

CITATION

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Dr. K. VENKATARAMAN
Director
Zoological Survey of India

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Dr. K. VENKATARAMAN
Director
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Silas, E.G. 1961. Occurrence of the Sea-cow *Halicore dugong* (Erxl) off Saurashtra coast. *J. Bombay nat. Hist. Soc.*, **58**(1) : 263-266.

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Rec. zool. Surv. India : 110(Part-4) : 1-4, 2010

A NEW RECORD OF SCLERACTINIAN CORAL FROM A SUBMERGED REEF NEAR-SHORE CHENNAI COAST

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INTRODUCTION

Recent surveys to assess Scleractinian coral diversity in Indian reefs indicate that there could be many new records yet to be described (Turner et al., 2001), which means, the diversity recorded at par with other Southeast Asian reefs, and may represent species numbers nearing Global Maximum. Besides, there may also be new reef areas to be surveyed for Scleractinian diversity among other reef fauna, as with the recent findings of submerged reefs near Malvan, in Maharashtra coast, and in the coasts of Andhra, Orissa and Kerala states. There was also an indication of a submerged reef near-shore Chennai (Gopala Aiyar, 1938), which is supported by the obtaining of a Scleractinian specimen, incidentally on a trawl net at ~2.5 km off Kovalam, Chennai coast.

The specimen obtained has been submitted by a fisherman to the National Zoological collection of Zoological Survey of India, Marine Biology Regional Centre, Chennai. Interestingly, the specimen, identified as *Coscinaraea crassa* Veron and Pichon, 1980, is a new-record to Indian waters, which is described in this paper. Biogeographically, this record is an important link, for this species has not so far been recorded from Indian waters, Sri Lanka and the Red Sea.

Key-words : Scleractinia, new record, Indian waters, submerged reefs, *Coscinaraea crassa*.

MATERIALS AND METHODS

The coral specimen which incidentally was grabbed in a trawl net by fishermen was submitted to the National

Zoological Collections of Marine Biology Regional Centre, Zoological Survey of India, Chennai. By the fisherman's word it has been obtained at a depth of 20 m, of what seemed to be submerged reef/bank, ~ 2.5 km off Kovalam, Chennai Coast. The specimen was stored in freshwater for rotting the tissue, while periodically replacing the water, and was then cleaned with a strong water jet to remove any sticking gelatinous tissue.

Detailed skeletal structures were studied under Magnus MS 24, stereoscopic zoom microscope. Whole corallum photographs were taken using Canon G11 camera, and close-ups using macro option.

RESULTS

Family SIDERASTREIDAE Vaughan and Wells, 1943

Genus *Coscinaraea* Edwards and Haime, 1848

Coscinaraea crassa Veron and Pichon, 1980

Material examined : Corallum—a broken plate of ¼ of a centrally attached circular colony or 1/3 of a sideways grown semicircular colony—39.5 cm parallel to the plate margin on its widest part to 28.5 cm perpendicular to the plate margin on its widest part. India, ~2.5 km off Kovalam, Chennai, 12° 45' 50.12" N; 080° 17' 00.14" E, Depth 20 m, 2.II.2002, Reg. No. C1-1–NZC–MBRC (Plate-1-a).

Description : The skeletal characteristics of the corallum match the descriptions of Veron & Pichon (1980) for their holotype: The corallum is a large explanate plate, thick, heavily calcified, attached centrally to the substratum (the present specimen had

broken out from the perimeter of the central attachment), but free on most of its undersurface (Plate-1-b). The thickness of the plate gradually increases from 2 mm at the margin to 30 mm at the centre (In the holotype it is 5-40 mm). Corallites at the margin are arranged in concentric rows parallel to the perimeter; towards the center they are irregularly arranged and more or less compact. The series of corallites are 5-10 mm apart in most cases, but in areas the laminae fold downwards the distance is up to 15 mm. There are small raised collines of 1-2 cm across, in between the series, however they are absent near the central part and also in the growing margin. The calices are round to elliptical, and are 3-8.6 (5.49 ± 1.3) mm in diameter (Plate 1-c, d). The walls are strictly synapticulothecate. They are arranged in rings and a maximum of 4 rings are found.

There are about 15-32 septa in each calice with a majority having 19-26 (average: 23.6); as an average of 10 ($1.3/3$) of them reach the columella. Septa of the higher order fuse with the lower order, however unlike *Coscinaraea mcneilli*, it is not regular, and rare. Septal margins and sides are highly ornamented with granules. The septa are raised to a lobe before plunging towards the columella. The lobe thickened and flattened on its surface with reduced ornamentation has visible perforations.

The septocostae mostly alternate in height and thickness. As observed by Veron & Pichon (1980) slight contortions or zig-zag patterns are noticed at the raised collines in few septocostae. The columellae are usually deeply seated single structure formed by the fusion of septal margins. In cases where they are well developed, the columella fills the central fossa. The costae are very fine and are separated by grooves which bear fine slit like depressions. Costal spines are observed near the corallum margin. Towards the centre they become blunt and indistinguishable (Plate 1-e, f).

In addition to the above characteristics, the secondary septa fusing into and encircling the primaries at their distal ends, which is observed in other species of *Coscinaraea* (*C. wellsi*, and *C. mcneilli*) is clearly observed in the present species. The secondaries in these cases look like inverted 'Y' shaped forks if viewed from the calice centre. The same is also observed *vice-versa*, with a few primaries.

Affinities : As per Veron and Pichon (1980), this species is placed in *Coscinaraea* because of the septal ornamentation. The specimen described in the present study has more resemblance to *Coscinaraea wellsi* Veron and Pichon 1980 and to some extent *C. mcneilli* Wells, 1962 however, distinguished from both by the structure of columellae which is a single fused structure, whereas, in *C. wellsi* and *C. mcneilli*, they are composed of papillary trabeculae. The present species also has superficial resemblance (due to the thamnosteroid structure) to agaricids such as *Leptoseris explanata* Yabe and Sugiyama, 1941 and *Pavona explanulata* (Lamarck, 1816), and the fungid *Podabacia crustacea* (Pallas, 1766) however, could first be negated by the presence of siderasterid characters of septal ornamentation and fusion of septa. In addition, *Leptoseris explanata* has septocostae radiating from the centers which are always perpendicular to the plate margin, and *Pavona explanulata* has pillar-like columella, radially symmetrical corallites, and also has bifacial lamina, which are not typical of *C. crassa*. From *Podabacia crustacea*, it is clearly distinguished by the septal ornamentation, thick laminae and the absence of other fungid characters like perforate undersurface and alternating costae.

Distribution : Reported for the first time from Indian waters. Elsewhere, it is reported from reef areas World-wide, except Sri Lanka and Red-Sea.

DISCUSSION

The identification of this species is confounded by superficial similarity with species of other genera and families which have thamnosteroid skeletal structure, like Agariciidae and Fungidae. However, the siderastrid characters to look for are ornamentation of the septa, fusion of inner margins of septa, and the synapticulotheca. This specimen is also distinguished from other genera of Siderastriidae: from *Psammacora* by the formation of low collines and large corallites (also elliptical); both *Siderastrea* and *Pseudosiderastrea* have cerioid polygonal corallites.

The finding of this species for the first time from Indian waters in a so far unexplored reef makes an interesting observation. Though having rare abundance (Veron and Smith, 2000), this species has been reported from majority of the world reefs. The occurrence of this

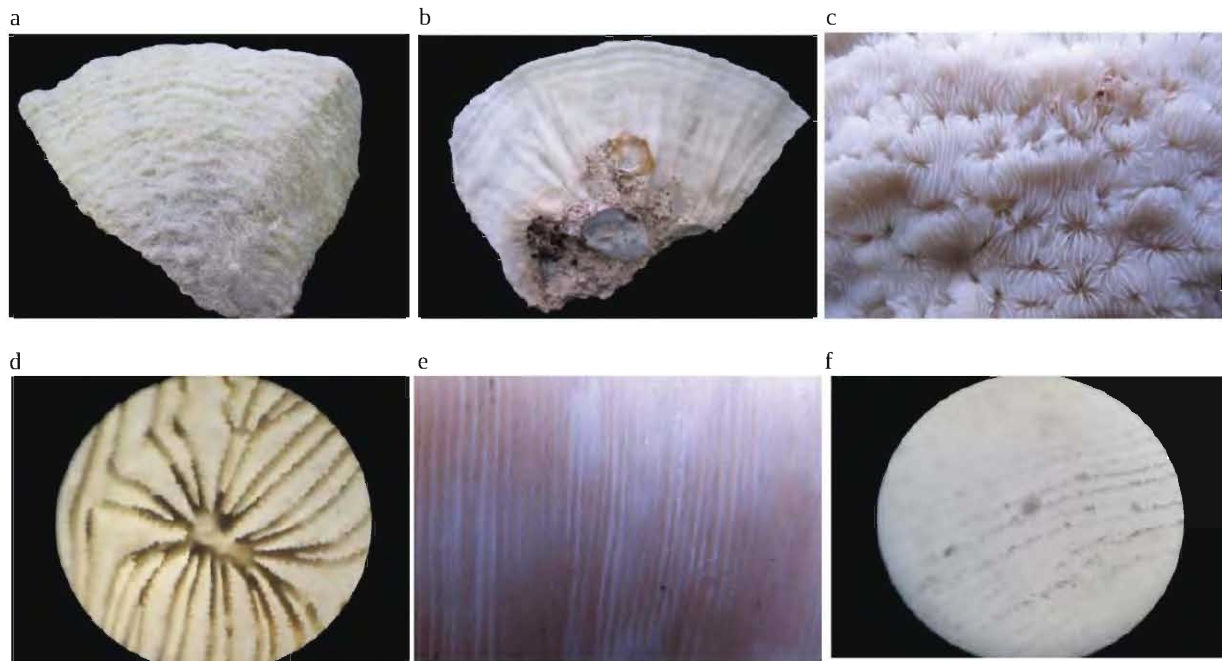


Plate 1. *Coscinaraea crassa* Veron and Pichon, 1980 : a. Dorsal view; b. Ventral view; c. Corallites; d. Details of septa and columella; e and f. Details of costae.

species in Indian waters makes an important link in the distribution of this species, which has also so far not been reported from Sri Lanka and Red Sea as well.

Prior to this description, *Coscinaraea monile* (Forskal, 1775), is the only species recorded so far from India, of the 8 species represented worldwide of *Coscinaraea* – interestingly from Gulf of Kachchh and Gulf of Mannar, leaving the diverse reefs of Andaman Nicobar and Lakshadweep Islands (Pillai, 1981; Pillai, 1983; Pillai and Patel, 1988). Other siderastrids have wider distribution in Indian waters: *Pseudosiderastrea* and *Siderastrea* – represented by one species each, and *Psammacora* – represented by 4 species, are found at least in 3 of the 4 reef areas (Matthai, 1924; Nagabushanam and Rao, 1972; Reddiah, 1977; Pillai, 1988; Pillai, 1983; Tikader *et al.*, 1986; Pillai and Patel, 1988; Pillai and Jasmine, 1989; Venkataraman *et al.*, 2003). However, the irregularity of record of species from this family taking into account both species of common and rare occurrence from the four reef areas of India, and the low species representation point to the fact that this family and the genus *Coscinaraea* in particular need revisionary studies for the Indian reefs. Further, this present finding is concurrent evidence that many species of uncommon, rare and cryptic occurrence could be found in all the Indian reefs with more extensive surveys.

SUMMARY

A specimen obtained from near shore Chennai coast has been studied. The skeletal characters confirm the species as *Coscinaraea crassa* Veron and Pichon, 1980, which is a new record to Indian waters. The finding of this species (at a depth of 20 m) from ~2.5 km off Kovalam, Chennai coast, allegedly of a sub-merged reef, confirms the occurrence of this species in coral reefs of the Indian waters, especially Gulf of Mannar and Andaman Nicobar Islands.

Key taxonomic characters: The corallum is a large, solid plate with compact corallites arranged in irregular concentric rows. The plate thickens gradually towards the centre. The corallite wall is synapticulothecate. The calices are 3-8.6 mm in diameter. The septal margins are covered with granules. The septal-lobe on the upper-side has small perforations. The columella is a deeply seated, single fused structure of septal margins. Differentiated from *C. mcneilli* Wells, 1962 by the columellar structure and grouping of septocostae in the latter. It has superficial resemblance to laminar forms of *Leptoseris explanata* (Yabe and Sugiyama, 1941), and *Pavona explanulata* (Lamarck, 1816).

ACKNOWLEDGEMENT

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Rec. zool. Surv. India : 110(Part-4) : 5-8, 2010

ON A NEW SPECIES OF *PARAMESIUS* WESTWOOD (DIAPRIIDAE : HYMENOPTERA : INSECTA) FROM INDIA

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INTRODUCTION

Genus *Paramesius* (Diapriidae : Proctotrupoidea : Hymenoptera) was erected by Westwood in 1832, with the type species, *Paramesius rufipes* Westwood. From Indian Region, the genus is known only by 5 species, viz. *P. incompletus* Kieffer, *P. monticola* (Kieffer), *P. malabarensis* Rajmohana & Narendran, *P. deccanus* Sharma and *P. pleuralis* Kieffer. Major taxonomic treatments on the Indian fauna include Sharma (1979), Mani & Sharma (1982) and Rajmohana (2006). In this paper, a new species, viz., *Paramesius primoris* is described, illustrated and affinities with other species discussed. This also forms the first report and description of a female belonging to *Paramesius* from India.

The present work is a part of the study conducted for assessing the diversity of Platygastroidea and Proctotrupoidea (Hymenoptera), at the high elevation forests of South Western Ghats, in 2006. Studies were made using Leica MZ16 stereomicroscope. Digital images were captured using Leica DFC 420 camera and series overlaid by Combine Z software. Terminology of the morphological terms follows as of Masner & Garcia (2002).

The Holotype is deposited at the Western Ghats Field Research Station, Zoological Survey of India, Calicut.

ABBREVIATIONS

OOL-Ocellular length; OD-Ocellar diameter; POL-Posterior Ocellar length; *pm*-Post marginal vein; A1-A13: antennal segments 1 to 13; T2-Second tergite of

metasoma; HH-Head height (measured in lateral view); HL-Head length (measured in lateral view); HW-Head width (measured in dorsal view); MH-Mesosoma height; (measured in lateral view); MW-Mesosoma width (measured in dorsal view); MTL-Metasoma length (measured in dorsal view); MTW-Metasoma width (measured in dorsal view).

NEW DESCRIPTION

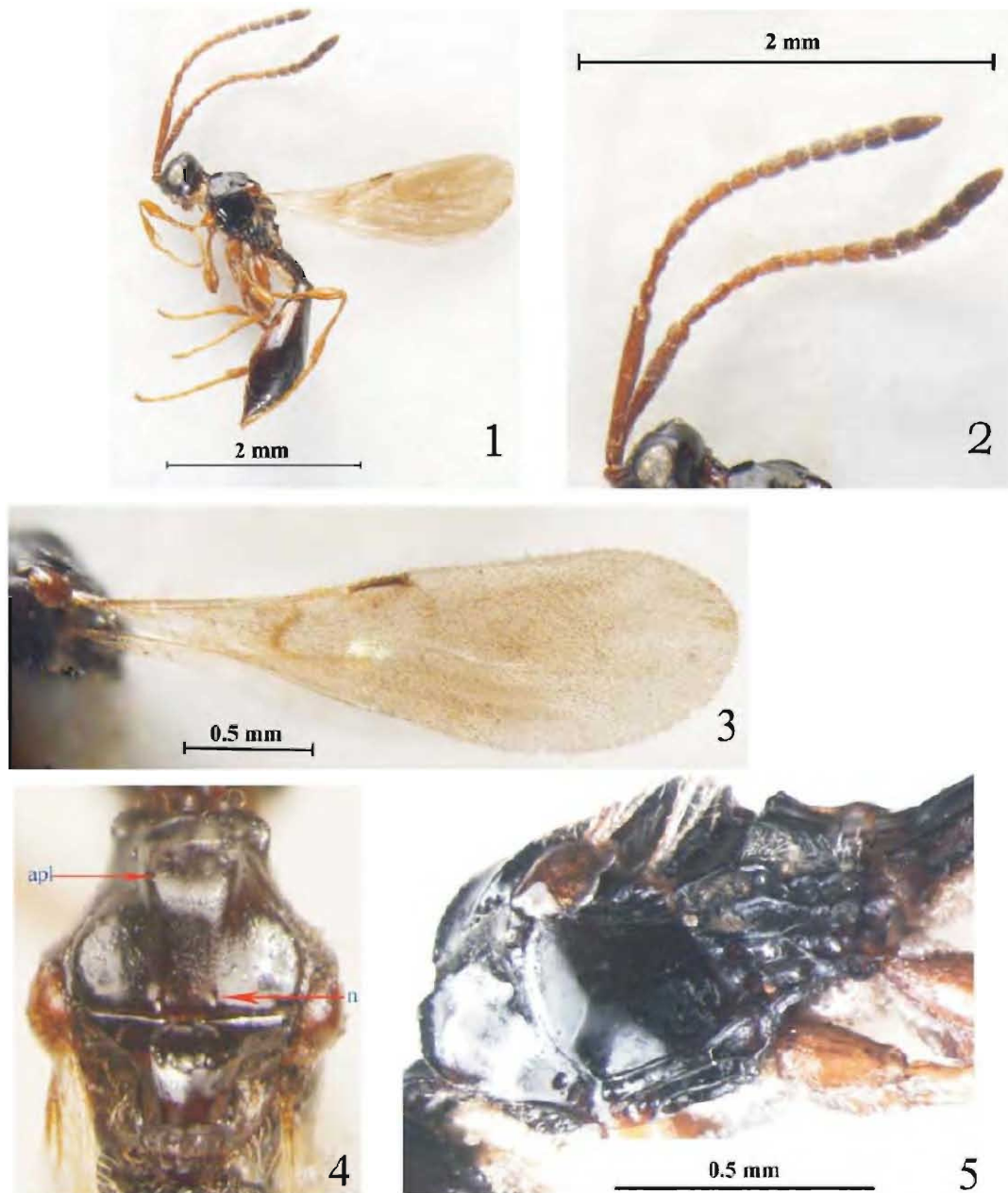
Paramesius primoris sp. nov.

(Figs. 1-5)

Holotype : Female. Length = 3.6 mm; head and body shining black; legs including coxae honey brown; basal antennal segments reddish brown, terminal segments of clava blackish brown, eyes silvery white, bordered by a very narrow black rim; wings infusate, veins reddish brown.

Head : (HH : HL : HW = 49 : 46 : 44); smooth and shiny; globose; transverse dorsally; toruli separated by a carinated emargination; pubescence on face denser than that on frons, vertex and occiput; temples a little longer than eye length when viewed dorsally, strongly receding; eyes large and ovoid, with sparse, erect, long setae; postgenal cushion sparse; occipital flange step-like, wide, bare, non-crenulate; tentorial pit distinct, small; clypeus convex; mandibles bidentate; malar sulcus absent; malar space : eye height = 9 : 20 (In lateral view); lower tooth longer and stouter; upper small tooth with a blunt end; ocelli arranged in a close triangle; lateral ocelli close to each other than with orbits; OOL : OD : POL = 12 : 5 : 10. Antenna with 13 segments; clava 6 segmented, not abrupt, rather incrassate towards

Plate 1



Figs. 1-5 : *Paramesius primoris* sp. nov. Female

1. Body (profile) 2. Antenna 3. Fore wing 4. Mesosoma dorsal view 5. Mesosoma (profile)

tip (Fig. 2); A3 longer than A2, subequal to A4; A13 as long as length of preceding two segments combined; ventral pit absent; proportions of length to width of antennal segments from scape being : 61 : 8, 13 : 6, 14 : 6, 14 : 6, 12 : 6, 11.5 : 6, 11.5 : 6, 9.5 : 7, 9.5 : 8, 9.5 : 8, 10 : 9, 11 : 9, 21 : 9.

Mesosoma : (MH : MW = 57 : 54); wider than head in dorsal view; convex dorsally; cervix strongly developed, with large and deep longitudinal impressions; pronotal shoulders well developed, sharp laterally; median mesoscutum with unusually raised zone amidst anterior parallel lines; epomium well developed; sharply angled; pronotal setae long and sparse; propleuron with a dense cushion; posterior margin of pronotum not bordered by a row crenulae, except one or two towards forecoxa (Fig. 5); notauli very much reduced, impressed pit-like (Fig. 4), situated posteriorly near trans scutellar articulation; humeral sulcus long, reaching well beyond level of tegula with a few crenulae restricted to part anterior to tegula, this part subequal to part bordering tegula; parapsidal lines absent; anterior scutellar pit large, with very short impressions of longitudinal keel posterolaterally; scutellar disc subquadrate; not much elevated; lateral keels sharp, lateral scutellar pits elongated, deep and wide; post scutellar pits large; axillar depression moderate; mesopleuron convex; sternaulus indicated by two to three long ridges (Fig. 5); epicnemial pits two to three; posterior margin of mesopleuron non crenulated; metapleuron clothed with fine pubescence, anterobasally with longitudinal carinae, developing to cell-like large irregular areolae towards hind coxa; metanotum with three minute equidistant keels medially, hairy; propodeum moderately elongate; median longitudinal keel moderately raised anteriorly; a pair of plicae present on either side part between them smooth; setation moderate; posterior rim of propodeum broad and smooth; legs hairy; foretibia without an outward directed tooth; forewing with a distinct pigmented basalis; length of submarginal : marginal = 30 : 7; postmarginal and stigmal highly reduced; medial vein indicated as a clear hairless line; marginal fringe moderate; forewing length : width = 34 : 11 (Fig. 3).

Metasoma : (MTL : MTW = 51 : 20); petiole 2.7x as long as wide, with five to six, non parallel longitudinal

striae; laterally with long setae; densely setose ventrally (Fig. 1); metasoma behind petiole spindle shaped; smooth and shiny; conical and pointed apically; rest of metasoma 3.1x length of petiole. T2 extending to 0.8x length of metasoma; basal margin of T2 without any incisions medially on basal margin or devoid of any basal patch of striae; metasoma more hairy towards tip.

Male : Unknown.

Host : Unknown.

Etymology : The species is named *primoris*, ('primoris' in Latin = first), being the first description of a female *Paramesius* from India.

Material examined : *Holotype* : Female : India : Kerala : Idukki district : Munnar (9°15' N and 76°37' E, at an altitude nearly 1520m), 5.xii.2006, coll. Mohana, in Yellow Pan Trap set among grasses and herbs in a homestead vegetation (Reg. No : ZSI/INV/3020).

DISCUSSION

All the 5 species described hitherto under *Paramesius* from Indian Region, were males. Thus *P. primoris* sp. nov. forms the first female to be reported and described from this region.

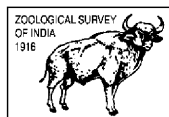
In *P. primoris*, the notauli are highly reduced and are seen only as a pair of tiny impressed pits, anterior to transscutellar articulation. This character along with the extremely raised anteromedian mesoscutum (the area between anterior parallel lines), makes this species distinct from *P. malabarensis* and *P. deccanus* as well as all other Oriental species. Further *P. primoris* does not possess an outward directed spine on foretibia as that of *P. deccanus*. From *P. monticola* (Kieffer), this species differs mainly in scutellar fovea not being entirely striated and from *P. pleuralis* Kieffer, by possessing only one fovea on scutellum instead of two. The abbreviate notauli and the much shorter, non-crenulate humeral sulcus differentiates *P. incompletus* Kieffer from *P. primoris* sp. nov.

ACKNOWLEDGMENTS

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Rec. zool. Surv. India : 110(Part-4) : 9-17, 2010

ELEVEN SPECIES OF SAPROPHAGOUS NEMATODES AS NEW RECORD FROM RAJASTHAN

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INTRODUCTION

The nematology literature reveals that Khera (1968-1975) published a series of papers on nematodes of Rajasthan belonging to order Rhabditida, Araeolaimida, Chromadorida, Monhysterida and Enoplida. Nama & Soni (1979) and Soni & Nama (1981) have also reported some species of free-living nematodes. Baqri and Bohra (2000-2005) and Bohra (upto 2008) reported several new species and new records of nematodes of order Tylenchida, Dorylaimida and Mononchida. However, the information on free-living or saprophagous nematodes from Rajasthan still remains meagre. Keeping this view in point, random surveys were conducted in Rajasthan State under districts of Indira Gandhi Nahar Pariyogna command area of Thar Desert. These samples yielded wide variety of nematodes. In all 11 species of nematodes belonging to orders Araeolaimida (3 spp.), Rhabditida (7 spp.) and Enoplida (1 sp.) are being reported as new records in the present paper. Information on their host(s) and locality(ies) have also been provided.

MATERIALS AND METHODS

Soil samples were processed by using sieving and decantation and modified Baerman's funnel techniques. For light microscopy (LM), nematodes were fixed in hot 4% formaldehyde, processed to anhydrous glycerine and mounted on glass slides. Measurements and drawings were made using a drawing tube mounted on Nikon Eclipse E600.

Order ARAEOLAIMIDA De Coninck & Schuurmans
Stekhoven, 1933

Family RHABDOLAIMIDAE

1. *Rhabdolaimus aquaticus* de Man, 1880

(Fig. 1, A-C)

Material examined : 3 ♀ ♀; date of collection : 30.iii.07.

Measurements : Females L = 0.6 mm; a = 30-35; b = 4.0-5.1; c = 3.2-4.1; V = 44-46.

Description : *Female* : Body slightly ventrally curved, tapering at both extremities, but more towards posterior. Cuticle thin, annulated, annuli less than 1 µm wide. Lip region continuous with body contour. Stoma 21-27 µm long, with a dorsal tooth at anterior end. Pharynx cylindrical, with pear-shaped basal bulb. Cardia small. Intestine with thin wall and wide lumen. Female reproductive system amphidelphic. Ovaries reflexed. Vagina 3-4 µm long. Vulva sunken. Rectum 7-9 µm long. Tail 10-12 anal body diameter long, with cylindroid spinneret.

Male : Not found.

Habitat and locality : Around roots of gram (*Phaseolus* sp.) from village Kawas, district Barmer, Rajasthan, India.

Family LEPTOLAIMIDAE Orley, 1880

2. *Chronogaster daoi* Loof, 1964

(Fig. 1, D-F)

Material examined : 3 ♀ ♀; date of collection : 20.iv.06.

