuchals; an enlarged temporal scale borders the outer margin of parietal; ear opening about half as large as the eye opening, with 6 minute lobules; 7 supralabials, 5th below the middle of the eye, longer than the adjacent labials; body covered with 32-34 smooth subequal scales; 50 scales down the middle of the back; marginal preanals slightly enlarged; digits long, fourth toe distinctly longer than third; 16 strongly keeled lamellae under the fourth toe; tail thick at the base, a little longer than the head and body.

Measurements.—1. Standard length 67 mm. 2. Tail length 72 mm. 3. Interorbital length 5 mm. 4. Maximum girth of body 22 mm.

Type specimens.—Holotype : One example, Z.S.I. Reg. No. 22393, Chitteri range, lat. $11^{\circ}50'$ N, long. $78^{\circ}25'$ E, Salem District, Tamil Nadu, India. Paratypes : Two examples from same lot as holotype.



Text-fig. 1. *Riopa pruthi* n. sp. Head in dorsal view; F., frontal; FN., frontonasal; FP., frontoparietal; IP., interparietal; N., nasal; NC., nasal canal; NU., nuchal; P., parietal; PF., prefrontal; R., rostral; SN., supranasal.

Comparison.—*Riopa pruthi* n. sp. closely resembles *Riopa punctata* (Gmelin), but is separable from the latter as follows : (i) Distance between axilla and groin $1\frac{1}{2}$ - $1\frac{3}{4}$ times (vs. 2 - $2\frac{3}{4}$ times) the distance between tip of snout and fore limb. (ii) Lower eyelids scaly (vs. with an undivided semitransparent disc) (iii) Frontal scale shorter (vs. longer) than frontoparietals and interparietal together. (iv) Two pairs of nuchal, (vs. single pair). (v) Ear opening with 6 (vs. 1 or 2) minute lobules on anterior margin. (vi) with 32 or 34 (vs. 24-28) scales round the body; 50 (vs. 62-76) scales down the middle of back. (vii) with 16 (vs. 11-14) lamellae under 4th toe.

I feel pleasure in naming this species after Dr. H. S. Pruthi, its collector.

STUDIES ON SOME SPIDERS OF THE GENERA *GNAPHOSA* LATREILLE AND *CALLILEPIS* WEST- RING (FAMILY GNAPHOSIDAE) FROM INDIA

By

B. K. TIKADER and U. A. GAJBE

Western Regional Station, Zoological Survey of India, Poona

(With 5 Text-figures)

INTRODUCTION

The spiders of the family Gnaphosidae are very little known in the Indian fauna. Even the classical work of Pocock (1900) on Indian spiders contains no reference to this family. Recently Tikader (1962, 1966 and 1973) has published a few papers on this group of spiders and he has reported only two species of spider of the genus *Gnaphosa* Latreille from India. The genus *Callilepis* is being recorded here for the first time from India.

While examining spider collections received from the Northern Regional Station, Dehra Dun, Desert Regional Station, Jodhpur and the Western Regional Station, Poona of the Zoological Survey of India, we came across two new species of *Gnaphosa* and three new species of *Callilepis*, which are described in this paper.

All type specimens will in due course be deposited in the National Zoological Collections, Zoological Survey of India, Calcutta.

Genus 1. *Gnaphosa* Latreille

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

1936. *Gnaphosa* : Tikader, *Rec. Indian Mus.*, 59 (4) : 439.

1975. *Gnaphosa* : Platnick & Shadab, *Bull. Amer. Mus. Nat. Hist.*, 155 : 1-66.

Characters : Cephalothorax nearly oval and broader in front, not attenuated. Pattern of widening streaks diverging from short fovea. Anterior row of eyes procurved (as seen from in front) occupying one-third to one-half width of head. Posterior row considerably longer than anterior and rather strongly recurved, medians irregular in out-

line, larger than laterals and farther from them than from each other. Sternum oval, pointed behind. Chelicerae not very strong, vertical, bearing numerous long bristles which form a scopula on inner part of apical surface. Inner margin with a prominent chitinous ridge, whose edge is concave and serrated. Outer margin with two teeth. Maxillae and labium shorter than that of *Drassodes*. Legs uniform in colour as carapace. Tibiae I and II with one to two ventral spines; metatarsi I and II with two to four ventral spines. Abdomen black or deep brown, generally six faint marks or impressions dorsally. Male palp with a strong single tibial apophysis.

Type-species : *Gnaphosa lucifuga* (Walckenaer)

Distribution : Europe, Asia, Africa and America.

1. *Gnaphosa pauriensis* n. sp.

General : Cephalothorax and legs deep brown; abdomen brownish black. Total length 7.00 mm. Carapace 3.00 mm. long, 2.10 mm. wide; abdomen 4.20 mm. long, 2.60 mm. wide.

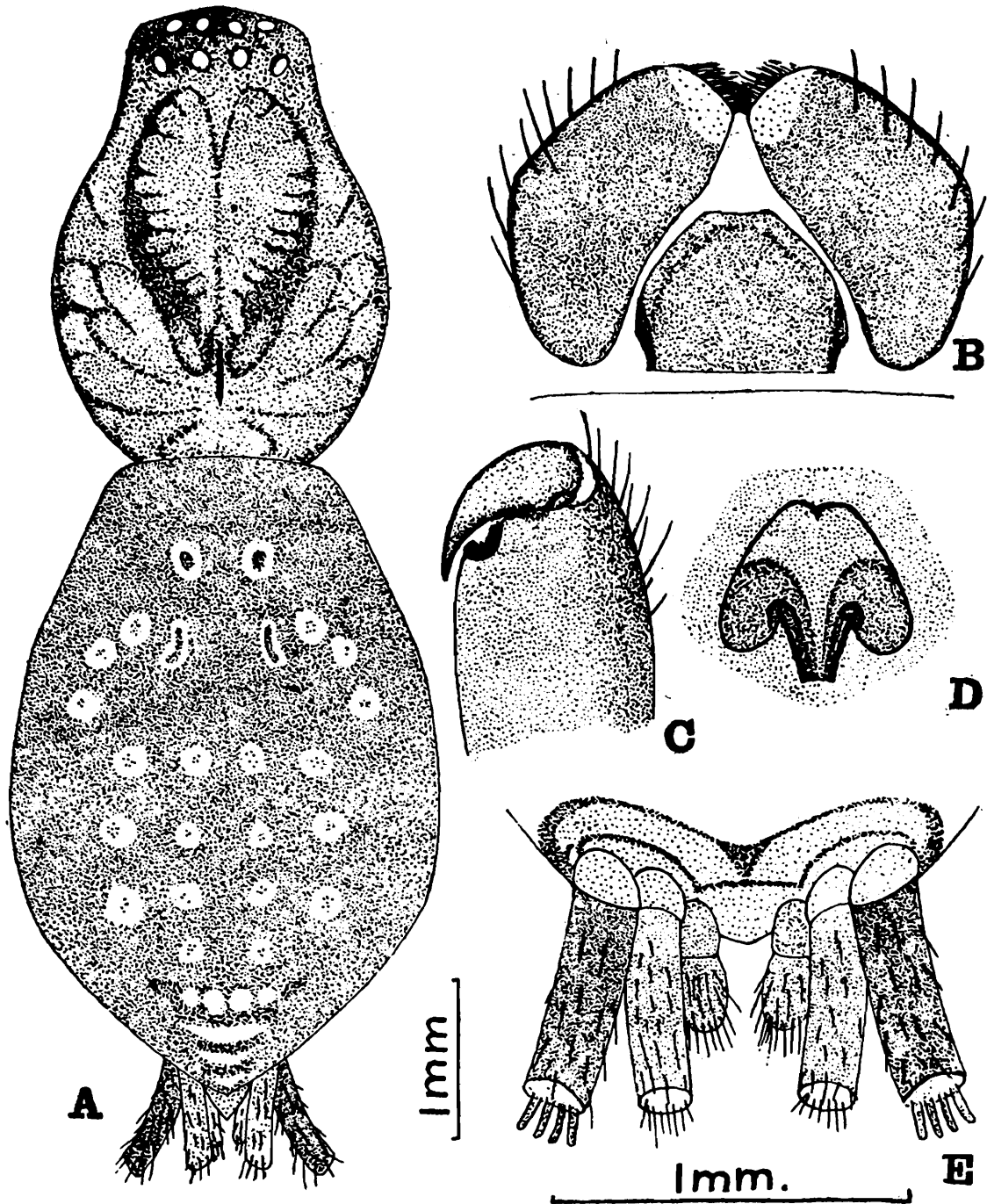
Cephalothorax : Longer than wide, narrowing in front, slightly convex, posterior middle provided with a conspicuous fovea with a V-shaped conspicuous brown marking starting from fovea, clothed with fine hairs. Anterior row of eyes slightly procurved (as seen from in front); medians more or less equal in size to laterals and slightly closer to laterals than to each other. Posterior row of eyes slightly recurved and longer than anterior row of eyes. Posterior median eyes conspicuously silvery white in colour, oval, larger than the laterals and slightly close to each other than to the adjacent laterals. Labium and maxillae as in text-fig. 1B. Chelicerae vertical, not strong, inner margin provided with chitinous ridge as in text-fig. 1C. Legs relatively long, stout, clothed with hairs and spines. Legs formula 4123.

Abdomen : Nearly elliptical, clothed with hairs and provided with some rounded chalk-white spots as in text-fig. 1A. Ventral side lighter than the dorsal. Epigyne as in text-fig. 1D. Spinnerets very prominent, anterior spinnerets cylindrical, slightly longer and darker in colour than others as in text-fig. 1D.

Holotype female, *paratype* five females in spirit.

Type-locality : Bhagwan Shrinagar, Dist. Pauri, U. P., India. Epil. J. C. Tripathi, 13-2-1972.

This species resembles *Gnaphosa poonaensis* Tikader but differs as follows. (i) Abdomen provided with small rounded chalk-white spots but in *G. poonaensis* abdomen provided with whitish chevrons. (ii) Epigyne also structurally different.



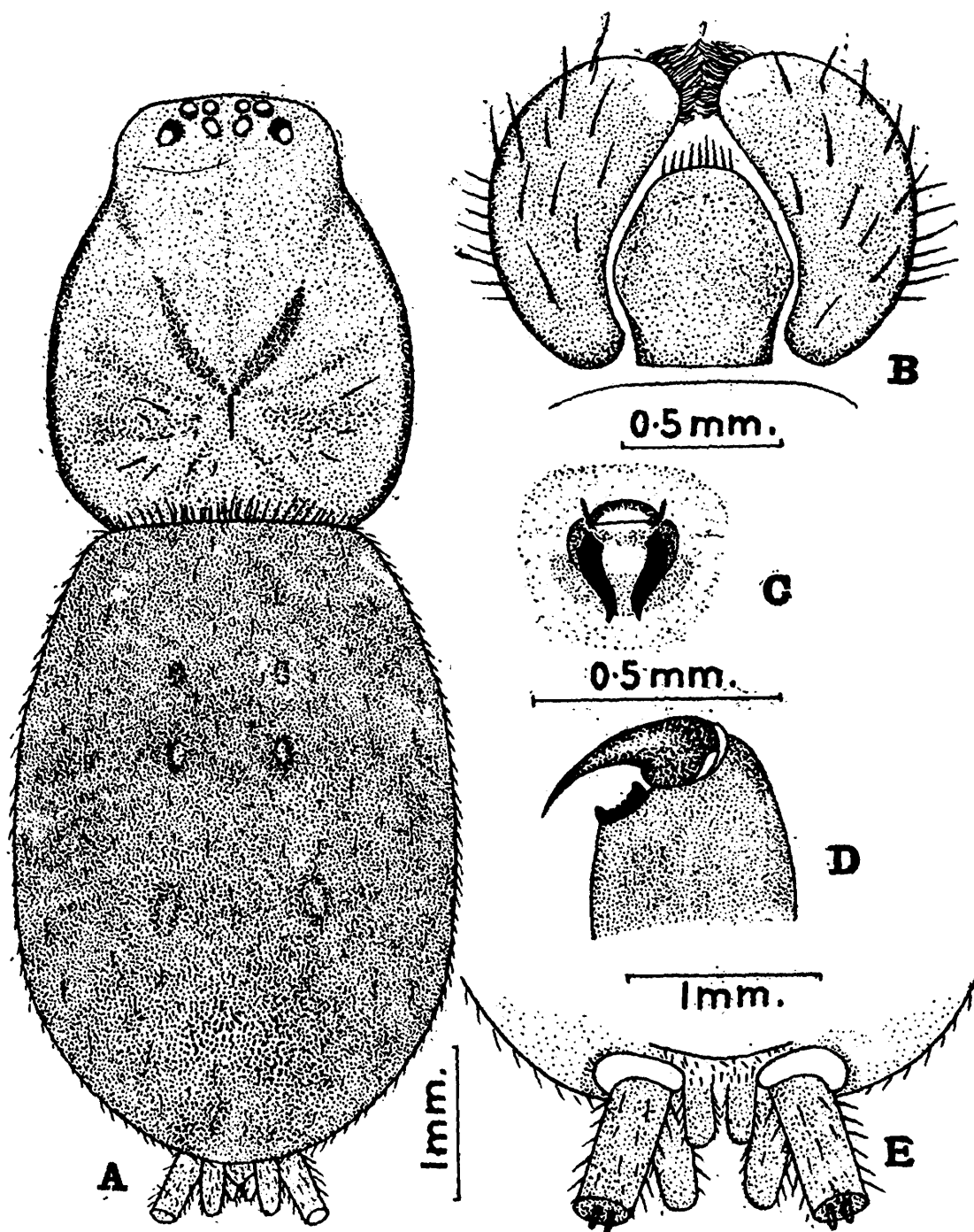
Text-fig. 1. *Gnaphosa pauriensis* n. sp. A. Dorsal view of female, legs omitted; B. Labium and maxillae; C. Chelicera; D. Epigyne; E. Spinnerets.

2. *Gnaphosa jodhpurensis* n. sp.

General : Cephalothorax and legs brownish green, abdomen brown. Total length 8.50 mm. Carapace 3.50 mm. long; 3.00 mm wide; abdomen 5.10 mm. long, 3.20 mm. wide.

Cephalothorax : Longer than wide, narrowing in front, slightly convex, posterior middle provided with a conspicuous fovea and V-shaped brown patch starting from fovea; clothed with fine hairs as in text-fig. 2A. Anterior row of eyes slightly procurved (as seen from in front); medians smaller than laterals and little closer to laterals than

to each other. Posterior row of eyes slightly recurved and longer than the anterior row of eyes. Posterior median eyes conspicuously silvery white in colour, oval, larger than the laterals and close to each other than to the adjacent laterals. Sternum heart-shaped, pointed behind, clothed with fine hairs. Labium and maxillae as in text-fig. 2B. Chelicerae vertical, not strong, inner margin provided with a chitinous ridge as in text-fig. 2D. Legs relatively long, stout, clothed with hairs and spines. Legs formula 4123.



Text-fig. 2. *Gnaphosa jodhpurensis* n. sp. A. Dorsal view of female, legs omitted; B. Labium and maxillae; C. Epigyne; D. Chelicera; E. Spinnerets.

Abdomen : Nearly elliptical, clothed with hairs. Ventral side lighter than the dorsal. Epigyne as in text-fig. 2C. Spinnerets very prominent,

anterior spinnerets cylindrical, slightly longer and darker in colour than others as in text-fig. 2E.

Holotype female, *paratype* one female in spirit.

Type-locality : Sardar samand, Dist. Jodhpur, Rajasthan, India.
Coll. R. C. Sharma, 26-11-1963.

This species resembles *Gnaphosa pauriensis* sp. nov. but differs as follows : (i) Abdomen uniform in colour but in *G. pauriensis* abdomen provided with small rounded chalk-white spots. (ii) Epigyne also structurally different.

Genus 2. *Callilepis* Westring

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

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

1975. *Callilepis* : Platnick, *Amer. Mus. Novit.*, 2573 : 1-32.

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

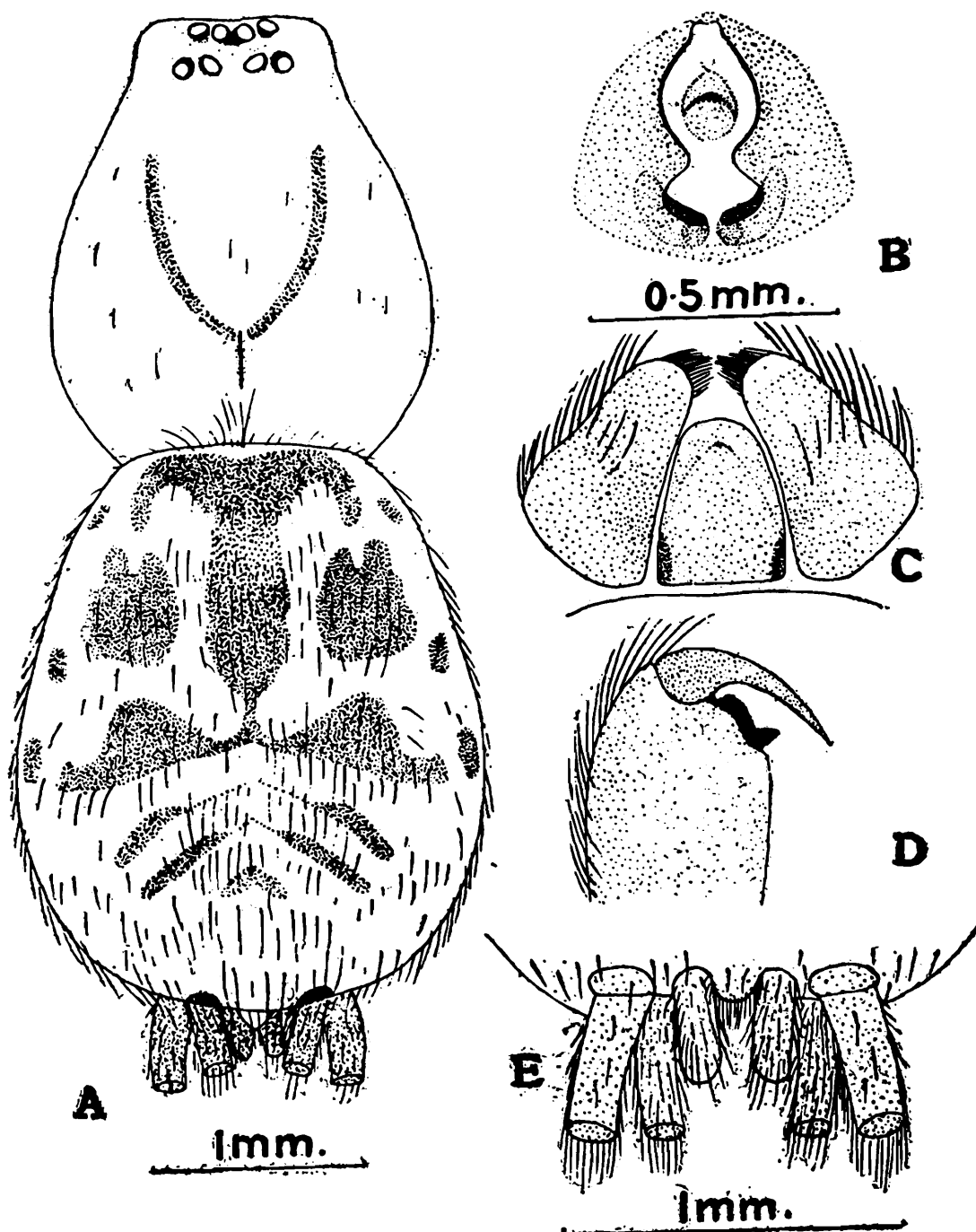
Type-species : *Callilepis nocturna* (Linnaeus)

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

3. *Callilepis rajasthanicus* n. sp.

General : Cephalothorax, abdomen and legs light brownish-green. Total length 4.80 mm. Carapace 2.20 mm. long, 1.80 mm. wide; abdomen 2.80 mm. long, 2.20 mm. wide.

Cephalothorax : Longer than wide, narrowing in front, slightly convex, posterior middle provided with an inconspicuous fovea with a U-shaped conspicuous brown marking starting from fovea, clothed with fine hairs. Anterior row of eyes slightly procurved (as seen from in front); medians slightly smaller than the laterals and little closer to laterals than to each other. Posterior row of eyes slightly recurved and slightly longer than anterior row of eyes. Posterior median eyes conspicuously silvery white in colour, oval, smaller than the laterals and closer to laterals than to each other. Sternum heart-shaped, pointed behind, clothed with fine hairs. Labium and maxillae as in text-fig. 3C. Chelicerae vertical, not strong, inner margin provided with a narrow lamina without serrated ridge as in text-fig. 3D. Legs relatively long, stout, clothed with hairs and spines. Legs formula 4123.



Text-fig. 3. *Callilepis rajasthanicus* n. sp. A. Dorsal view of female, legs omitted; B. Epigyne; C. Labium and maxillae; D. Chelicera; E. Spinnerets.

Abdomen : Nearly elliptical, clothed with hairs and provided with some deep brownish patches as in text-fig. 3A. Ventral side lighter than the dorsal. Epigyne as in text-fig. 3B. Spinnerets very prominent as in text-fig. 3E.

Holotype female in spirit.

Type-locality : Salawas village, Dist. Jodhpur, Rajasthan, India. Coll. K. C. Kausal, 13-6-1963.

This species resembles *Callilepis imbecilla* (Keyserling) but differs from it as follows : (i) Cephalothorax light brownish-green with a

U-shaped conspicuous brown marking starting from fovea but in *C. imbecilla* cephalothorax is orange without any markings. (ii) The abdomen is light brownish-green with deep brownish patches but in *C. imbecilla* abdomen is bluish black without patches. (iii) Epigyne also structurally different.

4. *Callilepis rukminiae* n. sp.

General : Cephalothorax and legs brownish, abdomen brownish-black. Total length 7.20 mm. Carapace 3.00 mm. long, 2.60 mm. wide; abdomen 4.40 mm. long, 3.00 mm. wide.

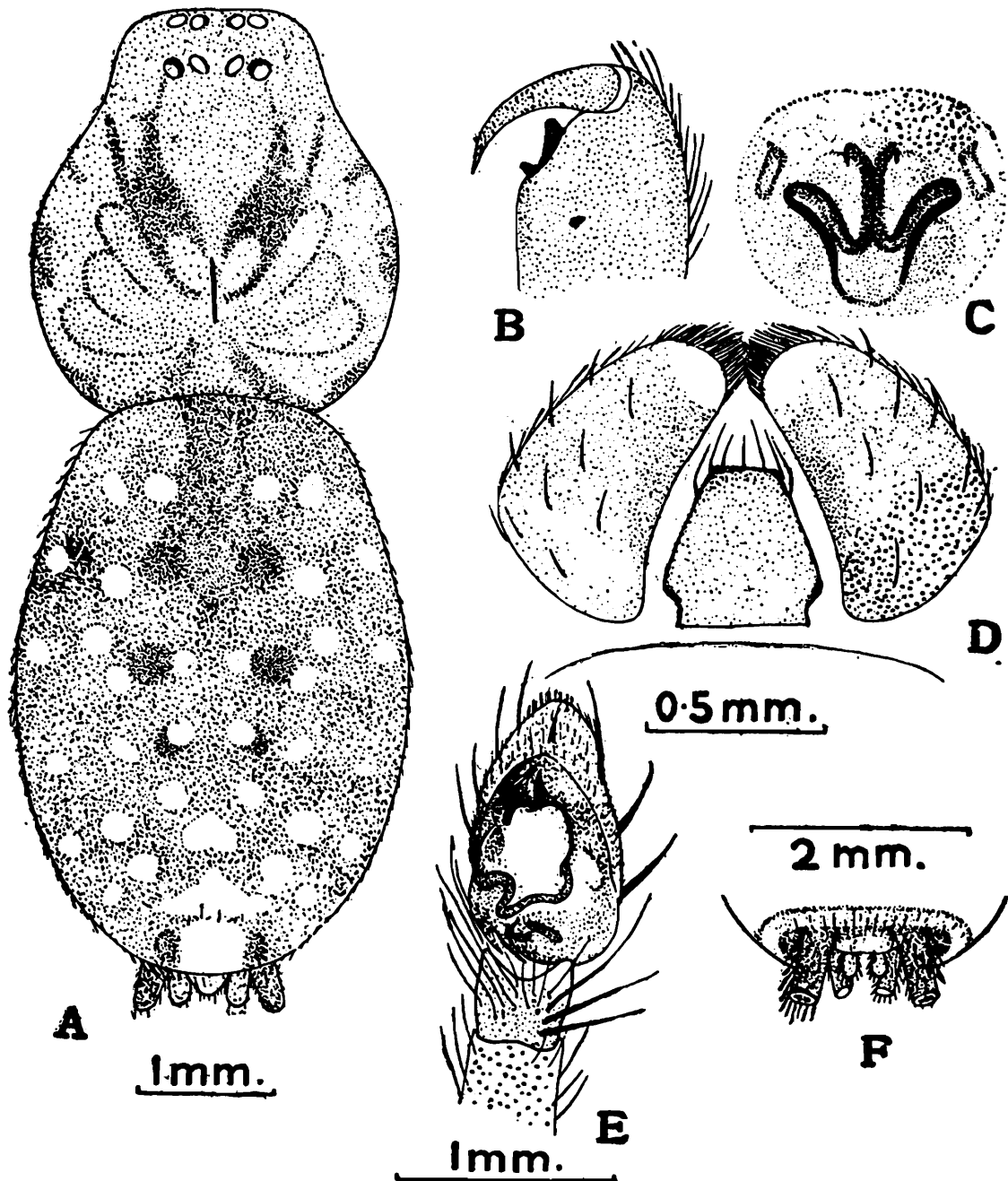
Cephalothorax : Longer than wide, narrowing in front, slightly convex, posterior middle provided with a conspicuous fovea and V-shaped brown patch starting from fovea; clothed with fine hairs. Anterior row of eyes procurved (as seen from in front); medians smaller than the laterals and little closer to laterals than to each other. Posterior row of eyes recurved and slightly longer than the anterior row of eyes. Posterior median eyes conspicuously silvery white in colour, oval, smaller than the laterals and little close to laterals than to each other. Sternum heart-shaped, pointed behind, clothed with fine hairs. Labium and maxillae as in text-fig. 4D. Chelicerae vertical, not strong, inner margin provided with a narrow lamina without serrated ridge as in text-fig. 4B. Legs relatively long, stout, clothed with hairs and spines. Legs formula 4123. Male same in colour as female but slightly larger than the female, male palp as in text-fig. 4E.

Abdomen : Nearly elliptical, clothed with hairs and some round whitish spots as in text-fig. 4A. Ventral side lighter than the dorsal. Epigyne as in text-fig. 4C. Spinnerets very prominent, anterior spinnerets cylindrical, slightly longer and darker in colour than others as in text-fig. 4F.

Holotype female, **Paratype** one immature female, **allotype** one male in spirit.

Type-locality : Katraj, near Poona, Maharashtra, India. Coll. K. R. Rao, 22-8-1968.

This species resembles *Callilepis rajasthanicus* sp. nov. but differs from it as follows : (i) Cephalothorax provided with a V-shaped brown patch starting from fovea but in *C. rajasthanicus* cephalothorax provided with U-shaped brown marking, starting from fovea. (ii) Abdomen provided with some round whitish spots but in *C. rajasthanicus* abdomen provided with deep brownish patches. (iii) Epigyne also structurally different.



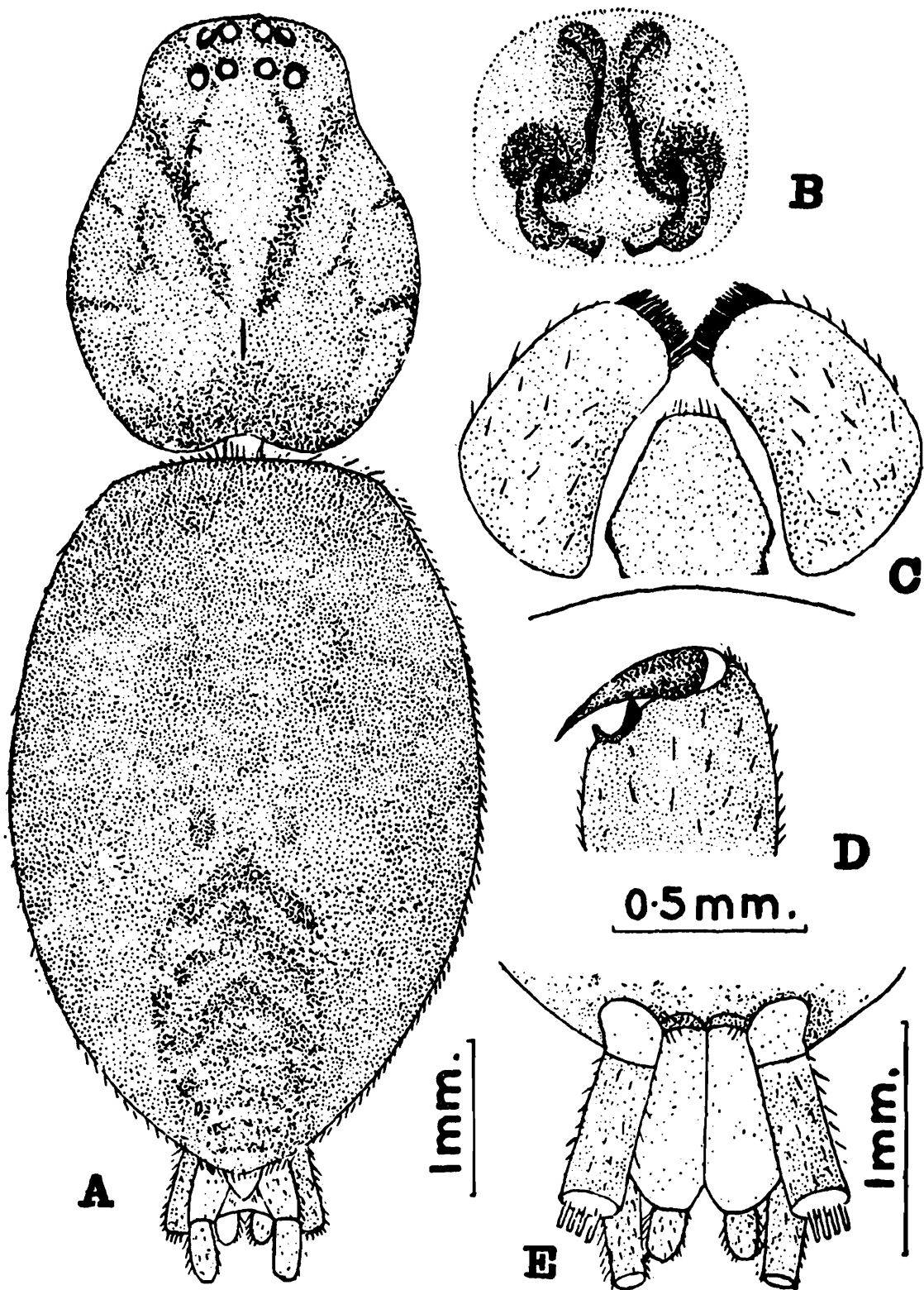
Text-fig. 4. *Callilepis rukminiae* n. sp. A. Dorsal view of female, legs omitted; B. Chelicera; C. Epigyne; D. Labium and maxillae; E. Right male palp, (Ventral view); F. Spinnerets.

5. *Callilepis lambai* n. sp.

General : Cephalothorax and legs brownish-green, abdomen brown. Total length 8.00 mm. Carapace 2.80 mm. long, 2.20 mm. wide; abdomen 5.00 mm. long, 3.20 mm. wide.

Cephalothorax : Longer than wide, narrowing in front, slightly convex, posterior middle provided with a conspicuous fovea and V-shaped brown patch starting from fovea; clothed with fine hairs. Anterior row of eyes slightly procurved (as seen from in front); medians more or less equal in size to laterals and closer to laterals than to each other. Posterior row of eyes slightly recurved and slightly longer than

anterior row of eyes. Posterior median eyes conspicuously silvery white, oval, smaller than the laterals and little close to laterals than to each other. Sternum heart-shaped, pointed behind and clothed with hairs. Labium and maxillae as in text-fig. 5C. Chelicerae vertical, not strong, inner margin provided with a narrow lamina without serrated ridge as in text-fig. 5D. Legs relatively long, stout, clothed with hairs and spines. Legs formula 4123.



Text-fig. 5. *Callilepis lambai* n. sp. A. Dorsal view of female, legs omitted; B. Epigyne; C. Labium and maxillae; D. Chelicera; E. Spinnerets.

Abdomen : Nearly elliptical, clothed with hairs, dorsally posterior half provided with light chevrons as in text-fig. 5A. Ventral side lighter than the dorsal. Epigyne as in text-fig. 5B. Spinnerets very prominent, anterior spinnerets cylindrical and darker than others as in text-fig. 5E.

Holotype female in spirit.

Type-locality : Kudgeri, Dist. Shimoga, Mysore, India. Coll. Dr. B. S. Lamba, 31-1-1927.

This species resembles *Callilepis rukminiae* sp. nov. but differs from it as follows : (i) Abdomen provided with light chevrons but in *C. rukminiae* abdomen provided with some round whitish spots. (ii) Epigyne also structurally different.

ACKNOWLEDGEMENTS

The authors are thankful to Dr. B. S. Lamba, Deputy Director, Northern Regional Station, Dehra Dun and Dr. T. G. Vazirani, Deputy Director, Desert Regional Station, Jodhpur, Zoological Survey of India, for supplying the spider collections for our study. They are also thankful to Dr. Norman I. Platnick, Assistant Curator, Arachnida Division, American Museum of Natural History, New York for help of literature on Gnaphosidae spiders.

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CONTRIBUTION TO THE STUDY OF AQUATIC
BEETLES (COLEOPTERA) 14. ON THE
COLLECTION OF DYTISCIDAE
FROM GUJARAT PART 2.

By

T G. VAZIRANI

Desert Regional Station, Zoological Survey of India, Jodhpur

(With 2 Text-figures)

INTRODUCTION

During December 1972 and January 1973 the author surveyed the 4 districts of Gujarat viz Bhavnagar, Mahesana, Palanpur and Bhuj. The last three districts fall within the Kutch region of Gujarat. In an earlier report (Vazirani, 1973), which covered districts of Junagadh, Jamnagar and Surendranagar 22 species were recorded. During the present coverage the number of species collected comes to 20. Five species marked with asterisc which were not collected earlier constitute new records from the general area under consideration, thus bringing the number of species known from Gujarat to 27. Infra-specific variation has been observed in 2 species which call for some comments. For the remaining species only the localities have been listed under each species. For the keys to genera and species known from India the reference may be made to Vazirani (1969 a, b, 1970, a, b). Geographical distribution of these beetles in the Saurashtra and Kutch areas of Gujarat has also been discussed.

SYSTEMATIC ACCOUNT

Family DYTISCIDAE

Subfamily NOTERINAE

1. *Canthydrus laetabilis* Walker

Gujarat : 2 ex stn 14 Mahesana 24. xii. 72; 1 ex Palanpur 28. xii.72; 2 ex Palanpur below Dantiwada Dam 29. xii. 72; 2 ex Deesa 29. xii. 72; 8 ex stn 27 Radhanpur 31. xii. 72; 1 ex stn 7 Bhavnagar 18. xii. 72.

Subfamily LACCOPHILINAE

2. **Laccophilus inefficiens** Walker
Gujarat : 1 ex stn 2 Bhavnagar 17.xii. 72; 1 ex stn 7, 18. xii. 72; 1 ex Palanpur 28. xii. 72.
3. **Laccophilus flexuosus** Aubé
Gujarat : 2 ex stn 24 Deesa 24. xii. 72.
4. **Laccophilus parvulus** Aubé
Gujarat : 4 ex stn 11 Mahesana 30.xii. 72; 5 ex stn 27 Radhanpur 31.xii. 72.
5. **Laccophilus sharpi** Régimbart.
Gujarat : 2 ex stn 2 Bhavnagar 16.xii. 72; 3 ex stn 11 Mahesana 23.xii. 72; 4 ex stn 18 Palanpur 28.xii. 72; 7 ex stn 24 Deesa 29.xii.72.
- *6. **Laccophilus wewalki** Vazirani
Gujarat : 1 ex stn 7 Bhavnagar 18.xii.72.
Remarks.—This species is so far known only from its type locality Goa and is now being reported from Gujarat.
- *7. **Neptosternus circumductus** Régimbart
Gujarat : 2 ex stn 37B Bhuj, 10.i.73.
Remarks.—This species has so far been recorded from Madhya Pradesh, Tamil Nadu, Maharashtra, Orissa and Uttar Pradesh. Its present record from the Kutch region of Gujarat shows that this species is very widely distributed in India. Species of this genus are generally confined to swift flowing streams but in this case the specimens were collected from a pool cut off from the main current of the river above the dam site. No waters were flowing at this time of the year, but there is no doubt that during the monsoon, at least, the river has generally fast flowing waters in the nearby upper reaches and that specimens had been trapped in this drying pool of water.

Subfamily HYDROPORINAE

8. **Hydrovatus** sp.
Gujarat : 1 ex stn 37A Bhuj 10.i.73.
9. **Herophydrus musicus** (Klug)
Gujarat : 1 ex stn 3 Bhavnagar 17.xii. 72; 2 ex stn 14 Mahesana 24.xii.72; 2 ex stn 23 Palanpur, Dantiwada Dam 29.xii.72; 1 ex stn 30 Radhanpur 2.i.73; 2 ex stn 34 Anjar 7.i.73; 1 ex stn 35 Anjar 7.i.73; 19 ex stn 36 Anjar 7.i.73.

10. *Peschetius toxophorus* Guignot

Gujarat : 3 ex stn 18 Palanpur 28.xii.72; 1 ex stn 36 Anjar 7.i.73; 1 ex stn 6 Bhavnagar 18.xii.72.

11. *Peschetius quadricostatus* (Aubé)

Gujarat : 2 ex stn 3 Bhavnagar 17.xii.72.

12. *Hyphydrus (Apriophorus) flavicans* Régimbart

Gujarat : 2 ex stn 14 Mahesana 24.xii.72; 1 ex stn 34 Anjar 7.i.73.

13. *Guignotus flammulatus* Sharp

Gujarat : 1 ex stn 6 Bhavnagar 18.xii.72; 1 ex stn 7 Bhavnagar 18.xii.72; 20 ex stn 11 Mahesana 23.xii.72; 18 ex stn 14, 24.xii.72; 10 ex stn 27 Radhanpur 31.xii.72; 2 ex stn 32 Gandhidham 5.i.73; 2 ex stn 34 7.i.73.

Remarks.—This species is very variable in the elytral markings as shown in Text-figure 1. (A to E).

14. *Guignotus gujaratensis* Vazirani

Gujarat : Mahesana, 21 ex stn 10 Mahesana, 22.xii.73; 5 ex stn 12, 23.xii.72; 9 ex stn 13, 24.xii.72; 7 ex stn 14, 24.xii.72; 6 ex stn 15, 24.xii.72; 13 ex stn 18 Palanpur, 28.xii.72; 5 ex stn 19, 28.xii.72; 5 ex stn 27 Radhanpur, 31.xii.72; 8 ex stn 30, 2.i.73; 5 ex stn 35 Anjar, 7.i.73; 8 ex stn 36 Gandhidham 7.i.73; 8 ex stn 37A Bhuj 10.i.73.

15. *Guignotus pendjabensis* Guignot

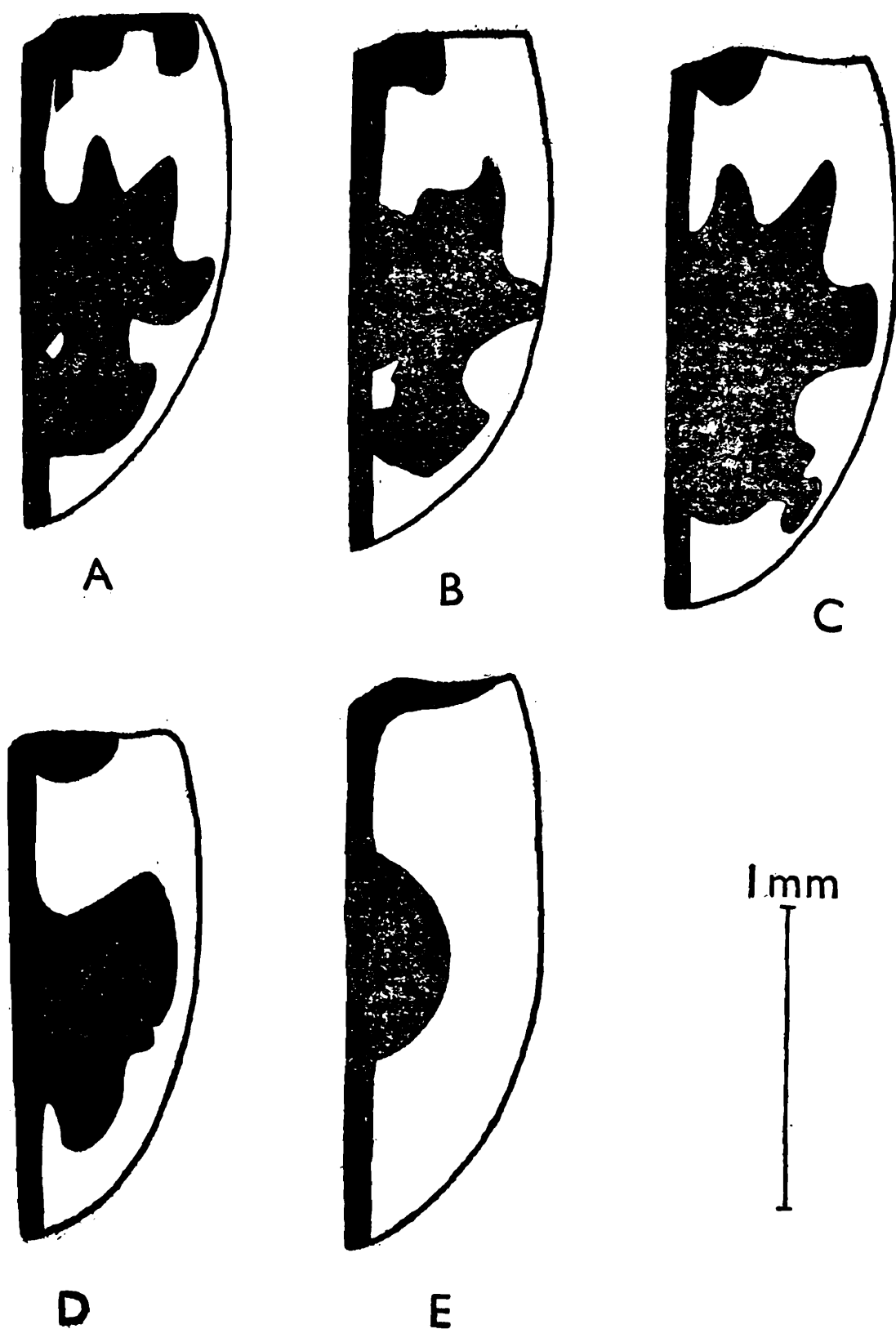
Gujarat : 40 ex stn 2 Bhavnagar 16.xii.72; 9 ex stn 10 Mahesana, 22.xii.72; 4 ex stn 11, 23.xii.72; 26 ex stn 13, 24.xii.72; 13 ex stn 14, 24.xii.72; 17 ex stn 15, 24.xii.72; 8 ex stn 22 Palanpur, 24.xii.72; 6 ex, 29.xii.72; 9 ex stn 26, Radhanpur 31.xii.72; 6 ex stn 27, 31.xii.72; 1 ex stn 30, 2.i.73; 35 ex stn 35 Anjar 7.i.73; 12 ex stn 36, 7.i.73; 40 ex stn 37A Bhuj 10.i.73.

Remarks.—This species is very variable in its elytral markings as shown in the Text-figure 2. (A to E) The most interesting instance of this variability is the example shown in Text-figure 2E which has different markings on each elytron.

***16. *Clypeodytes (Lioclypeus) orissaensis* Vazirani**

Gujarat : 1 ex stn 37A Bhuj 10--;73.

Remarks.—This species is so far known only from Orissa : Cuttack and Pakistan. Its present record from the extreme South West corner of India indicates that it is widely distributed but has been missed in several collections due to its very small size viz less than 2.0 mm.

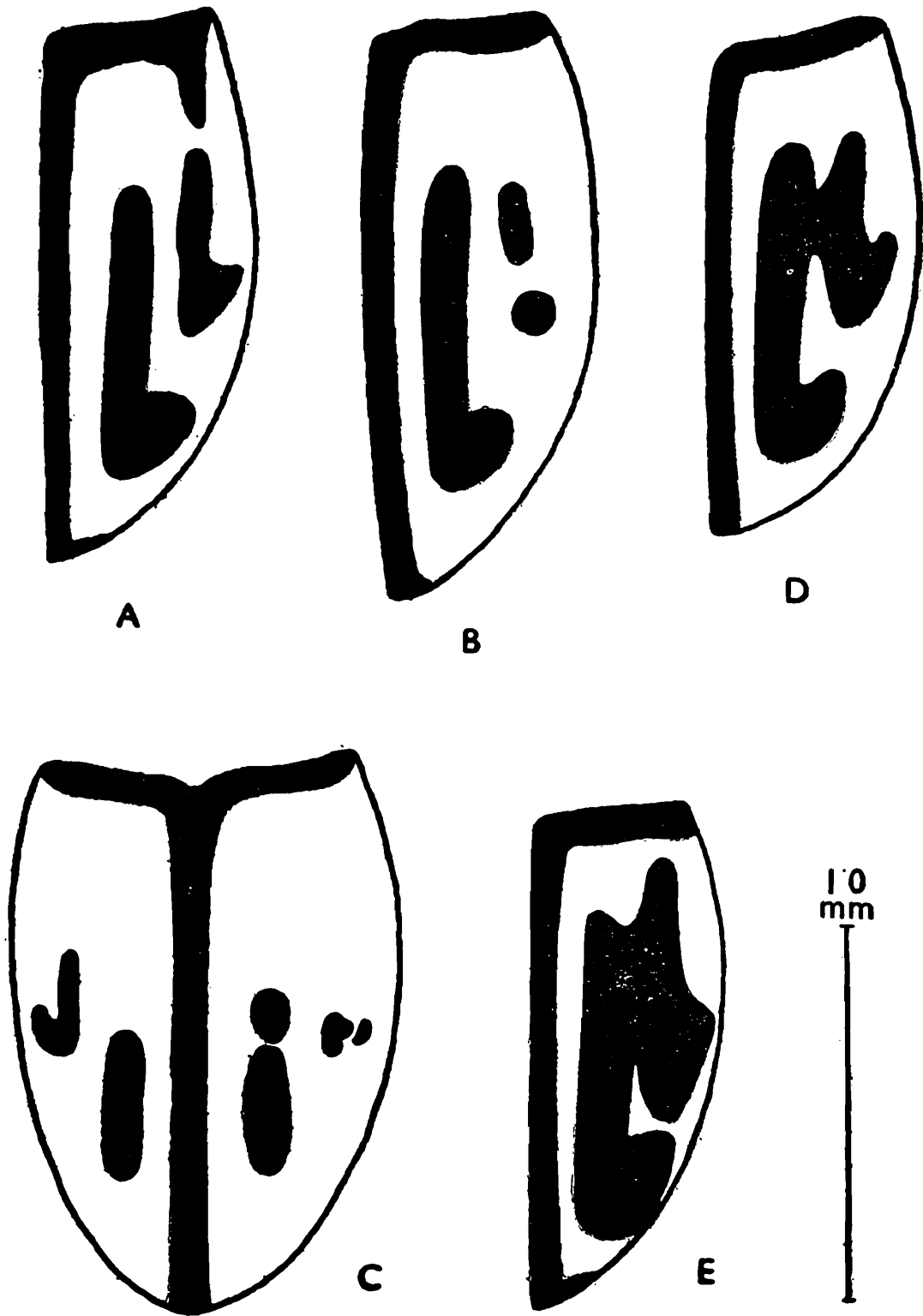


Text-fig. 1. *Guignotus flammulatus*, showing variation in the markings on elytron.

***17. *Uvarus genitilis* (Sharp)**

Gujarat : 1 ex stn 37A Bhuj 10.i.1973.

Remarks.— Being very small in size viz 2.0 mm, like the above species, it is quite rare in collections though it is widely distributed in India : Bihar, Orissa; Malayasia and Pakistan. The present record from the S.W corner of India is therefore of zoogeographical interest.



Text-fig. 2. *Guignotus pendjabensis* showing variation in the markings on elytron

Subfamily DYTISCINAE

18. **Eretes sticticus** (Linnaeus)
Gujarat : 1 ex stn 34 Anjar 7.i.73.
- *19. **Cybister (Meganectes) limbatus** (Fabricius)
Gujarat : 1 ex stn 34 Anjar 7.i.73.

Remarks.—This species is very widely distributed in India, Pakistan, Southern China, Japan, Indochina, Formosa &

Philippine Islands. In India it is known from Bihar, Kerala, Madhya Pradesh, Maharashtra, Goa, Orissa, Arunachal Pradesh and W Bengal. However it is now being recorded from Gujarat for the first time.

20. *Cybister (Meganectes) tripunctatus asiaticus* Sharp
Gujarat : 1 ex stn 35 Anjar 7.i.1973.

Geographical Distribution of Dytiscidae in Saurashtra and Kutch areas of Gujarat.

The Dytiscid fauna of the Saurashtra and Kutch regions of Gujarat is typically that of the Indian subregion as shown in the table of distribution of species.

There is only 1 species whose origin may be considered Ethiopian viz *Herophydrus musicus* (Klug) and which occurs in this region but it is very common in India extending up to Nepal, indicating its very early intrusion into the Oriental Region.

Nine species marked with asterisk* i.e. 33% of the species recorded from this area extend into Pakistan, which is included in the Palaearctic region. This may be considered as intrusion of the Oriental Fauna into this area before the formation of the Great Indian Desert which separates Pakistan from the area under consideration.

Twelve species i.e. nearly 45% species extend to Ceylon and 10 species i.e. 27% extend their distribution into N. E. India (Indo-Chinese subregion) and 14% of the species extend to the Malayasian subregion.

Only one species, *Eretes sticticus*, is cosmopolitan.

Certain genera like *Rhantus*, *Hyphoporus* may also be present in the area.

The absence of most of the Colymbetinae genera which generally prefer perennial sources of water may be due to absence of any such reservoirs of water in the area.

SUMMARY

This is a report on the collection of Dytiscidae made by the author mostly in Kutch region of Gujarat in the year 1972-73. Earlier the author had made collections in the Saurashtra region of the same state (vide Vazirani 1973). Twenty species spread over 13 genera are being recorded of which the following 5 species *Laccophilus wewalki* Vazirani, *Neptosternus circumductus* Regimbart, *Clypeodytes (Lioclypeus) orissaensis* Vazirani, *Uvarus genitilis* (Sharp) and *Cybister (Meganectes) limbatus* (Fabricius) constitute first records of these species from this region. Variation of elytral markings in *Guignotus flammulatus*, and *G. pendjabensis* has also been shown. Geographical distribution has been discussed separately. The absence of the subfamily Colymbetinae is suspected to be due to lack of perennial sources of water in the region.

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ORIENTAL

Name of species	Ceylonese subreg.			Indo-chinese subreg.				Malaysian subreg.				REMARKS		
	ETHIOPIAN	Palaeartic	Ceylon	India S. of Mysore	Indian Subreg.	N. E. India	Burma	Thailand	Indo-China	Malayasia	Indonesia		Phillipine	AUSTRALIAN
Peschetius quadri-costatus				×	×									
P. toxo-phorus				×	×									
Guignotus flammulatus		×	×		×	×	×	×	×		×			S. China Japan, Pakistan Pakistan
G. pend-jabensis		×			×									
G. gujara-tensis														
Clypeodytes (Lioclypeus) orissanesis		×	×		×									
Uvarus genitilis		×	×		×					×				Pakistan
Yola con-sanguinea				×					×					
Copelatus mysorensis				×										
Eretes sticticus	×	×	×	×	×	×	×	×	×	×	×	×	×	Cosmo-politan
Hydaticus (Guignotites) vittatus		×	×	×	×	×								Pakistan, Formosa, China, Japan
H. (G) luczonicus				×			×							
Sandracottus dejeani		×			×									Pakistan
Cybister (Meganectes) limbatus		×		×	×	×			×					Pakistan Formosa S. China, Japan, Phillipine Island.
Cybister (Meganectes) tripunctatus asiaticus		×	×	×	×	×	×	×	×	×	×			Pakistan

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TAXONOMIC STUDIES ON SOME SPIDERS OF
THE GENERA *DRASSODES* WESTRING,
HAPLODRASSUS CHAMBERLIN, *GEODRASSUS*
CHAMBERLIN AND *NODOCION* CHAMBERLIN
(FAMILY : GNAPHOSIDAE) FROM INDIA

By

B. K. TIKADER and U. A. GAJBE

Western Regional Station, Zoological Survey of India, Poona

(With 6 Text-figures)

INTRODUCTION

The spiders of the family Gnaphosidae are very little known from the Indian fauna. Even the representative work by Pocock (1900) on Indian spiders contains no reference to this family. Recently Tikader (1962-1973) has reported four species of the genus *Drassodes* from India, and Tikader and Gajbe (1975) have described five more species of this genus from India. The other genera are being recorded here for the first time from India.

While examining spider collections received from the Northern Regional Station, Dehra Dun, the Eastern Regional Station, Shillong, the High Altitude Zoology Field Station, Solan and the Western Regional Station, Poona, of the Zoological Survey of India, we came across two new species of the genus *Drassodes*, two new species of the genus *Haplodrassus* and a new species each of the genera *Geodrassus* and *Nodocion* which are described in this paper. A key to the four genera is given.

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

Key to the Genera

1. Anterior median eyes slightly larger than the anterior laterals. 2
- Anterior median eyes slightly smaller than the anterior laterals. 3

- ### Genus 1. *Drassodes* Westring

- Characters* : Cephalothorax flat, broad in front with a fovea and covered with pubescence. Eyes anterior row slightly procurved (as seen from in front); medians slightly larger than laterals and a little closer to the laterals than to each other. Posterior row longer, procurved; medians oval, slightly larger than laterals and much closer to each other than to adjacent laterals. Chelicerae strong, inner margin normally with two teeth and two on the outer margin. Sternum oval and pointed behind. Maxillae and labium longer than wide. Legs long and strong, tibiae I and II sometimes bear one ventral spine on the apical half. Scopulae consist of closely set, short blunt, little spines. Abdomen longer than wide, narrowing behind, covered with pubescence and with a 'mousy' appearance.

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

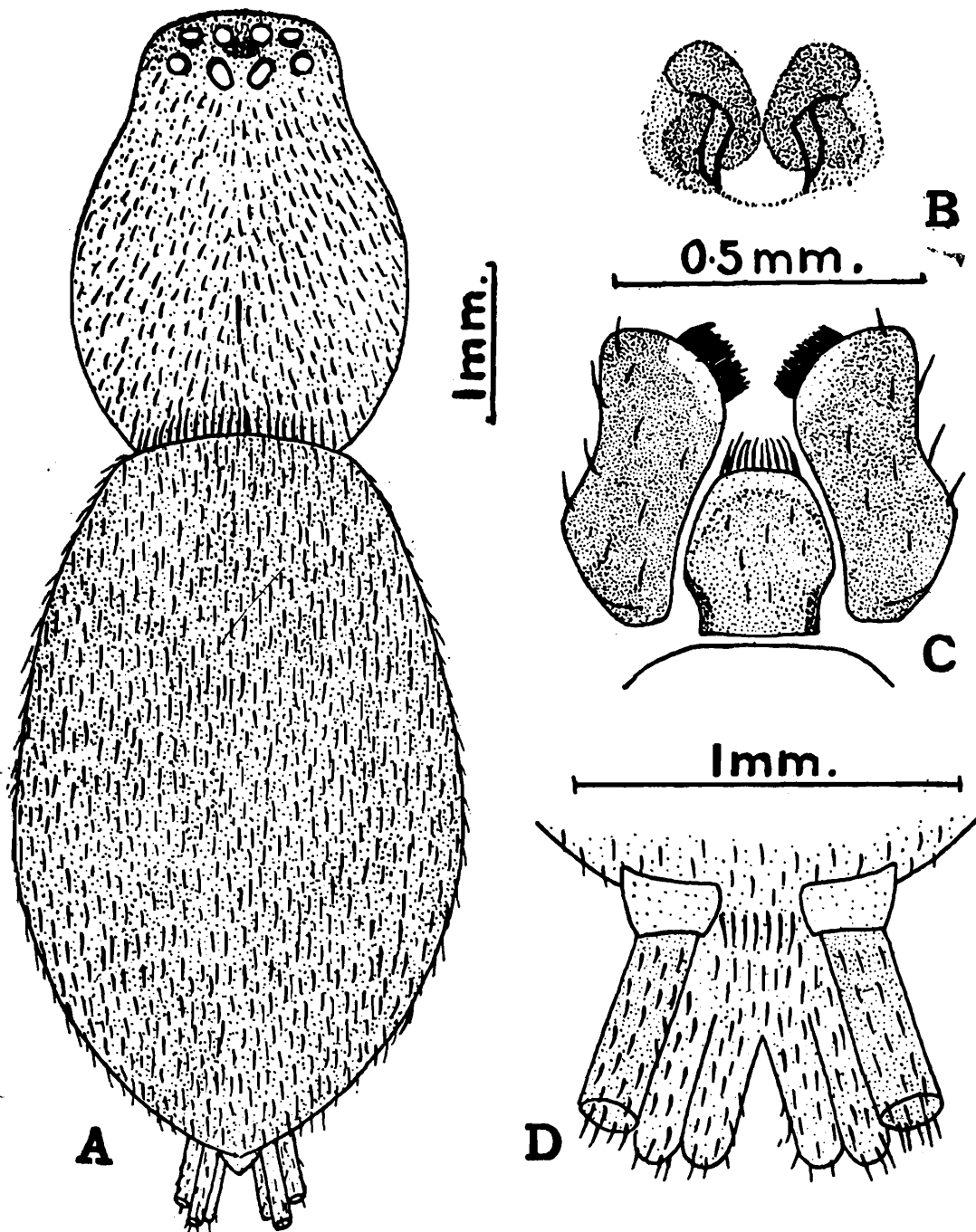
Distribution : Oriental, sub-tropical and temperate regions of the world.

1. *Drassodes pashanensis* n. sp.

General : Cephalothorx and legs light reddish-green. Abdomen brownish-green. Total length 7.60 mm. Carapace 2.90 mm. long, 2.20 mm. wide; abdomen 4.90 mm. long, 3.00 mm. wide.

Cephalothorax : Longer than wide, not very broad in front, thickly clothed with fine hairs, posterior middle provided with a conspicuous fovea. Cephalic region slightly high. Eyes pearly white except anterior medians, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes slightly procurved (as seen from in front), medians slightly larger than the laterals and closer to laterals than to each other. Posterior row of eyes procurved, medians oval, larger than the laterals

and much closer to each other than to the adjacent laterals. Chelicerae moderately strong, inner and outer margin provided with two small teeth and two slightly bigger teeth respectively. Sternum heart-shaped, pointed behind, clothed with fine hairs. Maxillae and labium reddish-green, shape as in text-fig. 1C. Legs relatively long and strong, clothed with hairs and spines. Metatarsi and tarsi I and II provided ventrally with conspicuous scopulae and tarsi with prominent claw tufts. Legs formula 4123.



Text-fig. 1. *Drassodes pashanensis* n. sp. A. Dorsal view of female, legs omitted; B. Epigyne, C. Labium and maxillae, D. Spinnerets.

Abdomen : Longer than wide, narrowing behind, clothed with thick hairs as in text-fig. 1A. Ventral side slightly lighter than the

dorsal. Epigyne as in text-fig. 1B. Spinnerets prominent as in text-fig. 1D.

Holotype female, *paratype* two females in spirit.

Type-locality : Pashan, Poona, Maharashtra, India. Coll. U. A. Gajbe, 23-3-1975.

This species closely resembles *Drassodes indraprastha* Tikader & Gajbe but differs as follows : (i) Anterior median eyes slightly larger than the laterals but in *D. indraprastha* they are of the same size. (ii) Maxillae and labium reddish-green but in *D. indraprastha* maxillae and labium light brownish green. (iii) Epigyne also structurally different.

2. *Drassodes meghalayaensis* n. sp.

General : Cephalothorax and legs reddish brown, abdomen brown. Total length 8.00 mm. Carapace 2.80 mm. long, 2.10 mm. wide; abdomen 5.00 mm. long, 2.40 mm. wide.

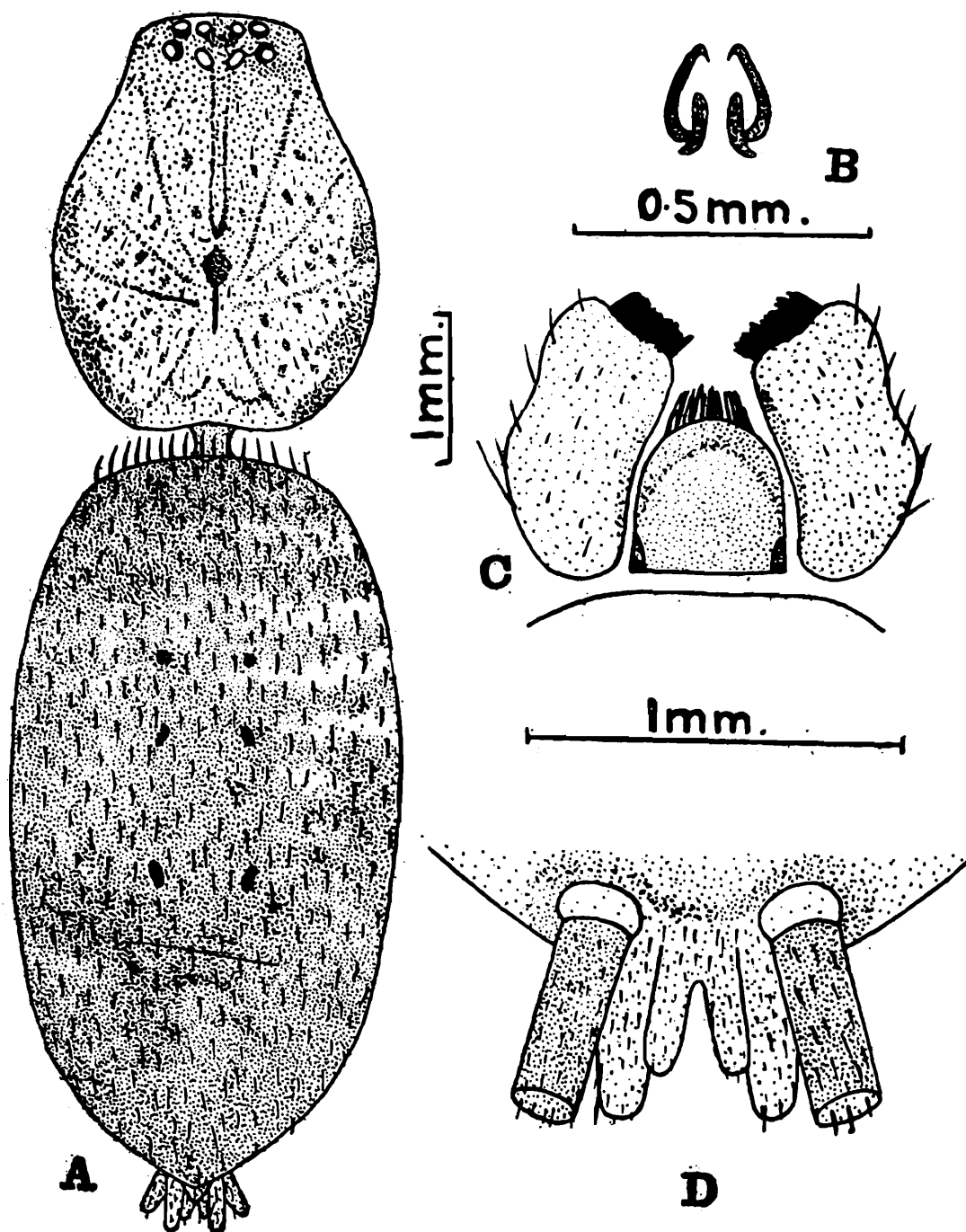
Cephalothorax : Longer than wide, not very broad in front, clothed with pubescence, posterior middle provided with a conspicuous fovea. A pattern of radiating streaks diverges from a short fovea to the sides. Eyes pearly white except anterior medians, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes procurved (as seen from in front), medians slightly larger than the laterals and closer to laterals than to each other. Posterior row of eyes procurved, medians elliptical, slightly smaller than laterals and closer to each other than to adjacent laterals. Chelicerae moderately strong, inner and outer margin provided with two small teeth each. Sternum heart-shaped, pointed behind, clothed with short, black fine hairs. Maxillae and labium light-reddish-green, shape as in text-fig. 2C. Legs relatively long and strong, clothed with hairs and spines. Metatarsi and tarsi of I and II provided ventrally with conspicuous scopulae and tarsi with prominent claw tufts. Legs formula 4123.

Abdomen : Longer than wide, nearly elliptical, clothed with hairs and provided with three pairs of sigilla as in text-fig. 2A. Ventral side lighter than the dorsal. Epigyne as in text-fig. 2B. Spinnerets prominent, anterior spinnerets longer than others as in text-fig. 2D.

Holotype female in spirit.

Type-locality : Degrangiri, Garo Hills, Meghalaya, India. Coll. S. Biswas, 10-11-1973.

This species resembles *Drassodes pashanensis* sp. nov. but differs as follows : (i) Posterior median eyes nearly elliptical but in *D. pashanensis* median eyes oval. (ii) Inner and outer margin of chelicerae provided with two similar teeth each but in *D. pashanensis* inner and outer



Text-fig. 2. *Drassodes meghalayaensis* n. sp. A. Dorsal view of female, legs omitted, B. Epigyne, C. Labium and maxillae; D. Spinnerets.

margin with two dis-similar teeth each. (iii) Epigyne also structurally different.

Genus 2. *Haplodrassus* Chamberlin

1922. *Haplodrassus* Chamberlin, *Proc. Biol. Soc., Wash.*, 35 : 161.

1940. *Haplodrassus* : Comstock, *The spider Book*, New York, 326.

1975. *Haplodrassus* : Platnick & Shadab, *Amer. Mus. Novit.*, 2583 : 5.

Characters : Carapace flat, ocular area narrowed, thoracic region with thin erect black setae, cephalic area not elevated. Anterior row of eyes slightly procurved (as seen from in front) and posterior row of

eyes procurved. Eyes of the anterior row round. Posterior medians larger than others and oblique, and close together, well away from the posterior laterals. Median ocular area as wide behind as in front. Height of the clypeus greater than the diameter of anterior medians. Inner margin of cheliceral furrow bears two teeth and outer margin with two or three teeth. Leg formula 4123. Fourth tibia without spines on dorsal side. Anterior spinnerets widely separated than median or posterior spinnerets. Epigyne with large paired chitinous processes separated by median septum.

Type-species : *Haplodrassus hiemalis* (Emerton).

Distribution : New York, America.

3. *Haplodrassus tehriensis* n. sp.

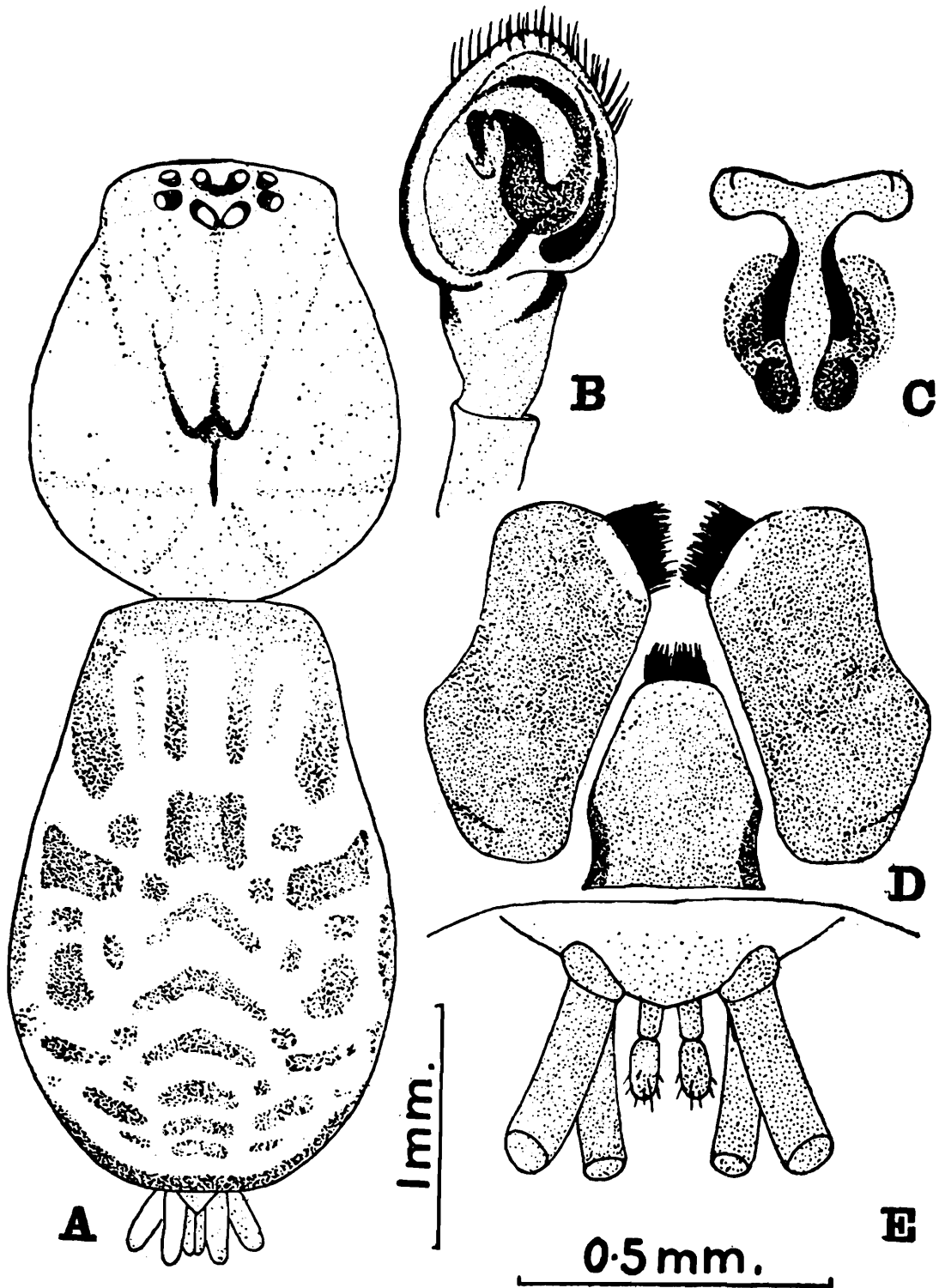
General : Cephalothorax and legs light brownish green. Abdomen light green. Total length 4.40 mm. Carapace 1.90 mm. long, 1.50 mm. wide; abdomen 2.50 mm. long, 1.60 mm. wide.

Cephalothorax : Longer than wide, broad in front, clothed with pubescence, posterior middle provided with a conspicuous fovea, just above the fovea there is a W-shaped conspicuous deep brown marking. Cephalic region slightly high. Eyes pearly white except anterior medians, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes slightly procurved (as seen from in front), medians slightly larger than the laterals and closer to laterals than to each other. Posterior row of eyes procurved, medians oblique, larger than the laterals and closer to each other than to the adjacent laterals. Chelicerae moderately strong, inner and outer margin provided with two and three small teeth respectively. Sternum heart-shaped, pointed behind, clothed with fine hairs. Maxillae and labium light reddish-green, shape as in text-fig. 3D. Legs relatively long and strong, clothed with hairs and spines. Metatarsi and tarsi of I and II provided ventrally with conspicuous scopulae and tarsi with prominent claw tufts. Legs formula 4123. The colour and size of male almost like female, male palp as in text-fig. 10.

Abdomen : Longer than wide, narrowing anteriorly, covered with pubescence and provided with brownish patches as in text-fig. 3A. Ventral side same in colour as dorsal. Epigyne with prominent chitinous ridge as in text-fig. 3C. Spinnerets prominent, anterior spinnerets cylindrical and longer than others as in text-fig. 3E.

Holotype female, *paratype* five females, *allotype* one male in spirit.

Type-locality : Rajchalli Chamba, Dist. Tehri, U. P., India. Coll. J. C. Tripathi, 8-2-1972.

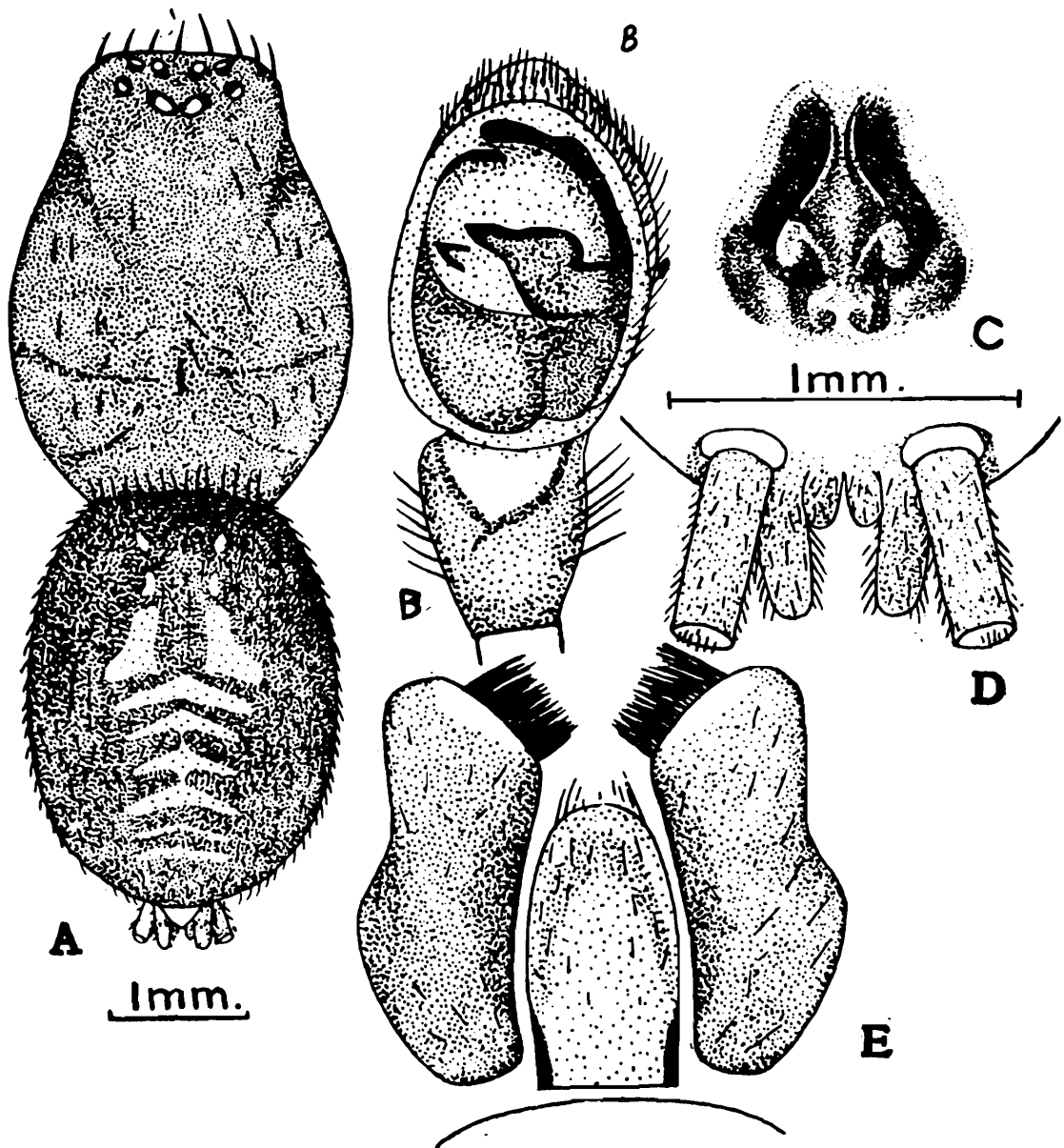


Text-fig. 3. *Haplodrassus tehriensis* n. sp. A. Dorsal view of female, legs omitted, B. Right male palp, ventral view, C. Epigyne, D. Labium and maxillae, E. Spinnerets.

This species resembles *Haplodrassus signifer* (Koch) but differs from it as follows : (i) On the cephalothorax just above the fovea there is a W-shaped deep brown marking but in *H. signifer* there is no such marking. (ii) Abdomen light-green, provided with brownish patches but in *H. signifer* abdomen is gray without brownish patches. (iii) Epigyne also structurally different.

4. *Haplodrassus sataraensis* n. sp.

General : Cephalothorax reddish-green, legs light reddish-green, abdomen dark brown. Total length 6.30 mm. Carapace 3.30 mm long, 2.40 mm. wide; abdomen 3.10 mm. long, 2.20 mm. wide.



Text-fig. 4. *Haplodrassus sataraensis* n. sp. A. Dorsal view of female, legs omitted; B. Right male palp, ventral view; C. Epigyne; D. Spinnerets; E. Labium and maxillae.

Cephalothorax : Longer than wide, broad in front, clothed with fine hairs, posterior middle provided with a conspicuous fovea. Eyes pearly white except anterior medians, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes slightly procurved (as seen from in front), medians slightly larger than the laterals and closer to laterals than to each other. Posterior row of eyes procurved, medians oblique, larger than the laterals and much closer to each other than to the adjacent laterals. Chelicerae moderately strong, inner margin provided with two small similar teeth and outer margin with three

dissimilar minute teeth. Sternum heart-shaped, pointed behind, clothed with fine thick hairs. Maxillae and labium reddish-green, shape as in text-fig. 4 E. Legs relatively long and strong, clothed with hairs and spines. Metatarsi and tarsi I and II provided ventrally with conspicuous scopulae and tarsi with prominent claw tufts. Legs formula 4123. The colour and size of male almost like female, male palp as in text-fig. 4B.

Abdomen : Longer than wide, nearly elliptical, clothed with thick hairs and provided with chalk-white chevrons as in text-fig. 4A. Ventral side same as dorsal. Epigyne with prominent chitinous ridge as in text-fig. 4C. Spinnerets prominent, anterior spinnerets cylindrical and longer than others as in text-fig. 4D.

Holotype female, *allotype* two males in spirit.

Type-locality : Ambanali village near Mahabaleswar, Dist. Satara, Maharashtra, India. Coll. M. Babu Rao, 9-2-1973.

This species resembles *Haplodrassus tehriensis* sp. nov. but differs as follows : (i) Cephalothorax without markings but in *H. tehriensis* just above the fovea there is a W-shaped deep brown marking. (ii) Abdomen provided with chalk-white chevrons but in *H. tehriensis* abdomen provided with brownish patches. (iii) Epigyne and male palp also structurally different.

Genus 3. *Geodrassus* Chamberlin

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

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

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

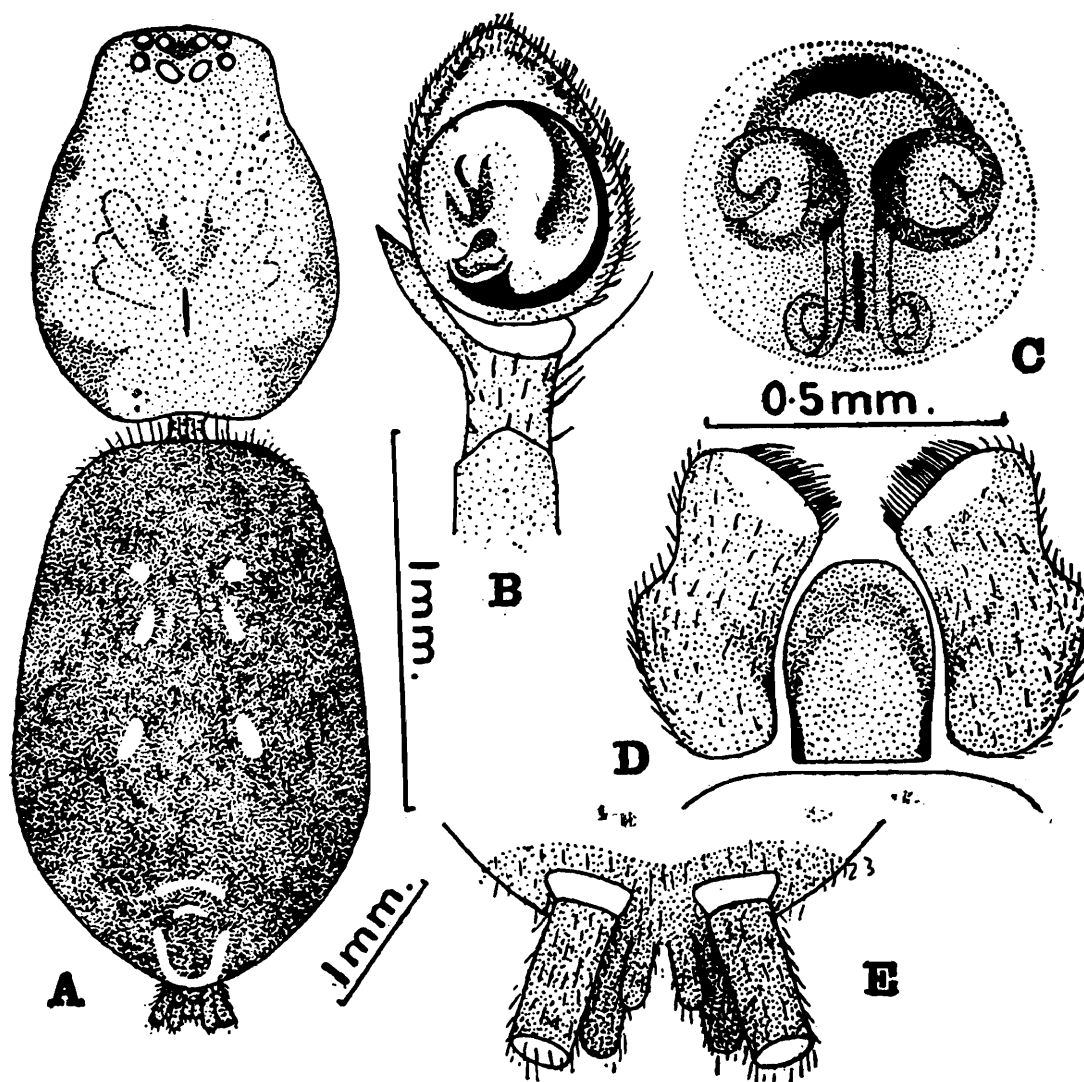
Type-species : *Geodrassus gosiutus* (Chamberlin)

Distribution : Utah, America.

5. *Geodrassus sirmourensis* sp. nov.

General : Cephalothorax and legs reddish-green, abdomen brown. Total length 6.50 mm. Carapace 2.50 mm. long, 2.00 mm. wide; abdomen 3.80 mm. long, 2.30 mm. wide.

Cephalothorax : Longer than wide, broad in front, clothed with fine thick black hairs, posterior middle provided with a conspicuous fovea. Pattern of radiating streaks diverges from a fovea to the sides. Eyes pearly white except anterior medians, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes procurved



Text-fig. 5. *Geodrassus sirmourensis* n. sp. A. Dorsal view of female, legs omitted; B. Right male palp, ventral view; C. Epigyne; D. Labium and maxillae; E. Spinnerets.

(as seen from in front), medians smaller than the laterals and closer to laterals than to each other. Posterior row of eyes procurved, medians oval, larger than laterals and much closer to each other than to the adjacent laterals. Chelicerae moderately strong, inner and outer margin provided with one and three teeth respectively. Sternum heart-shaped, pointed behind, clothed with fine thick hairs. Maxillae and labium reddish-green, shape as in text-fig. 5D. Legs relatively long and strong, clothed with hairs and spines. Metatarsi and tarsi of I and II provided ventrally with conspicuous scopulae and tarsi with prominent claw tufts. Legs formula 4123. Male smaller than female but colouring pattern is the same, male palp as in text-fig. 5B.

Abdomen : Longer than wide, nearly elliptical, clothed with thick hairs, provided with three pairs of sigilla and U-shaped white marking at the posterior end as in text-fig. 5A. Ventral side lighter than the dorsal. Epigyne as in text-fig. 5C. Spinnerets prominent, anterior spinnerets cylindrical and longer than others as in text-fig. 5E.

Holotype female, *paratype* one female, *allotype* one male in spirit.

Type-locality : Renuka lake, Dist. Sirmour, Himachal Pradesh, India. Coll. Arun Kumar, 5-4-1974.

This species resembles *Geodrassus phanus* Chamberlin but differs from it as follows : (i) Carapace and legs reddish-green but in *G. phanus* carapace and legs light brown. (ii) Posterior median eyes oval but in *G. phanus* posterior median eyes angular and oblique. (iii) Epigyne also structurally different.

Genus 4. *Nodocion* Chamberlin

1922. *Nodocion* Chamberlin, *Proc. Biol. Soc. Wash.*, 35 : 154.

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

Characters : The lower margin of the furrow of the chelicera is completely unarmed as in *Liodrassus*. The anterior median eyes are considerably smaller than the lateral eyes. The median ocular quadrangle is narrowed in front, the anterior median eyes smaller than the posterior median. The chelicerae are armed in front with a thick covering of stiff bristles.

