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Dr. K. VENKATARAMAN
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Dr. K. VENKATARAMAN
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STUDIES ON NEWLY RECORDED ANTIPATHARIAN CORALS FROM ANDAMAN AND NICOBAR ISLANDS

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INTRODUCTION

The order antipatharia is Black or Horny Corals. They are-like upright and plant-like forms. are arranged around an axial skeleton of black horny material bearing thorns. Most forms inhabit deep water and live in the tropics. Although black corals are among the most common azooxanthellate corals in tropical reefs, they are least studied group in Indian waters. One of the few ecological studies dedicated to black coral ecology is that of Grigg (1965) conducted in Hawaii. Other research works were devoted to the geographical and bathymetrical distributions or to the population structure of black corals in New Zealand (Grange, 1985, 1988; Grange and Singleton, 1988), St. Paul and Amsterdam Is., Southern Indian Ocean (Grasshoff, 1988), Hawaii (Grigg, 1965; 1974), East Malaysia (Oakley, 1997), the US Virgin Is. (Olsen and Wood, 1979), and the Caribbean Sea (Wamer, 1981; Sanchez *et al.*, 1998; Sanchez, 1999). A few studies have dealt with associated fauna (Totton, 1923; Wamer, 1981; Grange, 1991; Wirtz *et al.*, 2001), reproduction and growth (Oakley, 1988; Parker *et al.*, 1997), feeding strategies (Dantan, 1921; Lewis, 1978; Wamer 1981; Pax *et al.*, 1987), competition behavior (Goldberg, *et al.*, 1990), and the relationship with abiotic environmental features like currents (Wamer, 1981; Genin, *et al.*, 1986; Oakley, 1997). Other sparse ecological notes have been given by different authors dealing in taxonomic or faunistic works, in the Strait of Gibraltar (Grasshoff, 1989), Northeast Atlantic (Grasshoff, 1985), Bay of Biscay (Hickson, 1907), and Maldives and Laccadive Archipelagos (Cooper, 1903; 1909).

Taxonomic information on several species of antipatharians of the Indonesian Archipelago can be found in 2 detailed monographs (Brook, 1889, van Pesch, 1914). However neither of these provides a comprehensive evaluation of shallow-water species. Schultze (1896) has reported about on 7 species collected off the island of Ternate in the northern Moluccas. Hoeksema and van Ofwegen (2004) published descriptions and photos of some common shallow-water antipatharian species of the Indo-Malayan region. Information on some species of shallow- and deep-water Indo-Pacific antipatharians can also be found in taxonomic revisions of the families Aphanipathidae, Myriopathidae, Cladopathidae, and Schizopathidae published by Opresko (2001, 2002, 2003, 2004), but a comprehensive taxonomic study of the antipatharians of this region is still needed. The present work reports antipatharian coral assemblages at 4 different islands of the Andaman and Nicobar.

METHODOLOGY

This study was conducted by SCUBA diving in day time during July 2009 to March 2011 and the antipatharian coral (black corals) specimens were collected from Long Island (Lat. 12'21.749; Long. 092'55.410), Pongibalu (Lat. 11°30.956; Long. 092°39.201), Kamota Island (Lat. 08°02.183; Long.093°32.573) and Havelock Island (Lat.

Key words : Antipatharians, Cirrhipathes, Antipathes, Stichopathes, Cupressopathes, Myriopathes, Antipathella, Plumapathes, Andaman and Nicobar islands.

12°03.334; Long. 092°57.716) in Andaman and Nicobar Islands.

Quantitative data were obtained at each dive site by using the adapted belt transect method (Bianchi *et al.*, 2003) counting all the colonies observed along 5 transects with 2 m wide (including 1 m on each side of the diver) at depths of 5 to 30 m. The data obtained through the study were analysed with on several biological indexes such as species richness (SR, the total number of species observed), abundance (the number of individuals of each species), the Shannon index (H', calculated as $H' = - p_i \Sigma \log_2 p_i$, where p_i is n_i is the number of individuals of the ith-species, and N is the total number of individuals), and the evenness index (J', indicating how the abundances are partitioned across the species). Density measurements (colonies/m^2) were obtained by estimating a surface area of about 100 m^2 for each transect, which was calculated considering the width of the belt of observation (2 m) and the length of the transect of about 50 m.

For taxonomic studies, portion of colonies was sampled and directly fixed in 4% formaldehyde. The various species of black corals were identified on the basis of shape, thickness of the axis and the size and arrangement of the spines, respectively (Brook, 1889). Underwater photographs were made with a Sony – T900 digital camera and the morphology of the collected samples were examined with the help of a (Leica –DFC 500) compound microscope.