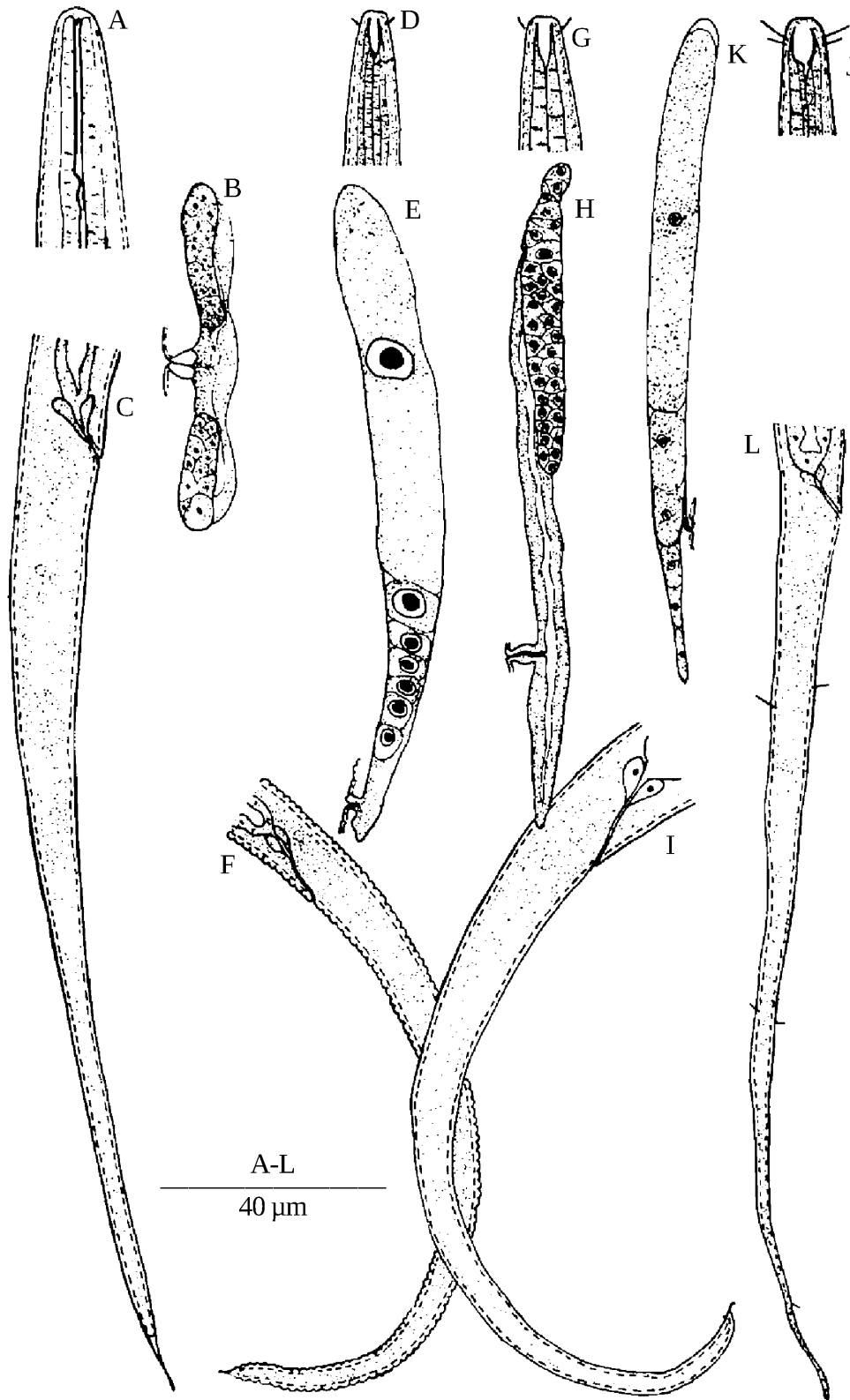


Fig. 1. A-C : *Rhabdolaimus aquaticus* de Man, 1880. A-Female anterior end; B-Female reproductive system; C-Female tail.
D-F : *Chronogaster daoi* Loof, 1964. D-Female anterior end; E-Female reproductive system; F-Female tail.
G-I : *Chronogaster typica* (De Man, 1921) De Coninck, 1935. G-Female anterior end; H-Female reproductive system; I-Female tail.
J-L : *Prismatolaimus parvus* Milne, 1963. J-Female anterior end; K-Female reproductive system; L-Female tail.

Measurements : Females : L = 0.7-0.8 mm; a = 46-51; b = 4.1-4.8; c = 6.8-7.8; V = 49-52.

Description : Female : Body, tapering towards both extremities, open C-shaped after fixation. Cuticle annulated, annuli 1.5 µm wide. Lip region continuous with body contour. Lips amalgamated, with setose papillae. Cephalic setae 4-5 µm or about one labial width long. Anterior part of stoma cylindrical, 5 µm long, posterior part 15-16 µm long. Amphid at middle of anterior stoma. Pharynx cylindrical, with 13-16 µm long basal bulb. Cardia large. Female reproductive system monoprodelphic. Tail 10-11 times of anal body diameter long, ventrally curved with a small mucro.

Male : Not found.

Habitat and locality : Around roots of wheat (*Triticum aestivum*) from village Manaklaw, district Jodhpur, Rajasthan, India.

3. *Chronogaster typica* (De Man, 1921)

De Coninck, 1935

(Fig. 1, G-I)

Material examined : 2 ♀ ♀; date of collection : 20.iv.06.

Measurements : Females : L = 1.0-1.3 mm; a = 45-62; b = 4.5-5.2; c = 6.1-8.4; V = 45-51.

Description : Female : Body tapering towards both extremities. Cuticle 1 µm thick, annulated, annuli 1 µm wide. Lip region anteriorly rounded, continuous with body contour. Cephalic setae 7-9 µm long, 1.0-1.2 times of labial diameter. Lateral fields, 1/5th-1/4th of corresponding body diameter. Anterior part of stoma 7 µm long. Pharynx cylindrical, with 20-25 µm long basal bulb. Cardia large, 20-25 µm long. Female reproductive system monoprodelphic, with 6-7 µm long post-uterine sac. Tail uniformly tapering, 8-11 times of anal body diameter, with small dorsal mucro.

Male : Not found.

Habitat and locality : Around roots of mustard (*Brassica campestris*) from Kannor, district Hanumangarh, Rajasthan, India.

Order ENOPLIDA FILIPJEV, 1939

Family PRISMATOLAIMIDAE MICOLETZKY, 1922

4. *Prismatolaimus parvus* Milne, 1963

(Fig. 1, J-L)

Material examined : 4 ♀ ♀; date of collection : 31.iii.06.

Measurements : Females : L = 0.4-0.7 mm; a = 39-48; b = 3.6-5.1; c = 2.9-3.7; V = 56-59.

Description : Female : Body medium-sized, slender, tapering gradually towards tail tip, ventrally curved upon fixation. Cuticle thin, finely annulated. Somatic setae present; four in pharyngeal region and five in tail region. Cephalic setae in two circles, in 6 + 4 arrangement. Stoma cylindrical with cuticularised walls, twice as long as wide. Pharynx a muscular tube, broaden posteriorly. Cardia spherical. Female reproductive system mono-prodelphic. Ovary reflexed, terminating posterior to vulva. Vulva-anus distance about half of tail length. Tail 15-16 anal body diameter long, tip with a small ventrally curved mucro.

Male : Not found.

Habitat and locality : Moist soil from a sewage drain of district Jodhpur, Rajasthan, India.

Order RHABDITIDA CHITWOOD, 1933

Family RHABDITIDAE ÖRLEY, 1880

5. *Distolabrellus veechi* Anderson, 1983

(Fig. 2, A-D)

Material examined : 5 ♀ ♀; 4 ♂ ♂; date of collection : 26.xii.06.

Measurements : Females : L = 1.2-1.3 mm; a = 14-20; b = 4.9-6.4; c = 10-21; V = 83-87.

Males L = 0.8-1.0 mm; a = 17-19; b = 2.9-4.8; c = 18-20.

Description : Female : Body large-sized, tapering towards both extremities, almost straight upon fixation. Cuticle about 1 µm thick, prominently annulated, annuli 1-2 µm wide. Lateral fields 4-5 µm wide, comprising of four lateral lines. Lip region slightly offset from adjoining body. Lips six, with six liplets. Lip papillae very small. Stoma 21-25 µm long, tubular. Metastegostom with denticles. Pharynx with swollen corpus, narrow isthmus

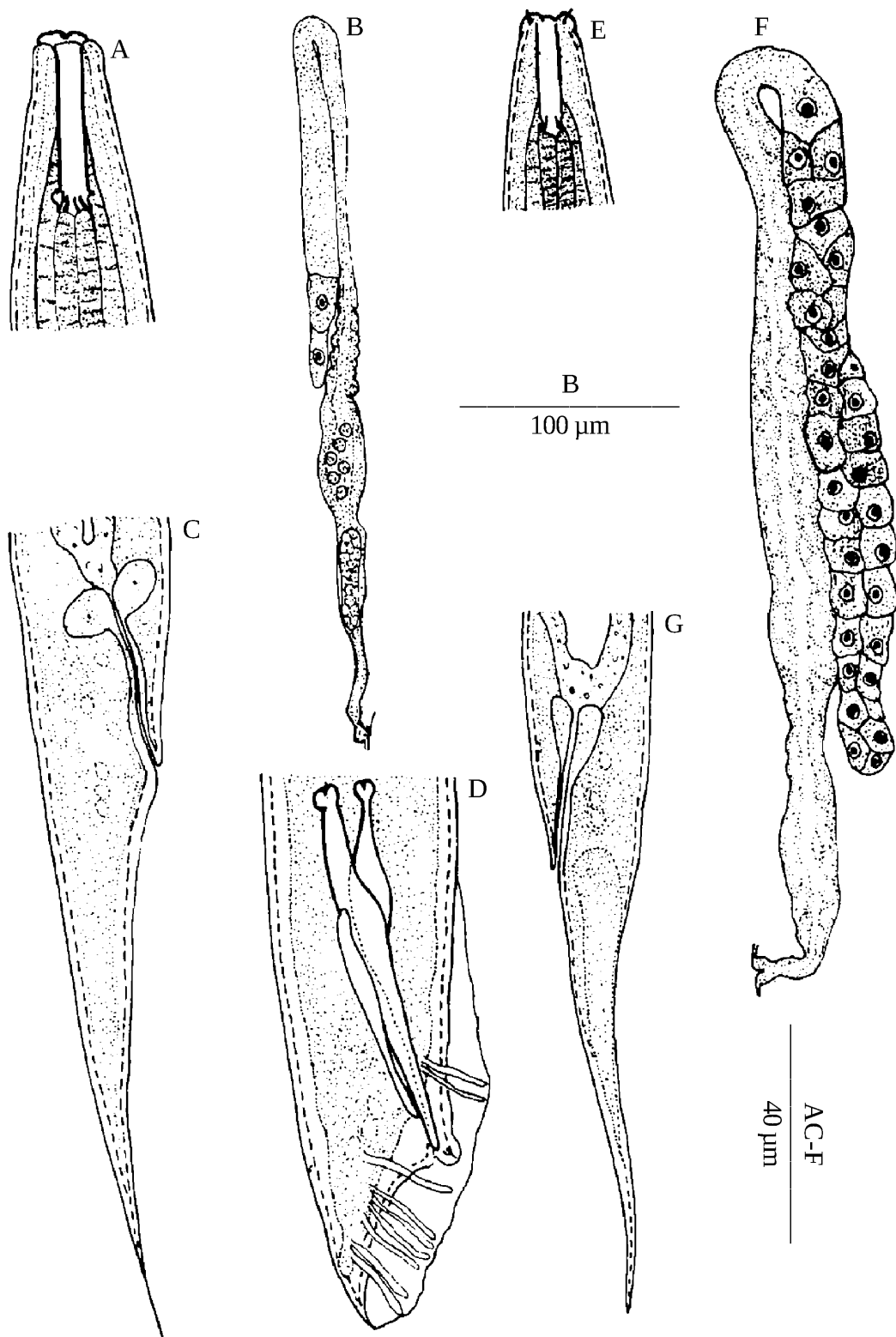


Fig. 2. A-D : *Distolabrellus veechi* Anderson, 1983. A-Female anterior end; B-Female reproductive system; C-Female tail; D-Male tail.

E-G : *Mesorhabdites anisomorpha* (Sudhaus, 1978) Andrassy, 1983. E. Female anterior end; F-Female reproductive system; G-Female tail.

and pear-shaped basal bulb. Excretory pore in isthmus region. Female reproductive system monoprodelphic. Ovary reflexed. Uterus filled with eggs. Vagina anteriorly directed. Vulva-anus distance smaller than tail. Tail elongate, 2.3-4.6 anal body diameter long.

Male : Similar to female in general morphology. Spicules 60-71 μm long, distally fused. Gubernaculum cuticularised, 34-40 μm long. Genital papillae in 2 + 1 + C + 4 + 2 arrangement.

Habitat and locality : Moist soil from a sewage drain of district Jodhpur, Rajasthan, India.

6. **Mesorhabditis anisomorpha** (Sudhaus, 1978)

Andrássy, 1983

(Fig. 2, E-G)

Material examined : 4 ♀ ♀; date of collection : 08.xii.06.

Measurements : Females : L = 0.6-0.7 mm; a = 14-20; b = 4.1-4.4; c = 8.2-9.8; V = 76-80.

Description : Female : Body, almost straight to very slightly curved ventrally upon fixation. Cuticle 1 μm thick, finely annulated. Lip region offset from adjoining body. Lip six, rounded, separate, each with setose papilla. Cheilostom rounded. Stoma tubular, cuticularised, 18-21 μm long. Metastegostomal swelling asymmetrical. Pharynx with narrow isthmus and pear-shaped basal bulb. Cardia small, conoid. Excretory pore in isthmus region. Female reproductive system monoprodelphic, with small post uterine sac. Ovary reflexed. Vulva-anus distance smaller than tail. Tail 4.0-4.5 anal body diameter long.

Male : Not found.

Habitat and locality : Around roots of soya (*Glycine max*) from district Hanumangarh, Rajasthan, India.

Family CEPHALOBIDAE FILIPJEV, 1934

7. **Chiloplacus sclerovaginitus** Sumenkova &

Razzhivlm, 1968

(Fig. 3, A-D)

Material examined : 5 ♀ ♀; 3 ♂ ♂; date of collection : 30.iii.06.

Measurements : Females : L = 0.5-0.7 mm; a = 16-22; b = 3.2-4.5; c = 15-20; V = 62-66.

Males : L = 0.5-0.7 mm; a = 17-21; b = 3.0-4.5; c = 14-22.

Description : Female : Body ventrally curved upon fixation. Lip region continuous with body contour. Cuticle finely annulated. Labial probolae slightly concave, 3-4 μm long. Stoma cephaloboid, with distinct rhabdions. Pharynx cylindrical, with pear-shaped basal bulb. Nerve ring encircles base of corpus. Cardia small, conoid. Intestine wall thick, with distinct lumen. Female reproductive system cephaloboid. Ovary reflexed. Spermatheca distinct. Vagina about half of corresponding body diameter. Tail 1.9-2.3 anal body diameter long, with 12-15 annuli ventrally.

Male : Similar to females in general morphology. Testis single. Spicules cephalated, 32-38 μm long, ventrally curved. Gubernaculum 20-24 μm long.

Habitat and locality : Around roots of Pearl millet (*Pennisetum americanum*) from Mohangarh, district Jaisalmer, Rajasthan, India.

8. **Zeldia minor** Allen & Noffsinger, 1972

(Fig. 3, E-G)

Material examined : 6 ♀ ♀; date of collection : 20.iv.06.

Measurements : Females : L = 0.7-0.8 mm; a = 15-23; b = 3.1-4.2; c = 15-22; V = 65-67.

Description : Female : Body medium-sized, tapering towards both extremities, straight upon fixation. Lip region continuous with body contour. Labial probolae rounded. Cephalic probolae flap-like. Cephalic axils narrow, deep with very small dentate point. Cuticle annulated, annuli 1.5-2.0 μm wide. Stoma cephaloboid. Pharynx cylindrical with pear-shape basal bulb. Nerve ring encircles base of corpus. Cardia small, 3 μm long. Intestine with wide lumen. Female reproductive system typical cephaloboid. Tail 1.4-2.3 anal body diameter long. Phasmid in anterior half of tail.

Male : Not found.

Habitat and locality : Dry leaf manure from a field of Ramgarh, district Jaisalmer, Rajasthan, India.

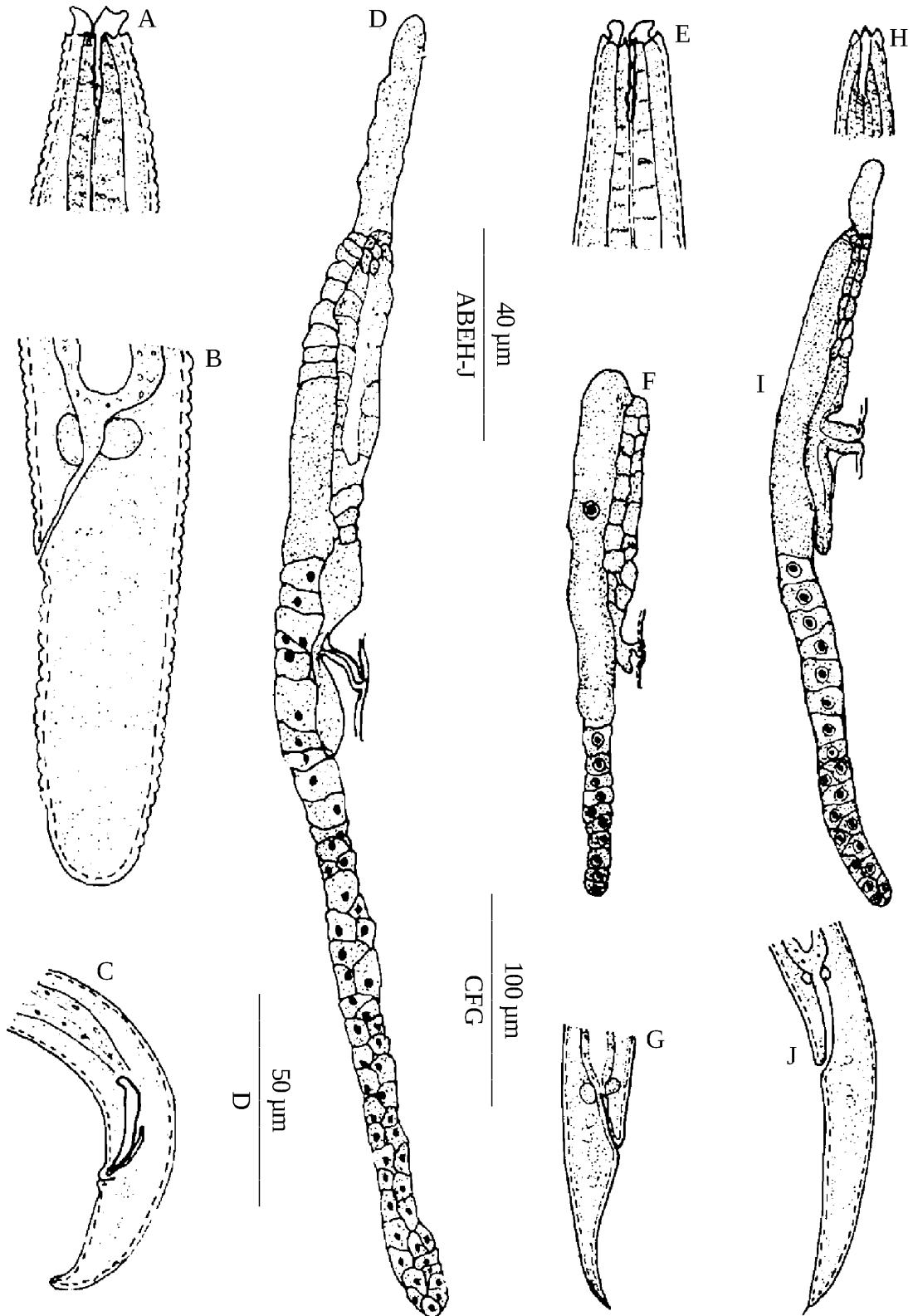


Fig. 3. A-D : *Chiloplacus sclerovaginitus* Sumenkova & Razzhivlm, 1968. A-Female anterior end; B-Female tail; C-Male tail; D-Female reproductive system.

E-G : *Zeldia minor* Allen & Noffsinger, 1972. E. Female anterior end; F-Female reproductive system; G-Female tail.

H-J : *Eucephalobus hooperi* Marinari-Palmisano, 1967. H-Female anterior end; I-Female reproductive system; J-Female tail.

9. *Eucephalobus hooperi* Marinari-Palmisano, 1967

(Fig. 3, H-J)

Material examined : 5 ♀ ♀; date of collection : 05.iv.07.

Measurements : *Female* : L = 0.3-0.5 mm; a = 16-28; b = 2.6-4.1; c = 9.1-10; V = 62-64.

Description : *Female* : Body small-sized, tapering towards both extremities, ventrally curved upon fixation. Lip region continuous with body contour. Labial probolae pointed. Cuticle 1 μ m thick, annulated, annuli 1.0-1.5 μ m wide. Lateral fields 1/6th-1/5th of corresponding body diameter. Stoma 10-14 μ m long. Pharynx cylindrical, corpus four times of isthmus length. Cardia 3 μ m long, conoid. Nerve ring encircles anterior half of isthmus. Female reproductive system cephaloboid. Ovary reflexed. Post uterine sac smaller than half of vulval body diameter. Tail 4-5 anal body diameter long, with 23-26 ventral annuli. Phasmids at mid of tail.

Male : Not found.

Habitat and locality : Around roots of garlic (*Allium sativum*) from IGNP command area, district Jaisalmer, Rajasthan, India.

Family DIPLOGASTRIDAE MICOLETZKY, 1922

10. *Mononchoides longicaudatus* Andr ssy, 1984

(Fig. 4, A-C)

Material examined : 3 ♀ ♀; date of collection : 26.xii.06.

Measurements : *Females* : L = 1.1-1.3 mm; a = 21-26; b = 6.0-7.2; c = 2.3-2.4; V = 35-40.

Description : *Female* : Body almost straight upon fixation. Lip region continuous with adjacent body. Metastegostom with claw-like tooth, telostegostom double as long as broad. Pharynx with strong valvated medium bulb, narrow isthmus and weak basal bulb. Intestine with thick wall and wide lumen. Female reproductive system amphidelphic. Ovary reflexed. Tail long filiform, about 20 anal body diameter long.

Male : Not found.

Habitat and locality : Moist soil from a sewage drain of district Jodhpur, Rajasthan, India.

11. *Butlerius okai* Rahm, 1938

(Fig. 4, D-F)

Material examined : 2 ♀ ♀; date of collection : 26.xii.06.

Measurements : *Females* : L = 0.9-1.1 mm; a = 28-34; b = 4.3-5.1; c = 3.9-4.5; V = 48-49.

Description : *Female* : Body large-sized, almost straight upon fixation. Cuticle thin, finely striated. Lip region continuous with body contour. Labial setae 1/5th -1/4^h of labial diameter. Stoma 10 μ m long, 6 μ m wide, with strong dorsal tooth. Pharynx with prominent medium bulb, narrow isthmus and basal bulb of 23-25 $\times$ 20-21 dimension. Nerve ring at 75% of pharyngeal length. Cardia small, conoid. Female reproductive system amphidelphic. Ovaries reflexed. Tail long filiform, 255-267 μ m long, 3.2-3.8 anal body diameter long.

Male : Not found.

Habitat and locality : Moist soil from a sewage drain of district Jodhpur, Rajasthan, India.

SUMMARY

Eleven species of free-living nematodes belonging to three orders Araeolaimida (3 spp.), Rhabditida (7 spp.) and Enoplida (1 sp.) have been reported for the first time from Rajasthan.

Rhabdolaimus aquaticus de Man, 1880; *Chronogaster daoi* Loof, 1964 *Chronogaster typica* (De Man, 1921) De Coninck, 1935; *Prismatolaimus parvus* Milne, 1963; *Distolabrellus veechi* Andr sson, 1983; *Mesorhabditis anisomorpha* (Sudhaus, 1978) Andr ssy, 1983; *Chiloplacus sclerovaginitus* Sumenkova & Razzhivlm, 1968; *Zeldia minor* Allen & Noffsinger, 1972; *Eucephalobus hooperi* Marinari-Palmisano, 1967 ; *Mononchoides longicaudatus* Andr ssy, 1984; *Butlerius okai* Rahm, 1938.

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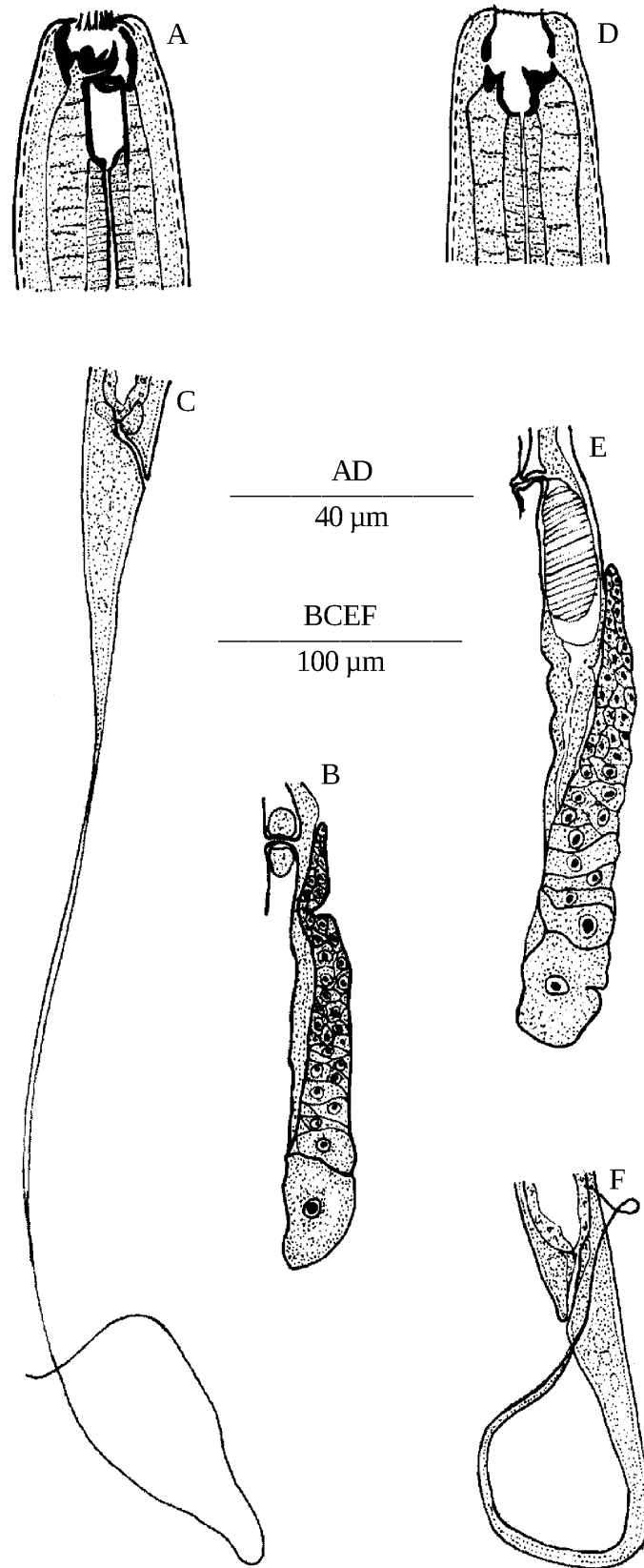
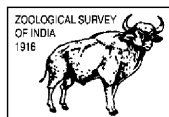


Fig. 4. A-C : *Mononchoides longicaudatus* (Khera, 1965) Andr ssy, 1984. A-Female anterior end; B-Female reproductive system; C-Female tail.

D-F : *Butlerius okai* Rahm, 1938. D-Female anterior end; E-Female reproductive system; F-Female tail.

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Rec. zool. Surv. India : 110(Part-4) : 19-29, 2010

DIVERSITY OF CLADOCERA (CRUSTACEA : BRANCHIOPODA) IN FLOODPLAIN LAKES OF MANIPUR, NORTHEASTERN INDIA

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INTRODUCTION

Cladocera, a group of the branchiopod crustaceans, serve as important fish-food organisms, comprise an integral component of metazooplankton and contribute significantly to secondary productivity in lentic freshwater biotopes. These entomostracous Crustacea have been studied from distant parts of this country since about one and half century but the Indian literature shows paucity of works on their ecosystem diversity in aquatic environments in general and in the floodplain lakes of India in particular (Sharma and Sharma, 2008). Referring to the later, important contribution is limited to the recent study by Sharma and Sharma (*loc cit.*) in the floodplain lakes (beels) of the Brahmaputra river basin, Assam, N.E. India.

The present study on the cladoceran diversity of fifteen floodplain lakes (pats) of Manipur, therefore, merits special mention for its biodiversity and ecological importance. The observations are made on faunal diversity, nature and composition, distribution of important species and community similarities of Cladocera in the different pats. In addition, the study deals with seasonal variations in richness and abundance, and their species diversity, dominance and evenness in the sampled lakes. Individual and cumulative influences of the abiotic factors on richness

and abundance are analyzed and comments are made on ecology of Cladocera.

MATERIALS AND METHODS

The observations were undertaken (during November 2002-October 2003) in fifteen floodplain lakes (pats) of the Iral, Imphal and Thoubal river basins (Longitude : 93° 45'-94° 00' E, Latitude : 24° 25'-24° 45' N) and located in Bishnupur, Imphal and Thoubal districts of Manipur.