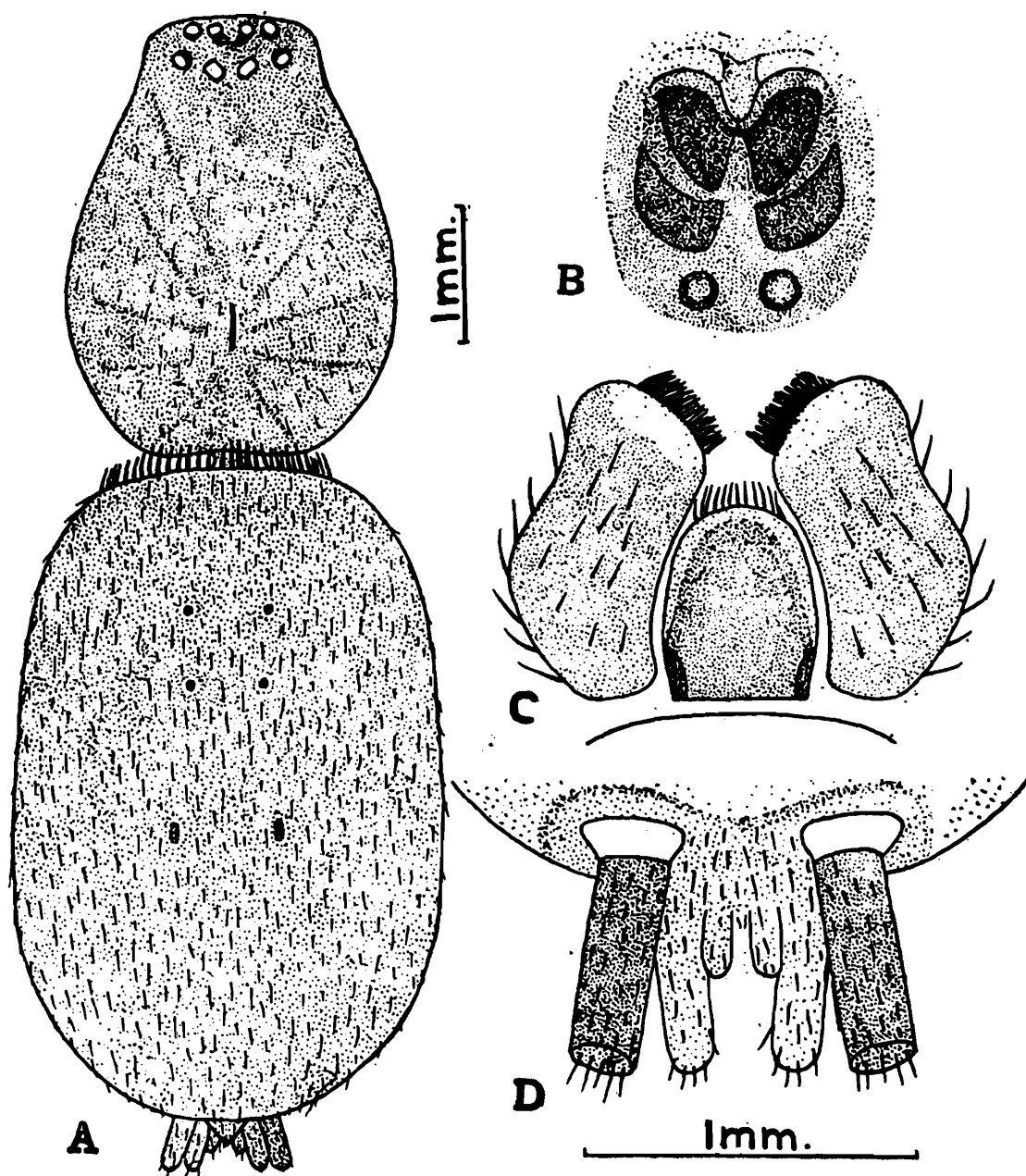
Type-species : *Nodocion mateonus* Chamberlin.

Distribution : California, America.

6. *Nodocion solanensis* sp. nov.

General : Cephalothorx and legs reddish-green, abdomen light brownish-green. Total length 8.80 mm. Carapace 3.50 mm. long, 2.40 mm. wide; abdomen 5.20 mm. long, 3.30 mm. wide.

Cephalothorax : Longer than wide, broad in front, clothed with pubescence, posterior middle provided with a conspicuous short fovea. Pattern of radiating streaks diverge from a short fovea to the sides. Eyes pearly white except anterior medians, posterior row of eyes slightly longer than the anterior row. Anterior row of eyes procurved (as seen from in front), medians smaller than the laterals and closer to laterals than to each other. Posterior row of eyes procurved, medians elliptical, slightly larger than the laterals and closer to each other, than to the adjacent laterals. Chelicerae moderately strong, inner margin without tooth and outer margin provided with teeth. Sternum heart-shaped, pointed behind, clothed with fine hairs. Maxillae and labium reddish-green, shape as in text-fig. 6C. Legs relatively long and strong, clothed with hairs and spines. Metatarsi and tarsi of I and II provided ventrally with conspicuous scopulae and tarsi with prominent claw tufts. Legs formula 4123.



Text-fig. 6. *Nodocion solanensis* n. sp. A. Dorsal view of female, legs omitted; B. Epigyne; C. Labium and maxillae; D. Spinnerets.

Abdomen : Longer than wide, nearly elliptical, clothed with hairs and provided with three pairs of sigilla as in text-fig. 6A. Ventral side lighter than the dorsal. Epigyne as in text-fig. 6B. Spinnerets prominent, anterior spinnerets cylindrical and longer than others as in text-fig. 6D.

Holotype female in spirit.

Type-locality : Kasoli, Dist. Solan, Himachal Pradesh, India. Coll. H. P. Agarwal 22-12-1972.

This species resembles *Nodocion mateonus* Chamberlin but differs from it as follows : (i) Carapace and legs reddish-green but in *N. mateonus* carapace and legs yellow. (ii) Abdomen light-brownish-green without a median longitudinal darker stripe but in *N. mateonus* abdomen yellowish with a median longitudinal darker stripe. (iii) Posterior median eyes elliptical but in *N. mateonus* posterior median eyes oblique and angular. (iv) Epigyne also structurally different.

ACKNOWLEDGEMENTS

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FOOD AND FEEDING HABITS OF SOME REPTILES OF RAJASTHAN

By

R. C. SHARMA AND T. G. VAZIRANI

Desert Regional Station, Zoological Survey of India, Jodhpur

(With 3 plates)

INTRODUCTION

Many papers on Indian reptiles include some information regarding their food and feeding habits but very little is known so far concerning the reptiles of Rajasthan. Among the few papers dealing with food of reptiles in Rajasthan, mention may be made of the researches by Dave (1961), as quoted by Prakash, (1973) who considers *Uromastix hardwickii* to be herbivorous. Sunder Singh (1960) has given some information on the food of snakes of Pilani. Rathore (1969) has published a detailed account of the food and feeding habits of Indian sand skink, *Ophiomorus tridactylus*, while Prakash (1973) has concluded this lizard to be insectivorous by laboratory experiments. Prakash (1971) published a short article on *Testudo elegans* and has given a brief account of its food at Bisalpur (Jodhpur) and the same author (1972) has given some remarks on the food of a few lizards. Prakash (1973) has presented a review of the observations on the ecology and zoogeography of the reptiles of Indian desert. He states 'Most of lizards thrive upon grasshoppers, crickets, beetles, dragonflies, antlions, butterflies and termites. Spiders have also been found in *Mabuya dissimilis* vide Minton (1966).

The present paper embodies the results of studies on 3 testudines, 16 lizards and 8 species of snakes. Some observations were made in the field by the first-named author and the stomach contents have been examined, of the material preserved at the Desert Regional Station, Zoological Survey of India, Jodhpur.

The first-named author has identified the reptiles and has made the field observations mentioned in the text while the last-named author has determined the insects in the stomach contents. The name of the collector of the specimens under study, is also given.

Order TESTUDINES

Family TESTUDINIDAE

1. *Testudo elegans* Schoepff

(Indian star tortoise)

Material examined.—1 ex., Udaipur, Udaipur Dist., 9. iii. 1972; 1 ex., Forest plantation, Burr, Ajmer Dist., 10. viii, 1973; 1 ex., *ca.* 15 km. from Burr towards Ajmer (on Beawar-Ajmer Road), 11. viii. 1973. All colln. by R. C. Sharma.

Stomach contents.—Vegetable matter.

Remarks.—On 10. viii. 1973 at Forest plantation, Burr, the tortoise was observed for many hours feeding on grass and other vegetable matter. It passed large amount of greenish and whitish excreta twice. On examination it was found that the excretory matter contained only vegetable waste. In captivity it rejected animal food namely, the raw flesh, insects and arachnids but freely devoured the vegetables.

Family TRIONYCHIDAE

2. *Trionyx gangeticus* Cuvier

(Indian soft shell turtle)

Material examined.—1 ex., Satlana village tank *ca.* 36 km. S. of Jodhpur, Jodhpur Dist., 9. i. 1964. coll., R. S. Pillai. 1 ex., Surpur; *ca.* 4 km. N. W. of Dungarpur, Dungarpur Dist., 26. iii. 1964. coll. R. N. Bhargava.

Stomach contents.—Nothing was found.

Remarks.—This turtle is well known as omnivorous and was observed in captivity by the first-named author, feeding on aquatic weeds, plants, grasses, small fishes, earthworms, raw flesh, tadpoles, gram seeds, wheat flour, groundnuts, bread and other eatables.

3. *Lissemys punctata punctata* (Lacépède)

(Indian flap shell turtle)

Material examined.—2 ex., Sardarsamand, Pali Dist., 7. viii. 1963, coll. G. M. Yazdani.

Stomach contents.—Insecta : Hymenoptera : 12 black, medium sized ants (family Formicidae). Vegetable matter : 1 plant seed; digested vegetable matter.

Remarks.—It is omnivorous and a voracious feeder and devours almost everything which is considered worth eating *e.g.*, aquatic vege-

tation, plant leaves, flowers, fruits, grasses, all kind of seeds and flesh of any kind.

Order SQUAMATA
Suborder SAURIA
Family GEKKONIDAE

4. *Stenodactylus orientalis* Blanford
(Sind sand gecko)

Material examined.—2 exs., Agolai village, Jodhpur Dist., 21. vii. 1972; 3 exs., Balotra, Barmer Dist., 3. viii. 1973; 2 exs., Osian village, Jodhpur Dist.; 7. x. 1973. All coll. by R. C. Sharma.

Stomach contents.—Insecta : Orthoptera : Head of longhorned grasshopper; legs of grasshopper. Lepidoptera : 1 caterpillar. Coleoptera : 2 larvae of the beetles of family Scarabaeidae; 1 unidentifiable larva; 9 ex. beetles. Hemiptera : 8 Jassids in the gut and numerous parts of the same down the gut. Diptera : 1 Asilidae. Acarina : 1 Tick. Vegetable matter : Seeds of some wild plants.

Remarks.—These nocturnal, fringe-toed lizards are abundant in many localities like Agolai, Balotra and Osian in Rajasthan, where they were observed by the first-named author running on sand dunes immediately after sunset in search of food. From July to October their food comprises mainly of longhorned grasshoppers, beetles and their larvae, lepidopterous larvae, jassids, asilids and ticks.

Minton (1966) states that they feed on termites and other soft bodied insects. Ticks and beetles now recorded in its stomach contents are hardly soft bodied. Our studies show a much larger variety of food consumption than known hitherto.

This record from Rajasthan not only confirms Minton's presumption that the species extends to western 'Rajputana' upto Kirthar Range but it also occurs quite close to Jodhpur.

5. *Cyrtodactylus scaber* (Heyden)
(Keeled rock gecko)

Material examined.—1 ex., Mandalgarh, Bhilwara Dist., 8. iii. 1972; 5 exs., Buchetty village, Jodhpur Dist., 25. vii. 1972; 1 ex., Osian, Jodhpur Dist., 2. xii. 1972. All coll. by R. C. Sharma.

Stomach contents.—Insecta : Orthoptera : 1 Gryllid (entire). Coleoptera : 1 ex. (1.7 mm.); elytra of beetles; mandibles of larvae (possibly of Scarabaeid beetles). Diptera : Portion of some insect. Hymenoptera : 1 ant (1.5 mm). Scorpionida : 1 Scorpion (sting and other body parts).

Remarks.—The food of this species has not been recorded earlier by any worker. The species was collected by the first-named author mostly during night.

Minton (1966) mentions that the species has been collected by him in areas of dry grassland, on rocky hill sides and in moderately sandy desert and does not often enter inhabited buildings. However the collections made above are almost under similar conditions, but in these areas it is quite acclimatized to living in inhabited houses where it may be found in company of *Gryllus* spp. hiding under stones/bricks. In the same house, other lizards such as *Hemidactylus brooki* and *Hemidactylus flaviviridis* may also be present.

Regarding range of distribution Minton (1966) includes Rajputana westwards to Egypt; except this mention (without any specific locality) there appears to be no other record from Rajasthan. The present collection from Rajasthan adds to its eastern range of distribution and observations on its food have been made for the first time.

6. *Cyrtodactylus fedtschenkoi* (Strauch) (Turkistan rock gecko)

Material examined.—1 ex., Burr, Ajmer Dist., 9. viii. 1973; 3 exs., Sandra, Ajmer Dist., 11. viii. 1973; 5 exs., A hill near Madar T. B. Sanitorium, Madar, Ajmer Dist., 11. viii. 1973. All coll. by R. C. Sharma.

Stomach contents.—Insecta : Orthoptera : Legs, mandibles, abdomen of Gryllids. Coleoptera : 3 beetles belonging to 3 species of Scarabacidae and other families, 1 larva. Hymenoptera : 1 ex. ♂, Braconidae. Vegetable matter : Seeds and fibres of some wild plants. Miscellaneous : Heads and wings of 4 small insects.

Remarks.—The food of this species is being recorded for the first time. Occurrence of this species from India thus extending its eastern range of distribution from Pakistan (Baluchistan) to middle of Rajasthan.

7. *Hemidactylus triedrus* (Daudin) (Blotched gecko)

Material examined.—2 exs., Bhensair, Chamundia near Jodhpur, 3. viii. 1970, coll., L. S. Rathore.

Stomach contents.—Insecta : Coleoptera : 3 beetles (2 species) evidenced by elytra and wings. Lepidoptera : 1 pupa. Hemiptera : 1 ex. (head only). Arachnida : 1 spider.

Remarks.—Smith (1935) quotes Deraniyagala stating that termites appear to be favourite food of this species. Minton (1966) states that

stomach contents of this species indicated crickets, grasshoppers and spiders. Our observations add Coleoptera, Hemiptera and Lepidopterous pupae to the known range of its food.

8. *Hemidactylus brooki* Gray (Spotted Indian house gecko)

Material examined.—4 exs., Bisalpur Dam, Jodhpur Dist., 17. i. 1972; 1 ex., Banswara, Banswara Dist., 18. iii. 1972; 1 ex., Achalgarh, Mt. Abu, Sirohi Dist., 21. iii. 1972; 11 exs., Hemawas Dam, Pali Dist., 28. vii. 1972; 6 exs., Kharda Dam, Pali Dist., 11. viii. 1972; 13 exs., Kharda Dam, Pali Dist., 27. ix. 1972; 1 ex., Salawas, Jodhpur Dist., 28. ix. 1972; 1 ex., Hemawas Dam, Pali Dist., 28. ix. 1972. All coll. by R. C. Sharma; 4 exs., Hemawas, Pali Dist., 26. vi. 1973, coll., K. C. Kansal.

Stomach contents.—Insecta : Orthoptera : 1 nymph, 1 grasshopper (wings, head, etc.). Coleoptera : 5 exs., belonging to Scarabaeidae and other families (as evidenced by elytra, head, pronotum etc.); 1 larva and parts of other larvae. Diptera : 3 exs. (in parts). Hymenoptera : many ants. Isoptera : many examples. Dictyoptera : 1 ex. Blattidae : Wings and parts of unidentifiable insects. Arachnida : 7 spiders, whole as well as in parts. Vegetable matter : Seeds of wild plants.

Remarks.—This species leads a harmonious existence with *Cyrtodactylus scaber* and *Hemidactylus flaviviridis* in most of the localities at Jodhpur and its vicinity. It has been collected from almost all parts of Rajasthan. Its range of distribution is very wide and includes Borneo, South China, to the east and upto northern half of Africa to the west. It feeds on a large variety of insects as shown above. One specimen from Achalgarh, Mt. Abu, contained a nematode in the stomach as a parasite.

9. *Hemidactylus flaviviridis* Rüppell (Yellow bellied house gecko)

Material examined.—1 ex., Pichyak Dam, Bilara, Jodhpur Dist., 22. vii. 1971; coll. P. D. Gupta, 5 exs., Pantela Dam ca. 13 km. W. of Banswara, Banswara Dist., 15. iii. 1972; 2 exs., ca. 4 km. on Banswara-Ratlam Road, Banswara Dist., 18. iii. 1972; 1 ex., Kharda Dam, Pali Dist., 11. viii. 1972; 1 ex., Paota, Jodhpur, Jodhpur Dist., 29. ix. 1972; 2 exs., Osian, Jodhpur Dist. 7. viii. 1972; 1 ex. Hemawas Dam, Pali Dist., 22. xii. 1972; All colln. by R. C. Sharma. 2 exs., Maroth village ca. 13 km. N. W. of Kuchaman city, 17. vii. 1973; 1 ex., Shyamgarh 10 km. E. of Maroth, Nagaur Dist., 18. vii. 1973; coll. Y. P. Sinha, 1 ex., Forest plantation, Burr, Ajmer Dist., 10. vii. 1973; Sandera village, Ajmer Dist., 11. viii. 1973, coll., R. C. Sharma.

Stomach contents.—Insecta : Orthoptera : 5 exs. Grasshoppers (legs, pronotum, wings etc.); 1 nymph of family Gryllidae. Lepidoptera : 2 Moths (complete specimens from the foregut); 2 caterpillars of moths. Coleoptera : 17 exs., of beetles (5 species), most of them belonging to Scarabacidae and Elateridae, represented by body parts (elytra, heads, abdomen and legs etc.) of at least 5 different species. Diptera : 1 ex. Muscidae (wings, legs and thorax). Hemiptera : 5 exs., one complete ex. and others in parts (thorax, mandibles and abdomen). Hymenoptera : 1 ant. Isoptera : 36 exs. (alate cast). Miscellaneous: Chitinous portions of head, wings, and legs of unidentifiable insects; 1 insect larva with prominent curved mandibles; 1 insect pupa. Arachnida : 3 spiders (body parts).

Remarks.—The food of this most common and mainly nocturnal house lizard has been recorded recently by Minton (1966) as "various insects" The insects found in the stomach contents now are listed above. The species was found catching a centipede by the first-named author. That the species also feeds on spiders and centipedes is not surprising in view of Minton's (*l.c.*) observations that the species is pugnacious and often pursues smaller geckos of its own or other species. 4 specimens were found to contain some nematode worms as parasites in the gut/stomach.

Family AGAMIDAE

10. *Sitana ponticeriana* Cuvier (Sargota lizard)

Material examined.—1 ex., Mewara village (near Bichewara: Dungarpur Dist., 11. iii. 1972; 4 exs., Surwania Dam, Banswara Dist.) 16. iii. 1972; 2 exs., Bajajsagar, Banswara Dist., 17. iii. 1972; 3 exs., *ca.*, 16 km. E. of Banswara, 18. iii. 1972; 1 ex., Forest Plantation, Burr, Ajmer Dist., 10. viii. 1973. All colln. by R. C. Sharma.

Stomach contents.—Insecta : Orthoptera : 1 grasshopper (body parts). Coleoptera : 7 beetles (3-4 species) as evidenced by elytra, legs and other chitinous parts; 2 larvae. Hemiptera : 3 exs. (head and wings). Hymenoptera : 7 ants (heads and legs). Miscellaneous : 1 larva; semi-digested parts, legs and wings of unidentifiable insects. Arachnida : 1 spider.

Remarks.—The food of this agamid lizard which inhabits the moist hilly areas of central and southern Rajasthan, does not appear to have been reported earlier. Minton (1966) remarks that the species does not occur in true desert. From localities of our collection Minton's remarks stand corroborated. The species extends from Sri Lanka, South India to Pakistan (Sind only).

11. *Calotes versicolor* (Daudin)
(Indian garden lizard)

Material examined.—1 ex., Chirula village ca. 22 km. S. of Banswara, Banswara Dist., 16. iii. 1972; 1 ex., Satlana village, Jodhpur Dist., 3. ix. 1972. All colln. by R. C. Sharma.

Stomach contents.—Insecta : Lepidoptera : 1 caterpillar of a moth; 1 butterfly. Coleoptera : 4 exs. beetles (one belonging to the family Carabidae). Odonata : 1 ex. dragon fly (evidenced by wing and other body parts). Hymenoptera: 13 exs. ants. Miscellaneous : 1 insect larva, numerous insect legs. Arachnida : 1 spider.

Remarks.—This lizard is completely diurnal. Smith (1935) states that it is a very common garden lizard, which is widely distributed from Indochina to Afghanistan and feeds on insects and their larvae, spiders, etc. and that the species is also known to consume young lizards in the nest. Minton (1966) specifically mentions grasshoppers and butterflies. Prakash (1973) has stated that spiders are also found in the stomach contents of this species besides the general insect food. The above observations are largely supported with more specific mention of the insect orders taken as food.

12. *Agama agilis* Olivier
(Brilliant agama)

Material examined.—1 ex, Pichyak Dam, Jodhpur Dist., 22. vii. 1971; 1 ex Bhopalgarh, Jodhpur Dist., 27. viii. 1972; 1 ex., Osian village, 7. x. 1972; 1 ex., Osian village, 4 vii. 1973; 5 exs, Jasol village near Balotra, Barmer Dist., 4. viii. 1973, All colln. by R. C. Sharma.

Stomach contents.—Insecta: Orthoptera : 1 grasshopper (abdomen); Coleoptera : 6 beetles (3-4 species mostly belonging to the family Scarabaeidae, as evidenced by elytra, legs, pronotum etc), 2 larvae of the family Scarabaeidae. Hemiptera : 1 bug (body parts and head). Hymenoptera : 3 ex., (2 species) evidenced by wings and body parts; numerous ants (2 or more species). Miscellaneous : Chitinous parts such as wings, legs, head etc of unidentifiable insects.

Remarks.—The food of this diurnal lizard has been reported by Minton (1966) as crickets and grasshoppers. A much wider variety of insect food is indicated in the present studies. The species extends from Iraq and Arabia to Western Rajasthan as pointed out by Minton who has however not indicated the exact localities of Rajasthan. Plenty of nematodes and a piece of small stone was also found in the gut of some of the specimens from Jasol village near Balotra.

13. *Uromastix hardwickii* Gray
(Indian spiny tailed lizard)

Material examined.—1 ex., Sardarsamand, Pali Dist., 20. ii. 1963; 1 ex., Satlana, Jodhpur Dist., 20. x. 1963. All coll., *Motilal*.

Stomach contents.—Insecta : Colcoptera : 1 beetle (legs and elytra). Vegetable matter : grass and other vegetable matter.

Remarks.—It is well known that this species is wholly vegetarian though newly hatched lizards may also feed on insects as mentioned by Minton (1966). Field observations (of the first-named) corroborate this very well. The presence of coleopterous elytra in one of the examples appears to be accidental. In view of the present study the observations of Pradhan (1971) and Bhanotar, Bhatnagar, Srivastava and Mahto (1973) reporting the species as feeding on *Schistocerca gregaria* cannot be corroborated as its normal food under natural conditions.

Family SCINCIDAE

14. *Mabuya macularia* (Blyth)
(Bronze grass skink)

Material examined.—1 ex., Kankroli, Udaipur Dist., 24. xii. 1961; coll., A. K. Datta; 6 exs., Pipar City, Jodhpur Dist., 23. v. 1963, coll., *Motilal*.

Stomach contents.—Insecta : Orthoptera : 3 grasshoppers (legs and body parts). Colcoptera : 1 beetle (body parts). Hemiptera : 1 bug (badly digested body parts). Hymenoptera : 6 ants (head, down the rectum). Miscellaneous : Semi digested parts of insects. Arachnida : 1 spider (body parts).

Remarks.—The food of this nocturnal skink has not so far been reported by any worker. Prakash (1973) mentions that spiders constitute as part of the food of the related species *Mabuya dissimilis*. Our studies show that *Mabuya macularia* consumes a wide variety of insects more than the spiders. The species is widely distributed from Indo-china to Pakistan (Southern Baluchistan and Sind).

15. *Eumeces taeniolatus* (Blyth)
(Yellow bellied mole skink)

Material examined.—1 ex., Jodhpur, July 1972; 1 ex., Kharda Dam, Pali Dist., 11. viii. 1972, coll. R. C. Sharma; 2 exs., Jodhpur, August, 1972, coll. R. Dheer; 1 ex., Borunda village, Jodhpur Dist., 15. xii. 1972, coll. R. C. Sharma.

Stomach contents.—Insecta : Coleoptera : 2 beetles (elytra, wings,

head, legs, thorax and abdomen); 1 larva. Hymenoptera: 6 ants (1 entire, 5 heads).

Remarks.—Minton (1966) has observed that they feed poorly and spend most of their time buried and that beetle larvae seem to be their chief food. This lizard has been observed to be equally comfortable in sandy burrows and under stones in rocky habitats in Rajasthan. Besides larvae of beetles as stated by Minton (1966), adult beetles ants and other softbodied insects were found in the stomach contents. While Smith (1935) includes, 'Rajputana' as within the range of distribution by this species, Minton (1966) has omitted it. Prakash (1972) has recorded *Eumeces taeniolatus* from Rajasthan at Jhunjhunu (Sikar Dist.). He has also recorded chitinous parts of beetles from its stomach contents.

16. **Ophiomorus tridactylus** (Blyth)
(Indian sand skink, Indian sand fish)

Material examined.—1 ex., Barmer, Barmer Dist., 1969, coll., M. S. Rathore; 1 ex., S'hergarh, Jodhpur Dist., 11. ii. 1970, coll., S. K. Dutta; 1 ex., Sawantgarh ca. 8 km. E. of Maroth, Nagaur Dist., 18. vii. 1973, coll., Y. P. Sinha; 1 ex., Bari-Jagiwalkala village on Jodhpur-Bhopalgarh Road, Jodhpur Dist., 27. viii. 1972, coll. R. C. Sharma.

Stomach contents.—Insecta : Coleoptera : 1 beetle, family Buprestidae. Hemiptera : 1 bug (head). Hymenoptera : 6 ants. Miscellaneous : Legs and other body parts of insects.

Remarks.—This species was first recorded from Rajasthan by Rathore (1969), who states that termites (Isoptera) form by far the majority of its food throughout the year while beetles, butterflies, moths, crickets and grasshoppers are also consumed. Minton (1966) also mentions termites and Neuroptera (ant lions) as its food. Bhanotar, Bhatnagar and Mahto (1971) state the species to be predatory on insect eggs.

Family LACERTIDAE

17. **Acanthodactylus cantoris cantoris** Günther
(Indian fringe-toed sand lizard)

Material examined.—1 ex., Bori village ca. 40 km. N. of Jodhpur, 25. v. 1963, coll. R. S. Pillai; 1 ex., Agolai village ca. 46 km. W. of Jodhpur, 28. v. 1963, coll. K. C. Kansal; 1 ex., Salawas village ca. 40 km. S. W. of Jodhpur, 13. vi. 1963, coll., R. C. Sharma; 1 ex., Agolai village, Jodhpur Dist., 4. xi. 1966, coll. V. C. Agrawal; 1 ex., Mathania village, Jodhpur Dist., 18. vi. 1969, coll. G. M. Yazdani; 1 ex., Osian,

Jodhpur Dist., 7. x. 1972, coll. *R. C. Sharma*; 1 ex., Osian, Jodhpur Dist., 4. vii. 1973, coll. *R. C. Sharma*; 1 ex., Shyamgarh, near Maroth, Nagaur Dist., 18. vii. 1973, coll. *Y. P. Sinha*; 1 ex., Jasol village, Balotra, Barmer Dist., 4. viii. 1973, coll. *R. C. Sharma*; 1 ex., Bevatia village ca. 5 km. from Burr village, Ajmer Dist., 10. viii. 1973, coll., *R. C. Sharma*.

Stomach contents.—Insecta : Orthoptera : 2 grasshoppers (legs, wings) : 1 nymph. Lepidoptera : 5 caterpillars; Coleoptera: 24 exs., belonging to Scarabaeidae, Buprestidae and Curculionidae as evidenced by elytra, legs, wings etc.; 10 larvae of family Scarabaeidae; Hemiptera : 4 exs., (1 whole and others in parts). Hymenoptera : 13 ants (complete) with numerous heads, legs. Isoptera: *Odontotermes* sp. (6 exs., soldier caste; 10 exs., worker caste; 4 exs., only parts). Neuroptera: 1 larva. Miscellaneous : legs, wings, mandibles and other chitinous parts of insects (Plate I, Figs. 1-3).

Remarks.—Minton (1966) writes that this subspecies is found in Pakistan (Sind, Punjab and Baluchistan) and that it seems to be a form of the coastal plain, desert basins and sandy plains of rivers and it avoids the mountains. It has been recently recorded from Rajasthan by Singh and Singh (1971). Bhatnagar and Bhanotar (1973) observed its general behaviour in Thar desert. The first named author has collected the specimens in the crevices of the hillocks around Jodhpur.

While nothing is known about the food of this subspecies, *blanfordi* has been recorded to feed on crickets, grasshoppers, butterflies, caterpillars, beetles and unidentified flying insects Minton (*l.c.*). Our studies on the stomach contents of an allied subspecies reveals a large variety of insects as its food.

18. *Ophisops microlepis* Blanford (Korba snake-eyed lizard)

Material examined.—1 ex., Pipar city ca. 40 km. N. W. of Jodhpur, 9. ix. 1961; 1 ex., Bijolai tank ca. 12 km. S. W. of Jodhpur, 6 vi. 1963, coll. *R. C. Sharma*; 1 ex., Hemawas Dam, Pali Dist., 28. vii. 1972, coll., *R. C. Sharma*; 1 ex., Hemawas Dam, 6. iii. 1973, coll. *R. C. Sharma*; 1 ex., Barawali village ca. 16 km. from Jawai Dam, 25. v. 1973, coll. *Y. P. Sinha*; 1 ex., Bishalpur village ca. 6 km. from Jawai Dam, 26. v. 1973, coll. *Y. P. Sinha*; 1 ex., Pichyak Dam, Bilara, Jodhpur Dist., 23. vi. 1973, coll. *R. C. Sharma*.

Stomach contents.—Insecta : Orthoptera : 1 grasshopper. Lepidoptera : 2 caterpillars of moths. Coleoptera : 1 larva of Scarabaeidae; 1 ex., family Elateridae. Hemiptera : 2 ex., Isoptera : *Odontotermes* sp. (in one ex.) unidentified numerous workers, 10 exs., soldier caste.

Miscellaneous : 1 wing, 1 larva and other chitinous parts. Arachnida : 1 spider. Vegetable matter: some unidentified vegetable fibres (plate II, Figs. 1-5).

Remarks.—From the stomach contents it is observed that it is mainly a predator on termites though it may take other insects as well.

This species does not appear to cross the desert into Sind (Pakistan).

19. *Varanus bengalensis* (Daudin) (Indian monitor lizard)

Material examined.—1 ex., Lalmaidan, Jodhpur, Jodhpur Dist. 6. xi. 1961, coll. *Ramreet Singh*; 1 ex., Banad village ca. 10 km. E. of Jodhpur, Jodhpur Dist., 1. ix. 1962, coll., *Motilal*; 1 ex., Paota, Jodhpur, Jodhpur Dist., 31. viii. 1963, coll. *R. C. Sharma*; 1 ex., Lalmaidan Jodhpur, Jodhpur Dist., 27. v. 1964, coll. *S. K. Baxi*; 1 ex., Patodi House, Paota, Jodhpur, Jodhpur Dist., 10. vii. 1967, coll. *Motilal*; 1 ex., Hemawas Dam, Pali Dist., 22. ix. 1971, coll. *P. D. Gupta*; 1 ex., Pichyak Dam, Bilara, Jodhpur Dist. 16. viii. 1972, coll. *R. C. Sharma*; 1 ex., Vishnoi. Ki Dhani on Jodhpur-Bilara Road, Jodhpur Dist., 16. viii. 1972, coll. *R. C. Sharma*; 1 ex., Nagaur, Nagaur Dist., 21. vii. 1973, coll. *Y. P. Sinha*.

Stomach contents.—Insecta : Orthoptera : 1 grasshopper. Coleoptera: 20 exs., family Tenebrionidae; 5 exs., Buprestidae; 5 exs., Scarabaeidae; 1 ex., Elateridae; 11 exs., other families (evidenced by elytra, head, thorax, legs and pronotum). Large number of legs, abdomen and other body parts of Tenebrionid and other beetles. Hymenoptera : 1 ant (large sized). Isoptera : 7 termites alate caste. Vegetable matter : Grass and other plant material (Plate I, Fig. 4).

Remarks.—This large lizard feeds mainly on beetles, ants, grasshoppers, termites and some vegetable matter as shown above. Though records are available about its feeding on small mammals, snakes and lizards but its natural food seems to be chiefly the beetles and other insects in this area between August to November. Minton (1966) mentions the following wide variety of food for this species; musk shrew, striped palm squirrel and cray-fish. Many specimens were found to be infested by nematodes.

Suborder SERPENTES

Family TYPHLOPIDAE

20. *Typhlops braminus* (Daudin) (Brahminy blind snake, worm snake)

Material examined.—2 exs., Paota, Jodhpur, 23. vii. 1962, coll. *Modaram*; 1 ex., Public garden, Jodhpur, 15. i. 1970, coll. *Motilal*;

3 exs., Meja Dam, Bhilwara Dist., 7. iii. 1972. coll. R. C. Sharma, 3 exs. Lalmaidan, Paota, Jodhpur, 10. vi. 1972, coll. Y. P. Sinha.

Stomach contents.—Insecta : Hymenoptera : 2 ants. Miscellaneous : Some unidentified parts of insects. Vegetable matter : Some unidentified fibres.

Remarks.—First-named author has observed these snakes feeding in captivity, on eggs and imagoes of small ants, small caterpillars, termites, minute crickets, mosses and fungi.

Family BOIDAE

21. *Eryx johani* (Russell) (Indian sand boa)

Material examined.—1 ex., Paota, Jodhpur, 4. vii. 1962; 1 ex., Paota, Jodhpur, 1 ix. 1962, coll., A. K. Datta; 1 ex., Paota, Jodhpur, 4. ix. 1963, coll. Bhagaluram; 1 ex., Sardarsamand, Pali Dist., 17. ix. 1968; 2 exs., Kherla village, Jodhpur Dist., 7. ix. 1971. coll., R. C. Sharma.

Stomach contents.—Mammalia : Rodentia : Muridae. 1 ex., *Meriones* sp.

Remarks.—Minton (1966) found a young musk shrew in its stomach contents and observed it to feed on lizards and small mammals in captivity. The present study of the stomach contents supports his observations as far as small mammals are concerned.

In the field they have been collected by the first-named author from the burrows of field rats and gerbils. In captivity they were observed by him showing no liking towards lizards like *Hemidactylus flaviviridis*, *Hemidactylus brooki* and *Calotes versicolor*. They were observed by the first-named author to be feeding on young squirrel, *Funambulus pennanti*, domestic rat *Rattus* sp., domestic mice, *Mus* sp. and frog, *Rana cyanophlyctis*.

Family COLUBRIDAE

22. *Ptyas mucosus* (Linnaeus) (Dhaman)

Material examined.—1 ex., Hemawas ca. 70 km. S. of Jodhpur, Pali Dist., 28. ix. 1972, coll. Mangej Singh.

Stomach contents.—Amphibia : Salientia : 3 exs., frogs, *Rana cyanophlyctis*.

Remarks.—There are quite a few observations on the food and the method of killing its prey by this snake Smith (1943) and Minton (1966). There is nothing to add to their observations though it may

be recorded that a large sized specimen of this species was observed chasing a field rat at speed, near Hemawas Dam, Pali District. Before the victim could enter a hole it was caught by the snake. The body of the victim was immediately coiled around and pressed strongly thus killing the rodent within a short period. Before further observations could be taken the snake escaped quickly in the dense vegetation of *Acacia* sp. with the prey in its jaws.

23. *Coluber ventromaculatus* Gray
(Glossy-bellied racer)

Material examined.—1 ex., Public garden, Jodhpur, 14. iii. 1961, coll. *Modaram*; 1 ex., Beldarpura, Jodhpur, 27. vii. 1961, coll. *Onkarsingh*; 1 ex., Arid Zone Research Farm, Jodhpur, 17. ix. 1961, coll. *I. Prakash*; 2 exs., Massoria Hills, Jodhpur, 31. v. 1962, coll., *A. K. Datta*; 1 ex., Paota, Jodhpur, 17. ix. 1969, coll. *Mangej Singh*; 1 ex., Beriganga, Jodhpur Dist., 14. iv. 1972, coll. *R. C. Sharma*.

Stomach contents.—Aves : 1 ex., young bird. Reptilia : Sauria (Lizards) : 1 ex., *Hemidactylus flaviviridis*; 1 ex., *Hemidactylus flaviviridis*; 1 ex., *Calotes versicolor*; 1 ex., *Hemidactylus brooki*; 1 ex., *Calotes versicolor*.

Remarks.—This snake is a predator on Gekkonid and Agamid lizards but occasionally it devours the young ones of small birds also. The victims are killed immediately by powerful strokes of head. The prey is pressed vigorously in powerful jaws and ultimately swallowed gradually.

This species is not known from the typically desert areas of Rajasthan and cannot be said to be a desert species. It is known from Almora and Khandesh in India, Sind and eastern Las Bela (forest) in Pakistan, Israel and Uzbekistan in U.S.S.R.

Besides the stomach contents mentioned above, on 29 July, 1972, the first-named author observed a large snake with young one of a bird in mouth at Central Arid Zone Research Institute, Pali. Minton (1966) found bats, musk shrew, lizards namely *Hemidactylus flaviviridis* and *Acanthodactylus* sp. in the stomach of these snakes and also observed them feeding on other species of lizards except skinks.

24. *Sphalerosophis diadema diadema* (Schlegel)
(Rajatbansi)

Material examined.—1 ex., Baildarpura, Jodhpur, 20. viii. 1961, coll. *Onkarsingh*; 1 ex., Paota, Jodhpur, 21. ii. 1963, coll. *R. N. Bhargava*; 1 ex., Gangani village, Jodhpur Dist., 24. iii. 1963, coll. *S. K. Baxi*; 1 ex., Paota, Jodhpur, 8. iv. 1965, coll. *R. N. Bhargava*; 1 ex., Paota,

Jodhpur, 16. viii. 1965, coll. *V. C. Agrwal*; 1 ex.; Jajiwal-Kala ca. 28 km. E. of Jodhpur, 27. viii. 1972, coll. *R. C. Sharma*; 1 ex., Arnaji ca. 20 km. W. of Jodhpur, Jodhpur Dist., 21. ix. 1972, coll. *R. C. Sharma*; 1 ex., Military petrol Depot, Jodhpur, 15. iii. 1973, coll. *R. C. Sharma*.

Stomach contents.—Mammalia : Rodentia : Muridae, 1 ex., *Tatera* sp.; 1 ex., *Tatera indica*; Sciuridae, 1 ex., squirrel (evidenced by tail).

Remarks.—This species is already known to feed upon rats, mice, and squirrels (Wall, 1913; Smith, 1943 and Minton, 1966). These large snakes were found in the agriculture fields going from one burrow to the other, obviously in search of field rats, gerbils and field mice. The study of the gut contents as shown above establishes that the food of this snake is probably the Indian gerbil, *Tatera indica* an important rodent pest of agriculture in Rajasthan (Plate III. Fig. 3). The snake has also been observed on one occasion climbing up a tree and chasing squirrels *Funambulus pennanti*, in the vicinity of Beriganga, Jodhpur. It has been further observed that in captivity these snakes show no liking towards frogs, toads and lizards.

25. *Xenochrophis piscater* (Schneider) (Checkered keelback)

Material examined.—1 ex., Gapesagar, Daungarpur, 23. iii. 1964, coll. *R. N. Bhargava*; Surpur Kinadi ca. 4 km., N. W. of Daungarpur, 26. iii. 1964, coll. *R. N. Bhargava*; 1 ex., Sardarsamand, Pali Dist., 13. xii. 1967, coll. *P. D. Gupta*; 1 ex., Sardarsamand, Pali Dist., 17. ix. 1968, coll., *D. S. Mathur*; 1 ex., Hemawas Dam, Pali Dist., 16. vii. 1971, coll. *R. C. Sharma*; 2 exs., Pichyak Dam, Jodhpur Dist., 22. x. 1971, coll. *P. D. Gupta*; 1 ex., Meja Dam, Bhilwara Dist., 7. iii. 1972, coll. *P. D. Gupta*; 3 exs.; Udaipur, 9. iii. 1972, coll. *P. D. Gupta*; 2 exs., Gapesagar, Daungarpur, 12. iii. 1972, coll. *P. D. Gupta*; 1 exs., Sardarsamand, Pali Dist., 19. vi. 1972; 1 exs., Jawai Dam, Pali Dist., 23. v. 1973, coll., *Y. P. Sinha*.

Stomach contents.—Amphibia : Salientia : 1 ex., *Rana cyanophlyctis*, 2 exs., *Rana* sp. Pisces : Cyprinidae : 1 ex., *Puntius* sp. (Plate III, Fig. 1).

Remarks.—This species is well known for feeding on fishes and other aquatic fauna excluding insects Minton (1966).

26. *Boiga trigonata* (Schneider) (Indian cat snake)

Material examined.—1 ex., Prithvipura, Jodhpur, 30. viii. 1961, coll. *Onkarsingh*; 1 ex., Paota, Jodhpur, 26. vi. 1963, coll. *Motilal*; 1 ex.,

Paota, Jodhpur, 13. v. 1964, coll. V. C. Agrawal; 1 ex., Paota, Jodhpur 3. viii. 1965, coll. R. N. Bhargava; 1 ex., Paota, Jodhpur, 9. viii. 1965, coll. R. N. Bhargava; 1 ex., Paota, Jodhpur, 1. viii. 1967, coll. Motilal; 1 ex., Lalmaidan, Paota, Jodhpur, 25. iii. 1968, coll. Laxman Singh; 1 ex., Satlana village, Jodhpur Dist., 3. ix. 1972, coll. R. C. Sharma; 1 ex., Polo, Jodhpur, 15. ix. 1974, coll. N. S. Rathore.

Stomach contents.—Aves : 1 ex., house sparrow. Reptilia : 2 exs., *Calotes versicolor* (Plate III, Fig. 2).

Remarks.—This species is already known for feeding on lizards of the genera *Calotes* and *Acanthodactylus* and to devour small birds Minton (1966). Our observations also confirm the above food habits of this snake. There is no specific record of this species from Rajasthan, either by Smith (1943) or by Minton (1.c.)

Family VIPERIDAE

27. *Echis carinatus* (Schneider) (Saw scaled viper)

Material examined.—1 ex., Paota, Jodhpur, 26. x. 1961, coll. Ghisuram; 2 exs., Salawas village, Jodhpur Dist., 7. ix. 1962, coll. A. K. Datta; 1 ex., Paota, Jodhpur, 23. viii. 1965, coll. P. D. Gupta; 1 ex., Narva village, Jodhpur Dist., 12. viii. 1969, coll. P. D. Gupta; 3 exs., Central Arid Zone Research Farm, Pali, 30. vii. 1971, coll. R. C. Sharma; 1 ex., Kharda Dam, Pali Dist., 11. viii. 1972, coll. P. D. Gupta; 2 exs., Mandalgarh ca. 48 km. S. W. of Bhilwara, 8. iii. 1972, coll. R. C. Sharma; 1 ex., Kharda Dam, Pali Dist., 28. vii. 1972, coll. R. C. Sharma; 3 exs., Central Arid Zone Research Farm, Pali 29. vii. 1972, coll. R. C. Sharma; 1 ex., Khajerla village, Jodhpur Dist., 5. viii. 1972, coll. R. C. Sharma; 4 exs., Kharda Dam, Pali Dist., 11. viii. 1972, coll. R. C. Sharma; 1 ex., Kaparda village, Jodhpur Dist., 16. viii. 1972, coll. R. C. Sharma; 1 ex., Bari Jagiwal Kala ca. 28 km. E. of Jodhpur, 27. viii. 1972, coll. R. C. Sharma; 1 ex., Kharda Dam, Pali Dist., 27. ix. 1972, coll. R. C. Sharma; 1 ex., Hemawas Dam, Pali Dist., 28. ix. 1972, coll. R. C. Sharma.

Stomach contents.—Insecta : Orthoptera : 1 ex., *Schistocerca gregaria*, *Poecilotheres pictus*. Arachnida : 1 ex., Scorpion; 2 exs., Spider; 1 ex., solifugid. Myriapoda : Chilopoda : 1 ex., *Scolopendra* sp. nr. *morsitans*. Amphibia : Salientia : 1 ex., *Rana cyanophlyctis*; 2 toads. Reptilia : Sauria : 1 ex., *Hemidactylus brooki*. Serpentes : 1 worm snake, *Typhlops braminus*.

Remarks.—This species is also known to feed on a wide variety of food Minton (1966). Our studies merely confirm his long list of preys of this snake.

ACKNOWLEDGEMENTS

We are thankful to the Director, Zoological Survey of India for providing the necessary facilities in connection with this work. We are highly grateful to Dr. M. L. Roonwal for his valuable suggestions.

SUMMARY

The food and feeding habits of 27 species of reptiles have been discussed in this paper on the basis of field observations as well as on the basis of gut contents study.

1. The food of the following species has been recorded for the first time :

Cyrtodactylus scaber, *Cyrtodactylus fedtschenkoi*, *Sitana ponticeriana*, *Mabuya macularia*, *Acanthodactylus cantoris cantoris* and *Ophisops microlepis*.

2. The following species are being reported from Rajsthan for the first time :

Stenodactylus orientalis, *Cyrtodactylus scaber*, *Cyrtodactylus fedtschenkoi*, *Sitana ponticeriana*, *Agama agilis*, *Coluber ventromaculatus* and *Boiga trigonata*.

3. Our studies reveal a larger variety of insects as food, than known hitherto in the following species;

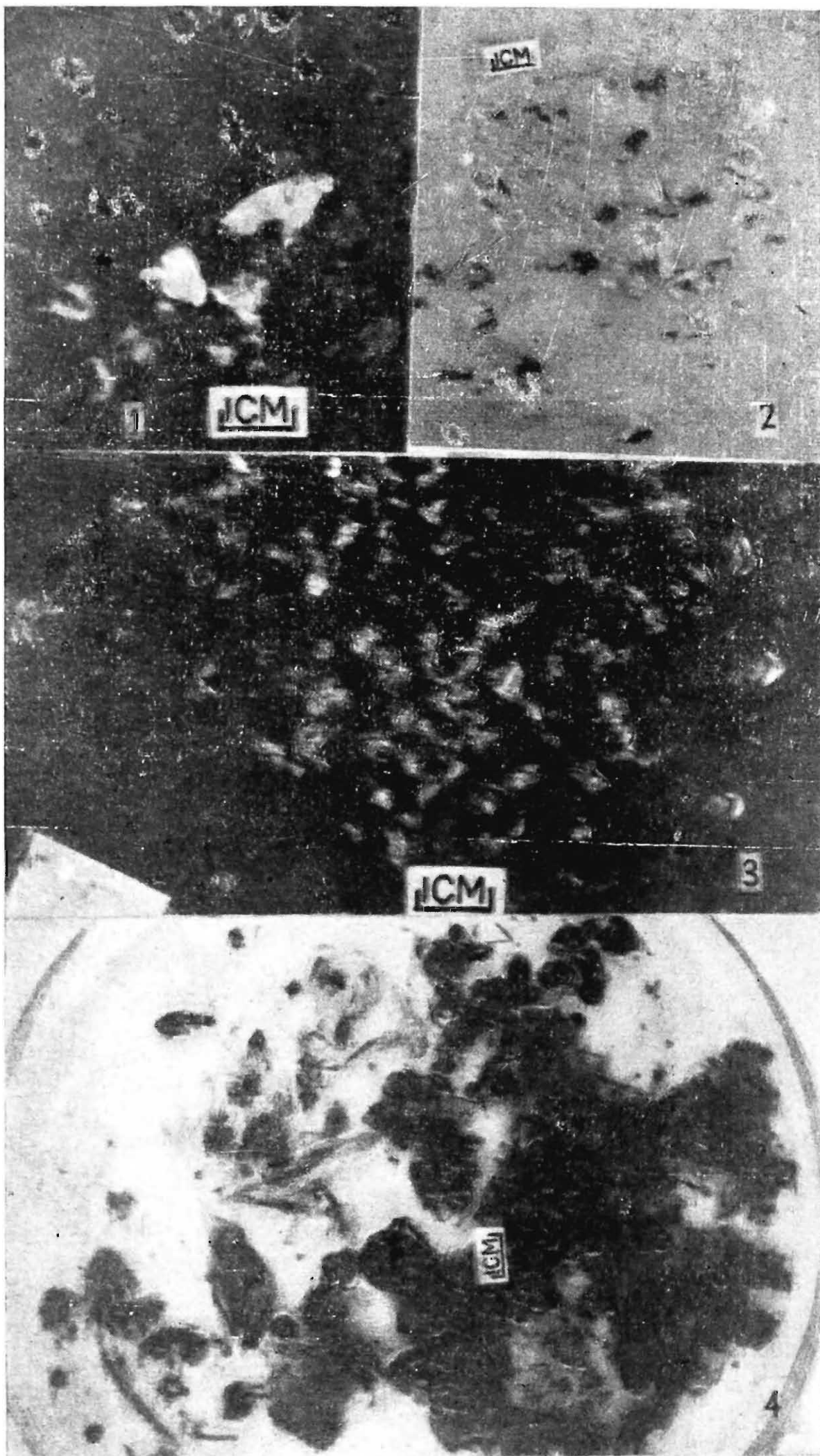
Stenodactylus orientalis, *Hemidactylus triedrus*, *Hemidactylus flaviviridis*, *Calotes versicolor*, *Agama agilis*, *Eumeces taeniolatus*, *Ophiomorus tridactylus*, *Varanus bengalensis* and *Typhlops braminus*.

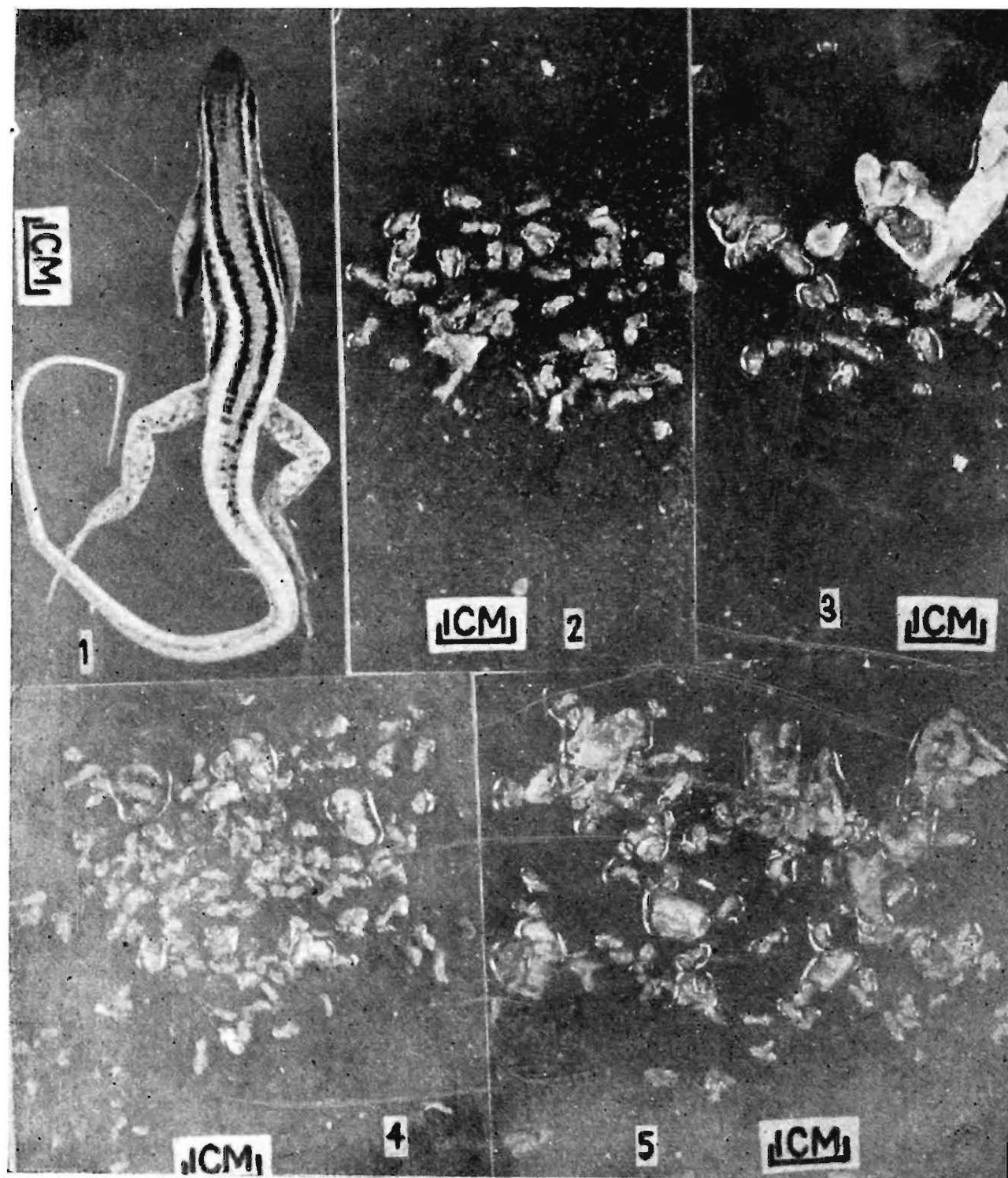
4. The following species feed exclusively on vegetable matter :
A Testudines, *Testudo elegans* and a lizard *Uromastix hardwickii*.

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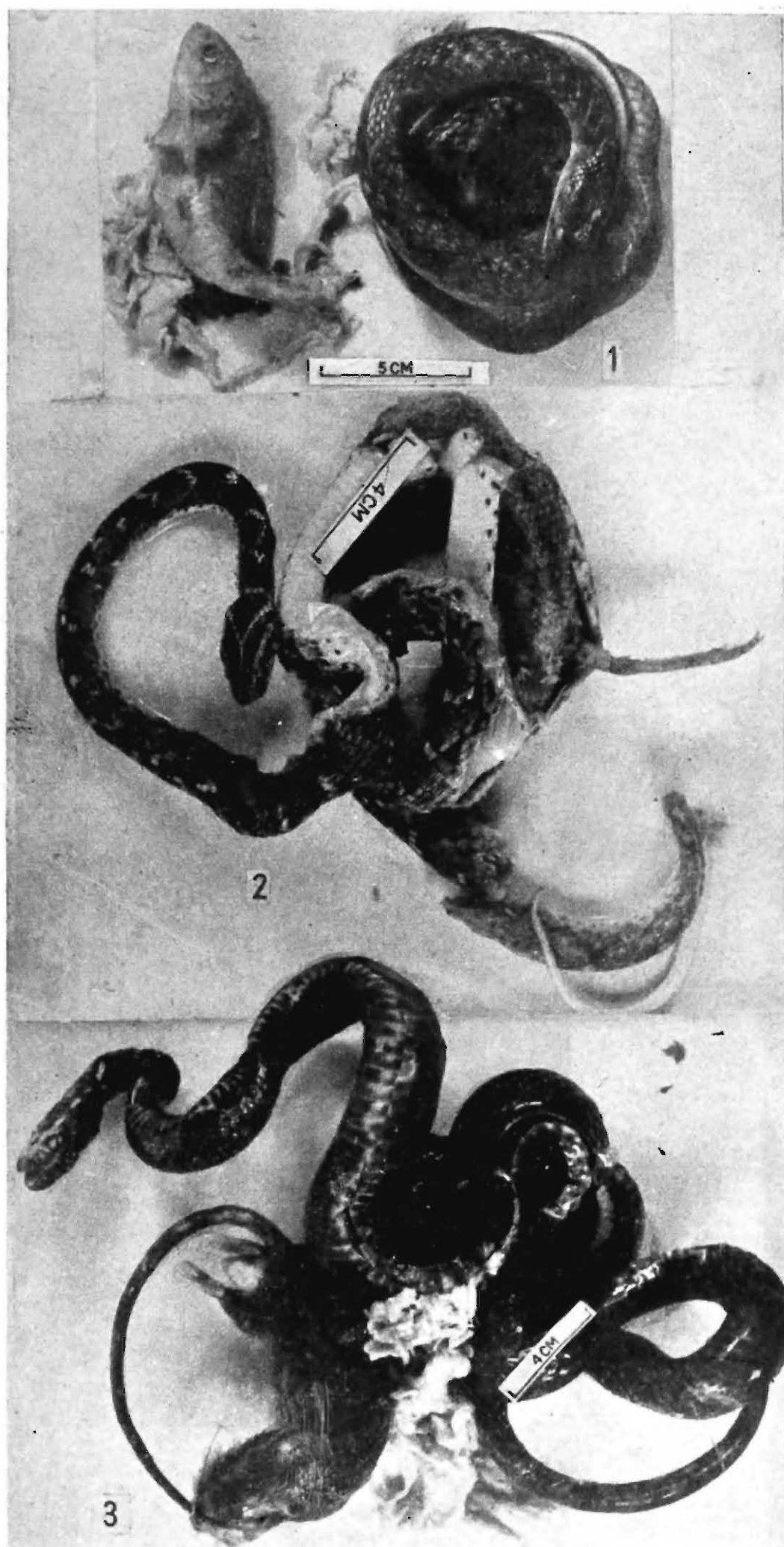


Plate I

- Fig. 1. Stomach contents of *Acanthodactylus cantoris cantoris* showing a grasshopper, caterpillars, beetles and termites.
- Fig. 2. Stomach contents of *Acanthodactylus cantoris cantoris* showing beetles, ants and termites.
- Fig. 3. Stomach contents of *Acanthodactylus cantoris cantoris* showing ants and numerous termites, *Odontotermes* sp.
- Fig. 4. Stomach contents of *Varanus bengalensis* showing various beetles, ants, winged termites and grasshoppers.

Plate II

- Fig. 1. Kobra snake eyed lizard, *Ophisops microlepis*, a strong predator on white ants.
- Fig. 2. Stomach contents of *Ophisops microlepis*, mostly the termites *Odontotermes* sp.
- Fig. 3. Stomach contents of *Ophisops microlepis*, showing absolutely the termites.
- Fig. 4. Stomach contents of *Ophisops microlepis* showing termites, grubs, few caterpillars and a bug.
- Fig. 5. Stomach contents of *Ophisops microlepis* showing the miscellaneous parts of termites, beetles, bugs and a spider.

Plate III

- Fig. 1. The checkered keelback *Xenochrophis piscator* with its food-removed from its stomach.
- Fig. 2. The Indian Gamma, *Boiga trigonata* with an agamid lizard *Calotes versicolor* in its gut.
- Fig. 3. The Rajatbansi, *Coluber diadema* with its prey a gerbil *Tatera indica* removed from its gut.

NOTES ON ECOLOGY AND BIOLOGY OF SOME REPTILES OCCURRING IN AND AROUND NANDANKANAN BIOLOGICAL PARK, ORISSA

By

S. BISWAS

Zoological Survey of India, Calcutta

and

L. N. ACHARJYO

Nandankanan Biological Park, P. O. Barang, Dist. Cuttack

(With 4 plates)

Six species of reptiles occurring in the Nandankanan Biological Park and its surroundings were collected and studied in the laboratory excepting *Varanus salvator* (Laurenti) which is not occurring in this region but has been kept in this park. The results of these observations are summarized.

The Nandankanan Biological Park is situated in the most natural surroundings of the green forests of Chandaka near Bhubaneswar. The facilities for studying reptilian ecology and biology are consequently good. The main advantage of this park is its natural setting of forests and the central lake with its flanking swamps and marshes. As the park is not enclosed by a boundary wall, but only by a barbed-wire fence, many reptiles enter the cage and the enclosures at night. The northern and western sides of the park are hilly with bushy forests.

Some of the observations made are not new but serve to confirm previous observations. We intend to continue this work on other species of reptiles occurring in this area.

Family COLUBRIDAE

Enhydris enhydris (Schneider)

(Oriya name : Dhanda Sap, Pani Dhanda, Mati Birali)

Distribution.—This species is distributed throughout north eastern India and in the south up to Vizagapatnam District. It occurs all over Orissa.

Habits and Habitat.—These snakes are fairly common in ponds, irrigated fields, and sluggish waters. They occur in the central lake of Nandankanan Biological Park and in the water logged marshes and swamps near about. Some specimens of this species were kept in captivity. Here they are generally seen at the water edges with tip of the nose sticking out and the remaining portion of the body lies inside water. With some disturbance they sink down and swim away. Some were seen completely submerged in the water where as some were seen on the land near the water basking in the sun during January, 1974.

Food.—The snake feeds principally on fishes and frogs but one from Barrgkok disgorged a skink (Smith, 1945).

Observations.—On 14.6.1973 at about 5 p. m. on the road near the Museum of Nandankanan at a distance of about 160 metres from the border of the lake one *Enhydris enhydris* was detected laying live young snakes one after another. The snake was lazy and sluggish. Its hind part near the vent was bulged out and a portion of the tail of a young snake that was being born was visible out of the vent. As the mother moved slowly forward, one after another young ones were being dropped and left behind. It took about half an hour to give birth to ten young. The bulged hind portion above the vent contracted while giving birth. There was no attempt of parental care. The young first moved a little and then remained still before they made another attempt to move. They were wet and encased in thin membranes which were lost. The colour pattern was prominent and distinct. After giving birth the mother remained almost still probably due to stress and exhaustion and could not be induced to move even when poked with a stick. Then it was collected and preserved. After autopsy, four more young ones were recovered from the mother's body cavity starting from the 100th ventral scale to vent. The fourteen young measured 175 to 185 mm. The colour pattern of the adult female was fainter than the young ones.

Another female of this species caught on January 25, 1974 contained 29 eggs of the following sizes 20 mm. $\times$ 11 mm., 16 mm. $\times$ 10 mm. and 9 mm. $\times$ 7 mm. between 104th to 142nd ventral scale of the body. The specimens are deposited in the Z. S. I. collection.

Measurement and scale count of two females.

Sl. No.	Details	No. I	No. II
1.	Length-snout to vent	406 mm.	615 mm.
2.	Length-vent to tail tip	98 mm.	120 mm.
3.	Ventral scales	151	157
4.	Subcaudal scales	50	49

Parasites.—Some nematodes belonging to the species *Tanqua anomala* (Linstow), Baylis, 1916, were found in the empty stomach of the mother snake.

Remarks.—Though *Enhydris enhydris* is mainly an aquatic snake it has to come to land to give birth. This breeding habit indicates that it was originally terrestrial, but subsequently changed to an aquatic habit. It gives birth six to eighteen young at a time (Smith, 1943). These two observations suggest that the breeding season may be from January to June.

Family COLUBRIDAE

***Ptyas mucosus* (Linn.)**
(Oriya name : Dhamana Sap)

Distribution.—The species occurs throughout India and the Andaman Islands. Outside India, it occurs in Yunnan, South China, Hainan Indo-China, Java and Sumatra. It is common throughout Orissa.

Habits and Habitat.—They are very swift snakes found here and there inside the park. They are mostly found around aviaries of small birds such as Budgerigars, Quails, and Bulbuls. Here these snakes feed on the birds and rodents which in turn feed on the food of birds. Sometimes they are seen moving along the wire netting walls in search of a hole. Many have been killed in these aviaries. Many were seen beneath heaps of stones. Some were seen basking in the sun inside the deer paddock during winter mornings but ran away upon slight disturbance.

Food.—Though rats and frogs are its main food, the snakes do not seem particular in its choice of food. On autopsy rats and birds have been recovered from the stomach of some of the rat snakes. Once four Budgerigar chicks were regurgitated by one snake when it was caught.

Observations.—One rat snake collected in the park on 4.7.1968, was kept in a wooden cage and laid 11 eggs on 18.7.1968. The eggs were white, soft shelled, shrunken and elongated with blunt ends. These 11 eggs measured 50 to 52.50 mm. $\times$ 27.50 to 32.50 mm. (Pl. IV, 2).

Another female specimen killed in the park on 27.5.1973. After dissection it was found to contain two sets of ovaries with several advanced egg follicles and in the oviducts some small eggs.

A baby rat snake measuring 576 mm. was caught from the lawns or the garden on 30.8.1973.

Two rat snakes of unknown sex were fighting near the nursery garden of Nandankanan on 1.8.1973. These two snakes were in an area

of about 10 metres $\times$ 10 metres from 10 A. M. to 4 P. M. Both were twisted on each other. The heads were facing each other with a space of a few centimetres in between them. The heads were about 45 cm. above the ground. There was continuous twisting movement of both snakes for several minutes at a time inside bushes and grasses. Some times they break apart and again repeat the same type of fighting.

They ignored the presence of human beings at a distance of about 6 to 7 metres.

Parasites.—Nematodes from the lungs of two rat snakes killed on 26.12.1972 and 27.5.1973 were recovered.

Remarks.—According to Smith (1943) mating of this species takes place in hot weather, May and June, eggs 6-14 in number are deposited in August and September, the young emerge between the end of September and December. The eggs measure 45.50 mm. $\times$ 30.40 mm. and the new born young measure 370-380 mm. (Smith, *loc. cit.*) Nicholson (1893) gives the egg depositing time of Bangalore population as May to September, 7-13 in number.

From our above mentioned observations on egg size of the second female, it is presumed that the mating may start in May and from the observation of the first female, the egg depositing time can be said to be July. In our collection the size of the eggs are also little larger. Wall and Bvans (1900) noted the incubation period of a brood of eggs and Derianiyagale (1960) observed the mating behaviour. However a brood of nine eggs recorded by Wall (1907) from Fyzabad agrees approximately ($2''-2\frac{1}{2}'' \times 1\frac{1}{2}''$).

Since mating of this snake takes place in hot weather May and June (Smith, *loc. cit.*) this fighting behaviour observed in August may be the struggle of two males. Carthy (1964) mentioned about such a behaviour among sand vipers as struggling between two males and Schmidt & Inger (1957) is also being referred in this connection. However Prater (1933) mentioned about a sex play of a pair of this species in which case the female contained eggs in advance stage.

Family BOIDAE

Python molurus molurus Linn.

(Oriya name: Ajagar Sap, Boda Sap)

Distribution.—Range: India, Peninsular India to the North East, West Bengal and to the West Punjab and Rajasthan. Outside India, Sind and Punjab or Pakistan, Sri Lanka and Bangladesh.

This species occurs throughout Orissa. It has been collected from Puri, Cuttack, Mayurbhanj and Phulbani Districts for this park. Mani-

bhadra Pahad (Hill) near Gonia in Puri District is well known for its occurrence.

Habits and Habitat.—In captivity they remain coiled up in a corner of the house during the day but move often late in the evening and at night. Often they are completely or partially submerged in the water tank. Most of the baby Pythons collected from the aviaries were found early in the morning. During July, 1971 to September, 1971 we could collect 7 baby pythons and 4 baby pythons were collected during the period from July, 1973 to October, 1973 from an aviary of small birds situated just at the edge of portion of the lake which is full of submerged grasses, marshes and bushes. One python was seen inside heaps of laterite stones and bushes in a hillock at Barang about 2 Kilometres from the park. This was caught by the workers of Barang glass factory and sent to the park on 4.1.1974.

Food.—Pythons can take any manageable animals and birds. Generally they prefer live ones but dead birds and small animals have also been accepted in captivity. They have been observed taking the common langur, ducks, common goose eggs and a number of species of other birds. In captivity they are generally fed with live fowls, pigeons and guineapigs.

While clearing the forests for the construction of buildings one python was seen swallowing a young spotted deer in the forests near Bhubaneswar during the year 1957-1958. (Pl. V).

Feeding mechanism of one year old baby python was studied by supplying immobilised sparrows (Pl. VI).

Observations.

Table—1. The weight and size of eight large pythons received so far in this park.

Sl. No.	Weight in kg.	Maximum circumference in cm.	Length tip to tip in cm.
1.	33.5	45.5	435
2.	37	—	396
3.	21	—	396
4.	30.500	—	411
5.	—	—	435
6.	29.4	38	465
7.	10.6	28	288
8.	11.4	26	284

No python longer than 465 cm. has been recorded in this Park or in any part of Orissa.

Table—2. The details of four baby pythons recently collected from a aviary of the park.

Sl. No.	Date of collection	Length in cm.	Circumference in cm.
1.	17.7.1973	79	8
2.	5.8.1973	80	8
3.	14.8.1973	81	8
4.	16.10.1973	90	9.5

The details of collection of some of the pythons from Nandan-
kanan park area as follows :

- (a) One was collected on 7.4.1966 while swallowing a common langur at the bank of the lake underneath a tree.
- (b) One was caught in May, 1966 in a fishing net while it was taking a duck inside the lake.
- (c) One was caught on 25.4.1971 from the common goose enclosure where it was lying coiled up after taking four spoiled common goose eggs. All the four eggs were regurgitated out after catching it.
- (d) Seven were caught during the period from July, 1971 to September, 1971 and four were caught during July, 1973 to October, 1973 from an aviary of small birds such as bulbuls, mynas, doves and barbets where they devoured some of these birds. Most of these birds were regurgitated soon after the snakes were caught.
- (e) One was collected on 1-10-1969 from the oven (chulla) of Zoo kitchen.
- (f) One was collected from submerged grasses inside a portion of the lake in August, 1973.

The monthly distribution of python collected or received in the park including 20 collected from this park area itself is as follows :

January	— 7	May	— 1	September	— 5
February	— 0	June	— 2	October	— 6
March	— 0	July	— 7	November	— 8
April	— 4	August	— 6	December	— 2
Total 48					

From this it can be seen that inter sloughing period observed in one case was from 37 days to 128 days whereas in the other case it was from 31 to over 97 days. The process of sloughing was completed either in one day or within three consecutive days.

Table—3. The details of sloughing of the skin observed in two captive adult Indian pythons.

Sl. No.	Date of last sloughing	Date of subsequent sloughing	Inter sloughing period in days	Remarks
Specimen No. I (Sl. No. 1 of Table I)				
1.	11.5.73 to 12.5.73	23.6.73 to 24.6.73	41	
2.	23.6.73 to 24.6.73	4.8.73 to 5.8.73	40	
3.	4.8.73 to 5.8.73	17.10.73	42	
4.	17.10.73	23.2.74 to 25.2.74	128	Winter
5.	23.2.74 to 25.2.74	4.4.74	37	
6.	4.4.74	30.6.74	86	Under incubation from 28.4.74 to 25.6.74.
7.	30.6.74	19.8.74	49	
8.	19.8.74	13.10.74	54	
9.	13.10.74	17.12.74	64	
Specimen No. II (Sl. No. 6 of Table I)				
1.	14.11.73 (Date of Procurement)	20.2.74	97+?	Winter
2.	20.2.74	24.3.74	31	
3.	24.3.74	11.6.74	78	
4.	11.6.74	23.8.74	72	
5.	23.8.74	18.11.74	86	

Mating of a pair of Indian pythons was observed in the first week of February, 1974 in this park. The female measuring 435 cm., weighed 33.5 kg. and had a circumference of 45.5 cm. Whereas the male measured 288 cm. weighed 10.6 kg. and had a circumference of 28 cm. at the time of mating.

Parasites : Helminth parasites i.e., *Bothridium pythonis*, Blainville, 1824 and *Ophioascaris filaria*, Dujardin, 1845 (= *O. Ajgariasis*, Khera, 1954) were found on autopsy of this species in the park (Patnaik and Acharjyo, 1970).

Remarks.—Wall (1911 & 1912) dealt elaborately with the food and feeding habit of Pythons and some more information can be gathered from Candell (1913) Campbell (1923), Jerdon (1959) and Stewart (1917). Corbett (1957) encountered pythons which have swallowed cheetal and barking deer.

In respect of sloughing our observations shows that the inter sloughing period is longer during winter and hybernation period.

From the period of gestation and the season when eggs are deposited Wall (*loc. cit*) extrapolated mating seasons from December to February. In the Paris Zoo. they were observed to mate in January and February and eggs were deposited in May. Our observation of mating in the February confirms the same. It is interesting to note that the copulation takes place in the winter at the time of their hybernation. Vinger *et al.* (1970) has studied metabolism and thermoregulation of this genus during breeding.

According to Smith (1943) hatchling measure on an average 2'-5" (73.66 cm.). Therefore the above four measurements of the baby pythons may be of the same brood, they might have hatched one or two months before capture in case of first three and three to four months in case of the fourth one because it is comparatively longer than the other three.

Since the start of the park (19.12.1960 to 28.2.1974) 48 pythons of different sizes have been received or collected in the park and out of these, 20 have been collected from this park area. This shows how common this species is in Orissa in general and Chandaka forest area in particular.

Now-a-days pythons are rarer in some parts of India due to indiscriminate killing of this species for their skins. In the markets of Puri, Bhubaneswar and other cities there is a great demand of its skin for making shoes, ladies handbags, belts and purses.

Family VARANIDAE

Varanus salvator (Laurenti)

(Oriya name; Pani Godhi, Pani Goisap)

Distribution.—**Range.** India including Andaman and Nicobar islands, Sri Lanka, Burma, Indochina, Southern China, East Indian Archipelago and Northern Australia.

It occurs in West Bengal, Eastern Himalayas but not in the Peninsular India, therefore it is not likely to be found in Orissa. The specimens in the Zoo were received from a supplier of Calcutta.

Observations : Three water monitors were received in the Park on 2-7-1970 from an animal dealer of Calcutta. On the morning of 29-7-1971 one egg was found in their enclosure. The egg was elongated with blunt ends on both sides, soft shelled and white. It measured on that day 9.5 cm. $\times$ 3.5 cm. and weighed 48 gms. (Pl. No. 1, 3). In this connection the observation of Deraiyagala (1958) on the reproduction of *Varanus bengalensis* (Daudin) is useful for further study on this species.

They were being fed with beef, without bones six days in a week with one day fasting. They also took eggs, small dead birds, rats, sometimes fishes and once one of them took even a young land monitor. While taking its feed, first it examines with its tongue, lifts the food by mouth and then gulps it. It takes eggs with or without breaking which pass entirely through the gullet.

Most of the time they are found submerged inside the water tank with the head remaining out of water. When annoyed at times it used to give lashing with its tail.

Parasites.—*Duthiersia Fimbriata* (Dies, 1850) Mont Et. Crety, 1891. It was recovered from stool of these monitors after medication (Acharjyo et. al., 1970).

Remarks.—Regarding the size of the egg in the collection it is bigger than that of mentioned by Smith (1935) as 70 $\times$ 40 mm. and about the number of eggs laid at a time are 15 to 30. In the present case the lizard also might have laid more eggs, but as all the lizards were kept together and as natural condition was not provided, they might have swallowed the rest of eggs due to their egg taking habit. According to Smith (*loc. cit.*) usually the laying season is June in Thailand but in this case it was July.

Order SAURIA

Family CHAMAELEONIDAE

Chamaeleon zeylanicus (Laurenti)

(Oriya name; Bahurupi Endua or Pohola Endua)

Distribution.—*Range.* Peninsular India, South Gangetic Plains, Cutch and Sri Lanka.

In Orissa this species is known to occur in the districts of Puri, Cuttack, Ganjam, Keonjhar, Mayurbhanj, Dhenkanal and Sambalpur and may be in other districts also.

The collection of Zoological Survey of India contain three specimens from the upper Godavari Dist., Betul Dist. and Midnapore (Reg. No. 6840), West Bengal. Wide distribution of this species in Orissa justifies its occurrence in some parts of Midnapore Dist. adjoining Orissa. Theobald (1876) also recorded it from Midnapore.

Habits and Habitat.—They were found on plants and bushes in the rainy season or just after rains. In other times it is very rare in Nandanakanan area though some are seen during summer months. Many were collected mostly from the ground on the roads and paths while they were passing from one side to the other. Others were taken from plants. The monthwise collection of eleven specimens of this species during 1972 and 1973 were: July 6, August 3 and September 2.

One was collected by Dr. N. K. Mohanty of Burla Medical College in April, 1973 at Burla (Sambalpur Dist.). Insects are plenty during rains and so the chameleon's activities are mostly observed during rains as they come out in search of their food.

Food.—Chameleons are voracious eaters. They were fed chiefly, with insects such as grass hoppers, sand hoppers, flies and butterflies.

Observations.—Of the eleven specimens, three were females and eight males. A chameleon was collected from the park area on 3.9.1972 and was kept in all indoor cage provided with water and small branches of a tree. In captivity most of them refuse to take food. Attempts were made to feed it with grass hoppers and sand hoppers holding the insect by forceps loosely a few inches in front of it. They were also seen taking cockroaches not more than 2 or 3 per day. These were readily taken. The chameleon remained motionless in the cage most of the time but used to be slightly active on showing the insects. Both its habits and movements were slow and deliberate and the movemenst of the eyes were independent of each other.

It was taking its food from 30-9-1972 to 21.10.1972 but refused to take food from 22.10.1972, laid 28 eggs on 25-10-1972 and found suddenly dead on 31.10.1972. After death three more white, hard shelled eggs were found in oviduct. The eggs deposited were oval, soft shelled, shrunken and some of these were studded with black dots and patches. The 31 eggs measured 1.6 cm. to 1.9 cm $\times$ 1 cm. to 1.2 cm. (pl. IV, 1).

Another female kept in captivity since 24.8.1973 took some insects at times from a forceps but found suddenly dead on 22.9.1973. On autopsy the whole of abdominal cavity was packed with 21 fully formed eggs pressing the lungs, and liver. These eggs were white oval, soft shelled, leathery to touch smooth and measured more or less the same as above.

A newly caught Indian chameleon when disturbed opens its mouth with a hissing sound and gives an attacking pose.

Two male chameleons were observed to fight in captivity. A male when gets ready for attacking an incoming another male, becomes flat vertically, thin and wide in its body. The body colour turns yellow with dark green stripes. In this posture, it nods its head with open mouth and strikes at the fore-quarters of the other male. The other male after repeated strikes just withdraws. At this time the submissive male is only green in colour and in its usual natural size.

At other times fighting of two males were also observed. During fighting each gets thinner and wider in their bodies, turn yellow with green stripes and strike with open mouth at each other. No biting or injury due to fighting was ever observed. At the end, the defeated one withdraws. This may be a defence of territorial behaviour.

One chameleon in the collection of Dr. N. K. Mohanty, of Burla Medical College was seen moving about in the cage with open mouth. It then sat in the water pot submerging its lower portion, probably due to extreme heat during May, 1973 when the temperature was 48.3°C.

Sloughing of skin from the head and neck of one only was observed in captivity from 24.7.1973 to 27.7.1973. The process was slow and pieces of white skin like tissue paper peeled off.

Measurement of some adult specimens

Sl. No.	Sex	Length Snout to vent in cm.	Length tail in cm.	
1.	Male	15.1	18.2	Specimens are deposited in the Z. S. I. collection
2.	Male	16.3	17.2	
3.	Male	17.4	18.8	
4.	Female	16	17.9	
5.	Female	15.1	17.3	

Inspite of all attempts all these specimens died within two months in captivity. But one chameleon in the collection of Dr. N. K. Mohanty is still living for over 10 months on a daily diet of cockroaches and water is sprinkled daily several times over the leaves of a plant kept inside the cage for licking.

Parasites.—Nematodes were collected from intestine of one and peritoneal cavity of two chameleons. They belong to the species *Polydelfis hexametra* (Gedocst, 1916).

Remarks—Our observations of number of eggs laid at a time agree with those of Trench (1972) but the size of this (13×7 mm.) is smaller. The size of our eggs conform to the eggs kept in the British Museum (19×12 mm.) Smith (1935). The black dots and patches on some of the eggs might be due to the development of mould.

The present specimens laid eggs after 26 days of capture, according to Trench (*loc. cit*) the gestation period is 36 days. In another female which was kept with males since 24.8.1973, fully formed eggs were collected from the abdominal cavity after death on 22.9.1973 on the 30th day of capture. However, no mating in captivity could be observed. A third female caught on 15.7.1973 and died on 11.9.1973, on autopsy revealed functional ovaries but no eggs. Therefore, the eggs of the lizards may have been fertilized in nature 10 days before its capture in the first case and a few days before its capture in the second case.

Hence, the breeding time of this lizard can be taken as August to October. In case of Trench's (*loc. cit*) specimen it was bit delayed due to mating delay.

The ability for changing colour to match their environment is well known in the chameleon (Schmidt and Inger, 1957). Though factors such as changes in light intensity or temperature are mostly responsible but change of emotion is also responsible for their colour change (Pl. VII).

The popular belief among the local people of the area is that the tail of these lizards has some curative properties for some diseases of infants, so tails of these lizards are cut on some auspicious days. In our collection 3 out of 11 were with mutilated tails. Such belief is wide spread in its range of distribution in India. It has been reported by Trench (*loc. cit*) that in Madhya Pradesh (Southern districts) people also believe that these lizards have some magical properties or charm. To save such a fascinating looking, entertaining and useful lizards the wrong ideas of the people should be dispelled and some protective measures might well be adopted.

Order TESTUDINES

Family TRIONYCHIDAE

Lissemys punctata granosa Schoepff (Oriya name: Kaincha)

Distribution.—The Indian Peninsula, South of Ganges and Sri Lanka. In Orissa it occurs in Mahanadi and its tributaries and also in ponds, tanks and lakes. It is very common in Nandankanan lake.

Habits and Habitat.—This turtle is aquatic. It occurs in canals, marshes and ponds, though mainly lives in rivers. In some places it

wanders ashore at night in search of food. Sometimes it aestivates in the summer particularly in time of drought. This turtle is kept in temple tanks. In captivity they are kept in the same tank along with Gharials (*Gavialis gangeticus*) and muggers (*Crocodilus palustris*) for several years without injury or death. They sometimes emerge, but immediately return to the water at the approach of the keeper. At times they sit on the back of the Gharials.

Food.—This species is mainly carnivorous. It feeds largely upon fishes, molluscs, frogs and tadpoles whether or not its food is alive. They often take rejected and dead fishes found in the tank of gharials and muggers.

Observations.—(a) One of the turtle kept along with the crocodiles and gharials laid 4 round, grey coloured and hard shelled eggs on 30.11.1971 and two on 1.12.1971. The weight of the turtle was 2.300 kg. the diameter of eggs was from 3 cm. to 3.25 cm. and the weight were from 12.200 gm. to 13.800 gm.

(b) While digging pits adjacent to a dried up formerly water-logged area, 6 eggs were excavated out on 28.5.1973 from a depth nearly 23 cm. Some of the eggs were broken and the developing young died after an hour.

(c) From the same area two very small young were collected on 29.5.1973. They had probably hatched within the last one or two days. One weighed 8.700 gm. and the other 9.500 gm. The plastron length was 3.5 cm.

A small cartilaginous raised knob occurred just above the entoplastron. It was shed in the second week, post hatching of both juveniles.

The two hatchlings were kept in a tray and maintained on a diet of wheat flour and small cut pieces of greens upto 24.6.1973. One young which weighed 9.500 gm. on 29.5.1973 weighed 10.300 gm. on 25.6.1973. They were never seen taking any of the food though they remained always active.

(d) One young turtle with blackish shell colour measuring 5 cm. × 5 cm. and weighing 17.500 gm. was caught on 21.6.1973 when water was pumped from a muddy shallow tank at Nandankanan.

Remarks.—According to Smith (1931) this species lays 10 to 12 eggs at a time and keep them burried in the ground close to the water. The eggs measure 40 to 33 mm. in diameter. The measurements, of eggs given by Deraniyagala (1939) agree with ours but the weight (17 to 19.25 gms.) differs from our non-fertilised eggs (12.200 to 13.800) gms.

From the above mentioned observations it appears that the species lays eggs from November upto December and the young hatch in May or June. The incubation period seems to be about six months.

This turtle is eaten by people living near about Nandankanan, but the flesh of it is not sold in the local market. There is a belief among some people that this turtle will cure some chronic ailments. It is sometimes caught accidentally in fishing nets but no regular turtle fishing is practiced here. In West Bengal there is a good demand for the turtle meat and the meat of *Trionyx gangeticus* and *Lissemys punctatus punctatus* are often sold in local markets. Consignments of these species from other states also come to the market of West Bengal. Therefore there is a good possibility and scope for starting turtle fisheries in Orissa.

SUMMARY

This paper notes some observations on biology of six species of reptiles occurring in and around Nandankanan Biological park. Earlier reports are also summarized.