RESULT

During the survey, 8 species (*Cirrhipathes anguina, Cirrhipathes contorta, Antipathes elegans, Stichopathes solorensis, Cupressopathes gracilis, Myriopathes antrocrada, Antipathella subpinnata, Plumapathes pennacea*) of antipatharian corals belonging to 2 families and 7 genera were recorded for the first time in Andaman and Nicobar Islands as well as in India (Table 1). *Cirrhipathes anguina* species were very common at these four stations. Each island has reported only three species, except Havelock Island where two species *Cirrhipathes anguina* and *Myriopathes antrocrada* were reported (Table-1). These species were identified during visual census from their gross morphologies (Plate-1- 8).

We took into consideration of 4 main categories for subdividing the species on the basis of their pattern of ramification such as unbranched, arborescent, bush and fan shaped. *Stichopathes* and *Cirrhipathes* are unbranched. These two genera differ in the presence of one or numerous rows of polyps. The various species of *Cirrhipathes* were identified on the basis of shape, thickness of the axis and the size and arrangement of the polyps (Plate-9). The arborescent species *Antipathes* and

Table-1. List of antipatharian coral species studied and reported at four study sites

Sl. No.	Material Examined	Family	Genus	Species	1	2	3	4
1	ZSI/ANRC - 5607	Antipathidae	*Cirrhipathes*	*Cirrhipathes anguina*	*	*	*	*
2	ZSI/ANRC - 5608			*Cirrhipathes contorta*	-	*	-	-
3	ZSI/ANRC - 5613		*Antipathes*	*Antipathes elegans*	-	-	*	-
4	ZSI/ANRC - 5609		*Stichopathes*	*Stichopathes solorensis*	-	-	*	-
5	ZSI/ANRC - 5606	Myriopathidae	*Cupressopathes*	*Cupressopathes gracilis*	-	*	-	-
6	ZSI/ANRC - 5610		*Myriopathes*	*Myriopathes antrocrada*	-	-	-	*
7	ZSI/ANRC - 5612		*Antipathella*	*Antipathella subpinnata*	*	-	-	-
8	ZSI/ANRC - 5611		*Plumapathes*	*Plumapathes pennacea*	*	-	-	-

1 - Long Island; 2 - Pongibalu; 3 - Kamota Island; 4 - Havelock Island.

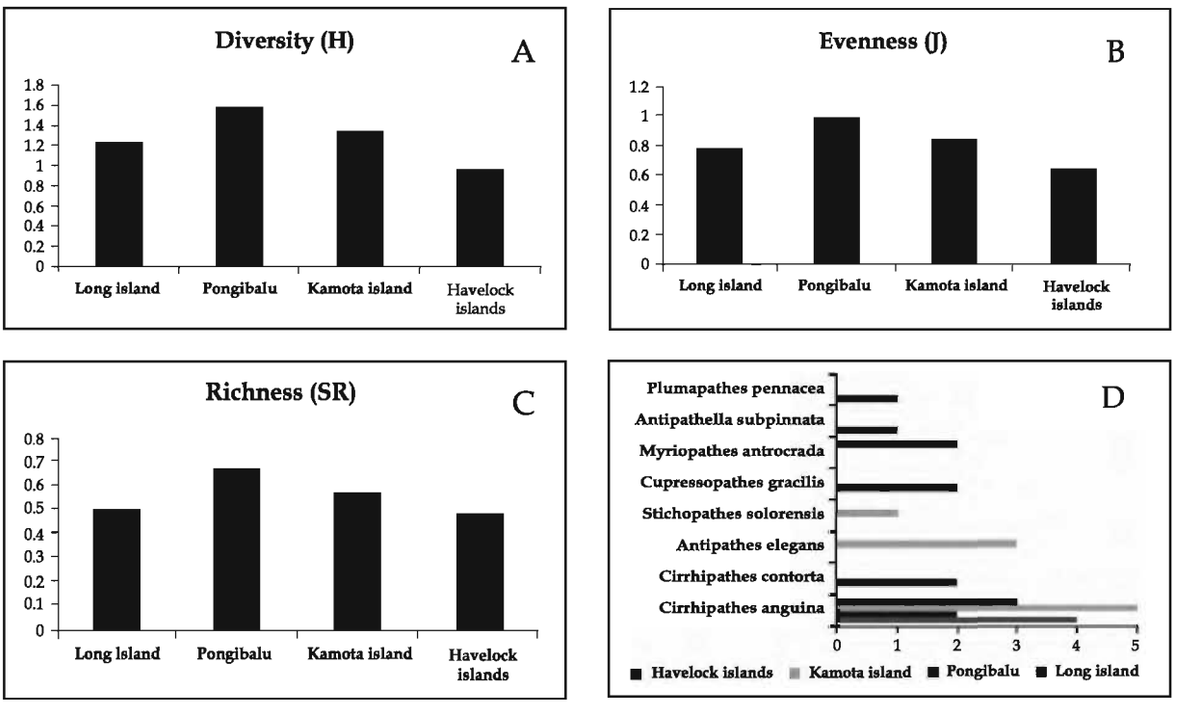

Figure 1, A- Shannon diversity index (H'), B- Pielour's evenness index (J'), C- Simpson richness index and D- Number of species at each study site.

show a distinct tree like shape, with a major axis giving rise to several secondary branches; they were easily identified on the basis of the pattern of ramification. The bushy *Plumapathes* is characterized by a net like corallum showing many anastomoses between its ramifications. The fan shaped species (*Antipathella subpinnata*) possess a planar or multi planar flabellate corallum and were identified on the basis of the pattern of ramification (Plate-1-8).