Sr. No.	Name of Lake (Pat)	District
1.	Loktak Pat	Bishnupur/Imphal
2.	Waithou Pat	Thoubal
3.	Utra Pat	Bishnupur
4.	Sana Pat	Bishnupur
5.	Lakoi Pat	Bishnupur
6.	Takmu Pat	Bishnupur
7.	Ikop Pat	Thoubal
8.	Kharung Pat	Thoubal
9.	Khoidum Pat	Thoubal
10.	Pumlen Pat	Thoubal
11.	Lousi Pat	Thoubal
12.	Karam Pat	Thoubal
13.	Ngagua Pat	Thoubal
14.	Tankha Pat	Imphal
15.	Lamphel Pat	Imphal

The common aquatic plants noticed at the sampled sites of these pats include *Eichhornia crassipes*, *Hydrilla verticellata*, *Euryale ferox*, *Vallisneria spiralis*, *Utricularia flexuosa*, *Trapa natans*, *Lemna trisula*, *Pistia striates*, *Salvinia* sp. *Nymphaea* spp., *Nymphoides* spp., *Nelumbo mucifera*, *Potamogeton* spp. and *Azolla pinnata*. It is not possible to categorize different pats because of heterogeneous occurrence of different aquatic macrophytes but all the stated species occur in Loktak Pat.

Water samples were collected seasonally from different pats during study period and were analyzed for water temperature, specific conductivity, pH, dissolved oxygen, alkalinity and hardness. Besides, qualitative and quantitative plankton samples were collected seasonally, from 4-5 sites each based on habitat variations, from various pats with nylobolt plankton net (Mesh size : 50 μ m); the former were obtained by towing and the later by filtering 25 litres of water each. All the plankton samples were preserved in 5% formalin. Qualitative samples were screened; individual species were isolated and were identified following the works of Smirnov (1971, 1976, 1992, 1996), Michael and Sharma (1988), Sharma and Sharma (1999) and Orlova-Bienkowskaja (2001). Quantitative plankton samples were analyzed for enumeration of the cladoceran densities (n/l).

Percentage similarities between cladoceran communities were calculated *vide* Sorensen's index and were analyzed by hierarchical cluster analysis (SPSS version 10). Species diversity (Shannon's index), dominance (Berger-Parker's index) and evenness (Pileou's index) were calculated following Ludwig and Reynolds (1988) and Magurran (1988). The significance of temporal variations of richness and densities were ascertained by ANOVA. Ecological relationships were analyzed with simple correlation coefficients (r) and multiple regression (R^2).

RESULTS AND DISCUSSION

Abiotic parameters

The sampled lakes (pats) depict subtropical nature (water temperature : $20.7 \pm 4.1 - 22.8 \pm 4.7^\circ\text{C}$) and are characterized by slightly acidic-circumneutral (pH : 5.70-6.92, mean pH : 6.02-6.44) and, relatively well oxygenated

(mean D.O. : $5.4 \pm 2.6 - 7.2 \pm 1.6$ mg/l) waters (Table-1). Specific conductivity (36.0-200 $\mu\text{S/cm}$) indicates very low ionic concentrations of all the parts and, hence, warrants their inclusion under 'Class I' category of 'trophic classification' of Talling and Talling (1965). Alkalinity ($21.2 \pm 4.9 - 32.4 \pm 4.2$ mg/l) and hardness ($18.3 \pm 3.3 - 38.3 \pm 7.8$ mg/l) affirm 'soft-water character' (*vide* Moyle 1946) of the different pats (Table-1).

Cladocera composition and distribution

Cladocera, second important qualitative component of zooplankton of all the pats of Manipur, reveal in all 56 species and comprise a significant fraction (50.9%) of the Indian Cladocera. The qualitative diversity assumes importance in light of a conservative estimate (Sharma and Michael, 1987; Sharma, 1991) of occurrence of up to 60-65 species of these branchiopod Crustaceans from tropical and subtropical parts of India. Amongst 42 genera and 10 families of freshwater cladocerans so far known from India (BKS, unpublished), 30 genera and 7 families are represented in our collections. Number of the examined species and higher taxa reflect rich and diverse taxocoenosis of Cladocera. The recorded families represent two phylogenetic stems of this group (Dumont and Negrea, 2002) namely the Ctenopoda and the Anomopoda; the former includes only the family Sididae while six families of the latter (Daphniidae-Bosminidae-Moinidae-Macrothricidae-Ilyocryptidae-Chydoridae) are noticed in our collections.

Overall Cladocera richness observed in the pats of Manipur tallies with their report from the floodplain lakes (beels) of the Brahmaputra river basin of Assam (Sharma and Sharma, 2008). On the other hand, the richness is notably higher than the reports of 36 species from 20 floodplain wetlands of Southeastern West Bengal (Khan, 2003), 11 species from two floodplain lakes (Khan, 1987) of Kashmir, 9 species from 65 wetlands of 24-Parganas district (Nandi *et al.*, 1993) of West Bengal, 12 species (Sanjer and Sharma 1995) from floodplains of Bihar and 14 species from 37 floodplain lakes (Sarma, 2000) of Assam. Total richness is even higher than 41 species reported in state faunas of Meghalaya (Sharma and Sharma, 1999) and Tripura (Venkataraman and Das, 2000) from Northeastern India.

Table-1 : Abiotic factors of Floodplain Lakes (Pats) of Manipur

Abiotic Factors	Water temp. (°C)	Specific conductivity (µS/cm)	pH	Dissolved oxygen (mg/l)	Alkalinity (mg/l)	Hardness (mg/l)
Loktak Pat	14.2-28.5 21.8 ± 4.2	66.0-132.0 93.3 ± 17.1	5.70-6.92 6.31 ± 0.32	4.2-9.0 5.7 ± 1.1	10.0-41.2 19.1 ± 7.1	24.0-54.0 38.3 ± 7.8
Waithou Pat	14.5-29.2 21.6 ± 4.8	52.0-120.5 92.3 ± 16.8	5.59-6.60 6.21 ± 0.28	2.4-12.0 5.3 ± 2.8	10.0-36.2 19.7 ± 5.6	20.1-56.0 33.6 ± 7.8
Utra Pat	16.2-27.9 22.2 ± 3.5	48.0-120.5 77.2 ± 21.6	5.40-6.68 6.23 ± 0.32	4.0-10.0 6.0 ± 1.4	10.0-44.0 19.5 ± 9.4	19.5 ± 9.4 33.0 ± 7.4
Sana Pat	13.1-28.5 21.2 ± 5.2	69.3-107.0 80.2 ± 8.3	6.12-6.78 6.37 ± 0.14	4.8-7.9 5.4 ± 2.6	25.1-38.5 29.2 ± 4.1	19.2-32.5 25.9 ± 3.7
Lakoi Pat	14.5-29.0 22.1 ± 4.9	41.8-82.0 61.4 ± 5.9	6.15-6.81 6.37 ± 0.12	5.2-9.0 6.6 ± 2.2	12.0-36.0 24.2 ± 4.9	10.0-34.2 20.4 ± 4.6
Takmu Pat	15.1-28.2 22.6 ± 3.1	79.5-128.0 100.5 ± 8.6	5.89-6.86 6.02 ± 0.34	4.2-10.0 5.8 ± 2.1	16.0-39.4 21.4 ± 5.3	15.4-48.0 24.9 ± 5.1
Ikop Pat	13.9-21.6 21.3 ± 5.5	124.1-200.0 168.7 ± 13.9	6.18-6.77 6.39 ± 0.12	4.0-9.2 6.9 ± 1.8	22.3-50.0 30.4 ± 5.9	18.0-48.4 24.9 ± 5.8
Kharung Pat	14.0-28.5 21.0 ± 4.0	36.0-68.0 46.0 ± 5.1	5.91-6.89 6.30 ± 0.29	6.0-9.0 7.2 ± 1.6	26.2-48.0 32.4 ± 4.2	22.0-44.2 30.0 ± 4.7
Khoidum Pat	12.4-27.6 22.8 ± 4.7	72.4-100.0 87.9 ± 7.2	5.92-6.62 6.22 ± 0.13	4.4-8.4 5.8 ± 2.1	21.4-32.6 25.8 ± 3.9	14.0-29.4 18.3 ± 3.3
Lousi Pat	14.5-27.9 21.7 ± 4.1	94.2-149.0 121.2 ± 9.0	6.12-6.89 6.44 ± 0.14	5.2-10.4 6.5 ± 2.6	12.0-35.4 24.1 ± 4.3	14.0-36.0 23.9 ± 3.7
Karam Pat	12.9-28.0 20.7 ± 4.1	78.1-108.0 80.8 ± 6.7	5.72-6.48 6.16 ± 0.10	4.2-8.8 6.4 ± 1.2	18.4-29.4 23.1 ± 2.1	16.2-28.0 21.2 ± 3.2
Ngagua Pat	14.0-29.2 22.2 ± 3.6	105.4-183.0 134.2 ± 16.7	6.12-6.78 6.43 ± 0.11	5.6-7.8 6.4 ± 1.3	20.1-38.8 32.2 ± 3.9	16.2-29.6 20.7 ± 3.9
Tankha Pat	14.0-29.0 22.0 ± 4.0	87.0-125.0 105.1 ± 6.6	6.01-6.77 6.37 ± 0.13	6.2-9.6 6.8 ± 2.4	25.2-48.0 30.3 ± 4.0	16.8-39.1 26.0 ± 4.4
Lamphel Pat	13.5-28.7 21.4 ± 3.5	153.0-200.0 177.4 ± 9.3	6.12-6.86 6.38 ± 0.12	5.4-9.8 6.0 ± 2.5	18.4-38.0 27.8 ± 4.2	16.8-36.2 26.2 ± 4.2
Pumlen Pat	13.5-30.0 21.5 ± 4.2	98.4-127.0 107.8 ± 5.3	5.82-6.78 6.26 ± 0.16	6.2-9.0 7.0 ± 1.8	12.5-37.4 21.6 ± 4.3	10.2-30.2 20.6 ± 3.7

Fifty-one species recorded from Loktak Pat is highest richness of Cladocera known till date from any floodplain lake or individual freshwater ecosystem of India and, hence, reflects greater micro-habitat diversity as well as environmental heterogeneity of this Ramsar site. The present report differs prominently than only 12 species (including certain un-determined and doubtful species) listed earlier by Shyamananda Singh

(1991) from this wetland. Interestingly, the cladoceran diversity of Loktak Pat even exceeds the highest Indian record of 45 species (Sharma and Sharma, 2008) from Deepor beel-another Ramsar site and one of the important beel of N.E. India.

Chydoridae, the largest family of Cladocera, is highly speciose (31 species, 55.3%) and also reflects rich higher diversity (16 genera). This family, in turn, includes

members of two sub-families namely Aloninae (13 species) and Chydorinae (18). The greater richness of the chydorids confirms with the composition of the Indian Cladocera (Sharma, 1991) in general and with the floodplain lakes of Assam (Sharma and Sharma, 2008) in particular. The sub-dominant families, Daphniidae (9 species) > Macrothricidae (6 species) > Sididae (5 species), together comprise an important component (35.7%). Among 30 genera, only *Alona* (10 species) > *Simocephalus* (6 species) are more speciose. Interestingly, lack of any species of *Daphnia* (the globally highly speciose genus of Cladocera) in the pats of Manipur is noteworthy. This interesting feature assumes special importance in light of earlier remarks (Sharma, 1991) on very limited distribution of this member of the Daphniidae in aquatic ecosystems of Northeastern India.

Amongst biogeographically interesting species (Sharma and Sharma, 2008) documented presently, *Disperalona caudata* is an Australasian species (Sharma and Sharma, 2007); *Simocephalus acutirostratus* is known with certainty only from Australia and South-East Asia; *Sida crystallina* and *Picripleuroxus laevis* are Palaearctic species; *Diaphanosoma senegal* and *Kurzia latissima* are the Palaeotropical elements, and *Chydorus reticulatus* is known only from the Indian subcontinent (India, Sri Lanka), Malaysia and tropical Australia. Besides, *Alonella clathratula*, *Alona davidi*, *A. globulosa*, *A. guttata*, *Camptocercus uncinatus*, *Ceriodaphnia laticaudata*, *Chydorus faviformis*, *C. reticulatus*, *C. ventricosus*, *Dadaya macrops*, *Guernella*, *raphaelis*, *Kurzia longirostris*, *Macrothrix odiosa*, *Moinodaphnia maclyei*, *Pseudochydorus globosus*, *Simocephalus heilongjiangensis*, *S. mixtus*, *S. serrulatus* and *Streblocerus serricaudatus* are examples of regional distributional interest with a majority of these species characterized by disjunct populations in freshwater ecosystems of India.

The Cladocera are invariably considered as a group showing cosmopolitan distribution while recent biogeographical considerations comment on careful analysis of cosmopolitan nature of various species and of geographical vicariants (Dumont and Negrea, 2002). The present study indicates dominance of cosmopolitan

species (42.8%) while cosmopolitan and circumtropical species, together, form an important component (35.7%). These features impart a general 'tropical character' to the studied fauna and concur with the composition of other tropical Cladoceran faunas (Fernando, 1980; Fernando and Kanduru, 1984; Dussart *et al.*, 1984; Sharma, 1991). The cladoceran communities are characterized by dominance of the littoral-periphytonic taxa particularly of the Chydoridae, Macrothricidae, Ilyocryptidae and littoral species of *Pseudosida*, *Sida* and *Simocephalus*. On the other hand, fewer planktonic species include *Bosmina longirostris*, *Bosminopsis deitersi*, *Ceriodaphnia cornuta*, *Diaphanosoma sarsi*, *D. excisum*, *Moina micrura* and *Moinodaphnia macleayi* and even these exhibit restricted occurrence in different pats. Further, only 12 species (21.4%) occur in all the lakes and may be categorized as common while a majority of the rest (25 species, 46.4%) are rare and occur in fewer pats.

Cladocera richness and community similarities

The present study indicates notable variations in Cladoceran richness (Table-2) in the different pats (21-51, 27 ± 7 species); the recorded range is higher than the results in the beels (21-39 species) of Assam (Sharma and Sharma, 2008). Distinctly higher richness noticed in Loktak Pat reflects micro-habitat diversity resulting from diverse nature of aquatic macrophytes in this pat and, hence, affirms greater environmental heterogeneity of the Ramsar site than the remaining pats. This statement is also affirmed by a relatively narrow range (21-31 species) of richness in the other sampled pats. Family Chydoridae (31 species) distinctly dominates cladoceran richness in all individual pats (9-29, 17 ± 9 species); peak chydorid richness is observed in Loktak Pat and the number of species in rest of the Pats varies between 9-18 (12 ± 2 species).

The cladoceran communities of the sampled pats depict 52.3-84.7% similarities (*vide* Sorenson's index); peak similarity is noticed between Waithou Pat and Utra Pat and lowest value is recorded between Loktak Pat and Ngagua Pat (Table-3). Only few instances in the matrix indicates similarity > 60% or < 80.0% and it ranges between 60-70% and 70-80% in 47.6% and 43.8% instances respectively. Relatively higher similarities result from common occurrence of several cosmopolitan

Table-2 : Cladocera of Floodplain lakes (Pats) of Manipur

Floodplain lakes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Phylum	ARTHROPODA														
Superclass	CRUSTACEA														
Class	BRANCHIOPODA														
Superorder	CLADOCERA (<i>s. str.</i>)														
Order CTENOPODA															
Family SIDIDAE															
<i>Diaphanosoma excisum</i> Sars, 1885	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>D. sarsi</i> Richard, 1895	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>D. senegal</i> Gauthier, 1951	+	–	–	–	–	–	–	–	–	–	–	–	–	–	
<i>Pseudosida bidentata</i> Herrick, 1884	+	+	+	–	–	–	–	+	–	–	–	–	–	+	+
<i>Sida crystallina</i> (O.F. Müller, 1776)	+	+	–	+	+	+	–	–	+	+	–	–	+	–	–
Order ANOMOPODA															
Family DAPHNIIDAE															
<i>Ceriodaphnia cornuta</i> Sars, 1885	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>C. laticaudata</i> P.E. Müller, 1867	+	–	–	–	–	–	–	+	–	–	–	–	–	–	R
<i>Scapholeberis kingi</i> Sars, 1901	+	+	+	–	–	+	+	–	+	+	+	+	–	–	
<i>Simocephalus acutirostratus</i> (King, 1853)	+	+	+	+	+	–	–	–	–	–	–	–	+	+	–
<i>S. heilongjiangensis</i> Shi & Shi, 1994	+	–	–	–	–	–	–	–	–	–	–	–	–	–	
<i>S. exspinosus</i> (De Geer, 1778)	–	–	–	–	+	+	–	–	+	+	–	+	–	–	+
<i>S. serrulatus</i> (Koch, 1841)	+	–	–	+	–	–	+	+	+	–	+	–	–	–	+
<i>S. mixtus</i> Sars, 1903	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>S. vetuloides</i> Sars, 1898	+	–	–	–	–	–	–	+	–	–	–	–	–	–	R
Family BOSMINIDAE															
<i>Bosmina longirostris</i> (O.F. Müller, 1776)	+	+	+	+	+	+	+	+	+	–	+	+	+	+	–
<i>Bosminopsis deitersi</i> Richard, 1895	+	–	–	+	–	+	+	+	–	+	+	+	–	–	+
Family MOINIDAE															
<i>Moina micrura</i> Kurz, 1874	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>Moinodaphnia macleayi</i> (King, 1853)	–	+	–	+	–	–	–	–	+	–	+	–	+	–	R
Family MACROTHRICIDAE															
<i>Guernella raphaelis</i> Richard, 1892	+	–	–	–	–	–	–	–	–	–	–	–	–	–	R
<i>Macrothrix laticornis</i> (Fischer, 1857)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>M. odiosa</i> (Gurney, 1907)	+	–	–	–	–	–	–	–	–	–	–	–	–	–	R
<i>M. spinosa</i> King, 1853	+	–	–	+	–	–	–	–	+	–	–	–	+	+	R
<i>M. triserialis</i> (Brady, 1886)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>Streblocerus serricaudatus</i> (Fischer, 1849)	–	–	–	+	–	–	–	–	–	–	+	+	–	–	R
Family ILYOCRYPTIDAE															
<i>Ilyocryptus spinifer</i> Herrick, 1882	+	–	–	+	+	–	–	–	+	+	–	–	–	+	R
Family CHYDORIDAE															
Subfamily CHYDORINAE															
<i>Alonella clathratula</i> Sars, 1886	+	–	–	–	–	–	–	+	–	–	–	–	–	–	R

Table-2 : Cont'd.

Floodplain lakes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>A. excisa</i> (Fischer, 1854)	+	+	+	+	–	+	–	–	+	+	+	+	–	+	+
<i>Chydorus faviformis</i> Birge, 1893	+	+	+	–	–	–	–	–	–	–	–	+	+	–	R
Family CHYDORIDAE															
Subfamily CHYDORINAE															
<i>Chydorus reticulatus</i> Daday, 1898	–	–	–	+	+	–	+	–	–	–	–	–	+	–	+
<i>C. sphaericus</i> (O.F. Müller, 1776)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>C. ventricosus</i> Daday, 1898	+	+	+	–	–	–	–	–	–	+	–	–	–	–	R
<i>Dadaya macrops</i> (Daday, 1898)	+	–	–	–	–	–	–	–	–	–	–	–	–	–	R
<i>Disperalona caudata</i> Smirnov, 1996	+	–	–	+	–	–	–	–	–	–	–	–	–	–	R
<i>Dunhevedia crassa</i> King, 1853	+	–	+	+	+	+	–	–	+	+	+	+	–	+	–
<i>Ephemeroporus barroist</i> (Richard, 1894)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>Picripleuroxus laevis</i> Sars, 1861	+	–	–	–	–	–	–	–	–	+	–	–	–	–	R
<i>P. similis</i> Vavra, 1700	+	+	+	–	+	–	–	+	–	+	+	–	–	–	R
<i>Pseudochydorus globosus</i> (Baird, 1843)	+	+	–	–	–	–	–	–	–	–	–	–	–	+	R
Subfamily ALONINAE															
<i>Acroperus harpae</i> (Baird, 1834)	+	+	+	+	+	–	+	+	–	+	+	+	+	+	+
<i>Alona affinis</i> (Leydig, 1860)	+	+	+	+	–	–	–	–	–	–	–	–	–	–	–
<i>A. costata</i> Sars, 1862	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>A. davidi</i> Richard, 1895	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>A. globulosa</i> (Daday, 1898)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>A. guttata</i> Sars, 1862	+	–	–	–	–	–	–	–	–	–	–	–	–	–	R
<i>A. intermedia</i> (Sars, 1862)	+	–	–	–	–	–	+	–	+	+	+	–	–	–	+
<i>A. monacantha</i> Sars, 1901	+	+	–	–	–	–	–	–	–	+	–	–	–	–	R
<i>A. quadrangularis</i> (O.F. Müller, 1776)	+	+	+	+	+	+	+	–	–	–	–	+	–	+	+
<i>A. rectangula</i> Sars, 1862	+	+	+	–	+	–	–	–	+	–	–	–	+	–	+
<i>A. verrucosa</i> (Sars, 1901)	+	–	–	+	+	–	–	+	–	–	–	–	–	–	R
<i>Euryalona orientalis</i> (Daday, 1898)	+	–	+	–	–	+	+	–	+	–	–	–	–	–	R
<i>Camptocercus uncinatus</i> Smirnov, 1973	+	+	+	–	–	+	+	–	–	–	–	+	–	–	R
<i>Karualona karua</i> (King, 1853)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C
<i>Kurzia latissima</i> (Kurz, 1875)	–	+	–	–	–	–	–	–	–	–	+	–	–	–	R
<i>K. longirostris</i> (Daday, 1898)	+	–	+	–	–	–	–	–	–	+	–	–	–	–	R
<i>Leydigia acanthocercoides</i> (Fischer, 1854)	+	+	–	–	+	–	–	–	+	–	–	–	–	–	R
<i>Oxyurella singalensis</i> (Daday, 1898)	+	–	–	–	–	–	+	–	–	–	+	–	–	+	R
Total No. of Cladocera Species	51	31	28	27	24	22	23	22	26	26	25	21	22	23	26

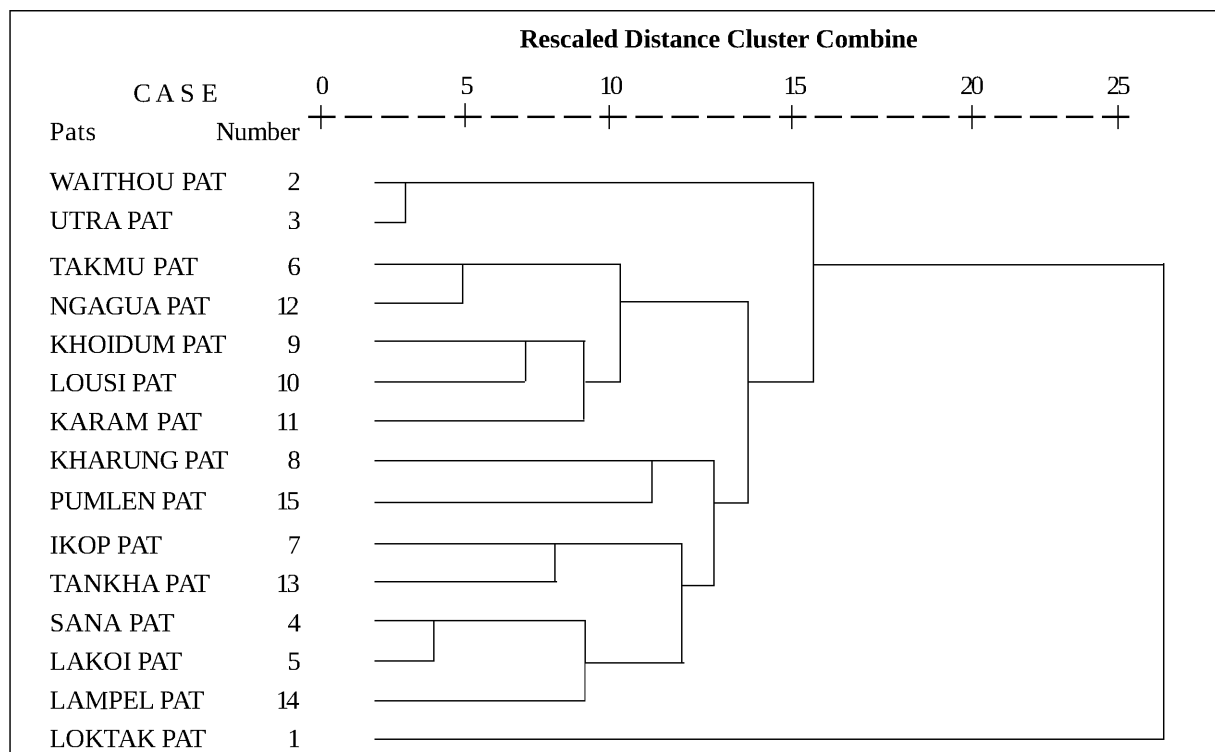
1-Loktak Pat, 2-Waithou Pat, 3-Utra Pat, 4-Sana Pat, 5-Lakoi Pat, 6-Takmu Pat, 7-Ikop Pat, 8-Kharung Pat, 9-Khoidum Pat, 10-Lousi Pat, 11-Karam Pat, 12-Ngagua Pat, 13-Tankha Pat, 14-Lamphel Pat, 15-Pumlen Pat

+ present, – absent, C–Common, R–Rare

Table-3 : Percentage similarities between Cladocera communities (Sorensen's index)

Floodplain lakes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Loktak Pat	–	70.7	70.9	64.1	61.3	54.5	59.4	60.3	63.3	64.9	52.6	52.3	57.5	59.4	57.1
Waithou Pat		–	84.7	65.5	72.7	64.1	62.9	60.4	66.7	66.7	73.1	69.2	67.9	70.4	63.1
Utra Pat			–	69.1	73.1	76.0	62.7	60.0	66.7	70.4	70.6	73.4	68.0	70.6	66.7
Sana Pat				–	82.3	73.4	68.0	73.4	67.9	67.9	73.1	70.8	77.5	76.0	75.5
Lakoi Pat					–	73.9	68.1	65.2	72.0	72.0	65.3	75.6	73.9	72.3	68.0
Takmu Pat						–	75.6	63.6	75.0	70.8	68.1	79.1	72.3	71.1	70.8
Ikop Pat							–	71.1	69.5	65.3	62.5	74.4	75.5	60.9	65.3
Kharung Pat								–	62.5	62.5	72.3	69.8	68.2	71.1	70.8
Khoidum Pat									–	73.1	74.5	70.8	62.5	61.2	69.2
Lousi Pat										–	74.5	72.3	62.5	61.2	69.2
Karam Pat											–	78.3	63.8	66.7	66.7
Ngagua Pat												–	69.8	68.2	72.3
Tankha Pat													–	71.1	62.5
Lamphel Pat														–	65.3
Pumlen Pat															–

1-Loktak Pat, 2-Waithou Pat, 3-Utra Pat, 4-Sana Pat, 5-Lakoi Pat, 6-Takmu Pat, 7-Ikop Pat, 8-Kharung Pat, 9-Khoidum Pat, 10-Lousi Pat, 11-Karam Pat, 12-Ngagua Pat, 13-Tankha Pat, 14-Lamphel Pat, 15-Pumlen Pat

**Fig. 1** : Dendrogram showing Hierarchical cluster analysis of Cladocera communities of different lakes (pats) of Manipur

and cosmopolitan species in various pats while differences may be ascribed to rare species and their limited occurrence. The cluster analysis (Fig. 1) affirms closer affinity between cladoceran faunas of Waithou Pat and Utra Pat followed by those in Takmu Pat and Ngagua Pat and again between Sana Pat and Lakoi Pat. On the other hand, the cladoceran communities of Loktak Pat differ notably in their composition from rest of the sampled pats; this feature may be ascribed to distinctly higher richness in this Ramsar site together with occurrence of seven rare species observed only this lake as well as presence of eight other rare species with limited distribution in other pats.