ACKNOWLEDGEMENT

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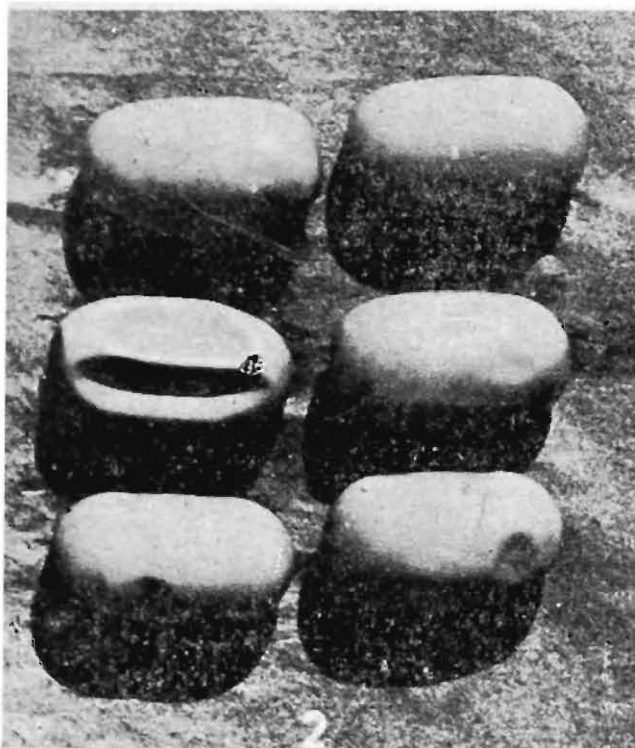
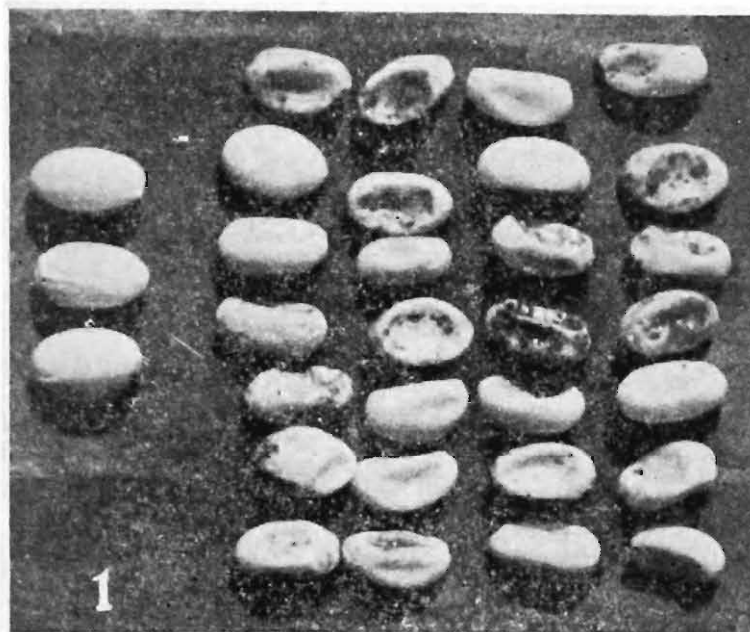
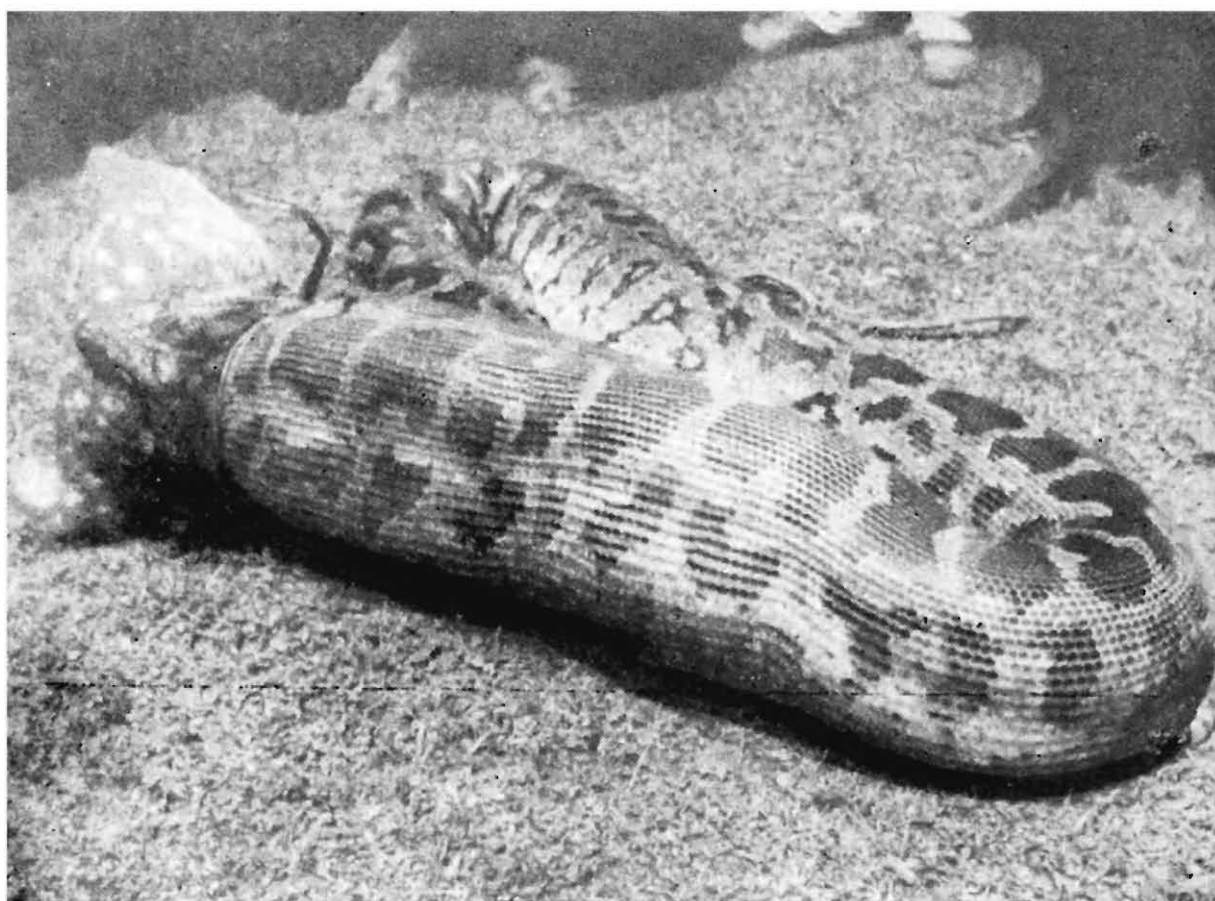


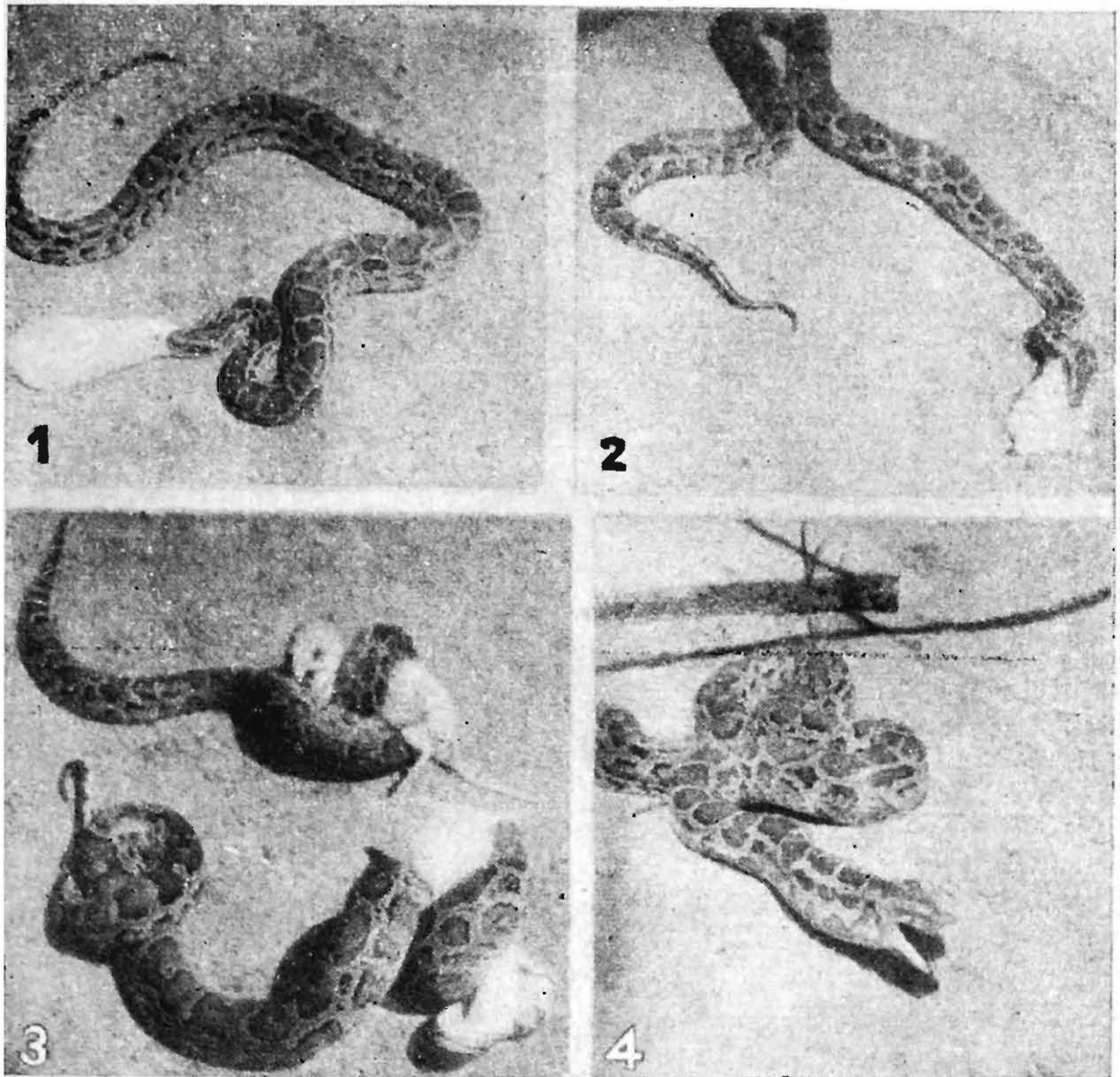
Fig. 1. Eggs of *Chameleon zeylanicus* (Laurenti)

Fig. 2. Eggs of *Ptyas mucosus* (Linn.)

Fig. 3. Egg of *Varanus salvator* (Laurenti)



Python molurus molurus Linn. swallowing a Cheetal.



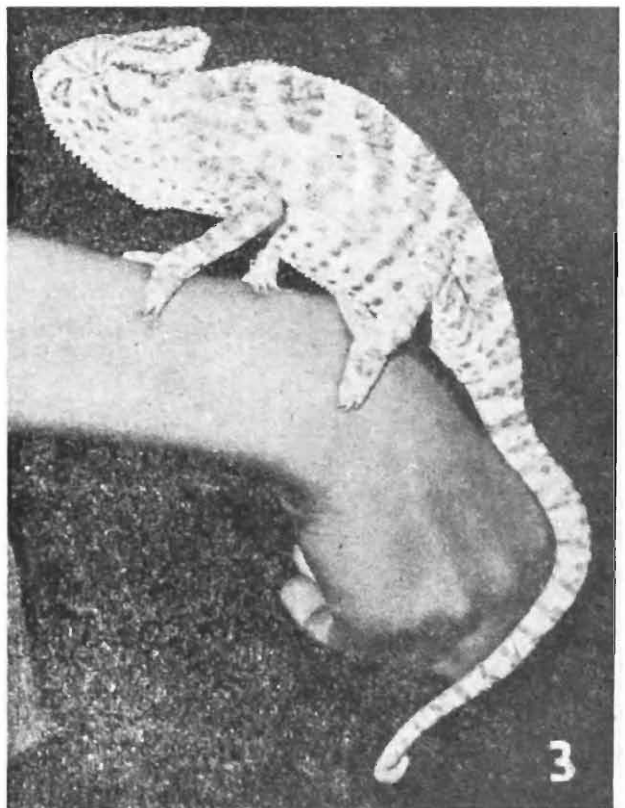
Four different poses of a young *Python molurus molurus* Linn in its food taking mechanism.

Fig. 1. Just caught the head of the prey.

Fig. 2. Progressing in its swallowing action.

Fig. 3. Coiling action on its prey.

Fig. 4. Gaping mouth action to facilitate further progress of the prey inside the gullet.



Figs. 1, 2, 3 *Chameon zeylanicus* (Laurent) showing different colour changes.

ON SOME TREMATODES FROM MEGHALAYA

By

T. D. SOOTA and R. K. GHOSH

Zoological Survey of India, Calcutta

(With 1 text-figure.)

INTRODUCTION

A faunistic survey of the regions in and around Shillong and Cherrapunjee (Meghalaya) was made by the senior author during the months of January and February 1974 and several helminths were collected from different vertebrates. In all 13 species of trematodes were collected and these belong to 13 genera and 11 families. One of these is a new species while others are known species but show some interesting variations. The present paper deals with the account of trematodes.

SYSTEMATIC ACCOUNT

Family ECHINOSTOMATIDAE Poche, 1926.

Subfamily SINGHIINAE Yamaguti, 1958.

Singhia thapari (Singh, 1953) Yamaguti, 1958.

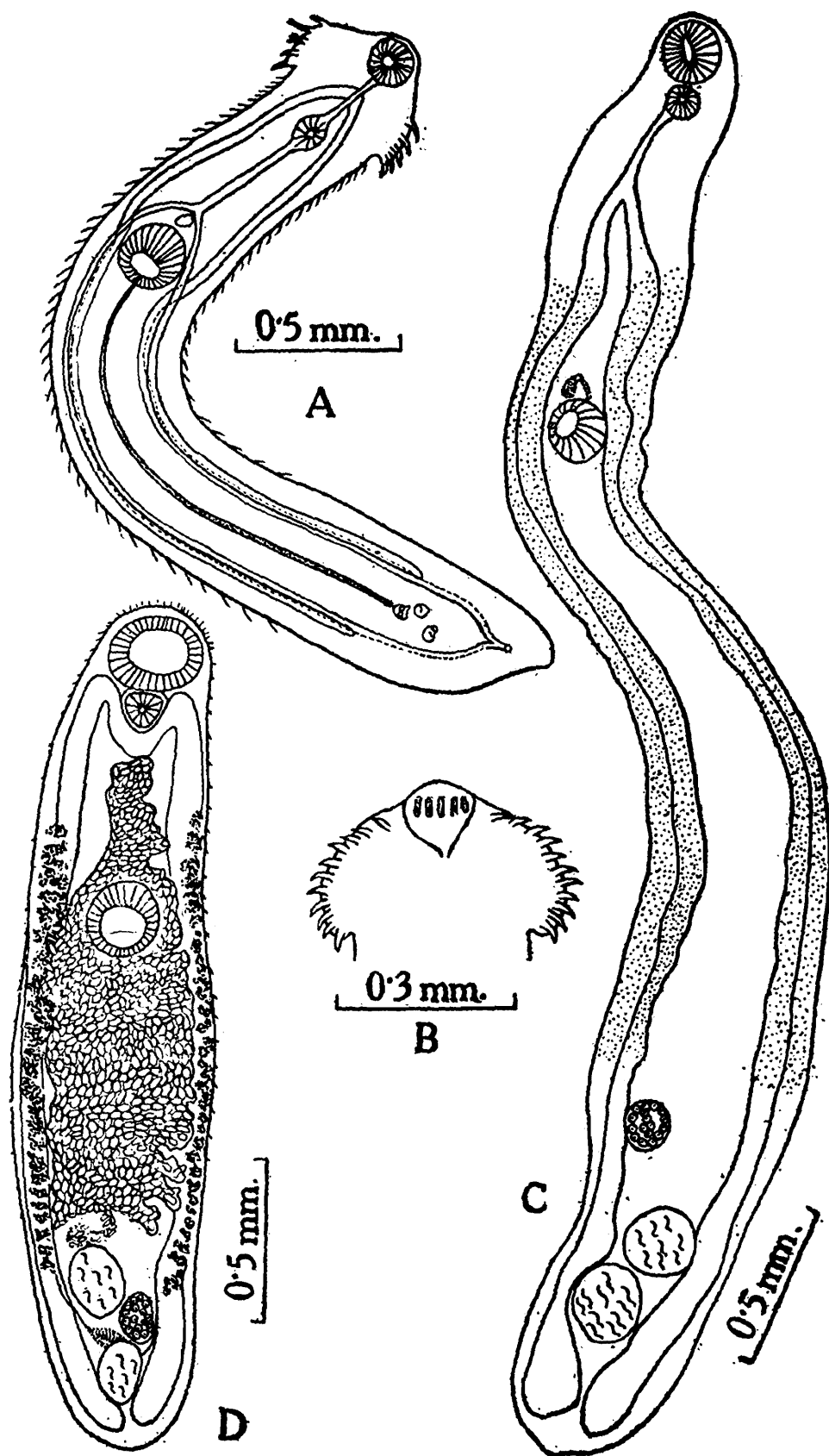
(Text-fig. 1 A & B)

1953. *Echinostoma thapari* Singh, *Thapar Comm. vol.* : 247.

Material.— 1 ex. (immature); Z.S.I. reg. no. W7233/1; host-fish, *Notopterus chitala*; location-intestine; locality-Shillong fish market; 6. ii. 1974; Coll. T. D. Soota.

Description.— Body elongated, spatulated, spinose, 2.38×0.38 , maximum breadth in acetabular region; cuticular spines extending to anterior two-thirds of body; cephalic collar well-developed bearing a single uninterrupted row of 27 conspicuous spines of variable size; end spines larger; first spine from end measuring 0.072×0.021 , second 0.053×0.012 , and mid-dorsal 0.048×0.012 ; oral sucker

All measurements are in millimetres.



Text-fig. 1.—A & B. *Singhia thapari* (Singh); C. *Thaparotrema vittalani* Gupta;
D. *Brachylaima shillongensis*, sp. n.

0.09×0.1; prepharynx 1.15; pharynx 0.07; 0.054; oesophagus moderately long, 0.29 in length, intestinal caeca extending almost up to posterior margin of body; acetabulum pre-equatorial, 0.18 in diameter; testes rudimentary, slightly diagonal, small and present in posterior end; anterior testes 0.027×0.036, posterior 0.036×0.045; cirrus pouch small, located just anterior to acetabulum; ovary small, 0.045×0.036 pretesticular, median; vitellaria not much developed; uterus runs as a straight tube and traceable up to acetabulum; eggs absent; 'Y'-shaped excretory system clearly discernible, wide anterior arms run parallel to intestinal caeca, excretory pore terminal.

Remarks.—Singh (1953) obtained fully matured specimens of this species from a fish (*Notopterus chitala*) in Lucknow and described it as a new species under the name *Echinostoma thapari*. Yamaguti (1958) erected the genus *Singhia* for this species and placed it in a new subfamily viz. Singhiinae under Echinostomatidae Poche, 1926. Subsequently, however, no other worker reported this species. The present find is the second record of this fish echinostome. This is the only echinostome recorded in India from fish. Another record of a fish echinostome is from Brazil viz. *Caballerotrema brasiliense* Prudhoe, 1960 from *Arapaima gigas*.

Family OPISTHORCHIIDAE Braun, 1901.

Subfamily OPISTHORCHIINAE LOOSS, 1899.

Thaparotrema vittalani Gupta, 1955.

(Text-fig. 1, C)

1954. *Thaparotrema vittalani* Dayal & Gupta *Proc. 40th Indian Sci. Congr.* Pt. III : 189.

1955. *Thaparotrema vittalani* Gupta, *Indian J. Helminth.* : 5 (1) 25.

Material.—3 ex. (Juvenile); Z.S.I. reg. nos. W7234-35/1; host—fish, *Rita rita*; location-2; locality-Shillong fish market; 6. ii. 1974; Coll. T D. Soota.

Description.— Body long and flattened, 4.18×0.58, maximum breadth in ovarian zone; cuticle spiny, spines dense anteriorly but sparse posteriorly; oral sucker subterminal 0.18×0.15; mouth leads into a short but distinct prepharynx, 0.018 long; pharynx globular, 0.03×0.09; oesophagus 0.216 long, intestinal caeca extend up to posterior end; acetabulum slightly smaller than oral sucker, 0.13×0.15, and 1.12 from anterior end (equal to about 1/3rd of body length); testes in posterior end, oblique in position, contiguous or apart; anterior testis 0.21×0.17, posterior 0.23×0.18; cirrus sac absent; vesicula seminalis faintly discernible, opening just in front of ventral sucker and extending back to acetabulum; ovary dextral and subglobular

0.11×0.09; vitelline follicles extending from preacetabular region to ovarion zone; follicles small and mostly lateral to intestinal caeca but overlapping the latter at places; uterus extending from ootype and forming intercaecal transverse loops up to ventral sucker; a few ova present, 0.034-3.043×0.022—0.024; excretory bladder 'Y'—shaped with terminal excretory pore.

Remarks.—The present species was reported by Dayal and Gupta (1954) in an abstract form as a new genus and species from the gall bladder of a fish (*Rita rita*) from Gauhati, Assam. Later Gupta (1955) defined the genus and described the species in detail. The present material shows variation in the extension of vitellaria, in position of ovary in relation to anterior testis, and in measurements. These are, however considered to be intraspecific variations.

Rai (1971) considered *Thaparotrema* a synonym of *Opisthorchis* Blanchard, 1895, but for the time being the genus *Thaparotrema* is being retained here.

Family LECITHODENDRIIDAE (Lühe, 1901) Odhner, 1910.

Subfamily PLEUROGENINAE Travassos, 1921.

Pleurogenoides pab dai (Pande, 1937) Kaw, 1943.

1937. *Pleurogenes pab dai* Pande, *Proc. Natn. Acad. Sci. India*, 7 (2) : 111.

Material.—2 ex. (damaged); Z.S.I. reg. nos. W7236-37/1; host-fish, *Ompok* sp.; location-intestine; locality—Shillong fish market; 6. ii. 1974; Coll. T D. Soota.

Description.—Body 0.85×0.06; cuticle spinose; oral sucker 0.13-0.15; acetabulum 0.12-0.13×0.99.—1.44; testes pre-equatorial, intercaecal, anterior testis 0.16×0.12 and posterior one 0.13×0.11; ovary post-testicular, 0.13×0.12; vitellaria comprising of 16 large follicles; genital pore antero-lateral to ventral sucker on the opposite side of ovary; eggs. 0.026—0.031×0.014.

Remarks.—Pande (1937) described *Pleurogenes pab dai* from a fish *Ompok bimaculatus* (= *Callichrous pabda*) from Lucknow, which Kaw (1943) transferred to the genus *Pleurogenoides* Travassos, 1921. Kakaji (1968) described another species viz. *Pleurogenes attui*, from a fish (*Wallago attu*) but Yamaguti (1971) transferred it to *Pleurogenoides*. The present specimens come close to *P. pab dai* described from the same host but differ in body size, in sizes of suckers and in lesser number of vitelline follicles. But these differences are considered as intraspecific variations and hence the present form has been identified as *P. pab dai*. As detailed description of this species has already been given by Pande (1937) only diagnostic features and measurements are given.

Family BRACHYLAIMIDAE Miller, 1936.

Subfamily BRACHYLAIMINAE Miller, 1936.

Brachylaima (Brachylaima) shillongensis sp. n.

(Text-fig. 1, D)

Material.— 5 ex.; Z.S.I. reg. nos. W7238-39/1; host—a bird, not identified; location-intestine; locality-Moti nagar, Shillong; 19. i. 1974; Coll. T D. Soota.

Description.— Body elongated with blunt extremities almost of uniform width throughout, $2.37-2.48 \times 0.51-0.61$; cuticle spinose, spines minute, extending up to $3/4$ of body length; oral sucker sub-terminal, $0.18-0.19 \times 0.22-0.24$; prepharynx absent; pharynx globular, $0.09-0.1 \times 0.09-0.12$; oesophagus absent; intestinal caeca run up to posterior end of body; acetabulum pre-equatorial, $0.16-0.18$ in diameter; genital organs in posterior region of body; testes behind one another; anterior testis $0.16-0.19 \times 0.15-0.16$, posterior $0.16-0.18 \times 0.14-0.18$; cirrus pouch not well defined, located just anterior to anterior testis; genital pore faintly visible anterolateral to anterior testis and on its left side; ovary intertesticular, $0.13-0.14 \times 0.09-0.11$; follicular vitellaria extending along the lateral margin of body from a short distance in front of acetabulum to anterior testis or ovary, follicles overlapping intestinal caeca; uterine coils dense and fill up both post-and pre-acetabular intercaecal fields, eventually the uterus opens by side of genital pore; eggs. $0.022-0.024 \times 0.009-0.014$.

Remarks.— Yamaguti (1971) has split the genus *Brachylaima* Dujardin, 1843 into two subgenera viz., *Brachylaima* and *Rallitrema*. The present species is referable to the former subgenus mainly on account of its uterus extending in forebody. Yamaguti (1971) included 28 species under this subgenus, of which only two species, viz. *Brachylaima tisa* Chatterji, 1956, and *B. indicum* Singh, 1962, are known from India.

The present species comes close to *B. Bulvus* (Dujardin, 1843) Blanchard, 1847, and *B. tisa* Chatterji, 1956 in the "relative size" of the suckers, but differs from both in a number of features. It can be easily distinguished from *B. fulvus* by the development and extension of uterine coils (poorly developed in *B. fulvus*) and by the position of gonads which are separate from each other (overlapping in *B. fulvus*). In having cuticular spines, it differs from *B. tisa* in which these are absent, and furthermore the body size and, shape and size of cirrus pouch are different in the present species from those in *B. tisa*. It agrees with *B. indicum* Singh, 1962 in the presence of cuticular spines and

position of gonads, but differs from it in the extension of vitellaria well beyond the acetabulum (in *B. indicum* the vitellaria go as far as the posterior half of the acetabulum) and in the "relative size" of suckers.

Hence the present form is being considered a new species and it is to be designated as *Brachylaima (Brachylaima) shillongensis*, sp. n.

Family PARAMPHISTOMIDAE Fischöder, 1901.

Subfamily (i) GASTROTHYLACINAE Stiles and Goldberger, 1901.

1. *Gastrothylax crumenifer* (Creplin, 1847) Otto, 1896.

1847. *Amphistoma crumenifer* Creplin, *Arch. Naturg.*, 13 (1) : 30.

Material.—25 ex.; Z.S.I. reg. no W7240/1; host-goat (*Capra* sp.); location-rumen; locality-Shillong; 3. ii. 1974; Coll. T. D. Soota.

Remarks.—This species commonly parasitizes goat and other ruminants.

2. *Fischöderius elongatus* (Poirier, 1883) Stiles and Goldberger, 1910.

1883. *Gastrothylax elongatum* Poirier, *Bull. Soc. Philom.*, 7 : 73.

Material.—6 ex ; Z.S.I. reg. no. W7242/1; host-goat (*Capra* sp.); location-rumen; locality—Shillong; 3. ii. 1974; Coll. T. D. Soota.

Remarks.—This species commonly parasitizes ruminants and is widely distributed in India.

Subfamily (ii) PARAMPHISTOMINAE Fischöder, 1901.

Orthocoelium scoliocoelium (Fischöder, 1904) Yamaguti, 1971.

1904. *Paramphistomum scoliocoelium* Fischöder *Ctbl. Bakt.* 1. Orig., 35 : 599.

Material.—15 ex.; Z.S.I. reg. no. W7241/1; host-goat (*Capra* sp.); location-rumen; locality-Shillong; 3. ii. 1974; Coll. T. D. Soota.

Remarks.—This species commonly parasitizes goat of Northern India and Bengal. This appears to be the first record from Meghalaya.

Family PLAGIORCHIIDAE Ward, 1917.

Subfamily ASTIOTREMATINAE Baer, 1924.

Astiotrema reniferum (Looss, 1898) Stossich, 1904.

1898. *Astia renifera* Looss, *Zool. Jahrb. Syst.*, 12 : 590.

Material.—4 ex. (2 mature & 2 immature); Z.S.I. reg. no. W7243/1; host-tortoise; location-intestine; locality-Shillong fish market; 1.ii.1974; Coll. T. D. Soota.

Remarks.—As this species commonly parasitizes different fishes and reptilia and is widely distributed in India, only important measurements are given below. Intraspecific variations in this species have been observed by Yeh and Fotedar (1958), and Basant Kumari *et al.* (1972). In our material we have noticed variations in the distribution of vitellaria which are asymmetrical in some cases, while in other cases extend beyond posterior testis. Further, testes may be smooth or deeply notched.

Body 3.06—3.15×0.5—0.68; oral sucker 0.18—0.21×0.14—0.18; pharynx 0.09—0.1×0.05—0.1; oesophagus 0.32—0.45×0.027—0.03; acetabulum 0.18—0.21—0.18—0.22; anterior testis 0.25—0.32×0.27—0.34, posterior testes 0.29—0.38×0.33—0.36; ovary 0.18—0.2×0.15—0.17; cirrus sac 0.49—0.67×0.16—0.18; eggs 0.024—0.036×0.012—0.014.

Family ISOPARORCHIIDAE (Travassos, 1922) Poche, 1926.

Isoparorchis hypselobagri (Billet, 1898) Ejsmont, 1932.

1898. *Distoma hypselobagri* Billet, *Bull. Sci. France Belgique*, 28 : 283.

Material.—12 ex.; Z.S.I. reg. no. W7244/1; host-fish, *Wallago attu*; location-air bladder; locality-Shillong fish market; 30. i. 1974; Coll. T. D. Soota.

Remarks.—This species is widely distributed and has been reported from different fishes. This is, however, first report of its occurrence in Shillong.

Family ALLOCREADIIDAE (Looss, 1902) Stossich, 1903.

Subfamily ALLOCREADIINAE Looss, 1902.

Allocreadium kamalai Gupta, 1956.

1956. *Allocreadium kamalai* Gupta, *Indian J. Helminth.*, 8 (2) : 100.

Material.—1 ex.; Z.S.I. reg. no. W7245/1; host-fish, *Colisa fasciata*; location-intestines; locality-Cherrapunjee fish market : 10. ii. 1974; Coll. T. D. Soota.

Description.—Body with blunt extremities, 4.24×1.44, maximum breadth in ovarian zone; cuticle smooth; subterminal oral sucker 0.21×0.28; prepharynx absent; pharynx 0.12×0.13; oesophagus 0.27×0.1; intestinal caeca run beyond testicular level; acetabulum 0.27—0.3, pre-equatorial, slightly larger than oral sucker and situated a short distance behind oesophagela bifurcation; testes post-equatorial, anterior 0.45×0.4, posterior 0.6×0.45; cirrus pouch pre-acetabular, 0.24×

0.12; genital pore median, a little in front of acetabulum; ovary pre-testicular, 0.19×0.23 ; recepticulum seminis just behind ovary; follicular vitellaria extending laterally from level of oesophageal bifurcation to posterior end, overlapping caeca at places and merging in post-testicular region; uterine coils pretesticular; eggs almost yellowish oval, $0.126-0.144 \times 0.081-0.09$.

Remarks.— The present specimen comes close to *A. kamalai* Gupta, 1956, reported from *Oxygaster bacaila* (= *Chela bacaila*) in Lucknow, on account of their oral sucker being slightly smaller than acetabulum and in the extension of vitellaria up to oesophageal bifurcation. But it differs in body size (which is smaller in the present specimen), in the absence of a prepharynx and in respect of positions of cirrus pouch and vesicula seminalis. These variations are considered intraspecific in nature.

The species is being recorded for the first time from a new host and a new locality.

Family OPECOELIDAE Ozaki, 1925.

Subfamily PLAGIOPORINAE Manter, 1947.

Neopodocotyle Indica Dayal, 1950.

1950. *Neopodocotyle indica* Dayal *Indian J. Helminth.*, 2 (1) : 5.

Material.— 2 ex. (one mature & partially damaged and another immature); Z.S.I. reg. no. W7246/1; host—mahseer fish, *Tor tor*; location—intestine; locality—Shillong fish market; 15. ii. 1974; Coll. T. D. Soota.

Description.— Body elongated with rounded extremities, 3.02×1.13 , maximum breadth just behind acetabulum; cuticle spinose; sub-terminal oral sucker 0.36×0.32 ; a short prepharynx present; muscular pharynx 0.21×0.18 ; oesophagus present; intestinal caeca run up to 0.18 from hinder end; acetabulum 0.4×0.32 , situated in anterior third of body; testes tandem, post-equatorial with crenated margin; anterior testis 0.41×0.38 , posterior 0.45×0.32 ; crescent shaped cirrus sac placed lateral to acetabulum, 0.54×0.14 ; seminal vesicle 0.32×0.09 , followed by ductus ejaculatorius; genital pore opening just anterior to acetabulum; ovary pretesticular, pre-equatorial and appears smaller than testes (measurements not taken due to ovary being partially covered with eggs); prominent recepticulum seminis 0.25×0.04 just behind acetabulum; vitelline follicles large, lateral to but overlapping caeca, extending from level of acetabulum to posterior end, contiguous in post-testicular field; uterine coils pretesticular, opening by side of genital pore; eggs yellowish oval $0.075-0.092 \times 0.06-0.07$; excretory pore terminal with tubular excretory bladder extending beyond testes.

Discussion.— Dayal (1950) created the genus *Neopodocotyle* for the reception of the species *Neopodocotyle indica* collected from the intestine of the fish, *Ompok bimaculatus* (= *Callichrous bimaculatus*) at Lucknow. Since then three more species have been described viz., *N. lucknowensis* Gupta and Chakrabarti, 1967, redesignated as *Puntiotrema lucknowensis* by Baugh and Chakrabarti, 1970, *N. spinipora* Sircar and Sinha, 1969, and *N. mehrui* Rai, 1971. Apparently Rai (1971) while describing his new species overlooked the paper by Sircar and Sinha (1969). Likewise Sircar and Sinha (1969) seem to have overlooked Gupta and Chakrabarti's (1967) work. The present form resembles closely *N. indica* in all major characters excepting extension of vitellaria and slight variations in relative size of oral sucker and acetabulum. These variations are considered to be intraspecific in nature.

Family DICROCOELIIDAE Odhner, 1910.

Subfamily DICROCOELIINAE Looss, 1809.

Brachydistomum sp.

Material.— 7 ex.; Z.S.I. reg. no. W7247-48/1; host-shrike, *Turdus speciosus*; location-intestine; locality-Cherrapunjee; 9. ii. 1974; Coll. T. D. Soota.

Description.— Body lanceolate, 2.52×0.34 , maximum breadth in acetabular region; cuticle smooth; subterminal oral sucker 0.06×0.12 ; mouth opening directly into small globular pharynx, 0.04; no prepharynx; oesophagus short, oesophageal bifurcation just in front of acetabulum, intestinal caeca extending almost up to posterior extremity; acetabulum larger than oral sucker, 0.27×0.17 and situated in anterior third of body; testes two, pre-equatorial, pre-ovarian, directly or obliquely tandem; anterior testes 0.11×0.13 , posterior 0.12×0.13 ; cirrus pouch just in front of acetabulum, enclosing seminal vesicle; genital pore located anterior to acetabulum; ovary almost round, just behind posterior testis, 0.091×0.117 ; shell glands complex just behind ovary; vitelline glands post-ovarian, lateral to caeca and with large follicles on each side extending from behind ovary to a short distance beyond equatorial level; eggs yellowish, $0.36-0.4 \times 0.024-0.026$, and distributed in post-ovarian zone; uterus not extending to intratesticular or ovarian space.

Remarks.— Jaiswal (1964) considered the genus *Brachydistomum* as a subgenus of *Lypersomum* Looss, 1899, but Yamaguti (1971) maintains it as a distinct genus to which we agree. The present form comes close to *Brachydistomum microscelis* (Yamaguti, 1933) Travassos, 1944. Because of belated fixation of the material some very important cha-

racters like opening of genital pore, number of vitelline follicles and extension of uterus have become obsolete in our specimens. Though we have no doubt that they belong to the genus *Brachydistomum*, specific identification is not possible.

Family HEMIURIDAE Lühe, 1901.

Subfamily DINURINAE Looss, 1907.

***Lecithocladium* sp.**

Material.—4 ex.; Z.S.I. reg. no. W7249-50/1; host-fish, *Hilsa ilisha*; location—intestine; locality—Shillong fish market; 4. ii. 1974; Coll. T. D. Soota.

Description.—Body cylindrical, tapering posteriorly, length 3.37-3.78 including ecsoma, breadth 0.42-0.54 maximum being near ovarian zone; cuticular spines not discernible; terminal oral sucker 0.13-0.18 $\times$ 0.21-0.22; pharynx 0.04-0.06 $\times$ 0.1; oesophagus absent; intestinal caeca arising immediately behind pharynx, continuing through the entire body including ecsoma and terminating almost at posterior end (in one specimen they are unequal); acetabulum 0.23-0.29 $\times$ 0.23-0.32, and situated a little behind first quarter of body length; testes two, obliquely or directly tandem and placed lateral to vesicula seminalis in the equatorial region of body; anterior testes lying in contact with the posterior end of vesicula seminalis, and is 0.09-0.11 $\times$ 0.09-0.13, posterior testis 0.08-0.11 $\times$ 0.09-0.11; vesicula seminalis elongated, extending behind acetabulum up to testicular level; prostatic duct a long coiled tube opening into ductus hermaphroditicus; genital pore at midlevel of pharynx or just behind it; ovary behind testes, transversely oval in shape, 0.1-0.13 $\times$ 0.15-0.18; vitellaria characteristically convoluted long filliform tubes seven or eight in number and situated in pre and post-ovarian zone overlapping uterine coils.

Remarks.—The present form has similarities with *Lecithocladium sexfasciatum* Gupta and Mehrotra, 1971, and *Lecithocladium harpodontis* Srivastava, 1942, in different features. As specimens collected were already dead, details could not be worked out and hence specific identification was not possible.

SUMMARY

Thirteen species of trematodes from Shillong and Cherrapunjee (Meghalaya) belonging to 13 genera and 11 families are dealt with in this paper. One species has been described as new, while remaining are known and show interesting variations.

ACKNOWLEDGEMENT

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NOTES ON A COLLECTION OF DYTISCIDAE (COLEOPTERA) FROM MAHARASHTRA, WITH DESCRIPTION OF A NEW SPECIES

By

T. G. VAZIRANI

Zoological Survey of India, Desert Regional Station, Jodhpur

(With 4 Text-figures)

INTRODUCTION

The Dytiscidae of Maharashtra are fairly well known. The author (1968) published the results of his earlier collections from the area and recorded thirty-six species belonging to seventeen genera. Subsequently Tonapi & Ozarkar (1969), in an account of the aquatic Coleoptera of Poona, added the following five species : *Laccophilus anticatus* Sharp, *Rhantaticus congestus* (Klug), *Sandracotus dejeani* Illiger, *Cybister confusus* Sharp and *C. rugulosus* Redtenbacher. *Hyphydrus indicus* Sharp, mentioned by these authors, is a junior synonym of *H. intermixtus* Walker and *Hydrocoptus subvittulus* Motschulsky is a case of mislabelling for *Hydaticus vittatus* (Fabricius), as is evident from the figure and measurements given in the text.

A large number of specimens collected by my colleagues at Western Regional Station, Zoological Survey of India, Poona, have now been examined by me. The present lot comprises twenty-four species, including one new species, and first records of *Laccophilus basalis* Motschulsky and *Hyphoporus severini* Regimbart from the area, thus bringing the number of species known from the area to forty-four.

Except for the remarks on five species *Laccophilus basalis* Motschulsky, *Hyphydrus* (*Apriophorus*) *renardi* Severin, *Hyphoporus severini* Regimbart *Peschetius toxophorus* Guignot and *Cybister cognatus* Aube, the other species do not call for any comments. Only the specimens have been listed under each species. The names of the collectors have been abbreviated as below : A. P. Kapur (APK), B. K. Tikader (BKT), B. S. Lamba (BSL), R. N. Chopra (RNC), K. R. Rao (KRR), M. Babu Rao (MBR), G. M. Yazdani (GMY), D. N. Tiwari (DNT).

SYSTEMATIC ACCOUNT

Family DYTISCIDAE

Subfamily NOTERINAE

1. *Canthydrus luctuosus* Aube

Maharashtra : Poona Dist., 3 ex. Vanawasi village, 15.ii.1972, *BSL*; 5 ex. Bhorghat, 16.xi.1965, *BSL*.

Subfamily LACCOPHILINAE

2. *Laccophilus anticatus* Sharp

Maharashtra : Satara Dist., 1 ex. Fritzgerald, 5.x.1972, *APK*.

3. *Laccophilus basalis* Motschulsky

Maharashtra : Kolaba Dist., 1 ex. Mahad, 14. ii. 1966, *BSL*.

Remarks.— This species has been reported by the author (1969) from India : West Bengal, for the first time and is also known from Sri Lanka, Andaman Islands and Indonesia. It is now being reported from Maharashtra for the first time. This species is obviously quite rare. It is very close to *L. inefficiens* in the elytral markings but has rufus irrotations as against black. They have however very distinct shape of penis as shown in Text-fig. 1 A-B.

4. *Laccophilus chinensis inefficiens* Walker

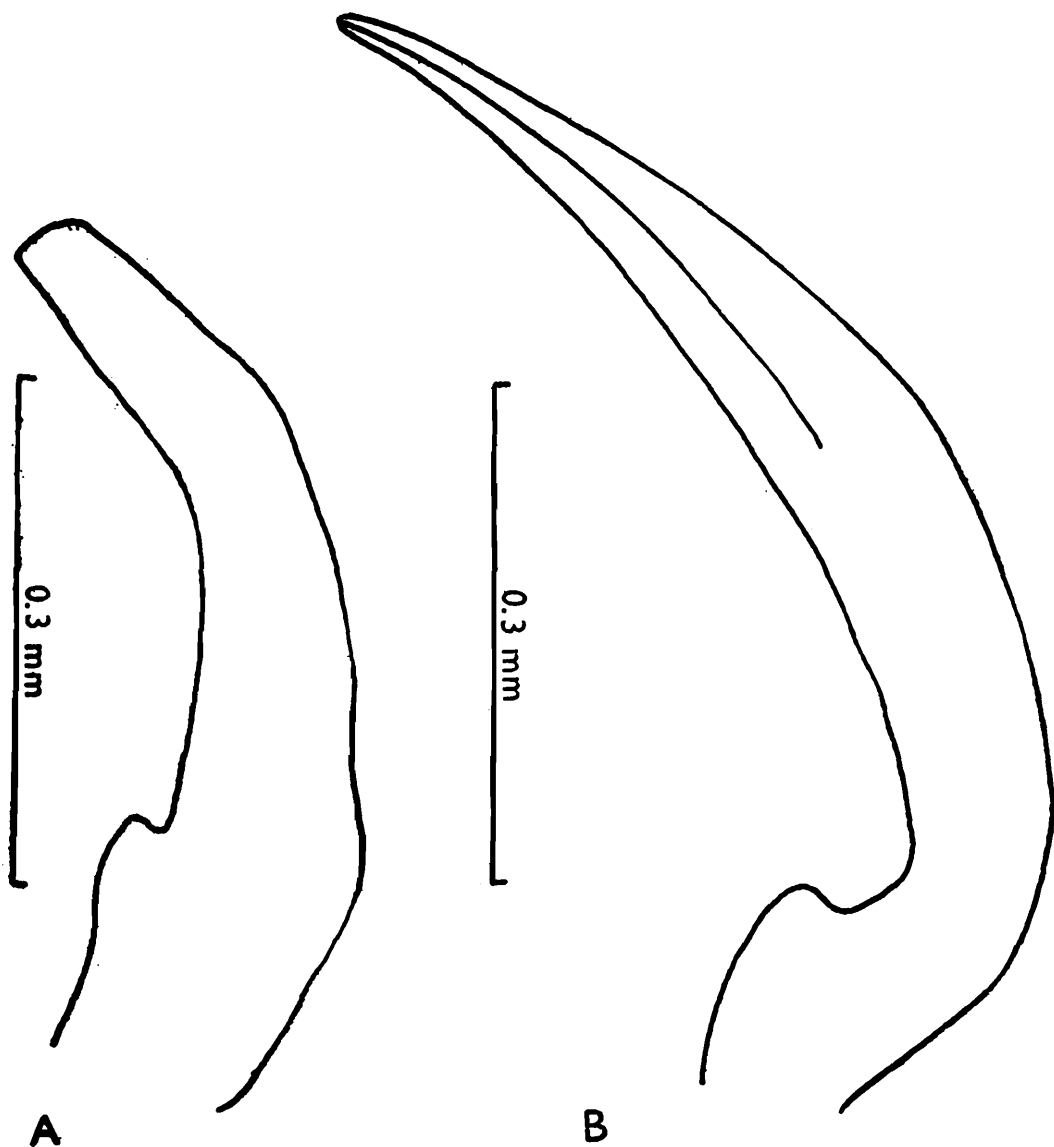
Maharashtra: Poona Dist., 1 ex. Sindewadi 29. ix. 1972, *BSL*; 3 ex. 22.i.1970, *BSL*; 8 ex. Moshi 24.i.1967, *BSL*; 10 ex. Moshi 7.v. 1971, *BSL*; 1 ex. Moshi 28.v.1971, *BSL*; 3 ex. Pirangut 18.i.1967, *RNC*; 2 ex. Pirangut 3.xii.1969, *RNC*; 5 ex Vanavasi 15.ii.1972, *BSL*; 3 ex. Kamathadi 25.vii. 1969, *RNC*; 1 ex. Kamathadi 19.ii.1969, *BSL*; 1 ex. Paud 6.xi.1969 *BSL*; 1 ex. Nira 20.v.1972, *MBR*; 1 ex. Shivapur, 3.iv.1969, *RNC*; 4 ex. Katraj Tank 8.xii.1970, *BSL*. Kolaba Dist., 1 ex. Mahad, 14 ii.1966, *BSL*.

5. *Laccophilus flexuosus* Aube

Maharashtra : Poona Dist., 1 ex. Kamset 10.xii.1970, *BSL*; 5 ex. Wagholi, 5..x.1967, *RNC*.

6. *Laccophilus parvulus* Aube

Maharashtra : Poona Dist., 3 ex. Moshi, 24.i.1967; 1 ex. Katraj Tank, 8.xii.1970; 1 ex. Kamset, 10.xii.1970, all *BSL* Colln.



Text-fig. 1.—Lateral view of penis, A-in *Laccophilus basalis*; B. in *L. in-efficiens*.

7. *Laccophilus sharpi* Regimbart

Maharashtra : Poona Dist., 1 ex. Moshi, 24.i.1974, *BSL*.

Subfamily HYDROPORINAE

8. *Hyphydrus* (*Apriophorus*) *intermixtus* Walker

Maharashtra : Poona Dist., 1 ex. Sindewadi 28.ii.1966, *RNC*; 1 ex. Sindewadi 29.ix.1972, *BKT*; 3 ex. Nira, (Bhirvi Bhaudon) 12.xi. 1967, *BSL*.

9. *Hyphydrus* (*Apriophorus*) *renardi* Severin

Maharashtra : Poona Dist, 1 ex. Bhorghat, 16.x.1965, *BSL*; 2 ex. Wagholi, 5.x.1967, *RNC*; 2 ex. Kamathadi, 19. ii. 1969, *BSL*; 1 ex. Shiva-

pur, 2.iv.1969, *RNC*; 1 ex. Kamathadi, 24.vii.1969, *RNC*; 1 ex. Kud, 9.x.1969, *BSL*; 1 ex. Shindewadi, 22.i.1970, *BSL*; 9 ex. Katraj tank, 8.xii.1970, *BSL*; 7 ex. Kamset, 10.xii.1970, *BSL*; 7 ex. Sindewadi, 23.ii.1971, *RNC*; 2 ex. Moshi, 24.i.1967, *BSL*; 1 ex. 28.v.1971, *BSL*; 1 ex. 7.v.1971, *BSL*.

Remarks.—Vazirani (1973) has discussed the variation in elytral pattern. Both the patterns A & B, as shown by Vazirani (*l. c.*) are present in this collection from the same locality, same pond and same date.

10. *Hyphoporus severini* Regimbart

Maharashtra : Poona Dist., 1 ex. Shinhagad, 28.ii.1966, *RNC*; 7 ex. Nira (Bhirvi Bhaudon), 12.xi.1967, *BSL*; 5 ex. Shindewadi, 16.x.1969, *RNC*, 1 ex. Sindewadi, 28.xi.1969, *BSL*; 2 ex. Moshi, 28.v.1971, *BSL*; 3 ex. Nira, 20.v.1972, *MBR*; Nasik Dist. 2 ex. Malegaon, 13.vi.1966, *BSL*.

Remarks.—Hitherto known from Bihar, Uttar Pradesh, Rajasthan and Pakistan. It is now being reported from Maharashtra for the first time.

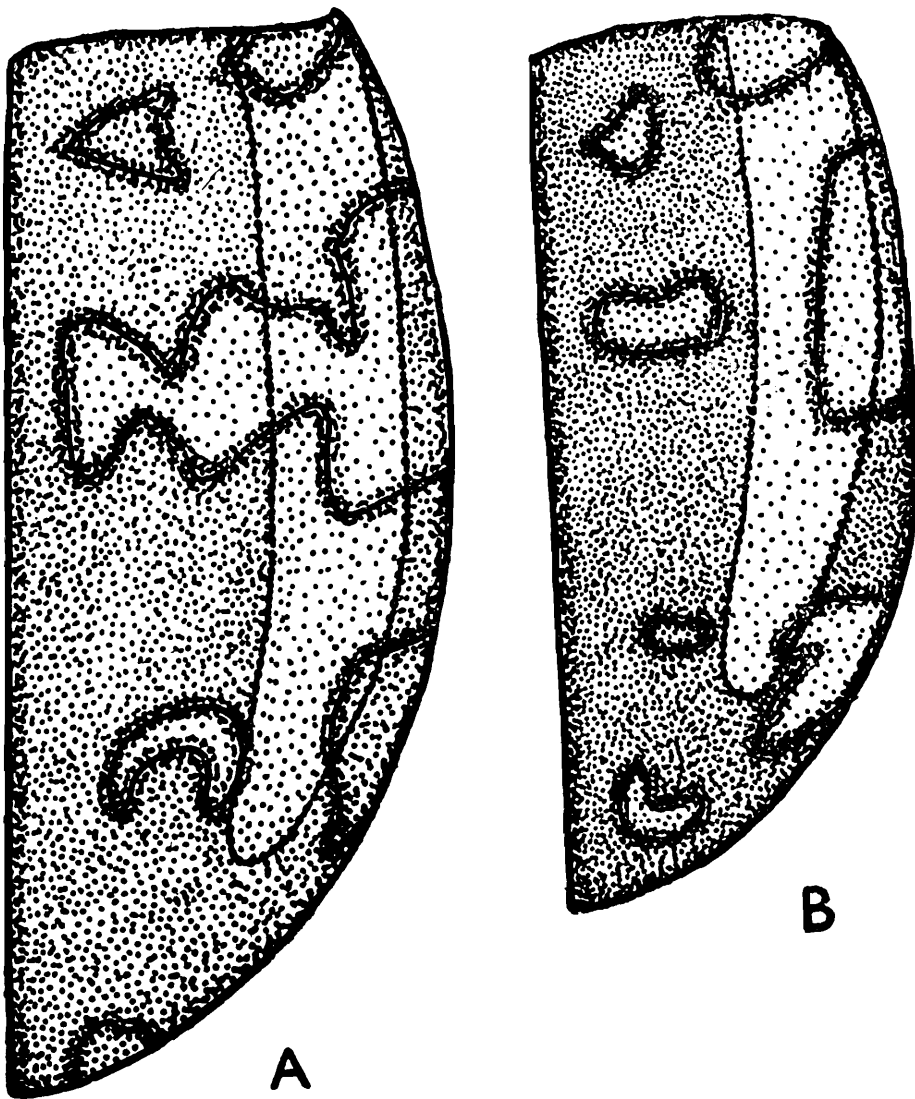
11. *Peschetius quadricostatus* Aube

Maharashtra : Poona Dist., 1 ex. Pirangut 18.i.1967, *RNC*; 1 ex. Moshi, 28.v.1971, *BSL*; Kolaba Dist., 1 ex. Mahad, 24.ii.1966, *BSL*.

12. *Peschetius toxophorus* Guignot

Maharashtra : Poona Dist., 1 ex. Moshi, 24.i.1967, *BSL*; 1 ex. Nira, 20.v.1972, *MBR*.

Remarks.—Omer-Cooper (1970) divided the African species into groups on the basis of the prosternal process being keeled or not. In both the species known from India the prosternal process is without keel and thus belong to the species group *P. parvus* Omer-Cooper and *P. nigeriensis* Omer-Cooper. Further two examples in the above collection have black labro-clypeus as against rufoferruginous in other examples. This difference is coupled with the differences in elytral markings (Text-fig. 2 A-B) but both examples happen to be female. These specimens also differ in having the elytral carina more prominent and surface more shining. It is suspected that 2 species may be involved but additional specimens need to be collected besides study of the type specimens.



Text-fig.2.— A & B Elytral markings in *Peschetius toxophorus*.

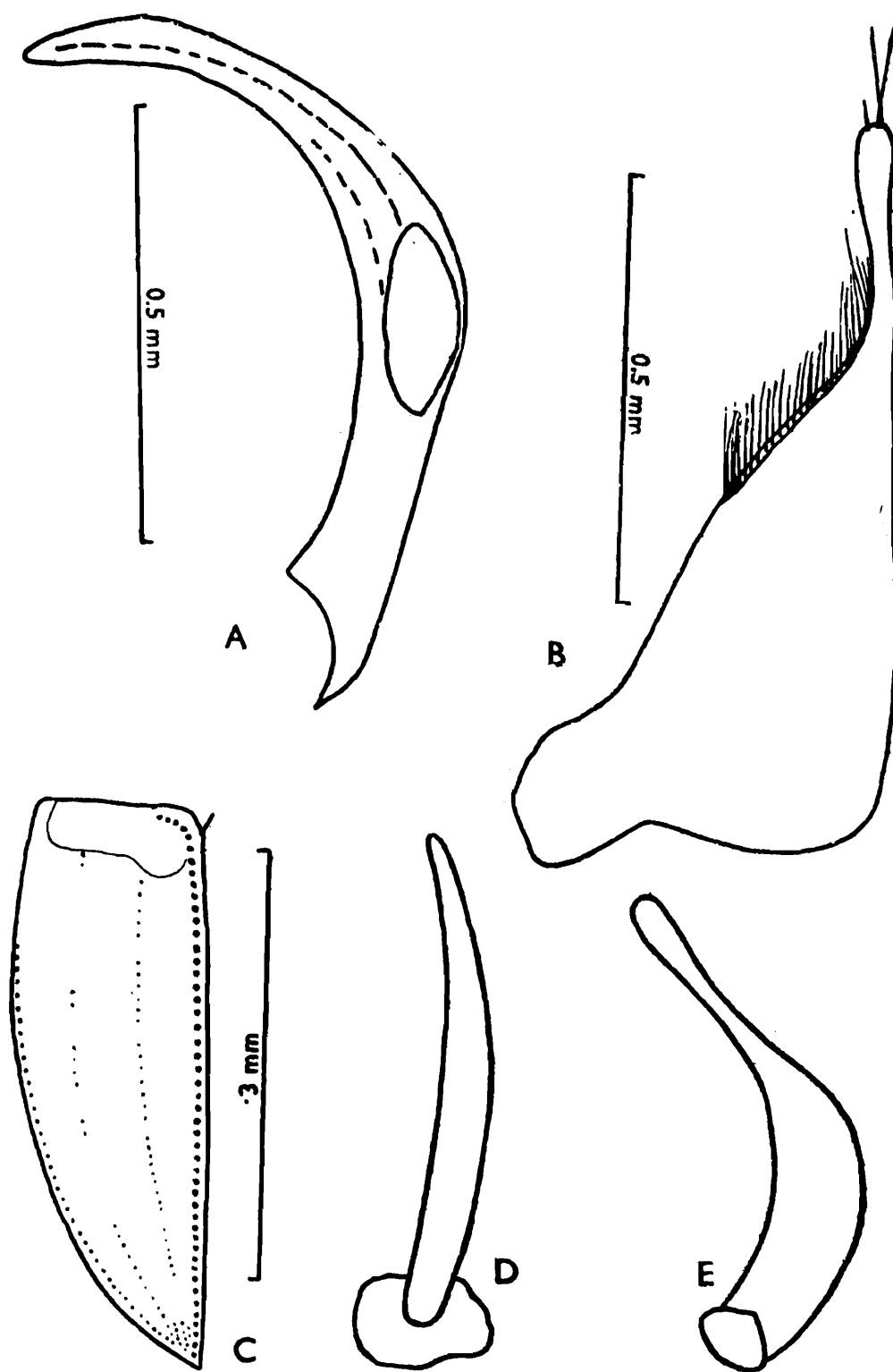
Subfamily COLYMBETINAE

13. *Lacconectus* (S. Str.) *lambai* sp. nov.

Holotype- Male, Maharashtra : Satara Dist., Fitzgerald, 5. x. 1972, A. P. Kapur colln. Paratypes—13 ex. same particulars as holotype in the Zoological Survey of India.

Length 5.0-5.6 mm.

Head testaceous anteriorly blending into ferruginous posteriorly, impunctate with reticulation indistinct. *Pronotum* ferruginous on the disc, testaceous at the sides and along the anterior border; anterior transverse row of black punctures fine and irregular, not exceeding beyond the outer margin of eyes; sides not rebordered, feebly arched, posterior angles pointed. *Elytra* (Text-fig. 3C) testaceous to ferruginous, rather iridescent, with a pale yellow undefined basal band not reaching the lateral margin, sutural row of fine black punctures, a row of



Text-fig.3.— A. Lateral view of penis, *Lacconectus lambai* B. paramere, C. left elytron. Penis in *Lacconectus tonkinensis* : D. dorsal view; E. lateral view.

few irregularly arranged punctures between the sutural row and inner striae of punctures, a similar row of irregular punctures between the inner and outer normal striae also present, sublaterally a row of black punctures, finer than the sutural row, commencing from the one third to the apex; reticulation imperceptible. *Ventral side* ferruginous with legs (except metatibiae and tarsi), abdomen and epipleurae rather testaceous; prosternal process depressed in between meso and meta

coxae, rounded at apex, sides of the apical portion rebordered. Penis (Text-fig. 3A) strongly curved, broad at base and narrowed towards apex; twisted in the apical portion, apex bluntly pointed; basal three segments of protarsi and mesotarsi feebly dilated to provide minute suckers underneath, 2+2+1 from basal segment.

Remarks.—In the key to the species of *Lacconectus* by Gueorguiev (1968) this species runs to *L. fulvescens* Motschulsky, but differs from it in the its much larger (5.0-5.6 mm as against 4.0-4.3 mm). Vazirani (1970) has split the genus into two subgenera on the basis of presence of metacoxal lines coupled with the normal striae on elytra consisting of stronger punctures. In this key to the species, this species runs near to *L. tonkinensis* Guignot, but differs from it (i) elytra testaceous as against brown-black and without any spots except the undefined basal band (ii) supplementary punctures on elytra are few in this species as against dense in anterior half and larger and coalescent in posterior half. The two species also differ in the shape of penis (Text-fig. 3 D, E).

14. *Rhantus taprobanicus* Sharp

Maharashtra : Poona Dist., 1 ex. Wagholi, 17.i.1972, *MBR*.

Subfamily DYTISCINAE

15. *Eretes sticticus* (Linnaeus)

Maharashtra : Poona Dist., Moshi, 13 ex. 2.iii.1969, *BSL*.

16. *Hydaticus* (Guignotites) *incertus* Regimbart

Maharashtra : Nasik Dist., 2 ex. Malegaon, 28.i.1968, *RNC*; Aurangabad Dist., 2 ex. Shaigadh, 17.ii.1970 *BSL*; Nanded Dist., 1 ex. Manded vill. Mangore R. 2.xii.1970, *RNC*; Poona Dist., 3 ex. Kamset, 10. xii.1970, *BSL*; 1 ex. Pirangut, 18.i.1967 *RNC*; 1 ex. Kondapuri, 30.xii.1971, *MBR*.

17. *Hydaticus* (Guignotites) *luczoncius* Aube

Maharashtra : Poona Dist., 1 ex. Khed, 10. iv. 1970, *KRR*; 2 ex. Wagholi, 17.i.1972, *MBR*.

18. *Hydaticus* (Guignotites) *vittatus* Fabricius

Maharashtra : Poona Dist., 1 ex. Wagholi, 5.x.1967, *RNC*; 1 ex. Wagholi, 7.xii.,1967, *RNC*; 1 ex. Khed Shivapur, 17.ix.1968, *RNC*; 3 ex. Wagholi, 25.ii.1968, *RNC*; 1 ex. Paud 8.v.1969, *RNC*; 1 ex. Khed 10.iv.1970, *KRR*; 1 ex. Katraj tank, 8.xii.1970, *BSL*; 2 ex. Koregaon, Z.S...9

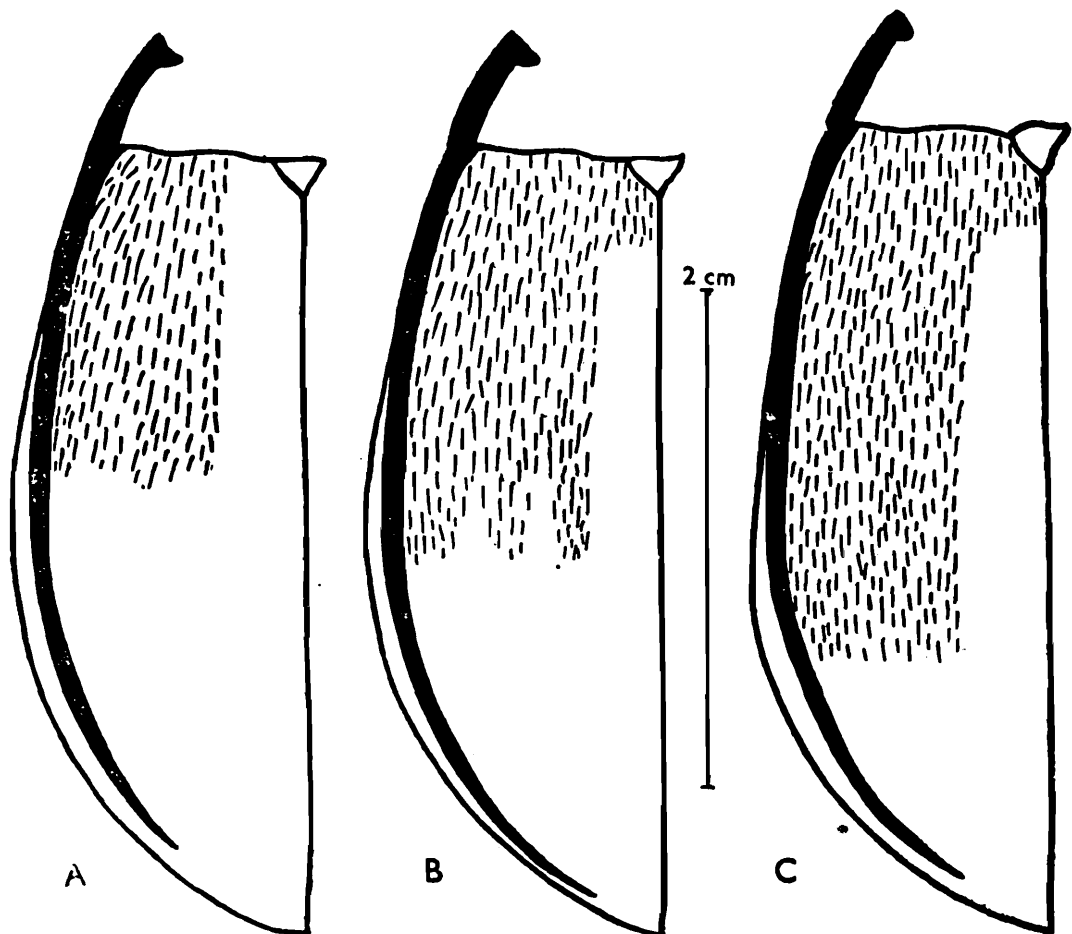
27.ix.1971, *BSL*; 3 ex. Kondapuri, 30.xii.1971, *MBR*; 9 ex. Wagholi 17.i.1972, *MBR*. Ratnagiri Dist., 2 ex. Kandamala R. 2.xii.1971, *BSL*. Aurangabad Dist., 1 ex. Shahgadh 17.ii.1970, *BSL*.

19. *Sandracottus dejeani* Aube

Maharashtra : Poona Dist., 1 ex. Moshi, 28.v.1971, *BSL*.

20. *Cybister (Meganectes) cognatus* Sharp

Maharashtra : Poona Dist., 1 ex. Kamset, 24.xii.1970, *RNC*; 2 ex. 20.xi.1970, *KRR*; 1 ex. 27.i.1971, *RNC*; 1 ex. Khed, 8.ii. 1968, *BSL*; 1 ex. 14.ii.1969, *BSL*; 1 ex. 3.ii.1970, *BSL*; 1 ex. 10.iv.1970, *KRR*; 1 ex. 1.v.1970, *RNC*; 2 ex. 12.xi.1970, *KRR*; 1 ex. 2.i.1971, *RNC*; 2 ex. 23.i.1971, *RNC*; 1 ex. 10.ix.1971, *BSL*; 1 ex. 7.v.1971; 1 ex. 13. xii.1971, *KRR*; 1 ex. 4.iii.1972, *KRR*; 1 ex. Pirangut, 6.xi.1969, *BSL*; 1 ex. 12.iii. 1970, *RNC*; 1 ex. Wagholi 5.ii.1968, *DNT*; 2 ex. 17.i.1972, *MBR*; 2 ex. Moshi 25.iii.1972, *KRR*; 1 ex. Sindewadi 5.xii.1969, *RNC*; 2 ex. 11.ii.1971, *RNC*; 1 ex. Ponolon, 24.viii. 1965, *SMK*; 1 ex. Kondapuri, 30.xii.1971, *MBR*; 1 ex. Paud 8.v.1969, *RNC*; 1 ex. 19.vi.1969, *RNC*; 1 ex. Kamathadi, 13.vi.1969, *RNC*; 1 ex. Talegaon, 27.i.1971, *RNC*.



Text-fig. 4—A-C variation in striations on the elytron of *Cybister cognatus*.

Remarks.—There is considerable infra-specific variation in this species in the colouration of ventral surface as well as the striations on the elytra in females. The colouration of the ventral surface is either variegated between yellow and ferruginous or dark ferruginous to black. The specimens with black ventral surface may be easily confused with *C. confusus*, but can be separated only by genitalic characters. The striations on the elytra in female vary between their presence on the anterior on fourth or half or three-fourths (Text-fig. 4. A-C). Among the twenty examples now studied 4 examples have the elytral striations on the anterior one fourth, 8 on the anterior half and 8 on the three fourth.

21. *Cybister (Meganectes) rugulosus* Redtenbacher

Maharashtra : Poona Dist., 2 ex. Koregaon, 29.iv.1971, *RNC*; 1 ex. Koregaon, 20.v.1971, *RNC*; 1 ex. Khed, 19.xi.1971, *KRR*; 1 ex. Saswad, 20.i.1972, *MBR*; 1 ex. Koregaon, 7.iii.1973, *BSL*; Aurangabad Dist., 1 ex. Paithan, 27.xii.1968, *BSL*. Parbhani, Dist., 3 ex. Gangakhed, 21.viii.1971, *KRR*; 1 ex. Godavari, River, N. Bank. Shahgad, 30.vi.1972, *MBR*.

22. *Cybister (Meganectes) tripunctatus asiaticus* Sharp

Maharashtra : Poona Dist., 2 ex. Moshi, 28.v.1971, *BSL*; 1 ex. 25.iii.1972, *KRR*; 1 ex. Khed 17.i.1969, *RNC*; 1 ex. 13.xi.1969, *BSL*; 2 ex. 22.v.1970, *BSL*; 1 ex. 23.i.1971, *RNC*; 1 ex. 4.iii.1972, *KRR*; 1 ex. Sindewadi 27.xi.1969, *BSL*; 1 ex. Wagholi 5.ii.1968, *DNT*; 3 ex. 29.ii.1968, *RNC*; 1 ex. 21.iii.1968, *RNC*; 1 ex. Kondapuri, 2.xii.1971, *BSL*; 1 ex. Kamathadi 29.v.1969, *RNC*; Ratnagiri Dist., 1 ex. Madkhol, 5.ii.1973, *MBR*; 1 ex. Srungaratbali, 16.ii.1973, *MBR*; 1 ex. Kamblevir, 28.ii.1973; 1 ex. Kasrali village, 16.viii.1971, *KRR*; 2 ex. Kondamala River, 18.ii.1973, *MBR*.

Gujarat : Broach Dist., 1 ex. Ankleshwar, 23.xi.1972, *GMY*

23. *Cybister (Meganectes) posticus* Aube

Maharashtra : Poona Dist., 1 ex. Talegaon, 2.ii. 1968, *BSL*, 1 ex. 27.i.1971, *RNC*; 1 ex. Pirangut, 2.iv.1966, *RNC*; 1 ex. 13.xii.1971, *KRR*; 1 ex. Kondapuri, 8.vii.1971, *BSL*; 1 ex. Kamathadi, 5.xii.1969, *RNC*; 3 ex. Bhorghat 16.x.1965, *BSL*; 1 ex. Nasarapur, 13.iii.1969, *RNC*; 1 ex. Moshi, 11.v.1967, *RNC*; 1 ex. Yerandvana 5.iii.1965, *BSL*. Ratnagiri Dist., 3 ex. Insuli Nalla, 2.iii.1973, *MBR*; 3 ex. Bidjilla Nalla 15. ii.1973, *MBR*; 1 ex. Khare Patten Nalla, 24.ii.1973, *MBR*; 1 ex. Kondhi River, 18.ii.1973, *MBR*; 2 ex. Nekka Nalla, 21.ii.1973, *MBR*; 2 ex. Nirukhe Nalla, 2.iii.1973, *MBR*; 1 ex. Avari Nalla, 26.ii.1973, *MBR*;

1 ex. Kamale vir Nalla, 28.ii.1973; 3 ex. Kondamala River, 18.ii.1973, *MBR*. Satara Dist.; 7 ex. Koyana River 24.ii.1965, *BSL*; 2 ex. Bhima-sankar Dak Bunglow, 1.v.1965, *BSL*; 2 ex. Wahi, (Mahabaleshwar) 24.iii.1965, *BSL*; Nasik Dist., 2 ex. Godavari River at Trimbak, 6.ii.1968, *RNC*. Nanded Dist., 1 ex. Sikarghat, 10.viii.1971, *KRR*. Thana Dist., 2 ex. Dungipura Nalla Palghar, 31.x.1972, *GMY*. Kolaba Dist., 1 ex. Mahad 16.ii.1966, *BSL*.

Karnataka : Belgaum Dist., 1 ex. Sirsi, 14.ii.1972, *BSL*; 1 ex. Devimane Ghat, Katgal 11.ii.1971, *BSL*.

24. *Cybister (Meganectes) confusus* Sharp

Maharashtra : Poona Dist., 2 ex. Kamset, 13.viii.1970, *RNC*; 2 ex. 20.xi.1970, *KRR*; 2 ex. 24.xij.1970, *RNC*; 1 ex. 11.iii.1971, *RNC*; 1 ex. Kamathadi, 1.v.1969, *KRR*; 1 ex. 25.iv.1972, *BSL*; 1 ex. Khed, 3.ii.1970, *BSL*; 1 ex. 1.v.1970, *RNC*; 1 ex. 12.xi.1970, *KRR*; 1 ex. 2 i. 1971, *RNC*; 1 ex. 7.v.1971, *BSL*; 1 ex. 10.ix.1971, *BSL*; 1 ex. 4.iii.1972, *KRR*; 1 ex. Koregaon, 7.iii.1973, *BSL*; 1 ex. 16.ii. 1969, *BSL*; 1 ex. 18. xii.1970, *KRR*; 1 ex. 26.iii.1971, *RNC*; 1 ex. 28.v.1971, *BSL*; 2 ex. 25. iii.1974, *KRR*; 1 ex. Pirangut, 23.i.1969, *BSL*; 1 ex. 22.v.1969, *RNC*; 1 ex. 7.vii.1969, *RNC*; 1 ex. 12.iii.1970, *RNC*; 1 ex. 7.i.1971, *RNC*; 1 ex. Rajbagh, 3.ii.1972, *KRR*; 5 ex. Sindewadi 11.ii.1971, *RNC*; 1 ex. Wagholi, 7.i.1972, *MBR*; Paud, 29.vi.1965, *BSL*. Ratnagiri Dist., 1 ex. Kondamala River, 18.ii.1973, *MBR*; 1 ex. Madkhol 5.ii.1973, *MBR*.

Gujarat : Broach Dist., 1 ex. Ankleswar Narmada River, 20.xi. 1972, *GMY*.

Karnataka : Mysore Dist., 1 ex. Kudgiri Village, 1.ii.1972, *BSL*.

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REPORT ON A COLLECTION OF MAMMALS FROM TRIPURA

By

V. C. AGRAWAL and T. P. BHATTACHARYYA

Zoological Survey of India, Calcutta

There is little authentic information about the mammalian fauna of Tripura. Stray records are available from the reports of Blyth (1844, 1847,) Sclater (1891), Khajuria (1954, 1955) and others, based on the collections made by F. Skipwith, A. Grote and J. Barbe, during the middle of the 19th century. During those days, Tripura was known as Tipperah and was in the former province of Bengal. Now, mainly, the hilly portion of Tipperah lies within Indian territory and the plains of Tipperah in Bangladesh. During 1969-73, the Indian portion of Tripura was surveyed on three occasions by us to explore its mammalian fauna. As a result, a collection of mammals was obtained which together with a few specimens in the National Zoological Collections represents 31 species and subspecies. The collection, though small, has produced a number of properly authenticated records of mammals from this area including a species of bat and a subspecies of mongoose new to the Indian region.

All measurements are in millimetres and have been taken after Pocock (1939) for Primates and Carnivora, Khajuria (1952) for Chiroptera, and Roonwal and Agrawal (1966) for the remainder, excepting those which are self-explanatory. The colour names in the text with initial capital letters are according to the nomenclature of Ridgway (1886). All collections have been made by us excepting those where otherwise mentioned.

Our thanks are due to the Director, Zoological Survey of India, Calcutta, for providing facilities for this work and to Dr. B. Biswas, Deputy Director, for suggestions. The assistance provided by the Conservator of Forests, Tripura, during the collection work is gratefully acknowledged.

Abbreviations

The following abbreviations have been used in the text.

- c*—*c.*, distance between outer surface of upper canines
cb., condylobasal length

<i>Cr.</i> ,	cranial rostrum measured from the anterior extremity of nasal to the front of orbit
<i>cw.</i> ,	braincase width
<i>E.</i> ,	length of ear
<i>FA.</i> ,	length of forearm
<i>HB.</i> ,	head and body length
<i>HF.</i> ,	length of hind foot
<i>iw.</i> ,	interorbital width
<i>i</i> ¹ — <i>m</i> . ³ ,	length of upper toothrow from first incisor to last molar
<i>l.</i> ,	greatest length of skull
<i>m.</i> ,	length of first lower molar
<i>m</i> — <i>m.</i> ,	maximum distance between outer surface of upper molars
<i>ml.</i> ,	mandibular length
<i>mw.</i> ,	maxillary width
<i>nas.</i> ,	nasal length
<i>on.</i> ,	occipito-nasal length
<i>orb.</i> ,	length of orbit
<i>pf.</i> ,	length of anterior palatal foramen
<i>pl.</i> ,	length of palate
<i>pow.</i> ,	post orbital width
<i>pm</i> ⁴ ,	length of upper fourth premolar
<i>tb.</i> ,	length of tympanic bulla
<i>Tib.</i> ,	length of tibia
<i>Tl.</i> ,	length of tail
<i>Tr.</i> ,	length of maxillary toothrow
<i>wt.</i> ,	weight of the animal
<i>zw.</i> ,	zygomatic width
<i>Z.S.I.</i> ,	Zoological Survey of India

Physiography

Tripura, the smallest of the five states of north-eastern India, is situated between latitudes 22°–24° 5' N and longitudes 91° 20'–92° 50' E, covering an area of approximately 10451 Sq. Km. It is bordered on the north, west and south by Bangladesh and on the east by Mizoram. For the administrative point of view, it is divided into three districts, namely, North Tripura, South Tripura and Sadar, with headquarters at Kumarghat, Udaipur and Agartala respectively. Tripura has a warm tropical climate. Temperatures are high in the valleys and cooler in the mountains. The monsoon results in an annual rainfall of over 200 cm., mostly between June to September.

Physiographically Tripura can be divided into the plains of Agartala and four valleys, namely, Khowai, Kamalpur, Kailashahar and Dharmanagar. The plains of Agartala are represented by the territory between Bangladesh on the west and the low Baramura and

Deotamura hill ranges on the east. The region is drained by a number of rivers, of which Gomti is the largest, flowing from east to west. East of the Baramura Range lies the Khowai valley, which is bordered on the east by the Atharamura Range (427 m in elevation) and drained by the north flowing Khowai River. Between the Atharamura Range on the west and the Langtharai Range on the east there is the Kamalpur valley, which is drained by the north flowing Dhalai River. The Kailashahar valley with the north flowing Manu River, is east of the Langtharai Range (457 m. alt.) Its eastern boundary is defined by the Sakhontlang Range (elevation ranging from 305 - 762 m). In between Sakhontlang and Jamraitlang Ranges lies the Dharmanagar valley, which is drained by the rivers Zuri in the north and Deo in the south.

These hills are clayey, which obviously means that these are of recent origin.

Tripura is basically an agricultural area in which paddy, jute, cotton, tea and other crops are cultivated. Natural vegetation consists largely of evergreen forests of Sal (*Shorea robusta*), Teak (*Tectona grandis*), Bamboo (*Bambusa* sp.), Rubber (*Ficus elastica*), Semul (*Bombax ceiba*), Jamun (*Sizium jambos*), Cashew nut (*Anacardium occidentale*), Peepul (*Ficus religiosa*), Banyan (*Ficus bengalensis*) etc. and various kinds of shrubs. The Sal, Teak and Rubber plantations have been established by the Forest Department.

Collecting localities

For a comparative study of the fauna occurring in the above valleys, the State is divided into four zones. The collections have been made in all of the zones at the places noted in parentheses. Zone A, plains of Agartala (Agartala, Charilam, Garjee and Abhoya); Zone B, Khowai valley (Teliamura and Ampì); Zone C, Kamalpur valley (Ambassa and Ganganagar) and Zone D, (Chailingta, Kumarghat and Kanchanpur). The following are the details of collecting localities.

Abhoya (23°18' N, 91° 25' E)—a small village situated *ca* 8 Km. NW. of Belonia.

Agartala (23°50' N, 91° 23' E)—capital of Tripura, as well as the headquarters of Sadar district.

Ambassa (23°55' N, 91° 50' E)—a small town situated on the Agartala-Dharmanagar Highway, *ca* 87 Km. east of Agartala.

Ampibazar (Ampì) (23°40' N, 91°38' E)—a small village, situated on the Teliamura—Amarpur road *ca* 25 Km. south of Teliamura.

Chailingta (24°02' N, 92° 02' E)—a large village situated on the bank of the river Manu *ca* 10 Km. south of Manu town.

Charilam (23°38' N, 91° 18' E)—situated on the Agartala—Udaipur road *ca* 25 Km. south of Agartala.

Ganganagar (23°45' N, 91° 50' E)—a small village situated on the bank of the river Khowai *ca* 28 Km. south of Ambassa.

Garjee (23°25' N, 91° 27' E)—situated on the Udaipur—Belonia road *ca* 65 Km. south of Agartala.

Kanchanpur (23°55' N, 92°12' E)—a sub-divisional town situated on the bank of the river Deo *ca* 40 Km. south of Kumarghat.

Kumarghat (24°10'N, 92°05' E)—the headquarters of the North Tripura District, situated on the Agartala-Dharmanagar Highway *ca* 60 Km. south-west of Dharmanagar.

Teliamura (23°50' N, 91° 35' E)—the second biggest town of Tripura situated *ca* 42 Km. east of Agartala.

SYSTEMATIC ACCOUNT

Order INSECTIVORA

Family Soricidae

Suncus murinus caerulescens (Shaw)

1796. *Sorex caerulescens* Shaw, *Gen. Zool. Mamm.*, 1 : 533 (India).

Material.—2 ♂ : Agartala; 10 and 11. xi. 1969; 3 ♂ : Teliamura; 28 and 30. i. 1971.

Measurements.—External : 5 ♂ : *HB* 142-176 (156); *TI* 66-104 (85); *HF* 20-28 (24.3); *E* 13.5-15 (14.3).

Cranial : 5 ♂ : *l* 34-40.5 (37.1); *iw* 6.2-7.2 (6.6); *pl* 17-20 (18.4); *i*¹—*m*³ 15.7-18 (16.7); *m*—*m* 10-11.4 (10.6); *cw* 13.6—17.3 (15.2); *ml* 17-21.7 (19.2).

Our specimens vary much in size. Their colour, especially dorsally, is variable, ranging from Gray to Mars Brown.

Order CHIROPTERA

Family PTEROPODIDAE

Pteropus giganteus ? subspecies

Material.—3 ♂ : Amarpur; 23.i.1971.

Measurements. — External : 3 ♂ : *HB* 248-250 (249); *HF* 50-52 (51); *E* 39-41 (40); *FA* 166-172 (169); *Tib* 83-87 (85).

Cranial : 2 ♂ : *l* 74.4, 75.5; *cb* 72, 72.6; *zw* 42.8, 44; *cw* 25, 26.2; *Cr* 22.5, 23.6; *pl* 40.7 (in both); *Tr* 32.6, 32.8; *m*—*m* 19, 19.9; *ml* 58.4, 59.

Blyth reported *Pteropus medius* Hodgson (type locality Nepal) from Nepal, Assam and Tipperah, which was, later, synonymized with *Pteropus giganteus leucocephalus* Hodgson (type locality Nepal) by

Andersen (1912). Our specimens from Tripura, however, resemble specimens of *leucocephalus* from Manipur in having thick fur but differ from them in the length of hair on the back and mantle, which is shorter as in the nominate subspecies. On the other hand, a specimen of *Pt. g. giganteus* collected in September from Madhya Pradesh has hair on the back, mantle and belly as long as those of *leucocephalus*. Thus, it appears that there is variability in the characters used to distinguish the two subspecies, namely the relative abundance and length of the fur. An examination of the type or of topotypical specimens may finally decide the status of *leucocephalus*.

***Rousettus amplexicaudatus* (E. Geoffroy)**

1810. *Pteropus amplexicaudatus* E. Geoffroy, *Annls Mus. Hist. nat., Paris*, 15: 96 (Island of Timor).

Material.—1 ♂ : Kanchanpur; 12. ii. 1971.

Measurements.—External : *HB* 132; *TL* 21; *HF* 17.5; *E* 22; width of ear 11.5; *FA* 86; *Tib* 43.

Cranial : *l* 38.7; *cb* 37; *zw* 22.7; *cw* 15.2; *Cr* 13.6; *Tr* 14.6; *pl* 20.3; *m—m* 11.5; *ml* 30.2.

This specimen resembles *Rousettus leschenaulti* in the size of the third lower molar (length $\times$ width = 1.9×1.0) but resembles *amplexicaudatus* in the width of the ear and in the structure of the baculum viz hurricane-lantern shaped (vide Agrawal and Sinha, 1973), a feature which appears to be a more constant but hitherto unmentioned character for the identification of this species.

The species has hitherto been reported from northern Thailand and Tenasserim eastward to Philippine Islands. Its occurrence in Tripura is, therefore, not only its first record from the Indian region but also extends its range further north-west.

***Cynopterus sphinx sphinx* (Vahl)**

1797. *Vespertilio sphinx* Vahl, *Skr. Naturh. Selsk. Kibenhavn*, 4(1) : 123 (Tranquevar, Tamil Nadu, India).

1912. *Cynopterus sphinx gangeticus* Andersen, *Ann. Mag. nat. Hist.*, 6 : 623 (Lucknow, Uttar Pradesh).

Material.—2 ♂, 3 ♀ : Agartala; 13.xi.1969; 5 ♂, 6 ♀ : Charilam; 18-20.xi.1969; 2 ♂ : Garjee; 26.xi.1969; 3 ♂, 3 ♀ : Abhoya; 4-5.xii.1969; 3 ♀ : Teliamura; 29.i.1971 and 1.ii.1971; 1 ♂, 3 ♀ : Ampu; 19-21.i.1971; 7 ♂, 5 ♀ : Ambassa; 3-7.i.1973; 1 ♂ : Ganganagar; 10.xii.1972; 4 ♂, 5 ♀ : Chailingta; 20-23.xii.1972; 5 ♂, 6 ♀ : Kanchanpur; 12-19.ii.1971.

Measurements.—External : 14 ♂ : *HB* 90-103 (96); *E* 17-22 (20);

FA 64-78 (69); *Tib* 23-28 (26). 24 ♂ : *HB* 90-106 (97); *E* 18-23 (21); *FA* 65-77 (71); *Tib* 25-31 (27).

Cranial : 6 ♂ : *l* 31.4-33.4 (32.1); *cb* 30-32.2 (30.8); *zw* 18.9-21.3 (20.3); *cw* 13.1-13.9 (13.6); *Cr* 9.1-9.4 (9.3); *Tr* 10-11.4 (10.7); *pl* 15.1-17.2 (16.2); *m—m* 8.9-10.3 (9.6); *ml* 22.9-24.1 (23.3). 6 ♀ : 32.1-34.4 (33); *cb* 31.0-33.4 (31.7); *zw* 19.4-21.3 (20.4); *cw* 13.2-13.9 (13.6); *Cr* 8.5-9.9 (9.2); *Tr* 10.5-11.3 (11.0); *pl* 15.4-17.0 (16.4); *m—m* 9.0-10.1 (9.8); *ml* 23.2-25.9 (24.1).

A specimen collected during the month of February was found to be pregnant, with one embryo.

Family EMBALLONURIDAE

***Taphozous longimanus longimanus* Hardwicke**

1825. *Taphozous longimanus* Hardwicke, *Trans. Linn. Soc. Lond.*, 14 : 525 (Calcutta, West Bengal).