From qualitative and quantitative points of view, notable differences among the studied sites were recorded (Fig.-1, A-D). Maximum species diversity, richness and evenness were reported at Pongibalu and Kamorta Island and minimum at Havelock and Long Islands. The list of species reported during the study period is given below :

SYSTEMATIC POSITION

Phylum CNIDARIA Hatschek, 1888
Class ANTHOZOA Ehrenberg, 1831
Subclass HEXACORALLIA
Order ANTIPATHARIA
Family ANTIPATHIDAE
Genus ***Cirrhipathes***

1. ***Cirrhipathes anguina*** (Dana, 1846)

Material Examined : 5607 ZSI/ANRC, Live colony 60 cm to 1 meter; depth: 5-10 meters; Havelock wall site (Lat. 12°03.334; Long. 092°57.716), South Andaman; shallow to reef edge with turbid water.

Description : Colonies unbranched and greenish brown colour, 60–100 cm in height, average axis size 3.9 mm, average spine size 0.09 mm in size, Polyps pale brown colour (Plate-1), transverse diameter about 1-2 mm arranged in multiple irregular rows, Sagittal tentacles about 2-3 mm, lateral tentacles 1.05- 1.4 mm and oral cone about 0.5-0.7 mm in size.

Distribution : Indo Pacific and India: Andaman and Nicobar Islands.

Remarks : Mostly observed on shallow reef to reef edge at tropical countries.

2. ***Cirrhipathes contorta*** van Pesch, 1910

Material Examined : 5608 ZSI/ANRC, Live colony more than 1.5 meter; depth: 10 meters; Pongibalu jetty (Lat. 11°30.956; Long. 092°39.201), Mahatma Gandhi Marine National Park, South Andaman; Reef slope with turbid and current water.

Description : Colonies unbranched and dirty white colour, 1.5 m in height, average axis size 6.88 mm, spines 0.19 mm, Polyps white colour and arranged in multiple irregular rows (Plate-2), Sagittal tentacles about 1.3-2.15 mm, lateral tentacles 1- 1.45 mm and oral cone about 0.4-0.6 mm in size.

Distribution : Indo Pacific, Red Sea and India: Andaman and Nicobar Islands.

Remarks : New record for Indian water.

Genus ***Antipathes***

3. ***Antipathes elegans*** (Thomson and Simpson, 1905)

Material Examined : 5613 ZSI/ANRC, Live colony height: 1 meter and width 50 cm; depth: 15 meters; Kamota Island (Lat. 08°02.183; Long 093°32.573); Reef slope with turbid and current water.

Description : Living colonies are orange colour, multibranched, bushy colonies reaching a size of 1 m or more and branches free (Plate-3). Spines are small, conical, smooth, mostly 0.08 - 0.1 mm in size. Polyps 1 - 1.4 mm in transverse diameter with short tentacles.

Distribution : Indian Ocean and India: Andaman and Nicobar Islands

Remarks : New record to India.

Genus ***Stichopathes***

4. ***Sticopathes solorensis*** van Pesch, 1914

Material Examined : 5609 ZSI/ANRC, Live colony height: more than 1.8 meters; depth: 15 meters; Kamota Island (Lat. 08°02.183; Long.093°32.573); Reef slope with turbid and current water.

Description : Colonies unbranched and greenish grey colour, 1.8 m in height, Axis size 8.24 mm, spiral curving is irregular, spiral's height 9-57 cm, spines 0.13 mm in size, Polyps pale orange in colour and arranged in multiple irregular rows, tentacles about 1.3-2.15 mm, and oral cone about 0.5-0.6 mm in size (Plate-4).

Distribution : Indo-Pacific and India: Andaman and Nicobar Islands.

Remarks : New record to India.

Family MYRIOPATHIDAE

Genus ***Cupressopathes***

5. ***Cupressopathes gracilis*** (Thomson and Simpson, 1905)

Material Examined : 5606 ZSI/ANRC, Live colony height: 75 cm; 60cm wide; depth: 20 meters; Pongibalu jetty (Lat. 11°30.956; Long. 092°39.201); near channel with high current and turbid water.

Description : Living colonies orange or brown colour and branched colonies; height 1.5 m and 60cm wide; inter node of braches 4.29 to 5.26 mm (Plate-5). Spines small, smooth, mostly 0.1 -0.15 mm in size. Polyps are very small tentacles.

Distribution : Gulf of Mexico, Indian Ocean, New Zealand, West North Atlantic and India: Andaman and Nicobar Islands.