Richness depicts significant temporal variations in different seasons ($F_{3,59} = 47.733$, $P < 0.005$) and in different pats ($F_{14,59} = 22.305$, $P < 0.005$). It shows notable differences (12-42 species) in different seasons in individual pats (Table-4) with peaks during winter and autumn in 13 and 2 pats respectively while lowest richness is noted during monsoon in all the pats. The present results differ from indistinct seasonal maxima reported in the floodplain lakes of Assam (Sharma and Sharma, 2008) while correspond with the latter in

monsoon minima. Further, seasonal richness shows maximum extent of variations in Loktak Pat (32 ± 7 species) and shows minima (15 ± 2 species) in Kharung Pat and Ngagua Pat. Peak mean richness in all the pats is noticed during winter (22 ± 6 species) and monsoon communities record (15 ± 2 species) lowest mean richness. Richness is inversely correlated with dissolved oxygen ($r = -0.575$) and alkalinity ($r = -0.636$) and is positively correlated with hardness ($r = 0.683$). Multiple regression indicates moderate cumulative influence of six abiotic factors on richness ($R^2 = 0.661$) while step-wise regression highlights significance of alkalinity, hardness and dissolved oxygen.

Cladocera abundance, diversity, dominance and evenness

Abundance of Cladocera ranges between 30-108 n/1 in different pats (Table-5) and it registers significant temporal variations between seasons ($F_{3,59} = 29.943$, $P < 0.005$) as well as between the pats ($F_{14,59} = 2.169$, $P < 0.02$). Ngagua Pat records lowest quantitative variations (42 ± 7 n/1) while peak value is noticed in Loktak Pat (72 ± 18 n/1). In general, the densities in different pats are relatively lower than their

Table-5 : Variations in Density, Species diversity, Dominance and Evenness of Cladocera

Lakes	Density (n/1)	Mean density (n/1)	Percentage	Species diversity	Dominance	Evenness
Loktak Pat	42-108	72 ± 18	27.1 ± 5.0	2.822 ± 0.250	0.060 ± 0.018	0.975 ± 0.038
Waithou Pat	32-99	59 ± 26	26.6 ± 4.2	2.673 ± 0.146	0.041 ± 0.011	0.986 ± 0.020
Utra Pat	37-83	59 ± 12	29.1 ± 3.2	2.649 ± 0.190	0.075 ± 0.018	0.943 ± 0.028
Sana Pat	40-76	55 ± 14	26.2 ± 3.1	2.706 ± 0.101	0.102 ± 0.012	0.908 ± 0.011
Lakoi Pat	47-79	57 ± 14	27.3 ± 3.1	2.802 ± 0.097	0.075 ± 0.021	0.933 ± 0.014
Takmu Pat	34-62	47 ± 10	27.6 ± 3.8	2.634 ± 0.112	0.089 ± 0.019	0.908 ± 0.017
Ikop Pat	32-68	48 ± 11	29.4 ± 3.6	2.716 ± 0.101	0.092 ± 0.027	0.909 ± 0.018
Kharung Pat	40-60	48 ± 8	31.7 ± 1.9	2.687 ± 0.106	0.112 ± 0.012	0.880 ± 0.033
Khoidum Pat	38-64	46 ± 10	30.5 ± 2.1	2.643 ± 0.097	0.098 ± 0.017	0.910 ± 0.022
Lousi Pat	30-62	46 ± 12	24.5 ± 3.4	2.534 ± 0.089	0.092 ± 0.021	0.906 ± 0.024
Karam Pat	40-70	51 ± 12	31.6 ± 2.1	2.708 ± 0.103	0.090 ± 0.034	0.903 ± 0.025
Ngagua Pat	31-52	42 ± 7	28.8 ± 3.5	2.660 ± 0.090	0.104 ± 0.020	0.889 ± 0.020
Tankha Pat	30-60	43 ± 12	25.3 ± 3.0	2.568 ± 0.110	0.097 ± 0.029	0.910 ± 0.019
Lamphel Pat	30-61	44 ± 11	25.6 ± 3.4	2.665 ± 0.104	0.091 ± 0.018	0.911 ± 0.020
Pumlen Pat	40-85	60 ± 18	31.2 ± 2.5	2.502 ± 0.089	0.088 ± 0.022	0.921 ± 0.012

counterparts from Assam state (Sharma and Sharma, 2008). Further, Cladocera comprise the second important quantitative component ($24.5 \pm 3.4 - 31.7 \pm 1.9\%$) of zooplankton in all the sampled pats (Table-5) and concur with the results in the beels of Assam State (Sharma and Sharma, *loc cit.*). The sampled pats indicate no clear pattern of seasonal quantitative variations; peak abundance is recorded in 11, 3 and 1 pats during winter, autumn and summer respectively while minima are noticed in 13 and 2 pats during monsoon and summer respectively. Maximum mean abundance of all the pats is noticed during winter (68 ± 18 n/1), followed by 57 ± 21 n/1 and 44 ± 9 n/1 during autumn and summer respectively while lowest density (37 ± 4 n/1) is observed during monsoon season. Cladocera abundance is inversely correlated with alkalinity ($r = -0.707$) and is positively correlated with hardness ($r = 0.581$). Multiple regression indicates moderate cumulative influence of six abiotic factors on abundance ($R^2 = 0.765$) while step-wise regression highlights significance of alkalinity, hardness, dissolved oxygen and specific conductivity.

The present results indicate moderately high species diversity of Cladocera with peak in Loktak Pat (2.822 ± 0.250) and minimum value in Pumlun Pat (2.502 ± 0.089). In general the recorded ranges correspond with their counterparts from Assam (Sharma and Sharma 2008). The diversity registers significant temporal differences between seasons ($F_{3,59} = 21.128$, $P < 0.005$ and between pats ($F_{14,59} = 5.017$, $p < 0.005$). The notable feature of high species diversity with relatively lower densities of a large number of species observed in this study may be ascribed to fine niche portioning amongst cladoceran species in combination with high micro- and macro-scale habitat heterogeneity, especially in the littoral environments as hypothesized by Segers (2008). Further, the present results exhibit lower Cladocera dominance ($0.041 \pm 0.011 - 0.104 \pm 0.020$) signifying quantitative influence of fewer species; ANOVA registers its insignificant variations between seasons as well as the different pats. The stated feature is re-affirmed by higher cladoceran evenness in various pats ($0.880 \pm 0.033 - 0.986 \pm 0.020$) indicating an equitable abundance of different species. ANOVA indicates significant variations of evenness in the different pats

($F_{14,59} = 3.835$, $P < 0.005$) while it shows insignificant seasonal variations. Evenness is inversely correlated with dominance ($r = -0.904$) while it is positively correlated with density ($r = 0.498$). The salient features of lower dominance and higher evenness concur with earlier remarks of Sharma and Sharma (2008).

SUMMARY

Plankton samples collected from fifteen floodplain lakes (pats) of Manipur indicate 56 species of Cladocera belonging to 30 genera and 7 families and exhibit rich and speciose composition. The cladoceran fauna shows dominance of the Chydoridae, cosmopolitan > cosmotropical species and general tropical character. Cladocera comprise the second important qualitative and quantitative group of zooplankton, following Rotifera, in all the pats. Richness ranges between 21-51 species and records 52.3-84.7% community similarities (*vide* Sorenson index). Cladocera form between $24.5 \pm 3.4 - 31.7 \pm 1.9\%$ of zooplankton abundance, follow indistinct quantitative seasonal patterns but show maxima and minima in majority of pats during winter and monsoon respectively. The cladoceran communities are characterized by moderately high species diversity, high evenness and low dominance in all the pats. ANOVA depicts significant variations of richness and density between pats as well as seasons. Both richness and density are inversely correlated with alkalinity and positively with hardness while richness is also inversely correlated with dissolved oxygen. Multiple regression registers moderate cumulative influence of six abiotic factors on richness and abundance.

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RANGE EXTENSION OF *RAORCHESTES CHROMASYNCHYSI* (BIJU AND BOSSUYT) (AMPHIBIA : ANURA : RHACOPHORIDAE) IN WESTERN GHATS, INDIA

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The family Rhacophoridae (Amphibia : Anura) is represented by eight genera *Chiromantis*, *Ghatixalus*, *Kurixalus*, *Polypedates*, *Rhacophorus* and *Theloderma* (Dinesh *et al.*, 2009) *Pseudophilautus* and *Raorchestes* (Biju *et al.*, 2010) in India. The genus *Raorchestes* Biju, Shouche, Dubois, Dutta and Bossuyt (earlier *Philautus*) is a group of frogs known for direct development (Patil and Kanamadi, 1997; Krishnamurthy *et al.*, 2002; Biju, 2003; Gururaja and Ramachandra, 2006), and in India this group is represented by 44 species of which 31 species are endemic to the Western Ghats (Dinesh *et al.*, 2009; Biju *et al.*, 2010; Dinesh *et al.*, 2010).

Taxonomy and systematics of *Raorchestes* (earlier *Philautus*) was considered to be convoluted due to less morphological differences and varied colour patterns. In the recent studies on the systematics and phylogeny of the genus, Biju and Bossuyt (2009) described the endemic taxa *Raorchestes chromasynchysi*, commonly called confusing green frog, from Kurichiyarmala (1 f 35' N, 75°58' E and an altitude of 1200 msl), Wayanad District (Western Ghats), Kerala (Fig. 5), collected during September 1997 and July 2002.

During one of our expeditions in the Western Ghats on 22nd November 2007, we could collect six individuals of *R. choromoasynchysi*, from Kemmanugundi, Bhadra Wildlife Sanctuary (BWLS), Chikkamagaluru, Karnataka (Fig. 5) and here we report the same with additional notes on sexual dimorphism and its range extension in Western Ghats.

We could determine the specific identity of these individuals as *R. chromasynchysi* based on the following diagnostic characters. A small to medium sized frog with a slender body; head length subequal to head width; snout slightly pointed and protruding; tongue with a free pointed papilla; canthus rostralis sharp; loreal region vertical, marginally concave; tympanum distinct; supratympanic fold distinct; forelimb shorter than hand; webbing in fingers absent; palmar tubercle and subarticular tubercle distinct; super-numerary tubercles present; nuptial pad absent; tibia length sub-equal to thigh; webbing moderate (I 1-2 II 1-2 III 1-2 IV 2-1 V); super-numerary tubercles present; skin on the dorsum smooth to sparsely granular but belly finely granular on the ventral side.

SEXUAL DIMORPHISM

Females : Larger (up to 34.8 mm in SVL) than males; skin colour uniformly green (Fig. 1) on the dorsum with different shades of the green depending upon the humidity of the surrounding area; colouration on hand faint yellowish green, forelimb and ann greenish without any crossbars; lateral sides of the body greenish with yellow granulations; upper surface of the thigh and tibia green, tarsal and metatarsal faint yellowish green; anterior part of thighs, front of thighs (groin) with brown and yellow blotches; posterior part of the thighs dark brown bordering yellow colour. Ventral side of the throat, hand, arm, belly, thigh and tibia creamish yellow; hand, tarsal and foot with brownish granulations.

Males : Smaller (up to 28.2.8 mm in SVL) than females; skin colour in males variable (Figs. 2, 3 and 4), in the dry spell overall body colouration is yellowish brown; dorsum between the interorbital space with an inverted triangular black patch and a dark brown 'X' shaped mark on the back, starting from the back of the orbit, intersecting behind the shoulders and extending into the region of groin; lateral sides of the body yellowish; fore and hind limbs with cross bars; anterior part of thighs, front of thighs (groin) with brown and yellow blotches; posterior part of thighs dark brown. Ventral side of the hand, arm, belly, thigh and tibia creamish yellow; throat, hand, tarsal and foot with brownish granulations.

Our field studies of the past three years suggest that activity of this frog is less during non-breeding season, during which individuals were located below the small boulders along the perennial water sources and occasionally below the leaf litter with high moisture content. But in the breeding season this species is found calling on the shrubs of *Melastoma malabathricum* above 5 feet from the ground level and on the big boulders of the streams after 19 hrs in the late evening. The other sympatric shrub frogs observed

in the breeding season are *R. charius*, *R. luteolus*, *R. tuberochumerus* and two other un-identified species of *Raorchestes*. Colour change in this species is very common, females are known to change colour in different shades of green, but males are generally brownish (Fig. 2) and they tend to change colour in different shades of yellow green.

RANGE EXTENSION

Biju and Bossuyt (2009) located this species in a small area of about 30 km² on an isolated mountain at the type locality Kurichiyarmala. Our present observation from BWLS extends the range of the species by about 218 km (aerial distance) north of the type locality and it is more likely that, this species is available in the high altitude forest stretches of BWLS and Wayanad region.

The specimens studied are deposited in the faunal depository of the Western Ghat Regional Centre, Zoological Survey of India, Calicut (ZSI/WGRC/V/A/ 690 and 712).

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Table-1. Morphometric data (in mm) of *Raorchestes chromasynchysi* Biju and Bossuyt.

Reg. No	Sex	SVL	HW	HL	IUE	UEW	SL	EL	FLL	HAL	TL	ShL	FOL	HeTo
*4433†	M	23.3	8.9	9.0	2.9	2.0	3.3	3.5	5.1	6.6	12.4	12.7	9.7	2
*4434†	M	18.0	7.2	7.3	2.7	1.8	2.7	2.9	4.2	4.5	9.8	10.5	7.3	2
*4436†	M	21.8	8.4	8.8	2.6	2.0	3.3	3.1	4.3	6.5	10.7	11.8	8.6	2
*4435†	M	20.2	7.8	8.0	3.2	1.7	3.0	2.9	4.6	5.4	10.5	11.2	8.5	2
*4437†	M	25.0	9.6	9.3	3.0	2.2	3.6	3.8	5.3	7.6	12.2	13.4	9.9	2
*4438†	M	23.5	8.5	8.6	2.7	1.8	3.4	3.6	5.0	6.6	12.1	12.1	9.6	2
*4439†	M	23.4	8.6	9.1	3.4	1.9	3.5	3.8	5.9	6.9	11.9	12.4	10.3	2
*4440†	M	27.6	10.6	10.5	3.4	2.2	4.1	3.9	6.2	8.3	14.3	14	11.7	2
Mean±SD		22.9±2.9	8.7±1.0	8.8±0.9	3.0±0.3	2.0±0.2	3.4±0.4	3.4±0.4	5.1±0.7	6.6±1.2	11.7±1.4	12.3±1.1	9.5±1.3	
*4441†	F	29.7	11.0	11.4	3.6	2.1	4.4	3.8	6.7	8.1	13.7	15.2	11.5	2
*4442†	F	27.7	10.3	10.3	3.4	2.3	3.8	4.0	5.8	7.2	12.8	14.7	11.0	2
Mean±SD		28.7±1.4	10.6±0.5	10.8±0.8	3.5±0.1	2.2±0.1	4.1±0.4	3.9±0.1	6.2±0.6	7.6±0.6	13.2±0.6	14.9±0.4	11.2±0.4	
#V/A/712a‡	F	29.5	11.2	10.3	4.0	2.7	4.7	4.6	6.6	8.3	16.4	16.1	13.8	2
#V/A/712b‡	F	28.7	11.1	9.9	4.5	2.6	4.5	4.3	6.6	8.6	16.8	15.8	11.8	2
#V/A/712c‡	F	20.2	8.3	8.3	3.4	1.9	3.4	3.6	5.1	6.1	10.7	11.2	8.3	2
#V/A/712d‡	F	28.0	11.0	9.1	4.3	2.6	3.9	4.5	6.6	8.0	16.3	15.3	12	2
#V/A/690b‡	F	34.8	13.1	11.2	4.5	3.2	5.0	5.4	9.0	8.9	18.2	18.4	14.1	2
Mean±SD		28.2±5.2	10.9±1.7	9.8±1.1	4.1±0.5	2.6±0.5	4.3±0.6	4.5±0.6	6.8±1.4	8.0±1.1	15.7±2.9	15.4±2.6	12.0±2.3	
#V/A/712e‡	M	28.2	10.1	9.5	3.5	2.6	4.5	4.0	6.3	8.0	14.1	14.1	11.6	2
#V/A/712f‡	M	25.9	10.1	8.9	3.5	2.5	4.0	4.9	6.3	7.7	13.9	13.8	10.4	2
#V/A/690a‡	M	23.9	8.9	7.9	3.2	2.5	3.8	4.1	6.2	7.1	12.9	12.8	10.2	2
Mean±SD		26.0±2.2	9.7±0.7	8.8±0.8	3.4±0.2	2.5±0.1	4.1±0.4	4.3±0.5	6.3±0.1	7.6±0.5	13.6±0.6	13.6±0.7	10.7±0.8	

*prefix BNHS (Bombay Natural History Society); #prefix ZSI/WGRC/V/A (Zoological Survey of India/Western Ghat Regional Centre/Vertebrata/Amphibia); † data from Biju & Bossuyt, 2009; ‡ present observation

Table-2. Collection localities of *R. chromasynchysi* in Western Ghats.

Sl. No.	Collection localities	Latitude (N)	Longitude (E)	Altitude (msl)
1.	Kurichiyarmala, Wayanad, Kerala	11°35'	75°58'	1200 m
2.	Bhadra Wildlife Sanctuary, Chikmagalur, Karnataka	13°31'	75°45'	1485 m

**Figure 1.** *Raorchestes chromasynchysi*
Female with green dorsum**Figure 2.** *Raorchestes chromasynchysi*
Male with brown dorsum**Figure 3.** *Raorchestes chromasynchysi*
Male with green dorsum**Figure 4.** *Raorchestes chromasynchysi*
Male with greenish brown dorsum

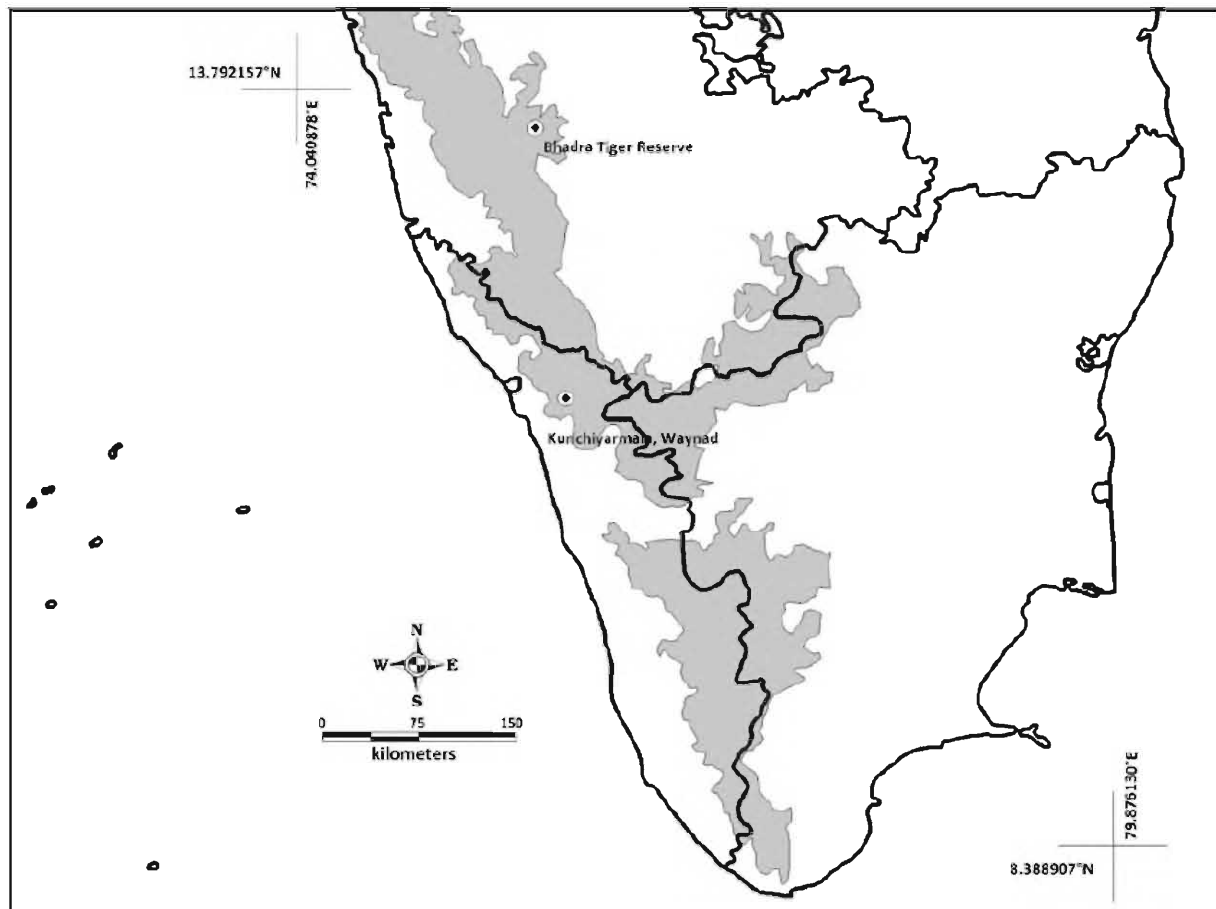


Figure 5. Map showing collection localities of *Raorchestes chromasynchysi* in the Western Ghats. Shaded areas indicate Western Ghats



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EXTENSION OF THE RANGE AND REDESCRIPTION OF *LYCODON JARA* (SHAW) (REPTILIA : SERPENTES : COLUBRIDAE)

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INTRODUCTION

The colubrid snake *Lycodon jara* commonly known as Yellow-speckled Wolf snake or Twin-spotted Wolf Snake was described by Russell (1796) from the specimens obtained in Ganjam, Orissa, India (Russell 1796). Subsequently the species was recorded from West Bengal and Arunachal Pradesh. There is a very interesting account of its first distributional record from Darjeeling by Wall (1909). He has stated that '*a solitary specimen was sent to me from Pashok (near to Darjeeling) an adult and I examined another in the Darjeeling museum. The labials were 8 as I usually find them (Boulenger say 9 or 10) and the 3rd, 4th and 5th touched the eye. The anterior temporal was single. The ventrals and sub-caudals 188 +66. It does not appear to have been recorded before from the Eastern Himalaya.*'

Gunther (1864) reported the species as *Leptorhityaon jara*. The specimen he examined was from Anamallay mountains. According to Cantor (1839) it occurs in Assam and Bengal.

Collected on 13.iii.07, Fc.No. 10, Locality Beat no. 1, at Kalesar National Park, Haryana, India by Rizvi, A and party, Northern Regional Centre, Zoological Survey of India, DehraDun is a new distribution record. In India it is known to be distributed in Orissa (Ganjam), West Bengal and Arunachal Pradesh; the westernmost records are from Dehra Dun, Uttarakhand.

Elsewhere : It has been reported from Nepal and Bangladesh. Very little is known about this attractive snake.

The examples collected from Kalesar National Park (District : Yamuna Nagar, Haryana) and from DehraDun District (Uttarakhand) were studied in detail to find any variation from the standard description of the species (Smith 1943, Wall 1909).

METHODOLOGY

One example was collected from Kalesar National Park, District Yamuna Nagar (Haryana), three examples were collected from NRC, ZSI, campus Kaulagarh, District DehraDun (Uttarakhand) during year 2005-2007. The material was killed after collection by anaesthisising them with chloroform & then put into 5% solution of formaldehyde for fixation. After fixation for two to three days the material along with the label containing the data of collection were taken out from the solution & washed in water & then put in 90% alcohol for permanent preservation for the purpose of the study.

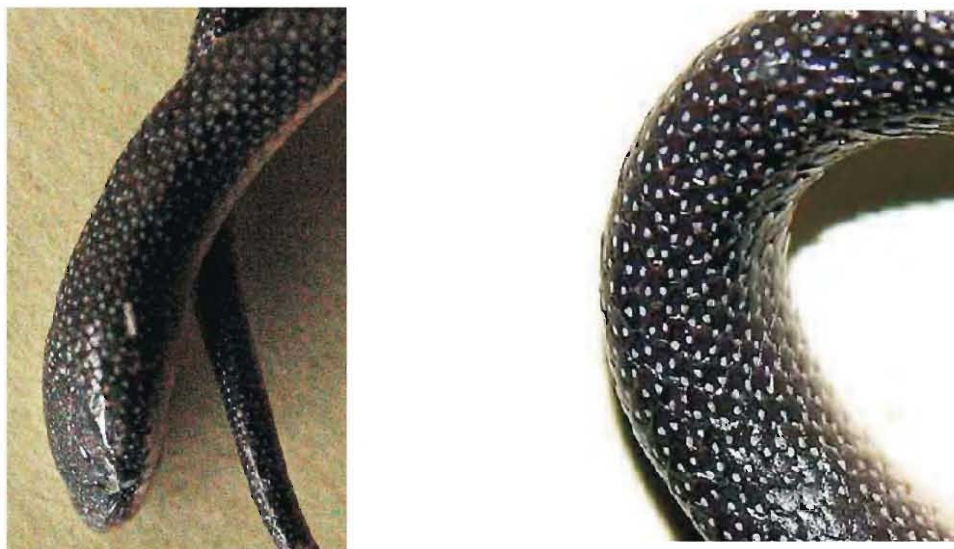
RESULT

All examples examined were slender bodied and smooth scaled. Head flattened slightly broader than neck (fig. 1), snout not projecting beyond lower jaw, eye entirely black (fig. 3) or glossy purplish black above speckled with two yellow spots (fig. 2). On the lip and belly scales were white.

Example from Kalesar National Park Reg. no. R/NRC/41 was 200 mm long with 15 rows scales dorsally (counted diagonally); ventrals 159 and subcaudals, 52.

Example from DehraDun (Reg. no. R/NRC/51) was 250 mm long with 15 rows of scales dorsally (counted diagonally); ventrals 158, subcaudals, 52.

PLATE-I



Lycodon jara (Shaw) A. Head and tail; B. Twin spotted marks on dorsal surface.

Example from Dehra Dun (Reg. no. R/NRC/50) 450 mm long, thicker bodied compared to other examples, with 17 rows of scales dorsally (counted diagonally), ventrals 167 and subcaudals 52.

Example from Dehra Dun (Reg. no. R/NRC/17) 420 mm long, 17 rows of scales dorsally (counted diagonally), ventrals 164 and subcaudals 63.

In all examples studied nasals were two, preocular 1; postoculars 2; temporals 1+2, supralabials 8 (3rd to 5th touching eye).

DISCUSSION

Kalesar National Park is located 60 km away from Dehra Dun. Most of the recent records of the species are from Dehra Dun. Recently one example was collected from Kalesar National Park (District : Yamuna Nagar), Haryana by A. Rizvi and party on 13.iii.07, Fc.No.10. Locality Beat no. 1.(30/8N, 77/34E314m asl). A specimen was collected from campus of NRC, Zoological Survey of India (lex, NRC ZSI campus, Kaulagarh District Dehra Dun, coll. A. Bahuguna, on 12.v.05. Further two specimens from same locality i.e. Kaulagarh was collected by A. Bahuguna on 13.ix.06 and on 25.xi.07.

Standard description of the species : Maximum length : 550 mm. Slender bodied, smooth scaled. Flattened head slightly broader than neck. Snout does

not project beyond lower jaw. Eye entirely black. Glossy brown or purplish-black above speckled with tallow (most upper body scales have two small yellow or white spots/short lines). Lip and belly scales white or yellow collar behind head. Loreal was 1, touches internasal; preocular 1; postoculars 2; temporals 1+2 or 2+3; supralabials 8 or 9 (3rd to 5th touching eye). Scalation : Scales in 17 : 17 : 15 rows, smooth. Ventrals 167-188, not angulate laterally; anal divided; subcaudals 52-74, paired. Loreal 1, touches internasal; preocular 1; postoculars 2; temporals 1+2 or 2+3; supralabials 8 or 9 (3rd to 5th touching eye). The snake is nocturnal and eats geckos. It lays eggs.

Non-Venomous and uncommon (Smith 1943, Sharma 2003, Whitaker and Captain 2001).

Comparing the scalation of the examples studied from that of standard description it was noted that there was some variation in the number of ventrals, it was 159 in case of example from Kalesar National Park (Reg. No. R/NRS/41) and 164 ventrals counted in collection from Dehra Dun (Reg. No. R/NRS/17,51) which is below the range given (Smith 1943, Wall 1909, Sharma 2003). Temporals were in 1+2 in all examples examined. The colouration on dorsal surface was purplish with yellow speckled markings (in live), the markings changed to

white and colour of dorsal changed to black on preserving. Ventral surface was whitish. Lip scales were also white in colour. Although very little is known of the species. But this collection adds to some variations in scalation of the species from that of standard. All examples were collected from bushy areas which tend to show that the species prefers to live in bushy areas.