Material.—1 ♂, 1 ♀ : Agartala; 9.xi.1969.

Measurements.—External : 1 ♂ : *HB* 80; *HF* 12; *E* 18.5; *FA* 61; *Tib* 25. 1 ♀ : *HB* 85; *HF* 13; *E* 18; *FA* 63; *Tib* 26.

Cranial : 1 ♂ : *l* 20; *cb* 19.5; *cw* 10.1; *m—m* 9.0; *c—c* 4.2; *iw* 7.0; *Tr* 9.0; *m* 16.0. 1 ♀ : *l* 19.3; *cb* 18.5; *cw* 10.0; *m—m* 8.5; *c—c* 4.0; *iw* 5.8; *Tr* 8.7; *ml* 15.7.

The male specimen has a minute aperture below the gular pouch as mentioned by Sinha (1970). These specimens were found to roost on a Palmyra Palm tree.

Family VESPERTILIONIDAE

***Scotophilus kuhlii kuhlii* Leach**

1822. *Scotophilus kuhlii* Leach, *Trans. Linn. Soc. Lond.*, 13 : 72 (India).

Material.—1 ♂, 1 ♀ : Agartala; 12.xi.1969; 4 ♂, 3 ♀ : Kanchanpur; 12.ii.1971.

Measurements.—External : 5 ♂ : *HB* 66-72.5 (69); *HF* 9-11 (10); *E* 13-15 (14); *FA* 48--49.5 (48.5); *Tib* 19-21 (20); 4 ♀ : *HB* 68-75 (72); *HF* 8.5-11 (10); *E* 14-14.5 (14); *FA* 47-53 (50.5); *Tib* 20-22 (21) ;

Cranial : 4 ♂ : *l* 18.2-18.6 (18.4); *cb* 17-17.9; *zw* 13-13.7 (13.3); *cw* 8.8-9.0 (8.95); *m—m* 8.3-8.5 (8.4); *c—c* 6.2-6.4 (6.3); *i* 4.9-5.0 (4.95); *Tr* 6.2-6.5 (6.4); *ml* 13.3-14 (13.5); 3 ♀ : *l* 18.2-18.8 (18.5); *cb* 17.4-18.2 (17.8); *zw* 12.9-13.6 (13.2); *cw* 9.0-9.2 (9.1); *m—m* 8.1-8.6 (8.4); *c—c* 6.0-6.6 (6.2); *iw* 4.6-4.9 (4.8); *Tr* 6.2-6.6 (6.4); *ml* 13.6-14.0 (13.7).

Genus *Scotophilus* is represented in India by two forms, a larger and a smaller. Three names namely *kuhlii* Leach, 1822; *temmincki* Horsfield, 1824; and *heathi* Horsfield, 1831, have been variously allocated to them (Hill and Thonglongya, 1972). This was mainly due to the uncertain status of *Scotophilus kuhlii* Leach. Recently, the same authors (*loc. cit.*) examined the holotype of *kuhlii* present in the British Museum (Natural History), and on the basis of dimensions of its teeth came to the conclusion that the holotype, though very young, resembled the smaller form. As such, the smaller form of the *Scotophilus*, until recently known as *Scotophilus temmincki*, should now be regarded as *Scotophilus kuhlii*.

According to Siddiqi (1961) the westernmost limit of distribution of *castaneus* (type locality Malacca) is West Bengal (India). But our specimens from Tripura (east of West Bengal) resemble both in colour and measurements with those of rest of India. We, therefore, would prefer to designate our specimens under the nominate subspecies, a conclusion also reached by Hill and Thonglongya (1972).

***Pipistrellus mimus mimus* Wroughton**

1899. *Pipistrellus mimus* Wroughton, *J. Bombay nat. Hist. Soc.*, 12 : 722 (Maheshkātri, Dangs, Surat Dist., Gujarat).

Material.—1 ♂ : Ambassa; 7.i.1973; 3 ♂, 3 ♀ : Kanchanpur; 16-19.ii.1971.

Measurements.—3 ♂ : *HB* 40-43 (41); *TL* 30-32 (31); *E* 10-10.5 (10.2); *FA* 28-29 (28.5); *Tib* 11-12 (11.6). 3 ♀ : *HB* 38-40 (39); *TL* 30-31 (30.6); *E* 9-10.5 (10); *FA* 28-29 (28.5); *Tib* 12 (in all)

Cranial : 2 ♂ : *l* 11 1, 11.4; *cb* 10.3, 10.6; *iw* 3.5, 3.6; *Tr* 3.5, 3.8, *m—m* 4.4, 5.0; *c—c* 3.4, 3.7; *ml* 7.3, 8.0. 3 ♀ : *l* 10.7-11.6 (11); 10-10.7(10.3); *zw* 6.9; *cw* 6-6.3 (6.1); *iw* 3.6-3.7 (3.6); *Tr* 3.3-3.5 (3.4); *m—m* 4.5—4.6 (4.5); *c—c* 3.3 (in all); *ml* 7.5-7.7 (7.6).

The above subspecies is found throughout India extending eastward to Burma, Laos and Vietnam. This is, however, its first authentic record from Tripura.

***Pipistrellus coromandra coromandra* (Gray)**

1838. *Scotophilus coromandra* Gray, *Mag. Zool. Bot.*, 2 : 498 (Pondicherry, Coromandal Coast, India).

Material.—1 ♂ : Ganganagar, 13.xii.1972.

Measurements.—External : 1 ♂ : *HB* 43; *TL* 35; *E* 10; *FA* 33; *Tib* 14.5.

Cranial : 1 ♂ : *l* 12.1; *cb* 11.5; *cw* 6.4; *iw* 3.5; *m—m* 5.7; *Tr* 4.6; *c—c* 4.0; *ml* 8.9.

The species has hitherto been reported from Ceylon to northern Uttar Pradesh, Sikkim, Bhutan Duars and Assam (Kurup, 1968). The present specimen is its first record from Tripura.

Order PRIMATES

Family TUPAIIDAE

Tupaia glis assamensis Wroughton

1921. *Tupaia belangeri assamensis* Wroughton, *J. Bombay nat. Hist. Soc.*, 27 : 599 (Mokokchung, Nagaland).

Material.—1 ♂ : Ambassa; 5.i.1973; 1 ♂ : Ganganagar; 13.xii. 1972.

Measurements.—External : 2 ♂ : *HB* 145, 170; *TL* 160, 162; *HF* 41, 44; *E* 16 (in both); *wt* 120, 140 gm.

Cranial : 1 ♂ : *l* 48.8; *cb* 46; *iw* 13.2; *tb* 9.2; *cw* 19.3; i^1-m^3 25.1; *ml* 32.9.

Two specimens were observed at Ganganagar and one at Ambassa. At both places they were seen moving on the ground in search of food. On being disturbed, they immediately took to trees, climbed up to a height of 3-4 metres, from where took up a position with head downwards and outwards to observe the situation. Two specimens were taken but the third escaped.

The stomach in one specimen had mainly seeds of *Ficus* sp. and a few pieces of insects.

This subspecies is reported from Arunachal Pradesh, Assam, Meghalaya, Nagaland and Manipur. Tripura should also now be included in its range.

Family LORISIDAE

Nycticebus coucang bengalensis (Fischer)

1804. *Loris bengalensis* Fischer, *Anat. Maki.*, 1 : 30 (Bengal).

Material.—1 ♀ and 1 Juv. (unsexed) : Tippera; 1846; F. Skipwith, *Coll*; 1 (unsexed) : Tippera; 28.vii.1864; A. Grote, *Coll*.

Measurements.—Nil.

The above specimens have already been catalogued by Khajuria (1955). An extensive search was made for more specimens of this species but in vain and it appears that the species has become very rare in this area.

Family CERCOPITHECIDAE

Macaca mulatta mulatta (Zimmermann)

1780. *Cercopithecus mulatta* Zimmermann, *Geor. Gesch. Mensch.*, 2 : 195 (India.)

Material.—1 ♂ : Charilam; 16.xi.1969; 1 ♂ : Ampu; 18.i.1971.

Measurements.—External : 2 ♂ : *HB* 540, 550; *TI* 230, 250; *HF* 152, 162; *E* 43, 45.

Cranial : 2 ♂ : *l* 115, 116; *cb* 88.5, 94.3; *zw* 85.3, 87.4; *orb* 64.2, 67.5; *iw* 42.4, 44.0; *mw* 31.4, 31.6; *Tr* 40.5, 42.5; *ml* 82.4, 87.3.

Out of the two monkeys collected, one was a solitary male while the other was the leader of a troop. These are the first authentic records of this species from Tripura.

***Macaca arctoides speciosa* F. Cuvier**

1825. *Macacus speciosus* F. Cuvier, *Hist. nat. Mamm.*, 3 : 47 (East-Indies).

1878. *Macacus arctoides* I. Geoffroy, *Zool. Voy. de Belanger*, p. 61 (Vietnam).

Material.—1 ♀ Juv. : Tipperah; 17.x.1878; Calcutta Zoological Gardens, *Donor*.

Measurements.—Nil.

This specimen has already been catalogued by Khajuria (1954 a). From the label it is not clear whether the specimen is from Tipperah, East Pakistan (= Bangladesh) as mentioned by Khajuria or from the Indian side. However, there has since been no other record of this species from this area. During December, 1972, the authors observed a troop of monkeys at Chailingta ca 10 Km. South of Manu, Tripura, probably of this species.

***Presbytis phayrei phayrei* Blyth**

1847. *Presbytis phayrei* Blyth, *J. Asiat. Soc. Beng.*, 16 : 733 (Arakan, Burma).

1847. *Presbytis barbei* Blyth, *J. Asiat. Soc. Beng.*, 16 : 734 (Ye, Tenasserim, Burma/Tipperah hills).

Material.—2 ♀ : Charilam; 21-22.xi.1969; 1 ♂ : Ampu; 25.i.1971; 1 ♂ : Kumarghat; 27.xii.1972.

Measurements.—External : 2 ♂ : *HB* 530, 565; *TI* 650, 720; *HF* 160, 161; *E* 30 (in both). 2 ♀ : *HB* 540 (in both); *TI* 720, 750; *HF* 153, 155; *E* 32, 36.

Cranial : 2 ♂ : *l* 102, 102.5; *cb* 78.2, 79.3; *zw* 76.5, 78; *orb* 62 (in both); *iw* 42.1, 42.8; *mw* 31 (in both); *Tr* 31.4, 34.1; *ml* 73.5, 75.9. 2 ♀ : *l* 93.5, 95.4; *cb* 73.6, 74.2; *zw* 74, 74.5; *orb* 58.5, 60.3; *iw* 43, 43.4; *mw* 25.4 (in both); *Tr* 31.1, 32.3; *ml* 68, 69.7.

The taxonomic status of this leaf monkey has already been discussed in detail by Agrawal (1974). These specimens agree with the description of *P. barbei* given by Blyth (1847) in all details, except that the crest over the head which was stated to be absent, is present. Thus no difference exists between the species *barbei* and *phayrei* and, there-

fore, Pocock (1939) was ultimately justified in synonymizing the former with the latter.

This monkey is found in small or large troops throughout Tripura (Table 2) on trees of Sal, Banyan, Cashew, Bamboo, etc. The preferred habitat is bamboos on the hill sides and on the bank of stream in the vicinity of banana plantations. It is fond of leaves and fruits of bamboo and banana respectively. A troop is invariably composed of males, females and young-ones but the exact number of these could not be ascertained. It is very shy and keeps itself hidden in the branches. But its presence is easily detected by its conspicuous white lips and the white area around the eyes. It normally vocalizes as *Hu-un* and when disturbed *Kha-Kha-Un*.

Nothing is known about its breeding habits. A specimen collected on 22 November was pregnant, with a fully developed foetus. The body of the foetus was still naked and white but sparse greyish hairs are present over head, long brown hairs over eye-brows and sparse long white hairs on the upper and lower lips. The eyes are not yet open but the nails are fully developed. The approximate measurements of the spirit-preserved foetus are HB 110, Tl 125, HF 40 and E 12.

***Presbytis pileatus durga* Wroughton**

1916. *Presbytis durga* Wroughton, *J. Bombay nat. Hist. Soc.*, 24 : 655 (Cachar, Assam).

Material.—1 ♂ : Tipperah hills; 1846; F. Skipwith, Coll; 1 ♂ : Charilam; 15.xi.1969.

Measurements.—External : 1 ♂ : *HB* 610; *Tl* 1000; *HF* 190; *E* 40.

Cranial : 1 ♂ : *l* 109; *cb* 87.7; *zw* 83.1; *orb* 69.7; *iw* 47.4; *mw* 31; *Tr* 36.1; *ml* 80.6.

The colour of head ranges from Hair-Brown to Slaty-Grey rather than buff and the manus and pes are darker (black) than in specimens from Assam in the National Zoological Collections.

An old specimen (Z. S. I. Reg. No. 12221) comes from the Tipperah hills. Khajuria (1954 *b*) reported it as Tipperah hills, East Pakistan but it is doubtful whether it is actually from East Pakistan (=Bangladesh) because the hilly region of Tipperah falls within the Indian limit. As it is, the recent collection is the first undoubted record from Tripura.

Family PONGIDAE

***Hylobates hoolock* (Harlan)**

1834. *Simia hoolock* Harlan, *Trans. Am. phil. Soc.*, 4 : 52 (Garo Hills, Meghalays).

Material.—1 ♀ : Tipperah; 18.viii.1879; *W.* Rutledge, Coll.; 2 ♂ and 1 ♀ : Ambassa; 4.ii.1971 and 6.i.1973.

Measurements.—External : 2 ♂ : *HB* 485, 550; *HF* 150, 160; *E* 29.5, 31.5. 1 ♀ : *HB* 530; *HF* 150; *E* 33.5.

Cranial : 2 ♂ : *l* 109, 112.3; *cb* 93, 95; *zw* 74, 76; *orb* 63.4, 65.5; *iw* 49.5, 49.8; *mw* 33+, 34.5; *Tr* 35.7, 38; *ml* 78.5, 80. 1 ♀ : *l* 110; *cb* 95; *zw* 72; *orb* 61.4; *iw* 48; *mw* 30.5; *Tr* 37; *ml* 77.

In Tripura, the hoolock is localized at Ambassa and in the Atharamura range. It was seen in parties of two to five individuals, thus supporting the observations of earlier workers such as McCann, Mackenzie etc. (quoted by Pocock, 1939).

Order CARNIVORA

Family VIVERRIDAE

Viverra zibetha picta Wroughton

1915. *Viverra zibetha picta* Wroughton, *J. Bombay nat. Hist. Soc.*, 24 : 64 (H'Kamti, 500' on the Upper Chindwin, Burma).

Material.—1 ♂ : Charilam; 21.xi.1969; 1 ♂ : Abhoya; 9.xii.1969; 1 ♀ : Amp; 17.i.1971.

Measurements.—External : 2 ♂ : *HB* 660, 785; *TI* 370, 430; *HF* 117, 134; *E* 50, 56. 1 ♀ : *HF* 800; *TI* 480; *HF* 119; *E* 55.

Cranial : 1 ♂ : *l* 140; *cb* 136; *zw* 64; *iw* 23.7; *pow* 20; *c—c* 25; *pm*⁴ 14.2; *m*₁ 13; *ml* 96. 1 ♀ : *l* 134.5; *cb* 135; *zw* 68; *iw* 23.4; *pow* 20.7; *c—c* 22.7; *pm*⁴ 13.3; *m*₁ 13.3; *ml* 94.

In two specimens the mid-dorsal black stripe, though narrow and gradually diminishing, extends upto the penultimate black bend of the tail, whereas in the third specimen from Amp, it only reaches the second black band from the proximal end.

The gut in one of the specimens contained 10 fishes (approx. 5 cm. in length) and a frog, and that in the other bird-feathers. This supports the observations of Blanford (1891) and Mackenzie (quoted by Pocock 1939).

This subspecies ranges from Assam east of the Brahmaputra to N. Burma. These specimens are the first to be recorded from Tripura.

Viverricula indica ? subspecies

Material.—1 ♂ : Amp; 17.i.1971; 1 ♂ : Chailingta; 21.xii.1972; 1 ♀ : Kumarghat; 26.xii.1972.

Measurements.—External : 2 ♂ : *HB* 600 (in both); *TI* 365, 420; *HF* 101, 102; *E* 38.5, 39.5. 1 ♀ : *HB* 585; *TI* 350; *HF* 90; *E* 40.

Cranial : 2 ♂ : *l* 97, 101.5; *cb* 96, 98; *zw* 42.6, 44.3; *iw* 10.3, 12.3; *pow* 10, 13.2; *c—c* 15, 15.3; *pm*⁴ 8.2, 9; *m*₁ 7.6, 7.9; *ml* 64.3, 65.2. 1 ♀ : *l* 97.6; *cb* 96.5; *zw* 43.2; *iw* 11.9; *pow* 12.5; *c—c* 14.7; *pm*⁴ 8.6; *m*₁ 7.9; *ml* 65.

The male specimen from Ampī tallies well with the description of *V indica thai* given by Pocock (1939) both in skull size and in coloration but the other two specimens differ from it in having the skull slightly smaller and the tail-tip being not conspicuously white but mixed with slaty.

A cursory examination of the skins of this species in the National Zoological Collection reveals that the pattern as well as the ground coloration varies widely irrespective of locality and season. Therefore, a detailed revision of the species may focus some light over the exact subspecific identity of our specimens.

***Herpestes auropunctatus birmanicus* Thomas**

1886. *Herpestes birmanicus* Thomas, *Ann. Mag. nat. Hist.*, (5) 17 : 84 (Pegu, Burma).

Material.—2 ♀ : Ampī; 18 and 19.i.1971; 3 ♂ : Ambassa; 7.ii.1971 and 4.i.1973; 1 ♀ : Chailingta; 22.xii.1972; 3 ♂, 1 ♀ : Kumarghat; 28-30.xii.1972.

Measurements.—External : 6 ♂ : *HB* 315-360 (340); *TI* 240-278 (253); *HF* 59-62 (61.2); *E* 24-25 (24.6). 4 ♀ : *HB* 290-315 (302); *TI* 200-230 (214); *HF* 52-55 (53); *E* 21.5-24 (22.5).

Cranial : 6 ♂ : *cb* 64.5-70 (67.7); *zw* 30.7-35.6 (33.3); *iw* 10.7-12.6 (11.8); *pow* 10.13-6 (11.4); *c—c* 11-12.1 (11.5); *pm*⁴ 5.8-6.8 (6.3); *m*₁ 5.6-6.1 (5.9); *tb* 14.6-16.3 (15.4); *ml* 41.5-45.5 (43.9). 3 ♀ : *cb* 61.9-63.7 (62.7); *zw* 29.8-30.4 (30.1); *iw* 10.6-10.9 (10.7); *pow* 9.4-10.4 (9.8); *c—c* 10.3-11 (10.6); *pm*⁴ 6-6.2 (6.1); *m*₁ 5.2-5.6 (5.4); *tb* 14.2-14.7 (14.4); *ml* 39.5-39.7 (39.6).

Female specimens are slightly smaller than the males. Our male specimens are definitely large and fall within the range of *H. a. birmanicus* but females are slightly smaller than the measurements given by Pocock (1941).

The known range of this subspecies is lower portion of Burma from Toungoo to Tenasserim. The present record extends its range further west, upto Tripura. Incidentally, it overlaps with the known distribution of *auropunctatus*, viz from Kashmir to Bhutan Duars, Orissa, West Bengal, Assam and Manipur.

Family FELIDAE

***Felis bengalensis bengalensis* Kerr**

1792. *Felis bengalensis* Kerr, *Anim. Kingd.*, : 151 (Southern Bengal),

Material.—1 ♀ : Tipperah Hills; Zoological Gardens, *Donor*.

Measurements.—Cranial : *l* 88; *cb* 81; *zw* 60.5; *iw* 14.2; *pow* 28; *pl* 34.7; *tb* 20.2; *pm*⁴ 9.4; *m*₁ 7.3; *ml* 55.8.

The specimen has already been catalogued by Sclater (1891). The skull has the orbit nearly complete.

Felis temmincki (Vigors and Horsfield)

1828. *Felis temminckii* Vigors and Horsfield, *zool. J. Lond.*, 3 : 451 (Sumatra).

Material.—1 ♂ (Skin) : Tipperah Hills; 1878; Zoological Gardens *Donor*.

Measurements.—Not known.

Sclater (1891) reported this specimen from Tipperah Hills, Bengal. As the hilly region of Tipperah falls in India, in all probability it came from the present Tripura State.

Order ARTIODACTYLA

Family CERVIDAE

Muntiacus muntjak vaginalis (Boddaert)

1785. *Cervus vaginalis* Boddaert, *Elench. Anim.*, 1 : 136 (Bengal).

Material.—? ♂ : Ambassa; 5.ii.1971 and 2.i.1973.

Measurements.—External : 2 ♂ : *HB* 710, 1000; *Tl* 72, 140; *E* 84, 97; *ht. at shoulder* 440, 600.

Cranial : 2 ♂ : *l* 159, 196; *cb* 147, 183.5; *iw* 33.2, 40.5; *zw* 68.4, 82; *nas* 38.5, 57.2; *pf* 26.6, 32.7; *pl* 91, 104; *cw* 51.5, 59.3; *ml* 124, 154.

Both of these are juvenile. In one the third upper and lower molars are half erupted, in the other still within the gums.

This subspecies is reported from Kumaon - to Bhutan Duars, Assam, Chindwin (Burma), Yunnan etc. These specimens are the first to be recorded from Tripura.

Order LAGOMORPHA

Family LEPORIDAE

Lepus nigricollis ruficaudatus Geoffroy

1826. *Lepus ruficaudatus* Geoffroy, *Dict. Class. Hist. Nat.*, 9 : 381 (Bengal).

Material.—1 ♀ ; Abhoya ; 9.xii.1969; 1 ♂, 2 ♀ : Kumarghat, 25 and 30.xii.1972.

Measurements.—External : 1 ♂ : *HB* 470; *TI* 75; *HF* 102; *E* 9.4
2 ♀ : *HB* 458, 500; *TI* 74, 78; *HF* 103, 115; *E* 93, 104.

Cranial : 1 ♀ : *on* 96; *cb* 82.8; *zw* 43; *iw* 23.4; *tb* 11.7; *nas* 40.7;
pl 38; *Tr* 15.2; *ml* 69.

A female collected at Abhoya during December was pregnant, with two fully developed foetuses, thus supporting Hodgson's view (quoted by Blanford, 1891) that two young are generally produced at a birth. However, Blanford (1891) found a single foetus in more than one instance. Winter appears to be the breeding season as is reported for the nominate subspecies. The fully developed foetus is about 100 mm in length; it is fully haired and the eyes are closed.

The species is common throughout northern India ranging from Rajasthan to Meghalaya, but this is its first authentic record from Tripura.

Order RODENTIA

Family SCIURIDAE

Ratufa bicolor gigantea (McClelland)

1839. *Sciurus giganteus* McClelland, *Proc. zool. Soc. Lond.*, : 150 (Assam),

Material.—1 ♂, 2 ♀ ; Garjee; 25-27.xi.1969; 1 ♀ : Abhoya; 3.xii. 1969; 1 ♂, 1 ♀ : Ganganagar; 13-15.xii.1972.

Measurements.—External : 2 ♂ : *HB* 390, 400; *TI* 408, 450; *HF* 86, 88; *E* 30 (in both). 4 ♀ : *HB* 309-390 (360); *TI* 435-490 (472); *HF* 85-90 (87); *E* 30-32 (31).

Cranial : 2 ♂ : *on* 74.7, 75.2; *zw* 46, 46.3; *pl* 33.3, 33.6; *nas* 24.1 (in both); *iw* 29.8, 30.9; *orb* 24.6, 24.8; *Tr* 14 (in both); *tb* 14.5, 15.3; *ml* 43, 43.6. 3 ♀ : *on* 75.1-77.6 (76.3); *zw* 45.9-47.1 (46.6); *pl* 32.5-34 (33.4); *nas* 23.5-25.4 (24.5); *iw* 29-32.1 (30.5); *Tr* 14.5-15.1 (14.7); *orb* 25.4-25.6 (25.5); *tb* 14.5-14.7 (14.6); *ml* 43.3-44.7 (44).

Out of six specimens, the pelage is black in three, blackish brown in two, and black with brown patches on the sides of the rump in one.

An examination of other specimens in the National Zoological Collection reveals that variation in the dorsal colour is marked in this subspecies. It varies from black to brown (Table 1.). Although there is no distinct seasonal variation there is a tendency to become black in winter as is found in *Callosciurus erythraeus*.

These specimens constitute the first authentic record of the subspecies from Tripura,

Table 1. — Dorsal colour of body in different months of the year, in *Ratufa bicolor gigantea* (McClelland).

Month	Locality	Dorsal colour of body		
		Brown	Blackish brown	Black
February	Assam	1	1	—
March	West Bengal & Assam	6	1	—
April	Burma	—	3	—
May	Bhutan & Arunachal	—	2	—
June	Assam	1	—	—
August	West Bengal & Burma	2	2	—
November	Assam & Tripura	—	4*	—
December	Bhutan & Tripura	—	—	3 + 1*

* Brown patch on the rump.

Callosciurus erythraeus punctatissimus (Gray)

1867. *Macroxus punctatissimus* Gray, *Ann. Mag. nat. Hist.*, 20 : 283 (India).

Material.—4 ♂ : Garjee; 26.xi.1969—1.xii.1969; 1 ♀ : Teliamura; 27.i.1971; 6 ♂, 3 ♀ : Ambassa; 4-10.ii.1971 and 1-4.i.1973; 2 ♂ : Ganganagar; 12-14.xii.1972.

Measurements.—External : 11 ♂ : *HB* 225-253 (237); *TI* 230-253 (246); *HF* 54-58 (55.5); *E* 20-23 (22). 4 ♀ : *HB* 212-253 (232); *TI* 225-260 (248); *HF* 56-58 (57); *E* 20-22 (21.5).

Cranial : 11 ♂ : *on* 55.4-57.9 (56.6); *zw* 31.7-34.7 (33.7); *iw* 18.7-22 (20.6); *nas* 17.8-18.9 (18.2); *pl* 26.9-28.5 (27.8); *tb* 10.2-12.1 (10.9); *Tr* 9.7-10.6 (10.2); *orb* 17.1-18.2 (17.5); *ml* 31.0-32.7 (31.5). 4 ♀ : *on* 54.6-58.5 (56.3); *zw* 31.4-34.6 (32.4); *iw* 17.5-22 (19.1); *nas* 17.5-18.7 (17.9); *pl* 27.2-28.3 (27.9); *tb* 10.4-11.3 (10.9); *Tr* 10-11 (10.4); *orb* 17.1-18 (17.4); *ml* 30.6-32.6 (31.5).

The taxonomic status of this species has been discussed in detail by Agrawal and Bhattacharyya (in press). These specimens differ from those of *Callosciurus erythraeus erythrogaster* in being much darker in dorsal body colour but tally well with the original description of *Macroxus punctatissimus* Gray (1867) (= *Callosciurus erythraeus punctatissimus*) both in the fine grizzling of the dorsal fur as well as in the darkness of colour. Therefore, we consider the latter to be a valid subspecies.

The stomach in three examples contained approximately 50% Insects (mainly ants and a few beetles) and 50% vegetative matter (mainly fruits and a few pieces of leaves). Roonwal (1949), however, found the stomach of one of this species full of pieces of figs with a few of its own hairs, at Manipur.

Callosciurus pygerythrus blythi (Tytler)

1854. *Sciurus blythii* Tytler, *Ann. Mag. nat. Hist.*, 14 : 172 (Dacca, Bangladesh).

Material.—2 ♂, 3 ♀ : Agartala; 10-11.xi.1969; 2 ♂ : Garjee; 24-26.xi.1969; 2 ♂ : Teliamura; 27.i.1971-2.ii.1971; 2 ♂ : Amp; 17-23.i.1971; 1 ♂ : Ambassa; 4.i.1973; 3 ♂, 1 ♀ : Ganganagar; 9-14.xii.1972; 1 ♂ : Chailingta; 21.xii.1972; 1 ♀ : Kumarghat; 25.xii.1972; 1 ♀, 2 ♀ : Kanchanpur; 16-17.ii.1971.

Measurements.—External : 12 ♂ : *HB* 182-213 (195); *TI* 173-201 (188); *HF* 42-48 (45); *E* 18-22 (19.7). 7 ♀ : *HB* 174-196 (186); *TI* 178-203 (185); *HF* 41-46 (44); *E* 18-20 (19.3).

Cranial : 12 ♂ : *on* 47.3-50.5 (49.3); *zw* 27.30 (28.6); *iw* 14.6-18 (16.2); *nas* 13.3-15 (14.5); *pl* 23-25.8 (24.1); *tb* 8.7-9.4 (9.0); *Tr* 9.0-9.8 (9.3); *orb* 15.1-16.5 (15.8); *ml* 26.2-29.1 (27.4). 6 ♀ : *on* 46.1-50.3 (48.5); *zw* 26.3-29.4 (28); *iw* 15-16.5 (15.6); *nas* 12.6-15 (14.3); *pl* 22.6-24.1 (23.6); *tb* 8.7-9.2 (8.9); *Tr* 8.8-9.5 (9.3); *orb* 14.5-16 (15.3); *ml* 26-27.4 (26.8).

The body colour is more or less similar to that described by Ellerman (1963) for this subspecies but the colour of the posterior abdominal region and of the flanks ranges from Buff to Orange-Buff or Vinaceous Pink.

Out of twenty-one specimens from Tripura, only one, collected in November, has a white patch on the thigh. The position of this patch in other specimens in the National Zoological Collection is as follows :

- (i) No patch in 44 examples collected between November to April.
- (ii) Patches present in 20 examples collected between May to October and one each in April and November.

The exact significance of these patches is obscure. But since these occur seasonally, they may be connected with breeding similar to that in *C. pygerythrus pygerythrus*, mentioned by Khajuria and Ghose (1970).

The stomach in two examples contained entirely vegetable matter (pieces of some pulpy fruit) except a large ant.

The subspecies is known so far from Assam, Meghalaya, Nagaland, Manipur and N. Burma. Tripura should now be added to its range.

Dremomys lokriah macmillani Thomas

1916. *Dremomys macmillani* Thomas, *J. Bombay nat. Hist. Soc.*, 24 : 238 (Tatkon, West Burma).

Material.—2 ♂ : Ambassa; 9.ii.1971 and 4.i.1973.

Measurements.—External : 2 ♂ : *HB* 171, 190; *TI* 162, 165; *HF* 48, 49; *E* 19, 21.

Cranial : 1 ♂ : *on* 52.4; *zw* 29; *iw* 15.5; *nas* 15.4; *Tr* 9; *tb* 8.4; *ml* 19.3.

The colour of the throat and belly is Buff-Pink in one specimen and Buffy in the other. The species is, no doubt, arboreal but seeks its food from the ground. In habit as well as in ventral colour it much resembles the tree-shrew (*Tupaia*).

This subspecies is reported from Assam, Meghalaya, Nagaland, Manipur and Burma. Tripura should now be added to its range.

Family MURIDAE

Rattus rattus arboreus (Horsfield)

1851. *Mus arboreus* Horsfield, *Cat. E. Ind. Mus.*, : 141 (Bengal).

Material.—3 ♀ : Charilam; 16-20.xi.1969; 1 ♂ : Abhoya; 4.xii.1969; 1 ♂, 7 ♀ : Ampì; 19-23.i.1971; 1 ♀ : Kumarghat; 26.xii.1972; 2 ♀ : Kanchanpur; 14-15.ii.1971.

Measurements.—External : 2 ♂ : *HB* 157, 172; *TL* 174, 176; *HF* 34, 35; *E* 21 (in both). 13 ♀ : *HB* 131-170 (151.5); *TL* 137-213 (181); *HF* 30-34 (32); *E* 20-23.5 (22).

Cranial : 2 ♂ : *on* 38, 39.1; *cb* 34.8, 37.5; *zw* 19, 19.4; *iw* 5.7, 6.2; *tb* 6.9, 7.1; *nas* 13.5, 13.7; *pl* 20, 21.8; *pf* 6.5, 6.9; *Tr* 7, 7.3; *ml* 20.4, 21.1. 10 ♀ : *on* 37.2-42.5 (39.6); *cb* 34.5-38.9 (36.9); *zw* 17.3-20.5 (19.3); *iw* 5.5-6.0 (5.8); *tb* 6.4-7.7 (7.2); *nas* 12.7-15.0 (14); *pl* 19.4-22.9 (21.4); *pf* 5.7-7.5 (6.7); *Tr* 6.4-7.2 (6.9); *ml* 19.8-22.3 (21.1).

The dorsal body colour ranges from light brown to rufous brown and the ventral colour from milky white to white suffused with slaty; the slaty colour is prominent in one specimen. Of fifteen specimens, three have a pink mid-thoracic stripe and three others a slaty stripe or slaty patches.

Although the subspecies is widely distributed throughout North-eastern India from Uttar Pradesh to West Bengal, this is its first record from Tripura.

Rattus nitidus nitidus (Hodgson)

1845. *Mus nitidus* Hodgson, *Ann. Mag. nat. Hist.*, (1) 15 : 267 (Nepal).

Material. — 1 ♂, 1 ♀ : Ganganagar; 10. xii. 1972.

Measurements. — External : 1 ♂ : *HB* 166; *TL* 167; *HF* 38; *E* 21.5. 1 ♀ : *HB* 161; *TL* 180; *HF* 36; *E* 22; mammae 12.

Cranial : 1 ♂ : *on* 40.2; *cb* 37.6 *zw* 19; *iw* 5.9; *tb* 5.9; *nas* 16; *pl* 21.2; *pf* 7.1; *Tr* 6.7; *ml* 21.1.

1 ♀ : *on* 44.7; *cb* 42; *zw* 21.3; *iw* 6.4; *tb* 6.1; *nas* 18; *pl* 24.8 *pf* 7; *Tr* 6.9; *ml* 24.

The dorsal colour of the body ranges from Ochraceous to Olive and the ventral surface is ashy.

The subspecies is known from northern Uttar Pradesh, Nepal, Sikkim, Bhutan and Meghalaya; this is its first authentic record from Tripura.

***Mus musculus castaneus* (Waterhouse)**

1843. *Mus castaneus* Waterhouse, *Ann. Mag. nat. Hist.*, 12 : 134 (Philippine Islands).

Material.— 1 ♂ : Teliamura; 27.i.—1971; 2 ♂, 1 ♀ : Kanchanpur; 14—16. ii.1971.

Measurements.— External : 3 ♂ : *HB* 67—83 (74); *TL* 76—97 (84); *HF* 16—17 (16.5); *E* 12—13 (12.6). 1 ♂ : *HB* 67; *TL* 84; *HF* 17; *E* 12.

Cranial : 1 ♂ *on* 21.7; *cb* 20; *zw* 11; *iw* 3.8; *tb* 2.8; *nas* 8.0; *pl* 10.7; *pf* 4.8; *Tr* 3.0; *ml* 10.5. 1 ♀ (Subad.) : *on* 19.5; *cb* 18; *zw* 9.6; *iw* 3.7; *tb* 3.0; *nas* 7.1; *pl* 10.2; *pf* 4.0; *Tr* 2.8 *ml* 8.9.

***Mus booduga booduga* (Gray)**

1837. *Leggada booduga* Gray, *Charlesworth's Mag. nat. Hist.*, 1 : 586 (South Maharatta, India).

Material. — 1 ♀ : Kumarghat; 19. xii. 1972.

Measurements. — External : *HB* 75; *TL* 65; *HF* 14; *E* 12.

Cranial : *on* 20; *cb* 19.2; *iw* 3.3; *Tr* 2.9; *ml* 10.6.

This specimen is not only the first record from Tripura but also extends the distribution of the subspecies slightly eastward.

***Bandicota bengalensis bengalensis* (Gray)**

1835. *Arvicola bengalensis* Gray, *Illust. Ind. Zool.*, 2, pl. 21 (Bengal).

Material. — 1 ♂, 2 ♀ : Abhoya; 5—9. xii. 1969.

Measurements. — External : 1 ♂ : *HB* 164; *TL* 118; *HF* 32; *E* 20. 2 ♀ : *HB* 147, 150; *TL* 110, 120; *HF* 30 (in both); *E* 20 (in both).

Cranial : 1 ♂ : *on* 34.5; *cb* 36.1; *zw* 22; *iw* 6.0; *tb* 8.1; *nas* 9.6; *pl* 20.9; *pf* 7.8; *Tr* 6.5; *ml* 21. 2 ♀ : *on* 32.8, 33.3; *cb* 34.6 (in both); *zw* 21.4, 22.2; *iw* 5.8, 6.0; *nas* 9.0; 9.7; *pl* 20, 20.2; *pf* 7, 7.5; *Tr* 6.5, 6.6; *tb* 7.8, 8.0; *ml* 20.7, 20.9.

All of the specimens are young. The length of the tail ranges from 72—80% (75%) of head and body length rather than over 80% as mentioned by Ellerman (1963).

Although this subspecies is known to occur throughout India except in Kashmir and Himachal Pradesh (Agrawal and Chakraborty, 1976, until now it has not been reported from Tripura where it is found only in the western portion adjoining Bangladesh.

General observations

It has been mentioned earlier that Tripura State is divided into four zones by seven hill ranges. Collections were made in all, the four zones. A list of species either collected or observed in these zones has been given in Table 2.

From the table, it is obvious that several species such as the Short-nosed Fruit Bat (*Cynopterus sphinx*), the Leaf-Monkey (*Presbytis phayrei*), the Capped Langur (*Presbytis pileatus*), the Rhesus Macaque (*Macaca mulatta*), the Irrawaddi Squirrel (*Callosciurus pygerythrus blythi*), the Jackal (*Canis aureus*) etc. are widely distributed throughout Tripura, whereas others such as the Slow Loris (*Nycticebus coucang bengalensis*), the Leopard Cat (*Felis bengalensis*), the Golden Cat (*Felis temmincki*) etc., which were very likely common in this area in the last century have since become scarce. Within the four Zones, the fauna of Zone C is quite characteristic, being represented by the Hoolock (*Hylobates hoolock*), the Tree-Shrew (*Tupaia glis*), the Orange-bellied Himalayan Squirrel (*Dremomys lokriah*), the Himalayan Rat (*Rattus nitidus*) etc., which were not seen in other Zones. Similarly, the Lesser Bandicoot Rat (*Bandicota bengalensis*) could only be collected in Zone A. Elephants, which are said to be very common throughout the State are now localized to its south-eastern portion, which is, still, the least disturbed area. Incidentally, seven tigers have been reported from this State in the Tiger Census report of 1972.

SUMMARY

This paper is based on a collection of mammals from Tripura. Thirty one species and subspecies are represented, of which twenty two constitute the first authentic record from this area, including two new to the Indian region. As a result of this study, variations in size, coloration, etc. are reported in a number of forms. The taxonomic status of *Presbytis barbei* Blyth, *Callosciurus erythraeus punctatissimus* (Gray) and *Pteropus giganteus leucocephalus* Hodgson has been discussed. The report also incorporates ecological observations made in the field.

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INDEX RHOPALOCERA INDICA

AN INDEX OF THE LOCAL-LISTS OF BUTTERFLIES FROM INDIA AND NEIGHBOURING COUNTRIES

By

R. K. VARSHNEY*

*Gangetic Plains Regional Station, Zoological Survey of India
Patna, India*

INTRODUCTION

Butterflies are one of those animal groups which attracted the early naturalists in Indian region. Linnaeus (1758) included some of them in his famous work, *Systema Naturae*. Among other earlier workers were Fabricius, Cramer, Moore and Swinhoe. Lionel de Nicéville published in about 20 years (1881-1902) books and series of papers on the butterflies from different parts of this region. Seitz's *Macrolepidoptera of the World* covered the Indian butterflies in Vol. 9.

However, the earliest lists of butterflies for any particular area were published by Hope (1843) for Sylhet; Kollar (1844) for Kashmir; Gray (1846) for Nepal; and Lang and Moore (1864) for N. W. Himalayan localities. Such lists of butterflies have been commonly referred in the literature as the local-lists. In the latter part of the 19th century a large number of local-lists were published for different parts of the Indian region.

There is no consolidated record of these local-lists of butterflies, with the unfortunate result that many of them are now almost forgotten. Evans (1932) has pointed out 31 of them. Peile (1937) has reproduced 22 local-lists in full and hinted about 10 other lists on a page of contents. Recently Cantlie (1962) has reported 38 further lists published mostly in *J. Bombay nat. Hist. Soc.*

The value of these local-lists need not be underscored. Besides providing the names of species occurring in an area, these lists are rich store-house of other informations. Many of them mention the best

*Present address : Zoological Survey of India, Calcutta 12.

spots for collection, months of occurrence and the status of population in that area. Some are so exhaustive that they provide details on immature stages and the food-plants of larvae. Some local-lists have been updated by supplementary lists. Hence, a consolidated account of these lists and other relevant literature on the butterflies of Indian region was considered useful. This prompted the author to compile the present Index.

This Index gives bibliographical references of about 260 local-lists, which have been arranged locality-wise, and under a locality chronologically. The localities themselves have been arranged "faunistic area-wise". These areas have been literally adopted from a table of the Indian Faunistic Areas by Evans (*in* Talbot, 1939, pp. 40-41), with only minor change when necessary, e.g., present name of a State in parenthesis. Since Evans has divided the whole Indian region (presently comprising India, Pakistan, Nepal, Bhutan, Burma and Sri Lanka countries) into 8 faunistic areas, keeping in view their butterfly wealth, and his divisions are more scientific zoo-geographically, it has been followed here. However, if desired, these same references can be easily arranged "country-wise", and within a country State-wise, from the present Index.

The abbreviated names of the journals have been taken from the *World List of Scientific Periodicals* (Butterworths, 1963). The year of publication mentioned for a local-list is that for which the journal was issued and not necessarily its actual year of publication. A list of other reference books and papers of wider coverage, dealing with the butterflies of India, has also been prepared and included in this Index.

During this study, it was noted that for certain areas of the Indian subregion, e. g. Bhutan, no local-lists of butterflies have been made uptill now. Evans (1932) has pointed out some such areas, stating that these should prove very interesting, as follows: Northern Distt. of Madras; Baluchistan — Razmak and Parachinar; Kashmir, Ladak, Kunawur, Shippi; Peshawar, Khyber; Kulu, Dalhousie; Nepal; Garhwal; and Bhutan. To these areas, present author may add Goa; Tripura; and Lakshadip (Laccadive Is.) also. It was further noted that for some other areas, e. g. Kerala and North Burma, the available local-lists are about a century older. Obviously, these deserve fresh lists. Hence, a number of localities in these countries are awaiting the butterfly chasers. It is hoped that this Index will help them in finding out if any previous local-list for their desired area exists or not, and from there whether the species collected by them have been recorded as yet or not.

A. LOCAL LIST

I. Ceylon (Sri Lanka)

- MOORE, F. 1877. *Ann. Mag. nat. Hist.*, (4) 20 : 339-348.
 MOORE, F. 1880-1887. *Lepidoptera Ceylon.*, Vols. i-iii.
 DE NICEVILLE, L. and MANDERS, N. 1900. *J. Asiat. Soc. Beng.*, Pt. 2, 68 (3) : 170-233.
 MANDERS, N. 1904. *J. Bombay nat. Hist. Soc.*, 16 : 76-85.
 ORMISTON, W. 1918. *Spolia zeylan.*, 1-69; 126-188.
 ORMISTON, W. 1924. *The Butterflies of Ceylon*, Colombo. (H. W. Cove and Co.).
 WOODHOUSE, L. G. O. and HENRY, G. M. R. 1942. *The Butterfly Fauna of Ceylon*, Colombo.
 WOODHOUSE, L. G. O. 1949. *The Butterfly Fauna of Ceylon*, 2nd ed., Colombo, (The Colombo Apothecaries Co.).
 WOODHOUSE, L. G. O. 1950. *The Butterfly Fauna of Ceylon*, abridged ed., 133 pp. Colombo, (The Ceylon Govt. Press).

II. Peninsular India

(East of the Indus River, south of the Himalayas and west of the Brahmaputra River) :

(i) SOUTH INDIA

A. Western Ghats :

(a) Travancore (Kerala) :

FERGUSON, H. S. 1891. *J. Bombay nat. Hist. Soc.*, 6 : 432-448.

(b) Palni Hills (Tamil Nadu) :

EVANS, W. H. 1910. *J. Bombay nat. Hist. Soc.*, 20 : 380-392.
 UGARTE, E. and RODRICKS, L. [with additions by SHARMAN, A. J.]
 1960. *J. Bombay nat. Hist. Soc.*, 57 (2) : 270-277.

(c) Nilgiri Hills (Tamil Nadu) :

HAMPSON, G. 1888. *J. Asiat. Soc. Beng.*, Pt. 2, 57 (4) : 346-368.
 HAMPSON, G. 1888. *J. Bombay nat. Hist. Soc.*, 3 : 346 [vide PEILE, 1937, p. 252].
 FLORENCE, J. 1926. *J. Bombay nat. Hist. Soc.*, 31 (2) : 529
 YATES, J. A. 1935. *J. Bombay nat. Hist. Soc.*, 38 : 330-340
 YATES, J. A. 1946. *J. Bombay nat. Hist. Soc.*, 46 (1) : 197-198.
 WYNTER-BLYTH, M. A. 1944. *J. Bombay nat. Hist. Soc.*, 44 (4) : 536-549.
 WYNTER-BLYTH, M. A. 1946. *J. Bombay nat. Hist. Soc.*, 45 (1) : 47-72.
 WYNTER-BLYTH, M. A. 1947. *J. Bombay nat. Hist. Soc.*, 46 (4) : 736
 Kallar, Mettupalaiyam Ghat :

WYNTER-BLYTH, M. A. 1943. *J. Bombay nat. Hist. Soc.*, 43 (4) : 671-672.

(d) Coorg (Karnataka) :

HANNYNGTON, F. 1916. *J. Bombay nat. Hist. Soc.*, 24 : 578-581.

YATES, J. A. 1931. *J. Bombay nat. Hist. Soc.*, 34 (4) : 1003-1014.

YATES, J. A. 1932. *J. Bombay nat. Hist. Soc.*, 35 (1) : 104-114.

HOME, W. M. L. 1934. *J. Bombay nat. Hist. Soc.*, 37 (3) : 669-674.

(e) Kanara Distt. (Karnataka) :

DAVIDSON, J., BELL, T. R. and AITKEN, E. H. 1896-1897. *J. Bombay nat. Hist. Soc.*, 10 : 237-258; 568-584; 11 : 22-63.

DE NICEVILLE, L. 1900. *J. Asiat. Soc. Beng.*, Pt. 2, 69 (2) : 187-215; 215-278 [Food-plants].

(f) Goa :

?

(g) Bombay (Maharashtra) :

[Old] Bombay Presidency :

SWINHOE, C. 1885. *Proc. zool. Soc. Lond.*, 124-148; 421; 503-524.

AITKEN, E. H. 1886. *J. Bombay nat. Hist. Soc.*, 1 : 126-135 [Bombay Nat. Hist. Society's coll.].

AITKEN, E. H. 1887. *J. Bombay nat. Hist. Soc.*, 2 : 35-44 [Bombay Nat. Hist. Society's coll.].

DAVIDSON, J. and AITKEN, E. H. 1891. *J. Bombay nat. Hist. Soc.*, 5 : 260-278; 349-375 [Larvae and pupae].

DAVIDSON, J. and BELL, T. R. and AITKEN, E. H. 1896-1897. *J. Bombay nat. Hist. Soc.*, 10 : 237-258; 568-584; 11 : 22-63.

Bombay and Salsette Is. :

BEST, A. E. G. [with notes by ALFREY, J. I.] 1951. *J. Bombay nat. Hist. Soc.*, 50 (2) : 331-339.

BEST, A. E. G. 1955. *J. Bombay nat. Hist. Soc.*, 53 (2) : 282-284.

BEST, A. E. G. 1956. *J. Bombay nat. Hist. Soc.*, 54 (1) : 215-216.

WIRTH, B. W. [vide EDITORS] 1959. *J. Bombay nat. Hist. Soc.*, 56 (2) : 358-359.

EDITORS 1960. *J. Bombay nat. Hist. Soc.*, 57 (1) : 233-234.

ABDULALI S. 1973. *J. Bombay nat. Hist. Soc.*, 70 (1) : 228.

BEST, A. E. G. 1977. *J. Bombay nat. Hist. Soc.*, 74 (1) : 190-191

Matheran :

SMITH, J. V. 1881. [vide PEILE, 1937, p. 241].

"List in *J. Bombay nat. Hist. Soc.*, 8" [vide EVANS, 1932, p. 33].

Nasik :

RAE, C. J. 1939. *J. Bombay nat. Hist. Soc.*, 40 (4) : 775.

Konkan :

AITKEN, E. H. and COMBER, E. 1903. *J. Bombay nat. Hist. Soc.*, 15 : 42-55

DE RHE PHILIPPE, G. W. V. 1908. *J. Bombay nat. Hist. Soc.*, **18** : 884-886.

Deccan :

SWINHOE, C. 1885-1886. *Proc. zool. Soc. Lond.*, **1885**; **1886**.

B. *South Indian Plains*

(a) Madras (Tamil Nadu) :

WATSON, E. Y. 1890. *J. Asiat. Soc. Beng.*, Pt. 2, **59** (3) : 265-269.

“MAITLAND EMMET'S list” [vide WYNTER-BLYTH, 1957, p. vi].

(b) Mysore (Karnataka) :

WATSON, E. Y. 1890. *J. Bombay nat. Hist. Soc.*, **5** (1) : 28-37.

WATSON, E. Y. 1891. *J. Bombay nat. Hist. Soc.*, **6** [vide PEILE, 1937, p. 243].

Bangalore :

YATES, J. A. 1933. *J. Bombay nat. Hist. Soc.*, **36** (2) : 450-459.

(c) Hyderabad (Andhra Pradesh) :

Secunderabad :

HOME, W. M. L. 1935. *J. Bombay nat. Hist. Soc.*, **37** (4) : 892-894.

SANDERS, D. F. 1936. *J. Bombay nat. Hist. Soc.* **38** (4) : 800-802.

Bapatla :

KRISHNAMOORTHY, C., DHARMARAJU, E and LAKSHMINARAYANA, K. V.
1961. Final Report, Named insect refererence coll., Agric.
College, Bapatla—Appendix, Pt. X : 62-65 [Catalogue].

(ii) SOUTH-EAST INDIA

C. *Central Provinces (Madhya Pradesh)*

[Old] Central Provinces :

BETHAM, J. A. 1890. *J. Bombay nat. Hist. Soc.*, **5** (1) : 19-28; **5** (2) : 152-161; 279-286.

WATSON, E. Y. 1890. *J. Bombay nat. Hist. Soc.*, **5** (1) : 28-37

BETHAM, J. A. 1891. *J. Bombay nat. Hist. Soc.*, **6** : 318-331.

Mhow :

FORSAYETH, R. W. 1884. *Trans ent. Soc. Lond.*, (3) : 377-419.

SWINHOE, C. 1886. *Proc. zool. Soc. Lond.*, 421-465.

Nimar Distt. :

WITT, D. O. 1909. *J. Bombay nat. Hist. Soc.*, **19** (3) : 564-570.

D. *Eastern Ghats*

Nagalapuram Hills :

BEST, A. E. G. 1954. *J. Bombay nat. Hist. Soc.*, **52** (2-3) : 365-373.

BEST, A. E. G. 1977; *J. Bombay nat. Hist. Soc.*, **74** (1): 189-190.

E. Orissa

Khorda :

TAYLOR, W. C. and DE NICEVILLE, L. 1888. *List of the Butterflies of Khorda in Orissa*. Calcutta (Central Press Co.).

Gopalpur, Ganjam Distt. :

SEVASTOPULO, D. G. 1940. *J. Bombay nat. Hist. Soc.*, **42** (1) : 211-212.

Barkuda Is. :

ANNANDALE, N. and DOVER, C. 1921. *Rec. Indian Mus.*, **22** (4) : 349-375.

(iii) PLAINS OF INDIA

F. Eastern India

HEWITSON, W. C. [with notes by ATKINSON, W S.] 1876. *Entomologists' mon. Mag.*, **13** : 149-152.

(a) BANGLADESH :

MOORE, F. 1865. *Proc. zool. Soc. Lond.*, 755-823.

MOORE, F. 1867. *Proc. zool. Soc. Lond.*, 612-686.

ROBBE, H. 1892. *Annl. Soc. ent. Belg.*, **36** : 122-131.

Sylhet :

HOPE, F. W. 1843. *Trans. Linn. Soc. Lond.*, **19** (2) : 103-112; 131-136.

(b) West Bengal (plains) :

Calcutta :

DE NICEVILLE, L. 1885. *J. Asiat. Soc. Beng.*, Pt. 2, **54** (1) : 39-54.

DE NICEVILLE, L. 1886. *J. Asiat. Soc. Beng.* Pt. 2, **55** (2) : 229-238.

SANDERS, D. F. 1944. *J. Beng. nat. Hist. Soc.*, **19** (1) 29-41.

SEVASTOPULO, D. G. 1944. *J. Beng. nat. Hist. Soc.*, **19** (2) : 76-87.

Barrackpore :

ROTHNEY, G. A. J. 1882. *Entomologists, mon. Mag.*, **19** : 33-36.

Sriniketan, Birbhum Distt. :

SUKUL, N. C. and JANA B. B. 1972. *Curr. Sci.*, **41** (3) : 843-844
[Relative populations.].

(c) Bihar :

Champaran Distt. :

HARMAN, A. C. 1950. *J. Bombay nat. Hist. Soc.*, **49** (1) : 93-190.

VARSHNEY, R. K. and NANDI, B. 1972. *J. Bombay nat. Hist. Soc.*, **69**
(3) : 667-668.

Patna :

VARSHNEY, R. K. and NANDI, B., 1977. *J. Bombay nat. Hist. Soc.*, **73** (2)
[1976] : 325-328

Hazaribagh National Park :

VARSHNEY, R. K. and NANDI, B. 1976. *Newsl. zool. Surv. India*, **2** (1) :
29-32.

Topchanchi, South Bihar :

MORRISON-GODERFY, P. W. 1948. *J. Bombay nat. Hist. Soc.*, **47** (4) : 644-651.

(d) United Provinces (Uttar Pradesh, plains) :

Benares (Varanasi) :

“ List in *J. Bombay nat. Hist. Soc.*, **26** ” [vide PEILE, 1937, p. 224].

Lucknow :

DE RHE PHILIPPE, G. W. V. 1902. *J. Bombay nat. Hist. Soc.*, **14** (3) : 481—493.

DE RHE PHILIPPE, G. W. V. 1905. *J. Bombay nat. Hist. Soc.*, **16** : 720—722.

Kanpur :

SEVASTOPULO, D. G. 1948. *J. Bombay nat. Hist. Soc.*, **47** (4) : 586—593.

G. Central India

(a) Delhi :

LONGSTAFF, G. B. 1912. *Butterfly hunting in many lands*. London. Longmans, Green & Co.)

JANDU, A. S. 1941. *Indian J. Ent.*, **3** (2) : 336—337.

JAUDU, A. S. 1942. *Indian J. Ent.*, **4** (2) : 201—214.

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DONAHUE, J. P. 1967. *J. Bombay nat. Hist. Soc.*, **64** (1) : 22—48.

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SEVASTOPULO, D. G. 1975. *J. Bombay nat. Hist. Soc.*, **72** (3) : 870-871.

(b) Rajputana (Rajasthan) :

Pilani :

MATHUR, S. N. and CHEMPAKAVALLI, K. R. 1961. *Proc. Rajasthan Acad. Sci.* **8** (1—2) : 135—139.

Udaipur :

KUSHWAHA, K. S., SHARMA, J. C. and SHARMA, L. S. 1963. *Indian J. Ent.*, **25** (2) : 141—146.

Jodhpur and Mount Abu :

MACPHERSON, A. D. 1927. *J. Bombay nat. Hist. Soc.*, **32** (1) : 228—230.

(c) Haryana and Punjab

Fatehgarh :

PEILE, H. D. 1911. *J. Bombay nat. Hist. Soc.*, **20** : 873—875.

Amritsar :

SEVASTOPULO, D. G. 1948. *J. Bombay nat. Hist. Soc.*, **47** (4) : 586—593.

OTHERS :

Northern India :

BUTLER, A. G. 1870 *Proc. zool. Soc. Lond.*, : 724—728 [Spaight coll.]

H. Western India

BUTLER, A. G. 1880. *Ann. Mag. nat. Hist.*, (5) 5 : 221—226.

BUTLER, A. G. 1881. *Proc. zool. Soc. Lond.*, 602—624.

BUTLER, A. G. 1886. *Proc. zool. Soc. Lond.*, 355—395 [Yerbury coll.].

(a) Gujarat, Kathiawar & Cutch :

Surat Dangs and Broach Distt. :

SHULL, E. M. 1963. *J. Bombay nat. Hist. Soc.*, 60 (3) : 585—599.

SHULL, E. M. 1964. *J. Lepidopterists Soc., U. S. A.* 18 (3) : 159—163.

SHULL, E. M. 1964 *J. Bombay nat. Hist. Soc.* 61 (2) : 464—466.

SHULL, E. M. and NADKERNY, N. T. 1967. *J. Bombay nat. Hist. Soc.*, 64 (2) : 256—266 [Lep., pp. 262—264].

NADKERNY, N. T. and SHULL, E. M. 1968. *J. Bombay nat. Hist. Soc.* 65 (3) : 800.

Kaira Distt. :

ALDRICH, H. C. 1946. *J. Bombay nat. Hist. Soc.*, 46 : 374—377.

Kathiawar :

MOSSE, A. H. 1929. *J. Bombay nat. Hist. Soc.*, 33 : 888—892.

Kutch :

NURSE, C. G. 1899. *J. Bombay nat. Hist. Soc.*, 12 : 511—514.

(b) Sind (PAKISTAN):

Lahore :

DE RHE PHILIPPE, G. W. V 1917. *J. Bombay nat. Hist. Soc.*, 25 : 135—142.

PURI, D. R. 1930. *Butterflies of Lahore*. Deptt. of Zoology, Panjab University.

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Lyallpur :

SEVEASTOPULO, D. G. 1948. *J. Bombay nat. Hist. Soc.*, 47 (4) : 586—593.

Sind :

MENESSE, N. H. 1950. *J. Bombay nat. Hist. Soc.*, 49 (1) : 20—24.

Karachi :

SWINHOE, C. 1882. *Proc. zool. Soc. Lond.*, [vide PEILE, 1937, pp. 241—242].

SWINHOE, C. 1884. *Proc. zool. Soc. Lond.*, : 503—529.

SWINHOE, C. 1887. *J. Bombay nat. Hist. Soc.*, 2 (4) : 269—280.

SWINHOE, C. 1888. *J. Bombay nat. Hist. Soc.*, 3 (2) : 117—134; 3 (3) : 168—183.

III. North—West Mountains (Pakistan & India)

(Sulaiman Range, Safed Koh, Hindu Kush, Karakoram, etc.) :

LANG, A. M. and MOORE, F. 1864. *Entomologists' mon. Mag.*, 1 : 101—104; 131—133; 181—183.

MOORE, F. 1865. *Proc. zool. Soc. Lond.*, 486—509 [Lang coll.]

- BUTLER, A. G. 1888. *Ann. Mag. nat. Hist.*, (6) 1 : 132—151.
 A. Baluchistan and Zhob (Sulaiman) :
 BUTLER, A. G. 1880. *Ann. Mag. nat. Hist.*, (5) 5 : 221—226.
 BUTLER, A. G. 1881. *Proc. zool. Soc. Lond.*. 602—624.
 EVANS, W. H. 1932. *J. Bombay nat. Hist. Soc.*, 36 : 196—209.

B. *Trans-Indus, N. W. Frontier Provinces*
 (Safed Koh; Gomal to Peshawar)

?

(i) Hindu Kush

- SHIROZU, T. and SAIGUSA, T. 1963. *Some Butterflies from West Pakistan and Iran*. Results of the Kyoto University Scientific Expedition to the Karakoram and Hindu Kush, 1955, 4 : 103—144.

C. *Chitral*

- LESLIE, G. A. & EVANS, W. H. 1903. *J. Bombay nat. Hist. Soc.*, 14 (4) : 666—678.

D. *Gilgit and Yasin*

- TYTLER, H. C. 1926. *J. Bombay nat. Hist. Soc.*, 31 (2) : 248—260;
 31 (3) : 579—590.

(ii) Karakoram

- EVANS, W. H. 1927. *Tijdschr. v. Ent.* [Visser Expedition coll.].
 SHIROZU, T. and SAIGUSA, T. 1963. *loc. cit.*

E. *Hunza Nagar*; F. *Baltistan* :

- TYTLER, H. C. 1926. *J. Bombay nat. Hist. Soc.*, 31 (2) : 248—260;
 31 (3) : 579—590.

G. *Ladakh* :

?

Others :

Pamir (U. S. S. R.) :

- GRUM--GRSHIMAILO, G. 1890. *Rom. Mem. Lep.*, 4.

IV. West Himalayas (India)

- LANG and MOORE 1864; MOORE 1865; BUTLER 1870, 1888. *loc. cit.*

A. Kashmir :

KOLLAR, V. 1844. IN HÜGEL's ' *Kaschmir und das Reich der Siek* ',
4 (2) : 395-496.

MOORE, F. 1874. *Proc. zool. Soc. Lond.*, 263-274.

LOGAN HOME, W. M. 1938. *J. Bombay nat. Hist. Soc.*, 40 (1) : 49-55.

Gulmarg :

LANG, A. M. 1868. *Entomologists' mon. Mag.*, 5 : 33-37.

A₁. Murree to Abbottabad (PAKISTAN)

SEVASTOPULO, D. G. 1948. *J. Bombay nat. Hist. Soc.*, 47 (4) : 586-593.

Rawalpindi, Attock :

" List in *Proc. zool. Soc. Lond.*, 1886 " [vide EVANS, 1932, p. 34].

B. Lahoul and Spiti

MANI, M. S. and SINGH, S. 1962. *J. Bombay nat. Hist. Soc.*, 59 (1) :
77-99 [*Lep.*, pp. 87-99].

C. Kangra (Himachal Pradesh) :

MOORE, F. 1882. *Proc. zool. Soc., Lond.*, 234-263 [Hocking coll.].

D. Kulu, Simla (Himachal Pradesh) :

Kulu :

FERRAR, M. L. 1934. *J. Bombay nat. Hist. Soc.*, 37 (1) : 230-233.

Simla :

DE RHE PHILIPPE, G. W. V 1931. *J. Bombay nat. Hist. Soc.*, 35 (1) :
172-183; 35 (2) : 415-429.

DE RHE PHILIPPE, G. W. V 1932. *J. Bombay nat. Hist. Soc.*, 35 (3) :
620-634.

WYNTER-BLYTH, M. A. 1940. *J. Bombay nat. Hist. Soc.*, 41 (4) :
716-741.

WYNTER-BLYTH, M. A. 1941. *J. Bombay nat. Hist. Soc.*, 42 (2) : 448.

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672-673.

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WYNTER-BLYTH, M. A. 1947. *J. Bombay nat. Hist. Soc.*, 46 (4) :
735-736.

E. Garhwal, Mussoorie (Uttar Pradesh Hills) :

Mussoorie :

MACKINNON, P. W. and DE NICEVILLE, L. 1897. *J. Bombay nat. Hist. Soc.*, 11 : 205-221.

MACKINNON, P. W. and DE NICEVILLE, L. 1898. *J. Bombay nat. Hist. Soc.*, **11** : 368-389; 585-623.

OLLENBACH, O. C. 1930. *J. Bombay nat. Hist. Soc.*, **34** (3) : 836-840.
Dun Valley :

MACKINNON, P. W. and DE NICEVILLE, L. 1897; 1898. *loc. cit.*

ROONWAL, M. L. *et al.* 1963. *Indian Forest Leaflet*. (*Ent.*), **121** (4) : 197-540 [F. R. I. coll.]

F. Kumaon (Uttar Pradesh Hills) :

DOHERTY, W. 1886. *J. Asiat. Soc. Beng.* Pt. 2, **55** (3) : 103-140.

HANNYNGTON, F. 1910. *J. Bombay nat. Hist. Soc.*, **20** : 130-142;
361-372.

HANNYNGTON, F. 1911. *J. Bombay nat. Hist. Soc.*, **20** : 871-872.
Nainital :

SEVASTOPULO, D. G. 1948. *J. Bombay nat. Hist. Soc.*, **47** (4) : 586-593.
Kumaon—Tibet border :

CHAMPION, H. G. 1926. *Entomologists' mon. Mag.*, **62** : 271-275.

G. NEPAL :

GRAY, G. R. 1846. *Lep. Ins. Nepal*.

GOUGH, W. G. H. 1935. *J. Bombay nat. Hist. Soc.*, **38** (2) : 258-265.

BAILEY, F. M. 1951. *J. Bombay nat. Hist. Soc.*, **50** (1) : 64-87.

BAILEY, F. M. 1951. *J. Bombay nat. Hist. Soc.*, **50** (2) : 281-298.

LOWNDES, D. G. 1953. *J. Bombay nat. Hist. Soc.*, **51** (3) : 756-758.

SHIROZU, T. 1955. Butterflies. In 'Fauna and Flora of Nepal Himalayas' Scientific results of the Japanese Expedition to Nepal Himalayas, 1952-53 (Ed. H. KIHARA) **1** : 317-391

FORSTER, W. 1961. *Veroff. zool. St. Samml., Münch.*, **6** : 138-150.
[German Nepal Expedition, 1955 coll.]

Central Nepal :

WADHI, S. R. and PARSHAD, B. 1968. *Indian J. Ent.*, **30** (1) : 92-93.

Mt. Everest region :

RILEY, N. D. 1923. *Trans. ent. Soc. Lond.*, **1922** (3-4) : 461-483.

RILEY, N. D. 1927. *Trans. ent. Soc. Lond.*, **75** : 119-129.

V North--East India :

N. E. Himalayas (High elevations) :

FAWCETT, J. M. 1904. *Proc. zool. Soc. Lond.*, (2) : 134-141.

A. Sikkim (Teesta and Chumbi Valleys) :

DE NICEVILLE, L. 1881. *J. Asiat. Soc. Beng.*, Pt. 2, **50** (1) : 49-60.

DE NICEVILLE, L. 1882. *J. Asiat. Soc. Beng.*, Pt. 2, **51** (2-3) : 54-66.

ELWES, H. J. 1882. *Proc. zool. Soc. Lond.*, 397-407.

- DE NICEVILLE, L. 1883. *J. Asiat. Soc. Beng.* Pt. 2, **52** (2-4) : 92-100.
 DE NICEVILLE, L. 1885. *J. Asiat. Soc. Beng.*, Pt. 2, **54** (1) : 1-5.
 ELWES, H. J. and MOLLER, O. 1888. *Trans. ent. Soc. Lond.*, (3) :
 269-465.
 DE NICEVILLE, L. 1894. *Gazetteer of Sikkim*, 116-187.
 " SANDER'S list " [*vide* WYNTER-BLYTH, 1957, p. v.].
 " SANDER'S Mss " [*vide* CANTLIE, 1962, p. iv.].

A₁. North Bengal Hills :

Darjeeling Distt. :

- MAUDE, E. W. 1949. *J. Beng. nat. Hist. Soc.*, **23** (3) : 86-92.
 MAUDE, E. W. 1949. *J. Beng. nat. Hist. Soc.*, **23** (4) : 119-122.
 MAUDE, E. W. 1949. *J. Beng. nat. hist. Soc.*, **24** (2) : 58-59.
 " SANDER'S list " [*vide* WYNTER-BLYTH, 1957, p. v.].

B. BHUTAN :

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C. Assam :

- DOHERTY, W. 1889. *J. Asiat. Soc. Beng.*, Pt. 2, **58** (1) : 118-134.
 NORMAN, T. 1952. *J. Bombay nat. Hist. Soc.*, **50** (4) : 952-953.
 NORMAN, T. 1953. *J. Bombay nat. Hist. Soc.*, **51** (2) : 515-517.
 NORMAN, T. 1946. *J. Bombay nat. Hist. Soc.*, **53** (4) : 738-740.
 CANTLIE, K. and NORMAN, T. 1960. *J. Bombay nat. Hist. Soc.*, **57** (2) :
 424-429.

Borders of Assam :

- BUTLER, A. G. 1885. *Ann. Mag. nat. Hist.*, (5) **16** : 298-347.

Manas Sanctuary :

- GHOSH, A. K. *et al.*, 1975. *Sci. and Cult.*, **41** (8) : 386-388.

(a) Khasi and Jaintia Hills, etc. (Meghalaya) :

- SWINHOB, C. 1893. *Trans. ent. Soc. Lond.*, (3) : 267-330; 396-432.
 SWINHOE, C. 1895. *Trans. ent. Soc. Lond.*, : 1-75.
 PARSONS, R. E. and CANTLIE, K. 1948. *J. Bombay nat. Hist. Soc.*, **47**
 (3) : 498-522.
 CANTLIE, K. 1952. *J. Bombay nat. Hist. Soc.*, **51** (1) : 42-60.
 CANTLIE, K. 1956. *J. Bombay nat. Hist. Soc.*, **54** (1) : 212-215.
 VARSHNEY, R. K. and CHANDA, S. K. 1971. *Indian Mus. Bull.*, **6** (1) :
 28-53.

Garo Hills :

- VARSHNEY, R. K. and CHANDA, S. K. 1971. *loc. cit.*

(b) Abor Valley: N.E.F.A. (Arunachal Pradesh) :

Tibet Frontier :

- ELWES, H. J. 1906. *Proc. zool. Soc. Lond.*, : 479-498.

S. E. Tibet :

SOUTH, R. 1913. *J. Bombay nat. Hist. Soc.*, **22** : 345-365 [Bailey coll.]

EVANS, W. H. 1915. *J. Bombay nat. Hist. Soc.*, **23** (3) : 532-546
[Bailey coll.].

Abor Hills :

EVANS, W. H. 1912. *Rec. Indian Mus.*, **8** (1-3) : 61-65

Subansiri :

BETTS, F. N. 1950. *J. Bombay nat. Hist. Soc.*, **49** (3) : 488—502.

Tirap, Siang, Kameng :

VARSHNEY, R. K. and CHANDA, S. K. 1971. *Indian Mus. Bull.*,
6 (1) : 28—53.

(c) Mishmi Hills :

SOUTH, R. 1913. *J. Bombay nat. Hist. Soc.*, **22** : 345—365
[Bailey coll.].

(c₁) Assam plains :

Balipara Frontier Tract :

BETTS, F. N. 1950. *J. Bombay nat. Hist. Soc.*, **49** (3) : 488—502.

Kaziranga National Park :

GHOSH, A. K. *et al.*, 1975. *Sci. & Cult.*, **41** (10) : 502—504.

Jorhat :

SAHARIA, D. 1967. *J. Assam agric. College*, 23—29.

Cachar :

BUTLER, A. G. 1879. *Trans. ent. Soc. Lond.*, (1) : 1—8.

WOOD-MASON, J. and DE NICEVILLE, L. 1886. *J. Asiat. Soc. Beng.*,
Pt. 2, **55** (3) : 343—393.

MANDERS, N. 1887. *J. Asiat. Soc. Beng.*, Pt. 2, **55** [“ 15 : 343 ”
vide PEILE, 1937, p. 261.].

(d) Manipur and Naga Hills :

Naga Hills (Nagaland) :

ELWES, H. J. 1891. *Proc. zool. Soc. Lond.*, 249—289 [Doherty coll.]

ELWES, H. J. 1892. *Proc. zool. Soc. Lond.*, 617—664.

TYTLER, H. C. 1911. *J. Bombay nat. Hist. Soc.*, **21** : 48—65.

TYTLER, H. C. 1912. *J. Bombay nat. Hist. Soc.*, **21** : 588—606.

TYTLER, H. C. 1914. *J. Bombay nat. Hist. Soc.*, **23** : 216—229.

TYTLER, H. C. 1915. *J. Bombay nat. Hist. Soc.*, **23** : 502—515.

TYTLER, H. C. 1915. *J. Bombay nat. Hist. Soc.*, **24** : 119—155.

Manipur :

BUTLER, A. G. 1885. *Ann. Mag. nat. Hist.*, (5) **16** : 298—347.

TYTLER, H. C. 1914. *J. Bombay nat. Hist. Soc.* **23** : 216—229.

TYTLER, H. C. 1915. *J. Bombay nat. Hist. Soc.* **23** : 502—515.

TYTLER, H. C. 1915. *J. Bombay nat. Hist. Soc.*, **24** : 119—155.

(e) Lushai Hills to Chittagong :

Lushai Hills (Mizoram) :

DE NICEVILLE, L. 1890. *J. Bombay nat. Hist. Soc.* 5 : 295—298.

WATSON, E. Y 1891 *J. Bombay nat. Hist. Soc.*, 6 : 26—59

[Chin—Lushai Expedition coll.].

Tripura ;

?

Chittagong, Cheringa (BANGLADESH) ;

EMMET, A. M. 1948. *J. Bombay nat. Hist., Soc.*, 48 (1) : 62—74.

VI. Burma

WOOD-MASON, J 1881 *J. Asiat. Soc. Beng.*, 50 (2) : 85.

WATSON, E. Y 1888. *J. Bombay nat. Hist. Soc.*, 3 (1) : 17—28

ADAMSON, C. H. E. 1905. *Trans. nat. Hist. Soc. Northumb., Durh. & Newc.*, 1 : 155—189.

ADAMSON, C. H. E. 1908. *Trans. nat. Hist. Soc. Northumb., Durh. & Newc.*, 3 : 116—148.

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TYTLER, H. C. 1926. *J. Bombay nat. Hist. Soc.*, 31 (3) : 579—590.

TYTLER, H. C. 1939. *J. Bombay nat. Hist. Soc.*, 41 (2) : 235—252.

TYTLER, H. C. 1940. *J. Bombay nat. Hist. Soc.*, 42 : 109—123.

“ COOPER’S list ” [*vide* PEILE, 1937].

A. North Burma :

Irrawaddy and Chindwin Valleys above Mandalay) :

(a) Kachin Country :

BUTLER, A. G. 1886. *Ann. Mag. nat. Hist.*, (5) 18 : 182—191

[Alfred Carpenter coll.].

(b) Chin Hills :

DE NICEVILLE, L. 1890. *J. Bombay nat. Hist. Soc.*, 5 : 295—298.

WATSON, E. Y 1891. *J. Bombay nat. Hist. Soc.*, 6 : 26—59.

WATSON, E. Y 1897. *J. Bombay nat. Hist. Soc.*, 10 : 634—687.

Upper Chindwin Distt. :

WATSON, E. Y 1897. *loc. cit.*

(c) Bhamo and Ruby Mines area :

?

B. Mid-Burma :

(a) Arakan Yoma to Bassein :

Arakan coast :

GLADMAN, J. C. 1946. *J. Bombay nat. Hist. Soc.*, 46 (3) : 516—524.

EMMET, A. M. 1948. *J. Bombay nat. Hist. Soc.*, 48 (1) : 62—74.

GLADMAN, J. C. 1949. *J. Bombay nat. Hist. Soc.*, 48 (2) : 379—380.

(b) Pegu Yoma to Rangoon :

Myingyan, Central Burma :

WATSON, E. Y. 1897. *J. Asiat. Soc. Beng.*, Pt. 2, 66 (3) : 606—611

Tharrawaddy and Pegu Yoma :

ELLIS, E. V. 1917. *J. Bombay nat. Hist. Soc.* 25 (1) : 104—120.

Rangoon :

BEST, A. E. G. 1957. *J. Bombay nat. Hist. Soc.*, 54 (3) : 776—784.(c) North Shan States (Ma ymyo); (d) South Shan States
(Kalaw to Taunggyi) :MANDERS, N. 1890. *Trans. ent. Soc. Lond.*, (3) 511—539.CARROTT, W. C. 1939. *J. Bombay nat. Hist. Soc.*, 40 (4) : 657—665CARROTT, W. C. 1940. *J. Bombay nat. Hist. Soc.*, 41 (3) 646—652.

(e) Karen Hills (Toungoo to Thandaung) :

ELWES, H. J. 1891. *Proc. zool. Soc. Lond.*, 249—289.ELWES, H. J. 1892. *Proc. zool. Soc. Lond.*, 617—664.

C. South Burma :

(a) Moulmein (Dawnas Range, Ataran Valley) :

Upper Tenasserim :

MOORE, F. 1878. *Proc. zool. Soc. Lond.*, 121—859 [Limborg coll.].

Tenasserim Distt. :

DE NICEVILLE, L. 1899. *J. Bombay nat. Hist. Soc.*, 12 : 329—336.“ List in *J. Asiat. Soc. Beng.*, 1886 ” [vide EVANS, 1932, p. 35].

(b) Tavoy area :

ELWES, H. J. and DE NICEVILLE, L. 1886. *J. Asiat. Soc. Beng.*, pt. 2, 55 (4) : 413—442 [Indian Mus./Pitman coll.].OLLENBACH, O. C. 1921. *J. Bombay nat. Hist. Soc.*, 27 : 883—897.

(c) Mergui area :

Mergui and its Archipelago :

MOORE, F. 1886. *J. Linn. Soc. Lond. (Zool.)*, 21 : 29—60.

(d) Victoria Point and Lenya Valley :

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VII & VIII. Andaman, Nicobar, Etc. Islands

(i) Bay of Bengal Is.

(a) Andaman Is. (India) :

HEWITSON, W. C. 1874. *Ann. Mag. nat. Hist.*, (4) 14 : 356—358
Wimberley coll.].MOORE, F. 1877. *Proc. zool. Soc. Lond.*, 579-632.FERRAR, M. L. 1948. *J. Bombay nat. Hist. Soc.*, 47 (3) : 470-491.

Port Blair :

WOOD-MASON, J. and DE NICEVILLE, L. 1880. *J. Asiat. Soc. Beng.*, Pt. 2, 49 (2) : 223-243.

WOOD-MASON, J. and DE NICEVILLE, L. 1881. *J. Asiat. Soc. Beng.*, Pt. 2, 50 (4) : 243-262.

(a) Nicobar Is. (India) :

MOORE, F. 1877. *Proc. zool. Soc. Lond.*, 579-632.

WOOD-MASON, J. and DE NICEVILLE, L. 1881. *J. Asiat. Soc. Beng.*, Pt. 2, 50 (3) : 224-238.

WOOD-MASON, J. and DE NICEVILLE, L. 1882. *J. Asiat. Soc. Beng.*¹ Pt. 2, 51 (1) : 14-20.

FERRAR, M. L. 1948. *J. Bombay nat. Hist. Soc.*, 47 (3) : 470-491.

(ii) ARABIAN SEA IS. :

(a) Laccadive Is. (Lakshadip, India) :

?

(b) MALDIVE IS. :

PHILLIPS, W. W. A. 1964 *J. Bombay nat. Hist. Soc.*, 61 (2) : 396-401.

B. WORKS OF WIDER COVERAGE

1. LINNAEUS, C. 1758. *Systema Naturae*, 10th ed.
2. CRAMER, P. 1775-1780. *Pap. Exot.*, Vol. i - iv.
3. GRAY, G. R. 1846. *Lep. Ins. Nepal*.
4. HORSFIELD, T. and MOORE, F. 1857-1859. [Catalogue East India Co. Museum coll.].
5. MOORE, F. 1880-1887. *Lep. Ceylon*, Vol. i - iii.
6. MARSHALL, G. F. L. and DE NICEVILLE, L. 1883-1890. *Butterflies Of India, Burmah and Ceylon*, Vol. i - iii.
7. MOORE, F. 1890-1907. *Lep. Indica*, Vol. i - vii.
8. WATSON, E. Y. 1891. *Hesperiidae Indicae*; — 1894. *J. Bombay nat. Hist. Soc.*, 8. [Classification of Hesperiidae].
9. SWINHOE, C. 1909-1913. *Lep. Indica*, Vol. vii - x.
10. BINGHAM, C. T. 1905. *Fauna of British India — Butterflies*, 1st ed., Vol. 1; — 1907. *Ibid.*, Vol. 2. London.
11. YOUNG, L. C. H. 1905-1907. *J. Bombay nat. Hist. Soc.*, 16 - 18. [Series of papers on common butterflies of plains of India].
12. SEITZ, A. (Ed.) 1906-1928. *The Macrolepidoptera of the World*, Vol. 1 - 9. [Indo-Australian Rhopalocera, Vol. 9]
13. LEFROY, H. M. 1909. *Indian Insect Life*. Calcutta.
14. FLETCHER, T. B. 1909. *Trans. Linn. Soc. Lond.*, 13 : 264-324. [Distribution of Lepidoptera, excluding Tortricidae and Tineidae].

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SUMMARY

References to 260 local-lists of butterflies for different parts of India, Pakistan, Burma, Nepal, Sri Lanka, Maldive Is. and Bangladesh are given. Localities have been arranged faunistic area-wise. A list of the books and papers of wider coverage on the butterflies of these countries has also been added.

ACKNOWLEDGEMENTS

The author is grateful to the Director, Zoological Survey of India, Calcutta, for the permission to publish this Index and encouragement.

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DESCRIPTIONS OF THREE NEW AND RECORDS OF TWO KNOWN SPECIES OF CHLOROPIDAE (DIPTERA) FROM INDIA

By

P. T. CHERIAN

Zoological Survey of India, Calcutta

(With 3 Text-figures)

INTRODUCTION

The genera *Meijerella* Sabrosky and *Oscinella* Becker are represented in India by only one species of the former and three of the latter. In the present paper three new species, one under *Meijerella* and two under *Oscinella* are described. Besides *Siphunculina striolata* (Wiedemann) and *Cadrema nigricornis* (Thomson) are being recorded for the first time from India.

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

I am grateful to the Director, Zoological Survey of India, for facilities for work and to Mr. K.S Pradhan, Superintending Zoologist, for constant encouragement.

SYSTEMATIC ACCOUNT

Cadrema nigricornis (Thomson) comb. nov.

1869. *Hippelates nigricornis* Thomson, *Eugen. Resa.* P : 607 (Type loc.— Ross Island)
1869. *Hippelates flavus* Thomson, *Eugen. Resa.* P : 607 (Type loc.— Keeling Island)
1904. *Hippelates bilineatus* de Meijere, *Bijdr. Dierkunde* : 113 (Type loc.— Java : Pasuruan)
1923. *Hippelates nigricornis* Thomson var. *bilineatus* de Meijere : Frey, *Notulae Ent.*, 3 : 100.
1934. *Liohippelates nigricornis* Thomson var. *bilineatus* (de Meijere) Duda, *Tijdschr. Ent.*, 77 : 61.
1934. *Liohippelates nigricornis* (Thomson) var. *flavus* (Thomson) : Duda, *Tijdschr. Ent.*, 77 : 61.

Frey (1923) considered *C. bilineatus* (de Meijere) a variety of *C. nigricornis* (Thomson) and this was followed by Duda (1934). Besides Duda considered *C. flavus* (Thomson) also a variety of *C. nigricornis* (Thomson). Out of the two specimens before me one agrees entirely with the descriptions of *flavus* (Thomson) but in the other out of the four longitudinal stripes on the mesonotum the two median ones are distinctly separable only anteriorly. Moreover in the latter specimen the lateral stripes are distinctly blackened and each is broken at the transverse suture. It is the first record of this species from India.

2 Examples. India : Calcutta, 1 ♀, 27. vii. 1972 (*P. T. Cherian*).
1 ♀, 28. viii. 1972 (*P. T. Cherian*).

Siphunculina striolata (Wiedemann)

1830. *Chlorops striolatus* Wiedemann, *Aussereurop. Zweifl. Insekten* 2 : 597 (Type loc.—China).
1858. *Oscinis signata* Wollaston, *Ann. Mag. nat. Hist.*, (3) 1 : 117 (Type loc.—Madeira).
1910. *Microneurum signatum* (Wollaston), Becker, *Arch. Zool.*, 1 : 132, 149.
1912. *Siphunculina signata* (Wollaston), Becker, *Ann. Mus. Nat. Hist.*, 10 : 191.
1963 *Siphunculina striolata* (Wiedemann), *Ann. Mag. nat. Hist.*, (13) 6 : 750.

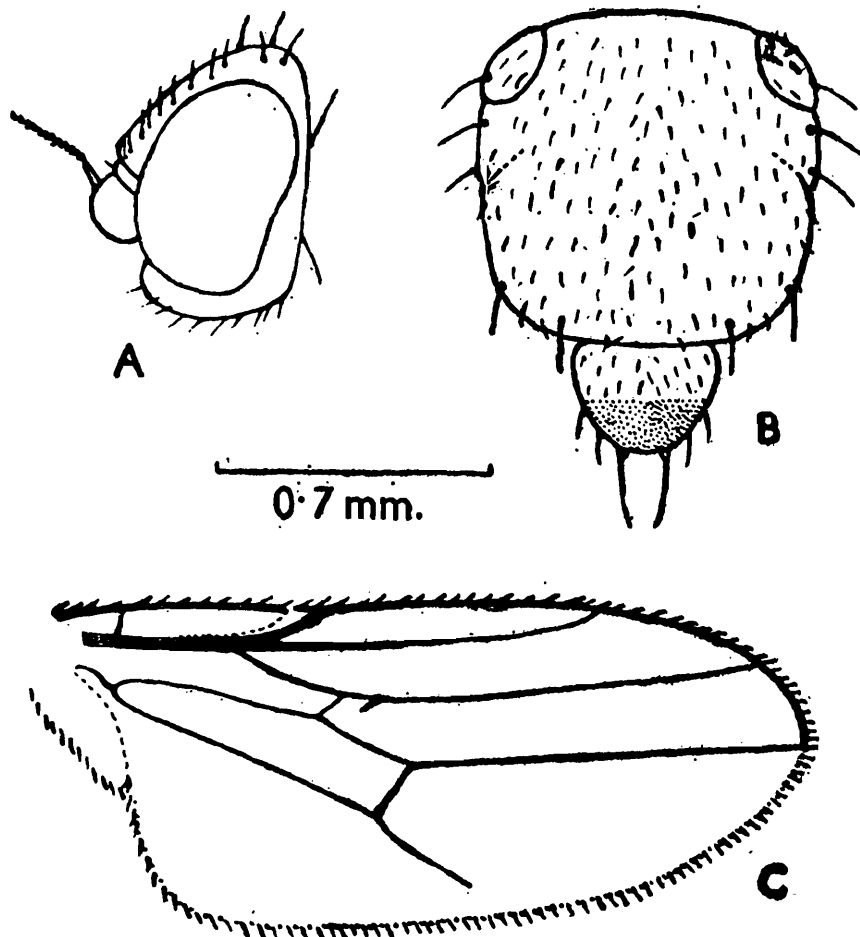
All the four specimens before me, three from Calcutta and one from the Andaman Islands, agree wholly with the descriptions of Wiedemann.