Remarks : New record to India.

Genus ***Myriopathes***

6. ***Myriopathes antrocrada*** (Opresko, 1999)

Material Examined : 5610 ZSI/ANRC, Live colony height: 75 cm; depth 25 meters; Havelock wall site (Lat. 12°03.334; Long. 092°57.716); Reef slope with current water.

Description : Live colonies 45 cm tall and 30 cm wide; reddish brown colour (Plate-6). The basal stem diameter 3.3 mm; large braches up to 9 cm long; spines conical and horn shaped, 0.14 to 0.18 mm sizes; polyps slightly elongated in the transverse axis, tentacles knob like and 0.15 mm long.

Distribution : Indonesia, Australia and India: Andaman and Nicobar Islands.

Remarks : New record to India.

Genus ***Antipathella***

7. ***Antipathella subpinnata*** (Ellis and Solander, 1786)

Material Examined : 5612 ZSI/ ANRC, Live colony height : 1 meter and 60 cm width; depth 15 meters; Long Island (Lat.12°21.749; Long. 092°55.410); Reef crust with turbid water.

Description : Live colonies brownish yellow colour; densely branched, small braches not even in size, the longest braches 13 cm length (Plate-7). The spines are needle like, 0.12 mm in size. Polyps are arranged uniserially and 7-9 polyps per centimeter along the axis.

Distribution : East North Atlantic, Mediterranean Sea, New Zealand, Portugese, Spanish exclusive economic zone and India: Andaman and Nicobar Islands.

Remarks : New record to Indian water.

Genus ***Plumapathes***

8. ***Plumapathes pennacea*** (Pallas, 1766)

Materials Examined : 5611 ZSI/ANRC, live colony height : 45cm and width: 60 cm; depth 25 meters; Long Island (Lat.12°21.749; Long 092°55.410); flat reef with turbid and current water.

Description : Live colonies brownish red colour and densely branched; primary pinnules simple and uniform in size. Spines are conical shape, 0.03 to 0.05 mm size. Needle like spines are in branches and stems, but similar size; polyps are arranged in a single series, 0.7 to 0.8 mm in size (Plate-8).

Distribution : Indo-Pacific, Caribbean Sea, Gulf of Mexico, South Atlantic, New Zealand and India : Andaman and Nicobar Islands.

Remarks : New record to Indian water.

DISCUSSION

The shallow water antipatharian coral community at the four study sites of the Andaman and Nicobar islands show very low species diversity during the study period. In this study, 8 species under 7 genera and, 2 family were reported first time from India including this area and the assemblage of black corals studied at SCUBA depths (30 m) is described on the basis of several standard ecological indexes, such as species richness (SR), Shannon index (H') and evenness Index (J'). Based on this maximum species diversity, richness and evenness were reported at Pongibalu and Kamota islands and minimum at Havelock and Long island. The high diversity of these sites can also be explained by the steep slope of the substratum since it is known that black coral settlement is more likely to occur on inclined and shaded calcareous substrata. A similar trend of increasing abundance and species diversity of black corals was also observed in the Caribbean (Grigg, 1965; Oakley, 1988; Sanchez *et al.*, 1998; Sanchez, 1999).

The shape of living polyps is probably also related to habitat (Plate-9): in unbranched black corals, the large polyps bend their tentacles upward, forming a basket-like structure around the mouth, while in flabellate colonies, all tentacles extend out laterally, increasing the net effect produced by the branching pattern. The basket shape seems to be more suitable for the capture of large isolated prey, whereas the net strategy optimizes the filtering of small suspended particles. Wamer (1977) described antipatharians as passive suspension feeders. Field observations made by Wamer (1981) indicate that direct interception is the most important way in which food can be trapped on the feeding surfaces, and that the major free-living prey are copepods. Lewis (1978) describes the use of a mucous-ciliary feeding strategy for fine suspended particulate matter in aquarium-reared specimens of *Cirrhipathes lütkeni*, *Plumapathes pennacea*, and *Antipathes* sp., as well as the occurrence of clusters of nematocysts on the tentacles and less commonly in the mesenterial filaments in order to catch larger prey. The wide open mouths were observed in *Stichopathes* and *Cirrhipathes* polyps during the daytime (Plate-9).

Sanchez *et al.* (1998) and Sanchez (1999) listed light attenuation, substratum inclination (shading), suspended food, flow regimes, wave exposure, and historical events as major factors explaining the distribution of black corals. In the study sites, the current (in terms of intensity and direction) is the major abiotic factor determining the distribution of different species. More extensive surveys in deeper waters of Andaman and Nicobar Islands may reveal out more antipatharian species.