Conclusion : A comparative study in scalation of ventrals of species *Lycodon jara* (Shaw) collected from Haryana and hitherto recorded material by the previous authors (Gunther 1864, Wall 1909, Smith 1943) has been made.

Appendix I : 1 ex, India, Beat no. 1, Kalesar National Park, Dist. Yamuna Nagar, Haryana, 13.iii.07, Reg. no. R/NRC/41. Coll A. Rizvi and party.

1 ex., India, NRC, ZSI, campus Kaulagarh, District Dehra Dun, Uttarakhand, 12.v.05, Reg. No. R/NRS/17,

coll. A. Bahuguna; 1 ex. India, NRS, ZSI, campus, Kaulagarh, Dist. Dehra Dun, Uttarakhand, 13.ix.06, Reg. No. R/NRS/50, Coll. A. Bahuguna.; lex., India, NRS, ZSI, campus Kaulagarh, District Dehra Dun, Uttarakhand, 25.xi.07. Reg. No. R/NRS/51, Coll. A. Bahuguna.

SUMMARY

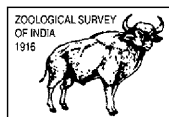
The paper reported the occurrence of the rare wolf snake, *Lycodon jara* (Shaw) in the State of Haryana, North India. In addition to the description of the species based on the material collected from Haryana, remarks on scalation, especially of the ventrals have been added.

ACKNOWLEDGEMENTS

We are thankful to all staff of NRC, Zoological Survey of India for their support and to Director, Zoological Survey of India for facilities and encouragement.

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Rec. zool. Surv. India : 110(Part-4) : 41-45, 2010

NEW DISTRIBUTIONAL RECORDS OF SOME SPECIES OF THE SUBGENUS *POLISTES (GYROSTOMA)* KIRBY (HYMENOPTERA : VESPIDAE) FROM VARIOUS STATES OF INDIA AND ADJACENT COUNTRIES

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INTRODUCTION

The genus *Polistes* Latrielle is the most abundant, widely distributed and speciose social wasp. They are commonly known as paper wasps and usually make relatively small colonies and usually build their nests in human inhabited areas. They are generally non-aggressive compared to other social wasps but can be provoked into an aggressive morale for defending their nests. They are considered as beneficial insects since all the species are predatory and many consume large numbers of caterpillars of many insect pests.

There have been occasional attempts to subdivide the species of the genus. The only comprehensive attempt at a subgeneric classification of *Polistes* is that of Richards (1973). Prior to that, a few generic and subgeneric names had come into use, but only on regional and limited basis (Carpenter, 1996a). Richards (1973, 1978) subdivided *Polistes* into eleven subgenera. Recently, Carpenter (1996a) divided this genus into four subgenera. They are : *Polistes (Polistes)* Latrielle primarily from Palearctic and African, barely penetrating into the Oriental Region, *P. (Gyrostoma)* Kirby from Oriental, Palearctic and Australian Regions and from oceanic Islands, *P. (Polistella)* Ashmead from Oriental, Palearctic and Australian Regions and from Wallacea and *P. (Aphanilopterus)* Meunier which is endemic to the New World. Two hundred and eleven described species and numerous subspecies are recorded under this genus from the world, of which 21 species belongs to the subgenus *Polistes (Gyrostoma)*. There are five species of *Polistes (Gyrostoma)* recorded from Indian subcontinent till date (Das & Gupta, 1983, 1989;

Carpenter, 1996b; Carpenter, 1996b Web page (updated, 2009)). In this paper, some new distributional records of the species *Polistes (Gyrostoma) tenebricosus* Lepeletier, *P. (G.) olivaceus* (De Geer) and *P. (G.) wattii* Cameron are provided.

The present study is based on a large number of collections present in the Hymenoptera Section, Zoological Survey of India, Kolkata. All the studied specimens were properly registered and kept in the Hymenoptera Section (NZSI).

Abbreviations used in the text: BMNH = Natural History Museum, London; NR = Naturhistoriska Riksmuseet, Stockholm; NZSI = Hymenoptera Section of Zoological Survey of India, Kolkata.

1. *Polistes (Gyrostoma) tenebricosus* Lepeletier (Plate I)

1836. *Polistes tenebricosus* Lepeletier, *Hist. Nat. Insect. Hym.*, 1 : 529. Type : Java (? Lost).
1852. *Polistes sulcatus* Smith, *Trans. Entomol. Soc. London*, 2 (2) : 38.
1854. *Polistes hoplites* de Saussure, *Et. Fam. Vesp.* 2, Errata : 255 (unjustified emendation).

Diagnosis : Colour : Head reddish except black mark on frons and vertex (black mark usually broader in males); antenna red with black marks on flagellar segments (black colour highly variable); thorax black mixed with red (highly variable); pronotum reddish except a black mark ventrally; mesoscutum predominantly black with sometimes a large red mark on each side of the posterior half; gaster red mixed with black (black colour highly variable); legs red mixed with black (black colour highly variable); wings

yellowish; thorax and legs generally more blackish in males.

Clypeus with close larger deep punctures; supraclypeal area, interantennal space, inner orbit below ocular sinus almost impunctate; frons, ocular sinus, vertex upto posterior ocellus with close punctures; vertex behind ocelli, temple, malar space with moderately close to sparse punctures; pronotal fovea present; pronotum, mesoscutum, scutellum, postscutellum, mesepisternum almost entirely densely rugoso-reticulate; mesepisternum with dorsal episternal groove but without distinct epicnemial carina; mesepimeron densely punctate; dorsal metapleuron with irregular striations, in between scattered larger punctures; ventral metapleuron strongly reticulate; propodeum with strong striations and a few larger punctures on sides and base; first gastral sternite with semicircular fine striations.

Length : 17-19 mm.

Material examined : India : Arunachal Pradesh : Lower Debang Valley dist., Roing, 1 F, 17.ix.2000, coll. A.R. Lahiri & Party, Regd. No. 12289/H3; Mizoram: Serchhip dist., Chekawn, 1 M, 27.xi.1996, coll. S.C. Mitra & Party, Regd. No. 12293/H3; Nagaland: Naga Hills, 1 F, 15.vii.1917, coll. S.W. Kemp, Regd. No. 1119/H3 (NZSI).

Distribution : India : Arunachal Pradesh (new record), Assam, Jammu & Kashmir, Meghalaya, Mizoram (new record), Nagaland (new record), Sikkim, Tripura, Uttarakhand, West Bengal.

Elsewhere : China, Myanmar, Nepal, Taiwan, Vietnam.

Remarks : This species is widely distributed in the Himalayan ranges of India. This species is the new record from Arunachal Pradesh, Mizoram and Nagaland.

2. *Polistes (Gyrostoma) olivaceus* (De Geer) (Plate II)

1773. *Vespa olivacea* De Geer, *Mem. Hist. Insect.*, **3** : 582.

Type : Sex not mentioned, America (NR).

1787. *Vespa hebraea* Fabricius, *Mant. Insect.*, **1** : 292.

1792. *Vespa undata* Olivier, *Encyc. Method*, **6** : 684.

1793. *Vespa macaensis* Fabricius, *Entomol. Syst.*, **2** : 259.

Diagnosis : *Colour* : Body yellow with variable black markings and few reddish markings; some are dark form with extensive black markings while others are pale

forms with less extensive black markings. Black markings as follows: basal and apical margin of clypeus narrowly, mandibular teeth, a short line on raised part of interantennal space, a mark above each antennal socket, a band on vertex (sometimes narrow line), occiput, a line on antennal scape and flagellum above (often only antennal scape apically above), in front of pronotal carina, a mark on pronotum ventrally towards propleuron (often absent), mesoscutum (except a longer median and two shorter lateral yellow lines, sometimes an incomplete median line), almost all the thoracic sutures (sometimes faint), a line along the median groove of propodeum (sometimes two marks on sides), first gastral tergite narrowly at base (sometimes absent), second to fifth gastral tergites and sternites with bisinuate marks, a line below coxae (sometimes absent), another line on hind tibiae above (sometimes faint). The reddish markings as follows: pronotum partly dorsally, two curved lines on propodeum on sides, second gastral tergite at base and legs partly.

Female : Clypeus densely finely punctate, with a few larger scattered punctures interposed; supraclypeal area, interantennal space, inner orbit including ocular sinus almost smooth; frons, vertex and temple with fine scattered punctures; malar space with moderately larger and close punctures; occipital carina incomplete; pronotum sparsely finely punctate; mesoscutum almost impunctate; scutellum, postscutellum and metapleuron impunctate; mesopleuron behind epicnemial carina and above sternopleural suture with scattered fine punctures; propodeum with distinct striations without distinct lateral edge; gaster almost impunctate, covered with short velvety pubescence, first gastral sternite transversely striated.

Male : Similar to female except clypeus not touching eye; temple wider; proximal tooth of mandible short; apical gastral sternite with bluntly projecting tubercle on each side; apophyses long, narrow and flattened at apex like a spatula, shiny and devoid of pubescence.

Length : Female : 13-20 mm; Male : 16-19 mm.

Material examined : India : Andhra Pradesh : Nagarjunsagar Srisailem Tiger Reserve, Mahaboobnagar dist., Mannanur, 1 F, 11.iv.1985, coll. S. Chatterjee & Party, Regd. No. 12096/H3; Medak dist., Medak, 1 F, 11.xii.1993, coll. A.K. Poddar & Party, Regd.

No. 12097/H3; Prakasam dist., Dornal, 1 F, 22.ix.1998, coll. S.K. Mandal & Party, Regd. No. 12098/H3; Gujarat : Mehsana dist., Visnagar, 1 M, 2.i.1974, coll. B. Dutta & Party, Regd. No. 12118/H3; Jharkhand : Godda dist., Sunder Pahari, 1 F, 6.iii.1938, coll. H.S.R. & H.A. Hafiz, Regd. No. 12124/H3; Pakur dist., Palmando, 3 M, 15.xi.1938, coll. H.A. hafiz, Regd. Nos. 4246/H3, 4248/H3 & 4249/H3; Nagaland : Dimapur dist., Kukidolong, 1 F, 28.x.1998, coll. T.K. Pal & Party, Regd. No. 12140/H3; Orissa : Khordha dist., Bhubaneswar, State botanical garden, 1 F, 10.ix.1984, coll. S. Biswas & Party, Regd. No. 12141/H3; Bangladesh: Chittagong, Maiui Mukh, 3 F, 1922, coll. R.P. Mullins, Regd. Nos. 1125/H3, 1126/H3 & 1128/H3; Pakistan : Punjab, Sialkote, Gharial, Murree, Alt. 6000 ft, 3 F & 1M, 19.ix.1928, coll. H.S. Pruthi, Regd. Nos. 1168/H3, 1172/H3, 1174/H3 & 1175/H3 (NZSI).

Distribution : India : Andhra Pradesh (new record), Arunachal Pradesh, Assam, Gujarat (new record), Himachal Pradesh, Jammu & Kashmir, Jharkhand (new record), Karnataka, Madhya Pradesh, Manipur, Meghalaya, Nagaland (new record), Orissa (new record), Rajasthan, Sikkim, Tripura, Uttarakhand, Uttar Pradesh, West Bengal.

Elsewhere : Afghanistan, Amirantes, Australia, Bangladesh (new record), Cambodia, Chagos Archipelago, Chile (introduced), China, Egypt, Fiji, Indonesia, Iran, Japan (?), Laos, Madagascar, Malaysia, Marianas, Marquesas, Mauritius, Myanmar, Nepal, New Caledonia, New Zealand, Oman, Pakistan (new record), Philippines, Reunion, Samoa, Seychelles, Singapore, Society Is., Sri Lanka, Tanzania, Thailand, Tongas, Tuamotu Archipelago, U.S.A., Vietnam.

Remarks : It is one of the most common and abundant paper wasp species in India, occurring in all the ecosystems and in areas of low to very heavy rainfall from sea level to high elevations. It is the first record of this species from Bangladesh and Pakistan. It is also the new record from the Indian states Andhra Pradesh, Gujarat, Jharkhand, Nagaland and Orissa.

3. *Polistes (Gyrostoma) wattii* Cameron (Plate III)

1900. *Polistes wattii* Cameron, *Ann. Mag. Nat. Hist.*, **6** (7) : 416. Type : Female, West Bengal (BMNH).

Diagnosis : *Colour* : Almost uniform yellow colour of head and thorax, in some specimens brown mixed with yellow especially on gaster; in some specimens a black spot on scape at apex above, a black mark around each ocellus narrowly, interrupted or uninterrupted narrow black marks on vertex of some males; hind tibia above usually black; a narrow transverse reddish brown line on first gastral tergite after middle, second to fifth gastral tergite and sternite with bisinuate reddish brown line; in some specimens two brown curved lines on propodeum.

Female : Clypeus finely punctate and interposed with scattered larger deep punctures; supraclypeal area, interantennal space, inner orbit including ocular sinus, frons, vertex, temple, pronotum, mesoscutum, scutellum, postscutellum mat; malar space with scattered punctures; occipital carina complete; mesepisternum behind epicnemial carina mat with scattered fine punctures; dorsal and ventral metapleuron impunctate; striations on propodeum weak, not distinct near the lower margin of side; gaster smooth covered with short pubescence; first gastral sternite smooth.

Male : Similar to female except clypeus not touching the eye; proximal tooth shorter and broader than other teeth; temple wider; apophyses of subgenital plate long and narrow, not flattened at apex, densely pubescent.

Size : Female : 10-20 mm; Male : 15-20 mm.

Material examined : India : Bihar : Samastipur dist., Pusa, 1 F, 26-30.viii.1925, coll. H.S. Pruthi, Regd. No. 1127/H3; Patna dist., Rajendra Nagar, 3 F, 6.viii.2009, coll. P.M. Sureshan, Regd. Nos. 12207/H3 to 12209/H3; Haryana : Gurgaon dist., Gurgaon, 1 F, 25.iv.1964, coll. S.K. Mitra, Regd. No. 12256/H3; Jammu & Kashmir : Jammu dist., Talab tiloo, 1 F, 1.x.1977, coll. R.C. Basu & Party, Regd. No. 12244/H3; Jharkhand : Ranchi dist., Nawadi, 1 F, 9.vi.1994, coll. A.K. Sanyal & Party, Regd. No. 12245/H3; Bokaro dist., Bandhudih, 1 F, 5.viii.2009, coll. Arun Kumar Roy Mahato, Regd. No. 12246/H3; Madhya Pradesh : Jabalpur, Pachpedi, 2 F & 1 M, 27.viii.1963, coll. H. Khajuria, Regd. Nos. 3613/H3, 4077/H3 & 12247/H3; Rajasthan : Nagaur dist., Sambhar Lakeside, 1 M, 10.xi.1956, coll. Unknown, Regd. No. 2217/H3; Bhilwara dist., Gudha, 4 F, 2-5.iii.1958, coll.

T.G. Vazirani, Regd. Nos. 2827/H3, 2830/H3, 2831/H3 & 2833/H3; Jaipur dist., Korsina, 2 F, 18.iv.1958, coll. T.G. Vazirani, Regd. Nos. 2835/H3 & 2841/H3; Nagaur dist., Sambhar Lakeside, 1 F, 11.xi.1958, coll. A.K. Mukherjee, Regd. No. 2834/H3; Jodhpur dist., Mandor garden, 1 F, 7.ix.1963, coll. Unknown, Regd. No. 3603/H3 (NZSI).

Distribution : India : Bihar (new record), Delhi, Gujarat, Haryana (new record), Himachal Pradesh, Jammu & Kashmir (new record), Jharkhand (new record), Madhya Pradesh (new record), Meghalaya, Orissa, Punjab, Rajasthan (new record), Uttarakhand, Uttar Pradesh, West Bengal.

Elsewhere : Afghanistan, China, Iran, Iraq, Mauritius, Oman, Pakistan, Saudi Arabia, U.A.E.

Remarks : This species is one of the widely distributed species of India. This is the new record of this species from Bihar, Haryana, Jammu & Kashmir, Jharkhand, Madhya Pradesh and Rajasthan.

SUMMARY

Three species of the subgenus *Polistes* (*Gyrostoma*) Kirby namely *P. (G.) tenebricosus* Lepeletier, *P. (G.) olivaceus* (De Geer) and *P. (G.) wattii* Cameron are studied in this paper. During the present study there are several new distributional records are found out. *P. (G.) olivaceus* (De Geer) is the new record from Bangladesh and Pakistan. *P. (G.) tenebricosus* Lepeletier is the new record from Arunachal Pradesh, Mizoram and Nagaland. *P. (G.) olivaceus* (De Geer) is the new record from Andhra Pradesh, Gujarat, Jharkhand, Nagaland and Orissa. *P. (G.) wattii* Cameron is the new record from Bihar, Haryana, Jammu & Kashmir, Jharkhand, Madhya Pradesh and Rajasthan.

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PLATE I



Polistes (Gyrostoma) tenebricosus Lepeletier. Female.

PLATE II

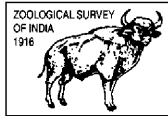


Polistes (Gyrostoma) olivaceus (De Geer). Female.

PLATE III



Polistes (Gyrostoma) wattii Cameron. Female.



Rec. zool. Surv. India : **110**(Part-4) : 47-49, 2010

STUDIES ON THE SEASONAL FLUCTUATION OF GRYLLID POPULATION IN BIRBHUM DISTRICT OF WEST BENGAL

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INTRODUCTION

The gryllid represents the most classical type of cricket characterized by the large globular head, the tarsi compressed, the posterior tibiae armed with spines. Numerous workers like Cade (1984, 1991), Cade and Wyatt (1984), Cade and Cade (1992), French and Cade (1987), Ciceran, Murray and Rowell (1994), Doherty and Storz (1992) studies on the calling behaviour of the gryllids. Some workers like Jang and Gerhardt (2005, 2006) studies on the divergence in the calling songs between sympatric and allopatric population. Works on the population fluctuation of the gryllid fauna is very rare. Only few workers like Veasey, Kay, Walker and Whitcomb (1976), Murray, and Cade (1995) works on the gryllid population. So an attempt was made to study the seasonal fluctuation of the gryllid population in the Birbhum district of West Bengal.

MATERIAL AND METHOD

This work was undertaken during April, 2003 to March, 2005. The area selected for the present study at Ballavpur Forest, Illambazar Forest, Santiniketan, Sriniketan, Amarkutir, Kankalitala and Nanoor. As the gryllids are nocturnal in habit the collections were made in the evening from 630 P.M. to 9 P.M. in Summer and Monsoon and from 6 P.M. to 8 P.M. in the Winter using light source to attract the insects. To study the population of the gryllids 10 m² plots were selected in forests, grassland and harvested paddy fields. A lighted petromax was used as light source to collect the gryllids. The lighted petromax was put in the middle point of the selected 10m² plot and the gryllids attracted by the light source collected by sweeping the insect net and

by hand picking. To know the actual population of the area five such plots were selected and in each 10m² plot the petromax was kept for half an hour. And the average number of the five plots in each habitat have been taken in to account to estimate the population of the gryllid fauna present per squire metre.

RESULTS AND DISCUSSION

In the present study the collections were made in different seasons in different habitats. It is found that the total population of gryllids were always higher in Pre-monsoon than that of monsoon and post monsoon in all the habitats. It is also found that the total population of gryllids were always higher in the forest than that of the grassland and harvested paddy field. The average number of gryllid present in three habitats in different seasons are ranges from 0.17/m² to 0.39/m² in grassland, from 0.31/m² to 1.57/m² in forest and from 0.11/m² to 0.32/m² in harvested paddy field (Table-1).

The rise and fall in the numbers of different species appear independent of each other. Seven species were identified and their occurrence are different in different seasons (Fig. 1). Among the seven species *Plebeiogryllus guttiventris* (Walker) shows the dominance in all seasons and occupying about 26.94%, 28.48% and 28.08% of the total population in pre-monsoon, monsoon and post monsoon respectively. As regards the abundance of the other species *Modicogryllus confirmatus* (Walker) occupies the second position in pre-monsoon having 16.88% of the total population when *Pteronemobius concolor* (Walker) and *Gryllodes sigillatus* (Walker) occupying second position having 17.08% and 17.80% of the total

Table-1 : Gryllid Population per m² in different seasons in Grassland, Forests, and Harvested paddyfield.

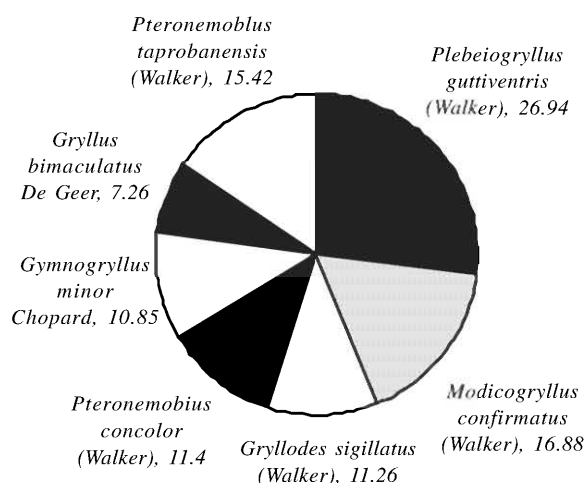
Vegetation	Seasons	Average Gryllid population per m ²
Grassland	Pre-monsoon	0.39
Grassland	Monsoon	0.30
Grassland	Post monsoon	0.17
Forest	Pre-monsoon	1.57
Forest	Monsoon	0.75
Forest	Post monsoon	0.31
Harvested paddy field	Pre-monsoon	0.32
Harvested paddy field	Monsoon	0.25
Harvested paddy field	Post monsoon	0.11

population in monsoon and post monsoon respectively. The genus *Pteronemobius* is very frequent in occurrence in all the collections of all the seasons.

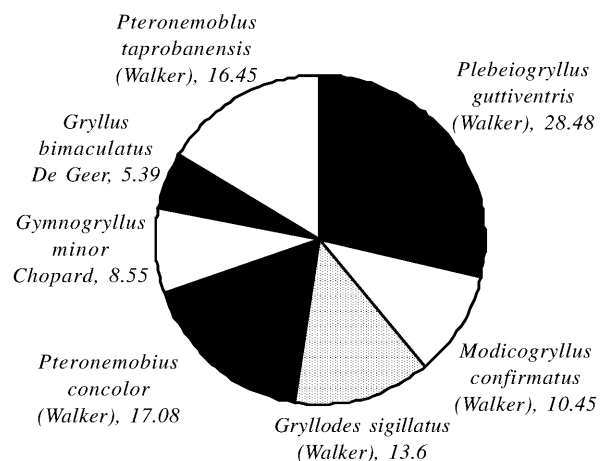
As regards the adult nymph ratio it is found that in the pre-monsoon collection the nymphs are very scanty but the nymphs are very frequent in monsoon and post monsoon collection. In the pre-monsoon collection the nymphs occupying 3.22% of the total population but in the monsoon and post monsoon the nymphs occupying about 89.24% and 91.09% of the total population respectively. The presence of large number of nymphs in the monsoon and post monsoon period suggests that the monsoon is the breeding season of this group of insects.

The presence of maximum number of gryllids in forest than that in the grassland and harvested paddy

Pre-monsoon



Monsoon



Post-monsoon

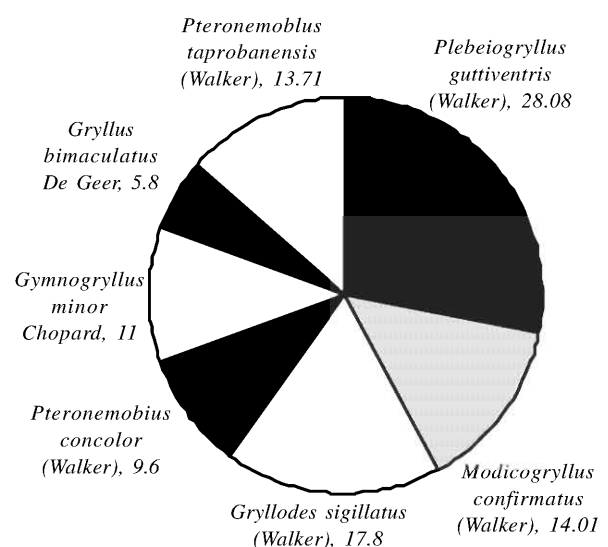


Fig. 1 : Relative Abundance of Seven species of Gryllid population in Pre-monsoon, Monsoon and Post Monsoon.

fields may be due to the availability of the required quantity of food for their living and less human interference. Fluctuations of different species in different seasons may be due to the favourable seasonal conditions and breeding period.

SUMMARY

Gryllid population was studied in forest, grassland and harvested paddy field in the Birbhum district during April 2003 to March 2005. The population of the gryllid fauna in the forest area was always higher than that of the grassland and harvested paddy field area. Seven species of gryllids were identified of which

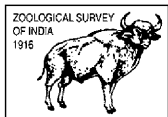
Plebeigryllus guttiventris (Walker) shows the dominance in all the seasons. The availability of the nymphs are much higher in monsoon and post monsoon period than in pre-monsoon.

ACKNOWLEDGEMENTS

The authors are deeply indebted to Dr. Ramkrishna, Director-in-Charge, Zoological Survey of India, Kolkata, for his keen interest in the work and to Dr. A.K. Sanyal, Scientist "F" and Dr. N.C. Nandi, Scientist "E" for giving valuable suggestions for the preparation of the manuscript. Thanks are also due to Dr. S.K. Mondal, Assistant Zoologist for the identification of the gryllids.

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TAXONOMIC STUDIES ON A COLLECTION OF PTEROMALIDAE (HYMENOPTERA : CHALCIDOIDEA) FROM PATNA AND NEARBY DISTRICTS OF BIHAR WITH THE DESCRIPTION OF TWO NEW SPECIES

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INTRODUCTION

Pteromalidae is one of the largest and taxonomically difficult families of Chalcidoidea (Hymenoptera Parasitica) members of which are distributed in all biogeographical regions of the world. Majority of Pteromalidae are primary or secondary parasitoids attacking a large range of insect orders in their various stages of development, thereby playing a vital role in the control of insect pests in nature. Many species of Pteromalidae were employed successfully in biological control programmes all over the world hence they also form a rewarding group of insects for various aspects of scientific studies like systematics, Biology, Ethology, ecology etc.

The family Pteromalidae contains over 3500 described species under 588 genera world wide (Noyes, 2003). When compared to the other parts of the world, the knowledge on the Pteromalid fauna of Indian subcontinent is still far from satisfactory. Boucek *et al.* (1979) provided a more complete picture of the Pteromalid fauna of Indian subcontinent which was supplemented by works of Farooqi & Subba Rao (1985, 1986), Sureshan (2003, 2007), and Sureshan & Narendran (2003, 2004). Currently 224 species of Pteromalidae under 101 genera and 18 subfamilies are reported from the Indian subcontinent, out of which Indian fauna is represented by 196 species under 91 genera and 18 subfamilies. When compared to the other parts of the country only fragmentary information is available on the Pteromalid fauna of the state of Bihar. 10 species of

Pteromalidae belonging to 10 genera and 5 subfamilies are reported from the state of Bihar (including the present state of Jharkhand).

The present paper is based on the study of collection of Pteromalidae made from some southern districts of Bihar near to Patna viz. Vaishali, Patna, Muzaffarpur, Gaya, Nalanda, Samasthipur, Chapra, Saran, Bhojpur and Jahanabad. Collections were made from the field employing an insect net specially made for the purpose and an aspirator. Specimens were also collected by rearing the suspected hosts (immature stages such as pupae, larvae, egg, etc.) in the laboratory. The specimens were properly preserved following standard procedures. The preserved specimens were identified following recent literature on Pteromalidae (Boucek, 1988, Boucek & Rasplus, 1991, Gibson *et al.*, 1993, Sureshan, 2003, Sureshan & Narendran, 2004 and Graham, 1969). The morphological terminology and the classification of the family given by Boucek 1988 is followed here. Altogether 34 species of Pteromalidae belonging to 25 genera and 7 subfamilies are reported here from Bihar which includes the species already known from the state. Two new species are described based on the present collections. The collections are deposited in Zoological Survey of India, Gangetic Plains Regional Centre, Patna, Bihar.