4 Examples. India : Calcutta, 1 ♀, 10.i. 1969 (*A.N.T. Joseph*); Calcutta, 1 ♂ 1 ♀, 11. viii. 1972 (*P. T. Cherian*); South Andamans, Cheria Tappu, 1 ♀, 23.x. 1972 (*P. T. Cherian*).

Meijerella indica, sp. nov.

Head (Text. Fig 1 a).—slightly higher than long, height, length and width in the ratio 15:14:18; frons parallel-sided, brownish-yellow, width 0.36 times that of head and two-thirds its own length, with short, golden yellow hairs; frontal triangle sharply demarcated, dull black with grey pollen imparting ash grey colour to the triangle, reaching three-fifths the frons. Eye densely and conspicuously pubescent, long axis vertical. Gena almost half as wide as third antennal segment, dull yellowish-grey, vibrissal angle rounded; postgena concolourous with frontal triangle. Face concave, yellowish-grey; facial carina extending in the form of a low, linear ridge to the epistomal margin. Second antennal segment brown; third segment brownish-yellow, distinctly wider than long; arista slender, basally yellowish-brown but distally dark brown, with concolourous pubescence. Palpi yellowish-brown

and proboscis brown. All head bristles and hairs slender, yellow; *ovt* 0.35 times the width of eye; *ivt* just over half the *ovt*; *ori* about 9, reclinate, longest more than half the *ovt*; *fr* hardly distinguishable from frontal hairs; *pvt* convergent, three-fourths the *ovt*; *oc* slightly reclinate, almost parallel, two-thirds the *ovt*.



Text-fig. 1.— *Meijerella indica*, sp. nov. A— head, B — thorax, C— wing.

Thorax (Text Fig. 1 *b*).— Mesonotum dull black, width equal to its own length and to the width of head, with grey bloom and uniformly with dense piliferous punctures and golden yellow pubescence; five longitudinal stripes are seen which are less grey, of these the median reaches upto the scutellum. Scutellum broadly semicircular with broadly obtuse apex, pubescent and punctate like mesonotum, the distal half ferruginous, the rest concolourous with mesonotum length to width at base 11 : 17; 1 *hu*, pale, slender, hair-like; *np* 1 + 1, almost equal a little less than half the width of eye; *pa*, equal to posterior *np*; *pa*₂ absent; 1 *dc* equal to *pa*; *as* half the width of eye and 0.8 times the length of scutellum, set on small tubercle; *ss*₁ half the *as*, very slender, pale, set on very fine tubercles, *ss*₂ two-thirds the *ss*₁. All the thoracic bristles, except the *hu* and *ss* dark brown.

Wing (Text fig. 1 c).— Hyaline, width to length 4 : 11 ; costal sectors 2 to 4 as 14 : 9; 5; middle cross-vein greatly distad of the middle of the discal cell as 2 : 1; terminal sectors of iii and iv veins straight. Knob of haltere white, stalk yellow.

Legs.— Coxae brown to dark brown; fore tibia brown, mid and hind tibiae and all tarsi yellowish-brown.

Abdomen.— Second segment at the posterolateral margin and third wholly blackish-brown; fourth segment yellowish-brown but for a large, subtriangular, black spot in the middle and two blackish patches, one on each side; fifth segment wholly black.

Measurements.— ♂ Body length 1.5 mm; Wing length 1.7 mm.

This species comes close to *M. inaequalis* (Becker) from Formosa from which it differs in the number and colouration of the longitudinal stripes on the mesonotum and the bicolourous nature of the scutellum. Moreover in *indica* the frons and gena are narrower.

Holotype : ♂ on pin, India : Lingamala water falls (Maharashtra), 17.i 1972. (K.S. Pradhan)

Genus *Oscinella* Becker

1909. *Oscinella* Becker, *Bull. Mus. Nat. Hist. Nat. Paris*, 15 : 120.

Oscinella Becker is a very large genus represented by many species in all the fauna! regions. It can be distinguished by the following characters : Frontal triangle shiny or dusted only between ocelli or (rarely) at angles and without hairs; front margin of frons concave; face perpendicular; eyes and arista pubescent and thoracic pubescence scanty and arranged more or less in lines. The larvae live mostly as stem-miners. Only three species *minuta* Becker, *pura* Becker and *frit* (Linn.) have so far been recorded from India. Two new species are described here.

Key to the Indian species of *Oscinella* Becker.

1. Legs yellow to ferruginous-yellow eye naked. *pura* Becker
 Legs partly black; eye pubescent. .. 2
2. Frontal triangle short, reaching only upto the middle of frons: antennae bright reddish yellow *minuta* Becker
 Frontal triangle reaching three-fourths or more the length of frons. 3
3. Gena only half as wide as third antennal segment: arista distinctly pubescent 4
 Gena nearly as wide as third antennal segment: arista not so distinctly pubescent ... *frit* (Linn.)
4. Frontal triangle dull, pointed apically : knob of haltere yellow : cerci widened at base, almost triangular *fusidentata*, sp. nov.
 Frontal triangle shiny, obtusely truncate apically; knob of haltere yellow; cerci slightly narrowed at base *moirangae* sp. nov.

***Oscinella fusidentata*, sp. nov.**

Male, Female : Head. (Text Fig. 2a)— Higher and wider than long, length, height and width in the ratio 5:7:8; frons dull black, width 1.1 times its own length and 0.56 times the width of head; frontal triangle raised, dull black, reaching nearly to the anterior margin of frons, pointed at apex; eye finely pubescent, long axis slightly diagonal; gena dull black, width half the width of third antennal segment, vibrissal angle rounded; postgena black; face very narrow, facial carina indistinct; epistomal margin retreating. Antenna black, third segment wide, width to length 5:4; arista black, with long black pubescence. Palpi and proboscis black. All the head and thoracic bristles and hairs black; *ovt* slender, 0.4 times the width of eye; *ivt* very slender, nearly three-fourths the *ovt*; *ori* 7, slender, reclinate, half the *ovt*; *pvt* cruciate, a little over one-third the width of eye; *oc* cruciate, slightly proclinate, a trifle shorter than *pvt*; *ovt* 7-8.

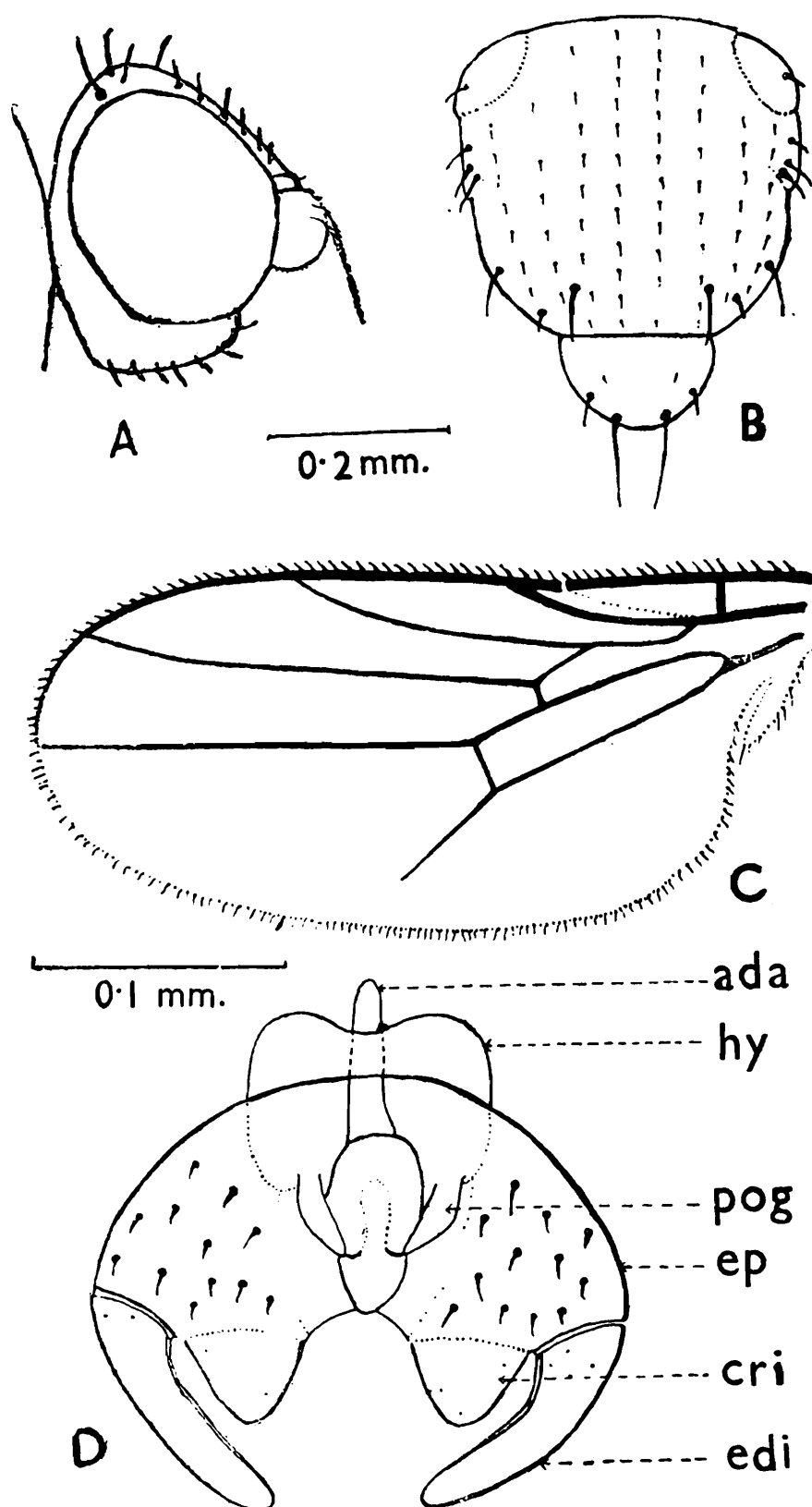
Thorax (Text Fig. 2 b).— Mesonotum slightly wider than long and as wide as head, width to length 8:7, black finely granulose, mesonotal hairs arranged in about eight longitudinal rows; pleural region polished; scutellum semicircular, dull black, width to length 8:5; *hu* 1, one-fifth the width of eye; *np* 1 + 2, anterior very slender, a little longer than *hu*, posterior two fairly stout and almost equal, nearly twice the *hu*; *pa*, slender, equal to posterior *np*; *pa*₂ represented by a fine hair that can scarcely be called a bristle; *l dc* slender, three-sevenths the width of eye; *as* convergent to cruciate, 1.25 times the scutellum; *ss* 1 pair, one-third the *as*.

Wing (Text Fig. 2 c).— Hyaline, veins brown, width 0.35 times the length; costal sectors 2 to 4 as 5 : 5 : 2; middle cross-vein distad of the middle of the discal cell as 3:2; terminal sectors of iii and iv veins nearly straight. Stalk of haltere pale grey, knob white.

Legs.— Coxae, trochanters and femora brownish-black; fore and mid tibiae yellowish-brown to dark brown; hind tibia dull black, but pale at both ends; tarsi dark brown, but basal segments of mid and hind tarsi yellowish-brown.

Abdomen.— Very narrow, dull black but two basal segments especially in the male, brownish-yellow, with dark brown patches.

Genitalia. (Text Fig. 2 d)— Edita (EDI) shorter than epandrium (EP), blunt at tip, set with scattered hairs; cerci (CRI) in the form of a triangular plate, less than half as long as the edita; gonite (POG) acute at tip, hypandrium (HY) only slightly sinuate proximally; aedeagal apodeme (ADA) a little over half the epandrium.



Text-fig. 2. — *Oscinella fusidentata*, sp. nov. A — head, B — thorax, C — wing, D — genitalia.

Length	♂	1.2 — 1.4 mm	Wing	1.3 — 1.4 mm
	♀	1.3 — 1.6 mm		1.3 — 1.6 mm

Holotype ♂, on pin, India : Agra, 4.v. 1967, Coll. P. T. Cherian.

Paratype 8 ♂♂, 6 ♀♀, data same as that of holotype.

O. fusidentata comes close to *pusilla* Meigen from Formosa and Europe from which it differs in the width of gena being only half and not almost equal to that of third antennal segment. Again in *fusidentata* the femora are pale at tips, the arista is with fairly long pubescence and fore and mid tibiae are not yellow but dark brown with pale tips.

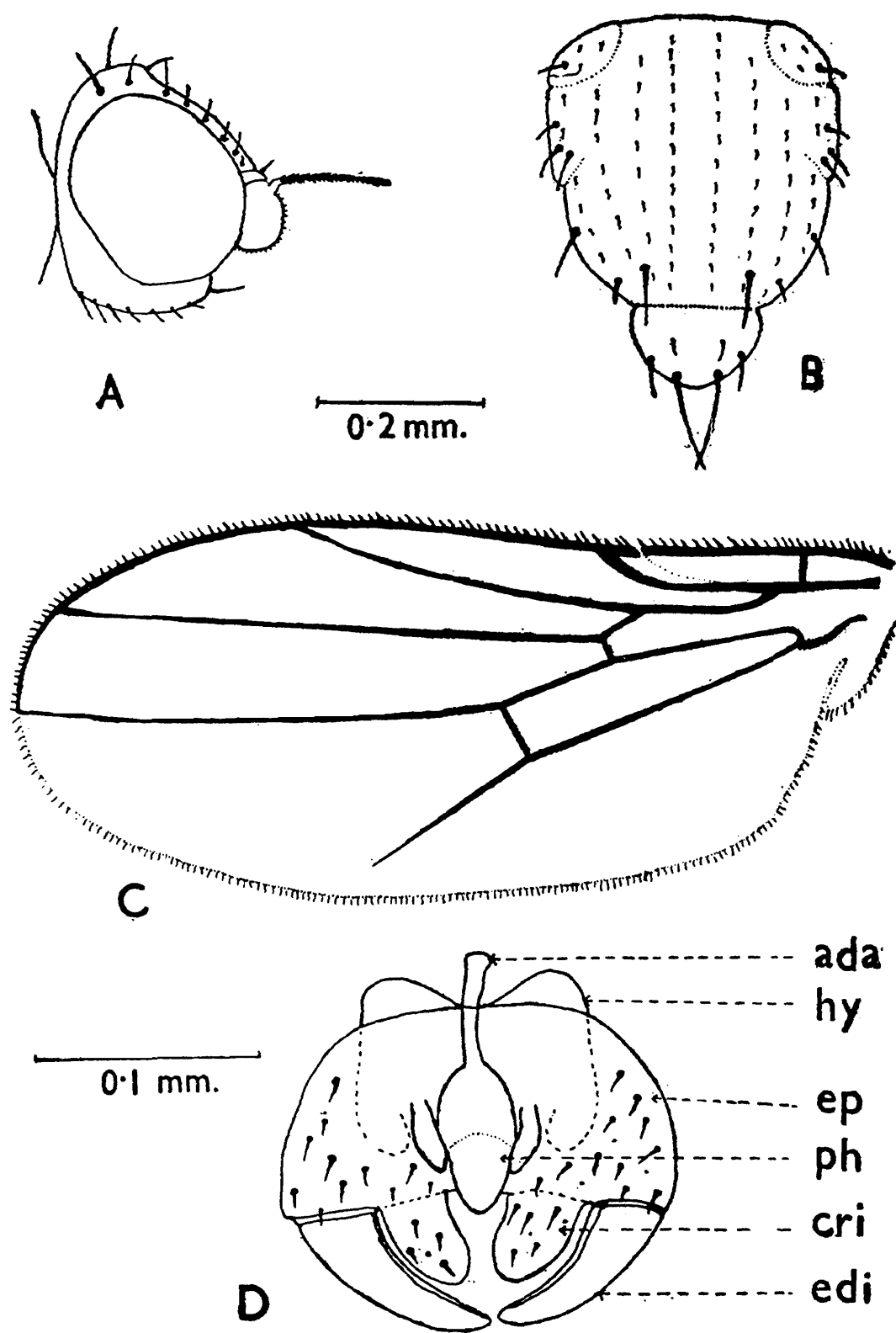
Oscinell 2 moirangae, sp. nov.

Male, Female : Head (Text Fig. 3 a).—A trifle higher and much wider than long, length, height and width in the ratio 31:33:43; frons almost parallel-sided, slightly concave in front, width 0.53 times that of head and a little more than its own length, brownish-black; frontal triangle polished, shiny black, reaching the anterior margin of frons and ending with an obtuse apex, eye densely and finely pubescent, the long axis nearly vertical, gena brownish-black, width half that of third antennal segment; vibrissal angle rounded, not projecting in front beyond the eye; postgena dull black; face narrow, concave, brownish-black, facial carina indistinct, epistomal margin a little raised, antennae approximated, black; third segment wider than long, width to length 11:9; arista 0.9 times the width of eye, black, with short black pubescence, palpi, proboscis and all the head and thoracic bristles and hairs black, *ovt* slender, 0.37 times the width of eye, *ivt* nearly four-fifths the *ovt*, *ori* 5—6, slender, reclinate, half the *ovt* last one shorter; *fr* 7, turned inwards, equal to *ori*; *pvt* nearly cruciate, 0.8 times the *ovt*, *oc* slender, proclinate, cruciate, over two-thirds the *pvt*. *ovi* 8, slender, last one stout.

Thorax (Text Fig. 3 b).—Shiny black, mesonotal hairs arranged in about eight longitudinal rows, pleura glabrous, scutellum short, not semicircular, width to length 3:2, the latter 0.3 times the length of mesonotum, *hu* 1, slender, one-fourth the width eye, *np* 1+2, 1.5 times the *hu*, anterior slightly slender, *pa*₁ slender, nearly equal to *np*: *pa*₂ not distinct, 1 *dc* half the width of eye, *as* convergent, 1 1 times the scutellum, *ss* 1 pair, two-thirds the scutellum.

Wing (Text Fig. 3 c).—Hyaline, veins brown, width to length 5:13, costal sectors 2 to 4 as 21:16:8, terminal sectors of iii and iv veins slightly diverging, middle cross-vein distad of the middle of the discal cell as 3:2 and beyond the level of the costal break, hind cross-vein slightly oblique. Stalk of haltere ferruginous-yellow, knob yellowish-brown.

Legs.—Coxae black, trochanters dull brown, femora brownish black except the pale ends, fore and mid tibiae dark yellowish at base and tip, in the middle brown: hind tibia broadly dull black in the middle, the ends brownish-yellow; fore tarsi and the last three segments of mid and hind tarsi dark brown, the rest yellowish-brown.



Text-fig. 3. — *Oscinella moirangae*, sp. nov. A — head, B — thorax, C — wing. D — genitalia.

Abdomen.— Black, finely granulose, sparsely short pubescent.

Genitalia (Fig. 3 d).— Edita (EDI) nearly as long as the epandrium (EP), blunt at apex; cerci (CRI) slightly narrowed at base, over half the length of edita; hypandrium (HY) sinuate proximally; phallus (PH) blunt apically; aedeagal apodeme (ADA) over half the epandrium.

Length	♂	1.3 mm	Wing	1.3 mm
	♀	1.5 mm		1.56 mm

Holotype ♂, India : Agra, 24.ix. 1967, Coll. *P. T. Cherian*.

Paratypes 10 ♂♂, 7 ♀♀, data same as that of holotype; 2 ♀♀, India: Manipur, Moirang, 7.v. 1968, Coll. *Ipe M Ipe*.

O. moirangae comes near *fusidentata* from which it differs especially in the polished frontal triangle which is obtuse at apex and the uniformly dull black abdomen.

Abbreviations Used In The Text.— *as* — apical scutellar bristle, *dc* — dorsocentral bristle; *fr* — frontal bristle; *hu* — humeral bristle; *ivt* — inner vertical bristle; *np* — notopleural bristle; *oc* — ocellar bristle, *ori* — fronto-orbital bristle, *ovi*—oral vibrissae, *ovt* — outer vertical bristle, *pa*₁ & *pa*₂ — postalar bristles, *pvt* — postvertical bristle, *ss*₁ *ss*₂—subapical bristle.

ADA— aedeagal apodeme, CRI — cerci, EDI—edita, EP — epandrium, HY—hypandrium, PHA— phallus, POG — gonite.

Summary Three new species of Chloropidae (Diptera), one under the genus *Meijevella* Duda, and two under *Oscinella* Becker are described here and two known species are recorded for the first time from India.

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A CHECK-LIST OF LEECHES OF HIMACHAL PRADESH, INDIA.

By

MAHESH CHANDRA

*High Altitude Zoology Field Station,
Zoological Survey of India, Solan*

INTRODUCTION

Harding and Moore (1927) recorded five species from Himachal Pradesh in the Fauna of British India (Hirudinea). Chandra (in press) recently recorded another five species from the area. The present check list is a result of author's extensive surveys and studies of the leech fauna from different parts of Himachal Pradesh. The check list now includes sixteen species, of which six are recorded for the first time from the area. A key to the species of leeches known from Himachal Pradesh to-date is provided. Data regarding type locality and type-depository have been given for each species wherever possible.

Key to the species

1. Jawless, protrusible proboscis present	...	2
Jawed protrosible proboscis absent	...	10
2. Eyes one pair	...	3
Eyes more than one pair	...	6
3. Mouth opening subterminal	...	4
Mouth opening within anterior sucker	...	5
4. Head region somewhat dialated; eyes in annulus	...	* <i>Placobdella emydae</i>
Head dialated and distinct from body, eyes in annulus 4 ...	...	* <i>Placobdella undulata</i>
5. Dorsal scute present ...	...	<i>Helobdella stagnalis</i>
Dorsal scute absent ...	...	* <i>Helobdella nociva</i>
6. Eyes two pairs	...	7
Eyes three pairs	...	8
7. Head somewhat dialated; Eyes in annuli 4 and 5	..	<i>Batracobdella reticulata</i>
Head dialated and distinct from body; Eyes in annuli 3 and 4	...	<i>Hemiclepsis marginata asiatica</i>

8. Mouth opening within anterior sucker *Glossiphonia weberi*
Mouth opening subterminal .. 9
9. Head region distinct from the body ... *Paraclepsis praedatrix*
Head region continuous with the body *Paraclepsis vulnifera*
10. Eyes forming a regular arch ..., 11
Eyes never forming a regular arch .. 15
11. Third and fourth pair of eyes
separated by an annulus . 12
Third and Fourth pair of eyes
usually on contiguous annuli 14
12. Teeth absent or vestigial;
vaginal stalk present * *Dinobdella ferox*
Teeth well developed; vaginal stalk absent 13
13. Dorsum brown; venter rarely green ... *Hirudinaria granulosa*
Colour bright green .. * *Hirudinaria viridis*
14. Colour mottled with a dorso-
median dark sripe .. * *Haemadipsa zeylanica*
Colour dark blotched pattern
without a dorso-median line ... * *Haemadipsa zeylanica agilis*
15. Eyes three pairs; postcephalic
accessory eyes absent *Barbronia weberi*
Eyes one pair; 5 pairs of postcephalic
accessory eyes present *Herpobdelloidea indica*

* New records from the area based on the collection present in the High Altitude Zoology Field Station, Z. S. I. Solan

CHECK LIST

Phylum ANNELIDA
Class HIRUDINEA
Order RHYNCHOBDELLAE
Family GLOSSIPHONIDAE
Genus *Batracobdella* Viguiet, 1879.

1. *Batracobdella reticulata* (Kaburaki)

1921. *Glossiphonia reticulata* Kaburaki, *Rec. Indian Mus.*, 22: 689-719 (Type-locality: Jullundhur, Type-deposited: Z. S. I.).
1936. *Batracobdella reticulata*, Autrum, *Bronn's Kl. Ordn. Tierreichs*, Teil, 1 Lief. 1:1-95. (Revision).
1976. *Batracobdella reticulata*, Chandra, *Rec. zool. Surv. India.*, 69 ; 255-259

Distribution.— Sirmour, Bilaspur (H.P.). Elsewhere—India : Punjab, Maharashtra.

Genus **Glossiphonia** Johnson, 18162. **Glossiphonia weberi** Blanchard

1897. *Glossiphonia weberi* Blanchard, *Zool. Ergebn einer Reise*, Maxweber, IV:332 (Type-locality : Sumatra, Type-deposited: not Known).
1927. *Glossiphonia weberi*, Harding, *Fauna Brit. India*, Hirudinea, 62-65. Distribution).
1976. *Glossiphonia weberi*, Chandra, *Rec. zool. Surv. India*. 69 : 255-259

Distribution.— Solan, Bilaspur, Sirmour (H. P.). *Elsewhere*—India: Widely distributed. Burma, Indonesia, Uganda and Pakistan.

Genus **Helobdella** Blanchard, 18963. **Helobdella nociva** Harding

1924. *Helobdella nociva* Harding, *Ann. Mag. nat. Hist.* Ser. 9, XIV : 489. (Type-locality and type deposited : not known).
1927. *Helobdella nociva* Harding, *Fauna Brit. India*, Hirudinea, 70-72. (Distribution).

Distribution.— Solan (H. P.). *Elsewhere* — India : Orissa, West Bengal.

4. **Helobdella stagnalis** (Linnaeus)

1758. *Hirudo stagnalis* Linnaeus, *Systema Naturae*, 10th, ed, (Type-locality and type-deposited: not known).
1927. *Helobdella stagnalis*, Harding, *Fauna Brit. India*, Hirudinea, 68-70 (Distribution).
1976. *Helobdella stagnalis*, Chandra, *Rec. zool. Surv. India*. 69 : 255-259.

Distribution.— Sirmour, Solan, (H. P.). *Elsewhere* India: Jammu and Kashmir. Canada, U. S. A., Europe, W. Asia and South America.

Genus **Hemiclepsis** Vejdovsky, 18825. **Hemiclepsis marginata asiatica** Moore

1924. *Hemiclepsis marginata asiatica* Moore, *Proc. Acad. nat. Sci., Philad.*, LXXVI: 343-388. (Type-locality: Kashmir, type-deposited : Z. S. I.).
1927. *Hemiclepsis marginata asiatica*, Harding, *Fauna Brit. India*, Hirudinea, 87-88. (Distribution).
1976. *Hemiclepsis marginata asiatica*, Chandra, *Rec. zool. Surv. India*. 69 : 255-259

Distribution.— Sirmour, (H. P.). *Elsewhere*—India: Jammu and Kashmir. Canada, U. S. A., Paraguay, Andes, Western Asia.

Genus *Paraclepsis* Harding, 19246. *Paraclepsis praedatrix* Harding

1924. *Paraclepsis praedatrix* Harding, *Ann. Mag. nat. Hist.*, Ser. 9, XIV: 489. (Type-locality and type-deposited: not known).
1927. *Paraclepsis praedatrix* Harding, *Fauna Brit. India*. Hirudinea, 88-90. (Distribution).
1976. *Paraclepsis praedatrix*, Chandra, *Rec. zool. Surv. India*. 69 : 255-259.

Distribution:— Solan, Bilaspur, Sirmour (H. P.). *Elsewhere*—India: West Bengal, Assam, Maharashtra and Rajasthan.

7. *Paraclepsis vulnifera* Harding

1924. *Paraclepsis vulnifera*, Harding, *Ann. Mag. nat. Hist.*, Ser. 9, XIV : 489. (Type-locality: Tanjore, Tamilnadu, type deposited : not known).
1927. *Paraclepsis vulnifera* Harding, *Fauna Brit. India*, Hirudinea, 91. (Distribution).
1976. *Paraclepsis vulnifera*, Chandra, *Rec. zool. Surv. India*. 69 : 255-259

Distribution.—Bilaspur, (H.P.). *Elsewhere*—Tamilnadu, Maharashtra and Rajasthan.

Genus *Placobdella* Blanchard, 18938. *Placobdella emydae* Harding

1920. *Placobdella emydae* Harding, *Mem. Indian Mus.*, V (7): 510. (Type-locality: Gatiagurh, W. Bengal, type-deposited: Z. S. I.).
1927. *Placobdella emydae* Harding, *Fauna Brit. India*. Hirudinea, 74-76. (Distribution).

Distribution.— Solan (H. P.). *Elsewhere*—India: W. Bengal, Orissa, Madhya Pradesh and Maharashtra. Burma.

9. *Placobdella undulata* Harding

1924. *Placobdella undulata* Harding, *Ann. Mag. nat. Hist.* Ser. 9, XIV : 489. (Type-locality and type-deposited : not known.)
1927. *Placobdella undulata* Harding, *Fauna Brit. India*, Hirudinea, 78-81. (Distribution).

Distribution.— Solan (H. P.) *Elsewhere*—India: Rajasthan; Ceylon.

Order ARHYNCHODELLAE

Family ERPOBDELLIDAE

Genus *Barbronia* Johanson, 1918.

10. *Barbronia weberi* (Blanchard)

1897. *Dina weberi* Blanchard, *Zool. Ergebn. Oiner. Reise Maxweber*, VI : 332-355. (Type-locality: Jawa, type-deposited in Z. S. I.).

1927. *Barbronia weberi*, Moore, *Fauna Brit. India*. Hirudinea, 135-140. (Distribution).

1976. *Barbronia weberi*, Chandra, *Rec. zool. Surv. India*. 69 : 255-259.

Distribution.— Sirmour, Solan, Bilaspur, Simla (H. P.). *Elsewhere* India: Kashmir, Uttar Pradesh, Madhya Pradesh and Rajasthan. Nepal, Indonesia, Philippines and Borneo.

Genus *Herpobdelloidea* Kaburaki

11. *Herpobdelloidea indica* (Kaburaki)

1921. *Nematobdella indica* Kaburaki, *Rec. Indian Mus.*, XVIII : 689—789. (Type-locality: Dharampur, (H. P.). Type-deposited: Z. S. I.).

1927. *Herpobdelloidea indica*, Moore, *Fauna Brit. India*. Hirudinea, 144-148. (Distribution).

1976. *Herpobdelloidea indica*, Chandra, *Rec. zool. Surv. India*, 69 : 255-259

Distribution.— Bilaspur, Simla, Sirmour and Solan, Chamba and Kangra (H. P.). *Elsewhere*—India: Haryana, Madhya Pradesh and Maharashtra

Family HIRUDIDAE

Genus *Dinobdella* Blanchard

12. *Dinobdella ferox* (Blanchard)

1896. *Whitmania ferox* Blanchard, *Mem. Soc. Zool. France*, IX: 316-330. (Type-locality: not known, Type-deposited: British Museum).

1927. *Dinobdella ferox*. Moore, *Fauna Brit. India*. Hirudinea. 175-185. (Revision).

Distribution.— Bilaspur (H. P.). *Elsewhere*—India : Assam, W. Bengal, Manipur and Uttar Pradesh. Malaysia and Pakistan.

Genus *Hirudinaria* Whitman

13. *Hirudinaria granulosa* (Savigny)

1820. *Sanguisuga granulosa* Savigny, *Système des Annelides*, Paris (1822). (Type-locality: Pondichery, Type-deposited: Z. S. I.).

1927. *Hirudinaria granulosa*, Moore, *Fauna Brit. India*, Hirudinera, 226-238. (Ecology).

1976. *Hirudinaria granulosa*, Chandra, *Rec. zool. Surv. India* 69 : 255-259

Distribution.— Bilaspur, Kangra and Solan (H. P.). *Elsewhere*, —India : widely distributed. Burma, Sri Lanka, Nepal.

14. *Hirudinaria viridis* Moore

1927. *Hirudinaria viridis* Moore, *Fauna Brit. India*, Hirudinea 239-243. (Type-locality: Shasthancottah, Kerala, Type-deposited: Z. S. I.)

Distribution.—Bilaspur (H.P.) *Elsewhere*—India : Kerala, Tamilnadu, Uttar Pradesh.

Family HAEMADIPSIDAE

Genus Haemadipsa Tennent, 1859

15. Haemadipsa zeylanica (Moquin-Tandon)

1826. *Sanquisuga zeylanica* Moquin—Tandon,—*Monographie de la famille des Hirudinees*, Montpellier. (Type-locality: Sir Lanka, Type-deposited: not known).

1927. *Haemadipsa zeylanica*, Moore, *Fauna Brit. India*, Hirudinea, 255-264. (Distribution).

1967. *Haemadipsa zeylanica*, Chandra, *Rec. zool. Surv. India*, 69 : 255-259

Distribution.—Sirmour (H. P.). *Elsewhere*—India : Nagaland. Throughout South East Asia upto Japan.

16. Haemadipsa zeylanica agilis Moore

1927. *Haemadipsa zeylanica agilis* Moore, *Fauna Brit. India*, Hirudinea, 266-267. (Type-locality: Nainital, Type-deposited: Z. S. I.).

Distribution.—Sirmour, Chamba (H. P.). *Elsewhere*—India : W.Bengal, Nagaland and Uttar Pradesh.

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ABBREVIATIONS USED

H. P. — Himachal Pradesh.

Z. S. I. — Zoological Survey of India.

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ON SOME POLYCHAETES FROM ANDAMAN AND NICOBAR ISLANDS

By

T D. SOOTA AND C. A. NAGESWARA RAO

Zoological Survey of India, Calcutta

(With 2 Text-figures)

INTRODUCTION

The polychaete fauna of the Andaman and Nicobar Islands is very rich in diversity as well as in abundance of species, because of numerous varied eco-niches available in the littoral and sublittoral zones of the coast. Our current knowledge of the polychaetes of these islands is based mainly on the works of Fauvel (1932, 1953) and Tampi and Rangarajan (1964), but it is far from complete. More intensive field collections are likely to yield rich dividends in knowledge and further additions to the faunal list, as will be evidenced from the present paper which reveals eight additional species from these islands, from amongst a total of 26 species dealt with.

The material for the present study was collected at various periods by different parties of the Zoological Survey of India. It comprises 26, species belonging to 20 genera and 13 families. Descriptions and variations have been furnished wherever necessary. Only relevant synonymies have been included since most of these have already been given by Fauvel (*op. cit.*), Tampi and Rangarajan (*op. cit.*) and Day (1951, 1953, 1957).

SYSTEMATIC ACCOUNT

Family POLYNOIDAE

***Iphione muricata* (Savigny)**

1818. *Polynoe muricata* Savigny, *Système Annél.* : 347.

1922. *Iphione muricata* Seidler, *Zool. Anz.*, **55** (3/4) : 75.

1953. *Iphione muricata* Fauvel, *Fauna of India*, Annelida, Polychaeta: 32.

Material.—Several ex.; Z.S.I. Reg. No. An 618/1; Locality—(under stones) Aberdeen Bay, Port Blair; 2. III. 1974. coll. G. C. Rao,

Description.—Prostomium with a small tubercle. Median tentacle absent, lateral tentacles one pair. Eyes two pairs. Elytra covering the whole body 13 pairs, each divided into polygonal areas. Dorsal setae many and spinulose, ventral setae stout and unidentate.

Harmothoe dictyophora (Grube)
(Text-fig. 1A)

1878. *Polynoe dictyophora* Grube, *Mém. Acad. imp. sci., St-Petersbourg*, 25 (7) : 44.
 1905. *Harmothoe dictyophora* Willey, *Ceylon Pearl oyster Fisheries Supp. rep.* 30 (4) : 251.
 1932. *Harmothoe dictyophora* Fauvel, *Mem. Indian Mus.*, 12(1) : 22.

Material.—One ex.; Z. S. I. Reg. No. An 619/1; Locality—Aerial Bay, Port Blair; 1. II. 1959, coll. K. K. Tiwari.

Description.—Elytra covering the whole body 15 pairs, each having polygonal areas fringed on one side and provided with simple and dichotomously branched chitinous spines. Dorsal cirri with papillae arranged spirally.

Remarks.—This is the first record of this species from the Andaman waters. Earlier reported from Orissa and Madras coasts.

Harmothoe ampullifera (Grube)
(Text-fig. 1B)

1878. *Polynoe ampullifera* Grube, *Mem. Acad. imp. sci. St-Petersbourg*, 25 (7) : 35.
 1901. *Lepidonotus ampulliferus* Gravier, *Nouv. Archs. Mus. Hist. nat., Paris*, 2 (4) : 214.
 1911. *Harmothoe ampullifera* Fauvel, *Archs. Zool. exp. gen.*, 6 (5) : 368.
 1932. *Harmothoe ampullifera* Fauvel, *Mem. Indian Mus.*, 12 (1) : 22.

Material.—One ex.; Z. S. I. Reg. No. An 620/1; Locality—Ross Island, Port Blair; 26. III. 1952, coll. H. C. Ray.

Description.—Elytra covering the whole body 15 pairs, each fringed and provided with large oval vesicles more at the outer border. Tentacles and cirri papillated. Ventral lamellae conspicuous.

Remarks.—Earlier recorded from Camorta Island and from Madras coast.

Gastrolepidia clavigera Schmarda

1861. *Gastrolepidia clavigera* Schmarda, *Neue Wirbellose Thiere*, 2 : 159.
 1932. *Gastrolepidia clavigera* Fauvel, *Mem. Indian Mus.*, 12 (1) : 25,

Material.—One ex.; Z. S. I. Reg. No. An 621/1 Locality—South point, Port Blair; 7. III. 1959. coll. K. K. Tiwari.

Description.—Elytra covering the whole body more than 15 pairs, thin and transparent. Dorsal setae stout and spinulose, ventral setae also stout with unidentate tip. Each segment with a pair of lamellae ventrally.

Family CHRYSOPETALIDAE

Bhawania goodei Webster

1884. *Bhawania goodei* Webster, *Bull. U. S. natn. Mus.*, **25** : 308.

1902. *Bhawania cryptocephala* Gravier, *Nouv. Archs. Mus. Hist. nat., Paris*, **2** (4) : 263.

1932. *Bhawania cryptocephala* Fauvel, *Mem. Indian Mus.*, **12** (1) : 43.

1953. *Bhawania goodei* Day, *Ann. Natal Mus.*, **12** (3) : 407.

Material.—Several ex., Z. S. I. Reg. No. An 622/1; Locality—Aberdeen Bay, Port Blair; 1 IV 1969. coll. T. D. Soota.

Several ex.; Z. S. I. Reg. No. An 623/1; Locality—(Muddy coast) Aberdeen Bay, Port Blair; 2. III. 1974. coll. G. C. Rao.

Description.—Body elongated, thin and covered dorsally by paleae arranged transversely on each segment, pale yellow to dark brown in colour. Ventral ramus with spinigers, many falcigers and a few compound capillary setae.

Family AMPHINOMIDAE

Amphinome rostrata (Pallas)

(Text-fig. 1C)

1766. *Aphrodita rostrata* Pallas, *Misc. Zool.* : 106.

1885. *Amphinome rostrata* McIntosh, *Rep. Challenger Soc.*, **12** : 21.

1930. *Amphinome rostrata* Fauvel, *Bull. Madras Govt Mus.*, **1** (2) : 10.

Material.—One ex.; Z. S. I. Reg. No. An 624/1; Locality—(Rocky coast) Aberdeen Bay, Port Blair; 25. III. 1974. coll. G. C. Rao.

Description.—Prostomium small with a pair of tentacles and a pair of eyes. Caruncle heart-shaped with a small median tentacle. Bushy gills orange-coloured, and beginning from 2nd setigerous segment. Dorsal setae capillary and some harpoon shaped. Ventral setae short and uncinata.

Remarks.—Earlier recorded from benthic habitat in Andaman Sea and from a drifting log off Puri, Orissa. The present specimen was collected from under a stone. Day (1953) reported this species also from intertidal habitat of South African coast.

Eurythoe complanata (Pallas)

1766. *Aphrodita complanata* Pallas, *Misc. Zool.*: 109
 1931. *Eurythoe complanata* Augener, *Fauna Südwest—Aust.*, 4 : 87.
 1932. *Eurythoe complanata* Fauvel, *Mem. Indian Mus.*, 12 (1) : 45.

Material.—One ex.; Z.S.I. Reg. No. An 625/1; locality—(Rocky coast) Aberdeen Bay, Port Blair; 1. IV 1969. coll. *T' D. Soota*. Several ex.; Z.S.I. Reg. No. An 626/1; Locality—Aberdeen Bay, Port Blair; 2. III. 1974. Coll. *G. C. Rao*.

Description.—Body elongated. Eyes 4, conspicuous. Caruncle oval, with small lateral lobes. Ventral setae furcate.

Eurythoe parvecarunculata Horst
 (Text-fig. 1 D)

1912. *Eurythoe parvecarunculata* Horst, *Siboga Exped.*, 24 : 37.
 1932. *Eurythoe parvecarunculata* : Fauvel, *Mem. Indian Mus.*, 12 (1) : 26

Material.—3 ex.; Z. S. I. Reg. No. An 627/1; Locality—Haddo Bay, Port Blair; 3. III. 1959. coll. *K. K. Tiwari*.

Description.—Body elongated. Caruncle small and oval. Bushy gills beginning from 3rd setigerous segment. Ventral setae furcate with unequal limbs. Aciculum of ventral ramus elongated with oval tip.

Family HESIONIDAE
Hesione pantherina Risso

1826. *Hesione pantherina* Risso, *Hist. Nat. principales productions : Europe meridionale*, 4 : 418.
 1923. *Hesione pantherina* : Fauvel, *Faune Fr.*, 5 : 233.
 1932. *Hesione pantherina* : Fauvel, *Mem. Indian Mus.*, 12 (1) : 60.

Material.—One ex.; Z. S. I. Reg. no. An 628/1; Locality—(Rocky coast) Aberdeen Bay, Port Blair; 1. IV. 1969; coll. *T' D. Soota*. 4 ex. Z. S. I. Reg. No. An 629/1; Locality—Aberdeen Bay, Port Blair; 2. III. 1974. coll. *G. C. Rao*.

Description.—Body with 17 segments. Prostomium bilobed with two small tentacles and two pairs of eyes. Peristomial tentacles 4 pairs on each side. Parapodia with a single ramus and with large dorsal cirri. Setae compound and sickles shaped.

Remarks.—Only one specimen showed the colour pattern on the dorsal side with dark brown elongate dots arranged longitudinally. Remaining 3 specimens which are light brown to flesh brown in colour lack this pattern.

Family PHYLLODOCIDAE

Phyllodoce quadraticeps Grube

1878. *Phyllodoce quadraticeps* Grube, *Mem. Acad. imp. sci., St. Petersburg.* 25 (7) : 98.

1932. *Phyllodoce quadraticeps* Fauvel, *Mem. Indian Mus.*, 12 (1) : 68.

Material.—One ex.; Z. S. I. Reg. No. An 630/1; Locality—Car Nicobar; 15. III. 1969; coll. *T. D. Soota*. One ex., Z. S. I. Reg. No. An 631/1; Locality—(Algal mass) Chiriatapu; 15. IV 1974. coll. *G. C. Rao*.

Description.—Body long and slender, green dorsally and yellow ventrally. Prostomium square shaped with 4 very small tentacles. Peristomial tentacles 4 pairs, out of which one pair subulate and the remaining three short and ovoid. Parapodia uniramous and with a big leaf-like dorsal cirri. Setae compound spinigers.

Remarks.—Earlier recorded from Camorta Island.

Family NEREIDAE

Lycastis indica Southern
(Text-fig. 1 E)

1921. *Lycastis indica* Southern, *Mem. Indian Mus.*, 5 : 578.

1932. *Lycastis indica* : Fauvel, *Mem. Indian Mus.*, 12 (1) : 82.

1951. *Lycastis indica* Day, *Ann. Natal Mus.*, 12 (1) : 27.

Material.—3 ex.; Z. S. I. Reg. No. An 632/1; Locality—Aberdeen Bay, Port Blair; 11. I. 1959, coll. *K. K. Tiwari*.

Description.—Dorsal cirri (in all the three examples) broad, flattened and with pointed ends. Dorsal setae 2-3 discernible below the dorsal cirri. Ventral ramus with many compound spinigerous setae.

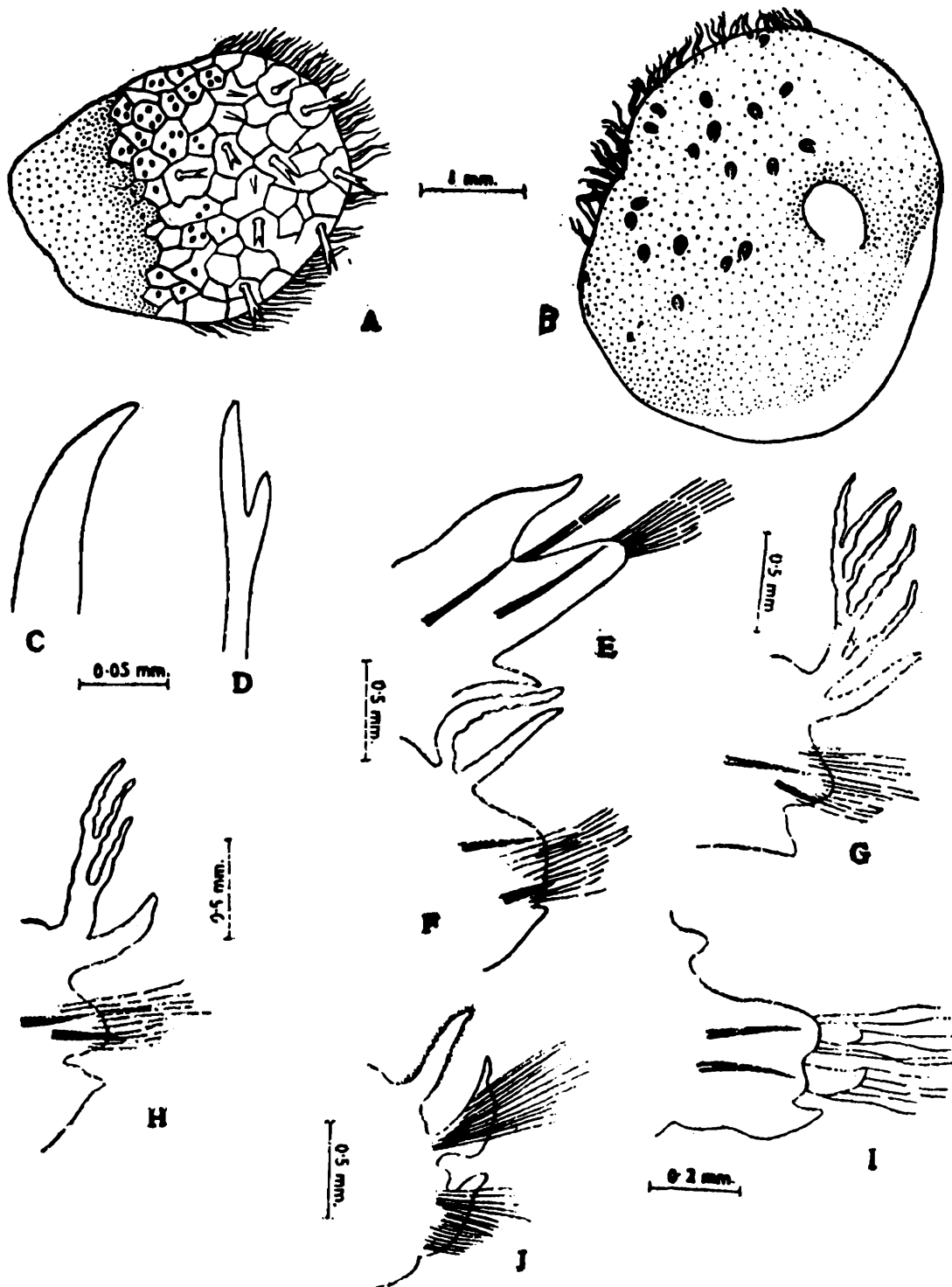
Remarks.—The present specimens show characters of both *Lycastis indica* Southern in having very few (2-3) dorsal setae as well as of *Lycastis meraukensis* Horst in having broad and flattened dorsal cirri. Such examples have also been reported by Day (1951) from the coast of South Africa.

Perinereis singaporiensis Grube

1878. *Perinereis singaporiensis* Grube, *Mem. Acad. imp. sci. St. Petersburg.* 25 (7) : 84.

1932. *Perinereis singaporiensis* Fauvel, *Mem. Indian Mus.*, 12 (1) : 103.

Material.—3 exs.; Z. S. I. Reg. No. An 633/1; Locality—(Under stones) Aberdeen Bay, Port Blair; 25. III. 1974. coll. *G. C. Rao*.



Text-fig. 1—A. *Harmothoe dictyophora* (Grube) elytron; B. *Harmothoe ampullifera* (Grube) elytron; C. *Amphinome rostrata* (Pallas), ventral seta; D. *Eurythoe parvecarunculata* Horst ventral furcate seta; E. *Lycastis indica* Southern, parapodium; F. *Eunice marenzelleri* Gravier, branchiate foot; G. *Eunice afra* var. *punctata* Peters anterior branchiate foot; H. *Eunice afra* var. *paupera* Grube anterior branchiate foot. I. *Glycera tessellata* Grube, parapodium from mid-body; J. *Nainereis laevigata* (Grube) thoracic foot.

Description.—Proboscis with 1st lobe having 2 paragnaths in a line, 2nd with 9-10 in a cluster, 3rd with many in a group, 4th with many small and large ones, 5th with only one small one, 6th with 2 transversely flattened ones, 7th & 8th with several arranged in 2 rows. Dorsal setae

homogomph spinigers. Ventral setae heterogomph falcigers and heterogomph spinigers. Dark brown median line present on the dorsal side of the anterior segments.

Remarks.—This is the first record of this species both from the Andaman and the Indian waters. Earlier reported from Diamond Island, Burma.

***Perinereis cultrifera* var. *helleri* Grube**

1878. *Perinereis camiquina* Grube, *Mem. Acad. imp. sci., St-Petersbourg*, 25 (7) : 87.
 1923. *Perinereis cultrifera* Fauvel, *Faune Fr.*, 5 : 352.
 1953. *Perinereis cultrifera* var. *helleri* Fauvel, *Fauna of India*, Annelida, Polychaeta : 208.

Material.—5 ex.; Z. S. I. Reg. No. An 634/1; Locality—Aberdeen Bay, Port Blair; May 1930; coll. K. N. Das.

Description.—Largest tentacular cirri reaching 10th segment. 1st lobe of proboscis with 2 paragnaths in a line, 2nd, 3rd and 4th with many in clusters, 5th with 3 in a triangle, 6th with one transversely flattened one, 7th & 8th with several arranged in 3 rows.

Remarks.—This is the first record of this species from the Andaman waters. Earlier reported from Gulf of Mannar and Bombay harbour.

Family EUNICIDAE

***Eunice siciliensis* (Grube)**

1840. *Palalo siciliensis* Grube, *Actinien, Echinodermen und wurmen*, J. H. Bon : 83.
 1904. *Eunice siciliensis* Crossland, *Proc., zool. Soc., Lond.*, 3 : 323.
 1932. *Eunice siciliensis* Fauvel, *Mem. Indian Mus.*, 12 (1) : 138.

Material.—Several ex.; Z. S. I. Reg. No. An 635/1; Locality—(Coral rocks) Havelock Island; 2. IV 1974. Coll. G. C. Rao.

Description.—Body elongated with simple gills beginning from 50th-60th segments. Acicular setae and comb setae absent. Parapodia with only capillary and falcigerous setae.

***Eunice marenzelleri* Gravier
(Text-fig. 1F)**

1900. *Eunice marenzelleri* Gravier, *Nouv. Archs. Mus. Hist. nat. Paris*, 2(4) : 229.
 1953. *Eunice marenzelleri* Fauvel, *Fauna of India*, Annelida, Polychaeta; 242,

Material.—An incomplete ex. with only anterior 40 segments Z. S. I. Reg. No. An 636/1; Locality—(Rocky coast) Aberdeen Bay, Port Blair; 2. III. 1974; Coll. G. C. Rao.

Description.—Tentacles and tentacular cirri smooth. Gill filaments simple, commencing from 24th segment and extending upto 40th. Dorsal cirri approaching in length to that of gill filaments. Parapodia with acicular bidentate setae, yellow coloured, comb setae, winged capillary setae and falcigerous setae.

Remarks.—The specimen is reddish brown in colour without any coloured dots and collar on 4th or 5th segments. This is the first record of this species from the Indian waters. Earlier it has been reported from Persian Gulf.

***Eunice antennata* Savigny**

1820. *Leodice antennata* Savigny, *Systeme Annelids. Description Egypte. Hist. Nat. Paris* : 21.

1904. *Eunice antennata* Crossland, *Proc. zool. Soc. Lond.*, 3 : 312.

1932. *Eunice antennata* Fauvel, *Mem. Indian Mus.*, 12 (1) : 138.

Material.—One ex.; Z. S. I. Reg. No. An 637/1; Locality—Chatam jetty, Port Blair; 16. II. 1974. Coll. K. V. Surya Rao.

Description.—Specimen short with regenerated posterior part. Prostomial tentacles annulated. Gills beginning from 6th segment, simple in first 2 segments and then becoming pinnately branched with 6-12 branches. Acicular setae tridentate and deep yellow in colour. Parapodia with comb setae, capillary setae and compound setae.

***Eunice afra* var. *punctata* Peters (Text-fig. 1G)**

1854. *Eunice punctata* Peters, *Akad. Wiss. Berlin* : 611.

1957. *Eunice afra* var. *punctata* Day, *Ann. Natal Mus.*, 14 (1) : 89.

Material.—3 ex.; Z. S. I. Reg. No. An 638/1; Locality—Havelock Island; 22. II. 1974. Coll. K. V. Surya Rao.

Description.—Body elongated, cylindrical and brown in colour with small white punctations only over the anterior portion. A white collar on 5th segment present. Gills commencing from 14th segment. Gill filaments single on first few segments, 4-6 on others, gradually decreasing posteriorly, and finally absent on the last segments. Parapodia with acicular bidentate setae black-coloured, comb setae, capillary setae and falcigerous setae.

Remarks.—The specimens were collected from corals. This is the

first record of the variety from the Indian waters. Earlier reported from South African coasts *vide* Day (1957).

***Eunice afra* var. *paupera* Grube**
(Text-fig. 1H)

1878. *Eunice paupera* Grube, *Mem. Acad. imp. sci., St. Petersburg*, 25(7) : 160.
1930. *Eunice paupera* Pruvot, *Archs. Zool. exp. gén.*, 70 : 69.
1932. *Eunice afra* var. *paupera* Fauvel, *Mem. Indian Mus.*, 12 (1) 135.

Material.—One ex.; Z. S. I. Reg. No. An 639/1; Locality—Rampur beach, Mayabander; 11. III. 1974. Coll. G. C. Rao.

Description.—Body elongated, flattened posteriorly and of green colour with a dorsal median line. Gills beginning from 19th segment, Gill filaments 3-4, gradually decreasing posteriorly, and completely absent on the last segments. Acicular setae bidentate and black in colour. Comb setae, capillary setae and falcigerous setae present.

Remarks.—The specimen was collected from algal plants along with corals. This variety is new for the Andaman waters. Earlier reported from Philippine Islands and Malay seas. The difference between the two varieties of the species *Eunice afra* lies in the beginning of gills. number of gill filaments, and colouration of body. But some intermediate forms have been found in the collections under study which are light brown in colour without punctations, with gills commencing from 15th-18th segments and having 3-4 gill filaments. The two varieties might be due to their different habitats.

***Lysidice collaris* Grube**

1870. *Lysidice collaris* Grube, *Akad. Wiss. Berlin* : 495.
1932. *Lysidice collaris* Fauvel, *Mem. Indian Mus.*, 12 (1) : 143.

Material.—Several ex.; Z. S. I. Reg. No. An 640/1; Locality—(on coral rocks) Havelock Island; 6. IV 1974, Coll. G. C. Rao.

Description.—Prostomial tentacles 3. Peristomial tentacles and gills absent. Parapodia with acicular setae, capillary setae, comb setae and falcigers.

***Marphysa mossambica* (Peters)**

1854. *Eunice mossambica* Peters, *Akad. Wiss. Berlin*: 612.
1919. *Marphysa mossambica* Fauvel, *Archs. Zool. exp. gén.* 58 : 380
1932. *Marphysa mossambica* Fauvel, *Mem. Indian Mus.*, 12 (1) : 142.

Material.—2 ex.; Z. S. I. Reg. No. An 641/1; Locality—Camorta Island; 12. II. 1974, Coll. K. V Surya Rao.

Description.—Prostomium with five tentacles. Peristomial tentacles absent. Gills beginning from 25th-30th segments. Gill filaments 6-8, number gradually increasing posteriorly. Parapodia with only simple setae.

Family GLYCERIDAE

Glycera tessellata Grube

(Text-fig. 1 I)

1863. *Glycera tessellata* Grube *vide* Hartman, 1959 *Catalog. Polychae tous Annelids of the world*

1932. *Glycera tessellata* : Fauvel, *Mem. Indian Mus.*, 12 (1) : 124.

Material.—4 ex.; Z. S. I. Reg. No. An 642/1; Locality—(on sandy coast) Havelock Island; 6. IV, 1974. Coll. *G. C. Rao*.

Description.—Each segment with 4-5 annulations. Gills absent. Papillae of proboscis long and slender with dentate margin. Parapodia with 2 unequal elongated anterior lobes and a pair of rounded posterior lobes slightly separated.

Family ORBINIIDAE

Nainereis laevigata (Grube)

(Text-fig. 1J)

1855. *Aricia laevigata* Grube, *Arch. Naturgesch.*, 21 : 112.

1927. *Nainereis laevigata* Fauvel, *Faune Fr.*, 16 : 22.

Material.—An incomplete ex.; Z. S.I. Reg. No. An 643/1; Locality—(under coral rocks) Havelock Island; 5. IV 1974. Coll. *G.C. Rao*.

Description.—Prostomium rounded and without tentacles and palps. Extruded proboscis with many large palmate lobes. Thorax flattened and having 24 segments. Abdomen rounded and cylindrical. Gills simple, long and beginning from 7th segment. Dorsal ramus with knife-like dorsal cirrus, spiny capillary and forked setae with unequal limbs. Ventral ramus padlike with many capillary denticulate setae and hooks. Ventral cirri absent.

Remarks.—This is the first record of this species from the Indian waters. Earlier recorded only from coasts of Sri Lanka.

Family CIRRATULIDAE

Audouinia tentaculata (Montagu)

(Text-fig. 2A)

1808. *Terebella tentaculata* Montagu, *Trans. Linn. Soc. Lond.*, 9 : 110.

1932. *Audouinia anchylochaeta* Fauvel, *Mem. Indian Mus.*, 12 (1) : 178.

1951. *Audouinia tentaculata* Day, *Ann. Natal, Mus.*, 12 (1) : 47.

Material.—3 ex.; Z. S. I. Reg. No. An 644/1; Locality—Aberdeen Bay, Port Blair; 16. I. 1959. Coll. K. K. Tiwari.

Description.—Prostomium pointed. Gills beginning from 1st setigerous segment. Tentacular cirri present on 4th-5th segments. Rami of parapodia wide apart. Dorsal ramus with few capillary setae and 4-5 hooks, ventral ramus also with few capillary setae but 4 hooks. Hooks in both rami of light red colour.

Remarks.—*Audouinia anchylochaeta* the Indo-pacific form was described as having 2-3 hooks only, while *Audouinia tentaculata* of the Atlantic ocean with 4-5 per ramus. As the present material shows 4-5 hooks per ramus, they are referred to *Audouinia tentaculata*. Fauvel (1932) indicated that the two species are synonymous and Day (1951) had actually synonymised them after finding 3-5 hooks per ramus. The occurrence of *Audouinia tentaculata* is a new record to the Indian waters.

Family SABELLARIIDAE

Idanthysus pennatus (Peters) (Text-figs. 2B₁-B₄)

1854 *Sabellaria* (Pallasia) *pennata* Peters, *Akad. Wiss. Berlin* : 613

1932 *Pallasia pennata* Fauvel, *Mem Indian Mus.*, 12 (1) : 212.

1964. *Idanthysus pennatus* Tampi & Rangarajan, *J. mar. biol. Ass. India*, 6 (1) : 117.

Material.—Several ex.; Z. S. I. Reg. No. An 645/1; Locality—(on coral rocks) Havelock Island; 5. IV 1974; Coll. G. C. Rao.

Description.—Opercular stalks with paleae in two rows, outer curved and serrated, inner straight with pointed tip. Two thoracic segments with rudimentary feet. Three parathoracic segments having biramous parapodia with oar-shaped setae. Abdomen having many segments with dorsal uncinigerous tori and ventral capillary setae.

Family TERESELLIDAE

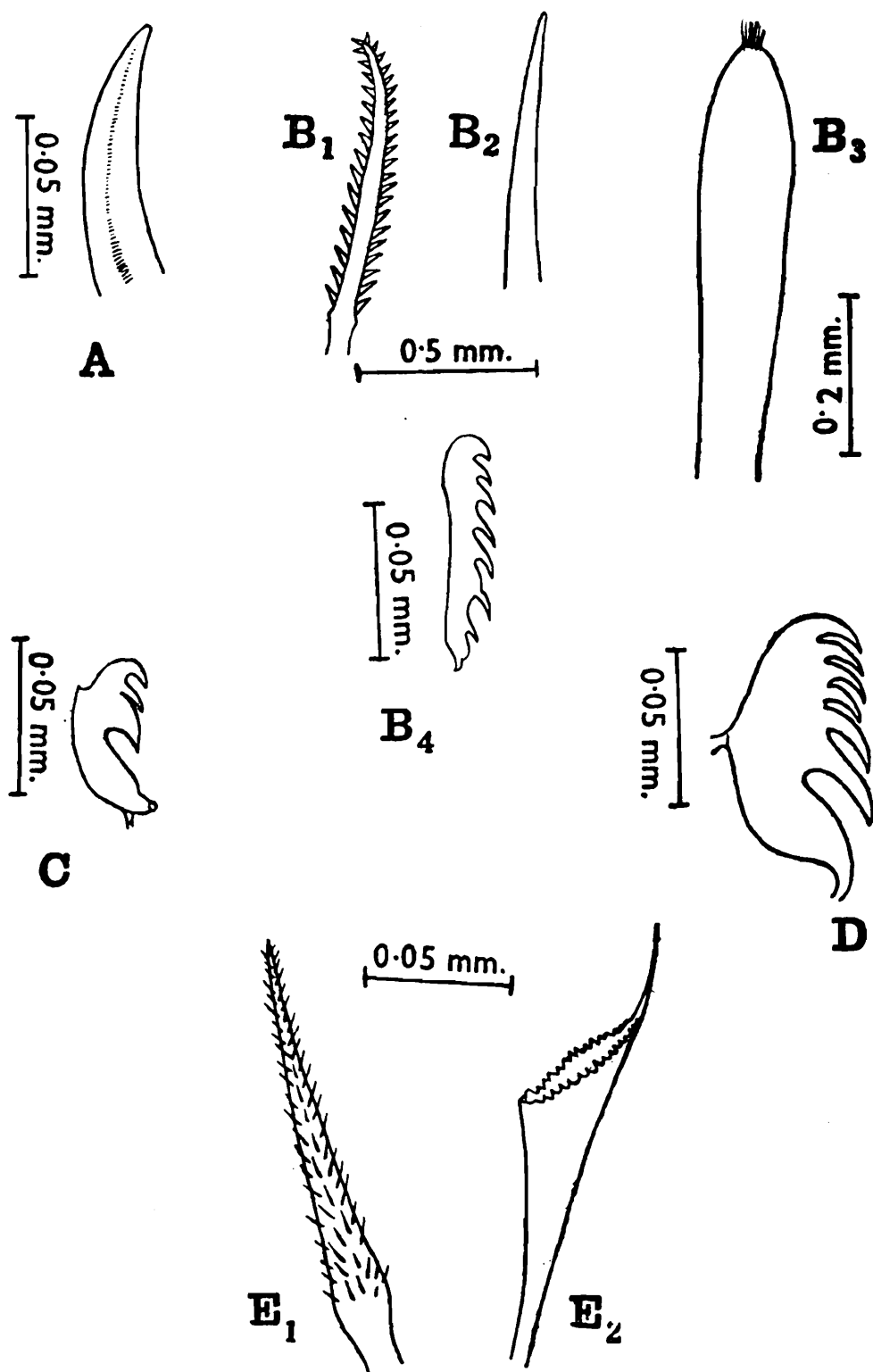
Streblosoma persica (Fauvel) (Text-fig. 2C)

1911. *Grynaea persica* Fauvel, *Archs. Zool. exp. gén.*, 6 : 419.

1930. *Streblosoma persica* Fauvel, *Bull. Madras Govt. Mus.*, 1 (2) : 58.

Material.—One ex.; Z. S. I. Reg. No. An 646/1; Locality—Rocky-coast) Aberdeen Bay, Port Blair; 25. III. 1974; Coll. G. C. Rao.

Description.—Body fleshy brown in colour. Tentacles long, stout and grooved. Gills 3 pairs each with numerous filaments of different sizes. Thorax with 30 segments. Dorsal setae beginning from 2nd seg-



Text-fig. 2—A. *Audouinia tentaculata* (Montagu), ventral hook; B₁-B₄ *Idanthysrus pennatus* (Peters) B₁. Outer palea; B₂ inner palea, B₃ oar-shaped seta, B₄. uncinus, C. *Streblosoma persica* (Fauvel), uncinus from thoracic foot; D. *Loimia medusa* (Savigny) uncinus from thoracic foot; E₁-E₂ *Spirobranchus giganteus* (Pallas), E₁ bayonet-shaped seta, E₂ trumpet-shaped seta.

ment. Uncinigerous tori appearing from 3rd setigerous segment. Tori with avicular uncini in single rows. Abdomen with 25-30 segments with pinnules well protruded.

Remarks.—This is the first record of this species from the Andaman waters. Earlier recorded from Gulf of Mannar.

Loimia medusa (Savigny)
(Text-fig. 2D)

1818. *Terebella medusa* Savigny (*vide* Hartman, 1959 *Catalog. Poly chaetous Annelids of the world*).

1932. *Loimia medusa* Fauvel, *Mem. Indian Mus.*, 12 (1) : 224.

Material.—3 ex.; Z. S. I. Reg. No. An 647/1; Locality—(On coral rocks) Havelock Island; 5. IV 1974; Coll. G. C. Rao.

Description.—Prostomium with lateral lobes. Prostomial tentacles many, long, slender and with purple coloured bands in live condition. Arborescent gills 3 pairs. Thorax with 17 segments. Uncini pectinate in single rows upto 10th segment, and then in double rows. Abdomen elongated and slender with uncinigerous pinnules. Thoracic region with conspicuous ventral shields.

Family SERPULIDAE

Spirobranchus giganteus (Pallas)
(Text-figs. 2E₁, E₂)

1766. *Serpula gigantea* Pallas (*vide* Hartman, 1959, *Catalog. Polychatetous Annelids of the world*).

1913. *Spirobranchus giganteus* Pixell, *Trans. Linn. Soc. Lond.*, 16 : 80.

1932. *Spirobranchus giganteus* Fauvel, *Mem. Indian Mus.*, 12 (1) : 224.

Material.—Several ex.; Z. S. I. Reg. No. An 648/1; Locality—Chatam jetty, Port Blair; 7. I. 1935; Coll. H. S. Rao.

Description.—Opercular stalk with lateral wings. Operculum with a round calcareous plate having 2 branched processes. Thorax having 7 segments of which the first with bayonet shaped setae, and the remaining with winged capillary setae. Abdomen long, cylindrical and many segmented. Abdominal parapodia with trumpet-shaped setae.

SUMMARY

The paper deals with the material of polychaetes collected from the Andaman and Nicobar Islands by the Zoological Survey of India parties. A total of 26 species have been identified in the collections. Eight among these are new to the Andaman and Nicobar waters and five are new records from the Indian waters. The morphological variations observed have been documented with illustrations where necessary.

ACKNOWLEDGEMENT

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SARCOPHAGID FLIES FROM ORISSA, INDIA (DIPTERA SARCOPHAGIDAE)

By

B. C. NANDI

Zoological Survey of India, Calcutta.

INTRODUCTION

This paper deals with the collection of Sarcophagid flies from Orissa collected by various parties of the Zoological Survey of India, Calcutta. All the materials are in the National Collection of Zoologica, Survey of India, Calcutta.

1. *Boettcherisca peregrina* (Robineau-Desvoidy)

1830. *Myophora peregrina* Robineau-Desvoidy, *Essai Myodaires*, 1 : 356.

1967. *Boettcherisca peregrina* (Robineau-Desvoidy) : Kano, Field and Shinonaga, *Fauna Japonica, Sarcophagidae* : 17.

Material.—1 ♂, Orissa : Balugoan, 1. 11. 1972, *S. Khera & Party* Coll.; 1 ♂, Orissa : Patna, 20. 3. 1973, *S. K. Gupta & Party* Coll.

Distribution.—Uttar Pradesh : Mussori, Dehra Dun; Maharashtra : Bombay, Nagpur; Tamil Nadu : Coimbatore; Bihar : Pusa Konar; Assam; Gauhati; Andaman Islands : Port Blair. It is reported for the first time from Orissa.

2. *Iranihindia futilis* (Senior-White)

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

1961. *Iranihindia futilis* (Senior-White) : Rohdendorf, *Stutt. Beitrag. Natur*, 58 : 2.

Material.—1 ♂, Orissa : Taptapani, 14.3.1974, *B. C. Nandi* Coll

Distribution.—Uttar Pradesh : Dehra Dun, Allahabad; Maharashtra : Nagpur; Orissa : Barkuda Island; Bihar : Pusa, Chapra; Assam : Gauhati; West Bengal : Calcutta, Siliguri, Purulia.

3. *Iranihindia martellate* (Senior-White)

1924. *Sarcophaga martellata* Senior-White, *Rec. Indian Mus.*, 26 : 247.

1961. *Iranihindia martellata* (Senior-White) : Rohdendorf, *Stutt. Beitrag. Natur.*, 58 : 2.

Material.—2 ♂♂, Orissa : Balugoan, 18.3.1974, *B. C. Nandi Coll*

Distribution.—Maharashtra : Nagpur; Karnataka : Kolar; Tamil-Nadu : Madras, Coimbatore; Kerala : Calicut; Bihar : Patna; West Bengal : Calcutta. It is the first report of this fly from Orissa.

4. *Iranihindia martellatoides* (Baranov)

1931. *Sarcophaga martellatoides* Baranov, *Konowia*, (2)10 : 114.

1961. *Iranihindia martellatoides* (Baranov) : Rohdendorf, *Stutt. Beitrag. Natur.*, 58 : 2.

Material.—2 ♂♂, Orissa : Balugoan, 19. 3.1974, *B. C. Nandi Coll*.

Distribution.—West Bengal : Calcutta. This species is the first record from Orissa.

5. *Parasarcophaga* (*s. str.*) *albiceps* (Meigen)

1826. *Sarcophaga albiceps* Meigen, *Syst. Besch.*, 5 : 22.

1837. *Parasarcophaga* (*s. str.*) *albiceps* (Meigen) : Rohdendorf, *Faune l' URSS*, 19(1) : *Sarcophagidae*, 199.

Material.—6 ♂♂ Orissa : Balugoan, 19.3.1974, *B. C. Nandi Coll*.
1 ♂ Orissa : Nandankanan, 26.3.1974, *B. C. Nandi Coll*.; 6 ♂♂ Orissa : Taptapani, 14-3-1974, *B. C. Nandi Coll*.; 2 ♂♂ Orissa : Bhagabanpur, 24.3.1974, *B. C. Nandi Coll*.; 2 ♂♂ Orissa : Balangir, 1.10.1972, *S. Khera & Party Coll*.; 1 ♂ Orissa : Baripada, 5.18.1972, *S. K. Mitra & Party Coll*.; 1 ♂ Orissa : Patna, 20.3.1973, *S. K. Gupta & Party Coll*.

Distribution.—Uttar Pradesh : Dehra Dun, Allahabad; Haryana : Ambala; Gujrat : Sidapur; Maharashtra : Bombay; Kerala : Calicut; Tamil Nadu : Coimbatore; Bihar : Bhagalpur; Assam : Gauhati; Meghalaya : Shillong, Cherapunji; West Bengal : Burdwan. Recorded for the first time from Orissa.

6. *Parasarcophaga* (*s. str.*) *knabi* (Parker)

1917. *Sarcophaga knabi* Parker, *Proc. U. S. Nat. Mus.*, 54: 96.

1958. *Parasarcophaga* (*s. str.*) *knabi* (Parker) : Souza Lopes, *Ins. Micron.*, 13 (2) : 36.

Material.—5 ♂♂ Orissa : Taptapani, 15.3.1974, *B. C. Nandi Coll*.; 1 ♂ Orissa : Kalijugeswar, 19.3.1974, *B. C. Nandi Coll*.; 1 ♂ Orissa :

Khutra, 18.9.1972, *S. Khera & Party* Coll.; 1 ♂ Orissa : Bhagabanpur, 24.3.1974, *B. C. Nandi* Coll.; 1 ♂ Orissa : Balugan, 19.3.1974, *B. C. Nandi* Coll.

Distribution.—Uttar Pradesh : Dehra Dun, Allahabad; Haryana : Ambala; Gujarat : Ahmedabad, Surat; Maharashtra : Bombay; Tamil Nadu : Coimbatore; Orissa : Barkuda Island, Balasor; Bihari: Pusa; Assam : Gauhati, Dibrugarh; Andaman Islands : Port Blair; West Bengal : Calcutta.

7. *Parasarcophaga (s.str.) orchidea* (Böettcher)

1913. *Sarcophaga orchidea* Böettcher, *Ann. Mus. Nat. Hungarici*, 11 : 375.

1958. *Parasarcophaga (s. str.) orchidea* (Böettcher) : Souza Lopes, *Ins. Micron*, 13 (2) : 38.

Material.—11 ♂ ♂ Orissa : Balugan, 18-20. 3. 1974, *B. C. Nandi* Coll.; 4 ♂ ♂ Orissa : Nandankanan, 24-25. 3. 1974, *B. C. Nandi* Coll.; 10 ♂ ♂ Orissa : Taptapani, 13-15. 3. 1974, *B. C. Nandi* Coll.; 5 ♂ ♂ Orissa : Bhagabanpur, 24.3.1974, *B. C. Nandi* Coll.; 1 ♂ Orissa : Balangir, 1.10.1972, *S. Khera & Party* Coll.; 2 ♂ ♂ Orissa : Jharsungada, 17.10.1972, *S. Khera & Party* Coll.; 1 ♂ Orissa : Baripada, 5.8.1972, *S. K. Mitra & Party* Coll.

Distribution.—Maharashtra : Bombay, Parel; Karnataka : Mangalore; Bihar : Pusa, Purna; Assam : Gauhati; Orissa : Barkuda Island; Andaman Islands : Port Blair; West Bengal : Canning, Bandel, Majerhat, Jalpaiguri.

8. *Parasarcophaga (Jantia) ruficornis* (Fabricius)

1794. *Musca ruficornis* Fabricius, *Ent. Syst.*, 4 : 314.

1958. *Parasarcophaga (Jantia) ruficornis* (Fabricius) : Souza Lopes, *Ins. Micron*, 13(2) : 48.

Material.—1 ♂ Orissa : Hatisalpara, 30.12.1971, *P. K. Maity & Party* Coll.

Distribution.—Uttar Pradesh : Dehra Dun; Haryana : Ambala; Gujarat : Surat; Maharashtra : Nagpur; Tamil Nadu : Madras, Coimbatore; Andhra Pradesh : Waltair; Orissa : Cuttack, Barkuda Island; Bihar : Purna, Pusa; West Bengal : Calcutta, Canning.

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

1934. *Sarcophaga brevicornis* Ho, *Bull. Fan. Mem. Inst. Biol*, 5 : 23.

1937. *Parasarcophaga (Liosarcophaga) brevicornis* (Ho) : Rohdendorf, *Faune l' URSS*, 19(1) : 222.

Material.—2 ♂ ♂ Orissa : Balugoan, 29-3-1974, *B. C. Nandi Coll.*

Distribution.—West Bengal : Diamond Harbour. It is the first record from Orissa.

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

1868. *Sarcophaga dux* Thomson, *Dipt. Eugen. Reise*, 540.

Parasarcophaga (Liosarcophaga) dux (Thomson) : N. Comb.

Material.—1 ♂ Orissa : Sundergarh, 12-4-1972, *S. Khera & Party Coll.*; 1 ♂ Orissa : Balugoan, 29-3-1974, *B. C. Nandi Coll.*; 1 ♂ Orissa : Baripada, 5-12-1972. *S. K. Maity & Party Coll.*

Distribution.—Uttar Pradesh : Dehra Dun; Kashmir : Jhelum Valley; Punjab : Jallundar; Maharashtra : Bombay, Parel; Tamil Nadu : Madras, Coimbatore, Nilgiri Hills; Orissa : Puri, Cuttack, Sambalpur; Bihar : Pusa; West Bengal : Canning, Domjur, Bali.

11. *Parasarcophaga (Pandelleisca) bainbriggei* (Senior-White)

1925. *Sarcophaga bainbriggei* Senior-White, *Spol. Zeyl.*, 13 : 212.

Parasarcophaga (Pandelleisca) bainbriggei (Senior-White) : N. Comb

Material.—1 ♂ Orissa : Taptapani, 14-3-1974, *B. C. Nandi Coll.*; 1 ♂ Orissa : Nandankanan, 22-3-1974, *B. C. Nandi Coll.*; 1 ♂ Orissa : Balugoan, 29-3-1974, *B. C. Nandi Coll.*

Distribution.—Tamil Nadu : Madras, Coimbatore; Orissa : Balugoan; Bihar : Pusa; West Bengal : Calcutta.

12. *Sarcosolomonina (Parkerimyia) nathani* Lopes & Kano

1969. *Sarcosolomonina (Parkerimyia) nathani* Lopes & Kano, *Pacific Ins.*, 11 (1) : 184.

Material.—1 ♂ Orissa : Balangir, 1-10-1972, *S. Khera & Party Coll.*; 1 ♂ Orissa : Balugoan, 29-3-1974, *B. C. Nandi Coll.*

Distribution.—Tamil Nadu : Singora (Nilgiri Hills); West Bengal : Birbhum, (Chandrapur Forest). It is a new record for Orissa.

13. *Sarcosolomonina (Parkerimyia) rohdendorfi* Nandi

1976. *Sarcosolomonina (Parkerimyia) rohdendorfi* Nandi, *Oriental Ins.*, 10(1) : 13..

Material.—2 ♂ ♂ Orissa : Taptapani, 15-3-1974, *B. C. Nandi Coll.*

Distribution.—West Bengal : 24-Parganas (Hijli Forest). This fly is reported for the first time here.

14. *Seniorwhitea krameri* (Böettcher)

1912. *Sarcophaga krameri* Böettcher, *Ent. Mitt.*, 1 : 165.

1964. *Seniorwhitea krameri* (Böettcher) : Souza Lopes, *Mem. Inst. Oswaldo Cruz.*, 62 : 162.

Material.—2 ♂♂ Orissa : Taptapani, 15-3-1974, *B. C. Nandi* Coll.

Distribution.—Uttar Pradesh : Dehra Dun; Maharashtra : Bombay
Tamil Nadu; Coimbatore; Bihar : Pusa, Chapra, Konor; Assam :
Sibsagar; Orissa : Barkuda Island.

15. *Sinonippomia bengalensis* Nandi

1977. *Sinonippomia bengalensis* Nandi, *Rev. Brasil. Biol.*, 37(1) : (in Press).

Material.—6 ♂♂ Orissa : Hathisalpara, 30-12-1972 *P. K. Maity & Party* Coll.; 1 ♂, Orissa : Balugoan, 2-10-1972, *S. Khera & Party* Coll.

Distribution.—West Bengal : Bankura (Panchubaga), Midnapore (Arabari Forest); 24-Parganas, (Diamond Harbour). It is a record for Orissa.

16. *Thyrsochnema* (*Pseudothyrsochnema*) *longistylata* Shinonaga & Lopes

1924. *Sarcophaga crinita*, Senior-White, *Rec. Indian Mus.*, 26(3) : 245.

1975. *Thyrsochnema* (*Pseudothyrsochnema*) *longistylata* Shinonaga & Lopes
Pacific Ins., 16(4) : 459. (Conspecific).

Material.—2 ♂♂ Orissa : Hatisalpara, 30-12-1972, *P. K. Maity & Party* Coll.

Distribution.—Tamil Nadu : Madras; Bihar : Pusa ; West Bengal :
Canning; Orissa : Harisalpara, Dongoaposi.

SUMMARY

This paper gives a systematic account of Sarcophagidae (Diptera) from Orissa, India, dealing with 16 species under 8 genera. Out of these, 8 species are recorded for the first time from Orissa. Distributional records of all the species from India are also appended. Two species, *Sarcophaga bainbriggei* Senior-White and *Sarcophaga dux* Thomson are shifted to their proper generic position, viz. *Parasarcophaga* Johnston & Tiegs.

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***HOLCOCERUS FUSCIBASIS* (HAMPSON) COMB.
NOV. (LEPIDOPTERA: COSSIDAE) — A NEW
RECORD FROM INDIA WITH ITS REVISED
DESCRIPTION**

By

G. S. ARORA

Zoological Survey of India, Calcutta

(With 1 Text-figure and 1 Plate)

INTRODUCTION

The family Cossidae constitutes an important group of moths as far as their economical as well phylogenetic importance are concerned, and recently revised by the author (Arora, 1976) on the basis of the material present at Z. S. I., Calcutta as well as drawn from various other sources. Hampson (1895) described this species as *Cossus fuscibasis* from Burma and was retained under this nomenclature in the revisionary studies since no material of this species was available. A male (plate VIII, fig. 3) has been collected recently from Shillong and was compared by the author with its original description, photographs of the type and its genitalia (Plate VIII, figs. 1-2) and was found to be conspecific.

The antennae are simple, laminate type, which is the characteristic feature of the genus *Holcocerus* Staudinger, to which genus this species (Plate VIII, fig. 3) is being assigned here. Besides, the genus is also characterised by the dilated hind tibiae which are beset with two pairs of tibial spurs; reduced frenulum and retinaculum; connate Rs-M₁ in the hind wings; and with the gnathos meeting below the uncus, in the male genitalia.

This rare species was described from Burma, rather inadequately, on the basis of a single specimen mentioned as a female but actually was a male. The present paper deals with the revised description of the species, including its genitalia which is described here for the first time, in the light of new combination.

SYSTEMATIC ACCOUNT

Holcocerus fuscibasis (Hampson) comb. nov.

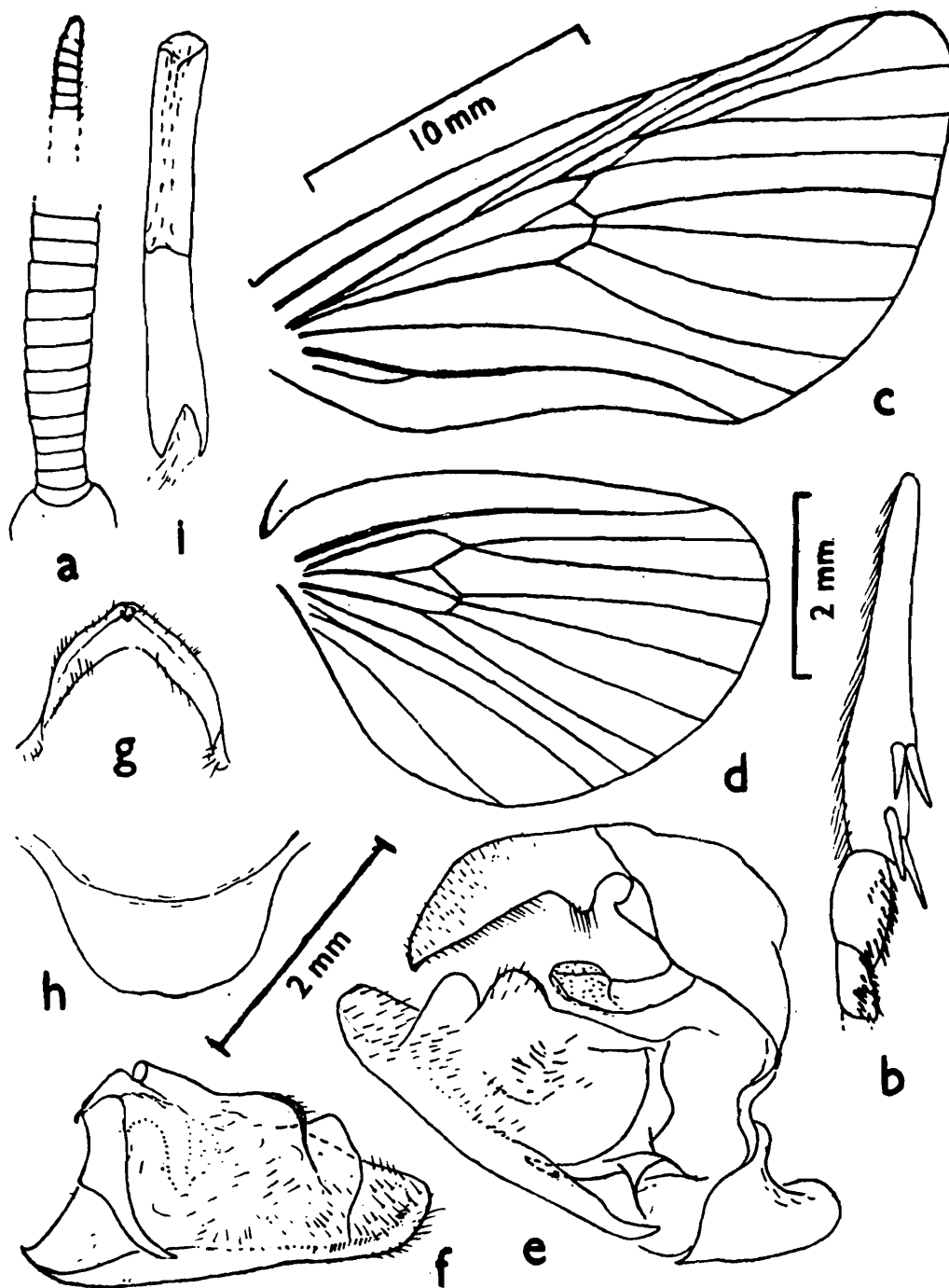
1895. *Cossus fuscibasis* Hampson, *Trans. ent. Soc. Lond.*: 287 (Type loc.—N. Chin Hills, Burma).
 1896. *Cossus fuscibasis* Hampson, *Fauna Brit. India*, Moths, 4 : 473.
 1976. *Cossus fuscibasis*, Arora, *Rec. zool. Surv. India*, 69 : 36-37.