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SUMMARY

Ecological observations of 8 species of antipatharian corals (Black corals) under 7 gnera and 2 families (Cirrhipathes anguina, Cirrhipathes contorta, Antipathes elegans, Stichopathes solorensis, Cupressopathes gracilis, Myriopathes antrocrada, Antipathella subpinnata, Plumapathes pennacea) living in shallow reefs at four study sites of the Andaman and Nicobar Islands are described for the first time. The community structure was evaluated using standard ecological parameters (species richness (SR), Shannon index (H') and evenness Index (J'). In general, the abundance of black corals increases with depth. The highly diversified black coral assemblage shows notable site-dependent differences.

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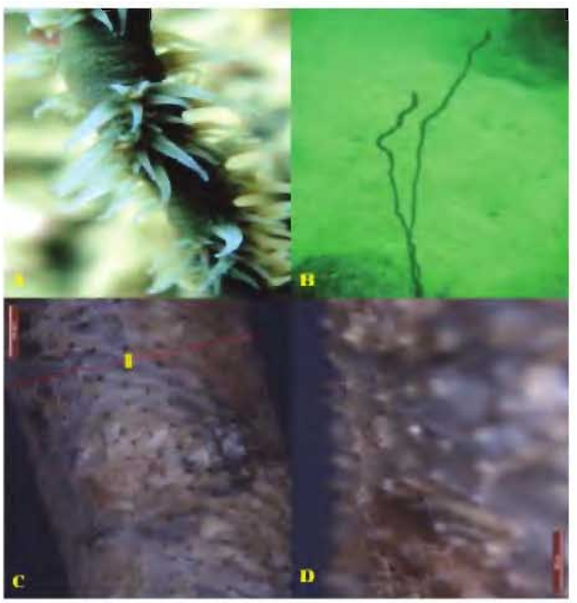
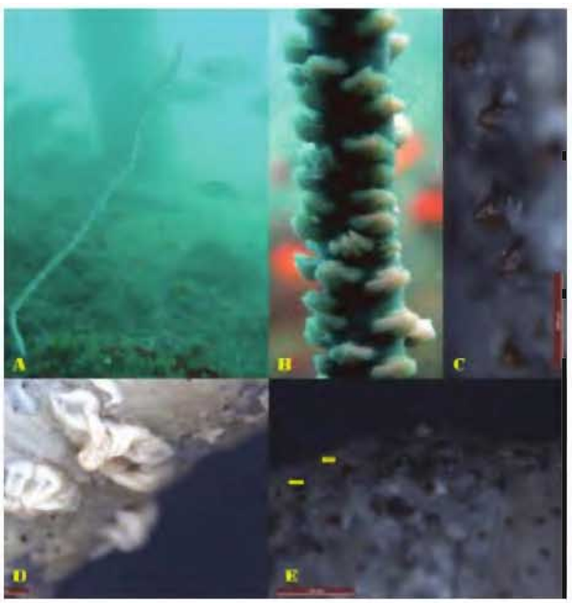
PLATE - 1



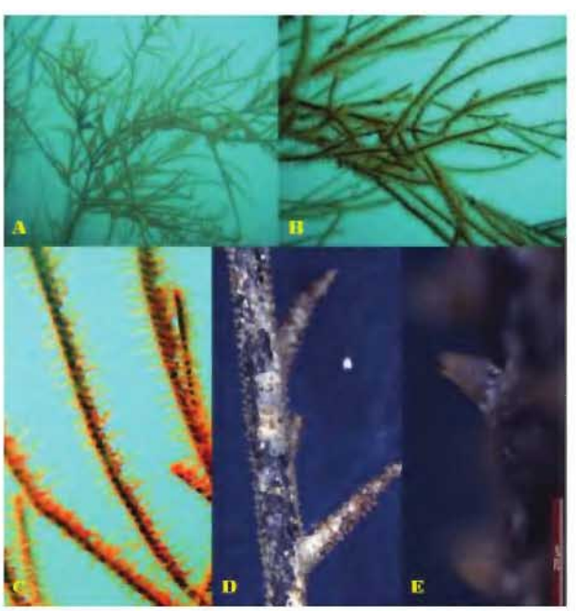
A- Extended polyps, B- Live colonies of a ***Cirrhipathes anguina***, C- 3.9 mm thickness colonies, D- 0.09 mm spines.

PLATE - 2



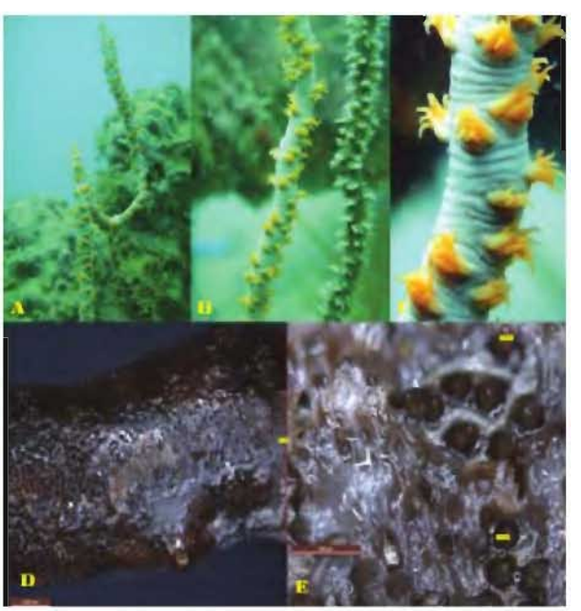
A-Live colonies of a ***Cirrhipathes contorta***, B- Extended polyps, C and E 0.15 mm spines, D-2.83 mm polyps from preserved sample.