Following abbreviations are used in the text : ANIC- Australian National Insect collection, Canberra, Australia; BMNH-The Natural History Museum, London, UK; F, Female, F1-F6-Funicular segments 1 to

6; IARI-Division of Entomology, Indian Agricultural Research Institute, New Delhi; M- Male, MCSG-Museo Civico di Storia Naturale, Genova, Italy; MV-Marginal vein; NM-Entomologické oddělení, Národní Museum, Praha, CSSR; NRS-Naturhistoriska Riksmuseet, Stockholm, Sweden; OOL-Ocellular distance; PMV-Post marginal vein; POL-Postocellar distance; QM-Queensland Museum, Brisbane, Australia; SMV-Submarginal vein; STV-Stigmal vein; T1-T5-Gastral tergites 1 to 5; USNM-United States National Museum of Natural History, Washington DC, USA; UZIL-Universitetets Zoologiska Institutionen, Lund, Sweden; ZSI- Zoological Survey of India, Calcutta, India. ZSIC- Zoological Survey of India, Western Ghats Regional Centre, Calicut, India.

SYSTEMATIC ACCOUNT

Order	HYMENOPTERA
Suborder	APOCRITA (Parasitica)
Superfamily	CHALCIDOIDEA
Family	PTEROMALIDAE
Subfamily	PTEROMALINAE

1. *Anisopteromalus calandrae* (Howard)

1881. *Pteromalus calandrae* Howard. *Ann.Rept.U.S.Dept. Agr. for 1880*. 273. M. USA. Texas. (USNM, presumably lost).
1951. *Anisopteromalus calandrae* (Howard). Peck, Transferred to *Anisopteromalus*. *U.S. Dept. Agr. Monogr.* 2 : 564.
1979. *Pteromalus oryzae* Cameron, 1881. Syn. Boucek *et al. Oriental Ins.* 12 : 435.
1937. *Neocatolaccus indicus* Ayyar & Mani, Syn. Boucek *et al.* 1979. *Oriental Ins.* 12 : 436.
1913. *Neocatolaccus australiensis* Girault. Syn Boucek 1988 *Australasian Chalcidoidea*. : 414.

Diagnostic characters: Body bluish black or dark greenish with metallic reflection. Coxae concolorous with thorax, femora brown except distal part and remainder of legs testaceous. Anterior margin of clypeus shallowly emarginate. Antennae with 3 anelli and 5 funicular segments, third anellus largest. Propodeum with short but distinct nucha, median carina indicated only anteriorly; plicae indicated only by the anterior plical foveae. Gaster with T1 subangularly produced, T1-T3 covering most of gaster.

Material examined : 4 F, Patna district, Rajendra Nagar, 28.ii.2009, coll. P.M. Sureshan. (Reg. no. A. 1333).

Distribution : India : Kerala, Bihar (present record) Orissa, Tamil Nadu, West Bengal. Cosmopolitan.

Remarks : Common parasite of beetles associated with stored products.

2. *Chlorocytus indicus* Sureshan

2000. *Chlorocytus indicus* Sureshan. *Rec. zool.Surv. India.* 98(2) : 143. F.M, India : Kerala (ZSIC).
2003. *Chlorocytus indicus*. Sureshan. *Rec. zool.Surv. India.* Occ. Paper. 205 : 25.

Diagnostic characters : Female length : 2.2 mm. Bright metallic bluish green; antenna with scape and pedicel testaceous, remainder brown. Fore and mid coxae brown; hind coxae concolorous with thorax, remainder of legs yellow with tips of tarsi brown. Head 1.3x as broad as thorax in dorsal view, antenna with pedicel plus flagellum length 1.2x head width; pronotal collar sharply carinate anteriorly; propodeum with fine complete median carina. Forewing with basal vein setate. Gaster longer than head plus thorax combined.

Material examined : 1 F, Vaishali dist., Bidarpur, 29.iii.2009, coll. P.M. Sureshan (Reg. No. A. 1256).

Distribution : India : Kerala, Bihar (current study).

Remarks : First record of the species from Bihar subsequent to the original description.

3. *Dinarmus acutus* (Thomson)

1878. *Dinarmus (Dinarmus) acutus* Thomson. *Hym. Scand.* 5 : 56.F, Boheman. (UZIL).

Diagnostic characters : Female : Length 2.1-3.3 mm. Dark metallic blue; coxae concolorous with thorax, femora and rest of legs brown, hind femora blackish; anterior margin of clypeus with two small teeth; antennae with third anellus not longer than second, pedicel as long as F1; propodeum with nucha long; forewing with PMV as long as MV; gaster short, non collapsing, 0.7x as long as head plus thorax combined.

Material examined : 1F, Vaishali dist., Hajipur, Chakia, 5.ii.2009 (Reg. No. A1199); 1 M, Patna dist., Fathua, Rasulpur, 28.ii.2009, coll. P.M. Sureshan (Reg. No. A. 1234).

Distribution : India : Kerala, Karnataka, Maharashtra, Orissa, Bihar (current study); Sri Lanka, Europe.

Remarks : Uncommon species parasitizing Bruchid beetles.

4. *Dinarmus basalis* (Rondani)

1877. *Entedon basalis* Rondani., *Boll. Soc. Ent. Ital.* 9 : 174. M. Italy. (Lectotype, Florence Mus).

1974. *Dinarmus basalis* (Rondani) : Boucek, transferred to *Dinarmus*. *Redia* 55 : 245-246.

Diagnostic characters : Dark green with brassy reflection, antennae yellowish brown; coxae concolorous with thorax, femora brown, remainder of legs testaceous. Anterior margin of clypeus shallowly emarginate; antennae with scape hardly reaching median ocellus, pedicel shorter than F1, third anellus longest. Forewing with PMV longer than MV. Gaster ovate, dorsally flat.

Material examined : Nil.

Distribution : India : Kerala, Delhi, Andhra Pradesh, Bihar, Haryana, Rajasthan.

Remarks : Parasities of bruchid beetles. Reported from Dholi (Samasthipur dist, Bihar) (Boucek *et al.*, 1979).

5. *Dinarmus colemani* (Crawford)

1913. *Bruchobius colemani* Crawford. *Proc. U.S. Natn. Mus.* 45 : 250. F, India (Bangalore). (USNM).

1956. *Dinarmus colemani* (Crawford). Delucchi, transferred to *Dinarmus*. *Z. Angew. Ent.* 39 : 240.

Diagnostic characters : Length. 2.4 mm. Bluish black with metallic reflection, gaster brownish black, head narrow in profile, anterior margin of clypeus almost straight, slightly projecting ; antennae with third anellus longest, pedicel little shorter than F1; propodeum with nucha long ; forewing with stigma moderately capitate; PMV little shorter than MV; gaster ovate, slightly collapsing, sub equal to head and thorax combined.

Material examined : Nil.

Distribution : India : Kerala, Bihar, Delhi, Karnataka, Tamil Nadu, Orissa; Bangladesh.

Remarks : Uncommon species, parasitoid of *Callosobruchus chinensis* and other bruchid beetles in stored products. Reported from Dholi (Samasthipur dist) of Bihar (Boucek *et al.*, 1979).

6. *Dinarmus maculatus* (Masi)

1924. *Sphaerakis maculata* Masi. *Ann. Mus. Civ. Stor. Nat. Giacomo Doria* 51 : 157. Myanmar. (MCSG).

1979. *Dinarmus maculatus* (Masi): Boucek, *et al.*, transferred to *Dinarmus*. *Oriental Ins.* 12(4) : 412.

Diagnostic characters : Female : Length 2.5-3 mm.

Metallic blue with bronzy patches on vertex and thorax, gaster darker; coxae concolorous with thorax, femora and median part of tibiae brown, base and apical part of tibiae and all tarsi yellow; anterior margin of clypeus almost straight, not projecting ; POL sub equal to OOL; antennal scape reaching up to middle of median ocellus; third anellus as long as first and second combined; forewing with PMV as long as or slightly longer than MV; gaster cordiform.

Material examined : 32 F, 3 M (in alcohol), 1 F (on card), Bihar, Patna dist., Fathipur, 13.vi.2009, Reg. No. (A. 1330, 1334); 2 F, Chapra dist., Sonepur, 30.ix.2009, coll. P.M. Sureshan. (Reg. No. 1335).

Distribution : India (Kerala, West Bengal, Maharashtra, Orissa, Bihar (present record); Myanmar.

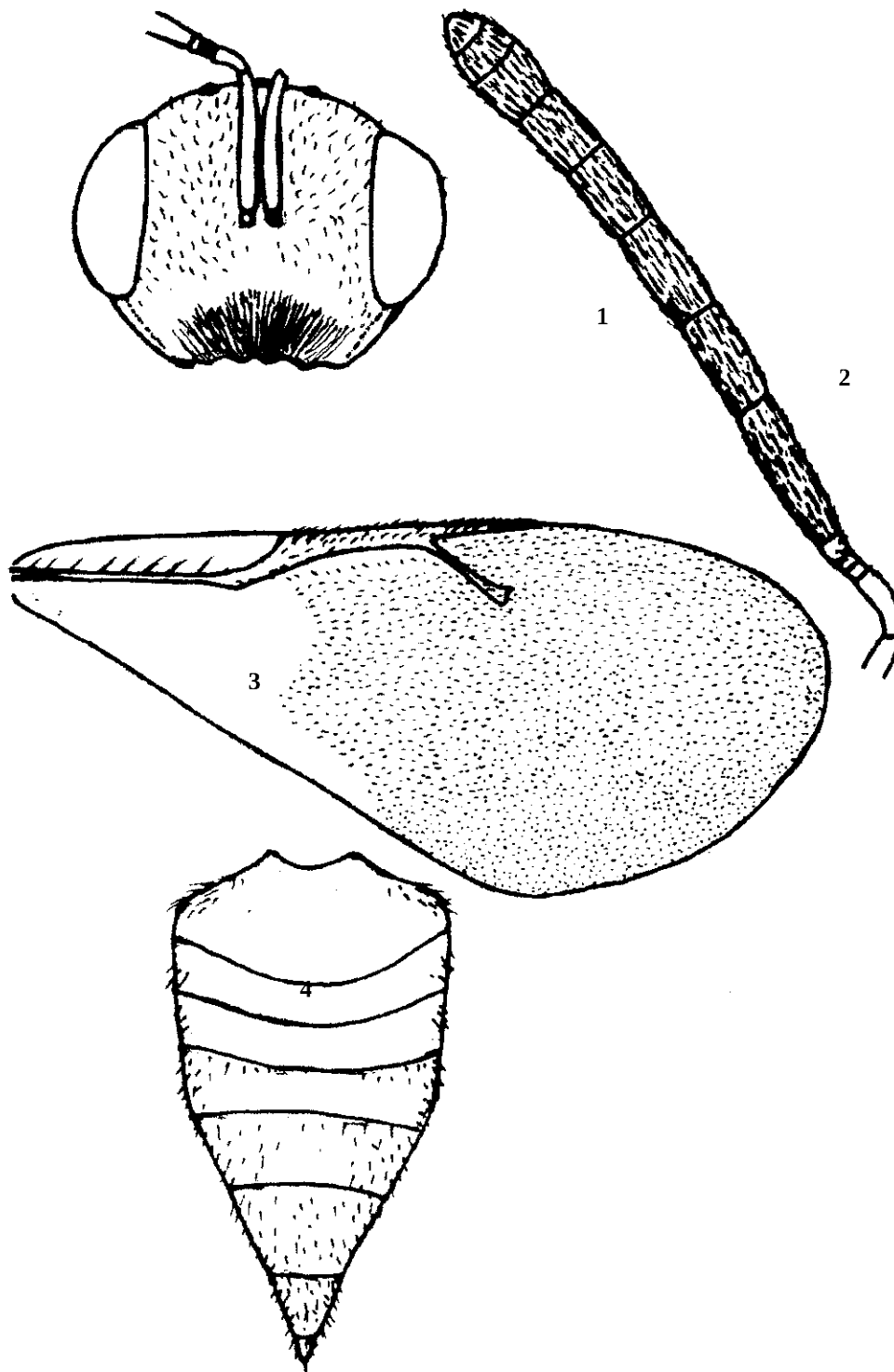
Remarks : Common species, parasitic on Bruchid beetles.

7. *Ischyroptyx biharensis* sp.nov.

(Photo 1, 2; Figs. 1-4)

Holotype : Female : Length 3.1 mm. Color black without metallic reflection, gaster slightly brownish ventrally with metallic reflection. Scape, pedicel and anelli pinkish brown, rest of antenna brownish black; ocelli brownish black; eye dark coffee brown. All coxae and femora concolorous with thorax, tibiae and tarsi pale yellowish white with base of tibia slightly darker, tips of tarsi black. Tegulae black, wings hyaline, veins pale brown. Hairs on the body silvery white.

Head : (Fig. 1) 1.2x as broad as mesoscutum, 2.4x as broad as long (in dorsal view); POL 1.6x OOL; temple length 0.5 eye length. Head uniformly and minutely reticulate, reticulation sharp. In front view head width 1.3x height; eyes separated 1.3x their length, eye length 1.4x width (in profile); gena minutely but distinctly reticulate, malar groove faintly indicated. Scrobe moderately deep. Anterior margin of clypeus deeply incised, clypeus radiately striated, striae extending little to the genal area, face with distinct white hairs, moderately dense. Antennae (Fig. 2) inserted slightly below middle of face, scape exceeding median ocellus, little more than the ocellar diameter. Scape length 0.8x eye length, pedicel plus flagellum slightly longer than width of head ; pedicel length 2.4x width, anelli three,



Figs. 1-4. *Ischyroptyx biharensis* sp. nov. Female: 1, Head front view; 2, Antenna (without scape); 3, Forewing; 4, Gaster dorsal view.

length together 0.7x as long as pedicel, third anellus quadrate, flagellum slightly broadening towards tip, club 1.7x as long as preceding segment. Relative lengths of F1-F5: 11, 9, 8, 6, 6; funicular segments with numerous minute sensillae.

Thorax : Moderately convex, clothed with white broad and long hairs. Pronotum uniformly reticulate, lateral panel transversely striated, anterior margin round except for a faint irregular carina only in the middle. Mesoscutum distinctly reticulate punctuate, 1.6x as broad as long, notauli faintly indicated, incomplete, reaching only up to middle. Scutellum similarly sculptured as on mesoscutum, 1.1x as broad as long, frenum not indicated, axilla reticulate, axillula longitudinally strigose. Dorsellum narrow, finely reticulate. Propodeum without plicae, median carina faintly indicated, incomplete, finely reticulate, almost smooth, basal part with small carinulae, spiracles large and oval, touching hind margin of metanotum, callus with patch of dense white hairs. Propodeum 4x as broad as median length. Prepectus reduced, triangular, fine. Metapleuron reticulate Mesopleuron reticulate with upper mesepimeron shiny. Hind coxa reticulate, femora slightly enlarged, tibia with 2 unequal spurs. Relative lengths hind coxa 19, femur 30, tibia 36, tarsus 26. Forewing (Fig. 3) length 2.4x width, marginal fringe small, pubescence small, basal part almost bare, speculum open below, costal cell hairy towards tip, otherwise with irregular rows of hairs (one or two) on the upper margin; MV 1.7x STV and 5x as long as the basal width. Stigma moderately capitate. Relative lengths of SMV 40, MV 20, STV 12, PMV 14.

Gaster (Fig. 4) sessile, spindle shaped, in dorsal view 1.8x as long as broad, as long as head plus thorax combined; posterior margins of T1 and T2 slightly curved, other tergites straight, hypopygium reaching middle of T4; tergites covered with white hairs on the sides.

Holotype : Female : India : Bihar, Vaishali district, Hajipur, 15.x.2009, coll. P.M.Sureshan, (Reg. No. A.1338)

Remarks : This species differs from the only described species *Ischyroptyx ligusticus* (Masi) in having forewing with long MV which is 1.7x STV and 5x as long as the basal width; antennae inserted slightly below middle of face and general body colour. (in

ligusticus MV short only 1.4x as long as STV and 3.8x as long as basal width. Antennae inserted slightly above middle of face and general body colour different.

8. *Lariophagus distinguendus* (Forster)

1841. *Pteromalus distinguendus* Forster. *Beitrage Zur. Monogr. Pterom.* Nees. 1 : 17. M. Germany. (NRS).

1921. *Lariophagus distinguendus* (Forster). Gahan. transferred to *Lariophagus*. *Proc. ent. Soc. Wash.* 22 : 239.

Diagnostic characters : Body bluish black, coxae concolorous with thorax, rest of legs yellowish brown. Clypeus narrowly emarginate. Head finely reticulate, densely pubescent. Malar space about two thirds the height of eye. Apical margin of forewing without cilia. Gaster dorsally convex.

Material examined : 1 F. Vaishali dist., Hajipur, 15.x.2009, coll. P.M. Sureshan.

Distribution : India : Kerala, Tamil Nadu, Bihar (present study). Cosmopolitan.

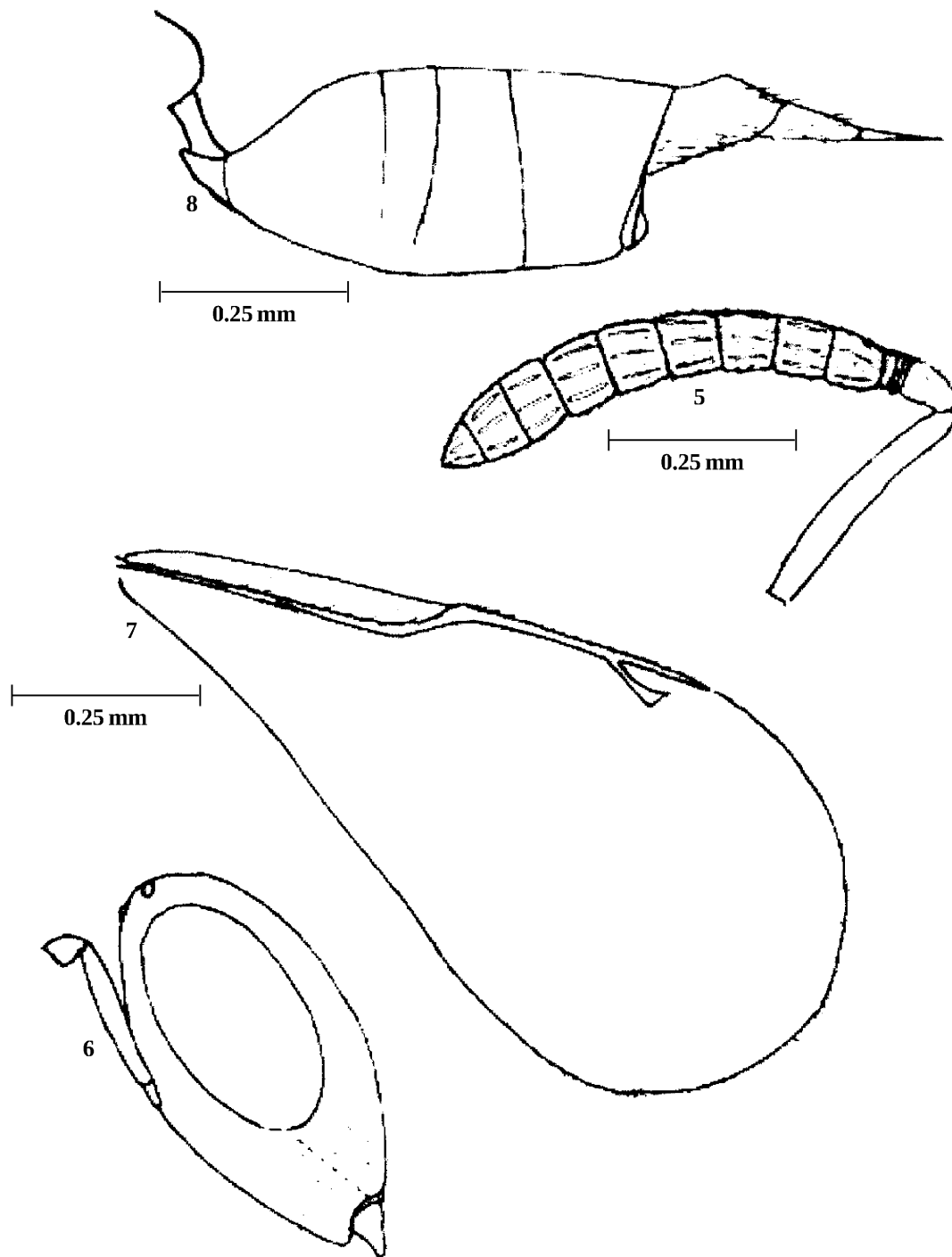
Remarks : A widely distributed parasite of beetles associated with stored grain.

9. *Merismomorpha intermedia* sp.nov.

(Photo 3; Figs. 5-8)

Holotype : Female. Length 1.71 mm. Head, thorax and petiole bluish black; gaster metallic blue. Antennae with scape pale brown, remainder brown; ocelli brown. Eyes coffee brown. Fore and hind coxae concolorous with thorax, mid coxae brown, remainder of legs testaceous. Tegulae and veins brown. Wings hyaline.

Head : (Fig. 6) finely engraved reticulate, little coarser on face above lower margin of eyes and vertex. Pubescence sparse and small. Anterior margin of clypeus sharply angulate, almost finely reticulate except for the short striae not extending out. In dorsal view head 1.2x as broad as thorax and 2.24 x as broad as long; POL slightly longer than OOL. In front view head width 1.2x height. Eye length 1.5x width; malar space 0.4x eye length (in profile). Antennae (Fig. 5) with scape 0.7x eye length, just short of reaching median ocellus, pedicellus plus flagellum 0.8x head width, club 1.4x as long as two preceding segments combined, funicular segments gradually broadening towards tip, pedicel slightly longer than F1, all funicular segments almost equal in length, each with one row of long sensillae, anelli transverse, third little thicker than others. Head



Figs. 5-8. *Merismomorpha intermedia* sp. nov. Female: 5, Antenna; 6, Head in profile; 7, Forewing; 8, Gaster in profile.

finely engraved reticulate, little coarse on face above lower margin of eyes; anterior margin of clypeus sharply acuminate, almost finely reticulate except of short fine striae on sides, not extending outside; malar grooves faintly indicated, almost indistinct; genal area very finely reticulate; temples roundly converging, 0.5x as long as eye; occiput without carina.

Thorax : Pronotal collar not margined anteriorly, moderately reticulate. Mesoscutum with mid lobe moderately raised reticulate, side lobes finely and transversely striate reticulate. Scutellum similarly reticulate as on mid lobe of mesoscutum., notauli deep and complete. Mesoscutum 2.3x as broad as long. Scutellum 1.2x as long as broad and 1.4x as long as mesoscutum medially. Propodeum width 2.2x median length, length of median triangular area little shorter than width (9/10.5). Axillae finely striate reticulate, frenum not marked, frenal area finely reticulate. Propodeum with median area moderately reticulate, marked with distinct plicate, median carina distinct and complete, nucha and sides of propodeum finely striate reticulate, callus less hairy. Forewing (Fig. 7) length 2x width; marginal fringe small, discal pubescence sparse, less distinct, few long hairs just below the marginal vein. Costal cell with one row of hairs in the middle, basal half of forewing almost bare, PMV 0.5x as long as MV. Relative lengths of SMV 20, MV 14, PMV 7, STV 4.

Gaster (Fig. 8) Petiole shorter than hind coxae, with a longer extension of first gastral sternite. in dorsal view 2.5x as long as wide. Gaster (including petiole) 0.9x as long as head plus thorax combined in profile. Hind margin of T1 and T2 incised in the middle, hind margin of T3 emarginate, exposed part of T4 2x T3 dorsally. Ovipositor exerted out.

Male : Unknown.

Holotype : Female : India : Bihar, Chapra district, Sonapur (Scrub jungle), 11.vii.2009, coll. P.M. Sureshan (Reg. No. A. 1323).

Remarks : In having distinctly angulate clypeus, similar forewing venation, short gastral petiole with longer extension of gastral sternite, distinctly convex lower face, and posterior margins of T1 and T2 incised in the middle this species resembles *M. minuta* Sureshan but differs from it in having gaster with exposed part of T3 equal to T4 (in profile), and 0.5x T4 medially and

propodeum with median carina distinct. (in *minuta* gaster with exposed part of T3 medially 2..6x T4 and distinctly longer than T4 (in profile), propodeum with median carina not indicated. This species resembles *M. elongate* Sureshan in the nature of propodeum, angulate clypeus but differs in having shorter petiole, different gaster and forewing venation. In the nature of forewing venation and gaster it also resembles *M. truncata* Sureshan but *truncata* has a truncate clypeus, longer petiole and hind margin of T1 and T2 not incised in the middle. *M. yousufi* Ahmad & Agarwal differs from this species in having POL 1.6x OOL, eye length 2 x width, mesoscutum with notauli not complete, pronotum anteriorly carinate, propodeum with plicae and median carina not distinct, gaster longer than head plus thorax combined and clypeus with striae radiating out side.

10. *Merismomorpha minuta* Sureshan

2000. *Merismomorpha minuta* Sureshan. *Rec. Zool. Surv. India*. 98(3) : 105. F. India : Kerala. (ZSIC).

Diagnostic characters : Length 1.5-2.1 mm. Head and mesosoma bluish black; gaster mainly metallic bluish black except T1 and ventral part dark brown, coxae and femora brown, remainder of legs testaceous; POL 1.3x OOL; lower margin of clypeus angulate; antennae inserted little above middle of face; pedicel as long as F1. Propodeum with median carina absent. Forewing with PMV 0.65x as long as MV. Gaster short, ovate, petiole short, widened medially, embraced by a long extension of first gastral sternite, gaster slightly longer than head plus thorax combined.

Material examined : 1F, Vaishali dist., Hajipur, Chakia, 5.ii.2009, (Reg. No. 1325); 1 F, Saran dist., Rampur, Emi, 11.vii.2009, coll. P.M. Sureshan (Reg. No. 1324).

Distribution : India : Kerala, Bihar (present record).

Remarks : Uncommon species. Recorded for the first time after original description.

11. *Metastenus indicus* Sureshan & Narendran

2002. *Metastenus indicus* Sureshan & Narendran. *Rec. Zool. Surv. India* 100(3-4) : 125. F, M, India (Kerala). (ZSIC).

Diagnostic characters : Length : 1.6-1.8mm. Black; antennae testaceous; fore and hind coxae concolorous with thorax, mid coxae and all femora dark brown; hind tibiae and tarsi yellow; fore and mid tibiae and tarsi

testaceous except proximal two third of former brown; POL little longer than OOL; antennae inserted below centre of face; both mandible with three teeth; anterior margin of pronotal collar not carinate; propodeum with nucha short, finely reticulate, plicae very fine, almost indistinct. Gaster little longer than head plus thorax combined.

Material examined : 2 F, Gaya dist., Chakand, 100 km south of Patna, 6.ii.2008, 2 F, Patna, dist., Fathua, 9.i.2008, (Reg. No. 1320) coll. P.M. Sureshan.

Distribution : India : Kerala, Orissa, Bihar (present record).

Remarks : Uncommon species. First time reported subsequent to original description.

12. *Norbanus acuminatus* Dutt & Ferriere

1961. *Norbanus acuminatus* Dutt & Ferriere. *Ind. Journal. Agric. Sci.* 31 : 141. F. India; Barrackpore. (ZSI).

Diagnostic characters : Length : 6-6.2. mm. Head and thorax bluish black, gaster brown with greenish coppery shine; antennae brownish black, legs brown, coxae and femora blackish; head 1.2x as wide as mesoscutum; POL at most as long as OOL; anterior margin of clypeus weakly emarginate; antennae with second anellus twice as long as first, clava almost equal to preceding two segments combined; gaster elongate, ovate, 1.2x as long as head plus thorax combined.

Material examined : 2 F, 2 M, Vaishali dist., Hajipur, 15.x.2009, coll. P.M. Sureshan, Reg. No. A1339.

Distribution : India : Kerala, West Bengal, Bihar (present record).

Biology : Parasitic on *Nupserha bicolor* Thoms. (Coleoptera).

Remarks : Uncommon species.

13. *Notoglyptus scutellaris* (Dodd & Girault)

1915. *Merismus scutellaris* Dodd & Girault, in Girault. *Mem. Qd. Mus.* 3 : 328. Queensland. (QM).