Male.—Head with the frons, labial palpi and vertex brown, grizzled; antennae brown. Thorax dark brown in the centre, pale-greyish brown on sides extending onto the metathoracical area. Abdomen dark brown throughout, mixed with grey scales, the tip greyish. Fore wings with the basal two-thirds dark brown, irrorated with fuscous; darker in the middle, bounded on outer side by irregular black postmedial line which is angled outwards at vein M_3 , incurved below vein M_3 up to $1A$ and sending a streak along $1A$; a pale patch below the cell between median nervure and $1A$; the distal area greyish, striated and reticulated with striae; the outer margin with small fuscous patches at the end of each vein from $1A$ to R_4 , beyond which the patches become black and continue downwards into striae. Hind wings with the basal half fuscous except on the costal and inner area; the area beyond discocellular from below costa to inner vein greyish, striated and reticulated with fuscous. *Unerside*: Thorax and wings fuscous, mixed with grey, more so in the basal two-thirds of the wings, the inner area being greyish and unmarked, the distal area and hind wings greyish, striated and reticulated with fuscous. Abdomen dark fuscous brown except near the extremity. Legs dark fuscous brown, hairy.

Head with the frons smooth; labial palpi moderate, not extending beyond frons and closely appressed to face. Antennae (Text-fig. 1 a) simple, laterally flattened from near the base to tip; about 63 segments present in the shaft, the total length not exceeding half the costal length of fore wings. Legs with a single pair of spurs on mid tibia, two pairs on the hind tibia (Text-fig. 1 b), the latter dilated beyond middle; tarsal segments beset with rows of spines. Hind wings with a single short and almost functionless frenulum since the latter does not reach up to the reduced retinaculum.

Venation.—Fore wings (Text-fig. 1 c): Vein R_1 arising free from the cell; R_2 from near the tip of areole which is extremely small; R_3 connate with the common stalk of R_{4-5} ; M_1 from upper angle of cell; median vein forked, forming a cell, the lower branch ending at M_3 ; M_2 - M_3 close to each other, from the lower angle of the cell; Cu_{1a} from lower angle; Cu_{1b} from behind, arising after the origin of median cell in the discocellular cell; Cu_2 present; $1A$ forked at base. Hind wings (Text-fig. 1 d) with the vein Sc free; Rs - M_1 connate; median

branched, forming median cell, with the lower branch ending between M_2 - M_3 ; three anal veins present.



Text-fig. 1. *Holcocerus fuscibasis* (Hampson) : a. parts of antenna, b. part of the hind leg with spurs; c. fore wing venation, d. hind wing venation, e. genitalia, lateral view without one of the claspers, f. a clasper as seen mesally, g. uncus, h. saccus, i. Aedeagus. (e-i of the same magnifications as of a, and d as of c).

Genitalia.—(Text-figs. 1 e-i.) Uncus sclerotised, gradually narrowing from base to apex, terminating into a point which is pointed downwards; gnathol arms curved inwards initially but later curved outwards, meeting below the uncus through *bulla* (of Roepke, 1957) which is sclerotised above. Tegumen short and broad; continuing below into short vinculum; saccus very broad. Clasper about twice as broad as its apex,

narrowing gradually from base to apex; mid-dorsal area, towards mesal side, raised into two prominent ridges one of which does not reach beyond the half way, while other runs across as far as two thirds from costa; distal area membranous; spinabasis well developed, but short. Juxta weakly sclerotised at its basal area. Aedeagus simple, cylindrical, without any ornamentation.

Female.—Not known.

Material examined.—India : Meghalaya, Shillong, Arunachal Circuit House, 1670 m., 1 ♂, 7.v.1976, At light (S. Khera and G. S. Arora coll.)

Measurements.—Expanse, 53 mm.; fore wing, 24 mm.; hind wing, 16 mm.; abdomen, 16 mm.; body length, 24 mm.

Distribution.—Burma: N. Chin hills. India: Meghalaya, Shillong (New record).

Comparison.—*Holcocerus fuscibasis* (Hampson) comb. nov. is close to *Holcocerus arenicola* (Staudinger) in respect of the origin of R_2 from areole and M_1 from cell angle, unlike in another species viz., *Holcocerus rufidorsia* (Hampson) where R_2 is close to the origin of R_3 or stalked with it, and M_1 arises from above the cell angle. It, however, differs from *H. arenicola* in the ending of lower branch of median cell in fore wing at M_3 (vs between M_2 - M_3 in *arenicola*).

In respect of the male genitalia this species differs from *H. arenciola* and *H. rufidorsia* in the structure of claspers which have two prominent but unequal ridges across (vs several short ridges not reaching half way across the clasper in *H. arenicola* and with one slight ridge in *H. rufidorsia*).

ACKNOWLEDGEMENTS

The author is grateful to Dr. S. Khera, Joint Director in charge and Dr. O. B. Chhotani, Superintending Zoologist for their constant encouragement and for providing the necessary facilities. The author is also grateful to Dr. A. P. Kapur, Emeritus Scientist, Zoological Survey of India, for giving valuable suggestions. Thanks are also due to Mr. W.H.T. Tams, B.M. (N.H.) London, who had very kindly sent the photographs of the type species and its genitalia, for my revisionary studies, to Dr. Kapur, the then Director, Zoological Survey of India.

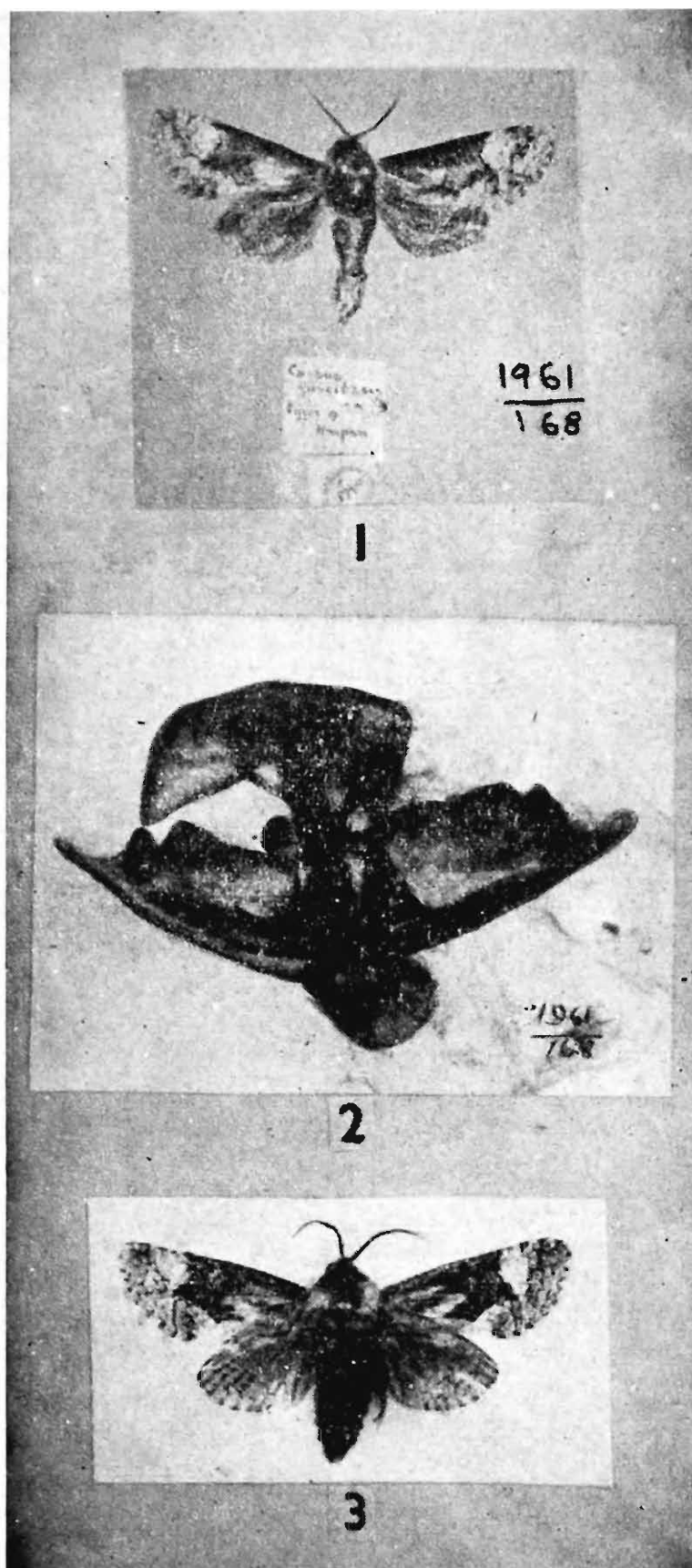
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Holcocerus fuscibasis (Hampson)

Figs. 1 and 2. The Type and its genitalia (at B.M.N.H.)

Fig. 3. A male recently collected from Shillong, India.

ON SOME TREMATODES FROM DARJILING DISTRICT, WEST BENGAL, INDIA

By

T. D. SOOTA and R. K. GHOSH,

Zoological Survey of India, Calcutta.

(With 1 Text-fig.)

INTRODUCTION

During the periods June-July 1974 and May-June 1975, the senior author conducted faunistic surveys of certain areas in Darjiling district (West Bengal) and collected some helminths from vertebrates. The present paper deals with the trematode component of this collection which comprises nine species belonging to nine genera and five families. Of these, one species is new, while others show interesting variations hitherto unrecorded. All measurements are in millimeters.

SYSTEMATIC ACCOUNT

Family DICROCOELIIDAE (LOOSS, 1899) Odhner, 1910

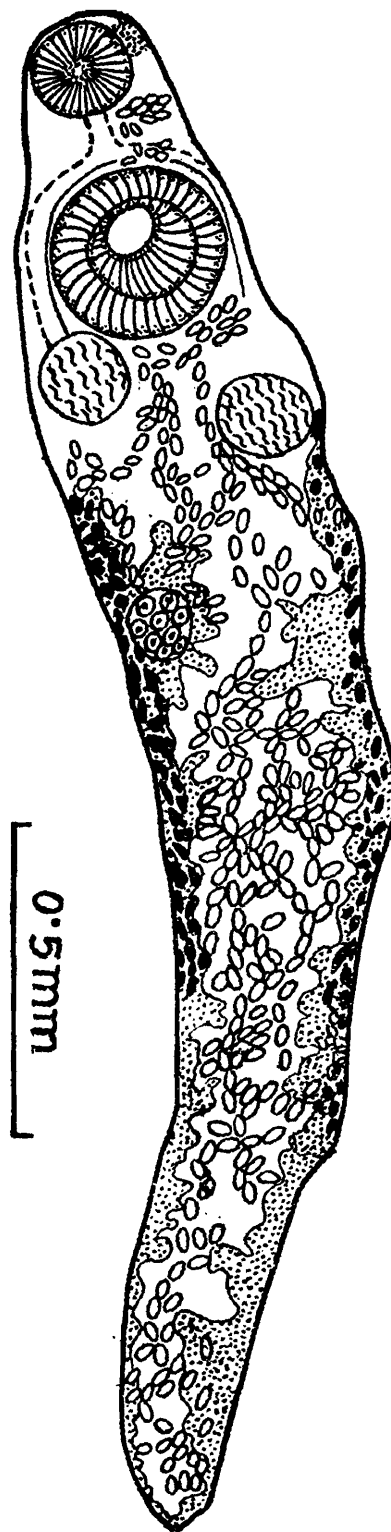
Subfamily DICROCOELIINAE LOOSS, 1899

Lypersomum (*Lypersomum*) *reangensis* sp. n.

(Text-fig. 1)

Material.—1 ex.; Z.S.I. reg. no. W 7260/1; host—Wood pecker (*Picus flavinucha flavinucha*); location-?; locality-Reang; 7.vii.1974; Coll. T. D. Soota.

Description.—Body elongated, bluntly rounded anteriorly and gradually tapering posteriorly, 4.34 × 0.75, with maximum width in testicular zone; cuticle smooth; oral sucker sub-terminal, 0.23 × 0.27 followed by a small pharynx; oesophagus 0.09 long, bifurcating into intestinal caeca which appear to be somewhat atrophied and run upto the caudal end of the body where their blind ends are obscured; acetabulum 0.45 × 0.49, larger than oral sucker, almost 1:2 in ratio and situated within anterior third of body 0.47 from anterior end; testes rounded, oblique and just behind acetabulum; right 0.27 × 0.26, left



Text-fig. 1. *Lypersomum (Lypersomum) reangensis* sp. n.

0.23 × 0.24; cirrus sac opens to the exterior just below oral sucker; ovary 0.19 × 0.14 and 0.38 behind right testis; receptaculum seminis and Mehlis gland complex present on the postero-lateral side of ovary; vitellaria confined roughly to mid-third of body, asymmetrical in extension extending from behind the posterior testis; uterus extensive with ascending and descending loops packed with eggs, extending posteriorly up to the hinder end of the body and anteriorly up to pharyngeal level running in between testes; eggs yellowish, elliptical, 0.36—0.48 × 0.22—0.26.

Remarks.—Yamaguti (1971) on the basis of the position of acetabulum and body shape divided the genus *Lypersomum* Looss, 1899 into two subgenera viz., *Lypersomum* and *Lypersomoides*. The present species on account of its closer proximity of acetabulum and body shape is placed under the subgenus *Lypersomum*. Yamaguti (1971) included 25 species under it, of which only two viz., *L. kavini* Fotedar and Raina, 1965 and *L. stunkardi* Agrawal, 1964 are reported from India.

The present specimen comes close to *L. clathratum* (Deslongschamps, 1824) in respect of asymmetrical extension of vitellaria and in size of ova, but differs in body size (being much larger in the present specimen), in ratio of oral sucker and acetabulum and in topography of gonads.

It also comes close to *L. kavini* Fotedar and Raina, 1965 in position of ovary and in size of ova, but differs greatly in body size, in extension of vitellaria and in ratio of oral sucker and acetabulum.

Further, the present specimen can be distinguished from all other species by smaller body size and in relative size of oral sucker and acetabulum. Hence, the specimen is described as a new species under the name *Lypersomum (Lypersomum) reangensis* n.sp.

***Dicrocoelium dendriticum* (Rudolphi, 1819)**

Material.—3 exs.; Z.S.I. reg. no. W 7261/1; host-goat (*Copra* sp.); location—bile duct; locality—Ghoom; 21.vi.1974; Coll. *T. D. Soota*.

Description.—Body 6.75—6.84 long, 2.16—2.25 wide; oral sucker 0.46—0.49 × 0.43; pharynx 0.15—0.2 × 0.18—0.2; oesophagus 0.41—0.45 long; ventral sucker in anterior third of body, 0.72—0.76 × 0.54—0.57; testes lobate, almost symmetrical; cirrus sac 0.9—0.99 × 0.13—0.22; ovary lobate, just behind testes and 0.4—0.54 × 0.31—0.45; vitellaria extending from testicular level to some distance beyond equatorial zone; eggs 0.036—0.045 × 0.024—0.031.

Remarks.—This species is cosmopolitan in distribution and shows a lot of intra-specific variations in such characters as body size, position and shape of testes and of ovary, relative size of suckers, extension of vitellaria etc. The present specimens also show variations in lobulation and position of testes which may be symmetrical or obliquely tandem and also in the distribution of vitelline glands.

Family FASCIOLIDAE Railliet, 1895

Subfamily FASCIOLINAE Stiles et Hassall, 1898

***Fasciola gigantica* Cobbold, 1855**

Material.—Several ex.; Z.S.I. reg. no. W 7262/1; host-buffalo (*Bubalus* sp.); location—liver; locality—Ghoom; 22.vi.1974 & 23.v.1975; Z.S...15

Coll. *T. D. Soota*. Several ex.; Z.S.I. reg. no. W 7263/1; host—cow (*Bos* sp.); location—liver; 21.vi.1974 & 23.v.1975; collector and locality same.

Description.—Body 73-76 long, short cephalic cone present; oral sucker $0.54-0.98 \times 0.86-0.98$; intestinal caeca with diverticula on both sides; ventral sucker $0.14-0.16 \times 0.14-0.15$; testes and ovary much branched; uterus in between ovary and acetabulum; eggs $0.13-0.15 \times 0.07-0.09$.

Remarks.—As this is a common liver fluke, a detailed description is not given. Roy (1954) observed that 50 to 75% of the buffaloes brought to Kalimpong abattoir were infected with this species. The present surveys revealed higher incidence of infection in buffaloes than in cows in Ghoom.

Subfamily FASCIOLOPSINAE Odhner, 1910.

Fasciolopsis buski (Lankester, 1857) Stiles, 1901

Material.—12 ex.; Z.S.I. reg. no. W 7264/1; host—pig (*Sus* sp.); location—intestine; locality—Ghoom; 13.vi.1974 & 25.v.1975; Coll. *T. D. Soota*.

Description.—Body 24—32 long; oral sucker $0.54-0.67 \times 0.57-0.72$; pharynx $0.43-0.49 \times 0.54-0.62$; intestinal caeca simple and reaching posterior extremity; acetabulum close to oral sucker, 2.25—3.12; testes and ovary branched; eggs $0.21-0.25 \times 0.07-0.09$.

Remarks.—This species occurs widely in pigs and has also been reported from man. In the present surveys, only two host animals showed infection by this species. Enquiries made at local piggeries revealed that the species is rarely found in the indigenous pigs.

Family ISOPARORCHIIDAE (Travassos, 1922) Poche, 1926.

Isoparorchis hypselobagri (Billet, 1898) Ejsmont, 1932

Material.—Several ex.; Z.S.I. reg. no. W 7265/1; host—*Wallago attu*; location—air bladder; locality—Siliguri; 12.vii.1974 & 18.vii.1974; Coll. *T. D. Soota*. Several ex.; Z.S.I. reg. no. W 7266/1; host—*Channa punctatus*; 14.vii.1974; location, locality and collector—same as above. Several ex.; Z.S.I. reg. no. W 7267/1; host—*Mastacembalus* sp.; 14.vii.1974; location, locality and collector—same as above.

Description.—Body 6.2-8.8 long, 2.3—4.9 wide; oral sucker subterminal, 0.7—1.2; pharynx 0.4—0.45; acetabulum almost equatorial in position, 2.07—3.7; eggs minute.

Remarks.—As this is a widely occurring and well described species, a detailed description is not necessary.

Family PARAMPHISTOMIDAE Fischöder, 1901

Subfamily DIPLODISCINAE Cohn, 1904

Diplodiscus amphichrus Tubangui, 1933

Material.—1 ex. (damaged); Z.S.I.; reg. no. W 7268/1; host-frog, location—intestine; locality-Sukna; 16.vii.1974. Coll. *T D. Soota*.

Description.—Body 2.34 long, 0.99 wide; oesophagus with a bulb, 0.24 long; testis single, 0.41×0.47 ; genital pore median, some distance beyond caecal bifurcation; vitelline follicles contiguous both anteriorly and posteriorly; eggs few, $0.9-0.99 \times 0.45-0.54$.

Remarks.—As this species is well-known, a detailed description is redundant.

Subfamily PARAMPHISTOMINAE Fischöder, 1901

Paramphistomum (Explanatum) explanatum (Creplin, 1847) Fischöder 1904

Material.—Several exs.; Z.S.I. reg. no. W 7269/1; host-buffalo (*Bubalus* sp.); location—intestine; locality—Ghoom; 22.vi.1974; Coll. *T D. Soota*.

Description.—Body 3.3—6.78 long, 2.3—3.33 wide; oral sucker 0.9—0.99 long; oesophagus 0.5—0.52 long; genital pore at level of caecal bifurcation; eggs $0.12-0.14 \times 0.07-0.08$.

Remarks.—As this species is quite well-known, a detailed description is not given.

Subfamily GASTRODISCINAE Monticelli, 1892

Gastrodiscoides hominis (Lewis and Mc Connell, 1876) Leiper, 1913.

Material.—Several exs.; Z.S.I. reg. no. W 7270/1; host Pig (*Sus* sp.) location—intestine; locality—Ghoom; 22.vi.1974 & 25.v.1975; Coll. *T D. Soota*.

Description.—Body 11.6—13.4 long and divided into two parts; ventral sucker almost three times the size of oral sucker; vitelline glands extending from level of ventral sucker to posterior testis; eggs $0.135-0.144 \times 0.045-0.054$.

Remarks.—This species commonly occurs in pigs throughout the Indian region.

Verma (1954) opined that the swine form differ from the human form and so erected the new variety *G. hominis* var. *suis*.

Family GASTROTHYLACIDAE Stiles et Goldberger, 1910

Subfamily GASTROTHYLACINAE Stiles et Goldberger, 1910

Gastrothylax crumenifer (Creplin, 1847) Otto, 1896.

Material.—Several exs.; Z.S.I. reg. no, W 7271/1; host-buffalo (*Bubalus* sp.); location—rumen; locality—Ghoom; 21.vi.1974. Coll. T D. Soota.

Description.—Body 8.3—11.5 long; oesophagus 'S' shaped; testes symmetrically placed on anterior side of ventral sucker; eggs $0.125-0.139 \times 0.062-0.069$.

Remarks.—As this species occurs widely, a detailed description is omitted.

SUMMARY

The paper deals with trematodes collected from vertebrates from Darjiling district during June-July 1974, and May-June 1975, and describes one new species and records interesting variations in others.

ACKNOWLEDGEMENT

We are thankful to Dr. S. Khera, Joint Director (Incharge), Zoological Survey of India, Culcutta, for his kind encouragement in the preparation of this paper.

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STUDIES ON SOME INDIAN CRICKETS WITH NEW DISTRIBUTIONAL RECORDS OF THE SUB-FAMILY GRYLLINAE (GRYLLIDAE ORTHOPTERA)

By

H. K. BHOWMIK

Zoological Survey of India, Calcutta.

(With 1 Text-figure)

INTRODUCTION

(a) *General*

The paper deals with new taxonomic characters and new distributional records of 14 species spread over 7 genera of the subfamily Gryllinae of Indian fauna. The material studied in this paper includes the unnamed materials collected by the Zoological Survey of India tour parties from different parts of the country including the South Andaman Island.

All material examined hereinunder are deposited in the National Collection of the Zoological Survey of India, Calcutta. All measurements used in the paper are in mm. The number of specimens measured in each case is indicated, wherever measurements are given.

(b) *Acknowledgements*

The writer owes his indebtedness to Dr. D. N. Raychawdhuri, Reader, Dept. of Zoology, Calcutta University, for guidance during his study and to late Prof. L. Chopard, Paris, for substantial help in many ways.

SYSTEMATIC ACCOUNT

Genus (1) *Gryllus* Linnaeus, 1758

1. *Gryllus bimaculatus* De Geer

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

1961. *Gryllus bimaculatus* Chopard, *Eos*, 37 : 269; Randell, 1964, *Canad. Ent.*, 96 : 1592.

Material.—1 ♀, Sanglichu, (5500m.) Kameng, Arunachal Pradesh; 2 ♂♂, 3 ♀♀, North Sikkim; 1 ♂, 7 ♀♀, Dehra Dun, 3 ♂♂ 5, ♀♀, Raipur, Dehra Dun, 1 ♀, Mall, Mussorie, Uttar Pradesh; 1 ♂, 1 ♀, Mettur Dam Survey, Yercand Shevroy Hills; 2 ♂♂, 1 ♀, Machalla, Dist. Guntur, Andhra Pradesh; 2 ♂♂, 2 ♀♀, Tamil Nadu; 2 ♂♂ (without labels); 1 ♀, Mysore city, Karnatak; 2 ♂♂, 1 ♀, Pilani, Rajasthan, (at light); 2 ♂♂, 1 ♀, South Andaman Island; 1 ♂, Hoshiarpur, Punjab; 1 ♀, Kangra, 2 ♀♀, Sirmor Forest Division, Himachal Pradesh.

Remarks.—The species (22—25.5) has the frontal rostrum convex, more than one and half times as wide as the first antennal segment; clypeo frontal suture slightly but broadly arched in males and almost straight in females. Size and shape of the two yellow spots at base of elytra may be very prominent or very inconspicuous, sometimes the entire basal region upto a distance of 1.5 is yellowish.

The species is a new record for Arunachal Pradesh, Sikkim, Himachal Pradesh and Rajasthan.

Genus (2) *Lenigryllus* Chopard, 1961

2. *Lenigryllus quadrimaculatus* (Saussure) (Text-fig. 1A)

1877. *Gryllus quadrimaculatus* Saussure, *Mémoires Soc. Phys. Hist. nat. Geneve*, 25 : 340.

1961. *Lenigryllus quadrimaculatus* Chopard, *Eos*, 37 : 270.

Material.—2 ♂♂, 1964, Mysore University campus, Karnatak, S. Vasantha.

Remarks.—The male specimens have the frontal rostrum one and half times as wide as the first antennal segment. Clypeo frontal suture almost straight. The male genitalia shows more affinity to the genus *Teleogryllus* but differs from the genus *Gryllus* in not having trilobed epiphallus and more or less tuberculated posterior portion of ectoparameres rather than the digitiform one. The species is known from Rajasthan, Karnatak, Tamil Nadu and also from Assam.

Measurements.—Length of body 24—24.5; length of pronotum 5.9—6.2; posterior femora 18—18.2; posterior tibiae 12.7—13.2; (measured 2 males only).

Genus (3) *Modicogryllus* Chopard, 1961

3. *Modicogryllus confirmata* (Walker) (Text-fig. 1B)

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

1877. *Gryllus consobrinus* Saussure, *Mem. Soc. Phys. Hist. nat. Geneve*, 25 : 356.
 1961. *Modicogryllus confirmata* Chopard, *Eos*, 37 : 272; Randell, 1964, *Canad. Ent.*, 96 : 1584.

Material.—4 ♂♂, 2 ♂♂, Rajasthan; 4 ♂♂, 3 ♀♀, Dhamni, Santal Parganas, Bihar; 2 ♀♀, Rajpur, Madhya Pradesh; 10 ♂♂, 16 ♀♀ Imphal valley, Manipur; 9 ♂♂, 17 ♀♀, Dehra Dun, U. P., 2 ♂♂ Bhiwani Tehsil, Dist. Hissar, Haryana; 1 ♂, 1 ♀, Kurukshetra, Dist. Karnal, Haryana.; 3 ♂♂, 2 ♀♀, Mysore city, Karnatak; 30 ♂♂, 42 ♀♀, Calcutta.

Remarks.—The species has the frontal rostrum convex, a little wider than the width of first antennal segment. Ventral view of male, genitalia as in fig. Among the allied species of the genus, it is more close to *M. clarellus* (S.) which is separable from the present species by its somewhat hook-like apical end of ectoparamere and shorter ovipositor. This species is recorded herewith for the first time from Rajasthan, Haryana, Santal Parganas and Manipur.

Measurements.—Length of body ♂♂ 11.5—12.5, ♀♀ 11-12.3; length of pronotum ♂♂ 2-2.2, ♀♀ 2.3—2.5; width of pronotum ♂♂ 3.6—3.9, ♀♀ 4—4.5; elytra ♂♂ 7.5—8, ♀♀ 8.5—8.8; posterior femora ♂♂ 6.5—7.5, ♀♀ 7.7—8; posterior tibia ♂♂ 4.8—5, ♀♀ 7.7—8, ovipositor 8.5—10 (measured 10 examples of both sexes, taken at random.)

4. *Modicogryllus clarellus* (Saussure)

1877. *Gryllus clarellus* Saussure, *Me'm Soc. phys. Hist. nat. Geneve*, 25 : 360.
 1954. *Acheta clarella* Chopard, *Verh. Naturf. Ges. Basel*, 65 : 34.
 1954. *Acheta meyeri* Chopard, *Idem* : 35.
 1961. *Modicogryllus clarellus* Chopard, *Eos*, 37 : 273.

Material.—1 ♂, 3 ♀♀, Humprygunj, South Andaman Island, 3-3-1964 B. S. Lamba; 1 ♂, Gudha, Rajasthan, 21-3-1958. T. G. Vazirani.

Remarks.—The male specimens at hand show the clypeo frontal suture variable—it may be almost straight or strongly arcuate. In females the elytra shorter than the abdomen by 2 to 2.5 mm.

Chopard (1954) created the species, *Acheta meyeri*, suggesting its resemblance to *M. clarellus* but separated from the former by its different colouration of head and very little undulating clypeo frontal suture inspite of similarity in genital complex. I consider *meyeri* Ch. as a synonym of *clarellus* Sauss. in view of similarities in genital complex as in my opinion it is considered a more important character for the purpose of separation of the species than either colouration or shape

of clypeo frontal suture. The species was known so far from Java, Sumba, Burma and Timor. It is recorded herewith for the first time from India.

Measurements.—Length of body ♂ 9-11, ♀ 11-11.5; length of pronotum ♂ 1.8-2.5, ♀ 2.3-2.7; maximum width of pronotum ♂ 2.8—3.8, ♀ 3.8—4; posterior femors ♂ 5.6—7, ♀ 7-7.5. posterior tibia ♂ 3.8—5, ♀ 5-5.6; ovipositor 5-5.5. (measured 2 ♂ and 3 ♀).

5. *Modicogryllus blennus* (Saussure)

1877. *Gryllodes blennus* Saussure *Me'm. Soc. phys. Hist. Nat. Geneve*, 25 : 215.
1961. *Modicogryllus blennus* Chopard, *Eos*, 37 : 274.

Material.—1♀, Pilani, Rajasthan, 5.vi.1967. *H. L. Kundu* (at light); 1 ♀ Behala, Calcutta, 5. viii.1967. *H. K. Bhowmik*.

Remarks.—The female specimens (8—9.5, elytra 5—6.5, ovipositor 5.5—6) studied have the frontal rostrum about one and half times as wide as the first antennal segment. Dorsal field of elytra with three clear veins and a sort of two branches from the discoidal and these are irregularly disposed; lateral field with second vein distinctly curved and widely separated from the rest. The species is recorded here for the first time from Rajasthan.

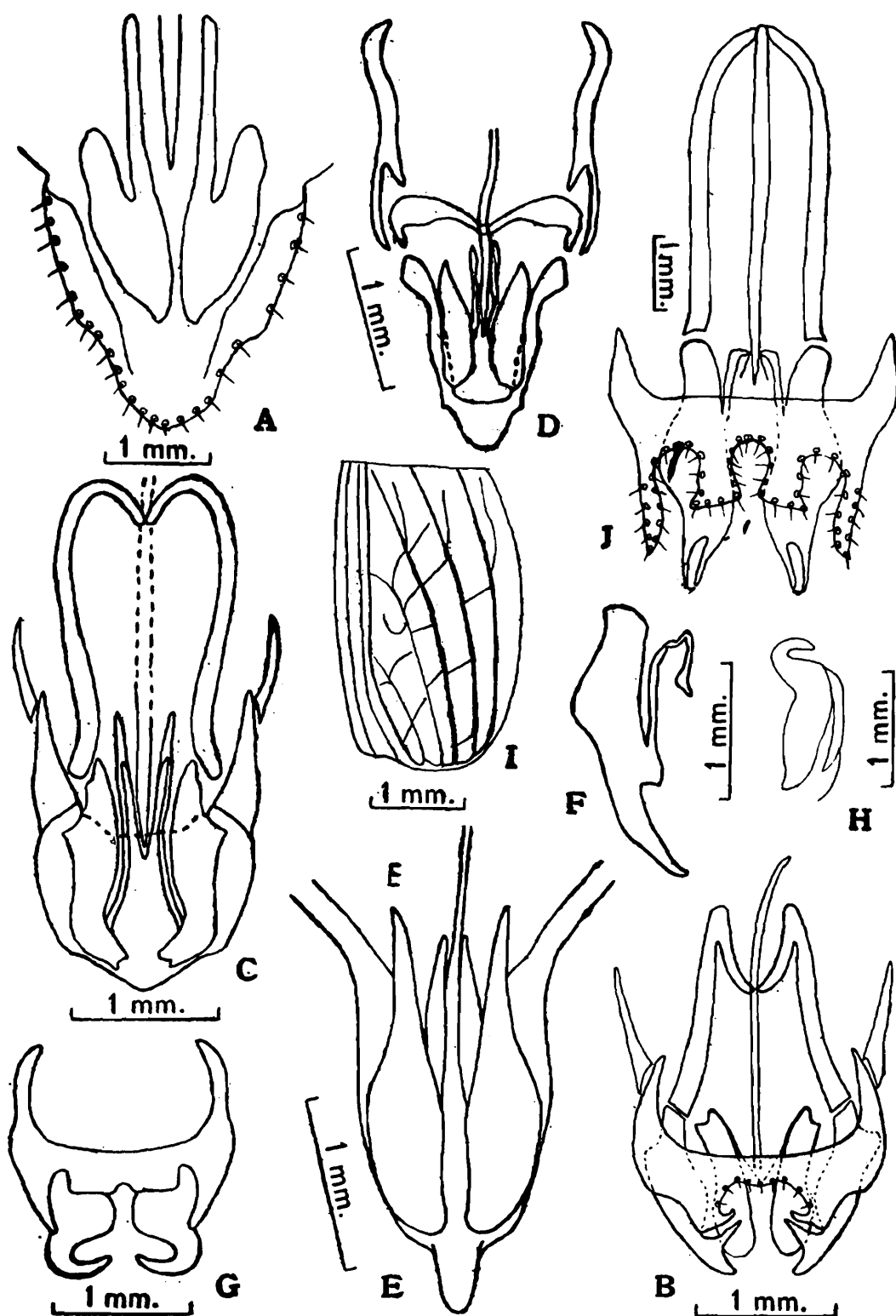
Genus (4) *Platygryllus* Chopard, 1961

6. *Platygryllus melanocephalus* (Serville) (Text-fig. 1C)

1839. *Gryllus melanocephalus* Serville, *Ins. Orth.*, 342.
1961. *Platygryllus melanocephalus* Chopard, *Eos*, 37 : 276; Randell, 1964, *Canad. Ent.*, 96 : 1598.

Material.—1 ♂, Hazaribagh, Bihar, ix-x. 1938; *H. S. Rao*. 1 ♂, Rajpur, Madhya Pradesh, xii. 1939; *H. S. Rao*. 1 ♂, Chhoma, Dist, Almorah, 1 ♂, Garhwal and 1 ♂, Dehra Dun, Uttar Pradesh; 4 ♀♀. Jawalamukhi, Dist. Kangra, Himachal Pradesh.

Remarks.—There is some confusion about the identity of the species, the type which is a female specimen from Bengal, being lost. The male is described here. Chopard (1969) gives the figure of genitalia and gives a very short description of a specimen which he considers as the male of the species. My observations supplement, however, his findings. Male: Body varies from deep wine to shiny black. Head small, smooth, shiny black, as wide as the pronotum in front; vertex not ornamented, moderately convex; frontal rostrum about one and half times as wide as the first antennal segment, converging at the



Text-fig. 1A. *Lenigryllus quadrimaculatus*, ♂ genitalia, apical portion, ventral view; B. *Modicogryllus confirmata*, ♂ genitalia, ventral view; C. *Platygryllus melanocephalus*, ♂ genitalia, ventral view; D. *Plebeiogryllus guttiventris*, ♂ genitalia, ventral view; E. *Teleogryllus testaceus*, ♂ genitalia, apical portion, ventral view; F. *Velarifictorus aspersus*, ectoparamere showing its attachment with mesal lobe, lateral view; G. & H. *Velarifictorus ceylonicus*, (G) ♂ genitalia, apical portion, dorsal view; (H) ectoparamere showing its attachment with mesal lobe, lateral view; I. & J. *Velarifictorus fallax*, (I) ♀ elytron; (J) ♂ genitalia, ventral view.

middle. Lateral ocelli prominent and rufous. Face, maxillary palpi and antennae concolourous with head but less shiny, transverse with a median longitudinal suture, pubescent with very fine hairs, evenly widened at posterior end, anterior margin concave, posterior one nearly straight or slightly obtuse; lateral lobes with somewhat rounded angles at both ends, concolourous with pronotum. Anterior tibia with a small round internal and a big oval external tympanum in each; posterior femora moderately stout; posterior tibiae with six external and five internal spines. Elytra brownish on the dorsal field except the humeral edge and a part of the basal anal field which are yellowish; mirror obliquely disposed, wider than long; supero-anterior and inferoposterior angles with somewhat rounded corners but other two more or less angulated, divided by a curved vein much below the middle, not united with the chords; four oblique veins, the first of which distinctly sinuate, other three slightly curved; diagonal almost straight; apical field prominent, clearly reticulated and with four curved veins and two false veins; the mediastinal vein with three to four branches; lateral field with six regularly spaced curved veins. Previously known from Bengal, Kashmir, Nepal and Burma, the species is reported here for the first time from Himachal Pradesh, Uttar Pradesh, Madhya Pradesh and Bihar.

Measurement.—Length of body ♂♂ 9.7—15.5, ♀♀ 11.0—16.0; length of pronotum ♂♂ 1.9—3, ♀♀ 2.5—3.3; width of pronotum ♂♂ 4—4.9, ♀♀ 4.3—5.3; elytra ♂♂ 7.2—12, ♀♀ 7.2—12.2; ovipositor 6.0—8.0. (measured 5 ♂♂ and 4 ♀♀).

7. *Platygyrillus brunneri* (Saussure)

1877. *Gryllus brunneri* Saussure, *Mem'm. Soc. phys. Hist. nat. Geneve*, **25** : 170.

1961. *Platygyrillus brunneri* Chopard, *Eos*, **37** : 276; Randell, 1964, *Canad. Ent.*, **96** : 1598.

Material.—1 ♀, Jodhpur, Rajasthan; 1 ♂, Taljhari, Santal Parganas, Bihar, 1 ♂, Muki, Dist. Balaghat, Madhya Pradesh.

Remarks.—This species is closely allied to *P. guttiventris* (Walk.) from which it differs in having a rufous tint on the occiput, frontal rostrum nearly twice as wide as the first antennal segment and with a median longitudinal suture, strongly arcuate clypeofrontal suture, more number of oblique veins (six) and also in the structure of the genitalia. The species is a new record for Bihar and Rajasthan.

Genus (5) *Plebeiogryllus* Randell, 1964

8. *Plebeiogryllus guttiventris* (Walker) (Text-fig. 1D)

1871. *Gryllus guttiventris* Walker, *Cat. Derm. Salt. Br. Mus.* **5**, suppl. 6.

1961. *Platygyrillus guttiventris* Chopard, *Eos*, 37 : 276.

1964. *Plebeigyryllus guttiventris* Randell, *Canad. Ent.*, 96 : 1598.

Material.—1 ♂, 1 ♀, Jabalpur, 1 ♂, Rajpur, and 1 ♂, Muki, Dsti. Balaghat, Madhya Pradesh; 9 ♂♂, 13 ♀♀, Dehra Dun, Uttar Pradesh; 1 ♂, Ajoy River, Santal Parganas, 3 ♂♂, 6 ♀♀, Chotanagpur, 1 ♂ Talihari, Santal Parganas (at light), 19.xii.1938. *H. S. Rao & H. A. Hafiz* 1 ♀, Hazaribagh, Bihar, 9.x.1938 *H. S. Rao*. 8 ♂♂, 8 ♀♀, Barasat, Calcutta, 3 ♂♂, 9 ♀♀, Hastings, Calcutta; 2 ♂♂, Botanical Garden, Calcutta; 1 ♂, 1 ♀, Anantapur, Dist. Hooghly, West Bengal; 11 ♂♂, 23 ♀♀, Behala, Calcutta (at light); 4 ♂♂, 1 ♀, Mysore University campus, Karnatak.

Remarks.—This is the only Indian representative of the genus. The members of the species are found in abundance in West Bengal during rainy season. The species differs in colouration depending on ecological conditions. The specimens (♂♂ 14-16, ♀♀ 13-14) at hand show the frontal rostrum more than one and half times as wide as the first antennal segment. Though the species is more or less common throughout oriental region, it is a new record for Uttar Pradesh, Madhya Pradesh and Santal Parganas.

Genus (6) *Teleogryllus* Chopard, 1961

9. *Teleogryllus mitratus* (Burmeister)

1838. *Gryllus mitratus* Burmeister, *Hand ent.*, 2 : 734.

1961. *Teleogryllus mitratus* Chopard, *Eos*, 37 : 277; Randell, 1964, *Canad. Ent.*, 96 : 1596.

Material.—6 ♂♂, 8 ♀♀, Subansiri Division (alt. 1585m.), 2 ♂♂, Kameng, (alt. 6500m), Arunachal Pradesh; 5 ♂♂, 4 ♀♀, 16 miles North of Imphal on Dimapur Road, Manipur; 2 ♂♂, Benaras, Uttar Pradesh; 1 ♀, Monghyr Fort, Bihar, 1 ♀, Chongpung, Sikkim.

Following specimens were collected from the South Andaman Island by B. S. Lamba, in March, 1964. Detailed localities are as follows: 3 ♂♂, 17 ♀♀, Manarghat, Mt. Harriet Range; 1 ♂, 4 ♀♀, Wright Myo, Mt. Harriet Range; 1 ♂, 1 ♀, Katan, Baratang; 1 ♂, 3 ♀♀, Rajahgarh, Baratang; 2 ♂♂, 6 ♀♀, Wrafters creek, Baratang; 1 ♂, Humphrygunj; 5 ♀♀, Mannarghat, Wright Myo; 1 ♂, 1 ♀, Burmal Nallah; 1 ♀, Renachang; 1 ♂, Port Blair; and 8 ♂♂, 7 ♀♀ nymphs from different localities.

Remarks.—The specimens studied exhibit the frontal rostrum narrower than one and half times as wide as the first antennal segment; clypeo frontal suture distinct and almost straight; eyes encircled by a characteristic yellowish band. Posterior femora longer than the

posterior tibia, each tibia with six internal and seven external spines, the superoexternal spur remarkably shorter than the intermediate external one (about half the size). Specimens from Arunachal Pradesh are usually shorter in size but darker in colouration and with more clear colour pattern on head.

Though the species is common throughout the oriental region, it has never been recorded earlier from Arunachal Pradesh, Manipur, Sikkim and South Andaman Island.

10. *Teleogryllus testaceus* (Walker) (Text-fig. 1 E)

1869. *Gryllus testaceus* Walker, *Cat. Derm. Salt. Br. Mus.*, 1 : 38.

1961. *Teleogryllus testaceus* Chopard, *Eos*, 37 : 277; Randell 1964, *Canad. Ent.*, 96 : 1956.

Material.—1 ♂, 1 ♀, Harjuga, Jabalpur, Madhya Pradesh; 1 ♂ Sahastra Dhara Hills, Dehra Dun, 3 ♂♂, Rajaji Sanctuary, Dist. Saharanpur, Uttar Pradesh; 1 ♂, 1 ♀, Mysore University campus, Karnatak, 1 ♀, Rajatgarh, Baratang, South Andaman; 1 ♂, 1 ♀, Port Blair.

Remarks. The species has the frontal rostrum convex, on profile narrowed at the middle, nearly as wide as the first antennal segment; clypeo frontal suture very slightly arched.

Genus (7) *Velarifictorus* Randell, 1964

11. *Velarifictorus aspersus* (Walker) (Text-fig. 1F)

1869. *Gryllus aspersus* Walker, *Cat. Derm. Salt. Br. Mus.*, 1 : 39.

1936. *Scapsipedus aspersus* Chopard, *Spol. Zeyl.* 20 : 29; B. Bienko, 1956, *Zool. Zh.*, 35., 2 : 224.

1964. *Velarifictorus aspersus* Randell, *Canad. Ent.*, 96 : 1587.

Material.—2 ♂♂, from Tudder Nala, Jammu and Kashmir, 12.ix.1964; *R. Tilak*. 1 ♂, Dehra Dun, Uttar Pradesh, 9.viii.1961. *S. Lal*.

Remarks.—The male specimens (12.7-13.2) studied have the frontal rostrum convex and about twice as wide as the first antennal segment; in posterior tibia the supero-internal spur subequal to supero-intermediate spur but the supero-external spur almost half of the supero-intermediate one. The species is reported here for the first time from Uttar Pradesh and Jammu-Kashmir.

12. *Velarifictorus ceylonicus* (Chopard)
(Text-fig. 1 G & H)

1928. *Scapsipedus ceylonicus* Chopard, *Rec. Indian Mus.*, 30 : 18; Chopard, 1969. *Fauna Ind. Grylloidea*, 2 : 113.

Material.—1 ♂, Mysore University campus, Karnatak, 1964, S. Vasantha and the types (deposited in Z.S.I.).

Remarks.—The specimens examined show the frontal rostrum about one and half times as wide as the first antennal segment. Clypeo frontal suture moderately arched at the middle. Male genitalia almost identical to that of *V. aspersus* but differs in the structure of ectoparamere and in the point of attachment of mesal lobe with it. Since its publication from Sri Lanka, it is the first reference of its occurrence in a place other than its type locality and is a new record from India.

13. *Velarifictorus bhadurii* (Bhowmik)

1967. *Scapsipedus bhadurii* Bhowmik, *Proc. zool. Soc. Calcutta*, 20 : 127.

The species was described from Dehra Dun and is now one more example of male specimen, has been available from Noorpur Forest Division, Dist. Gurdaspur (Punjab) which is identical to type.

14. *Velarifictorus fallax* (Chopard)
(Text-figs. 1 I & J)

1969. *Scapsipedus fallax* Chopard, *Fauna Ind Grylloidea*. 2 : 117.

Material.—3 ♂ ♂, 1 ♀, Mysore University campus, Karnatak, 1964, S. Vasanth.

Remarks. The species has the frontal rostrum slightly more than twice as wide as the first antennal segment and rounded when viewed from above, on profile slightly concave in the middle. Clypeo frontal suture moderately arcuate; ante clypeus concolourous with head and pronotum, but the apical portion of clypeus and mandibles rufous. Chopard (1969) described the species from Karnatak. The specimens examined here tally closely with original description save for their smaller size, shorter elytra and ovipositor.

SUMMARY

The paper deals with the studies of 14 species of Crickets distributed over 7 genera of the subfamily Gryllinae (Gryllidae: Orthoptera) of Indian fauna. *Modicogryllus calarellus* (Saussure) and *Velarifictorus*

ceylonicus (Chopard) are new records for India. The male of *Platygryllus melanocephalus* (Serville) is described in full for the first time and a number of new distributional localities are recorded for most of the species. *Acheta meyeri* (Chopard) is synonymised with *M. Clarellus* (Sours).

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NOTES ON A COLLECTION OF LYCTOCORINAE (HEMIPTERA : ANTHOCORIDAE) FROM GARO HILLS (MEGHALAYA)

By

N. MURALEEDHARAN

Zoological Survey of India, Calcutt

(With 3 Text-fig.)

INTRODUCTION

We owe greatly to Distant (1906, 1910) for his pioneering work on Oriental Anthocoridae. Since then not much is known except seven species recently described by Ghauri (1972) and three species by Mura-leedharan & Ananthakrishnan (1974*a*-1974*b*). Many more species still await discovery from the vast Indian subcontinent with its varied climate and rich vegetation.

The present paper deals with the anthocorids collected by the author during a recent survey to the Garo Hills, Meghalaya in September-October, 1975. It has been observed that anthocorids, especially the Lyctocorinae are well represented in the Garo Hills. Of the five tribes included under this subfamily, three tribes, namely *Cardiastethini*, *Scolopini* and *Xylocorini*, are represented in these hills. Gross (1955) has shown that the anthocorid fauna is rich in the tropics rather than in the temperate zones. This is especially true of anthocorids of the Garo Hills. The warm humid climate and comparatively dense rain forests of these hills seem to be favourable for these bugs.

I am thankful to the Director, Zoological Survey of India, Calcutta for the facilities provided.

SYSTEMATIC ACCOUNT

Order HEMIPTERA

Family ANTHOCORIDAE

Subfamily LYCTOCORINAE

Tribe CARDIASTETHINI

1. *Amphiareus constrictus* (Stal^o)

1860. *Xylocoris constrictus* Stal^o Rio Jan. Hemipt. 2 : 44
1871. *Poronotus constrictus* (Stal^o) Reuter, Ofvers. K. Vetensk Akad. Forh, 28 : 562.
1872. *Xylocoris fulvescens* Walker, Cat. Hemipt. Het. B. M., 5 : 160.
1872. *Xylocoris fumipennis* Walker, Cat. Hemipt. Het. B. M., 5 : 160.
1884. *Asthenidea constricta* (Stal^o), Reuter, Acta Soc. Sci. Fenn., 14 : 747.
1896. *Cardiastethus fulvescens* (Walker) : Lethierry & Servin, Cat. Gen. Hem., 3 : 250.
1896. *Cardiastethus* ? *fumipennis* (Walker) : Lethierry & Servin, Cat. Gen. Hem., 3 : 250.
1904. *Amphiareus fulvescens* (Walker) : Distant, Ann. Mag. nat. Hist., 14 : 221.
1904. *Poronotellus constrictus* (Stal^o) : Kirkaldy, Entomologist, 37 : 280.
1913. *Lasiochilus sladeni* Distant, Trans. Linn. Soc. Lond, 16 (2) : 185.
1958. *Cardiastethus macilentus* Hiura, Ent. Rev. Japan, 9 (2) : 39.
1965. *Amphiareus constrictus* (Stal^o) : Herring, Proc. ent. soc. Wash., 67 (3) : 202.
1972. *Amphiareus constrictus* (Stal^o) : Carayon, Ann. soc. ent. Fr. (N.S.), 8 (2) : 335.

Material.—2 ♂♂, 2 ♀♀, Meghalaya, Garo Hills, Songsak, 21.ix.1975. 2 ♀♀, Meghalaya, Garo Hills, Songsak, 19.ix.1975, (N. Muraleedharan).

Remarks.—This species has been the subject of much taxonomic controversy till Hering (1965) revealed its true systematic position. It is a very widely distributed species generally occurring in hay stacks, nests of birds and leaf litter.

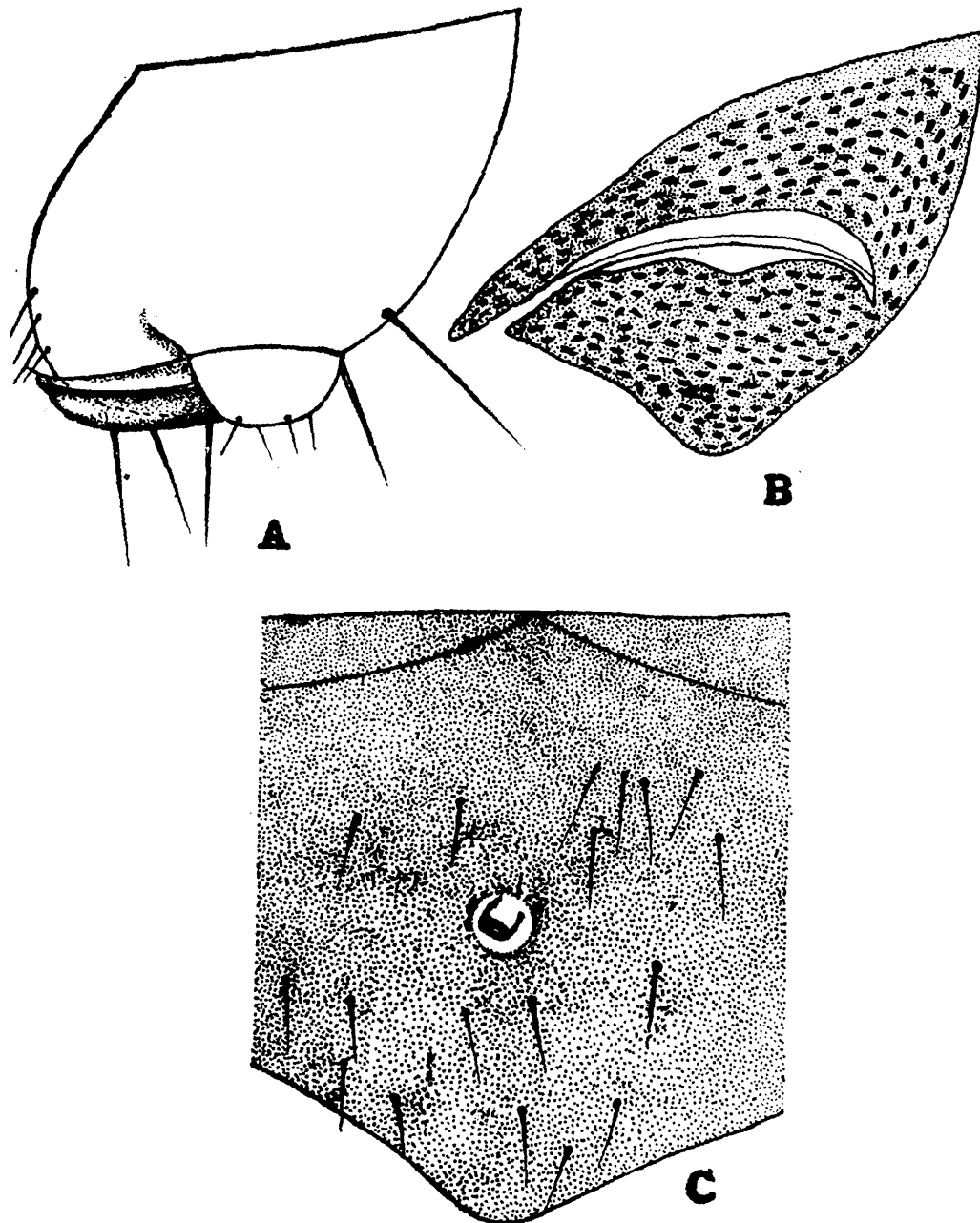
2. *Buchananiella indica* sp. nov.

(Text-fig. 1)

Body black. Antennal segments 1 and 2 yellowish-brown, 3 and 4 pale yellow. Rostrum yellowish-brown with apex dark. Head, pronotum and scutellum black. Legs uniformly yellow. Hemelytra with embolium, corium and clavus yellowish-brown, cuneus dark brown; membrane clouded. Ventral side of thorax and abdomen black.

Body densely pubescent. Head a little longer than wide. First segment of antenna reaching apex of head, second longest, third sub-equal to fourth. Rostrum short, reaching anterior margin of prosternum. Pronotum with a median callosity; lateral margins nearly straight and posterior border deeply concave. Scutellum setose with two fovea.

Legs not incrassate, foretibiae of males provided with a row of black teeth. Metathoracic scent gland canal curved posteriorly. Hemelytra reaching apex of abdomen; membrane with three veins. Long bristles present at posterior abdominal segments. Male genitalia without 'parameroid'. 'Omphalophore' in the form of a small circular opening.



Text-fig. 1.—*Buchananiella indica* sp. nov. A. Male genitalia, B. Scent gland, C. 'Omphalophore'

Measurements in mm.

	Male	Female
Length of head	0.34	0.34—0.40
Width of head across eyes	0.32	0.32—0.34
Length of antennal segment	1 0.08	0.08—0.10

Measurements in mm.

	Male	Female
„	2 0.27	0.25—0.30
„	3 0.15	0.15—0.17
„	4 0.18	0.18—0.20
Length of rostrum	0.34	0.35—0.42
Length of pronotum	0.25	0.25—0.30
Greatest pronotal width	0.59	0.46—0.51
Total length of body	1.90	2.46—2.51

Holotype: ♂ (Reg. No. 10144/H7), INDIA : Meghalaya, Garo Hills, Songsak, 19.ix.1975 (*N. Muraleedharan*). Paratypes: 3 ♀ ♀ (Reg. No. 10145/H7 to 10147/H7), same data as holotype, all in ZSI Colln.

The present bug resembles *B. crassicornis* Carayon in general appearance and colouration but can be readily separated from the latter by the nature of male genital clasper.

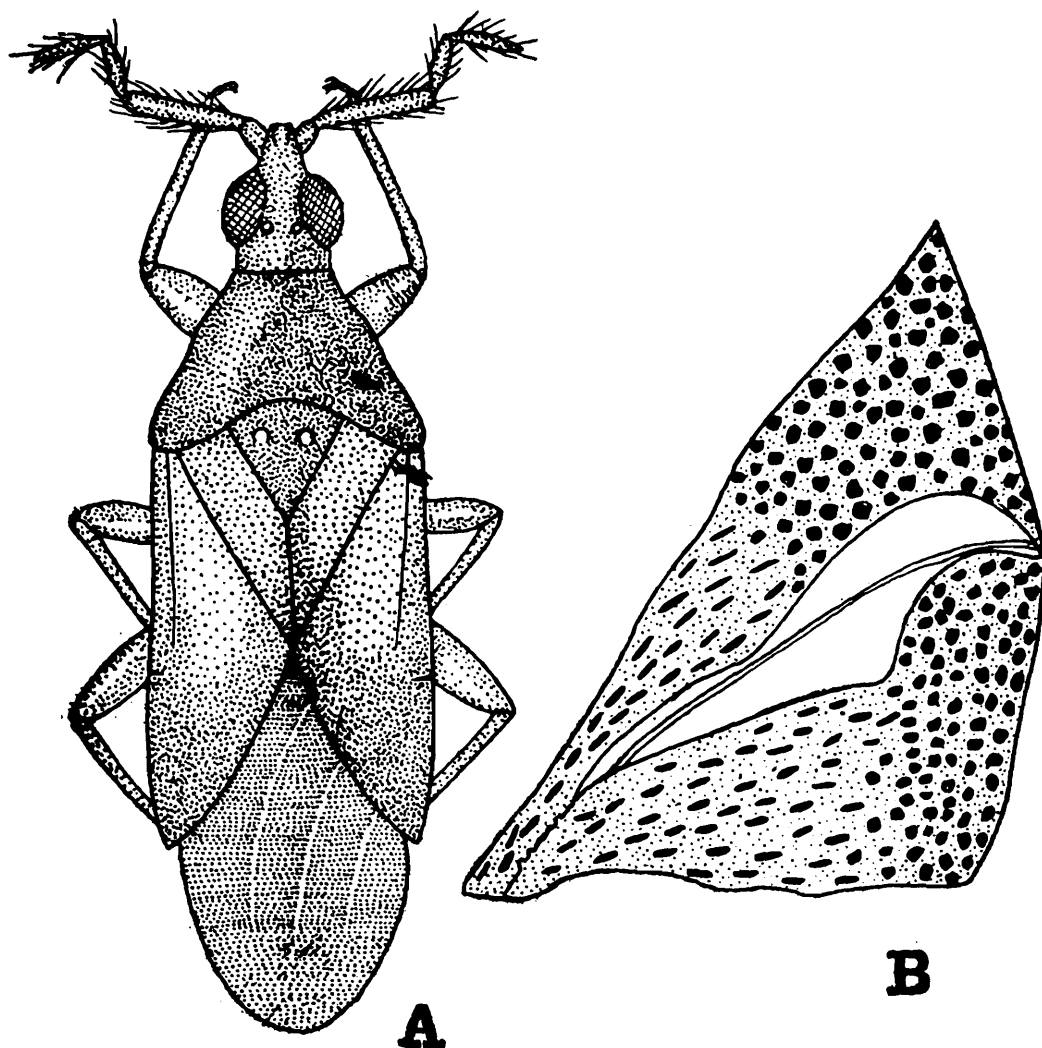
3. ***Buchananiella garoensis*** sp. nov.
(Text-fig. 2)

Body black. Antennal segments 1 and 2 black, 3 and 4 pale brown. Rostrum with apex yellow. Head, pronotum, scutellum and legs black. Hemelytra golden yellow with cuneus dark brown; membrane infumate

Head distinctly longer than wide. Rostrum reaching anterior margin of prosternum. Prothorax with median callosity; lateral margins nearly straight and posterior margin deeply concave. Scutellum bears two fovea. Hemelytra setose; membrane with three veins. 'Omphalophore' a circular opening.

Measurements of female in mm.

	Male
Length of head	0.39—0.42
Width of head across eyes	0.32—0.34
Length of antennal segment	1 0.10—0.10
„	2 0.30—0.42
„	3 0.25—0.28
„	4 0.18—0.22
Length of rostrum	0.34—0.42
Length of prothorax	0.25—0.28
Greatest pronotal width	0.61—0.71
Total length of body	2.38—2.72



Text-fig. 2.—*Buchananiella garoensis*, sp. nov. A. Adult ♀, B. Scent gland.

Holotype: ♀ (Reg. No. 10148/H7) : INDIA: Meghalaya, Garo Hills, Songsak, 19.ix.1975 (*N. Muraleedharan*). Paratypes: 3 ♀ ♀ (Reg. No. 10149/H7 to 10151/H7), data same as holotype (All in ZSI Colln.)

This species comes very close to the preceding one but can easily be differentiated by the dark colour of first and second antennal segments and legs and the longer second segment of antenna.

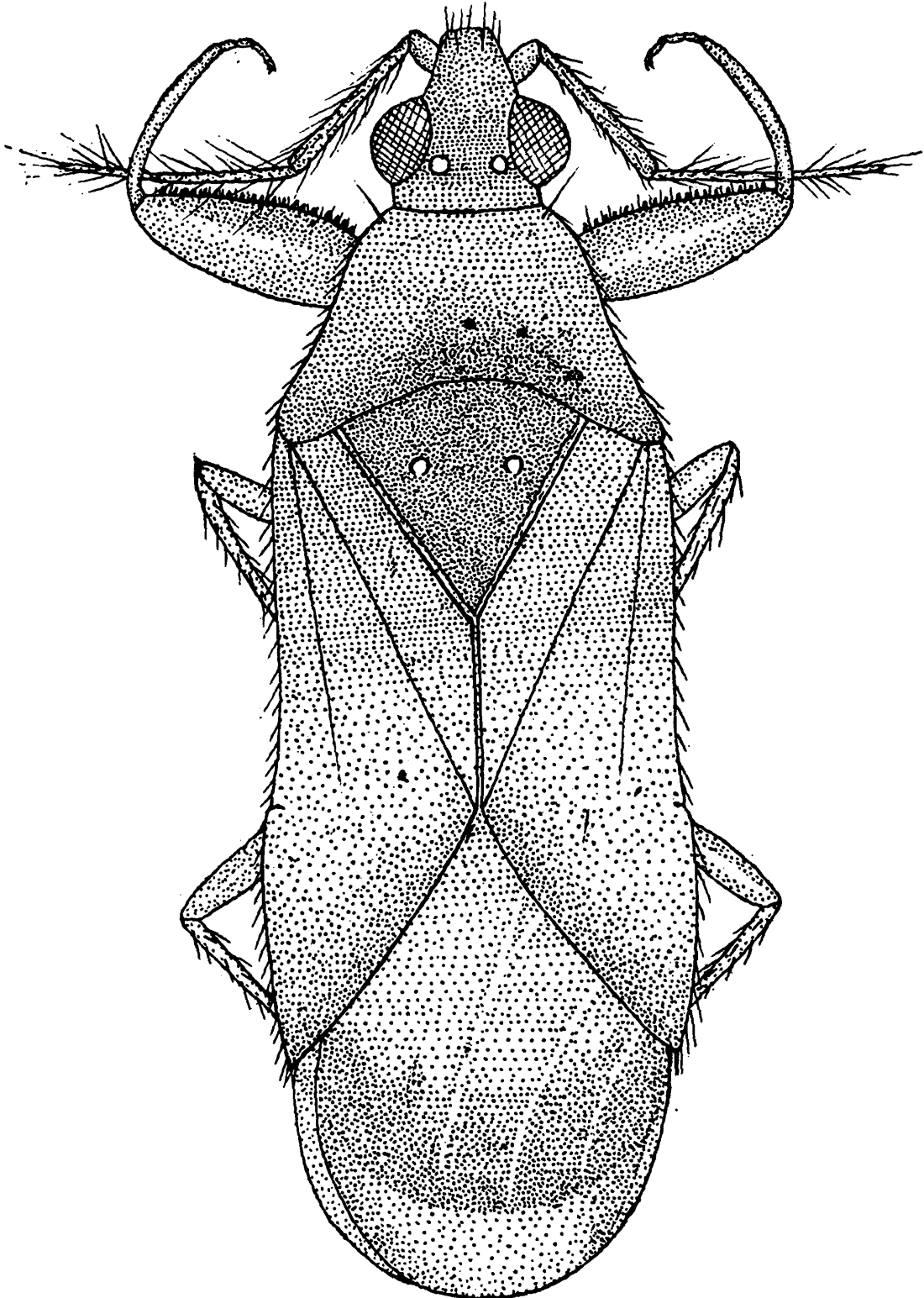
4. *Physopleurella vichitravarna* sp. nov.

(Text-fig. 3)

Body yellowish-brown. Antennae yellowish with apices of first and second segments dark. Rostrum uniformly pale yellow. Head yellowish-brown, posterior margin may be darker. Scutellum yellowish-brown to brown. Legs uniformly pale yellow. Hemelytra yellowish brown with dark brown cuneus. Meso and metasterna and ventro lateral regions of abdomen brown.

Body elongate, oval and densely setose. Head almost as long as wide. Eyes large. First antennal segment reaching apex of head, second

longest, fourth a little shorter than third. Rostrum very short, nearly reaching anterior margin of prosternum. Pronotum with two callosities and lateral carinae feebly developed. Anterior pronotal margin straight, lateral margins sinuate and posterior margin deeply concave. Scutellum depressed anteriorly with two fovea; lateral margins serrate. Forefemora incrassate and beset with two rows of spines, each row bearing 25-30 spines; foretibiae arched. Hemelytra extending to apex of abdomen; membrane with three veins, the inner one forked at base. Ostiolar canal curved anteriorly. Apex of abdomen with long bristles.



Text-fig. 3.—*Physopleurella vichitravarna*, sp. nov. Adult ♀.

Measurements of female in mm.

Length of head	0.37—0.39
Width of head across eyes	0.40—0.47
Length of antennal segment	1 0.08—0.10
„	2 0.37—0.52
„	3 0.22—0.35
„	4 0.20—0.34
Length of rostrum	0.30—0.35
Length of prothorax	0.34—0.35
Greatest pronotal width	0.83—1.01
Total length of body	2.67—3.62

Holotype: ♀ Reg. No. 10152/H7), INDIA: Meghalaya, Garo Hills, Songsak, 19.ix.1975. *N. Muraleedharan*). Paratypes: 2 ♀ ♀, (Reg. No. 10153/H7, 10154/H7) same data for holotype; 2 ♀ ♀, (Reg. No. 10155/H7-10156/H7) INDIA: Meghalaya, Garo Hills, Dainadubi, 12.ix.1975, (*N. Muraleedharan*), all in ZSI Colln.

The present species shows some similarities in colouration to *P. armata* Poppius but can be easily distinguished by the sinuate lateral margins of pronotum.

Tribe SCOLOPINI

5. *Scoloposcelis parallelus* (Motschulsky)

1863. *Anthocoris parallelus* Motschulsky, *Bull. Soc. nat. Moscou.*, 36 (3) : 89.
 1885. *Scoloposcelis parallelus* (Motschulsky) : Reuter, *Acta Soc. Sci. Fenn.* 14 : 717.
 1906. *Scoloposcelis parallelus* (Motschulsky) : Distant, *Fauna Brit. India Rhynch* 3 : 7.
 1909. *Scoloposcelis picicornis* Poppius, *Acta Soc. Sci. Fenn.* 39 : (9) : 26.
 1909. *Scoloposcelis parallelus* (Motschulsky) : Distant, *Fauna Brit. India Rhynch* 5 : 304.
 1909. *Scoloposcelis parallelus* (Motschulsky) : Poppius, *Wien ent. Ztg.* 29 : 140
 1954. *Scoloposcelis paralleus* (Motschulsky) : Gross. *Rec. S. Aust. Mus.* 11. (2) : 155.

Material.—4 ♂ ♂, 4 ♀ ♀, INDIA: Meghalaya, Garo Hills, Dainadubi, 13.ix.1975 (*N. Muraleedharan*).

Remarks.—*S. parallelus* (Motschulsky) is widely distributed in the Indo-Australian region. During the present survey, it has been observed that this species occur under barks of fallen trees, living among large colonies of *Dinothrips sumatrensis* Bagnall feeding on their eggs and larvae.

Tribe XYLOCORINI

6. *Xylocoris* (*Proxylocoris*) *clarus* (Distant)

1906. *Septicius clarus* Distant, *Fauna Brit. India Rhynch.* 5 : 295.
 1972. *Xylocoris clarus* (Distant): Carayon, *Ann. Soc. ent. Fr. (N.S.)* 8 (2) : 347.
 1972. *Xylocoris* (*Proxylocoris*) *clarus* (Distant) : Carayon, *Ann. Soc. ent. Fr. (N.S.)* 8 (3) : 597.

Material.—1 ♀, Meghalaya, Garo Hills, Songsak, 21.ix.1975
 (N. Muraleedharan).

Remarks.—Distribution in West Bengal, South India and Burma.

SUMMARY

This paper deals with six species of Anthocoridae from the Garo Hills. Of these, three species, namely *Buchananiella indica*, *Buchananiella garoensis* and *Physopleurella vichitravarna*, are new and the remaining three, viz. *Amphiareus constrictus* (Stål), *Scoloposcelis parallelus* (Motschulsky) and *Xylocoris* (*Proxylocoris*) *clarus* (Distant), are recorded for the first time from these hills.

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FAUNA OF RAJASTHAN, INDIA, PART . REPTILIA

By

S. BISWAS and D. P. SANYAL

Zoological Survey of India, Calcutta

INTRODUCTION

(1) *General*

The present work on Rajasthan reptiles is based largely on the extensive collections in the Zoological Survey of India made during faunistic surveys between the years 1941 to 1965.

Though the reptile fauna of India as whole is fairly well studied and Smith's works (1931, 1935, 1943) are valuable, there is no consolidated faunistic work on Rajasthan reptiles. In this connection the work of Blanford (1879) on a collection from the Ajmer area and Murray's (1884) work mainly on the reptiles of Sind are worth mentioning. The papers of Krishna and Dave (1959, 1960), and Dave (1960) on the collections from the Jodhpur area and Sunder Singh's work (1960) from Pilani area are ecological, not taxonomic.

For general account of the topography, climate, vegetation etc. of Rajasthan, and also for details of the collecting stations cited here see part I (General introduction) this series of papers (Roonwal, 1963).

Collections made subsequent to those mentioned in Roonwal's paper have been cited in Table 1 below. The eastern zone is comparatively less surveyed for reptiles and some districts (Alwar, Dungarpur, Banswara, Bundi, Swai Madhopur, Jalore) have not been surveyed at all. Some earlier collections included in the present study are those collection O.B.St. John from Ajmer (worked out by Blanford, 1879) and of G. S. Sutherland's (Mt. Abu) and N. Belletty from Rajputana (no date).

Altogether 333 specimens comprising 28 species, and 7 subspecies belonging to 28 genera and 12 families were examined. Of these 14 species and 2 subspecies are new records from Rajasthan. One species, *Crocodilus palustris* Lesson, is observed in the field only by the author (S. B.).

(2) List of collections examined

The collections were made in the following surveys (Table I).

Table 1. List of surveys from which the material for Rajasthan Reptilia was studied.

Name of the survey	Year	Leader of survey party or collector	Districts surveyed
Rajasthan Survey	1941	Drs. B. N. Chopra and M. L. Roonwal	Udaipur
Rajasthan Survey	1948	Shri K. S. Pradhan	Sirohi
Purchased	1957	Dr. S. D. Gupta	Bikaner
Rajasthan Desert Survey	1956 1957 1958	Dr. B. Biswas	Jaipur, Nagaur, Bikaner, Sikar and Ganganagar.
Western Rajasthan Survey	1957—58	Dr. K. K. Tiwari & Shri S. Biswas	Jodhpur, Barmer and Jaisalmer
Sambhar Lake Survey	Nov.' 57—Jan.' 59	Shri T. G. Vazirani Shri A. K. Mukherjee Shri S. Biswas	Nagaur and Jaipur.
Jodhpur Survey	1960	Shri R. K. Bhatnagar	Jodhpur
Rajasthan Desert Survey	1960-61	Dr. B. Biswas	Bikaner
Rajasthan Survey	1962	Dr. P. D. Gupta	Barmer and Jodhpur
S. E. Rajasthan Survey	1963	Dr. N. Majumdar	Jhalawar
Rajasthan Survey	1963 & 1964	Shri K. K. Mahajan	Ajmer, Udaipur, and Jaisalmer.
Southern Rajasthan Survey	1964	Dr. P. D. Gupta	Udaipur, Kotah, and Chittorgarh
Southern Rajasthan Survey	1965	Shri S. Biswas	Ajmer, Udaipur, Sirohi, Chittorgarh, Bhilwara & Kotah.

(3) Acknowledgements

The authors are thankful to the Director, Zoological Survey of India for allowing them facilities to work out the old collections, particular thanks are due to Dr. M. L. Roonwal, Ex-Director of the Z.S.I. without whose encouragement this paper would not have been completed.

COLLECTING LOCALITIES

The reptiles examined were collected from a total of 80 collecting stations distributed over 17 districts of Rajasthan.

For the Map of Rajasthan showing most of the collecting localities please consult the Map, Plate 9, Fauna of Rajasthan Part I (Roonwal, 1963).

Abbreviations

AKM, Dr. A. K. Mukherjee; BB, Dr. B. Biswas; BNC, Dr. B. N. Chopra; GSS, G. S. Sutherland; IP, Iswar Prakash; JC, Jaswant College; KKM, K. K. Mahajan; KKT, Dr. K. K. Tiwari; KSP, K. S. Pradhan; MLR., Dr. M. L. Roonwal; NM., Dr. N. Majumdar; NB, N. Belletty; PDG., Dr. P. D. Gupta; RKB, R. K. Bhatnagar; SB, S. Biswas; SDG., Dr. S. D. Gupta; TGV, Dr. T. G. Vazirani.

SYSTEMATIC ACCOUNT

Order I LORICATA

Family (1) CROCODILIDAE

1. *Crocodilus palustris* Lesson

The mugger or marsh crocodile.

1834. *Crocodilus palustris* Lesson, in Belang. *Voy. Ind. orient. Zool.* : 305.

Remarks.—Though absent in the present or earlier collections, it was observed by the author in the Pichola Lake, Udaipur, and Budha Pushkar, Ajmer. Blanford (1879) also mentioned about its occurrence in the Pushkar Lake (near Ajmer) and in a small tank in Chittor hill. The species is now reported to breed in Jaipur (Prakash, 1971 b), it is becoming rarer day by day in Rajasthan.

Order II TESTUDINES

Suborder *THECOPHORA*

Family (2) TRIONYCHIDAE

2. *Lissemys punctata granosa* (Schoepff)

1972. *Testudo granosa* Schoepff, *Hist. Test.* : 127, pls. XXX A & B.

Material.—Ajmer Dist: 1 ex., Anasagar, 17, viii.1965 (coll. SB). Jodhpur Dist.: 1 ex, Sta. 10, Bisalpur, 14.x.1962 (coll. PDG), 4 ex., Jodhpur, viii.1960 (coll. RKB). Jaipur Dist.: 1 ex., Sta. 6, Devdyani, Sambhar town, 7.x.1963 (coll. KKM).

Measurements :

<i>Reg. No.</i>	<i>Length</i> (in mm)	<i>Breadth</i> (in mm)	<i>Remarks</i>
21129	73	68	Entoplastron Callosity absent
21151	95	78	„ „
21007	210	165	„ „
21007	184	152	„ present
21007	232	172	„ „
21007	295	192	„ „

Distribution.—Rajasthan : Localities mentioned above (First record from Rajasthan). *Elsewhere*: India: Barakar, Kasai, Mahanadi and Godavari rivers; Indian Peninsula south of the Ganga : Tamil Nadu, Maharashtra, Gujarat (Kutch).

Remarks.—Measurements given above show that the young are nearly round, but with growth they become more elongate. Excepting in the young the callosities on the plastron are not prominent, and the entoplastron callosity is absent. This subspecies differs from the typical one in having entoplastral callosity moderate in the adult, and in the presence of longitudinal streaks in the head of young, and in the carapace being uniformly brown.

Family (3) TESTUDINIDAE

3. *Testudo elegans* Schoepff

1972. *Testudo elegans* Schoepff, *Hist. Test.* : 111 pl. XXV.

Material.—Bhilwara Dist.: 1 ex. near Pandal village, Bhilwara town, 13.ix.1965. (coll. SB).

Measurements.—Length 170 mm, breadth 105 mm.

Distribution.—Rajasthan; Pandal village, Bhilwara town. *Elsewhere*: India: Central and Southern India, extending West as far as Sind. Also in Sri Lanka.

Remarks.—One typically coloured male was collected near a maize field in a grassland.

Prakash (1971 *a*) also recorded this species at Bisalpur, about 5 km. north of Jawai Bandh Rly. Stn. on the Western side of the Aravallis; he also studied its food habits.

Order SQUAMATA

Suborder SAURIA

Family (4) GEKKONIDAE

4. *Stenodactylus orientalis* Blanford

1876. *Stenodactylus orientalis* Blanford, *J. Asiat. Soc. Bengal* 45 : 21, pl. 1, fig. 2.

Material.—Bikaner Dist.: 1 ex. Kolayat, 12.ix.1960, 1 ex. Pugal, 19.ix.1960, (Coll. *BB*).

Measurements.—Length Largest, snout to vent 51 and 55 mm., tail 42 and 46 mm. In one example 12 upper and 11 lower labials; in the other both 11.

Distribution.—Rajasthan: As above (first record from Rajasthan) *Elsewhere*: Khairpur, from hills of Larkana, Rohri and Hala in Sind (Pakistan) and Iran.

Remarks.—Three or four indistinct brown transverse bars over the body of our specimens are distinguishable but those on the tail are prominent and 12 in number.

Of the three species from the Indian Region only the present one occurs in the Indian desert, the other two are from Baluchistan and Afghanistan. The present species differs from its nearest ally *S. lumsdeni* Boulenger, by having a shorter snout, longer limbs, smooth ventral scales.

5. *Gymnodactylus scaber* (Heyden)

1827. *Stenodactylus scaber* Heyden, *In Rüppell, Atlas N. Afr. Rept.* : 15, pl. 4 fig. 2.

Material.—Bikaner Dist.: 1 ex., Pugal, 21.ix.1960 (coll. *BB*). Jaisalmer Dist.: 2 exs., Jaisalmer town, 9.i.1958, 1 ex., on way to Josirasar, 21.1.1958; 2 ex., Pokran, 22.xii.1957 (coll. *KKT & SB*).

Measurements.—Length 2 ♂♂ : Snout to vent, 42, 43 mm., tail 55, 63 mm. 3 ♀♀ 28, 42 and 46.5 mm.; tail 37, 59, 63 mm.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan). *Elsewhere*: Pakistan (Salt Range, Punjab; Sahasan, Sind; Malakand and Waziristan, N.W.F. Province) Afghanistan, Iran, Iraq, Arabia and Egypt.

Remarks.—Common throughout its range, of particularly in the Western Rajasthan usually found in pair on trees and walls.

Except in the young, the lateral fold is rather distinct. The longitudinal series of large subtriangular tubercles on the back are also arranged more or less in transverse rows (22-23 rows from neck to groin). At least three rows of longitudinally arranged brown spots and 12-13 dark bands on the tail could be seen,

This species is very near to *G. montium-salsorum* Annandale (based on only four specimens from the Salt Range, Punjab) but can be differentiated by the presence of preanal pore only (in the other species, the preanal and femoral pores are continuous).

6. *Hemidactylus brooki* Gray

1845. *Hemidactylus brooki* Gray, *Cat. Liz. Brit. Mus.* : 153.

Material.—Ajmer Dist.: 5 ex., Sta. 8, Anasagar, 2. x.1964 (coll. *KKM*). Bhilwara Dist.: 3 ex., Harnai Vill., 4 km. SW of Bhilwara, 16.ix.1965 (coll. *SB*). Chittorgarh Dist.: 1 ex., Chittorgarh fort, 6.ix.1965; 2 ex., near Berach river, 3 km. SW. of Chittorgarh Dakbunglow, 7.ix.1965 (coll. *SB*). Jaipur Dist., 1 ex., Bisalpur, 6.vii.1960 (coll. *RKB*). Nagaur Dist.: 2 ex., between Indana and Didia, 4.ix.1960 (coll. *BB*). Sirohi Dist.: 1 ex., Sta. 12, Nakki lake, 7.ix.1964 (coll. *KKM*).

Measurements.—Length Snout to vent: 21-51 mm.; tail 24 mm.

Distribution.—Rajasthan: As above (first record from Rajasthan). *Elsewhere*: India: Whole of India. Also Sri Lanka, Burma, China, SE. Asia, North Africa and West Indies.

Remarks.—This is a common gecko of Rajasthan. Out of the 15 examples examined, four were males.

This species is easily separated from all other species belonging to the group in which there are regularly arranged larger tubercles on the back and in having 8 to 10 lamellae under the fourth toe. Another species of this group which occurs in Rajasthan is *H. triedrus* Daudin.

7. *Hemidactylus leschenaulti* Dumeril & Bibron

1836. *Hemidactylus leschenaulti* Dumeril & Bibron, *Erp. Gen.* 3 : 364.

Material.—Barmer Dist.: 1 ex., Balotra, 9.ii.1958 (coll. *KKT & SB*). Nagaur Dist. 1 ex., Gudha, 2.viii.1958 (coll. *AKM*).

Measurements.—Length snout to vent 42 mm., tail 46 mm.

Distribution.—Rajasthan: Western Rajasthan (South of Jaisalmer, and as above). *Elsewhere*: India: Annamalai, Nilgiri and Palkonda Hills, Madras, Ramnad, Malabar, Godavari valley, Belgaum Dist., Bombay, Surat, Nagpur, Ellora, Khandesh and Calcutta (?) Also Sri Lanka.

8. *Hemidactylus flaviviridis* Rüppell

1835. *Hemidactylus flaviviridis* Rüppell, *Neue Wirb : Fauna. Abyss.* : 18, pl. VI. fig. 2.

Material.—Barmer Dist.: 1 ex., Jorbir, 11.i.1957 (coll. *BB*). 2 ex., Barmer town, 6.xi.1958 (coll. *KKT & SB*). Bikaner Dist.: 1 ex., Pugal,

24.ix.1960. Churu Dist.: 1 ex., Taranagar, 26.x.1960 (coll. *BB*). Chittorgarh Dist.: 1 ex., Chittorgarh fort, 10.ix.1965 (coll. *SB*). Jaipur Dist.: 2 ex., Sta. 4a, PWD, Rest House, Sambhar lake, 5.x.1963. 1 ex., Bazarnagar, 26.ix.1963 (coll. *KKM*); 1 ex., Dudu, 8.i. 1959 (coll. *SB*); 3 ex., P.W.D. Rest House, Sambar lake (coll. *AKM*). Jaisalmer Dist.: 2 ex. Nokh, 22 & 28.viii.1960 (coll. *BB*). Jodhpur Dist.: 1 ex., Phalodi, 16.xii.1967 (coll. *KKT* & *SB*), Nagaur Dist.: 2 ex., Gudha, 3.iii.1958 & 17.vi.1957. 2 ex., Nawa, 12.iv. 1958 (coll. *TGV*); 4 ex. Gudha, 29.iv.1957 & 14.vii.1958 (coll. *AKM*); 2 ex., Gudha, 1.xii.1958 (coll. *SB*); 2 ex., Nagaur, 2.ix.1960 (coll. *BB*). Udaipur Dist.: 1 ex., Udaipur, 2.ix.1965, (coll. *SB*).

Measurements.—Length: Snout to vent 60-84 mm.; tail 86 mm.

Distribution.—Rajasthan: Ajmer (*O. B. St. John's* coll.) and as above. *Elsewhere*: India: North India from West Bengal to the Punjab upto south of lat. 20° Also Bangladesh, in the west Iran and Arabia to the shores of Red Seas; Pakistan, Sind, Salt Range, Rawalpindi.

Remarks.—According to Smith (1935) it is the northern representative of *H. leschenaulti* Dum. & Bibr. from which it differs in the following characters: 12 to 15 upper and 10 to 12 lower labials, 7 to 10 lamellae under the first toe, 11 to 14 under the fourth; back with fewer enlarged tubercles; males with 5 to 7 femoral pores on each side.

Family (5) AGAMIDAE

9. *Sitana ponticeriana* Cuvier

1844. *Sitana ponticeriana* Cuvier, *Guerin, Icon. Reg. Anim. Rept.* Pl. X. fig. 2.