PLATE - 3



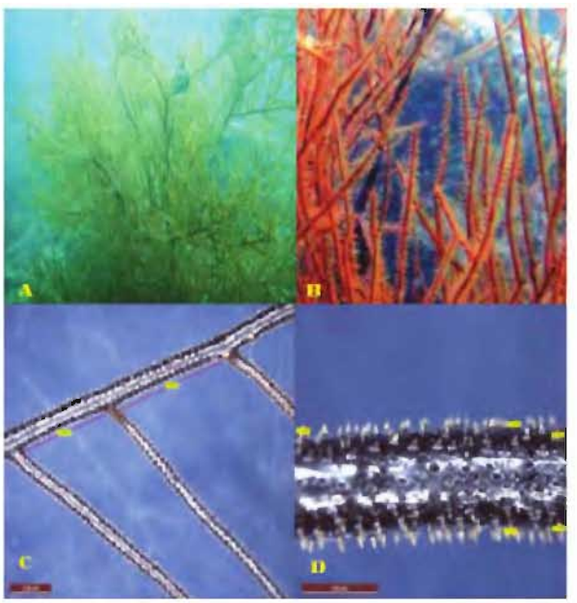
A-B Live colonies of a ***Antipathes elegans***, C- Extended polyps, D- Leica –DFC 500 Microscopic image of braches, E – 0.14 mm spines.

PLATE - 4



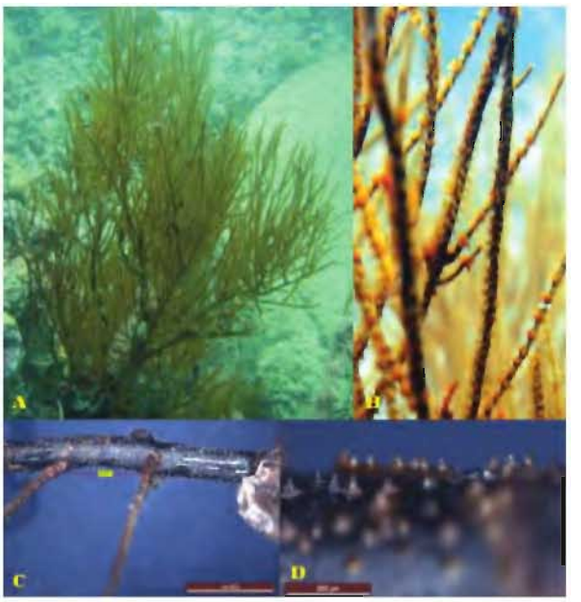
A and B - Live colonies of a ***Stichopathes solorensis***, C- Extended polyps, D-8.24 mm thickness colonies, E- 0.11 mm spines.

PLATE - 5



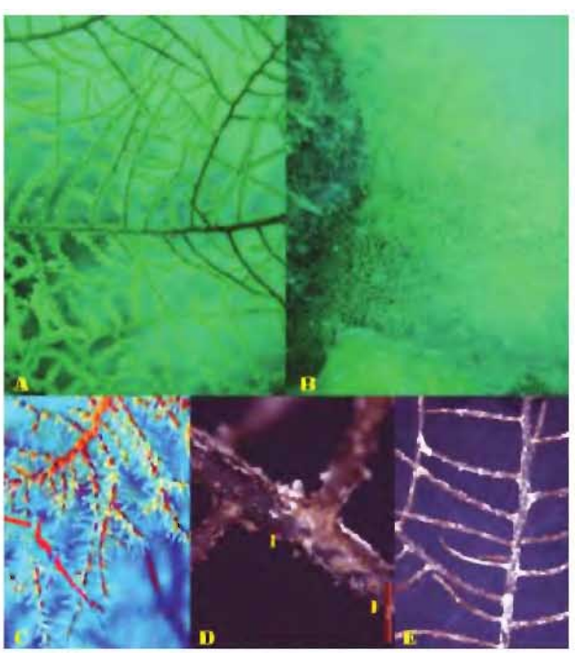
A-Live colonies of a ***Cupressopathes gracilis***, B- Extended polyps, C- 5.2 mm inter node, D- 0.12mm spines.