1988. *Notoglyptus scutellaris* (Dodd & Girault) : Boucek, transferred to *Notoglyptus Australasian Chalcidoidea* : 466.

Diagnostic characters : Length 1.3 mm. Head, thorax and petiole dark green, gaster brown; antennae with scape yellow, remainder brown; legs yellow; clypeus separated from face by obscure sulcus, anterior margin nearly straight, slightly reflexed; pronotal collar finely

carinate, scutellum coriaceous with distinct discal fovea; propodeum with nucha not bordered by carina anteriorly; gastral petiole length 1.2x width with weak median carina, gaster length 1.3x width.

Material examined : 1 F, 1 M, Chapra dist., Sonapur, 30.ix.2009, coll. P.M. Sureshan.

Distribution : India (Delhi, Orissa, Bihar (present record) Kerala, Uttar Pradesh); Italy, Japan, America, Australia.

14. *Oniticellobia longigastra* Sureshan & Narendran (Photo 4)

1994. *Oniticellobia longigastra* Sureshan & Narendran. *Rec. Zool. Sur. India.* 94(1) : 113. F, M. India (Kerala) (ZSIC).

Diagnostic characters : Length 2.5-5 mm. Body shiny black with greenish gloss; coxae concolorous with thorax, rest of legs reddish testaceous, tarsi paler with tips brown; antennae with third anellus as long as first and second combined; POL 1.5x OOL; ocelli moderate, median from lateral by 1.5x of its maximum diameter; gaster long, acuminate, 1.4x as long as head plus thorax combined, epipygium 2.5x as long as broad.

Material examined : 2F, Bihar, Chapra district, Sonapur, 11.vii.2009, coll. P.M. Sureshan. (Reg. No. 1316, 1321).

Distribution : India : Kerala, West Bengal, Orissa, Bihar. (Present record); Sri Lanka.

Remarks : Specimens from Bihar show some variation such as antennae uniformly testaceous except club dark brown, gaster narrow and more elongatedly pointed than specimens collected elsewhere in India. Uncommon species.

15. *Oxysychus coimbatorensis* (Ferriere)

1939. *Dinarmus coimbatorensis* Ferriere, Bull. Ent. Res. 33 : 164. India : Coimbatore. (BMNH).

1979. *Oxysychus coimbatorensis* (Ferriere). Boucek *et al.*, transferred to *Oxysychus Oriental Ins.* 12(4) : 449.

Diagnostic characters : Length 2.5-5 mm. Head and thorax dark bluish green, gaster aeneous shining green at base, coxae green, femora black with metallic reflection, tibiae brown, tarsi paler. Body stout, covered with distinct white pubescence; antennae with F1 2x as long as pedicel. Thorax convex, scutellum broadly rounded at tip; propodeum without median carina.

Forewing with MV 3x STV; PMV almost 2x STV. Gaster elongate, longer than head plus thorax combined.

Material examined : Nil.

Distribution : India : Kerala, Tamil Nadu, Delhi, Bihar, Andhra Pradesh.

Remarks : Reported from Pusa in Bihar (Boucek *et al.*, 1979).

16. *Pachyneuron groenlandicum* (Holmgren)

1872. *Pteromalus groenlandicus* Holmgren. *Ofvers Kungl. Vet. Akad. Forh.* 29 : 100.

1939. *Pachyneuron karnalensis* Mani. *Ind. J. Ent.* 1 : 85. Syn. by Boucek *et al.*, *Oriental Ins.* 12 : 452.

1955. *Pachyneuron umbratum* Delucchi. *Z. Angew. Ent.* 38 : 132-133.

1977. Syn. by Hedqvist, *Ent. Scand.* 8 : 238.

1974. *Pachyneuron bakrotus* Mani & Saraswat. *Mem. School. Ent. Agra* No. 3 : 102.

1979. Syn. by Boucek *et al.*, *Oriental Ins.* 129(4) : 452.

Diagnostic characters : Length : 2.3 mm. Body bluish black with metallic reflection; antennae dark brown, scape paler, coxae concolorous with thorax, remainder of legs brown, clypeus lightly emarginate or truncate anteriorly; antennae with scape reaching median ocellus. Scutellum with a faint frenum. Propodeum with nuchal area polished, median carina absent. Forewing without speculum, few hairs on the basal hairline; gaster shot, petiole widened towards the end.

Material examined : 1 F, Patna dist., Saguni, 6.ii.2008, (Reg. No. 1318) coll. P.M. Sureshan. 1 F, Gaya dist., Chakand, 100 kms. Patna, 6.ii.2008, Reg. No. A. 1116, coll. P.M. Sureshan.

Distribution : India : Delhi, Himachal Pradesh, Kerala, Haryana, Jammu & Kashmir, Orissa, Tamil Nadu, Karnataka.

Remarks : First record of the species from Bihar.

17. *Pachyneuron leucopiscida* Mani

1939. *Pachyneuron leucopiscida* Mani. *Ind. J. Ent.* 1 : 86. M, F. India : Coimbatore. (IARI).

1953. *Pachyneuron cremifaniae* Delucchi. Syn. by Boucek *et al.*, 1979. *Oriental Ins.* (1294) : 453.

Diagnostic characters : Length : 1.5 mm. Body dark metallic blue, gaster brownish black, coxae concolorous with thorax basal two thirds of femora reddish brown, rest of legs honey yellow. Anterior margin of clypeus weakly emarginated, antennal scape just reaching front

ocellus, POL 2x OOL. Pronotal collar finely carinate anteriorly; propodeum with nucha almost smooth and marked off by a distinct constriction. Gaster fusiform, T1 occupying nearly half length of gaster, petiole longer than hind coxa, reticulate.

Material examined : Nil.

Distribution : India : Kerala, Bihar, Tamil Nadu, Delhi.

Remarks : Originally described from the material collected from Pusa, Bihar with *Dactylopius* sp. on cotton (Boucek *et al.*, 1979).

18. *Propicroscytus mirificus* (Girault)

1915. *Arthrolysis mirificus* Girault. *Mem. Qd. Mus.* 4 : 191. Australia (Queensland) (QM).

1981. *Propicroscytus indicus* Subba Rao. Syn. by Boucek, 1988 : Australasian Chalcidoidea : 410.

Diagnostic characters : Length 2.5-4 mm. Head and thorax black or bluish black, gaster pale to dark yellow, sides and middle with brown streaks longitudinally, antennae dark brown with scape, pedicel and anelli testaceous, legs including coxae yellow with tips of tarsi brown; clypeus slightly emarginate anteriorly; POL almost equal to OOL; pronotum distinctly at lower level, notauli indicated only anteriorly; gaster lanceolate, 1.2x as long as head plus thorax combined.

Material examined : 1F, Vaishali dist., Bidarpur, 29.iii.2009, coll. P.M. Sureshan (Reg. No. 1235). 1F, Vaishali dist., Hajipur, 15.x.2009, coll. P.M. Sureshan (Reg. No. A. 1340).

Distribution : India (Andhra Pradesh, Karnataka, Kerala, Maharashtra, Orissa, Bihar (present record), Uttar Pradesh. South China, East Malaysia, Indonesia, Sri Lanka.

Remarks : Parasitic, sometimes secondarily on gall midges in rice and stems of some other grasses. Commonly occurring in paddy fields and adjacent grassy vegetations.

19. *Psilocera vinayaki* Sureshan & Narendran

1995. *Psilocera vinayaki* Sureshan & Narendran. *J. Ecobiol.* 7(3) : 209. F.M, India : Kerala.(ZSIC).

Diagnostic characters : Length 1.6 mm. Head and thorax black, gaster metallic green with brownish reflection ventrally; coxae concolorous with thorax, remainder testaceous with tips of tarsi brown; POL : OOL 14 : 13. antennal scape hardly reaching lower

margin of median ocellus, flagellum less clavate. Gaster length 3x that of scutellum.

Material examined : 1 F, Vaishali dist., Gatarotola, 31.i.2009, coll. P.M. Sureshan (Reg. No. 1198).

Distribution : India : Kerala, Bihar (present record).

Remarks : Uncommon species reported for the first time from Bihar, subsequent to original description.

20. *Pteromalus puparum* (Linnaeus)

1758. *Ichneumon puparum* Linnaeus. *Syst. Nat. 10th Edt.* 567. M.F. Sweden (Linn. Society, London).

1795. *Pteromalus puparum* (Linnaeus) : Swederus, transferred to *Pteromalus* *Akad. Handl.* 16 : 203.

Diagnostic characters : Length 2.4-3 mm. Dark metallic blue, antennae brown, scape testaceous. Coxae concolorous with thorax, femora dark brown except tips, remainder of legs testaceous; POL as long as OOL; temple wide, length 0.6x eye length; anterior margin of clypeus shallowly emarginate; antennae with F1 longer than pedicel, funicular segments longer than wide, propodeum with nucha long, gaster ovate, shorter than head and thorax combined.

Material examined : Nil.

Distribution : India (Kerala, Uttar Pradesh, Orissa, Bihar, Assam). Cosmopolitan.

Remarks : Parasitic in the pupae of various butterflies. Reported from Pusa, Bihar. (Boucek *et al.*, 1979).

21. *Pteromalus semotus* (Walker)

1834. *Eutelus semotus* Walker. *Ent. Mag.* 2 : 367. F. England. (BMNH).

1965. *Habrocytus semotus* (Walker) : Syn. By Boucek, : *Sb. faun. Praci ent. odd. ndr. Mus. Praze* 11 : 8, 35.

1978. *Pteromalus semotus* (Walker) : Syn. By Boucek & Graham : *Entomologist's Gaz.* 29 : 225-235.

Diagnostic characters : Length 1.9-2.8 mm. Dark metallic green with golden reflection, antennae testaceous, coxae concolorous with thorax, femora brown, rest of legs pale yellow; POL 1.8x OOL; temple 0.4x as long as eye; anterior margin of clypeus weakly emarginate; antennae with pedicel little longer than F1. Forewing with MV short, 1.1 -1.6x STV, gaster 1.1x as long as head plus thorax. combined.

Material examined : 1 F, Patna dist., Saguni, 50 km South of Patna, 6.ii.2008, Reg. No. A. 1238), 1F, Gaya

dist., Chakand, 100 km. South of Patna, 6.ii.2008, coll. P.M. Sureshan.

Distribution : India (Kerala, Orissa, Bihar (present record) cosmopolitan.

Remarks : Primary or secondary parasite in pupae of various Lepidoptera, less often certain beetles (Curculionidae).

22. *Sphegigaster stepicola* Boucek

1965. *Sphegigaster stepicola* Boucek. *Acta. Fauna. Ent. Mus. Natl. Pragae* 11 : 12-14. M, F. Bohemia. (NM).

1971. *Acroclisis melanagromyzae* Mani. *J. Nat. Hist.* 5 : 591-593. Syn. Boucek *et al.*, 1979. *Oriental Ins.* 12 (4) : 458.

Diagnostic characters : Length : 1.5-2 mm. Body shiny black, slender; Legs black; antennae with all funicular segments transverse, F1 shorter than pedicel; gaster oval, shorter than mesosoma, petiole length nearly 3 x width, hind margin of T1 with middle portion truncate or virtually so.

Material examined : Nil.

Distribution : India : Kerala, Delhi, Bihar, Uttar Pradesh, Orissa.

Remarks : Reported from Dholi, Bihar. (Boucek, *et al.*, 1973).

23. *Trichomalopsis apanteloctena* (Crawford)

1911. *Trichomalopsis apanteloctenus* Crawford. *Proc. U.S. natn. Mus.* 39 : 618 M, F. Japan : Konosu. (USNM).

1919. *Eupteromalus parnarae* Gahan. *Proc. U.S. Natn. Mus.* 56 : 522. F, India (Karvetnagar). Syn. Kamijo & Grissell, 1982 : *Kontyu, Tokyo* 50(1) : 77.

Diagnostic characters : Length 1.6-2.5 mm. Metallic bluish green, coxae concolorous with thorax, remainder of legs testaceous; Lower margin of clypeus rather deeply incised medially, striae on clypeus extending to lower margin of eyes and to malar sulcus; both mandibles with four teeth; occipital carina sharp, in posterior-dorsal view strongly curved medially. Antennae with combined length of pedicel plus flagellum length 0.8-0.93x head width in female and 0.95-1.05x in male. Gaster 1.7-2x as long as broad.

Material examined : 1F, Muzafupur dist., Muzafarpur, Bagavanpur, 2.xii.2007 (Reg. No. A. 1239) 1 F, Vaishali dist., Bidarpur, 29.iii.2007, coll. P.M. Sureshan (Reg. No. 1230).

Distribution : India (Kerala, Tamil Nadu, Karnataka, Orissa, Bihar (present record)); Bangladesh, Korea, Malaysia, China, Japan, Taiwan, Philippines. Vietnam.

Remarks : Parasitic on *Cnaphalocrocis medinalis* (Lepidoptera : Pyralidae) and *Pelopidas mathias* (Lepidoptera : Hesperidae) Commonly occurring in paddy field and adjacent grassy vegetations.

24. *Trichomalopsis nigra* Sureshan & Narendran
2001. *Trichomalopsis nigra* Sureshan & Narendran. *Journal Bombay Nat. Hist. Soc.* 98(3) : 400. M, F. India (Kerala) (ZSIC).

Diagnostic characters : Length : 1.5-2 mm. Body blue black with slight metallic reflection, Legs testaceous except base of hind coxae blackish. Head and thorax black with little metallic reflection. Pronotal collar weakly but sharply margined except at sides; antennae with scape as long as eye, pedicel plus flagellum 0.84x head width; gaster with T1 reaching almost half length of it; temple narrow, length 0.4x eye length.

Material examined : 1 F, Gaya dist., Chakand, 100 km. South of Patna, 6.ii.2008, coll. P.M. Sureshan.

Distribution : India : Kerala, Orissa, Bihar (present record).

Remarks : Associated with paddy field and grasses.

25. *Uniclypea kumarani* Sureshan & Narendran
(Photo 6)
1994. *Uniclypea kumarani* Sureshan & Narendran. *Hexapoda* 6(2) : 62-63. F. India : Kerala. (ZSIC).

Diagnostic characters : Length 2.9 mm. Head and thorax black, gaster dark metallic blue, almost black towards tip; coxae concolorous with thorax, remainder of legs testaceous. Antennae testaceous with clava brown; POL 1.2x OOL; antennae with scape reaching the vertex, pedicel little longer than F1. Propodeum with median carina not reaching beyond costula, callus thickly pilose. Gaster longer than head plus thorax combined.

Material examined : 1 F, Bihar, Vaishali dist., Hajipur, 9.vii.2003, (Reg. No. A. 1320) coll. P.M. Sureshan.

Distribution : India : Kerala, Maharashtra, Bihar (present record).

Remarks : The specimens from Bihar show some variations such as gaster more elongate, little longer than head plus thorax (1.3x), (probably due to slight

protrusion of the epipygium and basal termites) metallic blue tinge on thorax more pronounced than specimens collected elsewhere. Uncommon species.

Subfamily CEROCEPHALINAE

26. *Theocolax elegans* (Westwood, 1874)

1874. *Choetospila elegans* Westwood. *Theas. entomology. illust.* xxiv. 157. F. West. Indies. (Hope Dept. Uni. Museum, Oxford).

1979. *Choetospila elegans* Westwood : syn. By Boucek *et al. Oriental Ins.* 12(4) : 440.

1988. *Theocolax elegans* (Westwood) : Boucek. *Australasian Chal.* 339.

Diagnostic characters : Body brown with metallic sheen, legs brown with tarsi paler. Antennal flagellum slightly clavate, with funicle much longer than scape, funicular segments subglobose or subquadrate; winged or sometimes wingless, wings with distinct tuft of black setae on parastigma.

Material examined : 2F, 1M, Bihar, Patna dist., Fathipur, 13.vi.2009, (from stored rice) coll. P.M. Sureshan.

Distribution : India : Kerala, Maharashtra, Bihar (current study) Tamil Nadu, Karnataka, West Bengal, Delhi (Cosmopolitan).

Remarks : A cosmopolitan parasite of beetles in stored grain.

Subfamily SPALANGINAE

27. *Spalangia nigroaenea* Curtis

1839. *Spalangia nigroaenea* Curtis *Brit. Ent.* 16 : fol. 740. P (2). M. Britain. ANIC.

2008. *Spalangia nigroaenea* Curtis : Sureshan, *Fauna Lon. Crat. Sanct. Cons. Area. Series*, 37 : 171.

Diagnostic characters : Female : Length : 2.9-3.8 mm. Black, often with brassy lusture; Legs concolorous with thorax except tips of tarsi testaceous; head distinctly longer than broad (in male only as long as broad), umbilicately punctate with interspaces about as wide as punctures; pronotum with an isolated crenulate cross-line consisting of close punctures in front of hind margin, disc of collar more or less smooth, impunctate, collar bordered anteriorly by a narrow groove, setting off ridge like margin; gaster petiole expanded anteriorly.

Material examined : 1 M, Patna dist., Manpur, 9.vii.2009, coll. P.M. Sureshan (Reg. No. A. 1331).

Distribution : India : Delhi, Karnataka, Maharashtra; Orissa, Bihar, Kerala, Pondicherry .Cosmopolitan.

Remarks : Parasitoid of fly puparia, especially of the synanthropic species.

28. *Spalangia gemina* Boucek

1963. *Spalangia gemina* Boucek *Acta Ent. Mus. Nat. praeae*. 35 : 484. M, F. Mauritius. (BMNH).

Diagnostic characters : Female : Length 2.3-2.6 mm. Body black without metallic tinge. Legs darker except basal four tarsal segments yellow. Head hardly longer than wide; pronotal collar not margined anteriorly, with very deep coarsely crenulate cross line off hind margin; antennae longer, second funicle segment sub quadrate, following ones transverse; gastral petiole about 1.4x as long as broad, bare with distinct carinae, gaster ovate, polished, T2 distinctly emarginate. Male : Length : 2.6 mm. Head in facial view slightly wider than long, genae dull, crowdedly punctate, antennal scape as long as four following segments combined, pedicel 1.5x as long as broad, F1 2x as long as broad and about 1.7x as long as pedicel, clava as long as two preceding segments combined

Material examined : 2 M, Bihar, Patna district, Fathua, Didarganj, 11. vi.2009; 2 M, Chapra district, Sonapur, 30.ix.2009, (Reg. No. A. 1333); 1 F, Patna dist., Digarganj, 20.vi.2009, (Reg. No. A. 1327); 1 F, Digarganj, 20.vi.2009 (Reg. No. 1332); 2 M, Chapra dist., Sonapur, 30.ix.2009 (Reg. No. A. 1336) coll. P.M. Sureshan.

Distribution : India : Karnataka, Tamil Nadu, West Bengal, Bihar (present record).

Remarks : Parasitoid of dipterous puparia.

Subfamily ORMOCERINAE

29. *Systasis dalbergiae* Mani

1942. *Systasis dalbergiae* Mani. *Indian J. Ent.* 4 : 157-158. M, F. India (Dehradun). (IARI).

2009. *Systasis dalbergiae* Mani. Sureshan. *Rec. zool. Surv. India*. 109(4) : 97.

Diagnostic characters : Length 1.5-1.8 mm. Body bright metallic green, antennae dark brown, coxae, fore and hind femora concolorous with thorax, remainder of legs yellow; OOL 1.25x ocellar diameter, face rugously punctate between scape and inner orbital border, just below antennae transversely reticulate; both mandibles

tridentate; antennae with pedicel much longer than F1, all funicular segments sub equal.

Material examined : 1F, Saran dist., Rampur, Emi, 11.vii.2009, coll. P.M. Sureshan.

Distribution : India (Karnataka, Orissa, Bihar. (Present record)).

Remarks : Parasite of cecidomyid flies making galls on *Dalbergia*.

30. *Systasis dasyneurae* Ahmad & Mani

1939. *Systasis dasyneurae* Mani. in Ahmad & Mani, : 535-537 M, F. India (Haryana). IARI.

2009. *Systasis dasyneurae* Ahmad & Mani. Sureshan. *Rec. zool. Surv. India*. 109(4) : 98.

Diagnostic characters : Length 1.75-2.0 mm. Bright metallic green, all coxae and hind femora concolorous with thorax, fore and mid femora coppery brown, remainder of legs testaceous. Antennae with pedicel slightly longer than first funicular segment, funicular segments sub equal; left mandible tridentate, right with an additional tooth between second and third; propodeum very short, almost hidden by scutellum medially; forewing hyaline, about twice as long as broad, MV nearly twice STV, PMV nearly one and one fourth to twice STV.

Material examined : 1 F, Bihar, Patna dist., Didarganj, 11.vi.2009, (Reg. No. 1328); 1 F, Nalanda dist., Parwalpur, 7.vii.2009, (Reg. No. A. 1329); 1F, Chapra dist., Chapra, 11.vii.2009, (Reg. No. 1326), coll. P.M. Sureshan.

Distribution : India : Uttar Pradesh, Madhya Pradesh, Orissa, Bihar.

Remarks : Reported from Bihar as parasite of the Cecidomyiid *Dasyneura lini* Barnes (Boucek *et al.*, 1979).

31. *Ecrizotomorpha tashkiri* Mani, 1939

1939. *Ecrizotomorpha tashkiri* Mani, in Ahmad & Mani, *Indian j. Agric. Sci.* 9 : 538. M, F. India : Haryana. IARI.

1979. *Ecrizotomorpha tashkiri* Mani : Boucek *et al. Oriental Ins.* 12(4) : 442.

Diagnostic characters : Female : Length 0.9-1.5 mm. Body black, non metallic, coxae and femora concolorous with thorax, remainder of legs light brown. Ocelli arranged in a line; scutellum without frenum; forewing

with MV about two third the SMV; PMV somewhat shorter than STV.

Material examined : Nil.

Distribution : India : Bihar.

Remarks : The species was reported from Pusa, Bihar, probably hyperparasitic on *Dasyneura lini* Barnes (Cecidomyiidae) (Boucek *et al.*, 1979).

Subfamily EUNOTINAE

32. *Cephaleta brunniventris* Motschulsky

1859. *Cephaleta brunniventris* Motschulsky, *Etudes Entomol. Helsingfors*. 8 : 173. F. Sri Lanka.

1979. *Cephaleta brunniventris* Motschulsky. Boucek *et al.*, *Oriental Ins.* 12(4) : 439.

Diagnostic characters : Length : 1.6 mm. Head and thorax shiny black, gaster purple violet with basal part brownish; coxae concolorous with thorax, remainder yellowish brown. Antennae stout, distinctly clavate, pedicel longer than F1, F1 and F2 quadrate or subquadrate. Forewing sub hyaline with little brown infumation basally; MV little longer than 0.5x SMV; gaster almost as long as thorax with a small tuft of white setae at base on either side of petiole; T1 more than 4x or dorsal length of gaster.

Material examined : 1 F, Chapra dist., Sonapur, 11.vii.2009, coll. P.M.Sureshan (Reg. No. A. 1317).

Distribution : India : Assam, Andhra Pradesh, Bihar, Andaman, Goa, Kerala, Pondicherry, Uttar Pradesh, Karnataka; Sri Lanka, Pakistan.

Remarks : Parasitoids of various coccids. Reported earlier from Sabour, Bihar (Boucek *et al.*, 1979).

Subfamily DIPARINAE

33. *Dipara miniae* Narendran & Sureshan

2005. *Dipara miniae* Narendran & Sureshan. *Zoos'print journal*. 16(4) : 453. F. India : Kerala (ZSIC).

Diagnostic characters : Length 1.9 mm. Head and thorax honey brown, antennae brown except scape pale yellow, remainder yellowish brown, Fore coxae yellowish white, femora yellowish brown, mid legs yellowish brown, hind legs pale whitish yellow, gaster honey brown with base and sub apical part paler. Forewing hyaline with three brown infuscations, setae on head and thorax black. Head broader than thorax; POL 2x OOL. Vertex with three pairs of setae. Antennal formula 11173. Scutellum with frenum smooth. Propodeum

without median carina. Gaster with T1 largest, as long as combined length of T4 to tip of epipygium.

Material examined : 1 F, Chapra dist., Sonapur, 20.xi.2009. coll. P.M. Sureshan. Reg. No. A. 1341.

Distribution : India : Kerala, Bihar (present record).

Remarks : Rare species first time collected from Bihar subsequent to original description from Kerala.

Subfamily HERBERTINAE

34. *Herbertia indica* Burks

1959. *Herbertia indica* Burks. *Proc. Ent. Soc. Wash.* 61(6) : 252. M.F, India : Gwalior.USNM.

2007. *Herbertia indica* Burks : Sureshan, *Rec. zool. Surv. India. Occ. Paper* 268 : 11.

Diagnostic characters : Female : Length 1.4 mm. Black, metallic violaceous reflection on face and gaster dorsally; legs whitish except coxae, trochanter and femora bluish black; head and thorax granulate reticulate; antennae inserted on lower face, scape not reaching middle of face, extending 0.75x eye height, F1 shorter than pedicel, club as long as three preceding segments combined; forewing with MV slightly greater than 2x as long as PMV; gaster broad and short; T1 covering most of the gaster.

Material examined : 1 F, Chapra district, Sonapur, 20.xi.2009, coll. P.M. Sureshan, Reg. No. A. 1342.

Distribution : India : Madhya Pradesh, Karnataka, Maharashtra, Bihar (present record); Sri Lanka, Malaysia.

Remarks : Parasitoid of leaf mining dipterous larvae, uncommon species reported for the first time from Bihar.

DISCUSSION

The present paper deals with the record of 34 species of Pteromalidae belonging to 25 genera under 7 subfamilies from Patna and near by districts of South Bihar. Two species viz. *Ischyroptyx biharensis* sp.nov and *Merismomorpha intermedia* sp.nov. are described new to science. Some of the remaining species are reported for the first time from the state of Bihar. The genus *Ischyroptyx* Delucchi is a monotypic genus known for the speices *I. ligusticus* Masi, 1956 described from Italy. Boucek *et al.* (1979) reported *Ischyroptyx* from the Indian subcontinent mentioning the occurrence of an undescribed speices from Delhi and Bihar. The

Photos : 1-2. *Ischyroptyx biharensis* sp. nov. Female : ;



1. Body in profile



2. Part of the body with forewing (in profile)



3. *Merismomorpha intermedia* sp. nov. 3. Body in profile.



4. *Oniticellobia longigastrea* Sureshan & Narendran, female, body in dorsal view.



5. *Uniclypea kumarani* Sureshan & Narendran, female; body in dorsal view.

description of a new species of *Iscyroptyx* viz. *I. biharensis* sp.nov. from Bihar is interesting since it represents the second described species and the extension of the distribution of the genus in the Oriental region. The genus *Merismomorpha* Girault is distributed in the Australian region and India and four species are known from India. A new species of *Merismomorpha* viz. *M.intermedia* sp.nov, is described here from Bihar.

According to Mani, 1974 the fauna of the Gangetic plains (which includes the present study area) is largely a spill over that of the Peninsula. The eastern parts of the plains are largely dominated by the derivatives from the South Chinese, Indo-Chinese and Malayan region and in the West Mediterranean and Ethiopian elements are dominated. Autochthonous or endemic elements are very poorly represented in the region. The genera *Uniclypea* Boucek and *Oniticellobia* Boucek are Ethiopian elements. Two species of *Uniclypea* and one species of *Oniticellobia* are known from the Indian subcontinent. The occurrence of these genera and their species in the Gangetic plains is interesting. *Ischyroptyz* Delucchi is a Mediterranean element and is reported here from the Gangetic plains by a new species. During the present study it has also been observed that the

diversity of Parasitic Hymenoptera is comparatively less in the agro ecosystems of Patna and near by districts which is revealed by the limited number of specimens in the collection. Excessive use of chemical pesticides and intense agricultural practices are very common in the area and the same may be the reason of the occurrence of less populations of parasitic hymenoptera in the agroecosystems. Though the present paper deals with a collection of Pteromalidae from a small part of Bihar, it throws some light on the distributional patterns of fauna in the Gangetic plains. Further serious attempts of field exploration and collection of Pteromalidae and other Parasitic hymenoptera from the Gangetic plains will provide more information on their distribution, endemism, intra-specific variations, biocontrol potential etc.