Material.—Jaipur Dist.: 1 ex., Sta. 11, 3 km. south of Kotputli Bus Station, 10.vi.1963 (coll. *NM*).

Measurements.—Length: Snout to vent 39 mm., tail (Broken), 62 mm. hindlimb 37 mm.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan.) *Elsewhere*: India: whole of India up to Himalayan foothills except Bengal east of Ganges, but there is a specimen from Haldibari, (North Bengal). Also Sri Lanka.

Remarks.—The above specimen was collected under a log. It belongs to the smaller form out of two forms mentioned by Smith (*loc. cit.*) due to the following characters : tail more than twice the length of head and body, hindlimb reaching the tip of snout, labial and occipital scales intermixed with larger.

There are five dark brown black-edged rhomboidal spots along the middle of the back and an elliptical one on the tail.

10. *Calotes versicolor* (Daudin)

1802. *Agama versicolor* Daudin, *Hist. Nat., Rept.* 3 : 395.

Material.—Ajmer Dist.: 1 ex., Sta. 7, by the side of the Jaipur road, 20.ix.1964 (coll. *KKM*). Barmer Dist.: 2 ex., Barmer, 6.xi.1958 (coll. *KKT & SB*). Bikaner Dist.: 1 ex., Bikaner, Oct. 1956; 1 ex., Kolayat, 13.ix.1960 (coll. *BB*). 24 ex., Bikaner, (coll. *SDG*). Jaipur Dist.: 1 ex., Bazaznagar, 24.ix.1963 (coll. *KKM*); 1 ex., Sambhar Lake, 28.iv.1957; 1 ex., Devdyani, Sambhar lake, 13.v.1958, (coll. *AKM*); 1 ex., Koni, 24.vi.1958; 2 ex., Phulera, 17.v.1958; 1 ex., Naraina, 23.iii.1958 (coll. *TGV*). Jaisalmer Dist.: 1 ex., Sta. 13, Jaisalmer, 28.x. 1962; 1 ex., Sta. 5, Badebagh, Jaisalmer, 14.viii.1964 (coll. *PDG*). Jhalawar Dist.: 1 ex., Sta. 30, Ahu river, 26.iii.1963 (coll. *NM*). Jodhpur Dist.: 1 ex., Sta. 10, Jodhpur, Oct. 1963 (coll. *PDG*); 1 ex., Umed Sagar, Jodhpur, 22.xii 1956; 1 ex., Kaylana Desert afforestation area, 13.xii.1956 (coll. *BB*); 1 ex., Bishalpur, 6.vii.1960 (coll. *RKB*). Nagaur Dist.: 1 ex., Merta, 29.xii.1956; 1 ex., Kharnal, 6.ix.1960; 1 ex., Barni, 5.ix.1960; 1 ex., Balaia, 6.ix.1960 (coll. *BB*); 1 ex., Gudha 20.ii.1958 (coll. *KKT & SB*); 2 ex., Nandana Nadi, 28.vii.1958; 2 ex., Gudha, 8.vii.1958 (coll. *AKM*). 2 ex., Lihorana, April 1958; 1 ex., Lihorana, 6.v.1958; 2 ex., Gudha, 9.iii.1958; 1 ex., Gudha, 18.v.1958; 1 ex., Gudha, 3.vii.1958 (coll. *TG*). Pali Dist.: 1 ex., Pali, 1 ex., Pali, 4.xii.1956 (coll. *BB*). Udaipur Dist.: 1 ex., Barapal, 14.x.1941; 2 ex., Udaisagar Lake, 11.x.1941; 1 ex. Palsad, 18.x.1941 (coll. *MLR*).

Measurements.—Length: Snout to vent 74-180 mm., tail 179-270 mm.

Distribution.—Rajasthan: Ajmer (*O. B. St. John*); Jaipur and Udaipur (*Blanford*) and as above. *Elsewhere*: India: Common throughout India and the Andaman Islands. Also Pakistan (Sind and Baluchistan), Afghanistan, Sri Lanka, Nepal, Burma Borneo, northern part of Malay Peninsula, Indo-China, Hainan, Hongkong and South China.

Remarks.—This is the most common lizard of Rajasthan. It is very common in the summer and rainy seasons but is conspicuously absent in winter.

In a full grown male the dorsal scales are bordered white and brown within, gular pouch white and well developed, throat black.

This species comes very near to *C. bhutanensis* Biswas, which differs from *versicolor* in its short snout, two rows of erect scale by the two sides of the neck and the characteristic colour pattern.

11. *Agama agilis* Olivier

1807. *Agama agilis* Olivier, *Voy. Emp. Ortho.* iv. : 394; *Atlas* (12) pl. XXIX, fig. 2.

Material.—Barmer Dist.: 1 ex., Pachpadra, 11.ii.1958 (coll. *KKT & SB*). Bikaner Dist.: 5 ex., Kolayat; 1 ex., Kolayat, 12.ix.1960; 1 ex., Pugal, 20.ix.1960; each day 1 ex., Pugal, on 18.ix.1960; 29.ix.1960; 22.ix.1960; 23.ix.1960; and 3 ex. on 25.ix.1960; 1 ex., Lunkaranasar viii., 30.ix.1960; 1 ex., Kotri, 15.ix.1960 (coll. *BB*). Ganganagar Dist.: 2 ex., Suratgarh 9.x.1960 (coll. *BB*). Jaipur Dist.: 1 ex., Sambhar Lake town, 17.vi.1958 (coll. *TGV*). Jaisalmer Dist.: 3 ex., Nokh, 24.viii.1960 (coll. *BB*).; 12 ex., Sta. 13, Jaisalmer, 22.x.1962 (coll. *PDG*). Jodhpur Dist.: 1 ex., Sta. 6, Phalodi, 25.viii.1964 (coll. *KKM*); 1 ex., Jodhpur, (Donor, *J.C.*). Nagaur Dist.: 1 ex., Lihorana 6.v.1958 (coll. *TGV*).

Measurements.—Length: Snout to vent 34-106 mm.; tail 60-176 mm.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan and from India). *Elsewhere*: Pakistan (Sind, Punjab, Baluchistan), Afghanistan and Iran.

Remarks.—9 juveniles in the collection differ from adults in the following characters:—Pointed projections of scales within tympanum not prominent (absent in some), occipital spines and spine posterior to tympanum not well developed; parietal region convex; fourth toe longer than third; crossbars more prominent (in adults, colouration is nearly uniform).

12. *Uromastix hardwickii* Gray.

1827. *Uromastix hardwickii* Gray, *Zool. J.* 3 : 219.

Material.—Bikaner Dist.: 5 ex., Lunkaransar, 3.x.1960 (coll. *BB*), 2 ex., Sta. 6, Bikaner, 5.x.1962 (coll. *PDG*). Ganganagar Dist.: 2 ex., Nohar, 14.x.1960; 1 ex., Charano-ki-Dhani, 18.x.1960; 1 ex., Diplana, 13.x.1960; 1 ex., Sothi, 14.x.1960 (coll. *BB*). Jaisalmer Dist. : 2 ex., Mohangarh, Jan. 1958 (coll. *KKT & SB*).

Measurements.—Length : Snout to vent 135-183 mm.: tail 100-123 mm.

Distribution.—Rajasthan: Bikaner (*S. D. Gupta*) and as mentioned above. *Elsewhere*: India: North-Western India as far east as Uttar Pradesh. Pakistan (Sind, Baluchistan and Punjab).

Remarks.—Differs from *U. asussi* (Strauch), the species which meets it at the fringe of its distribution, (Baluchistan and Afghanistan) in having 20 to 24 comparatively small spines in a cross series at the base of tail.

The observations made by Smith (1935) hold true in case of specimens from Sind, Pakistan and Kathiawar, Saurashtra. The specimens of this area are usually larger in size and the enlarged dorsal scales are

arranged in cross series. Further, spines on the dorsal base of the tail are less sharp, blunt and flat at the base.

Family (6) SCINCIDAE

13. *Mabuya macularia* (Blyth)

1853. *Euprepes macularius* Blyth, *J. Asiat. Soc. Beng.* 22 : 652.

Material.—Ajmer Dist.: 1 ex., Sta. 71, by the side of Jaipur road, Ajmer, 1.x.1964 (coll. KKM).

Measurements.—Length: Snout to vent 40 mm., tail broken.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan). *Elsewhere*: India: Throughout. Also Pakistan (Sind and Rawalpindi), Indo-China, Malay-Peninsula, Burma and Sri Lanka.

Remarks.—Smith (1935) distinguished five geographical "forms"; the present example conforms to the second "form" due to the presence of 28 scales round the body, dorsal and lateral scales with 5 feeble keels the legs reaching wrist or elbow, the colouration uniformly brown above and the flank not spotted. *M. macularia* and *M. carinata* (Schneider) in most of their characters come very near to each other and even the differences overlap.

14. *Ablepharus grayanus* (Stoliczka)

1872. *Blepharosteres grayanus* Stoliczka, *Proc. Asiat. Soc. Beng.* : 74.

Material.—Jaisalmer Dist.: 1 ex., Sta. 8, Badebagh, 17.viii.1964 (coll. KKM). Sirohi Dist.: 1 ex., Sta. 12, Nakkilake, (Mt. Abu), 7.ix.1964; 1 ex., Sta. 13, Achalgarh Fort (Mt. Abu), 7.ix.1964 (coll. KKM).

Measurements.—(Length, in mm).

Reg. No.	Snout to vent	Tail	Snout to axilla	Axilla to groin	No. of scales round body
21471	25	50	11	16	18
21470	32	30	12	18	18
21469	35	63	12	22	18

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan). India: Gujarat (Kutch). *Elsewhere*: Pakistan (Sind and Baluchistan).

Remarks.—Two examples are pale olive green above, the third one brown with three dotted lines on tail. *A. pannonicus* Fitzinger, occurs in Pakistan (Punjab and Sind) and differs from the present one in having small but distinct ear openings.

15. *Riopa punctata* (Gmelin)

1799. *Scincus punctatus* Gmelin, *Hist. Amphib* : 197.

Material.—Jaipur Dist.: 4 ex., Sta. 11, Kotputli, 10.vi.1963 (coll. NM). Udaipur Dist.: 1 ex., Sta. 3, Fateh Sagar, 14.ix.1964 (coll. KKM).

Measurements.—Length: Snout to vent 56 mm.; tail 48 mm.; 24 scales round the body and 13 keeled lamellae under the toe.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan). *Elsewhere*: India: Widely distributed in South and Central India, but absent in Bihar and Orissa. In the Z.S.I. collection there is a specimen from Kalimpong (Darjeeling Dist., West Bengal) (coll. Gravelly). Also Sri Lanka.

The present species is nearest to *R. guentheri* (Peters) in having a common scale count (24 to 26) round the body and in respect of their similar colouration but it differs having fewer scales on middle of body. *R. guentheri* is confined to Maharashtra and North Kanara.

In juveniles there are no dark brown spots on scales of tail, appears creamy white; and is subequal to the body.

16. *Ophiomorus tridactylus* (Blyth)

1855. *Sphenocephalus tridactylus* Blyth, *J. Asiat. Soc. Beng.* 22 : 654.

Material.—Rajasthan. 1 ex., "Rajputana" (Western Rajasthan); no date (coll. N. Belletty). Jodhpur Dist.: 1 ex., Jodhpur (Coll. I. Prakash, no date).

Measurements.—Length: Snout to vent 65-89 mm.; tail 43-58mm., axilla to groin 72 mm., fore-limb 7 mm.; scales round body 22.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan). *Elsewhere*: India: Gujarat (Kutch). Also Pakistan (Punjab, Sind and Baluchistan), Afghanistan and eastern Iran.

Remarks.—This is the only species known from India. The other two species, occurring in Iran and Baluchistan differs from the present one in having 4 fingers (vs. 3). While recording this species from Sind Blanford (1876) wrote: "When in Indian desert between Sind and Rajputan in 1876, I daily saw tracks in the sand which I believe to have been made by this lizard." This lizard is popularly known as "Rig Mahi" i.e. sand fish and its fat is supposed to be of medicinal value for impotency.

Rathore (1970) has studied its fast movement under sand.

Family (7) LACERTIDAE

17. *Acanthodactylus cantoris cantoris* Günther

1864. *Acanthodactylus cantoris* Günther *Rept. Brit. Ind.* : 73.
Z.S...17

Material.—Barmer Dist.: 1 ex., Sta. 21, Barmer 2.xi.1962. (coll. *PDG*). Bikaner Dist.: 1 ex., Pugul, 23.xi.1960; 1 ex., Pugul, 22.xi.1960; 11 ex., Kolayat, 10 to 13.ix.1960; 2 ex., Lunkaransar, 1.x.1960; 1 ex., Lunkaransar, 28.ix.1960 (coll. *BB*). Jaipur Dist.: 3 ex., Devdayani, Sambhar Lake, 13.v.1958; 3 ex., Phulera, 17.v.1958; 3 ex., Sambhar Lake, 25.vi.1958; 1 ex., Korsina, 14.v.1958; 4 ex., Sambhar Lake town, 23.vi.1958; 2 ex., Sambhar Lake town, 17.vi.1958; 2 ex., Devdyani, 18.vi.1958 (coll. *TGV*). Jodhpur Dist. : 1 ex., Kaylana, 13.xiii.1956 (coll. *BB*). Jaisalmer Dist.: 1 ex., Mohangarh, 15.i.1958 (coll. *KKT & SB*); 1 ex., Nokh, 22.viii.1960, 1 ex., 3 km. west of Nokh, 24.viii.1960 (coll. *BB*). Nagaur Dist.: 4 ex., Gudha, 18.v.1958; 2 ex., Lihorana, 6.v.1958; 1 ex., Gudha, 21.vi.1958; 1 ex., Kuni, 24.vi.1958; 1 ex., Kuchaman Road, 16.ii.1958; 1 ex., Lihorana 4.iv.1958. 1 ex., Gudha, 3.ii.1958 (coll. *TGV*) 3 ex., Gudha, 12.vii.1958 (coll. *AKM*). Sikar Dist.: 1 ex., Puranchhoti, 9.xi.1960 (coll. *BB*).

Measurements.—Length: Snout to vent: 29-73 mm., tail 50-157 mm.

Distribution.—Rajasthan: "Rajputana" (coll. N. Belletty) and as above: *Elsewhere*: India: Uttar Pradesh (Agra). Also Pakistan (Sind Punjab, North-west Frontier Provinces and Baluchistan), S. Afghanistan, S. E. Iran and Aden.

Remarks.—We have 12 juveniles obtained in June and September; Blanford (1875) had many juveniles in November from Sind, Baluchistan and S.E. Iran. In the young, the six black and white longitudinal streaks on the body are very prominent; in adult, the streaks gradually fade away with age, and some examples are of a uniform chocolate colour.

Very common in Rajasthan. Differs mainly from the *A. cantoris blanfordi* Boulenger in having lesser number of scales in the middle of body (26-36 vs. 40-46).

18. *Ophisops jerdoni* Blyth

1853. *Ophisops jerdonii* Blyth, *J. Asiat. Soc. Beng.* 22 : 653.

Material.—Ajmer Dist.: 2 ex., Sta. 9. Road towards Rammar Dhari, 3.x.1964 (coll. *KKM*). Bhilwara Dist. : 1 ex., near Pandal Village, 13.ix.1965 (coll. *SB*). Chittorgarh Dist.: 1 ex., Southern side of Chittorgarh fort, 10.ix.1965; 2 ex., 3 km. S. W. of Chittorgarh Rest House, near Berach river, 7.ix.1965 (coll. *SB*). Jaisalmer Dist.: 1 ex., Badebagh, 25.xii.1957; 2 ex., Pokran, 22.ix.1957 (coll. *KKT & SB*); 1 ex., Sta. 4 Amarsagar, 13.viii.1964 (coll. *KKM*). Jodhpur Dist.: 1 ex., Kaylana desert afforestation demonstration station, 13.xii.1965 (coll. *BB*).

Measurements.—Length: Snout to vent 16-38 mm., tail 36-79 mm.

Distribution.—Rajasthan: Jaisalmer and above. *Elsewhere*: India: Gujarat (Kutch), Punjab, Kashmir, M. P. (Rewa), Karnataka (Bellary). Also Pakistan (N.W.F.P., Baluchistan, Sind, Karachi).

Remarks.—In the juveniles the keels and striations of the head-shield are not prominent as in adults: the upper and lower lateral streaks on the sides of head and body are very prominent; and the space between the stripes is not interrupted or spotted. In adults the upper surface is lighter in colour than the lower.

O. jerdoni differs from *O. microlepis* Blanford also known from Ajmer in having head shields rugose, keeled and straight (vs. smooth) and 25-35 scales (vs 56-66) round middle of body.

Family (8) VARANIDAE

19. *Varanus griseus* (Daudin)

The Desert Monitor.

1803. *Tupinambis griseus* Daudin, *Hist. Nat. Rept.* viii : 352.

Material.—Bikaner Dist.: 1 ex., Pugal, 20.ix.1960 (coll. *BB*); 13 ex., Bikaner, 5.vi.1957 (coll. *SDG*). Jaipur Dist.: 1 ex., Chapparawara, 5.v.1957 (coll. *AKM*).

Measurements.—Length: Snout to vent 210-325 mm., tail 470-580 mm.

Distribution.—Rajasthan: As mentioned above (fairly common in parts of Rajasthan; Smith, 1935). *Elsewhere*: India: Punjab (Ambala) Uttar Pradesh (Agra) and M. P. (Narsingharh). Also Pakistan, West Asia upto the Caspian Sea and North Africa.

Remarks.—Differs from *V. bengalensis* (Daudin) in its round tail (slightly compressed posteriorly); body colour grayish-brown or yellowish-brown, with smaller brown spots.

20. *Varanus bengalensis* (Daudin).

The common Indian Monitor.

1802. *Tupinambis bengalensis* Daudin, *Hist. Nat. Rept.* iii : 67.

1758. *Lacerta monitor* Linnaeus, *Syst. Nat.* ed. x : 201.

Material.—Bikaner Dist.: 1 ex., Pugal 22.ix.1960 (coll. *BB*) 10 ex., Bikaner, 5.iv.1957 (coll. *SDG*). Jaisalmer Dist.: 1 ex., Sta. 8, Badebagh. 17.viii.1964 (coll. *KKM*); 1 ex., Jaisalmer, 23.x.1962 (coll. *PDG*). Jodhpur Dist.: 1 ex., Sta. 9, Jodhpur, 10.x.1962 (coll. *PDG*). Nagaur Dist.: 1 ex., Bhakrod, 6.ix.1960 (coll. *BB*).

Measurements.—Length: Snout to vent 210-450 mm., tail 054-695 mm.

Distribution.—Rajasthan: As above: and Ajmer (*O.B. St. Jhon*). *Elsewhere*: India: Throughout India (Assam, West Bengal, Orissa, Uttar Pradesh, Kerala, Andamans). Also Burma, Sri Lanka, Pakistan and Iran.

Remarks.—The body in adults is brownish or olive above, usually with blackish dots; lower parts are yellowish sometimes spotted black. According to Murray (1884) *V. flavescens* (Gray) also occurs Rajasthan. In both *V. bengalensis* and *V. flavescens*, the tail is compressed and has a low double-toothed crest above; in *bengalensis* the nostril is nearer the orbit, in *flavescens* it is nearer the end of the snout.

Suborder SERPENTES

Family (9) TYPHLOPIDAE

21. *Typhlops braminus* (Daudin)

1803. *Eryx braminus* Daudin *Hist. Nat. Rept.* vii : 279.

Material.—Ajmer Dist.: 2 ex., Sta. 6, Dakbunglow compound, Ajmer, 29.ix.1964 (coll. *KKM*). Bikaner Dist.: 2 ex., Bikaner, Oct. 1956 (coll. *BB*).

Measurements.—Total length of one ex.: 75 mm. 20 scales round the body; 295 transverse rows of scales.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan). *Elsewhere*: India: Throughout, including the Andaman and the Nicobar Islands. In the east it extends to Indo-china and Malaysia and in the west upto Africa. Also Mexico.

Family (10) BOIDAE

22. *Eryx conicus* (Schneider)

1801. *Boa conica* Schneider, *Hist. Amphib.* ii : 268.

Material.—Jodhpur Dist.: 1 ex., Khokhra village, 6.viii.1960 (coll. *RKB*).

Measurements.—Length: Snout to vent 179 mm.; tail 20 mm. Scales: ventral 182, subcaudal 9, costal 20.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan). *Elsewhere*: India: North India, as far east as Bihar and Orissa and Naini Tal districts in Uttar Pradesh. Also Pakistan (Sind and Baluchistan) and Sri Lanka.

Remarks.—The example has 14 small scales surrounding eye, and

nine between labials and the eye. Differs from *E. jonhi jonhi* (Russell), in the absence of mental groove and in having a pointed tail.

23. *Eryx johni johni* (Russell)

1801. *Boa johni* Russell, *Ind. Serp.*, ii : 18 & 20, pls. XVI & XVII.

Material.—Bikaner Dist.: 1 ex., Kolayat, 12. ix.1960 (coll. *BB*) Chittorgarh Dist.: 1 ex., by the side of Sanod tank, Chottorgarh, 10.x. 1964 (coll. *PDG*). Jodhpur Dist.: 2 ex., Khokhra Village, 6.viii.1960 (coll. *RKB*). Kotah Dist.: 1 ex., Sta. 26, Kishoresagar, 25.x.1964 (coll. *PDG*). Nagaur Dist.: 1 ex., Gudha, 12.x.1964 (coll. *TGV*).

Measurements and Counts:

Reg. No.	Ventral	Subcaudal	Costal	Snout to vent Length in mm.	Tail
21799	205	31	53	260	38
20997	203	30	53	250	39
20998	211	26	55	497	72
20999	204	34	54	630	78
21800	210	21	58	670	68
21782	210	33	60	653	95

Distribution.—Rajasthan: Ajmer (*O. B. St. John*), Jaipur (*R. Patton*), and as above. *Elsewhere*: India: North-western India (Uttar Pradesh, Punjab) and South India (Andhra Pradesh, Tamil Nadu and Maharashtra). Also Pakistan (Sind, Baluchistan and North-West Frontier Province).

Remarks.—Two young examples have 19 colour bars on the body and tail; the posterior bars are prominent. In adults the body colour is uniform brown, with distinct bars only on tail.

The present species meets the western *Erix johni persicus* in Baluchistan and N.W.F.P.

Family (11) COLUBRIDAE

24. *Elaphe helena* (Daudin)

1803. *Coluber helena* Daudin, *Hist. Nat. Rept.* vi, p. 277.

Material.—Sirohi Dist.: 1 ex., Mount Abu 8.iii.1948 (coll. *KSP*), 1 ex., Mount Abu (*G. S. Sutherland*).

Measurements.—Length: Snout to vent 696 mm., tail 200 mm, Scale counts: Dorsal 23:25:23, Ventral 232, subcaudal 90.

Distribution.—Rajasthan: Ajmer (*O. B. St. John*); Mt. Abu, Udaipur, Jaipur (*Wall*) and as mentioned above. *Elsewhere*: India: Peninsular India, Himalaya, northern Bengal, Assam, Madhya Pradesh and Bihar.

Remarks.—Smith (1943) mentioned two distinct colour forms; the present specimen belong to his first form (with two longitudinal black stripes, parallel, or converging posteriorly). The second form (with a white black edged collar interrupted in the middle) is restricted to the Western India, south of Bombay. The distinct festooned marking on each ventral side considered by Wall (1913) as confined to specimens from Western India only is also present in our specimens.

25. *Coluber ventromaculatus* Gray & Hardwicke

1834. *Coluber ventromaculatus* Gray & Hardwicke, *Ill. Ind. Zool.*, ii, pl. 80, fig. 1.

Material.—Bikaner Dist.: 1 ex. Pugal, 26.ix.1960 (coll. *BB*). Jaipur Dist.: 1 ex. Naraina, 2.xi.1958, Devdyani, 26.iv.1957 (coll. *BB*); 1 ex. Phulera road, 4.x.1963 (coll. *KKM*). Jaisalmer Dist.: 2 ex., Nokh, 21.viii.1960 (coll. *BB*). Jodhpur Dist.: 1 ex., Jodhpur 6.viii.1960 (coll. *BB*); 2 exs., Khokhara Village, 6&7.viii.1960 (coll. *RKB*); 1 ex., "Rajputana", no date, (coll. *N. Belletty*).

Measurements & Counts:

<i>Reg. No.</i>	<i>Ventral</i>	<i>Sub-caudal</i>	<i>Length in mm.</i>	<i>Tail Snout to vent.</i>
21002	207	101	842	285
21001	205	109	540	230
21003	201	80+?	310	86+
21156	204	95	240	78

Distribution.—Rajasthan: As above. *Elsewhere*: India: North-Western India, Uttar Pradesh (East to Almora Dist.), and south to Kandesh (Maharashtra). Also Pakistan (Chitral) Afghanistan, Iran South USSR (Uzbekistan) and Isreal.

26. *Coluber arenarius* (Boulenger)

1890. *Zamenis arenarius* Boulenger, *Fauna Brit. India* : 329.

Material.—Bikaner Dist.: 1 ex., Pugal, 20.ix.1960 (coll. *BB*); 1 ex., "Rajputana", no date (coll. *N. Belletty*).

Measurements & Counts: Length: Snout to vent 805 mm., tail 180 mm. Dorsals in middle, 25; ventrals 226; subcaudals 75.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan). *Elsewhere*: India: N.W. India. Also Pakistan (Sind)

Remarks.—The first specimen has two longitudinal lines on the parietal. The colour is mostly confined to the edge of the scales though some scales are entirely or partly coloured. There are two longitudinal streaks on the sides on the nape and one in between. These appear to be interrupted into bigger spots behind the middle of the body and are arranged obliquely or diagonally. Besides three more spots on each side of the body are present.

C. arenarius is distinguished from *C. diadema* by its much higher and broader rostral.

27. *Coluber diadema diadema* Schlegel

1837. *Coluber diadema* Schlegel, *Phys. Serp.* ii : 148.

Material.—Nagaur Dist.: 1 ex., Gudha, 9.iii.1958 (coll. TGV).

Measurements & Counts.—Length: Snout to vent 555 mm., tail 155 mm., Dorsal 27:27:19, ventral 247. subcaudal 104.

Distribution.—Rajasthan: Jodhpur, Bhartpur, Ajmer (Wall); and as above. *Elsewhere*: India: Orissa, Uttar Pradesh, Punjab, Kashmir. Also Bangladesh (Chittagong), Pakistan (Lahore and Baluchistan), Southern Turkistan, Iran and Northern Africa.

Remarks.—The subspecies has a definite colour pattern, and is more slender than *C. d. atriceps*. The head is distinct from the neck.

28. *Coluber diadema atriceps* (Fischer)

1885. *Zamenis diadema* var. *atricsps* Fischer, *Jahrb. Hamburg wiss. anst.* ii : 102.

Material.—Nagaur Dist.: 1 ex., Gudha 6.x.1958 (coll. BB).

Measurements & Scale Counts: Length: Snout to vent 835 mm., tail 225 mm. Dorsal 27:29:19; Ventral 248 subcaudal 109, anal 1.

Distribution: Rajasthan: As mentioned above (first record from Rajasthan). *Elsewhere*. India: North-west India (Uttar Pradesh, Punjab and Haryana), and Kashmir (Gilgit).

Remarks.—Our specimen has one extra loreal above the posterior one (usually there are two loreals, one behind the other).

This subspecies is distinguished from the typical one by its irregularly scattered dark brown spots and its head being partly or entirely dark coloured. The body and head are also more robust; the head shields are larger, the suboculars and upper labials are arranged in an angular manner.

29. *Lycodon aulicus aulicus* (Linnaeus)

1754. *Coluber aulicus* Linn. *Mus. Adolph. Frider*, i : 29 pl. xii, fig. 2.

Material.—Chittorgarh Dist.: 1 ex., Sta. 19, Ghosuda village, 5.x.1964 (coll. PDG).

Measurements & Scale Count.—Length: Snout to vent 532 mm., tail 95 mm., Dorsal 17:17:15, Ventral 215, subcaudal 59.

Distribution.—Rajasthan: Ajmer (O. B. St. John) and as above. *Elsewhere*: India: Throughout India. Also Nepal and Burma north to Lat. 17° N.

Remarks.—Two colour forms are known: *typica* and *capucinus* Boie; the former is found throughout the Indian mainland and the latter occurs in the Andaman and Nicobar Islands.

In the present specimen instead of 12 to 19 white crossbars there are 29 on the body which also do not expand laterally or bifurcate; the posterior four are reduced to short vertebral spots.

30. *Natrix piscator* (Schneider)

1799. *Hydrus piscator* Schneider, *Hist. Amph.* i : 247.

Material.—Chittorgarh Dist.: 2 ex., Sta. 22, Bir tank, 11.x.1964. (coll. PDG). Sirohi Dist.: 1 ex., Mount Abu (coll. G. S. Sutherland).

Measurements & Scale Counts.—Length: Snout to vent 205 mm.; tail 80 mm., Ventrals 142, subcaudal 81.

Distribution.—Rajasthan: Ajmer (O. B. St. John), and as mentioned above. *Elsewhere*: India: whole of India. Also Pakistan (Baluchistan and North-West Frontier Province) and of upper Burma (Myitkina).

Remarks.—Smith (1943) distinguished four well defined races, each with its own geographical range. The specimen from Mt. Abu is a juvenile with faded colouration but five faint spots indicate that it belongs to the typical form.

31. *Macropisthodon plumbicolor* (Cantor)

1839. *Tropidonotus plumbicolor* Cantor, *Proc. Zool. Soc.*, : 54.

Material.—Sirohi Dist.: 1 ex., Mount Abu, 15.viii.1965 (coll. SB); 2 ex., Mount Abu (G. S. Sutherland).

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan). *Elsewhere*: India: Throughout except the Ganga valley and the extreme north-west. also Sri Lanka.

Measurements & Scale Counts:

Reg. No.	Length in mm. Snout- tovent	Tail	Ventral	Subcaudal	Dorsal
7514	540	90	152	42	23
7515	200	35	154	42	23
21684	142	22	152	39	25

32. *Ahaetulla nasutus* (Lacépède)

1789. *Coluber nasutus* Lacépède, *Hist. Nat. Serp.*, 1 : 100 & 2 : 277 pl. 4, fig. 2

Material.—Sirohi Dist.: 2 ex., Mt. Abu, no date (coll. G. S. Sutherland).

Measurements & Scale Counts.—Length: Snout to vent 715, 550 mm., tail 390, 357 mm. Ventrals 192, 195; subcaudals 156, 159.

Distribution.—Rajasthan: As mentioned above (first record from Rajasthan,. *Elsewhere*: India: Peninsular India: also Bihar (east of Patna), West Bengal and Assam. Also Burma (as far south as Rangoon), Thailand, Cambodia, Viet Nam and Sri Lanka.

Remarks.—*A. nasutus* and *A. pulverulentus* (Dum. & Bib.) are the two species grouped together by their dermal appendages usually extending beyond the lower jaw, but in *nasutus* it is formed only by the rostral scales. The head shields and the ventral scales have very minute scattered black dots.

33. *Psammophis schokari* (Forskål)

1775. *Coluber schokari* Forskal, *Descr. Anim.*, : 14

1896. *Psammophis schokari* Boulenger, *Cat. Sn. Brit. Mus.*, iii : 157.

Material.—Bikaner Dist.: 1 ex., Kolayt, 12.ix.1960; 1 ex., Pugal, 19.ix.1960; 1 ex., Pugal, 25.ix.1960 (Coll. BB).

Measurements & Scale Counts:

Reg. No.	Ventral	Caudal	Snout to vent & Length in mm.	Tail
21789	182	100 blunt	760	345
21787	177	121	620	330
21788	179	128	720	382

Distribution.—Rajasthan, Jodhpur (*Wall*) and as mentioned above *Elsewhere*: India: Kashmir. Also Pakistan (Punjab, Sind, N.W.F. Province), Iran, Arabia and North Africa.

Remarks.—In two of our specimens four dark brown longitudinal stripes are prominent in the anterior half of the body, but posteriorly they are faded, leaving only black spots. In the third specimen these stripes are wanting; the anterior part is dark spotted and the posterior uniformly gray.

Family (12) ELAPIDAE

34. *Bungarus caeruleus* (Schneider)

1801. *Pseudoboa caerulea* Schneider, *Hist. Amphib.* ii : 284.

1890. *Bungarus caeruleus* Boulenger, *Fauna Brit. Ind.*, : 388.

Material.—Bikaner Dist.: 1 ex., Siasar, 32 km. W. of Pugal 24. ix.1964 (coll. *BB*).

Measurements & Scale Counts : Length: Snout to vent 740 mm., tail 115 mm., dorsals 17, ventrals 229, subcaudal 48.

Distribution.—Rajasthan: As mentioned above. *Elsewhere*: India: Throughout India but not east of the eastern part of West Bengal. Also Sri Lanka.

Remarks.—*B. caeruleus* can be subdivided into four colour forms or races and the present specimen is referable to the form *B. sindanus* Boulenger in which the transverse bars are always distinct with a vertebral spot widening on the sides.

35. *Naja naja oxiana* (Eichwald)

1831. *Tomyris oxiana* Eichwald, *Zool. spec.*, iii : 171.

1889. *Naja oxiana* Boulenger, *Tr. Zool. Soc.*, (z) v : 103

Material.—Ajmer Dist.: 2 ex., Sta. 25, Ararka Village, 14.x.1961 (coll. *PDG*). Chittorgarh Dist.: 1 ex., Sta. 21, Sanod tank, 10.x.1964 (coll. *PDG*)., 1 ex., Sta. 21 Matapahar, 16.xi.1957 (coll. *AKM*).

Measurements & Scale Counts.—Length: Snout to vent 890 to 1245 mm.; tail 205-260 mm., ventrals 188-197; subcaudals 58-66, scales on hood 23.

Distribution.—Rajasthan: Pilani, *Elsewhere*: India north-west India. Also Pakistan, Iran to W. to Transcaspia.

Remarks.—Three sub species, *Naja naja naja* (Linn.) *N. n. Kaouthia* Lesson and *N. u. oxiana* (Eichwald) are recognised. The distinguishing character of *oxiana* to which all the specimens of the collection are referable are: ventral plus subcaudal scales range between 248 to

228; number of scales on the hood 23-27 and without any marking on the hood, but body is often barred. In our examples the body is not barred; it is uniformly brown or deep brown.

Family (13) VIPERIDAE

36. *Echis carinatus* (Schneider)

1801. *Pseudoboa carinata* Schnieder, *Hist. Amphib.* ii : 285.

1874. *Echis carinata* Fayrer, *Thanatoph. Ind.* pl. xii.

Material.—Bikaner Dist.: 2 ex., Pugal, 21 & 25.ix.1960 (coll. *BB*)
Jaisalmer Dist.: 1 ex., Nokh, 24.viii.1960 (coll. *BB*). Nagaur Dist.:
1 ex., Between Indana & Didia, 4.ix.1960 (coll. *BB*). Sirohi Dist.: 1 ex.,
Mount Abu. near Palanpur Point, 8.iii.1948 (coll. *KSP*); 1 ex., Patehia
(coll. *N. Belletty*).

Measurements & Scale Counts:

<i>Regd.No.</i>	<i>Dorsal</i>	<i>Ventral</i>	<i>Subcaudal</i>	<i>Length in mm. Snout to vent</i>	<i>Tail</i>
21792	28:32:21	172	33	308	32
21793	27:32:21	180	33	305	33
21791	27:32:21	165	31	195	23
21006	26:32:21	157	31	335	37

Distribution.—Rajasthan: Ajmer (*O. B. St John*); and as mentioned above. *Elsewhere*: India: Whole of India south of the Ganga; western part of West Bengal and Kashmir. Also Sri Lanka, Pakistan, South-West Asia and Africa north of the equator.

Remarks.—The parietal scales in the three specimens are nearly equal in size to that of its upper row; there are 11 upper labials. The colour pattern is similar in all these specimens. But in the specimen from Mt. Abu the parietals are larger than that of the adjoining row, the number of ventrals are fewer though the subcaudal count is similar to the other specimens; and also the colour pattern is slightly different. Thus, two forms may be in Rajasthan.

SUMMARY

This paper deals with the reptile fauna of Rajasthan. It is based on several recent collections made by parties of the Zoological Survey of India, with altogether 333 specimens. This collection contains 28 species and 7 sub-species belonging to 28 genera and 12 families. Of

these 14 species and 2 sub species are new records from Rajasthan, and one (*Agma agilis* Olivier) a new record from India. *Crocodilus Palustris* Lesson is included based on observing it in the field by the author (S.B.).

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NEW HOST RECORDS OF AND OBSERVATIONS
ON THE EPIZOIC GASTROPOD *SAPTADANTA*
NASIKA PRASHAD AND RAO

by

A. S. RAJAGOPAL

Zoological Survey of India, Calcutta

(With one plate)

INTRODUCTION

Prashad and H. S. Rao (1934) described a new genus and species of limpet-like gastropod, epizoic on a shell of *Trochus niloticus* Linnaeus, family Trochidae, from the Andamans under the name *Saptadanta nasika*. Twenty-six years later, K. V. Rao (1960) reported the same species on the shells of *Pterocera lambis* (Linnaeus) from Minicoy, Lakshadwip Islands and on *P. lambis* and *chiragra* (Linnaeus), family Strombidae, from Mangalore.

Such recorded instances of commensalism in which both partners involved are molluscs, are not many. The above species in its partnership with the molluscan hosts stated above provides a good example of such an association.

The present note deals with additional hosts of interest so far not recorded for this commensal, its noticeable preference to a particular location on host shell for attachment and discussion on other points such as its probable mode of feeding consistent with its sedentary life and a comparison with the mode of feeding in other sessile forms which are closely allied to it.

MATERIAL

The material utilised for this study is obtained from the collections of the Zoological Survey of India and is as follows:—

A. 2 ex. on *Turbo spinosus* Gmelin, Sta. No. ?—Pearl Bank 16 km. from the shore of Tuticorin, 18. 28m (10 fms.), Feb-Mar., 1926, Coll. H. S. Rao.

B. 1 ex. on *Cerithium Columna* Sowerby., Sta. No ?—Pearl Bank,

19.20 km. from shore, Tuticorin, 16.45m to 18.28m (9-10 fms.), Feb.—Mar., 1926 Coll. H. S. Rao.

C. Several ex. on *Turbo brunneus* Röding, (both living and dead), Sta. No. 24-Coast (intertidal zone) near Arong village, Car Nicobar, 11-3-1972, Coll. A. S. Rajagopal.

All the specimens agree well with the holotype of the species and the original description (Prashad & H. S. Rao, 1934).

The specimens of the epizoon entrench themselves firmly in deep concavities made on host shells. Extricating them therefore often causes damage to the soft body parts as remarked by Prashad and H. S. Rao (*op. cit.*). In the present material also, it was particularly so with specimens infesting shell of *T. brunneus* where the lodgement was deep, unlike in *T. spinosus* and *Certithium Columna* Sowerby where it was superficial.

REMARKS

On the basis of observations on the present material and on information available in literature about the epizoon *S. nasika* certain facts, some of them hitherto unrecorded, have come to light which are enumerated below:—

1. The previous host record of the epizoon was limited to three species in two gastropod families, Trochidae and Strombidae. With the addition of three more species in Turbinidae and Cerithiidae to the list as shown in the material above, the number has increased to six species in four genera spread over four families. It would therefore be reasonable to expect that the host-range to be more extensive than hitherto believed and to say that there is no evidence of host-specificity in this case.

2. Since all the host records known so far are limited to gastropods only and they are not known to extend to any other group of molluscs, it would be reasonable to say the species favours gastropod hosts.

3. The material indicates that the samples were collected from varying depths from shallow water upto 10 fms. (18.28m.). How far the factors such as depth, temperature, etc., might be influencing the infestations or commensalism has not been studied. Further, the samples themselves are too insufficient to draw any conclusion on the causes of the infestation or commensalism.

4. Some of the examples of the epizoon were found attached to dead shells in the material above but none has been reported from stationary objects such as rocks and corals. In its habit it is similar to *Hipponix australis* Quoy and Gaimard which also lodges itself on gastropod shells, especially *Turbo*. Another closely allied species *H. antiquatus* (Linnaeus), however, attaches itself permanently to rocks

by secreting a valve beneath the foot. It can thus be seen that there is no uniformity in the mode of life even among closely allied species.

5. The shape and the size of the much-flattened patelloid shells are variable. When the infestation is heavy, these two characters in the shells are dependent to a large degree on the location and the extent of space available to each individual for lodging.

6. The number of ridges on a shell is also variable as was shown by K. V Rao (*op. cit.*, Table).

7. When the epizoon settles on a host shell in large numbers, tendency for them to cluster together as closely as possible in a small area is noticed. This condition is found in two shells of *T. brunneus* under study (see plate. .figs. .). The illustration given by K. V Rao (*op. cit.*, fig. 2) also shows a similar condition.

8. One specimen settling on another *vide* K. V Rao (*op. cit.*) is observed on the shell of a live specimen of *brunneus* in the present author's collection.

9. The highest infestation on a shell noticed by K. V Rao (*op. cit.*) was close to the apical region in his specimen of *Pterocera*, whereas in all cases in the present material the site is quite different. The infestation, whether high or low, is concentrated on the ventral aspect of the body-whorl of the host, particularly near its columella or around the umbilicus when the latter is present (see plate. .figs. .). Also, as many as eight characteristic concavities of the epizoon can be seen in the same location on two shells of *brunneus* (Plate. .figs. .). one from Car Nicobar and the other from Andamans.

In an old shell of *P. chiragra* from the same collections, three excavations on two finger-like processes (two on one and one on another) are found on the ventral aspect (plate. .figs. .)

DISCUSSION

It is interesting to note that while Hyman (1967, p. 383) refers the present species to the genus *Sabia* Gray, Thiele (1931) considers this genus and three others namely, *Hipponix* Defrance, *Cochlolepas* (? Klein) and *Malluvium* Melvill as congeneric with *Amalthea* Schumacher.

Though a discussion on the validity or otherwise of the transfer of *nasika* under *Sabia* is beyond the scope of this paper, the transfer of it from the family Lepetellidae to Amaltheidae (=Hipponicidae) seems to be fully justified.

The association involved between *S. nasika* and its host is an example of commensalism, of unequal partnership wherein the epizoon which is the active partner settles on a shell of its host, a passive partner, essentially for substrate, shelter and transport. The relationship fits in well with van Beneden's definition of commensalism expanded and

elaborated by Allee *et al* (1949, p. 243). In this relation whether the epizoon partakes the food of its host or not could not be investigated because field observations on its mode of feeding were not feasible. Therefore, any comment on it is not possible except by alluding to the mode of feeding in closely related forms like *Hipponix antiquatus* (Linnaeus), studied by Yonge (1953) and *H. australis* Quoy and Gaimard, studied by Risbec (1935). The former has a very specialised sedentary habit spending all its life cemented to rocks while the latter which lives on the shells of other gastropods, usually species of *Turbo* characteristically close to the exhalent aperture, has some similarity with the present species in its mode of existence. Yonge (*op. cit.*) observes that *H. antiquatus*, despite its sedentary mode of life is surprisingly not a ciliary feeder. It uses its long proboscis for browsing on its food material *viz.* organic detritus, pieces of algae etc., that are continually brought in front of the shell by the Pacific surf, while Risbec (*op. cit.*) reports that *australis* swallows by means of its proboscis, faecal pellets rejected by the host.

Though *S. nasika* leads a sedentary life, lodged on its host's shell, it is probably not a mucociliary feeder. In this connection Hyman's (*op. cit.*, p. 353) remark, "Contrary to expectation, not all sessile prosobranchs are ciliary feeders" seems to be appropriate. Further, its preference to the ventral side of the host shell for its settlement, as is noticed in all the cases of the present material, shows a similarity to *australis* and probably the mode of feeding also may be identical. In any case, it needs further study to elucidate the point.

Prashad and H. S. Rao (*op. cit.*) and H. S. Rao (1937) observe that as a result of the excavations made by the epizoon on the shell substance, the commercial value of *T niloticus* shells was diminished. Similarly, the commercial value of affected *T brunneus* shells would also diminish since these are also used for table decoration, cameos, ornamental pieces, curios etc.

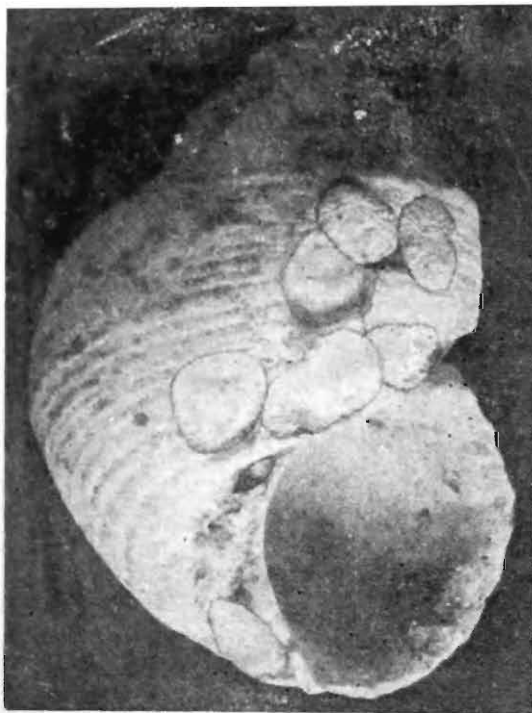
ACKNOWLEDGEMENTS

The author expresses his thanks to the Director, Zoological Survey of India, for facilities provided for this study. His grateful thanks are also due to Dr. K. K. Tiwari, for going through the paper and offering useful suggestions and criticism and to the colleagues Shri S. Biswas, Dr. K. V. Lakshminarayana and Shri P. Dhandapani for their help in various ways in finalising the paper.

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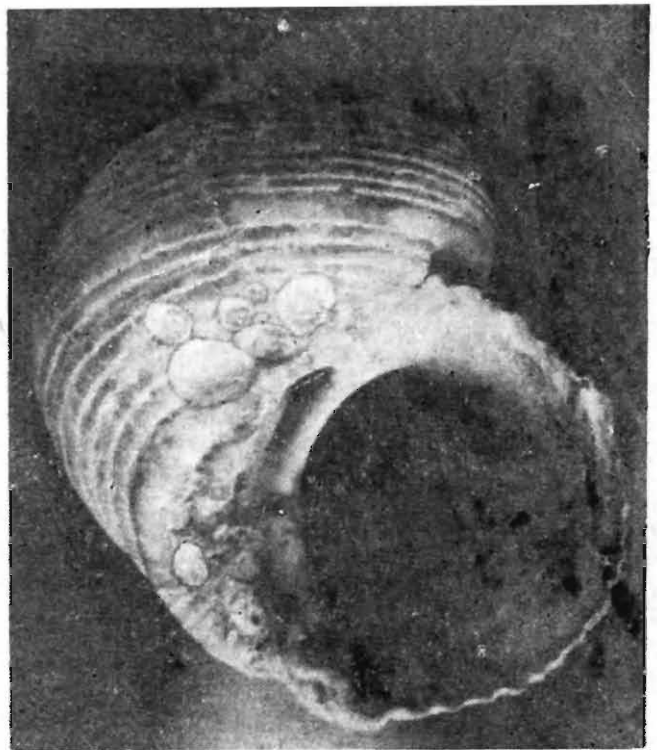
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2 cm

1



2 cm

2



10 mm



6



5 cm

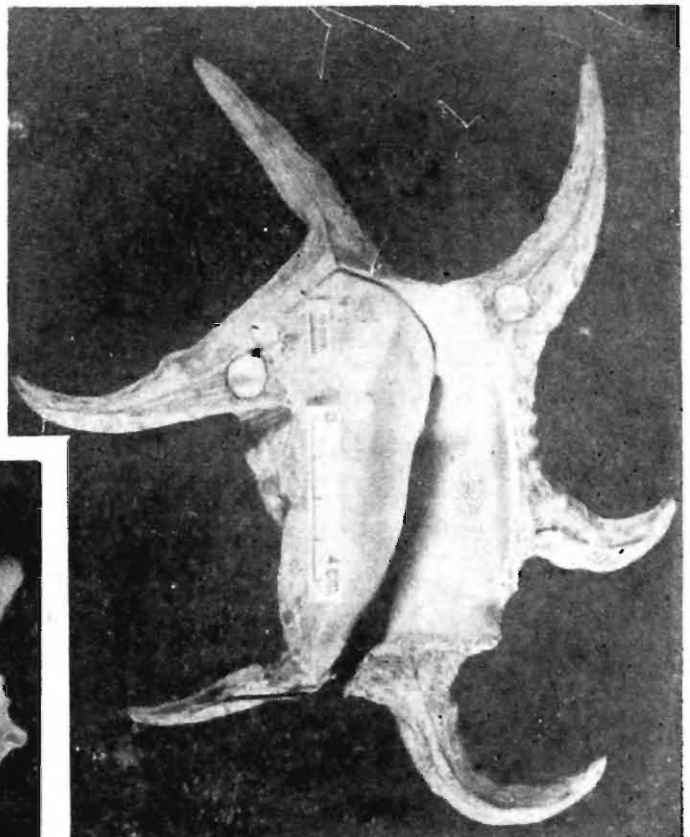
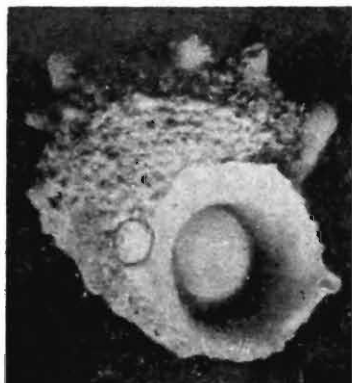
5



4

10 mm

3



Explanation for plate No. IX

Different gastropod shells (host) showing concavities (marked by black line) made by the epizoon. *Saptadanta nasika* Prashad and Rao.

Fig. 1 & 2. *Turbo brunneus* Röding : Shells from Car Nicobar and Andamans respectively, each with 8 concavities.

Fig. 3. *Turbo spinosus* Gmelin : Shell from Pearl Bank, Tuticorin with single concavity.

Fig. 4. *Cerithium Columna* Sowerly : Shell from Pearl Bank, Tuticorin with single concavity.

Fig. 5. *Pterocera chiragra* Linnaeus with 3 concavities on two finger-like processes.

Fig. 6. *Saptadanta nasika* Prashad and Rao : Shells in dorsal (3) and ventral (1) views.

CHECK-LIST OF INDIAN PLANIPENNIA (ORDER NEUROPTERA)

By

S. K. GHOSH

and

S. SEN

Zoological Survey of India, Calcutta.

Linnaeus erected the order Neuroptera in 1758 and included the heterogenous group e.g. Plecoptera, Isoptera, Embioptera, Odonata, Corodentia, Mallophaga, Mecoptera, Trichoptera in addition to Neuroptera, S. Str. Now it is divided into several well defined orders. Megaloptera and Planipennia constitute the order Neuroptera.

The present authors are taking the opportunity to publish the check list of Indian Planipennia (order Neuroptera) and it is hoped that this check list may serve as a basis for future investigations on this suborder of insects.

Sala de Castellarnau, 1946 (*Lisbon ci. nat.*, **15**, pp. 114-128) has listed only 53 spp. of Planipennia out of about 250 spp. described from India, which necessitates the publication of the present check list.

The literature on Indian Neuroptera is scattered, the important contributions being made by Walker, F., MacLachlan, R., Navas, L., van der Weele, H. W., Withycombe, C. L., Banks, N., & Kimmins, D. E.

In many of the recorded references exact localities were not recorded. In view of the fact an exact record of locality for each species is not possible to mention and though the use of "India" or "Hindustan", as a locality is misleading, yet the authors have no other alternative than to indicate "India" or "Hindustan" etc. in the distribution column of those species. Type-localities are unknown in some species as these were not recorded by the authors of those species.

We take pleasure in expressing our gratitude to Dr. A. P. Kapur, former Director, Zoological Survey of India for giving facilities and to Sri K. S. Pradhan, Superintending Zoologist, Zoological Survey of India for his encouragement to complete the work.

Family CONIOPTERYGIDAE Burmeister, 1839
 Subfamily ALEUROPTERYGINAE Enderlein, 1905
 Tribe ALEUROPTERYGINI Enderlein, 1905

Genus **Heteroconis** Enderlein

1905. *Heteroconis* Enderlein, *Zool. Anz.*, **29**, p. 226.
 1925. *Niphadicera* Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.), **9**, p. 6.

H. terminalis (Banks)

1913. *Malacomyza terminalis* Banks, *Trans. Am. ent. Soc.*, Philadelphia, **39**, p. 220.
 1925. *Niphadicera terminalis* : Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.) **9**, p. 6.
 1972. *Heteroconis terminalis* : Meinander, *Acta Zool. Fennica*, **136**, pp. 90-91.
Type locality : Bombay.
Distribution : Maharashtra.

Tribe CONIOCOMP SINI Enderlein, 1905
 Genus **Coniocompsa** Enderlein

1905. *Coniocompsa* Enderlein, *Zool. Anz.*, **29**, p. 225.

C. indica Withycombe

1925. *Coniocompsa indica* Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.), **9**, p. 9.
Type locality : Pusa
Distribution : Bihar

Tribe FONTENELLEINI Carpentier & Lestage, 1928
 Genus **Spiloconis** Enderlein 1907

1907. *Spiloconis* Enderlein, *Stett. ent. Ztg.*, **68**, p. 6.

S. cerata (Hagen)

1858. *Coniopteryx cerata* Hagen, *Verh. Zool.bot. Ges.*, Wien, **8**, p. 484.
 1925. *Coniopteryx cerata* : Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.) **9**, p. 15.
 1968. *Spiloconis cerata* : Tjeder, *Entomol. Tidskr.*, **89**, p. 141.
 1972. *Spiloconis cerata* : Meinander, *Acta. Zool. Fennica*, **136**, pp. 139-140.
Distribution : India: Maharashtra.
 Sri Lanka.

Subfamily CONIOPTERYGINAE Enderlein, 1905

Tribe CONIOPTERYGINI Burmeister, 1839

Genus *Coniopteryx* Curtis

1834. *Coniopteryx* Curtis, *British Entomology*, London, **11**, pls. 482-529.

C. (*Coniopteryx*) *ambigua* Withycombe

1925. *Coniopteryx ambigua* Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.) **9**, p.13.
1968. *Coniopteryx withycombei* : Tjeder, *Entomol. Tidskr.*, **89**, p. 145.
1972. *Coniopteryx* (*Coniopteryx*) *ambigua*: Meinander, *Acta Zool. Fennica*, **136**, pp. 237-239.

Distribution : Assam, U. P., Tamilnadu.

C. (*Coniopteryx*) *exigua* Withycombe

1925. *Coniopteryx exigua* Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.), **9**, p. 12.
1925. *Coniopteryx pusana* Withycombe *loc. cit.*, p. 14.
1972. *Coniopteryx* (*Coniopteryx*) *exigua*: Meinander, *Acta Zool. Fennica*, **136**, pp. 242-243.

Type locality : Pusa.

Distribution : Bihar

C. (*Xeroconiopteryx*) *obtusa* Withycombe

1925. *Coniopteryx obtusa* Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.), **9**, pp. 13-14.
1972. *Coniopteryx* (*Xeroconiopteryx*) *obtusa*: Meinander, *Acta Zool. Fennica*, **136**, p. 219.

Type locality : Pusa.

Distribution : Bihar.

Genus *Nimboa* Navas

1914. *Nimboa* Navas, in Alluaud & Jeannel, *Voy. Afr. Or. Neur.*, no. 24, p. 39.

N. *basipunctata* Withycombe

1925. *Nimboa basipunctata* Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.), **9**, p. 10.

Type locality : Pusa.

Distribution : Bihar.

N. immaculata Withycombe

1925. *Nimboa immaculata* Withycombe, *Mem. Dept. Agric. India*, **9**, , p. 11.

Type locality : Hoshiarpur.

Distribution : Punjab.

Tribe CONWENTZIINI Enderlein, 1905**Genus Conwentzia Enderlein**

1905. *Conwentzia* Enderlein, *Westpreuss. Bot. Zool. Ver.*, Ber., 26-27, pp.10-12.

C. inverta Withycombe

1925. *Conwentzia inverta*, Withycombe, *Mem. Dept. Agric. India*, (Ent. Ser.) **9**, p. 10.

Type locality : Pusa.

Distribution : Bihar.

Genus Semidalis Enderlein

1905. *Semidalis* Enderlein, *Wien. ent. Zeit.*, **24**, p. 197.

S. aleyrodiformis (Stephens)

1836. *Coniopteryx aleyrodiformis* Stephens, *Illustration of British Entomology, Mandibulata*, London, VI-240 pp.

1907. *Semidalis albata* Enderlein, *Stett. Ent. Ztg.*, **68**, p. 5.

1925. *Semidalis poinciana* Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.), **9**, p. 18.

1925. *Semidalis alpina* Withycombe, *loc. cit.*, p. 17.

1972. *Semidalis aleyrodiformis*: Meinander, *Acta Zool. Fennica*, **136**, pp. 316-320.

Type locality : Pusa.

Distribution : Bihar.

S. decipiens (Roepke)

1916. *Parasemidalis decipiens* Roepke, *Zool. Mededeel.*, **2**, p. 157.

1930. *Metasemidalis decipiens* : Enderlein, *Arch. Klassifikatorische Phylogenetische Entomol.*, **1**, p. 106.

1925. *Semidalis fletcheri* Withycombe, *Mem. Dept. Agric. India* (Ent. Ser.), **9**, p. 16.

1934. *Coniopteryx remota* Banks, *J. Federated Malay State Mus.*, **17**, p. 572.

1968. *Semidalis remota*: Tjeder, *Opusc. ent.*, **33**, p. 155.

1972. *Semidalis decipiens*: Meinander, *Acta Zool. Fennica*, **136**, pp. 313-314.

Type locality : Coonoor.

Distribution : Tamilnadu.

Family DILARIDAE Handlirsch, 1906

Genus *Dilar* Rambur

1842. *Dilar* Rambur, *Hist. nat. Ins. Neur.*, Roret, Paris, 534 pp.

D. hornei MacLachlan

1859. *Dilar hornei* MacLachlan, *Ent. Mon. Mag.*, 5, p. 240.

1909. *Dilar hornei*:Navas, *Mem. Ac. Cs.*, Barcelona, 7, no. 17.

Distribution : N. W. India.

Genus *Neonallachius* Nakahara

1963. *Neonallachius* Nakahara, *Kontyu*, 20 (VI), p. 77.

N. annandalei Nakahara

1963. *Neonallachius annandalei* Nakahara, *Kontyu*, 20 (VI), pp. 77-78.

Type locality : Barkuda Island, Chilka lake.

Distribution : Orissa.

Genus *Nepal* Navas

1909. *Nepal* Navas, *Mem. Ac. Cs.*, Barcelona, (3) 7, No. 17, p. 627.

A. harmandi Navas

1909. *Nepal harmandi* Navas, *Mem. Ac. Cs.*, Barcelona, 7, No. 17, p. 627.

Distribution : India.

Family BEROOTHIDAE Handlirsch, 1908

Genus *Acroberotha* Navas

1929. *Acroberotha* Navas, *Mem. Ac. Ci.*, Zaragoza, 2, p. 58.

A. nicobarica Navas

1912. *Berotha nicobarica* Navas, *Broteria*, Braga, 10, p. 108.

1929. *Acroberotha nicobarica* Navas, *Mem. Ac. Ci.*, Zaragoza. 2, p. 58.

Type locality : Nicobar Is.

Distribution : Nicobar Is.

Genus *Berotha* Walker

1859. *Berotha* Walker, *Trans. ent. soc. Lond.*, (N.S.) 5, p. 186.

B. insolita Walker

1859. *Berotha insolita* Walker, *Trans. ent. soc. Lond.*, (N.S.) 5, p. 187.
 1914. *Berotha insolita* : Banks, *Rec. Indian Mus.*, 8, p. 354.
 1933. *Berotha insolita* : Banks, *Indian Forest. Rec.*, 18 (6) p. 1.

Distribution : Karnataka, Abor (E. Himalayas).

Genus Lekrugeria Navas

1929. *Lekrugeria* Navas, *Mem. Ac. Ci. Zaragoza*, 2, p. 40.

L. lineata Navas

1929. *Lekrugeria lineata* Navas, *Mem. Ac. Ci.*, Zaragoza, 2, p. 41, fig. 19.
 1933. *Lekrugeria lineata* : Banks, *Indian Forest Rec.*, 18 (6), p. 1.

Distribution : Maharashtra & S. India.

Family MANTISPIDAE Westwood, 1840

Subfamily MANTISPINAE Enderlein, 1910

Genus Climaciella Enderlein

1910. *Climaciella* Enderlein, *Stett. ent. Ztg.* 71, p. 343.

C. brianti Navas

1914. *Climaciella brianti* Navas, *Mem. Ac. Ci.*, Barcelona, 11, p. 92.

Distribution : India.

Genus Euclimacia Enderlein

1910. *Euclimacia* Enderlein, *Stett. ent. Ztg.*, 71, p. 342.

E. woodhousei Navas

1914. *Euclimacia woodhousei* Navas, *Mem. Ac. Ci.*, Barcelona, 11, p. 94.

Distribution : India.

Genus Mantispa Illiger

1798. *Mantispa* Illiger, *verz. Kafer Preussens*, p. 499.
 1910. *Mantispa* Enderlein, *Stett. Ent. Ztg.*, 71, p. 344.

M. alicante Banks

1913. *Mantispa alicante* Banks, *Trans. Am. ent. Soc.*, 39, p. 208.
 1933. *Mantispa alicante*: Banks, *Indian Forest Rec.*, 18 (6), p. 2.

Distribution : W. Bengal, Bihar, S. India.

M. femoralis Banks

1933. *Mantispa femoralis* Banks, *Indian Forest Rec.*, **18** (6), p. 2.

Type locality : Coorg.

Distribution. : Karnataka.

M. indica Westwood

1852. *Mantispa indica* Westwood, *Trans. R. ent. Soc. Lond.*, (N.S.) **1**, p. 268, 44, pl. 18, fig. 5.

1853. *Mantispa indica* : Walker, *Cat. Brit. Mus. Neur.*, p. 226.

1903. *Mantispa indica* : Needham, *Rec. Indian Mus.*, **3**, p. 195.

1933. *Mantispa indica* : Banks, *Indian Forest Rec.*, **18** (6), p. 2.

Distribution : India : W. Himalayas, Assam, W. Bengal, Karnataka, Nepal.

M. lineolata Westwood

1852. *Mantispa lineolata* Westwood, *Trans. R. ent. soc. Lond.*, (N.S.) **1**, p. 267, 43, pl. 18, fig. 4.

1853. *Mantispa lineolata* : Walker, *Cat. Brit. Mus., Neur.*, p. 226.

1909. *Mantispa lineolata* : Needham, *Rec. Indian Mus.*, **3**, p. 195.

Distribution : India : Kulu. Nepal.

M. maindroni Navas

1909. *Mantispa maindroni* Navas, *Mem. R. Ac. Cs.*, Barcelona, **7**, No. 10, p.8.

Distribution : India.

M. nodosa Westwood

1848. *Mantispa nodosa* Westwood, *Cabinet Oriental ent.*, London, pp. 70-71, fig. 7.

1909. *Mantispa nodosa* : Needham, *Rec. Indian Mus.*, **3**, p. 195.

Distribution : Assam.

M. quadrituberculata Westwood

1852. *Mantispa quadrituberculata* Westwood, *Trans. R. ent. Soc. Lond.*, (N.S.) **1**, p. 264, 39, pl. 18, fig. 1.

1853. *Mantispa quadrituberculata* : Walker, *Cat. Brit. Mus. Neur.*, p. 225.

1909. *Mantispa quadrituberculata* : Needham, *Rec. Indian Mus.*, **3**, p. 195.

Distribution : Kulu, N. Bengal, Assam.

M. rugicollis Navas

1905. *Mantispa rugicollis* Navas, *Bol. Soc. Aragon*, **4**, p. 54.
 1909. *Mantispa rugicollis* : Needam, *Rec. Indian Mus.*, **3**, p. 195.

Distribution : Himalayas, Assam, Sikkim.

Genus Mantisvilla

1910. *Mantisvilla* Enderlein, *Stett. Ent. Ztg.*, **71**, p. 342.

M. salana Navas

1930. *Mantisvilla salana* Navas, *Rec. Accad. Cienc.*, Zaragoza, pp. 89-90.
 1946. *Mantisvilla salana* : Castellarnau, *Lisbon Ci. nat.*, Broteria, **15**, pp. 123-124.

Distribution : Maharashtra.

M. torquilla Hagen

1866. *Mantisvilla torquilla* Hagen, *Stett. ent. Ztg.*, **27**, p. 429.
 1933. *Mantisvilla torquilla* : Banks, *Indian Forest Rec.*, **18**(6), p. 3.

Distribution : Karnataka.

Family OSMYLIDAE Newman, 1853**Subfamily OSMYLINAE Kruger, 1913****Genus Dictyosmylus Navas**

1910. *Dictyosmylus* Navas, *Ann. Soc. Scient.*, **34**, p. 189.

D. lunatus Navas

- 1910 *Dictyosmylus lunatus* Navas, *Ann. Soc. Scient.*, **34**, p. 189.

Type locality : Darjeeling.

Distribution : W. Bengal.

Genus Heterosmylus Kruger

1913. *Heterosmylus* Kruger, *Stett. ent. Ztg.*, **74**, p. 37.

H. aspersus Kruger

1913. *Heterosmylus aspersus* Kruger, *Stett. ent. Ztg.*, **74**, p. 37.

Type locality : Sikkim.

Distribution : Sikkim.

Genus Lahulus Navas

1930. *Lahulus* Navas, *Broteria*, (Ser. Zool.), **16**, p. 10.

L. babulti Navas

1930. *Lahulul babulti* Navas, *Broteria* (Ser. Zool.), **16**, p. 10.

Distribution : Himalayas.

Genus Osmylus Latreille

1802. *Osmylus* Latreille, *Hist. nat.*, Paris, 467 pp.

O. naevius Navas

1912. *Osmylus naevius* Navas, *Mem. R. Acad. Sci.*, Barcelona (ser. 3) **10**, (9), p. 52.

Distribution : India.

O. punctipennis Walker

1859. *Osmylus punctipennis* Walker, *Trans. R. ent. Soc. Lond.*, **5**, p. 183.

Distribution : India.

Genus Parosmylus Needham

1909. *Parosmylus* Needham, *Rec. Indian Mus.*, **3**, p. 209.

P. belae Ghosh & Sen

1968. *Parosmylus belae* Ghosh & Sen, *Zool. Anz.*, Bd. 180, Heft 1/2, pp. 107-109, pl. 1, fig. 1.

Type locality : Ukhal, Garhwal Dt.

Distribution : U. P.

P. prominens Needham

1909. *Parosmylus prominens* Needham, *Rec. Indian Mus*, **3**, p. 209.

Distribution : W. Himalayas.

Subfamily SPILOSMYLINAE Kruger, 1913**Genus SPILOSMYLUS** Kolbe

1897. *Spilosmylus* Kolbe, *Dietrich Reimer*, Berlin, p. 34.

S. lineatocollis MacLachlan

1870. *Spilosmylus lineatocollis* MacLachlan, *Ent. M.M.* **6**, p. 196.

Distribution : India.

Genus *Thyridosmylus* Kruger

1913. *Thyridosmylus* Kruger, *Stett. ent. Ztg.*, **74**, p. 87.

***T. langii* (MacLachlan)**

1870. *Osmylus langii* MacLachlan, *Ent. M.M.*, **6**, p. 197.

1913. *Thyridosmylus langii* : Kruger, *Stett. ent. Ztg.*, **74**, p. 87.

Type locality : Masuri (?)

Distribution : N. India.

***T. langii angustus* Kimmins**

1942. *Thyridosmylus langii angustus* Kimmins, *Ann. Mag. nat. Hist.*, **11** (9), p. 842.

Type locality : Khasi Hills.

Distribution : Meghalaya.

***T. pastulatus* Kimmins**

1942. *Thyridosmylus pastulatus* Kimmins, *Ann. Mag. nat. Hist.*, **11** (9), pp. 849-851.

Type locality : Khasi Hills.

Distribution : Meghalaya.

***T. perspicillaris* Gerst.**

1884. *Osmylus perspicillaris* Gerst., *MT. Vorpomm.*, Rugen, **16**, p. 46.

1911. *Lysmus perspicillaris* : Navas, *Rev. russe Ent.*, **11**, p. 113.

1914. *Thyridosmylus perspicillaris* : Kruger, *Stett. ent. Ztg.*, **75**, p. 56.

Type locality : Darjeeling.

Distribution : W. Bengal.

***T. perspicillaris fenestratus* Kimmins**

1942. *Thyridosmylus perspicillaris fenestratus* Kimmins, *Ann. Mag. nat. Hist.*, **11** (9), pp. 852-853.

Type locality : Gudulur, Nilgiris.

Distribution : Tamilnadu & Kerala.

***T. perspicillaris minor* Kimmins**

1942. *Thyridosmylus perspicillaris minor* Kimmins, *Ann. Mag. nat. Hist.*, **11** (9), pp. 851-852.

Type locality : Phedong.

Distribution : Sikkim.

Family SISYRIDAE Handlirsch, 1906

Subfamily SISYRINAE Banks, 1905

Genus *Sisyr* Burmeister

1839. *Sisyr* Burmeister, *Handbuch der Entomologie*, Berlin, 11, p. 975.

S. aquavivai Navas

1929. *Sisyr aquavivai* Navas, *Memorie Accad. pont. Nuovi Lincei*, Roma, (2) 12, p. 52.

Distribution : Maharashtra.

S. fasciata Navas

1930. *Sisyr fasciata* Navas, *Rev. Accad. Ciene.*, Zaragoza, 13, p. 44.

Distribution : India.

S. indica Needham

1909. *Sisyr indica* Needham, *Rec. Indian Mus.*, 3, p. 206.

Type locality : Calcutta.

Distribution : W. Bengal.

Genus *Sisyrina* Banks

1939. *Sisyrina* Banks, *Bull. Mus. Comp. Zool. Harv.*, Cambridge, Mass, 85 (7), p. 470.

S. nirvana Banks

1939. *Sisyrina nirvana* Banks, *Bull. Mus. Comp. Zool. Harv.*, Cambridge, Mass, 85(7), p. 470, fig. 36.

Type locality : Nedungata.

Distribution : S. India.

Family HEMEROBIIDAE Leach, 1815

Subfamily HEMEROBIINAE Kruger, 1922

Genus *Annandalia* Needham

1909. *Annandalia* Needham, *Rec. Indian Mus.*, 3, p. 208.

A. iniqua (Hagen)

1859. *Hemerobius iniquus* Hagen, *Verh. Zool.-bot. Gesel. Wien*, 9, p. 208.

1910. *Notiobiella maindronica* Navas, *Broteria*, (Ser. Zool.), 9, p. 110.

1932. *Annandalia iniqua* : Banks, *Psyche*, 39, p. 104.

Distribution : Bihar & S. India.

Genus **Drepanacrella** Kimmins

1940. *Drepanacrella* Kimmins, *Ann. Mag. nat. Hist.*, (11) 6, pp. 222, 223.

D. khasiana Kimmins

1940. *Drepanacrella khasiana* Kimmins, *Ann. Mag. nat. Hist.*, (11) 6, pp. 223, 224.

Type locality : Khasi Hills.

Distribution : Meghalaya.

Genus **Hemerobius** Linnaeus

1758. *Hemerobius* Linnaeus, *Syst. Nat.*, ed. X, 1, p. 549.

H. indicus Kimmins

1938. *Hemerobius indicus* Kimmins, *Ann. Mag. nat. Hist.*, (11) 2, p. 305.

Type locality : Kodaikanal.

Distribution : S. India.

Genus **Megalomus** Rambur

1842. *Megalomus* Rambur, *Hist. nat. Ins. Neur.*, p. 418.

M. nouhalieri Navas

1910. *Megalomus nouhalieri* Navas, *Broteria*, 9, p. 77.

Distribution : India.

M. setulosus (Walker)

1859. *Hemerobius setulosus* Walker, *Trans. ent. Soc. Lond.*, (N.S.) 5, p. 186.

1935. *Megalomus setulosus* : Kimmins, *Ann. Mag. nat. Hist.*, 10 (16), pp. 607-608.

Distribution : Kashmir

Genus **Neuronema** MacLachlan

1869. *Neuronema* MacLachlan, *Ent. M. M.*, 6, p. 27.

N. assamensis Kimmins

1943. *Neuronema assamensis* Kimmins, *Ann. Mag. nat. Hist.*, 11 (10), pp. 44-47.

Type locality : Khasi Hills.

Distribution : Meghalaya.

N. decisum (Walker)

1859. *Hemerobius decisus* Walker, *Trans. R. ent. Soc. Lond.*, (N. S.) 5, p. 185.
1869. *Neuronema decisum* : MacLachlan, *Ent. M. M.*, 6, p. 27.
1922. *Neuronema decisum* : Kruger, *Stett. ent. Ztg.*, 83, p. 170.

Distribution : W. Bengal, Punjab.

Subfamily MICROMINAE Kruger, 1922

Genus **Eumicromus** Nakahara

1915. *Eumicromus* Nakahara, *Annot. Zool. Jap.*, 9, p. 11.

E. kapuri Nakahara

1971. *Eumicromus kapuri* Nakahara, *Kontyu*, 39, pp. 11-12, figs. 4 & 5.

Type locality : Cherrapunji.

Distribution : Assam, W. Bengal.

Genus **Micromus** Rambur

1842. *Micromus* Rambur, (Roret's Suite a Buffon) *Neuropteres*, p. 416.

M. australis Hagen

Micromus australis Hagen*

1933. *Micromus australis* Banks, *Indian Forest Rec.*, 18, (6), p. 2.

Distribution : India.

M. benardi Navas

1912. *Micromus benardi* Navas, *Insectos Neuropteros nuevos Verh. intern. Zool. Kongr.*, Jena, 8, p. 750.

Distribution : Maharashtra.

M. nilghiricus Navas

1910. *Micromus nilghiricus* Navas, *Broteria S. Fiel*, 9, p. 74.
1933. *Micromus nilghiricus* : Banks, *Indian Forest Rec.*, 18 (6), p. 2.

Distribution : Karnataka.

M. sabulosus Navas

1908. *Micromus sabulosus* Navas, *Mem. R. Ac. Cs.*, Barcelona, 6, p. 406.

Distribution : India.

*Original reference could not be traced.

M. umbrosus Navas

1931. *Micromus umbrosus* Navas, *Rev. Acad. Cienc., Zaragoza*, **14**, p. 87.

Type locality : Bandra.

Distribution : Maharashtra.

Family SYMPHEROBIDAE Brues & Melander, 1932

Genus **Notiobiella Banks**

1909. *Notiobiella* Banks *Proc. ent. Soc. Wash.*, **11**, pp. 76-82.

N. khandalensis Navas

1929. *Notiobiella khandalensis* Navas, *Mem. Acad. Nuovi. Lincei.*, (2) **14**, p. 422.

Distribution : India.

N. maindronina Navas

1910. *Notiobiella maindronina* Navas, *Broteria S. fiel*, **9**, p. 70.

Distribution : India.

N. viridinervis Banks

1933. *Notiobiella viridinervis* Banks, *Indian Forest Rec.*, **18** (6), p. 2.

Distribution : S. India.

Family CHRYSOPIDAE Newman, 1853

Subfamily CHRYSOPINAE Esben-Petersen, 1918

Genus **Ankylopteryx Brauer**

1864. *Ankylopteryx* (=Ancylo—auct.,) Brauer, *Verh. Zool.-bot. Ges., Wien*, **14**, Abh., p. 899

A. octopunctata (Fabricius)

1793. *Hemerobius octopunctata* Fabricius, *Ent. Syst.*, **11**, p. 85.

1798. *Hemerobius candidus* Fabricius, *Ent. Suppl.*, p. 202.

1851. *Chrysopa candida* : Schneider, *Mon. Chrysop.*, p. 161.

1853. *Chrysopa candida* : Walker, *Cat. Brit. Mus. Neur.*, p. 274.

1864. *Ankylopteryx candida* : Brauer, *Verh. Zool.-bot. Ges., Wien*, **14**, p. 901.

1858. *Chrysopa punctata* Hagen, *Syn. Neur. Ceyl.*, **1**, p. 483.

1864 *Ankylopteryx punctata* : Brauer, *loc. cit.*, p. 901.

1853 *Hemerobius trimaculatus* Girard, *Ann. Soc. Ent. Fr.*,)3) **7**, p. 163.

1864. *Ankylopteryx trimaculata* : Brauer, *loc. cit.*, p. 901.
1864. *Ankylopteryx anomala* Brauer, *loc. cit.*, p. 901.
1866. *Ankylopteryx anomala* : Brauer, *Novara. Exp. Zool.*, 11, p. 35.
1893. *Ankylopteryx sigillaris* Gerstaecker, *Mitt. Naturw. Ver. Neu-Vorpommern und Rugen*, 25, p. 162.
1909. *Ankylopteryx octopunctata* : Weele, *Notes Leyden Mus.*, 31, pp. 57-58.
-Distribution : S. India; Andamans; Kobo, Rotung.

A. octopunctata var. **salai** Navas

1929. *Ankylopteryx octopunctata salai* Navas, *Mem. Acad. Nuovi. Lincei.*, (2) 14, p. 424.

Distribution : Maharashtra.

A. tessellatus Needham

1909. *Ankylopteryx tessellatus* Needham, *Rec. Indian Mus.*, 3, p. 205.

Type locality : Assam.

Distribution : Assam.

A. viridis Navas

1929. *Ankylopteryx viridis* Navas, *Mem. Acad. Nuovi. Lincei.*, (2) 14, p. 424.

Distribution : India.

Genus Chrysacanthia Lacroix

1923. *Chrysacanthia* Lacroix, *Bull. Soc. ent. France*, p. 120.

C. esbeniana Lacroix

1923. *Chrysacanthia esbeniana* Lacroix, *Bull. Soc. ent. France*, p. 120.

Distribution : Tamilnadu.

Genus Chrysopa Leach

1815. *Chrysopa* Leach, Artikel entomology-Brewster, *Edinburgh Encyclopaedia*, 9, (1), pp. 57-172.

C. alcestes Banks

1911. *Chrysopa alcestes* : Banks, *Proc. ent. Soc. Wash.*, 13, pp. 102-103.
1914. *Chrysopa alcestes* : Banks, *Rec. Indian Mus.*, 8, p. 355.
1933. *Chrysopa alcestes* : Banks, *Indian Forest Rec.*, 18, (6), p. 3.

Distribution : Bihar, Upper Rotung, S. India,

C. bandrina Navas

1935. *Chrysopa bandrina* Navas, *Mems. R. Acad. Cienc. Artes., Barcelona*, (3) 25, p. 55.

Type locality : Bombay.

Distribution : Maharashtra.

C. bertrani Navas

1931. *Chrysopa bertrani* Navas, *Rev. Accad. Cienc., Zaragoza*, 14, p. 83.

Distribution : Maharashtra.

C. caesa Navas

1929. *Chrysopa caesa* Navas, *Mem. Acad. Nuovi. Lincei., Roma*, (2) 12, p. 47

Distribution : India.

C. cymbele Banks

1933. *Chrysopa cymbele* Banks, *Indian Forest Rec.*, 18, (6), p. 3.

Type locality : Madras.

Distribution : Tamilnadu, Karnataka.

C. faceta Navas

1912. *Chrysopa faceta* Navas, *Broteria, Braga* 10, p. 103.

Type locality : Nicobar Islands.

Distribution : Nicobar Isles.

C. herasina Navas

1928. *Chrysopa herasina* Navas, *Rev. Accad. Cienc., Zaragoza*, 12, p. 192.

Distribution : Maharashtra.

C. ignita Navas

1910. *Chrysopa ignita* Navas, *Rev. russe Ent.*, 10, p. 192.

Type locality : Matheran.

Distribution : Maharashtra.

C. ignobilis Walker

1859. *Chrysopa ignobilis* Walker, *Trans. R. ent. Soc. Lond.*, 5, p. 183.

Distribution : "Hindostan".

C. inflecta Walker

1853. *Chrysopa inflecta* Walker, *Cat. Brit. Mus. Neur.*, p. 246.

Distribution : Kerala.

C. khandalensis Navas

1932. *Chrysopa khandalensis* Navas, *Rev. Accad. Cienc.*, Zaragoza, **15**, p. 16.

Type locality : Khandala.

Distribution : Maharashtra.

C. khandalina Navas

1931. *Chrysopa Khandalina* Navas, *Rev. Accad. Cienc.*, Zaragoza, **14**, p. 84.

1933. *Chrysopa khandalina*. : Banks, *Indian Forest Rec.* **18** (6), p. 3.

Type locality : Khandala.

Distribution : Maharashtra.

C. lacciperda Kimmins

1955. *Chrysopa lacciperda* Kimmins, *Indian J. Ent.*, **17**, p. 217.

Distribution : India.

C. madestes Banks

1911. *Chrysopa madestes* Banks, *Proc. ent. Soc. Wash.*, **13**, p. 103.

Type locality : Pusa.

Distribution : Bihar.

C. notata Navas

1910. *Chrysopa notata* Navas, *Broteria S. Fiel.*, **9**, p. 55.

Type locality : Darjeeling.

Distribution : W. Bengal.

C. orestes Banks

1911. *Chrysopa orestes* Banks, *Proc. ent. Soc. Wash.*, **13**, p. 102.

1933. *Chrysopa orestes* : Banks, *Indian Forest Rec.*, **18** (6), p. 3.

Type locality : Pusa.

Distribution : Bihar, Karnataka.

C. procubitalis Navas

1912. *Chrysopa procubitalis* Navas, *Broteria*, Braga, **10**, p. 105.

Type locality : Nicobar

Distribution : Nicobar.

C. rocasolanai Navas

1928. *Chrysopa rocasolanai* Navas, *Rev. Accad. Cienc.*, Zaragoza, **12**, p. 193.

Distribution : Maharashtra.

C. scelestes Banks

1911. *Chrysopa scelestes* Banks, *Proc., ent. Soc. Wash.*, **13**, p. 103.

Type locality : Pusa.

Distribution : Bihar.

C. (Chrysopa) septempunctata Wesmael

1841. *Chrysopa septempunctata* Wesmael, *Bull, L'Acad. Brux.*, **8**, p. 210.

1842. *Hemerobius pallens* Rambur, *Hist. nat. ins. Neur.*, p. 425.

1842. *Hemerobius mauricianus* Rambur, *ibid.*, p. 425.

1851. *Chrysopa nobilis* Brauer (Nec Heyden) *Haid nat. Abh.*, **4**(4), p. 7.

1851. *Chrysopa pallens* : Schneider, *Sym. Mon. Gen. Chrysop.*, p. 101.

1851. *Chrysopa septempunctata* : Schneider, *Sym. Mon. Gen. Chrysop.*, p. 101.

1858. *Chrysopa septempunctata* : Hagen, *Ent. Ann.*, p. 23.

1868. *Chrysopa septempunctata* : MacLachalan, *Trans. R. ent. Soc. Lond.*, p.201.

1923. *Cintameva septempunctata*: Navas, *Entom. Catalunya Neuropt.*, p. 164.

1927. *Chrysopa septempunctata* : Lucas, *Entomologist*, **60**, p. 7.

1929. *Chrysopa septempunctata* : Killington, *Trans. ent. Soc. Hamps. and, S. Eng.*, p. 32.

1966. *Chrysopa (Chrysopa) septempunctata* : Tjeder, *South African animal life*, **12**, p. 352.

Distribution : India.

C. silleme Esben-Petersen

1935. *Chrysopa silleme* Esben-Petersen, *Wiss. Ergebn. niederl. Exped., Karakorum*, **1**, p. 234.

Distribution : Karakorum.

C. smitzi Navas

1913. *Chrysopa smitzi* Navas, *Rev. russe. Ent.*, **13**, p. 426.

1933. *Chrysopa schmitzi* : Banks, *Indian Forest Rec.*, **18** (6), p. 3.

Type locality : Bombay.

Distribution : Maharashtra, Karnataka.

C. villalongae Navas

1935. *Chrysopa villalongae* Navas, *Mems. R. Acad. Cienc. Artes.*, Barcelona, (3) 25, p. 56.

Type locality : Bombay.

Distribution : Maharashtra.

C. virgestes Banks

1914. *Chrysopa virgestes* Banks, *Rec. Indian Mus.*, 8, p. 103.

1933. *Chrysopa virgestes* : Banks, *Indian Forest Rec.*, 18 (6), p. 3.

Distribution : Karnataka, Assam.

Genus Chrysopidia Navas

1910. *Chrysopidia* Navas, *Broteria S. Fiel.*, 9, p. 54.

C. nigrata Navas

1910. *Chrysopidia nigrata* Navas, *Broteria S. Fiel.*, 9, p. 55.

Type locality : Darjeeling.

Distribution : W. Bengal.

C. numerosa Navas

1914. *Chrysopidia numerosa* Navas, *Rev. russe. Ent.*, 14, p. 11.

Type locality : Darjeeling.

Distribution : W. Bengal.

Genus Cintameva Navas

1914. *Cintameva* Navas, *Rev. russe. Ent.*, 14, p. 214.

C. bandrensis Navas

1929. *Cintameva bandrensis* Navas, *Mem. Ac. Nuovi. Lincei.*, (2) 12, p. 49.

Distribution : India.

C. benaventii Navas

1930. *Cintameva benaventii* Navas, *Mem. Ac. Nuovi. Lincei.*, (2) 14, p. 423.

Distribution : India.

C. gloriosa Navas

1930. *Cintameva gloriosa* Navas, *Rev. Accad. Cienc.*, Zaragoza, pp. 85-86.