PLATE - 6



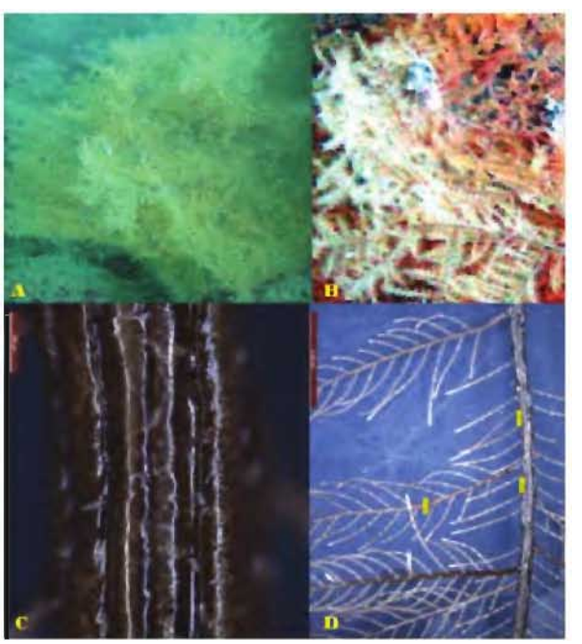
A - Live colonies of a ***Myriopathes antrocrada***, **B**- Extended polyps, **C**- 4.17 mm inter node, D - 0.097 mm spines.

PLATE - 7



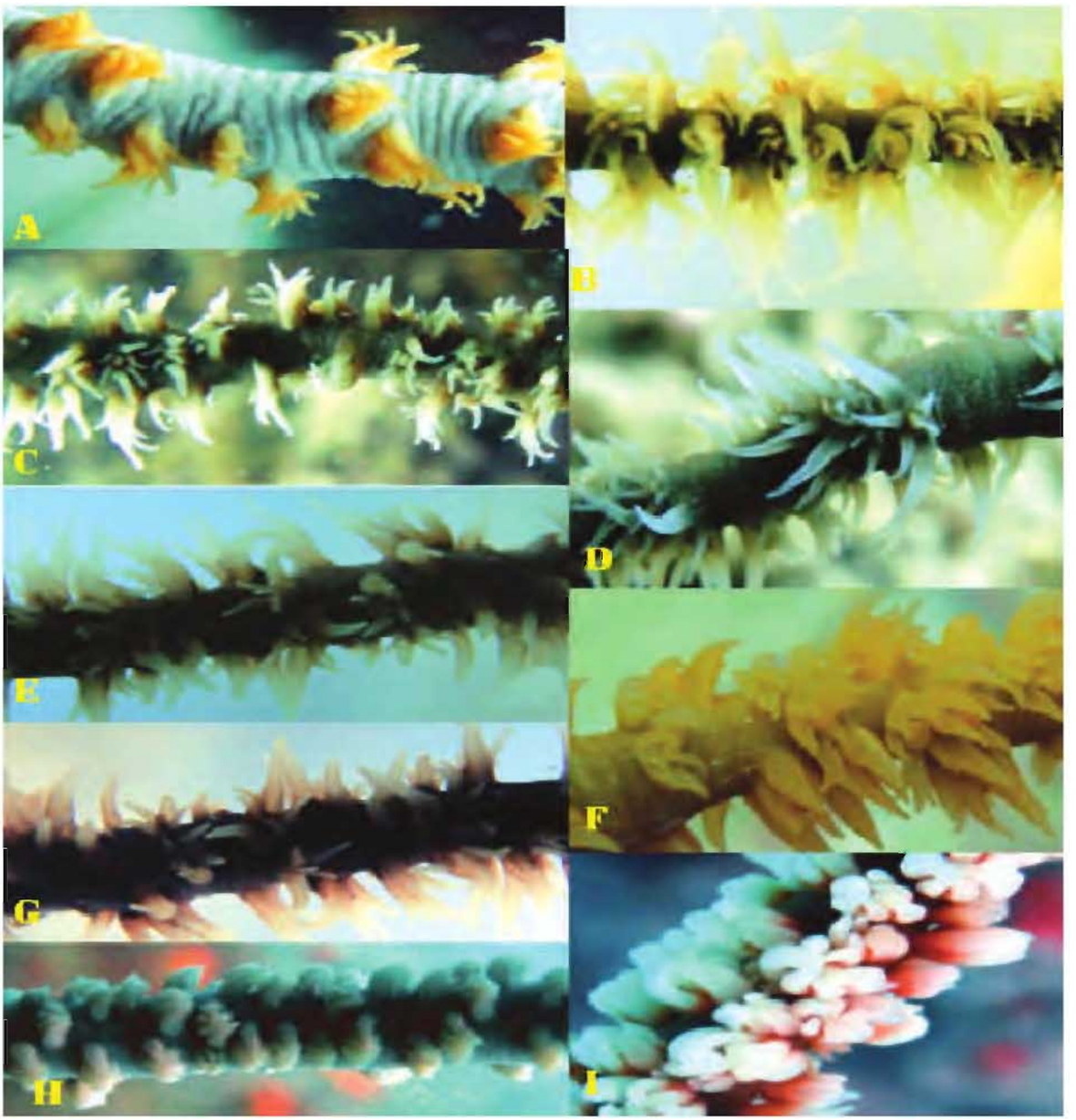
A-B Live colonies of ***Antipathella subpinnata***, C- Extended polyps, D – 0.08 mm spines, E- 1 mm inter node.