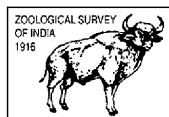
ACKNOWLEDGEMENTS

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Rec. zool. Surv. India : 110(Part-4) : 67-68, 2010

Short Communication

NEW RECORD OF THE SPECIES *NEBRIA XANTHACRA* VAR. *NIGRICOLLIS* ANDREWES (NEBRIINI : CARABIDAE : COLEOPTERA) FROM UTTAR PRADESH

INTRODUCTION

Carabidae is one of the largest family of the order Coleoptera. It comprises 34,275 species in the world (Lorenz, 2005). In India, it is represented by nearly 2000 species (Saha, 1992). These beetles are cosmopolitan in distribution. They live under bark, under log, under stone, at light, vicinity of water and sand bank of water bodies etc. Most of the Carabid beetles are carnivorous and nocturnal. While studying the earlier collections of Uttar Pradesh by J.C. Tripathi and party, we have found two specimens of the species *Nebria xanthacra* var. *nigricollis* Andrewes. The species was discovered by Chaudoir in 1850 and the variety *nigricollis* was designated by Andrewes in 1925.

SYSTEMATIC ACCOUNT

Order COLEOPTERA

Suborder ADEPHAGA

Family CARABIDAE Latreille, 1802

Subfamily NEBRIINAE Laporte, 1834

Tribe NEBRIINI Laporte, 1834

Genus *Nebria* Latreille, 1802

Species *Nebria xanthacra* var. *nigricollis* Andrewes

1850. *Nebria xanthacra* Chaudoir, *Bull. Mosc.* 1 : 423.

1925. *Nebria xanthacra* var. *nigricollis* Andrewes, *Ann. Mag. Nat. Hist.* (9) 15 : 312.

1929. *Nebria xanthacra* var. *nigricollis* Andrewes, *Fauna of British India including Ceylon and Burma (Coleoptera : Carabidae)* Vol. 1, Carabinae : 122-123.

1930. *Nebria xanthacra* var. *nigricollis* Andrewes, *Catalogue of Indian Insects. (Carabidae)* Part 18 : 227.

We could able to determine the species *Nebria xanthacra* var. *nigricollis* Andrewes by the following diagnostic characters.

Maxillary Palpi and Labial Palpi yellowish. Labial Palpi with joint 2 trisetose. Mentum with two emarginated teeth. Gula with two setae on either side, close to the buccal fissure. One deep puncture present on each gular line. Ligula provided with two seta. Clypeal suture black. Clypeus having striations near its anterior margin. Mandible having only one seta in its scrobe. Joint 1-4 of antennae glabrous and 5-11 pubescent and dark brown. 3rd and 5-10 antennal segments nearly equal in length. 4th and 11th segments of antennae nearly equal in length. 2nd segment of antennae just more than half of the length of 4th segment. Head reddish brown and wide, neck not constricted. Frons having some transverse and some irregular striations. One supraorbital seta present on each side. Pronotum black in color with two setae, one on lateral margin and another on posterior corner on each side. Two fovae on either side of posterior region of pronotum. Shallow punctures are present on the area in between two basal fovae. Medial line shallow and some fine transverse striations irradiating from it. Very fine striations present on sides of pronotum, but disk smooth. Thorax black, abdomen reddish brown but apical region yellowish. Procoxal cavity open behind. Mesepimera reaching the Mesocoxae. Mesosternum provided with longitudinal sulcus. Protibae obliquely grooved and variable spurs present near apex. Tarsal segments glabrous. Elytra black and provided with punctate striations. Punctations deeper towards basal region in comparison to apical region. Interval 1 having one setiferous puncture near base. Interval 2 normal and not unusually wide. Intervals 4-8 merge near apex and form a dark raised area. Elytra pointed at apex and produced posteriorly. Apex and apical carina of elytra

yellowish. Scutellum not covered by pronotum and light yellowish brown in color.

Length : Male : 11 mm. (Reg. No. 5364/H4A), Female : 11.5 mm. (Reg. No. 5365/H4A).

Sexual dimorphism : In male, protarsal segments are provided with 3 dilated joints but in female tarsal segments are not dilated.

Variations : Metacoxae is bisetose, one seta is near base and other at some distance from joint with trochanter. Femur and tibia are yellowish but tarsal segments are brown in color.

Material examined : 1 ex. ♂ and 1 ex. ♀, India : Uttar Pradesh; Saharanpur dist., Beharigarh, 17.vi.1971, J.C. Tripathi and Party Coll.

Distribution : India : Uttarakhand, Himachal Pradesh and Uttar Pradesh.

Remarks : This species was earlier recorded from hilly areas of Uttarakhand and Himachal Pradesh at altitude ranging up to 6000-8000 ft. This species is first time recorded from Uttar Pradesh.

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We are very much indebted to the Director, Zoological Survey of India, Kolkata for facilities. We are very much thankful to the O/C Entomology Division (A) for his valuable suggestions and all the staff of Coleoptera Section for their constant encouragement.



Fig. : Female *Nebria xanthacra* var. *nigricollis* Andrewes

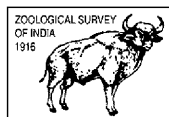
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Short Communication

FIRST RECORD OF *GLARIDOGLANIS ANDERSONII* (DAY, 1870) (SILURIFORMES : SISORIDAE) FROM INDIA

INTRODUCTION

While studying the fishes collected from Arunachal Pradesh the authors came across a single specimen which after a thorough study identified as *Glaridoglanis andersonii* (Day, 1870) (Plate-I A, B). As per the literature available, distribution of this species was restricted only in the Irrawaddy drainage, Myanmar and Hotha in Yunan and Pensee, China (Day, 1870; Hora and Silas, 1952). Subsequently, Chu *et al.*, (1999) recorded the species from the Brahmaputra drainage, China (Thomson and Page, 2006). The species is being recorded for the first time from India.

Thomson and Page (2006) did some revisionary work on Asian Sisorids. Norman (1925) erected the genus *Glaridoglanis* to accommodate *Exostoma andersonii* Day, 1870. The genus can be distinguished from other related genera occurring in N.E. India namely *Exostoma*, *Myeroglanis* and *Parachiloglanis* by having an interrupted post labial groove (Post labial groove is continuous in *Exostoma* and *Myeroglanis* and absent in *Parachiloglanis*) (Plate-II, A). Like *Glaridoglanis*, *Pareuchiloglanis* is also having interrupted post labial groove but *Glaridoglanis* differs from the latter in having strong, distally flattened teeth (small, pointed in *Pareuchiloglanis*) in both the jaws and also by less number of branched pectoral fin rays (10-11 in *Glaridoglanis*; 13-16 in *Pareuchiloglanis*).

Since the species has been recorded for the first time from India, a detailed description of the specimen is given below.

MATERIAL EXAMINED

1 ex. TL 61.34 mm, SL 53.41mm. Regd. No. V/F/ERS/2404, Airfield near Tezu, Lohit district, Arunachal Pradesh, 12.3.07, Coll. R. Mathew and Party.

DESCRIPTION

D. i.6, P. i.10, V. i.6, A. i.6, C. 16.

Body elongated and flattened ventrally, its depth 6.92 mm. Head and anterior part of the body depressed. Head length 11.37 mm, its width 10.88 mm and depth 5.79 mm. Snout length 10.87 mm. Eyes minute and dorsally placed, its diameter 1.06 mm with inter-orbital distance 4.03 mm. Mouth transverse and sub-terminal, thick labial fold, fleshly and papillated, post-labial groove (width 6.29mm and length 2.72mm) broadly interrupted medially. Teeth flattened, strong and blunt. Barbels 4 pairs (2 nasal, 2 maxillary and 4 mandibular). Maxillary barbels with well-developed membrane and soft base. Gill openings narrow, not extending below pectoral-fin base. Fins are without spines and paired fins plaited to form an adhesive apparatus. Dorsal fin arises closer to the tip of snout than to the base of the caudal fin and placed in advance of pelvics. Dorsal fin height 8.53 mm, its base 3.87 mm. Pectoral fin length 11.19 mm, pre-pectoral distance 10.21 mm. Pelvic fin length 9.13 mm, pre-pelvic distance 24.29 mm. Distance between pectoral and pelvic fin origin 14.33 mm, pelvic and anal fin 14.29 mm, pelvic fin and anus 12.74 mm. (Plate-III, A, B). Anal fin height 8.14 mm, base 4.55 mm, pre-anal distance 37.62 mm, and from anus 1.24 mm. Dorsal adipose fin long, soft, thick and confluent with caudal fin (Plate-I, B). The tail is compressed from side to side. Length of caudal peduncle 11.77 mm and its depth is 4.96 mm. Caudal fin emarginate (Plate-II, B) its length 8.21 mm. Lateral line complete. Skin soft and smooth.

ACKNOWLEDGEMENTS

The authors are grateful to Director, Zoological Survey of India, Kolkata for permission to publish the same and to Mrs. R. Mathew and her party for collecting the specimen.

PLATE-I

A : *Glaridoglanis andersonii* (Lateral view)



B : *Glaridoglanis andersonii* (Dorsal view showing dorsal adipose fin confluent with caudal fin)

PLATE-II

A : *Glaridoglanis andersonii* (Ventral view showing an interrupted post labial groove)



B : *Glaridoglanis andersonii* (Showing an emarginated caudal fin)

PLATE-III



A : *Glaridoglanis andersonii* (Ventral view)



B : *Glaridoglanis andersonii* (Ventral view showing the pelvic fin and anus distance)

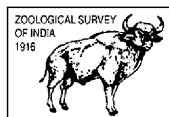
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Short Communication

NEW DISTRIBUTION RECORDS OF *TYPHLOPS DIARDII* SCHLEGEL, 1839 AND *SIBYNOPHIS SUBPUNCTATUS* (DUM & BIBR 1854) IN HARYANA STATE

INTRODUCTION

During an extensive faunistic survey of Kalesar National Park (District Yamuna Nagar, Haryana State), for a project approved by the Director ZSI, three examples of snakes were collected from a locality namely Paddal line (Alt 1292 ft, lat : N 30° 23' 12.2", long : E 077° 0' 44. 5"). After close examination of the specimens, two examples (figs 2) were identified as *Sibynophis subpunctatus* (Dum & Bibr, 1854), Dumeril's Black-headed Snake, while another example as *Typhlops diardii* Schlegel, 1839 (fig 1), Diard's worm snake. A perusal of the literature so far thus available (Dumeril and Bibron, 1854; Husain *et al.*, 1995, Schlegel, 1839; Sharma, 2003, Smith, 1943; Whitaker and Captain, 2004) revealed the interesting fact that both the species are the first records for the State of Haryana, thus extending the known range of the species considerably. Probably the on-going faunal survey of the Kalesar National Park, Haryana may throw up some more new and significant records of reptiles from the area.

Description of species examined

Phylum	VERTEBRATA
Class	REPTILIA
Order	SQUAMATA
Suborder	SERPENTES
I. Family	TYPHLOPIDAE

1. *Typhlops diardii* Schlegel, 1839

Diard's worm snake

The specimen examined (1 ex) had length of 180mm, subadult.

Diagnostic features : The species is one of the largest (adult 430 mm, young ones 100 mm) and thickest worm snakes. Scales are smooth, shining and small. Head is not broader than neck. Snout is rounded and

has poorly developed eyes, visible as a tiny dark spot. It has a short tail ending in spine like projection. The ventral surface is whitish and paler and dorsal surface is dark brown (fig 1). According to Smith 1943 the upper portion of rostral is 1/3 rd to 3/5th breadth of the head, extending to the level of eye.

Scalation : Scales are 24-26 rows rarely 28 rows around the body; 260-300 transverse scale rows. Total length of snake is 26-32 times the diameter of body.

The present example has 28 scales round the body.

The snake was found under the decaying wood. It eats worms, soft-bodied insects and their larvae. It lays 4-14 eggs in March-June (Whitaker and Captain 2004).

Distribution : India : The species has been reported in Western Himalaya upto Dehra Dun, Eastern Himalaya to Arunachal Pradesh; West Bengal and Assam.

Elsewhere : Nepal, Bangladesh and Myanmar (Sharma, 2003., Whitaker and Captain, 2004).

Since Kalesar National Park in Siwalik range is situated about 70 km away from Dehra Dun, the present record reports extension of the distribution of the snake species upto Kalesar National Park in Haryana State.

II. Family COLUBRIDAE

2. *Sibynophis subpunctatus* (Dum & Bibr 1854).

Dumeril's black headed Snake

Two examples of snakes collected from Paddal line in Kalesar National Park (District Yamuna Nagar, Haryana) were examined and identified as *Sibynophis subpunctatus* (Dum & Bibr, 1854). The species is a new record from Haryana State as its distribution so far has been reported from Peninsular India. It has been reported by Whitaker and Captain, 2004, that its extent



Fig. 1 : *Typhlops diardii* Schlegel, Diard's worm snake from Paddal line in Kalesar National Park (District Yamuna Nagar), Haryana (Photo by Mr. Rakesh Kumar Photographer, NRC ZSI).



Fig. 2 : *Sibynophis subpunctatus* (Dum & Bibr 1854) Dumeril's Black headed snake from Paddal line in Kalesar National Park (District Yamuna Nagar, Haryana State) (Photographs by Mr. Rakesh Kumar, photographer, NRC, ZSI).

of distribution is not precisely known. Other areas from where the species has been reported are south of Rajasthan and south of Ganges valley in India (Sharma, 2003., Whitaker and Captain, 2004).

Elsewhere : Sri Lanka, Bangladesh and Nepal.

The species is non venomous and uncommon. Adult length is reported to be 250 mm.

Diagnostic features : Body is slender with smooth scales. Head is slightly broader than neck, eye with round pupil. Body is with black dots in a series with brown colour. Head is black with white or pale yellow markings. Neck has a white collar. Underside greenish yellow; belly scales has black dots on each side. Tail is long and tapering. Sides of the body gray, separated from brown back by a dark line (fig. 2).

Scalation : Scales in 17 :17 :17 rows, smooth. Ventrals 172-215 (India north of lat. 18). Supralabials 9 (4th to 6th touching eye), rarely 8 (3rd to 5th touching eye); preocular 1; postocular 2; anterior temporals 2; parietal touches both postoculars.

Anal scales divided; subcaudals paired (males 60-76, females 54-63).

It is often confused with the venomous slender coral snake (which has a coral red belly and two distinct black rings on its short tail). This species is known to

be active by day and night. It lives in a leaf litter. It has been reported to be found under stones and logs. It preys on geckos, skinks and smaller snakes. It lays 2-5 eggs (Whitaker and Captain 2004).

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Short Communication

FIRST RECORD OF TWO SPECIES OF SEA ANEMONES *EDWARDSIA JONESII* AND *PARACONDYLACTIS INDICUS* FROM KARNATAKA, INDIA

INTRODUCTION

Actinarians, popularly called as 'Sea-Anemones', belongs to the phylum Cnidaria form an important group of intertidal invertebrate distinguished by their habit, habitat and beautiful colouration. The sea anemones are least studied organisms in India. However Annandale (1907 & 1915), Carlgren (1925 & 1949), Parulekar (1968 & 1990), Seshaiya and Cuttress (1971), Misra (1975 & 1976) and Bairagi (1998, 2001) worked on this group and a total 40 species of sea anemones belongs to 33 genera and 17 families are so far recorded from India. During the recent faunal survey (February-March, 2009) of coastal districts of Karnataka the authors encountered with some specimens of this group. They were identified as *Edwardsia jonesii* Seshaiya & Cuttress, 1969 and *Paracondylactis indicus* Dave, 1957. Both the species are reported for the first time from the state of Karnataka. One species *Edwardsia jonesii* Seshaiya & Cuttress, 1971 is first time reported from the west coast of India. A short description, habitat-choice and distribution of the two species are provided in this short communication.

MATERIALS AND METHODS

As both the species are burrowing, the collection was done by inserting spade into the muddy or sandy substrata without disturbing the animals and lever up to the mud along with the Anemone. Specimens were picked up carefully and brought to the camp laboratory in sea water. Giant anemone *Paracondylactis indicus* Dave, was collected by digging the sand 20-25 cm around the specimens up to depth of about 70-120 cm depending on the size of the anemone. The animals were detached from the substratum by lifting the basal disc manually and narcotized with 1% formalin for the

period of 6-8 hours. The narcotized anemones with fully expanded condition were preserved in 10% formalin for further studies.

SYSTEMATIC ACCOUNTS

Phylum CNIDARIA

Class ANTHOZOA

Subclass HEXACORALLIA

Order ACTINIARIA

Family EDWARDSIIDAE

1. *Edwardsia jonesii* Seshaiya & Cuttress, 1969 (Plate-IB)

1971. *Edwardsia jonesii* Sheshaiya & Cuttress, 1969. *J. Mar. Biol. Ass. India*, **11**(1&2) : **73**, Figs. 1, 2.

1998. *Edwardsia jonesi*, Bairagi, Cnidaria: Sea anemone. *Fauna of West Bengal, state fauna series*, **3**(Part-11) : 33.

2001. *Edwardsia jonesi*, Bairagi, Cnidaria : Sea anemone. *Fauna of Godavari Estuary, Estuarine ecosystem series*, **4** : 12.

Material examined : 2 exs, India, Karnataka, Uttar Kanada district, Sunkeri (Middle reaches of Kali river estuary), 16.iii.2009, Coll. M.K. Deb Roy and party, Reg. No. P3522/1.

Diagnosis : Tentacles 12, smooth and arranged in two cycles of six each. Body distinctly divided into capitulum, scapulus, scapus and inflatable physa without cuticle. Capitulum thin-walled, almost transparent, smooth and without cuticle. Scapus thick-walled, covered with thick shaggy rusty-red cuticle. Actinopharynx with 8 longitudinal ridges, siphonoglyph indistinct.

Habitat : Burrowing forms in soft muddy substratum of Intertidal zonation of Kali river estuary.

PLATE-I

A. *Paracondylactis indicus*

Distribution : India : East coast : Subarnarekha estuary, Chilika (Orissa), South 24 parganas (West Bengal), Andhra Pradesh, Tamilnadu; West coast : Sunkeri (middle reaches of Kali river estuary), Karnataka.

Remarks : *Edwardsia jonesii* Seshaiya & Cuttress, 1969 is fairly distributed in east coast of India. The present observation is the first record of this species from the west coast of India.

B. *Edwardsia jonesii*

Family ACTINIIDAE

2. *Paracondylactis indicus* Dave, 1957
(Plate-IA)

1957. *Paracondylactis indicus* Dave, Study of anthozoa, M.Sc.thesis, Univ. of Bombay (unpublished).
1968. *Paracondylactis indicus* Perulakar, Sea-Anemones of Bombay. *J. Bombay. nat. Hist. Soc.* **65** : 143, pl. II, fig. 10.
1998. *Paracondylactis indica* Bairagi, Cnidaria : Sea anemone. Fauna of West Bengal, state fauna series, 3(Part-11) : 38.

Material examined : 3 exs, India, Karnataka, Uttara kanada district, Murudeswar temple beach, 17.iii.2009, Coll. M.K. Deb Roy and party, Reg. No. P3523/1.

Diagnosis : Redish orange coloured, column elongated and tapering. Pseudospherules present on columns. Pedal disc flattend and distinct. Tentacles 96, arranged in 5 cycles. Colour of the tentacles and oral disc are white to colourless.

Habitat : In the sandy beaches of the left side of the Murudeswar temple they are available in the middle to lower littoral zone. This anemone can retreat up to a depth of 120 cm.

Distribution : India : East coast : Orissa, West Bengal; West coast : Maharashtra and Karnataka.

Remark : This species is endemic to Indian coast. The present observation is the first record of *Paracondylactis indicus* Dave, 1957 from Karnataka.

SUMMARY

The present communication deals with two species of actinarians from the state of Karnataka. Both the species are recorded for the first time from the area. It

also furnishes the systematic account, habitat and their distribution in Indian region.

ACKNOWLEDGEMENTS

The authors wish to express their deep felt gratitude and thanks to the Director, Zoological Survey of India, Kolkata, for providing facilities to complete this work. The Authors thank Dr. A.K. Singh, Scientist 'E' and Officer in-charge, Fire Proof Spirit Building for encouragement and also grateful to Dr. M.K. Dev Roy and Dr. S. Kar for their help in collecting the specimens and advice through out the work. All staff of General Non Chordata section and publication division of Zoological Survey of India also acknowledged for their sincere help.

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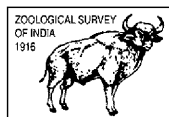
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Short Communication

FIRST RECORD OF *LUMBRINEREIS PSEUDOBIFILARIS* FAUVEL (ANNELIDA : POLYCHAETA) FROM WEST BENGAL, INDIA

INTRODUCTION

Polychaetes or bristle worms are recognized as a very important and significant group among the marine organisms. Though, basically these animals are the inhabitants of the marine environments, they are also common in the estuarine and brackish-water environments and some live in freshwater zone also. During the recent study (2004-06) of benthic fauna of the East Calcutta Wetland area authors came across a few specimens of *Lumbrinereis pseudobifilaris* Fauvel, 1932 from a sewage fed nursery pond named Nalban Bhery. Misra (1984, 1998) studied the polychaetes of West Bengal, which comprise 72 species belonging to 50 genera and 27 families. Mitra *et al.* (1997) reported 27 species of polychaetes from the Digha coast, but there was no mention of the *L. pseudobifilaris*, so it is the first record of this species from this state. Brief descriptions of the species are given here with a note of its habitat.

DESCRIPTION OF THE SITE

The collection spot (Latitude 22° 33.529' N, Longitude 88°25.083' E) is a sewage fed fish culture pond situated in the eastern fringe of Calcutta. This area is actually called as Saltlake swamps consisting of many bheries, like Nalban bheri, Sukantanagar, Goltala etc. These wetlands are fed by the sewage of Calcutta city through a channels and lock gates. The wetland area is reputed as Ramsar site.

MATERIALS AND METHOD

Live specimens of polychaetes were collected from the silty bottom of the pond. Soft substratum was generally dug out by a box type sampler (15 cm × 15 cm × 10 cm) and was washed through a 5 mm mesh size sieve. After hand sorting, all the samples were

preserved in 10% formalin after necessary narcotization. Preserved samples are sorted out very carefully using a low power stereomicroscope.

SYSTEMATIC ACCOUNT

Phylum ANNELIDA

Class POLYCHAETA

Family LUMBRINEREIDAE

Lumbrinereis pseudobifilaris Fauvel, 1932

1932. *Lumbrinereis pseudobifilaris* Fauvel, p. 154, text. fig. 22, pl. vi, figs. 7-13.

1998. *Lumbrinereis pseudobifilaris*, Srikrishnadhes, B. Murugusen, P. and Ajmal Khan, S. pp. 110.

Material examined : 2 ex; Loc : India, West Bengal, Nalban Bhery (sewage fed fish culture pond) Dist. South 24 Parganas; Coll. M. Roy. Regd. No. An 3628/1; 03.ix.2005; 3 exs, Loc : India, West Bengal, Nalban Bhery (sewage fed fish culture pond); Coll. M. Roy. Regd. No. An 3627/1; 03.ix.2006.

Diagnosis : Size : 42-56 mm in length and 2-3 mm in width; body cylindrical, deeply annulated. Prostomium conical, rather sharp, eyeless. The first two achaetous segments each about the same size as the following. On the ventral side of the prostomium three longitudinal grooves reaching across the next segment. Capillary setae present, hooks absent, ligules of the feet long.

Distribution : India : West Bengal (Nalban Bhery); Tamilnadu (Vellar estuary); Cochin backwaters (Kerala).

Elsewhere : Indo-west Pacific.

SUMMARY

Lumbrinereis pseudobifilaris Fauvel, 1932 is recorded for the first time from West Bengal. Previously this species was recorded from the marine and estuarine



Fig. 1 : *Lumbrinereis pseudobifilaris* Fauvel, 1932.

habitats Indian waters. Here it is found from a fresh water pond, which also indicates the variable habitat choice of the species.

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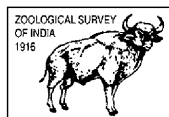
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Short Communication

NEW DISTRIBUTIONAL RECORD OF *LEPTOPENTACTA JAVANICUS* (SLUITER) (ECHINODERMATA : HOLOTHUROIDEA) IN THE WEST COAST OF INDIA

INTRODUCTION

Echinoderms being common and conspicuous organisms of the seashore have attracted the attention of the naturalists since very early times. Exclusively marine, echinoderms are among the most common and widely spread groups of animals in the sea (Hyman, 1955). Holothuroid, commonly known as sea cucumber, is deemed a high-diversity group of echinoderm occurring in almost every part of marine environment (Kerr & Kim 2001, Kerr *et al.* 2005). During the faunistic survey in March, 2009, conducted in Karnataka coast, the authors came across large number of small sea cucumbers in trawl catches at different areas along this coastal stretch. The Karnataka Coast ($12^{\circ}45' \text{N}$ - $15^{\circ}00' \text{N}$ and $74^{\circ}00' \text{E}$ - $75^{\circ}00' \text{E}$), about 267 km long, The is narrow except near around estuaries, intercepted by rivers, rivulets, creeks, rocky headlands, spectacular spits, estuaries, shallow lagoons, mudflats and few patches of mangroves. The northern coast is rocky while the southern coast has long linear sandy beaches.

Sastry (2007) reported 27 species of echinoderms from the coast of Karnataka, including 6 species of Holothuroidea. The species *Leptopentacta javanicus* Sluiter, 1881, has not been reported so far from these coastal waters, and the present account forms the first distributional record.

MATERIALS AND METHODS

Holothurian specimens from the trawl collection were hand picked and immersed in a container of seawater added with few crystals of magnesium sulfate or menthol, to expand and extend their tentacles, which also anaesthetized the animals. The specimens were then preserved in 70% alcohol.

SYSTEMATIC ACCOUNT

Phylum ECHINODERMATA

Class HOLOTHUROIDEA

Order DENDROCHIROTIDA

Family CUCUMARIIDAE

Leptopentacta javanicus (Sluiter, 1881)

1881. *Oncus javanicus* Sluiter, C.P. *Tijdschr. Ned-Indie.* **40** : 9.
1971. *Leptopentacta javanicus* : Clark, A.M. and Rowe, F.W.E. *Monograph of shallow-water Indo-West Pacific echinoderms* **180**, pl. 29, fig. 5.
1985. *Leptopentacta javanicus* : James, D.B. In : James, P.S.B.R. (ed.), *Recent advances in Marine Biology*, P. 580.
1987. *Leptopentacta javanicus* : James, D.B. *J. mar. biol. Ass. India*, **26** : 112.

Material examined : 18 ex; India, Karnataka, Uttar Kanada district, Karwar off shore, 13.iii.2009, coll. M.K. Dev Roy and party; Reg. No. E 2024/1; 15 exs; India, Karnataka, Uttar Kanada district, Bhatkal fishing jetty, 17.iii.2009, coll. M.K. Dev Roy and party, Reg. No. E 2025/1; 2 exs; India, Karnataka, Uttar Kanada district, Tonka (Near Honavar), 18.iii.2009, coll. M.K. Dev Roy and party, Reg. No. E 2026/1.

Diagnosis : Body form small and slender, slightly curved, pentagonal in cross section. Pedicles in a double row along each side of the ambulacral areas ventrally. Papillae in three rows, along the dorsal ambulacral areas. Aggregations of spicules in inter-ambulacral areas make a reticulate appearance. Spicules smooth nodular buttons with four hole baskets and large lenticulate plates also present.

Habitat : Burrowing forms in soft substratum along the off shore area.

Distribution : India : East coast : Visakhapatnam (Andhra Pradesh); Gulf of Mannar (Tamil Nadu); West coast: Lakshadweep; Neendakara (Kerala); Uttar Kanada district (Karnataka).

Abroad : S.E. Arabia, Maldives.

SUMMARY

The present communication deals with the sea cucumber, *Leptopentacta javanicus* (Sluiter, 1881) from the coast of Karnataka. This species is recorded for the first time from Karnataka coast. The systematic account, habitat and their distribution of the species in Indian region is also provided.

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Fig. 1 : *Leptopentacta javanicus* Sluiter, 1881.

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