Type locality : Bandra.

Distribution : Maharashtra.

C. guttata Navas

1929. *Cintameva guttata* Navas, *Rev. Accad. Cienc.*, Zaragoza, **13**, p. 42.

Type locality : Kurseong.

Distribution : Kurseong.

Genus Glenochrysa Esben-Petersen

1920. *Glenochrysa* Esben-Petersen, *Ann. South African Mus.*, **17**, p. 518.

G. marmorata (Needham)

1909. *Eremochrysa marmorata* Needham, *Rec. Indian Mus.*, **3**, p. 205.

1940. *Glenochrysa marmorata* : Kimmins, *Ann. Mag. Nat. Hist.*, (11) **5**, p.449,

Type locality : Upper Assam.

Distribution : Assam.

Genus Leucochrysa MacLachlan

1868. *Leucochrysa* MacLachlan, *Trans. R. ent. Soc. Lond.*, p. 208.

L. mira Navas

1913. *Leucochrysa mira* Navas, *Annls. Soc. Scient. Brux.*, **38**, p. 110.

Distribution : India.

Genus Stigmachrysa Navas

1925. *Stigmachrysa* Navas, *Annls. Soc. Scient. Brux.*, **44**, p. 570.

S. elisabethe Navas

1928. *Stigmachrysa elisabethe* Navas, *Bol. Soc. ent. esp.*, Saragossa, **11**, p. 135.

Distribution : India.

Genus Tumeochrysa Needham

1909. *Tumeochrysa* Needham, *Rec. Indian Mus.*, **3**, p. 204.

1910. *Chrysoplecta* Navas, *Broteria*, **9**, p. 55.

1940. *Tumeochrysa* Banks, *Proc. U. S. nat. Mns.*, **88** (3079) p. 187.

T. cirerai (Navas)

1930 *Chrysoplecta cirerai* Navas, *Rev. Accad. Cienc.*, Zaragoza, **13**, p. 43.

Distribution : West Bengal.

T. indica Needham

1909. *Tumeochrysa indica* Needham, *Rec. Indian Mus.*, **3**, p. 204.

Type locality : Bhimtal.

Distribution : W. Himalayas.

Subfamily NOTHOCHRYSIDAE Navas, 1910.

Genus **Nothochrysa** MacLachlan

1868. *Nothochrysa* MacLachlan, *Trans. R. ent. Soc. Lond.*, pp. 145-224.

N. aequalis (Walker)

1853. *Chrysopa aequalis* Walker, *Cat. Brit. Mus. Neur.*, p. 266.

1933. *Nothochrysa aequalis* : Banks, *Indian Forest Rec.* **18** (6), p. 3.

Distribution : Karnataka.

N. carletoni Banks

1939. *Nothochrysa carletoni* Banks, *Bull. Mus. Comp. Zool. Harv., Cambridge, Mass.* **85** (7), p. 472.

Type locality : Sikkim.

Distribution : Sikkim.

N. cladostigma Navas

Nothochrysa cladostigma Navas, *Anns. Soc. Scient. Brux.*, **37**, p. 325.

Distribution : India.

N. henryi Kimmins

1938. *Nothochrysa henryi* Kimmins, *Ann. Mag. nat. Hist.*, **11** (2), p. 307.

Distribution : Kerala.

N. indigena Needham

1909. *Nothochrysa indigena* Needham, *Rec. Indian Mus.*, **3**, p. 203.

Type locality : Calcutta.

Distribution : W. Bengal.

N. lefroyi Needham

1909. *Nothochrysa lefroyi* Needham, *Rec. Indian Mus.*, **3**, p. 203.

Distribution : Bihar, Punjab, Assam, Meghalaya, W. Himalayas.

N. robusta Needham

1909. *Nothochrysa robusta* Needham, *Rec. Indian Mus.*, 3, p. 202.

Type locality : Sibsagar.

Distribution : Assam.

N. talaverae Navas

1928. *Nothochrysa talaverae* Navas, *Bol. Soc. ent. esp.*, Saragossa, 11, p.133.

Type locality : Sikkim.

Distribution : Sikkim.

Family PSYCHOPSIDAE Handlirsch, 1908

Genus **Balmes** Navas

1910. *Balmes* Navas, *Broteria*, 9, p. 85.

B. terrissimus (Navas)

1910. *Balmes terrissimus* Navas *Broteria*, 9, p. 85.

Distribution : Tibet.

Family NEMOPTERIDAE Burmeister, 1839.

Tribe CROCINI Navas

Genus **Croce** MacLachlan (restr.)

1885. *Croce* MacLachlan, *Proc. ent. Soc.*, London, p. 378.

C. braueri Navas

1910. *Croce braueri* Navas, *Mem. R. Ac. Cs.*, Barcelona, 8, No. 18, p. 63.

Distribution : India.

C. filipennis Westwood

1841. *Nemoptera filipennis* Westwood, *Proc.*, *Zool. Soc.*, London, p. 13.

1842. *Nemoptera filipennis* Westwood, *Cabinet Oriental Ent.*, pl. 34.

1853. *Nemoptera filipennis* : Walker, *Cat. Brit. Mus. Neur.*, p. 476.

1909. *Croce filipennis* : Needham, *Rec. Indian Mus.*, 3, p. 196.

1911. *Croce filipennis* : Imms, *Trans. Linn. Soc.*, 11, pp. 151-156.

1921. *Croce filipennis* : Dover, *Rec. Indian Mus.*, 22, p. 398.

Distribution : W. Bengal, Bihar, Orissa, U.P., Maharashtra, Gujarat.

Genus **Nina** Navas

1910. *Nina* Navas, *Mem. Acad.*, Barcelona, (3) 8, p. 352.

N. meade-waldoi Navas

1911. *Nina meade-waldoi* Navas, *Zs. Wiss Insectenbiol.*, Berlin, 7, p 25.

Distribution : India.

Tribe NEMOPTERINI Navas

Genus **Eretmoptera** Navas

1910. *Eretmoptera* Navas, *Mem. R. Ac. Cs.*, 8, No. 18, p. 21.

E. neglecta Navas

1910. *Eretmoptera neglecta* Navas, *Mem. R. Ac. Cs.*, 8, No. 18, p. 27.

Distribution : India.

Genus Halter Rambur

1842. *Halter* Rambur, *Ins. Neur.*, p. 332.

H. halterata (Forsk.)

1785. *Panorpa halterata* Forsk., *Descript. Anim.*, 97, pl. 25, fig. 2.

1815. *Nemopteryx africana* Leach, *Zool. Miscell.*, 11, 74, pl. 85.

Nemopteryx africana : Griff., ed. *Anim. Kingd.*, 15, 324, pl. 105, fig. 4.

1842. *Nemoptera pallida* Lam., *Hist. nat. Anim. Invert.*, IV-, 419, 5.

1851. *Nemoptera pallida* : Oliv., *Enc. Meth.*, 8, p. 179, n. 5.

1853. *Nemoptera halterata* : Walker, *Cat. Brit. Mus. Neur.*, p. 473.

Nemoptera halterata : Klug, *Abh. Kon. Akad. Wiss.*, Berlin, 94, 8.

Nemoptera forskalli Westwood, *Proc. Boston Soc. nat. Hist.*, 23, p. 11, n.6.

1887. *Nemoptera pallida* : Hagen, *Proc. Boston Soc., nat. Hist.*, 23, p. 257.

1887. *Nemoptera halterata* : Hagen, *Proc. Boston Soc. nat. Hist.*, 12, p. 257, n. 8.

1909. *Halter halterata* : Needham, *Rec. Indian Mus.*, 3, p. 196.

Distribution : India: Rajasthan : Pakistan : Baluchistan.

H. nutans Navas

Halter nutans Navas, *Mem. R. Accad. Cienc.*, 8 (18), pp. 35-36.

1950. *Halter nutans* Kimmins, *Vidensk. Meddr. dansk. naturh. Foren.*, 112, p.

Type locality : Quetta.

Distribution : N. W. India.

Pakistan ; Quetta.

Family MYRMELEONTIDAE Burmeister, 1829

Tribe ACANTHACLISINI Navas, 1912

Genus *Acanthaclisis* Rambur

Acanthaclisis Rambur, *Hist. nat. Ins. Neur.*, p. 378.

A. edax (Walker)

1853. *Myrmeleon edax* Walker, *Cat. Brit. Mus. Neur.*, p. 317.
 1909. *Myrmeleon edax* : Needham, *Rec. Indian Mus.*, 3, p. 200.
 1921. *Acanthaclisis edax* : Dover, *Rec. Indian Mus.*, 22, pp. 397-398.

Distribution : Tamilnadu, Orissa.

A horridus (Walker)

1853. *Myrmeleon horridus* Walker, *Cat. Brit. Mus. Neur.*, p. 336.
 1868. *Acanthaclisis horridus* : MacLachlan, *J. Linn. Soc.*, London, 9, p. 276.
 1909. *Acanthaclisis horridus* : Needham, *Rec. Indian Mus.*, 3, p. 200.
 1911. *Acanthaclisis horridus* : Banks, *Proc. ent. Soc. Wash.*, 13, p. 101.
 1921. *Acanthaclisis horridus* : Dover, *Rec. Indian Mus.*, 22, p. 396.

Distribution : W. Bengal, Assam, Bihar, Orissa, Tamilnadu.

A. indica Banks

1911. *Acanthaclisis indica* Banks, *Proc. ent. Soc. Wash.*, 13, p. 100.

Type locality : Chapra.

Distribution : Bihar.

Centroclisis Navas

1909. *Centroclisis* Navas, *Butll. Inst. Catalana Hist. nat.*, 6, p. 71.
 1911. *Neboda* Navas, *Rev. russe. Ent.*, 11, p. 114.
 1912. *Sogra* Navas, *Broteria*, 10, p. 43.
 1914. *Neoclis* Navas, *Ann. Mus. Civ.*, 46, p. 205.
 1932. *Stenoclis* Navas, *Broteria Ci. nat.*, 1, p. 62.
 1954. *Centroclisis* : Markl, *Verh. naturf. Ges., Basel*, Bd. 65, No. 2, p. 231.

C. bandrensis (Navas)

1933. *Sogra bandrensis* Navas, *Mem. Pont. Acad. Sci.*, (3) 1, p. 219.

Distribution.— India.

C. eustalacta Gerst.

1863. *Acanthaclisis eustalacta* Gerst. *Stett. ent. Ztg.*, 24, p. 178.
 1866. *Centroclisis eustalacta* Hagen, *Stett. ent. Ztg.*, 27, p. 378.
 1909. *Acanthaclisis eustalacta* : Needham, *Rec. Indian Mus.*, 3, p. 200.

Distribution.— U. P.

C. lutea Navas

1912. *Centroclisis lutea* Navas, *Broteria*, Ser. Zool., 10, p. 42.

Type locality : Bombay.

Distribution : Maharashtra.

Genus Stiphroneura Gerst.

1885. *Stiphroneura* Gerstaecker, *Mitt., naturw. Ver. Neu Vorpomm.*, 16, p. 91.

1926. *Neriga* Navas, *Broteria*, 23, p. 69.

S. inclusa (Walker)

1853. *Myrmeleon inclusus* Walker, *Cat. Brit. Mus. Neur.*, p. 327.

1886. *Stiphroneura inclusus*:Gerst. *Mt. Vorpomm.*, 16, p. 91.

1909. *Stiphroneura inclusa*:Needham, *Rec. Indian Mus.*, 3, p. 200.

Type locality : East Indies.

Distribution : Sikkim.

Genus Syngenes Kolbe

1897. *Syngenes* Kolbe, *Deutsch. O. Afrika*, 4, p. 16.

S. palpalis Banks

1931. *Syngenes palpalis* Banks, *Psyche*, 38, p. 62.

Type locality : Vizagapatam.

Distribution : Andhra Pradesh.

Tribe CREOLEONINI Navas, 1912**Genus Creoleon Tillyard**

1860. *Creagris* Hagen, *Stett. ent. Ztg.*, 21, p. 364.

1918. *Creoleon* Tillyard, *Proc. Linn. Soc. N. S. Wales*, 43, p. 436.

1954. *Creoleon*:Markl, *Verh. naturf. Ges.*, Basel, Bd. 65, No. 2, pp. 241-242.

C. fulvinervis (Navas)

1932. *Creoleon fulvinervis* (Navas), *Rev. Accad. Cienc.*, 15, pp. 14-16.

Type locality : Bandra.

Distribution : Maharashtra.

C. littorea (Navas)

1940. *Creagris littorea* Navas, *Annl. Soc. Scient. Brux.*, 38, p. 240.

Type locality : Pondichery.

Distribution : Tamilnadu.

C. lugdunensis (Villers)

1789. *Myrmeleon lugdunense* Villers, *Ent. Faun.*, **10**, p. 63.
 1807. *Myrmeleon lineatus* Latreille, *Gen. Crust. Ins.*, **3**, p. 193.
 1811. *Myrmeleon plumbeus* Olivier, *Encycl. Meth.*, **8**, p. 126.
 1834. *Myrmeleon murinus* Klug *Symb. Phys.* IV Tafel 36, fig. 6.
 1839. *Myrmeleon pictus* Burmeister, *Handb. Entomol.*, **2**, p. 994.
 1841. *Myrmeleon tabidus* Eversmann, *Bull. Moscou*, **14**, p. 550.
 1842. *Myrmeleon pallidipennis* Rambur, *Hist. nat. Ins. Neur.*, p. 304.
 1856. *Myrmeleon conspurcatus* Kolenati, *Bull. Moscou*, **29**, p. 502.
 1860. *Creagris plumbea*:Hagen, *Stett. ent. Ztg.*, **21**, p. 364.
 1946. *Creoleon murinus*:Castellarnau, *Lisbon Ci. nat.*, *Broteria*, **15**, p. 121.
 1972. *Creoleon lugdunensis*:Holzel, *Beitr. naturk. Forsch. SudwDtl.*, **1**, p. 60.

Distribution : Bandra, Maharashtra.

C. parallela (Banks)

1911. *Creagris parallela* Banks, *Proc. ent. Soc. Wash.*, **13**, p. 101.

Type locality : Pusa.

Distribution : Bihar.

C. griseus (Klug)

1834. *Myrmeleon griseus* Klug, *Symb. Phys.* IV, Tafel 36, fig. 8.
 1853. *Myrmeleon perfidus* Walker, *Cat. Brit. Mus.*, *Neur.*; p. 350.
 1853. *Myrmeleon sedulus* Walker, *Cat. Brit. Mus. Neur.*, p. 355.
 1853. *Myrmeleon adversus* Walker, *Cat. Brit. Mus. Neur.*, p. 358.
 1868. *Creagris perfidus*:MacLachlan, *J. Linn. Soc.*, **9**, pp. 277-278.
 1909. *Myrmeleon adversus* : Needham, *Rec. Indian Mus.*, **3**, p. 201.
 1909. *Creagris sedulus*: Needham, *Rec. Indian Mus.*, **3**, p. 201.
 1972. *Creoleon griseus* : Holzel, *Beitr. naturk. Forsch. SudwDtl.*, **1**, p. 61.

Distribution : W. Bengal, Bihar, Orissa, U. P., Tamilnadu, Maharashtra.

Genus Allogama Banks

1912. *Gama Navas*, *Broteria* **10**, p. 57.
 1943. *Allogama* Banks, *Bol. ent.*, *Venezolana*, **2**, p. 166.
 1954. *Allogama*:Markl, *Verh. Naturf. Ges.*, *Basel*, Bd. **65**, No. 2, p. 242.

A. irene (Banks)

1939. *Gama irene* Banks, *Bull. Mus. Comp. Zool. Harv.*, *Cambridge, Mass.*, **85**, No. 7, pp. 456-457.

Distribution : W. Begal, Karnataka.

Tribe DENDROLEONINI Navas, 1912.

Genus **Borbon** Navas

1914. *Borbon* Navas, *Mem. R. Acad. Cienc.*, **11**, p. 111.

B. regius Navas

1914. *Borbon regius* Navas, *Mem. R. Acad. Cienc.*, 11, p. 112.

Distribution : Himalaya.

Genus Gatzara Navas

1915. *Gatzara* Navas, *Mem. R. Acad. Cienc.*, 11, p. 385.

G. benaci Navas

1915. *Gatzara benaci* Navas, *Mem. Acad. Cienc. Artes.*, (3) 25, p. 47.

Distribution : India

G. jubilaea Navas

1915. *Gatzara jubilaea* Navas, *Mem. R. Acad. Cienc.*, 11, No. 23, p. 16.

Type locality : Darjeeling.

Distribution : W. Bengal.

Genus Indoclystus Banks

1941. *Indoclystus* Banks, *Am. Mus. Novit.*, New York, 1143, p. 3.

I. singularis (Westwood)

1848. *Myrmeleon singularis* Westwood, *Cabinet Oriental ent.*, p. 70, pl. 34.

1853. *Myrmeleon singularis*:Walker, *Cat. Brit. Mus. Neur.*, p. 399.

1868. *Glenurus singularis*:MacLachlan, *J. Linn. Soc. Zool.*, 9, p. 281.

1941. *Indoclystus singularis* : Banks, *Am. Mus. Novit.*, New York, No. 1143, p 3.

Distribution : N. India.

Genus Layahima Navas

1912. *Layahima* Navas, *Broteria*, 10, p. 36.

L. nebulosa Navas

1912. *Layahima nebulosa* Navas, *Broteria*, 10, pp. 36 & 38.

Type locality : Darjeeling.

Distribution : W. Bengal.

Genus Nuglerus Navas

1912. *Nuglerus* Navas, *Ann. Soc. Sci.*, 36, p. 245.

1915. *Bofia* Navas, *Mem. R. Acad. Ci.*, 11, p. 383.

1917. *Bullanga* Navas, *Memorie Accad. pont. Nuovi. Lincei.*, (2) 3, p. 15.

1954. *Nuglerus* Markl, *Verh. naturf. Ges.*, Basel, Bd. 65, No. 2., p. 221.

N. scalaris Navas

1912. *Nuglerus scalaris* Navas, *Ann. Soc. Sci.*, **36**, p. 246.

1941. *Nuglerus scalaris* : Banks, *Am. Mus. Novit.*, New York, No. **1143**, 5 pp.

Distribution : N. India.

Tribe ECHTHROMYRMICINI Markl, 1954**Genus Echthromyrmex MacLachlan**

1867. *Echthromyrmex* MacLachlan, *J. Linn. Soc. Lond.*, **9**, p. 243.

E. orientalis MacLachlan

1873. *Echthromyrmex orientalis* MacLachlan, *Ann. ent. Belg.*, **16**, p. 143.

Distribution : Goa, Orissa.

Tribe FORMICALEONINI Navas, 1912**Genus Banyutus Navas**

1912. *Banyutus* Navas, *Broteria*, **10**, p. 66.

1925. *Folla* Navas, *Rev. Zool.-bot. afric.*, **13**, p. 130.

1932. *Dallus* Navas, *Rev. Zool.-bot. afric.*, **22**, p. 274.

1954. *Banyutus* Markl, *Verh. naturf. Ges.*, Basel, Bd. **65**, no. 2, p. 237.

B. indicus Navas

1929. *Banyutus indicus* Navas, *Rev. Accad. Cienc.*, **12**, p. 186-188.

Type locality : Kandala.

Distribution : Maharashtra.

Genus Distoleon Banks

1910. *Distoleon* Banks, *Ann. ent. Soc. Am.*, **3**, p. 42.

1918. *Eidoleon* Esben-Petersen, *Ark. Zool.*, **11**, No. 26, p. 15.

1954. *Distoleon* Markl, *Verh. naturf. Ges.*, Basel, Bd. **65**, No. 2, p. 237.

D. pallipennis Banks

1939. *Distoleon pallipennis* Banks, *Bull. Mus. Comp. Zool. Harv.*, Cambridge, Mass, **85**, No. 7, pp. 463-464.

Type locality : Chapra.

Distribution : Bihar.

D. rhodocerus Navas

Distoleon rhodocerus Navas*

1939. *Distoleon rhodocerus* Banks, *Bull. Mus. Comp. Zool. Harv.*, Cambridge, Mass, **85**, No. 7, pp. 462-463.

Distribution : Tamilnadu

*Original reference could not be traced.

Genus Dolicholeon Navas

1929. *Dolicholeon* Navas, *Rev. Accad. Cienc.*, **12**, p. 190.

D. rhegmalis Navas

1931. *Dolicholeon rhegmalis* Navas, *Rev. Accad. Cienc.*, **14**, p. 81.
Distribution: India.

D. substigmalis Navas

1929. *Dolicholeon substigmalis* Navas, *Rev. Accad. Cienc.*, **12**, p. 191.
Distribution : W. Bengal, Maharashtra.

Genus Formicaleon Banks

1815. *Formicaleo* Leach, *Edinburgh Encycl.*, **9**, p. 138.
1865. *Formicaleo* : Brauer, *Verh. Zool.-bot. Ges. Wien.*, **15**, p. 904.
1911. *Formicaleon* : Banks, *Ann. ent. Soc. Am.*, **4**, p. 16.

F. bivittatum Banks

1914. *Formicaleon bivittatum* Banks, *Rec. Indian Mus.*, **8**, p. 355.
Distribution : India : Abor.
Burma.

F. brahmanicus Banks

1913. *Formicaleon brahmanicus* Banks, *Proc. ent. Soc. Wash.*, **15**, p. 142.
Type locality : Pusa.
Distribution : Bihar.

F. cerdo Gerst.

1893. *Formicaleon cerdo* Gerstaecker, *MT. Ver. Vorpomm.*, p. 127.
Type locality : W. Bengal.
Distribution : W. Bengal.

F. cubitalis Navas

1914. *Formicaleon cubitalis* Navas, *Ann. Soc., Sci.* **38**, p. 252.
Type locality : N. India.
Distribution : N. India.

F. levis Navas

1914. *Formicaleon levis* Navas, *Rev. russe Ent.*, **14**, p. 8, fig. 2.
Type locality : Pondicherry.
Distribution : Tamilnadu.

F. marcida Banks

1939. *Formicaleon marcida* Banks, *Bull. Mus. Comp. Zool. Harv.*, Cambridge, Mass, **85**, pp. 460-61.

Type locality : Nedungata, Tanjore.

Distribution : S. India.

F. plebejus Navas

1914. *Formicaleon plebejus* Navas, *Rev. russe. Ent.*, **14**, p. 7.

Distribution: India.

F. pugnax (Walker)

1853. *Myrmeleon pugnax* Walker, *Cat. Brit. Mus. Neur.*, p. 344.

1868. *Formicaleo pugnax*:MacLachlan, *J. Linn. Soc. Zool.*, **9**, p. 277.

Type locality : North India.

Distribution : N. India.

F. tappa (Walker)

1853. *Myrmeleon tappa* Walker, *Cat. Brit. Mus. Neur.*, p. 364.

1868. *Formicaleo tappa*:MacLachlan, *J. Linn. Soc., Zool.*, **9**, p. 278.

Type locality : Nepaul (?)

Distribution : Nepaul (?)

F. truculentus (Walker)

1853. *Myrmeleon truculentus* Walker, *Cat. Brit. Mus. Neur.*, p. 347.

1868. *Formicaleo truculentus*:MacLachlan, *J. Linn. Soc.*, **9**, p. 277.

Type locality : North India.

Distribution : N. India.

F. vasanus (Walker)

1853. *Myrmeleon vasanus* Walker, *Cat. Brit. Mus. Neur.*, p. 343.

1868. *Formicaleo vasanus*:MacLachlan, *J. Linn. Soc.*, **9**, p. 277.

Type locality : N. India.

Distribution : N. India.

F. verendus (Walker)

1853. *Myrmeleon verendus* Walker, *Cat. Brit. Mus. Neur.*, p. 342.

1853. *Myrmeleon minax* Walker, *Cat. Brit. Mus. Neur.*, p. 343.

1868. *Formicaleo verendus*:MacLachlan, *J. Linn. Soc.*, **9**, p. 277.

1909. *Formicaleo verendus*:Needham, *Rec. Indian Mus.*, **3**, p. 200.

Type locality : N. India.

Distribution : N. India.

Genus *Hyloleon* Navas

1929. *Hyloleon* Navas, *Rev. Accad. Cienc.*, **12**, p. 188.

***H. pallidus* Navas**

1929. *Hyloleon pallidus* Navas, *Rev. Accad. Cienc.*, **17**, pp. 33-34.

Type locality : Kalka.

Distribution : Punjab.

***H. rhodocerus* Navas**

1929. *Hyloleon rhodocerus* Navas, *Rev. Accad. Cienc.*, **12**, p. 189.

Type locality : Khandala.

Distribution : Maharashtra.

Genus *Macronemurus* Costa

1855. *Macronemurus* Costa, *Fauna Napolitana Myrm.*, **10**, p. 8.

***M. nefandus* (Walker)**

1853. *Myrmeleon nefandus* Walker, *Cat. Brit. Mus. Neur.*, p. 357.

1868. *Macronemurus nefandus*:MacLachlan, *J. Linn. Soc.*, **9**, p. 278.

1909. *Macronemurus nefandus*:Needham, *Rec. Indian Mus.*, **3**, p. 201.

Type locality : N. India.

Distribution : N. India.

***M. trivittatus* Banks**

1911. *Macronemurus trivittatus* Banks, *Proc. ent. Soc. Wash.*, **13**, p. 101.

Type locality : Pusa.

Distribution : Bihar.

Genus *Neuroleon* Navas

1909. *Neuroleon* Navas, *Act. Mem. Congr. nat. esp.*, **1**, p. 148.

***N. apicalis* Navas**

1915, *Neuroleon apicalis* Navas, *Mem. R. Acad. Ci.*, **11** (23), p. 11.

Type locality : Pondicherry.

Distribution : Tamilnadu.

N. guernei Navas

1914. *Neuroleon guernei* Navas, *Rev. russe., Ent.* **14**, p. 319.

Type locality : Sri Lanka.

Distribution : India : Maharashtra;
Sri Lanka.

Genus Nocaldria Navas

1912. *Delfimeus* Navas, *Insecta*, **2**, p. 224.

1915. *Nocaldria* Navas, *Ann. Mus. Doria*, **47**, p. 362.

N. pallida Banks

1939. *Nocaldria pallida* Banks, *Bull. Mus. Comp. Zool. Harv., Cambridge, Mass.* **85**, No. 7, pp. 464-465.

Type locality : Bangalore.

Distribution : Karnataka.

Genus Salvaza Navas

1917. *Salvaza* Navas, *Insecta*, **7**, p. 42.

S. lebasinus Navas

1931. *Salvaza lebasinus* Navas, *Rev. Accad. Cienc.*, **14**, p. 80.

Type locality : Ranchi.

Distribution : Bihar.

Tribe GEPINI Markl, 1954**Genus Solter Navas**

1912. *Solter* Navas, *Broteria*, **10**, p. 32.

S. felderi Navas

1912. *Solter felderi* Navas, *Mem. Real Acad. Ci.*, **10**, No. 9, p. 170.

1929. *Nelus griseipennis* Navas, *Mem. Pont. Acad. Nuovi Lincei.*, **12**, p. 44.

1969. *Solter felderi*: Holzel, *Ann. Nat. Mus. Wien.*, **73**, p. 301.

Distribution : India.

Tribe GLENURINI Banks, 1927**Genus Glenurus Hagen**

1856. *Glenurus* Hagen, *Stett., ent. Ztg.*, **27**, p. 372.

G. infestus (Walker)

1853. *Myrmeleon infestus* Walker, *Cat. Brit. Mus. Neur.*, p. 357.
 1868. *Glenurus infestus*: MacLachlan, *J. Linn. Soc.*, 9, p. 278.
 1909. *Macronemurus infestus*: Needham, *Rec. Indian Mus.*, 3, p. 201.

Distribution : N India, Bihar, Maharashtra.

G. pupillatus Navas

1905. *Glenurus pupillatus* Navas, *Bol. Soc. Aragon*, 4, p. 54, pl. 2, fig. 4.

Distribution : Himalaya.

Negrokus Navas

1930. *Negrokus* Navas, *Memorie Accad. pont. Nuovi. Lincei.*, (2) 14, p. 420.

N. lebasi Navas

1930. *Negrokus lebasi* Navas, *Memorie Accad. pont. Nuovi. Lincei.*, (2) 14, p. 421.

Type locality : Sikkim.

Distribution : Sikkim.

Tribe MYRMECAELURINI Esben-Petersen, 1918**Genus Myrmecaelurus Costa**

1855. *Myrmecaelurus* Costa, *Fauna Neapolitana Myrm.*, p. 10.
 1910. *Nohoveus* Navas, *Insecta*, 8, p. 169.
 1954. *Myrmecaelurus* : Markl, *Verh. naturf. Ges.*, Basel, Bd. 65, no. 2, p. 227.
 1969. *Myrmecaelurus* : Holzel, *Ann. Naturhistor. Mus. Wien*, 73, pp. 279-280.

M. acerbus (Walker)

1853. *Myrmeleon acerbus* Walker, *Cat. Brit. Mus. Neur.*, p. 366.
 1868. *Myrmecaelurus acerbus* : MacLachlan, *J. Linn. Soc.*, 9, p. 278.
 1909. *Myrmecaelurus acerbus* : Needham, *Rec. Indian Mus.*, 3, p. 200.

Type locality : N. India.

Distribution : W. Himalayas, N. India, Punjab, Bihar.

M. afghanus Kimmins

1950. *Myrmecaelurus afghanus* Kimmins, *Vidensk. Meddr, dansk. naturh. Foren*, 112, pp. 239-241, fig. 2.

Type locality : N. W. India.

Distribution : N. W. India.

M. implexus (Walker)

1853. *Myrmeleon implexus* Walker, *Cat. Brit. Mus. Neur.*, p. 376.

1868. *Myrmecaelurus implexus* : MacLachlan, *J. Linn. Soc.*, 9, p. 279.

Type locality : N. India.

Distribution : N. India.

Tribe MYRMELEONINI Banks, 1911**Genus Balaga Navas**

1912. *Balaga* Navas, *Rev. russe. Ent.*, 12, p. 111.

B. pupillatus Navas

1930. *Balaga pupillatus* Navas, *Rev. Accad. Cienc.*, 13, p. 36.

Type locality : Khandala.

Distribution : Maharashtra.

Genus Baliga Navas

1912. *Baliga* Navas, *Rev. russe. Ent.* 12, p. 110.

B. monticola Navas

1937. *Baliga monticola* Navas, *C. R. Congr. int. Zool.*, 12, p. 1475.

Type locality : Kurseong.

Distribution : W. Bengal.

Genus Grocus Navas

1925. *Grocus* Navas, *Mem. R. Acad. Ci.*, 19, p. 185.

G. frontalis Burmeister

1925. *Grocus frontalis* Burmeister.*

1946. *Grocus frontalis* Castellarnau, *Lisbon Ci. nat.*, Broteria, 15, p. 122.

Distribution : Maharashtra.

G. fulvescens Navas

1934. *Grocus fulvescens* Navas, *Mem. Pont. Acad. Ci.*, (3) 1, p. 220.

Distribution : Maharashtra.

* Original reference could not be traced.

Genus Myrmeleon Linnaeus

1767. *Myrmeleon* Linnaeus, *Syst. nat.*, XII, p. 913.

M. abducens Walker

1859. *Myrmeleon abducens* Walker, *Trans. R. ent. Soc. Lond.*, 5, pp. 190-191.

Distribution : "Hindostan"

M. angusticollis Rambur

1842. *Myrmeleon angusticollis* Rambur, *Hist. nat. ins. Neur.*, 399, 23.

1853. *Myrmeleon angusticollis* : Walker, *Cat. Brit. Mus. Neur.*, p. 363.

Distribution : Maharashtra.

M. clothilde Banks

1913. *Myrmeleon clothilde* Banks, *Trans. Am. ent. Soc.*, 39, p. 223.

Type locality : Pusa.

Distribution : Bihar.

M. contractus Walker

1859. *Myrmeleon contractus* Walker, *Trans. R. ent. Soc. Lond.*, 5, pp. 192-193.

Distribution : "Hindostan"

M. fryeri Navas

1914. *Myrmeleon fryeri* Navas, *Insecta Rennes*, 4, p. 135.

Distribution : India : Tamilnadu.

Sri Lanka; Burma.

M. infensus Walker

1853. *Myrmeleon infensus* Walker, *Cat. Brit. Mus. Neur.*, p. 383.

1868. *Myrmeleon infensus* : MacLachlan, *J. Linn. Soc.*, 9, p. 280.

Distribution : N. India.

M. insolitus Walker

1859. *Myrmeleon insolitus* Walker, *Trans. R. ent. Soc., Lond.* 5, p. 194.

Distribution : "Hindostan".

M. marginicollis Gerst.

1859. *Myrmeleon marginicollis* Gerstaecker*

1909. *Myrmeleon marginicollis* : Needham, *Rec. Indian Mus.*, 3, p. 200.

Distribution : Kulu.

M. montanus Navas

1914. *Myrmeleon montanus* Navas, *Ann. Soc., Sci.*, **38**, p. 234.

Type locality : Darjeeling.

Distribution : W. Bengal.

M. morosus Walker

1853. *Myrmeleon morosus* Walker, *Cat. Brit. Mus. Neur.*, p. 389.

Type locality : N. India.

Distribution : N. India.

M. nicobaricus Brauer

1865. *Myrmeleon nicobaricus* Brauer, *Verh. Zool.- bot. Ges. Wien.*, Bd. **15**, p. 904.

Type locality : Nicobar Is.

Distribution : Nicobar Is.

M. periculosus Walker

1853. *Myrmeleon periculosus* Walker, *Cat. Brit. Mus. Neur.*, p. 337.

1868. *Myrmeleon periculosus* : MacLachlan, *J. Linn. Soc.*, **9**, p. 277.

1909. *Formicaleo periculosus* : Needham, *Rec. Indian Mus.*, **3**, p. 201.

Distribution : Bihar.

M. perplexus Walker

1859. *Myrmeleon perplexus* Walker, *Trans. R. ent. Soc. Lond.*, **5**, pp. 191-192.

Distribution : "Hindostan"

M. pulverulentus Rambur

1842. *Myrmeleon pulverulentus* Rambur, *Hist. nat. Ins. Neur.*, 392, 12.

1853. *Myrmeleon pulverulentus* : Walker, *Cat. Brit. Mus. Neur.*, p. 336.

Distribution : W. Bengal.

M. punctulatus Rambur

1842. *Myrmeleon punctulatus* Rambur, *Hist. nat. Ins. Neur.*, 405, 32.

1853. *Myrmeleon punctulatus* : Walker, *Cat. Brit. Mus. Neur.*, p. 371.

1909. *Myrmeleon punctulatus* : Needham, *Rec. Indian Mus.*, **3**, p. 200.

Distribution : W. Bengal, Orissa.

* Original reference could not be traced.

M. sagax Walker

1853. *Myrmeleon sagax* Walker, *Cat. Brit. Mus. Neur.*, p. 382.
 1868. *Myrmeleon sagax* : MacLachlan, *J. Linn. Soc.*, 9, p. 280.
 1909. *Myrmeleon sagax* : Needham, *Rec. Indian Mus.*, 3, p. 200.

Type locality : Silhet.

Distribution : India : Eastern & Western Himalayas.
 Bangladesh : Silhet.

M. tenuipennis Rambur

1842. *Myrmeleon tenuipennis* Rambur, *Hist. nat. Ins. Neur.*, p. 405.
 1916. *Myrmeleon tenuipennis* : Banks, *Phil. J. Sci.*, 11, p. 209.

Distribution : N. India, Maharashtra.

M. tivialis Gerst.

1884. *Myrmeleon tivialis* Gerstaecker, *MT. Ver. Vorpomm*, 16, p. 24.

Distribution : Himalaya.

M. (Morter) hyalinus (Olivier)

1811. *Myrmeleon hyalinum* Olivier, *Encycl. Meth.*, 8, P. 126.
 1834. *Myrmeleon cinereus* Klug, *Symb. phys.* IV; Tafel, 36, fig. 3.
 1842. *Myrmeleon distinguendum* Rambur, *Hist. Nat. Ins. Neur.*, p. 407.
 1946. *Morter hyalinus* : Castellarnau, *Lisbon Ci. nat.*, Broteria, 15, p. 122.
 1972. *Myrmeleon (Morter) hyalinus* : Holzel, *Beitr. naturk. Forsch. SudwDtl.*, 1, pp. 37-38.

Distribution : Gujarāt.

Genus Nelees Navas

1911. *Nelees* Navas, *Rev. Zool-bot. afric.*, 1, p. 244.

N. reticulatus Navas

1930. *Nelees reticulatus* Navas, *Rev. Accad. Cienc.*, 13, p. 40.

Type locality : Khandala.

Distribution : Maharashtra.

N. roscidus Navas

1937. *Nelees roscidus* Navas, *C. R. Congr. int. Zool.*, 12, p. 1476.

Type locality : Bombay.

Distribution : Maharashtra.

Genus Tafanerus Navas

1921. *Tafanerus* Navas, *Rev. Accad. Cienc.*, 6, p. 62.

T. indicus Navas

1921. *Tafanerus indicus* Navas, *Rev. Accad. Cienc.*, **6**, p. 63.

Distribution : India.

Genus Talosus Navas

1923. *Talosus* Navas, *Memorie Accad. pont. Nuovi. Lincei.*, (2) **6**, p. 35.

T. oberthurai Navas

1923. *Talosus oberthurai* Navas, *Memorie Accad. pont. Nuovi. Lincei.*, (2) **6**, p. 35.

Distribution : West Bengal.

Tribe NESOLEONINI Markl, 1954**Genus Cueta Navas**

1911. *Cueta* Navas, *Insecta*, **1**, p. 242.

1914. *Polancus* Navas, *Voyage Alluaud et Jeannel*, No. 24, p. 19.

1954. *Cueta* : Markl, *Verh. naturf. Ges.*, Basel, Bd. **65**, No. 2, p. 229.

C. abdominalis Navas

1930. *Cueta abdominalis* Navas, *Rev. Accad. Cienc.*, **13**, p. 35.

Type locality : Hyderabad.

Distribution : Andhra Pradesh.

C. facile Banks

1939. *Cueta facile* Banks, *Bull. Mus. Comp. Zool. Harv.*, Cambridge, Mass., **85**, pp. 455-456.

Type locality : Coimbatore.

Distribution : Tamilnadu.

C. hugeli Navas

1914. *Cueta hugeli* Navas, *Ann. Soc. Sci.*, **38**, p. 239.

Distribution : India.

C. hugeli inciva Banks

1939. *Cueta hugeli inciva* Banks, *Bull. Mus. Comp. Zool. Harv.*, Cambridge, Mass., **85**, p. 455.

Type locality : Coimbatore.

Distribution : Tamilnadu.

C. levis Navas

1931. *Cueta levis* Navas, *Rev. Accad. Cienc.*, **14**, p. 79.

Type locality : Hyderabad.

Distribution : Maharashtra, Andhra Pradesh.

C. maindroni Navas

1923. *Cueta maindroni* Navas, *Memorie Accad. pont. Nuovi. Lincei.*, (2) **6**, P. 36.

Type locality : Pondicherry.

Distribution : Tamilnadu.

C. salai Navas

1928. *Cueta salai* Navas, *Rev. Accad. Cienc.*, **12**; p. 185.

Type locality : Khandala.

Distribution : Maharashtra.

Genus Nesoleon Banks

1909. *Nesoleon* Banks, *J. New York ent. Soc.* **17**, p. 46.

1914. *Peringus* Navas, *Voyage Alluaud et Jeannel* no **24**, p. 19.

1954. *Nesoleon* : Markl, *Verh. naturf. Ges.*, Basel, Bd. **65**, no. 2, p. 229.

N. perpunctatus Banks

1931. *Nesoleon perpunctatus* Banks, *Psyche*, **38**, p. 60.

Type locality : Vizagapatnam.

Distribution : Andhra Pradesh.

Tribe PALPARINI Banks, 1911**Genus Palpares Rambur**

1842. *Palpares* Rambur, *Hist. nat. Ins. Neur.*, p. 365.

P. astarti Banks

1913. *Palpares astarti* Banks, *Ann. ent. Soc. Am.*, p. 187, pl. 19; fig. 18.

Distribution : India.

P. contrarius (Walker)

1853. *Myrmeleon contrarius* Walker, *Cat. Brit. Mus. Neur.*, p. 301.

1868. *Palpares contrarius* : MacLachlan, *J. Linn. Soc.*, **9**, p. 274.

1909. *Palpares contrarius* : Needham, *Rec. Indian Mus.*, **3**, p. 200.

1921. *Palpares contrarius* : Dover, *Rec. Indian Mus.*, **22**, p. 398.

Type locality : Sri Lanka.

Distribution : India : Orissa, Maharashtra, Karnataka.
Sri Lanka.

P. infimus (Walker)

1853. *Myrmeleon infimus* Walker, *Cat. Brit. Mus. Neur.*, p. 307.

1868. *Palpares infimus* : MacLachlan, *J. Linn. Soc.*, **9**, p. 275.

1909. *Palpares infimus* : Needham, *Rec. Indian Mus.*, **3**, p. 200.

Type locality : N. India.

Distribution : N. India, Maharashtra.

P. nobilis Navas

1931. *Palpares nobilis* Navas, *Rev. Accad. Cienc.*, **14**, p. 77.

Distribution : India.

P. pardus (Rambur)

1842. *Myrmeleon pardus* Rambur, *Hist. nat. Ins. Neur.*, p. 375, 15.

1853. *Myrmeleon pardus* : Walker, *Cat. Brit. Mus. Neur.*, p. 308.

1868. *Palpares pardus* : MacLachlan, *J. Linn. Soc.*, **9**, p. 275.

1909. *Palpares pardus* : Needham, *Rec. Indian Mus.*, **3**, p. 200,

1921. *Palpares pardus* : Dover, *Rec. Indian Mus.*, **22**, p. 398.

Distribution : North India, Sikkim, W. Bengal, Orissa, Maharashtra, S. India.

P. pardus asanai Kuwayama

1933. *Palpares pardus asanai* Kuwayama, *Proc. Imp. Acad.*, **9**, p. 446.

Type locality : Bombay.

Distribution : Maharashtra.

P. pardus partitus Banks

1911. *Palpares pardus partitus* Banks, *Proc. ent. Soc. Wash.*, **13**, p. 100.

Type locality : Bombay.

Distribution : Maharashtra.

P. patiens (Walker)

1853. *Myrmeleon patiens* Walker, *Cat. Brit. Mus. Neur.*, p. 305.

1868. *Palpares patiens* : MacLachlan, *J. Linn. Soc.*, **9**, p. 275.

1921. *Palpares patiens* : Dover, *Rec. Indian Mus.*, **22**, p. 398.

Distribution : North India, W. Bengal, Orissa.

P. tigroides (Walker)

1859. *Myrmeleon tigroides* Walker, *Trans. ent. Soc. Lond.*, 5, p. 187.
1909. *Palpares tigroides* : Needham, *Rec. Indian Mus.*, 3, p. 200.

P. trichogaster Navas

1913. *Palpares trichogaster* Navas, *Mems. R. Acad. Cienc.*, Barcelona, 10, No. 24, p. 5.

Distribution : India.

Genus Stenares Hagen

1866. *Stenares* Hagen, *Stett. ent. Ztg.*, 27, p. 372.

S. frazeri Banks

1931. *Stenares frazeri* Banks, *Psyche*, 38, p. 58.

Type locality : Coorg.

Distribution : Karnataka.

S. harpyia (Gerst.)

1863. *Palpares harpyia* Gerstaecker, *Stett. ent. Ztg.*, p. 180.
1866. *Stenares harpyia* Hagen, *Loc. Cit.*, p. 456.

Distribution : Tamilnadu.

S. hyaena clara Navas

1932. *Stenares hyaena clara* Navas, *Mem. Acad. Nuovi. Lincei.*, (11) 16, p. 951.

Distribution : India.

S. improbus (Walker)

1853. *Myrmeleon improbus* Walker, *Cat. Brit. Mus. Neur.*, p. 326.
1868. *Stenares improbus* : MacLachlan, *J. Linn. Soc.*, 9, p. 276.
1909. *Stenares improbus* : Needham, *Rec. Indian Mus.*, 3, p. 200.

Distribution : N. India, Karnataka.

Genus Tomatares Hagen

1866. *Tomatares* Hagen, *Stett. ent. Ztg.*, 27, p. 372.

T. astutus (Walker)

1853. *Myrmeleon astutus* Walker, *Cat. Brit. Mus. Neur.*, p. 398.
1868. *Tomatares astutus* : MacLachlan, *J. Linn. Soc.*, 9, p. 281.

Distribution : N. India.

T. clavicornis babaulti Navas

1924. *Tomatares clavicornis babaulti* Navas, *Memorie Accad. pont. Nuovi. Lincei.*, (2) 7, p. 217.

Type locality : Kalka.

Distribution : Punjab.

T. pardalis Fabricius

Tomatares pardalis Fabricius*

1853. *Myrmeleon compositus* Walker, *Cat. Brit. Mus. Neur.*, p. 397.
 1868. *Tomatares pardalis* : MacLachlan, *J. Linn. Soc.*, 11, p. 281.
 1909. *Tomatares compositus* : Needham, *Rec. Indian Mus.*, 3, p. 200.

Distribution : N. India, W. India, W. Bengal.

Uncertain taxonomic position below family

Genus Baga Navas

1930. *Baga Navas*, *Rev. Accad. Cienc.*, 13, p. 37.

B. mediata Navas

1930. *Baga mediata* Navas, *Rev. Accad. Cienc.*, 13, p. 66.

Distribution : India.

B. montana Navas

1930. *Baga montana* Navas, *Rev. Accad. Cienc.*, 13, p. 38.

Distribution : India.

Family ASCALAPHIDAE Schneider, 1845
 Subfamily HOLOPHTHALMINAE Weele, 1908.

Genus Idricerus MacLachlan.

1871. *Idricerus* MacLachlan, *J. Linn. Soc.*, 11, p. 240.

I. decrepitus (Walker)

1859. *Ascalaphus decrepitus* Walker, *Trans. R. ent. Soc. Lond.*, (2) 5, p. 197.
 1871. *Idricerus decrepitus* : MacLachlan, *J. Linn. Soc.*, 9, p. 240.
 1908. *Idricerus decrepitus* : Weele, *Cat. Coll. Selys*, 8, pp. 66-67.
 1909. *Idricerus decrepitus* : Needham, *Rec. Indian Mus.*, 3, p. 197.

Distribution : N. India, Arunachal.

* Original reference could not be traced.

I. sogdianus MacLachlan

1875. *Idricerus sogdianus* MacLachlan, *Fedtschenko's Reise in Turkestan*, p. 11, Taf. 1, fig. 8.

1908. *Idricerus sogdianus* Weele, *Cat. Coll. Selys*, 8, pp. 65-66.

Type locality : Turkestan.

Distribution : India : N. India. Turkestan.

Genus Protidricerus Weele

1908. *Protidricerus* Weele, *Cat. Coll. Selys*, 8, p. 61.

P. elwesi (MacLachlan)

1891. *Idricerus elwesi* MacLachlan, *Trans. R. ent. Soc. Lond.*, p. 512.

1908. *Protidricerus elwesi* Weele, *Cat. Coll. Selys*, 8, p. 63.

Distribution : Assam.

Subfamily SCHIZOPHTHALMINAE Weele, 1908**Tribe ACMONOTINI Weele, 1908****Genus Pseudoptynx Weele**

1908. *Pseudoptynx* Weele, *Cat. Coll. Selys*, 8, p. 209.

P. furcifer Weele

1908. *Pseudoptynx furcifer* Weele, *Cat. Coll. Selys*, 8, pp. 209-210.

Type locality : Bombay.

Distribution : Maharashtra.

Tribe ASCALAPHINI Weele, 1908**Genus Ascalaphodes MacLachlan**

1871. *Ascalaphodes* MacLachlan, *J. Linn. Soc.*, 11, p. 272.

A. canifrons (Westwood)

1848. *Bubo canifrons* Westwood, *Cabinet Oriental ent.*, t. 34.

1853. *Ascalaphus canifrons* : Walker, *Cat. Brit. Mus. Neur.*, p. 422.

1908. *Ascalaphodes canifrons* : Weele, *Cat. Coll. Selys*, 8, p. 282.

Distribution : India.

Genus Parascalaphus Alexandrov-Martynov

1926. *Parascalaphus* Alexandrov-Martynov, *Rev. russe. Ent.*, 20, p. 200.

P. oreobius Alexandrov-Martynov

1926. *Parascalaphus oreobius* Alexandrov-Martynov, *Rev. russe. Ent.*, 20, p. 200.

Distribution : India.

Tribe ENCYOPOSINI Weele, 1908

Genus *Ogcogaster* Westwood

1848. *Ogcogaster* Westwood, *Cabinet Oriental ent.*, t. 34.
 1866. *Ogcogaster* : Hagen, *Stett. ent. Ztg.*, 27, p. 374.
 1868. *Ogcogaster* : Brauer, *Verh. Zool.-bot. Ges. Wien.*, 18, p. 397.
 1871. *Ogcogaster* MacLachlan, *J. Linn. Soc.*, 11, p. 264.

O. kempi Fraser

1922. *Ogcogaster kempi* Fraser, *Rec. Indian Mus.*, 24, p. 518.

Type locality : Talewadi.

Distribution : Karnataka.

O. kirbyi Weele

1908. *Ogcogaster kirbyi* Weele, *Cat. Coll. Selys*, 8, p. 254.

Type locality : Kashmir.

Distribution : Kashmir.

O. segmentator (Westwood)

1848. *Ascalaphus* (*Ogcogaster*) *segmentator* Westwood, *Cabinet Oriental ent.* t. 34.
 1853. *Ascalaphus segmentator* : Walker, *Cat. Brit. Mus. Neur.*, p. 421.
 1871. *Ogcogaster segmentator* : MacLachlan, *J. Linn. Soc.*, 11, p. 265.
 1908. *Ogcogaster segmentator* : Weele, *Cat. Coll. Selys*, 8, p. 255.
 1909. *Ogcogaster segmentator* : Needham, *Rec. Indian Mus.*, 3, p. 198.

Distribution : W. Himalayas, Kashmir, Maharashtra, Karnataka.

O. tessellata (Westwood)

1848. *Ascalaphus* (*Ogcogaster*) *tessellatus* Westwood, *Cabinet Oriental ent.*, t. 34.
 1853. *Ascalaphus tessellatus* : Walker, *Cat. Brit. Mus., Neur.*, p. 420.
 1871. *Ogcogaster tessellatus* : MacLachlan, *J. Linn. Soc.*, 11, p. 265.
 1908. *Ogcogaster tessellata* : Weele, *Cat. Coll. Selys*, 8, p. 253.
 1909. *Ogcogaster tessellatus* : Needham, *Rec. Indian Mus.*, 3, p. 198.
 1911. *Ogcogaster tessellata* : Banks, *Proc. ent. Soc. Wash*, 13, p. 99.
 1922. *Ogcogaster tessellata* : Fraser, *Rec. Indian Mus*, 24, p. 518.

Distribution : India : W. Himalayas, Bihar, Gujarat.

Pakistan : Rawalpindi.

Genus *Siphlocerus* MacLachlan

1871. *Siphlocerus* MacLachlan, *J. Linn. Soc.*, 11, p. 260.

S. nimius (Walker)

1853. *Ascalaphus nimius* Walker, *Cat. Brit. Mus. Neur.*, p. 429.
 1853. *Ascalaphus luctifer* Walker, *Loc. Cit.*, p. 432.
 1871. *Siphlocerus nimius* : MacLachlan, *J. Linn. Soc.*, **11**, p. 261.
 1909. *Siphlocerus nimius* : Needham, *Rec. Indian Mus.*, **3**, p. 198.
 1922. *Siphlocerus nimius* : Fraser, *Rec. Indian Mus.*, **24**, p. 518.

Type locality : N. Bengal.

Distribution : W. Bengal, Bihar, U. P. & Punjab.

Tribe HYBRISINI Weele, 1908

Genus **Acheron** Lefebvre

1842. *Acheron* Lefebvre, *Guer. Magasin*, t. 92, p. 6.
 1866. *Hybris* partim. Hagen, *Stett. ent. Ztg.*, **27**, p. 373.
 1871. *Acheron* : MacLachlan, *J. Linn. Soc.*, **11**, p. 265.

A. trux (Walker)

1853. *Ascalaphus trux* Walker, *Cat. Brit. Mus. Neur.*, p. 432.
 1853. *Ascalaphus loquax* Walker, *Cat. Brit. Mus. Neur.*, p. 434.
 1853. *Ascalaphus anticus* Walker, *Cat. Brit. Mus. Neur.*, p. 434.
 1853. *Ascalaphus longus* Walker, *Cat. Brit. Mus. Neur.*, p. 435.
 1871. *Acheron longus* : MacLachlan, *J. Linn. Soc.*, **11**, pp. 265-266.
 1893. *Helicomitus ctenocerus* Gerst., *Mitt. naturw. Ver. Neu orpomm. and Rugen*, **15**, p. 101.
 1906. *Helicomitus ctenocerus* : Weele, *Notes Leyden Mus.*, **26**, pp. 200-238.
 1908. *Acheron trux* : Weele, *Cat. Coll. Selys*, **8**, pp. 228-230, figs. 180-183.
 1922. *Acheron trux* : Fraser, *Rec. Indian Mus.*, **24**, p. 516.

Type locality : Bengal.

Distribution : India : W. Bengal, Assam, Sikkim, Bhutan.

Bangladesh : Sylhet.

Burma.

Genus **Glyptobasis** MacLachlan

1871. *Glyptobasis* MacLachlan, *J. Linn. Soc.*, **11**, p. 268.

G. cornuta Kimmins

1849. *Glyptobasis cornuta* Kimmins, *Ann. Mag. Nat. Hist.*, **12** (2), p. 25.

Distribution : India.

G. dentifera (Westwood)

1848. *Ascalaphus (Ogcogaster) dentifer* Westwood, *Cabinet Oriental ent.*, pl. 34.
 1853. *Ascalaphus dentifer* : Walker, *Cat. Brit. Mus. Neur.*, p. 421.
 1871. *Glyptobasis dentifera* : MacLachlan, *J. Linn. Soc.*, **11**, p. 278.
 1908. *Glyptobasis dentifera* : Weele, *Cat. Coll. Selys*, **8**, p. 241.

1909. *Glyptobasis dentifer* : Needham, *Rec. Indian Mus.*, 3, p. 198.
 1922. *Glyptobasis dentifera* : Fraser, *Rec. Indian Mus.*, 24, p. 516.
 1949. *Glyptobasis dentifera* : Kimmins, *Ann. Mag. nat. Hist.*, 12 (2), p. 19.

Distribution : W. Bengal, Orissa, U. P., Maharashtra, Goa, S. India.

G. nigrifrons Kimmins

1949. *Glyptobasis nigrifrons* Kimmins, *Ann. Mag. nat. Hist.*, 12 (2), p. 25.

Type locality : Nadungayam, Malabar.

Distribution : Kerala.

G. nugax (Walker)

1853. *Ascalaphus nugax* Walker, *Cat., Brit. Mus. Neur.*, p. 433.
 1858. *Ascalaphus nugax* : Hagen, *Verh. Zool.-bot. Ges. Wien.*, 8, p. 481.
 1853. *Ascalaphus incusans* Walker, *Loc. Cit.*, p. 442.
 1858. *Ascalaphus incusans* : Hagen, *Loc. Cit.*, p. 481.
 1871. *Glyptobasis incusans* : MacLachlan, *J. Linn. Soc.*, 11, p. 268.
 1908. *Glyptobasis nugax* : Weele, *Cat. Coll. Selys*, 8, p. 243.
 1922. *Glyptobasis nugax* : Fraser, *Rec. Indian Mus.*, 24, p. 517.

Type locality : Sri Lanka.

Distribution : India : Orissa, Maharashtra, Karnataka,
 Sri Lanka.

G. weelei Kimmins

1908. *Glyptobasis dentifera* Weele (Partim) nec Walker, *Cat. Coll. Selys*, 8, p. 242.
 1949. *Glyptobasis weelei* Kimmins, *Ann. Mag. nat. Hist.*, 12 (2), p. 22.

Type locality : Goregaon (? Gurgaon).

Distribution : Punjab.

Genus Hybris Lefebvre

1842. *Hybris* Lefebvre, *Guer Mag.*, pl. 92, p. 6.
 1866. *Hybris* : Hagen, *Stett. ent. Ztg.*, 27, p. 393.
 1868. *Hybris* : Brauer, *Verh. Zool.-bot. Ges. Wien.*, 18 p. 397.
 1873. *Hybris* : MacLachlan, *J. Linn. Soc.*, 11, p. 266.
 1842. *Bubo Rambur*, *Neuropt.*, p. 353.
 1848. *Ogcogaster* Westwood, *Cabinet Oriental ent.*, (partim).

H. angulata (Westwood)

1848. *Ogcogaster angulatus* Westwood, *Cabinet Oriental ent.*, p.
 1853. *Ascalaphus angulatus* : Walker, *Cat. Brit. Mus. Neur.*, p. 421.
 1853. *Ascalaphus accusans* Walker, *Loc. Cit.*, p. 431.
 1873. *Hybris angulata* : MacLachlan, *J. Linn. Soc.*, 11, p. 267.
 1908. *Hybris angulata* : Weele, *Cat. Coll. Selys*, 8, p. 236.
 1909. *Hybris angulatus* : Needham, *Rec. Indian Mus.*, 3, p. 198.

Distribution : India : Assam.
Bangladesh : Sylhet,
Burma.

H. javana (Burmeister)

1839. *Ascalaphus javanus* Burmeister, *Handb. Entom.*, **11**, p. 1001.
1853. *Ascalaphus javanus* : Walker, *Cat. Brit. Mus. Neur.*, p. 419.
1873. *Ascalaphus javanus* : MacLachlan, *J. Linn. Soc.*, **11**, p. 267 (partim).
1908. *Hybris javana* : Weele, *Cat. Coll. Selys*, **8**, p. 231.
1909. *Hybris javanus* : Needham, *Rec. Indian Mus.*, **3**, p. 198.

Distribution : India.
Pakistan : Karachi.

Genus Protacheron Weele

1908. *Protacheron* Weele, *Cat. Coll. Selys*, **8**, p. 225.

P. westermanni Esben-Petersen

1933. *Protacheron westermanni* Esben-petersen, *Vidensk. Meddr. dansk. naturh.*,
Foren, Kjobenhavn, **94**, p. 110.

Distribution : Himalayas.

Tribe SUHPALACSINI Weele, 1908

Genus Agrionosoma Weele

1908. *Agrionosoma* Weele, *Cat. Coll. Selys*, **8**, p. 169.

A. dohrni Weele

1908. *Agrionosoma dohrni* Weele, *Cat. Coll. Selys*, **8**, p. 171.

Type locality : Sikkim.

Distribution : Sikkim.

A. swinhoei Weele

1908. *Agrionosoma swinhoei* Weele, *Cat. Coll. Selys*, **8**, pp. 169-170.

Type locality : Khasi Hills.

Distribution : Meghalaya.

Genus Helicomitus MacLachlan

1871. *Helicomitus* MacLachlan, *J. Linn. Soc.*, **11**, p. 261.
1906. *Helicomitus* : Weele, *Notes Leyden Mus.*, **26**, p. 200.

H. abdominalis Kimmins

1949. *Helicomitus abdominalis* Kimmins, *Ann. Mag. nat. Hist.*, **12(2)**, pp. 4-6.

Type locality : Hoskoti, Coorg.

Distribution : Karnataka.

H. dicax (Walker)

1853. *Ascalaphus dicax* Walker, *Cat. Brit. Mus. Neur.*, p. 423.
 1853. *Ascalaphus immotus* Walker, *Cat. Brit. Mus. Neur.*, p. 425.
 1853. *Ascalaphus procax* Walker, *Cat. Brit. Mus. Neur.*, p. 425..
 1853. *Ascalaphus odiosus* Walker, *Cat. Brit. Mus. Neur.*, p. 426.
 1853. *Ascalaphus insimulans* Walker, *Cat. Brit. Mus. Neur.*, p. 429.
 1888. *Ascalaphus insimulans* : Westwood, *Trans. R. ent. Soc. Lond.*, pp.1-12, taf. 1-11, fig. 1-35.
 1858. *Ascalaphus cervinus* : Hagen, *Verh. Zool.-bot. Ges. Wien.*, p. 481.
 1871. *Helicomitus insimulans* : MacLachlan, *J. Linn. Soc.*, **11**, p. 262.
 1905. *Helicomitus insimulans* : Weele, *Notes Leyden Mus.*, **26**, p. 200.
 1907. *Helicomitus insimulans* : Weele, *Notes Leyden Mus.*, **28**, p. 153.
 1885. *Suphalasca cervinus* : Gerstaecker, *Mitt. naturw. Ver. Neu. Vorpomm., und Rugen*, **16**, p. 88.
 1906. *Suphalasca placida* Weele, *Notes Leyden Mus.*, **26**, p. 228.
 1907. *Suphalasca placida* : Weele, *Notes Leyden Mus.*, **28**, p. 156.
 1908. *Helicomitus dicax* : Weele, *Cat. Coll. Selys*, **8**, pp. 178-180.
 1922. *Helicomitus dicax* : Fraser, *Rec. Indian Mus.*, **24**, pp. 514-515.
 1949. *Helicomitus dicax* : Kimmins, *Ann. Mag. nat. Hist.*, **12**(2), pp. 2-3.

Distribution : W. Bengal.

H. procax (Walker)

1853. *Ascalaphus procax* Walker, *Cat. Brit. Mus. Neur.*, p. 425.
 1908. *Helicomitus dicax* (partim) Weele, *Cat. Coll. Selys.*, **8**, pp. 178-180.
 1949. *Helicomitus procax* : Kimmins, *Ann. Mag. nat. Hist.*, **12**, (2), p. 4.

Type locality : Nepal.

Distribution : Nepal.

H. prothoracicus Kimmins

1949. *Helicomitus prothoracicus* : Kimmins, *Ann. Mag. Nat. Hist.*, **12** (2), pp. 6-7.

Distribution : India.

H. salvatoris Navas

1920. *Helicomitus salvatoris* Navas, *Memorie Accad. pont. Nuovi. Lincei.*, Roma, (2) **7**, p. 220.

Type locality : Punjab.

Distribution : Punjab.

H. sinister (Walker)

1853. *Ascalaphus sinister* Walker, *Cat. Brit. Mus. Neur.*, p. 424.
 1853. *Ascalaphus odiosus* Walker, *Cat. Brit. Mus. Neur.*, p. 426.

1888. *Ascalaphus insimulans* Westwood, *Trans. R. ent. Soc. Lond.*, pp. 1-12.
1908. *Helicomitus dicax* Weele, (partim) *Cat. Coll. Selys*, 8, pp. 178-180.
1949. *Helicomitus sinister* : Kimmins, *Ann. Mag. nat. Hist.*, 12, (2), pp. 3-4.

Distribution : India : N. India, W. Bengal, Maharashtra.
Sri Lanka.

Genus *Suphalasca* Hagen

1866. *Suphalasca* Hagen, *Stett. ent. Ztg.*, 27, p. 373.
1868. *Suphalasca* (partim) Brauer, *Verh. Zool.-bot. Ges. Wien.*, 18, p. 397.
1871. *Suphalasca* : MacLachlan, *J. Linn. Soc.*, 11, p. 253.

S. obscura Fraser

1922. *Suphalasca obscura*. Fraser, *Rec. Indian Mus.*, 24, p. 515.

Type locality : Khemsa.

Distribution : India.

S. orsedice Banks

1914. *Suphalasca orsedice* Banks, *Proc. Acad. nat. Sci.*, 66, p. 617.

Distribution : India.

Genus *Suphalomitus* Weele

1908. *Suphalomitus* Weele, *Cat. Coll. Selys*, 8, p. 181.

S. brevis Kimmins

1949. *Suphalomitus brevis* Kimmins, *Ann. Mag. nat. Hist.*, 12, (2) pp.15-17, fig. 6.

Type locality : Kalar, Nilgiris.

Distribution : India : Tamilnadu, Karnataka, Kerala, W. Bengal.
Sri Lanka.

S. parvus Kimmins

1949. *Suphalomitus parvus* Kimmins, *Ann. Mag. nat. Hist.*, 12 (2), pp. 18-19,
fig. 7.

Type locality : Dohnavur.

Distribution : Tamilnadu.

S. verbosus (Walker)

1853. *Ascalaphus verbosus* Walker, *Cat. Brit. Mus. Neur.*, p. 426.
1853. *Ascalaphus profanus* Walker, *Cat. Brit. Mus. Neur.*, p. 428.

1871. *Helicomitrus verbosus* : MacLachlan, *J. Linn. Soc.*, **11**, p. 262.
1871. *Helicomitrus profanus* : MacLachlan, *J. Linn. Soc.*, **11**, p. 262.
1908. *Suphalomitrus verbosus* : Weele, *Cat. Coll. Selys*, **8**, pp. 183-184.
1922. *Suphalomitrus verbosus* : Fraser, *Rec. Indian Mus.*, **24**, p. 514.
1933. *Suphalomitrus verbosus* : Banks, *Indian Forest Rec.*, **18** (6), p. 4.

Type locality : N. Bengal.

Distribution : India : W. Bengal, Karnataka.

Sri Lanka.

East Indies.

ON SOME POLYCHAETES FROM ORISSA COAST

By

T. D. SOOTA AND C. A. NAGESWARA RAO

Zoological Survey of India, Calcutta

(With 1 Text-figure)

INTRODUCTION

While going through the unnamed material of polychaetes from the coast of Orissa collected on different occasions by parties of the Zoological Survey of India, we came across several specimens of a number of species, besides those of the exotic *Talehsapia annandalei* Fauvel. This latter species was originally described from Taleh-sap, Siam (now Thailand) and has not been subsequently reported from there or elsewhere and its occurrence now in Orissa is therefore of considerable interest as far as the distribution of brackish water species is concerned. In the present paper, apart from giving additional description of *T. annandalei* based on our specimens, we are giving a list of the other species in the collection alongwith relevant remarks about structural variations, distribution etc., where necessary.

SYSTEMATIC ACCOUNT

Family POLYNOIDAE

Gattyana deludens Fauvel

Material : 4 ex; Z.S.I. Reg. No. An 727/1; Locality—sandy shore near Chandipur; 24. i. 1972; Coll. *V* K. Premkumar.

Description : Prostomium with a long dorsal median tentacle and a pair of small ventral ones; body fully covered with 15 pairs of elytra, each divided into polygonal areas and fringed; dorsal cirri papillated; dorsal setae many, thin and spinulose; ventral setae stout with unidentate tip.

Lepidonotus dictyolepis Haswell

Material : 2 ex.; Z.S.I. Reg. No. An 728/1; locality—from a gastropod shell, Puri; 6. ii. 1972; Coll. *V* K. Premkumar.

Description : Prostomium with a large median ventral tentacle and a pair of small laterals situated dorsally; body fully covered with 12 pairs of elytra each fringed and divided into polygonal areas, these

in turn with a black rounded papilla; dorsal setae few, thin and spinulose; ventral setae many, stout, unidentate and without any spinous pouch.

Remarks : Earlier recorded from Shingle Island, Gulf of Mannar.

Family AMPHINOMIDAE
Amphinome rostrata Pallas

Material : 4 ex.; Z.S.I. Reg. No. An 729/1; locality—from damaged coconut trunks found on sandy shore near Paradeep Port; Coll. V. K. Premkumar. 31. i. 1972.

Eurythoe parvecarunculata Horst

Material : One ex. ; Z.S.I. Reg. No. An 730/1; locality—Gopalpur beach; 30. iii. 1973; Coll. V. K. Premkumar.

Family PHYLLODOCIDAE
Phyllodoce (Anaitides) madeirensis Langerhans

Material : 9 ex.; Z.S.I. Reg. No. An 731/1; locality—from intertidal mud, Bitarkanika river beach near Chandbali; 7. i. 1976. Coll. S. Biswas,

Description : Prostomium with 4 small tentacles and a pair of eyes; peristomial tentacles 4 pairs, largest reaching 15th segment; proboscis long and divided into two regions, basal and upper; basal region with 12 longitudinal rows of soft papillae, each row with 4-6 papillae; median row absent in all the specimens; upper region smooth and with papillae at its opening; dorsal cirri large and with a cirrophore, setae compound, ventral cirri smaller than dorsal.

Remarks : This is the first record of the species from Indian coasts. Earlier recorded from Andamans, Ceylon and Laccadive Islands.

Eulalia (Eumida) sanguinea Oersted

Material : 4 ex.; Z.S.I. Reg. No. An 732/1; locality—sandy shore, Puri; 6. ii. 1972; Coll. V. K. Premkumar.

Description : Prostomium with 5 tentacles with median one in between two eyes; peristomial tentacles 4 pairs; proboscis smooth; parapodia with heart-shaped dorsal cirri, compound setae and oval-shaped ventral cirri.

Remarks : Earlier recorded from Gulf of Mannar.

Eteone barantollae Fauvel

Material : 7 ex., Z.S.I. Reg. No. An 733/1; locality—muddy shore Bitarkanika river beach near Chandali; 9. i. 1976; Coll. S. Biswas.

Description : Prostomium with 2 pairs of antennae; eyes indistinct; peristomial tentacles 2 pairs; body with first few segments closely arranged and light brown in colour, subsequently they become broad and deep brown in colour; proboscis divided into two regions, basal and upper; basal region smooth and transparent; upper region long, deep brown in colour with 5 longitudinal rows of soft, large papillae; first setigerous segment without dorsal cirri; dorsal cirri symmetrical and rather broader than longer; a pair of anal cirri.

Remarks : Hitherto, the only record of its occurrence was from the banks of a canal near Barantolla, Salt Lakes, Calcutta. This is the second record of the species.

Eteone flava (Fabricius)

(Text-fig. 1A)

Material : 9 ex.; Z.S.I. Reg. No. An 734/1; locality—sandy shore, Puri; 5. iii. 1972; Coll. *V. K. Premkumar*, 14 ex.; Z.S.I. Reg. No. An 735/1; locality—banks of Burhabalang river, Chandipur; 19. iii. 1973; Coll. *V. K. Premkumar*.

Description : Prostomium square-shaped with 2 pairs of tentacles and a pair of eyes; peristomial tentacles two pairs; first setigerous segment with setae and ventral cirrus but without dorsal cirrus; proboscis smooth, upper part occasionally with ridges; proboscis opening with papillae; parapodia with compound setae, dorsal cirrus broader than longer and symmetrical; ventral cirri smaller in size with a cirrophore; a pair of anal cirri.

Length 3-6 cm and 1-2 mm. in width.

Remarks : This is the first record of the species from Indian waters. Earlier recorded from Persian Gulf and Atlantic Ocean.

Family PILARGIIDAE

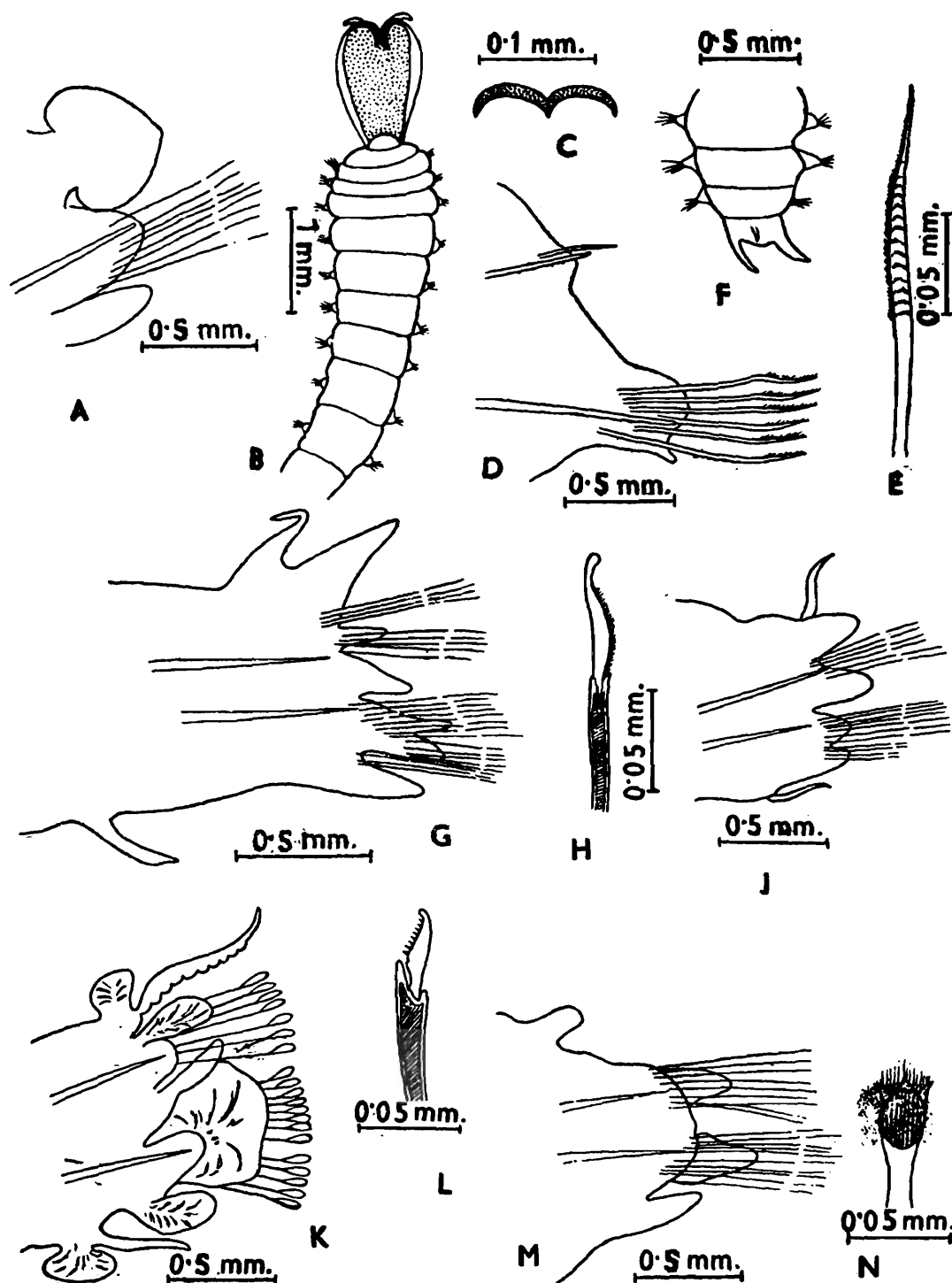
Talehasapia annandalei Fauvel

(Text-figs. 1, B-F)

Material : 6 ex.; Z.S.I. Reg. No. An 736/1; locality—Biatarani river beach, Chandbalai; 4. i. 1976; Coll. *S. Biswas* 6 ex.; Z.S.I. Reg. No. An 737/1; locality—Biatarani river mouth, Talchua; 12. i. 1976; Coll. *S. Biswas*.

Description : Body with approximately 150-280 segments; prostomium small, lobe-like, without eyes, antennae or palps; peristomium or first segment achaetous; peristomial tentacles absent; first few segments (5) bulbous and tessellated into polygonal areas; subsequent ones moniliform; proboscis in all the specimens extruded, covered outside by transparent membrane and with 2 jaws, chitinous, thin, curved and

joined with each other on both sides; proboscis opening dorso ventral with 10-12 soft papillae; parapodia uniramous with many long capillary setae, slightly curved and with hairy spines at its upper part; a small ventral cirrus; dorsal ramus rudimentary with 1-2 simple setae



Text-fig. 1.— A. *Eteone flava*, parapodium; (B-F) *Talehasapia annandalei*, B. anterior end showing everted proboscis, C. Jaw, D. Parapodium, E. Ventral setae, F. Posterior end showing 3 anal cirri; (G-H) *Leonnates persica*; G. Anterior parapodium, H. Heterogomph falciger from 10th segment; (J-L) *Nereis (Neanthes) willeyi*; J. Anterior parapodium, K. Modified parapodium, L. Heterogomph falciger; (M-N) *Glycera lancadivae*, M. Parapodium, N. papilla of the proboscis with nail-like appendage.

and an aciculum; anal segment plate-like with 2 lateral and a median small ventral cirrus; 10-12 cm in length and 2-3 mm in width; the specimens yellowish white in colour.

Remarks : Fauvel (1932) on the basis of 2 incomplete specimens from Taleh-sap, Siam (now Thailand) established the genus *Talehasapia* with *T. annandalei* as its type species and placed it in the family Hosionidae. Hartman (1947) included this species in the family Pilargiidae and gave a comprehensive account of the genus alongwith other genera of the family. Since then this monotypic genus has not been reported from anywhere else. However, its present record from Orissa, India, extends its range of distribution considerably further westwards.

Family NEREIDAE

Leonnates persica Wesenberg-Lund

(Text figs. 1, G, H)

Material : One ex. with only anterior 52 segments; Z.S.I. Reg. No. An 738/1; locality—intertidal mud, Bitarkanika river beach near Chandbali; 1.1. 1976; Coll. *S. Biswas*.

Description : Prostomium with long pointed palps and 2 pairs of eyes; peristomial tentacles 4 pairs; anterior 20 segments broader than subsequent ones; proboscis with 1st and 3rd lobe of maxillary ring without any paragnath, 2nd and 4th each with 4, Chitinous ones, 5th and 6th lobes of oral ring with a few soft ones arranged irregularly, 7th and 8th with many soft ones arranged in 5-6 rows; parapodia with 3 ligules in each ramus; dorsal cirri just above dorsal ligule, ventral cirri at base of parapodia; dorsal setae long and homogomph spinegers; ventral setae of two kinds, homogomph spinegers and a few heterogomph falcigers with tips ending abruptly; the above type of falcigers present from 7th to last segment of the specimen.

Remarks : The present specimen agrees in most of the character with Wesenberg—Lund's description of the species excepting in shape of falcigerous setae in which character it agrees with Days' (1957) description. It also differs from two Indian forms viz., *Leonnates jousseounei* Gravier and *L. decipens* Fauvel in shape of falcigerous setae and arrangement of paragnaths respectively.

This is the first record of the species from Indian waters. Earlier recorded from Iranian Gulf and estuarine waters of South Africa.

Dendronereides heteropoda Southern

Material : Several ex.; Z.S.I. Reg. No. An 739/1; locality—banks of Burhabalang river, Chandipur; 4. i. 1976; Coll. *S. Biswas*.

Dendronereis arborifera Peters

Material : Several ex.; Z.S.I. Reg. No. An740/1; locality—Bitarkanaka river beach near Chandbali; 8. i. 1976; Coll. S. Biswas.

Nereis chingharhataensis Fauval

Material : 9 ex.; Z.S.I. Reg. No. An 741/1; locality—Chandipur; 20. i. 1976; Coll. S. Biswas.

Description : Proboscis with 1st lobe having 2 paragnaths in a line, 2nd with 15-20 in 3 rows, 3rd and 4th with several in a cluster, 5th and 6th with the ones in a single row, and 7th and 8th in 3-4 rows; parapodia with 3 ligules in each ramus; falcigerous bristles absent all over body, only homogomph and heterogomph spinegers present; dorsal and ventral cirri nearly of same size; jaws transparent and light yellow in colour; a dorsal median reddish line present.

Remarks : Hitherto, the only record of its occurrence was from Chingrighatta, Salt Lakes, Calcutta. This is the second record of the species.

Nereis (Neanthes) willeyi Day

(Text. figs. 1, J-L)

Material : One ex.; Z.S.I. Reg. No. An 742/1; locality—from Gastropod shell, Puri; 6.ii.72; Coll: V. K. Premkumar.

Description : Heteronereid stage; prostomium with a pair of bulbous palps, 2 pairs of eyes and a pair of tentacles; peristomial tentacles 4 pairs; epitokous segments starting from 15th; proboscis with 1st lobe having one paragnath, 2nd with 20 in two oblique rows, 3rd with many in a cluster, 4th with several in 3 oblique rows, 5th with only one, 6th with 5 on each side, and 7th and 8th with many in 3-4 rows; parapodia in anterior region having 2 lobes each in dorsal and ventral rami and with rounded ends; dorsal setae homogomph spinegers, ventral homogomph, heterogomph spinegers and heterogomph falcigers; posterior feet with only oar-shaped setae and ligules modified into foliaceous lamellae; dorsal cirri larger than ventrals; a pair of long anal cirri.

2 cm in length and 1-2 mm. in width.

Remarks : This species has so far been recorded from coasts of Cape of Good Hope by Willey (1904) and of South Africa by Day (1934, 1951 and 1957). This is the first record of the species from Indian waters.

***Pseudonereis gallapagensis* Kinberg**

Material : Several ex; Z.S.I. Reg. No. An 743/1; locality—Gopalpur; 31 iii. 1973; Coll. *V K. Premkumar*.

Remarks : An heteronereid form was found in which the first epitokous segment is 16th setigerous segment; modified segments with oar-shaped setae and foliaceous lamellae. Earlier recorded from Gulf of Mannar and Andaman Islands.

Family NEPHTHYDIDAE

***Nephtys oligobranchia* Southern**

Material : 4 ex.; Z.S.I. Reg. No. An 744/1; locality—intertidal mud, Bitarkanika river beach near Chandbali; 8. i. 1976; Coll. *S. Biswas*.

Description : Prostomium small, flattened, with 4 small tentacles and a pair of eyes; proboscis with soft papillae and a pair of horny jaws inside; branchiae long and foliaceous, starting from 7th segment and continuing to 27th; parapodial rami wide apart with both rami having simple capillary setae.

Family EUNICIDAE

***Marphysa macintoshi* Crossland**

Material : 4 ex.; Z.S.I. Reg. No. An 745/1; locality—Gopalpur; 29. i. 1973; Coll. *V K. Premkumar*.

Description : Prostomium horse-shoe shaped with 5 equal tentacles; gills starting from 18th segment and with 1-4 filaments; dorsal setae capillary, ventral setae compound with knife-like terminal pieces, and comb setae.

Remarks : Earlier recorded from Krusadai Island.

***Marphysa corallina* Kinberg**

Material : 2 ex.; Z.S.I. Reg. No. An 746/1; locality—Gopalpur; 31. ii. 1972; Coll. *V K. Premkumar*.

Description : Prostomium rounded with palps, eyes and 5 tentacles; gills starting from 22-24 segments and with 1-4 filaments; parapodia with dorsal simple setae and ventral compound, bidentate sickle-shaped setae.

Remarks : Earlier recorded from Gulf of Mannar.

Family ONUPHIDAE

***Diopatra neapolitana* Delle Chiaje**

Material : One ex.; Z.S.I. Reg. No. An 747/1; locality—Chandipur; 18. i. 1976; Coll. *S. Biswas*.

Onuphis eremita Audouin and Milne-Edwards

Material : One ex.; Z.S.I. Reg. No. An 748/1; locality—Puri, 22.i. 1976; Coll. S. Biswas.

Family LUMBRICONEREIDAE

Lumbriconereis polydesma Southern

Material : 5 ex.; Z.S.I. Reg. No. An 749/1; locality—Chandipur; 10. iii. 1973; Coll. V K. Premkumar.

Description : Prostomium pointed without any appendage; peristomium achaetous; dorsal and ventral cirri absent; simple capillary setae and simple hooded hooks; posterior segments with elongated posterior ligule; 4 anal cirri.

Family GLYCERIDAE

Glycera lancadivae Schmarda

(Text-figs. 1, M-N)

Material : 4 ex.; Z.S.I. Reg. No. An 750/1; locality—sandy shore, Gopalpur; 27.iii.1973; Coll. V K. Premkumar.

Description : Prostomium pointed; body segments with 2-3 annulations; branchiae absent; parapodia with a pair of equally elongated anterior lobes and a single posterior rounded one; dorsal setae simple, ventral setae compound; proboscis with two types of papillae, one long with pointed end, and other broad with a nail-like appendage hitherto unrecorded; chitinous Jaws with 2 unequal supporting limbs.

Remarks : Earlier recorded from Madras coast and Laccadives.

Family SPIONIDAE

Polydora (Polydora) ciliata Johnston

Material : Several ex., Z.S.I. Reg. No. An 751/1; locality—Talchua near Chandbali; 12. i. 1976; Coll. S. Biswas.

Family CIRRATULIDAE

Tharyx multifilis Moore

Material : One ex.; Z.S.I. Reg. No. An 752/1; locality—Baitarani river beach, Haripur, Chandbali; 4. i. 1976; Coll. S. Biswas.

Description : Prostomium conical and pointed without any appendage; peristomium and subsequent two segments achaetous; first setigerous segment showing only markings of attachments of palps and gills; gills attached very near parapodial base; parapodial rami slightly apart; both rami with simple setae; dorsal setae longer than ventral,

anterior segments thin and closely arranged, deep brown in colour; posterior segments broad, pale brown in colour.

Remarks : Earlier recorded from Madras and Californian coasts; the present report of its occurrence in estuarine habitat is of interest.

Family OWENIDAE
Owenia fusiformis Delle Chiaje

Material : Several ex.; Z.S.I. Reg. No. An 753/1; locality—Chandipur; 18. i. 1976; Coll. S. Biswas.

Description : Specimens found in long tubes formed of fine sand particles with openings at both ends.

Remarks : Earlier recorded from Pearl Banks, Tuticorin.

SUMMARY

A collection of polychaetes from Orissa coast has been reported in the paper. The material contains 25 species of 22 genera and 13 families. Brief taxonomic notes including morphological variations, new locality records and other relevant information is furnished with respect to each species listed herein. Chief highlight of the report is the discovery from the Orissa coast of *Talehasapia annandalei* Fauvel, originally reported from Taleh-sap, Siam (now Thailand). This species has never been rediscovered nor redescribed. Based on the examination of the material at our disposal, we have given additional description of this species. Five species are being recorded for the first time from Indian waters.

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