PLATE - 8



A - Live colonies of a ***Plumapathes pennacea***, B- Extended polyps, **C**- 0.15 mm spines, D – 0.63 mm inter note.

PLATE - 9



Living antipatharian polyp's morphology from different study sites: A- Contracted polyps of a ***Stichopathes solorensis***, B- Extended polyps of a ***Cirrhipathes anguina***, C-G and I Types of polyp from ***Cirrhipathes*** sp, H- Contracted polyps of a ***Cirrhipathes contorta***.

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TWO NEW AND TWO KNOWN SPECIES OF DORYLAIMOIDEA (NEMATODA)FROM WEST BENGAL, INDIA WITH A KEY TO THE SPECIES OF THE GENUS *INDODORYLAIMUS* ALI AND PRABHA, 1974

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INTRODUCTION

A small female population of *Indodorylaimus asaccatus* sp. n. was collected from the soil around the roots of guava *(Psidium guajava* L.) and that of I. *baqrii* sp. n. was collected from the soil around the roots of both guava and litchi (*Litchi chinensis* Sonn.) at South 24-Parganas district, West Bengal, India. The representatives of the genus *Indodorylaimus* Ali and Prabha, 1974 are predominant in India. Of the four valid species described earlier, three have been described from India (Ali and Prabha, 1974; Thomber et al., 1980; Ahmad & Jairajpuri, 1984), and one from South Africa (Andrassy, 1987); the genus has been reported from nowhere else in the world. Male specimens of the proposed new species were not encountered even after extensive searching. Although males are characteristically as common as females in the genus *Indodorylaimus* (Andrassy, 1987), the morphological characters of the present specimens, particularly the moderately sclerotized labial frame work and mono-opisthodelphic reproductive system, strongly support their placement under the genus *Indodorylaimus*, even in the absence of males. Therefore, both the proposed new species have been characterized by the absence of males. This is the first report of the genus from West Bengal, India. Both the species *Discolaimus tenax* Siddiqi, 1964 and *Discolaimium mazhari* Baqri and Jairajpuri, 1968 are being reported for the first time from West Bengal, India and the present specimens of the above genera agree well with their original description except some minor variations.

MATERIALS AND METHODS

The collected soil samples were processed by Cobb's sieving and decantation technique (Cobb, 1918) followed by modified Baermann funnel technique (Christie and Perry, 1951) for extraction of nematodes. The nematode specimens were fixed and preserved in their characteristic body posture in hot (FA (formalin-acetic acid 4:1) solution and were mounted in anhydrous glycerin, sealed by paraffin wax to make permanent slides. Then they were observed under a compound microscope (Olympus BX 41), measured and photographed. The formulae, to locate the positions of pharyngeal gland nuclei and the terms to denote them, were used as given by Andrássy (1998).

SYSTEMATIC ACCOUNT

Order DORYLAIMIDA Pearse, 1942

Suborder DORYLAIMINA Pearse, 1936

Superfamily DORYLAIMOIDEA De Man, 1876

Family DORYLAIMIDAE De Man, 1876

Subfamily THORNENEMATINAE Siddiqi, 1969

Genus ***Indodorylaimus*** Ali and Prabha, 1974

Species ***Indodorylaimus*** asaccatus sp. n.

Species ***Indodorylaimus baqrii*** sp. n.

Family QUDSIANEMATIDAE Jairajpuri, 1965

Subfamily DISCOLAIMINAE Siddiqi, 1969
Genus ***Discolaimus*** Cobb, 1913
Species *Discolaimus tenax* Siddiqi, 1964
Genus ***Discolaimium*** Thorne, 1939
Species *Discolaimium mazhari* Baqri and Jairajpuri, 1968

DESCRIPTIONS

Indodorylaimus asaccatus sp. n.
(Figures 1 and 2)

Measurements : Shown in Table 1. The measurements given hereafter are based on holotype. Minimum-maximum ranges of measurements of paratypes are given in parenthesis.

Female : Body ventrally curved on fixation, almost cylindrical except slightly tapering towards anterior end from the base of pharynx and ending in a uniformly attenuated elongated tail. Striations in cuticle and body pores indistinct. Cuticle 2.5µm at midbody and 5.0µm (5.0 – 7.0µm) thick on tail. Lip region almost continuous or very minutely demarcated from body, almost equal in width to or slightly narrower than adjoining body, moderately sclerotized, 5.0µm (5.0 – 6.0µm) high and 9.5µm (8.5 – 9.5µm) wide, lips amalgamated. Amphids not distinctly visible. Odontostyle 1.4 (1.2 – 1.7) lip region-widths long, its aperture distinct, 28.5% (26.5 – 33.0%) of the odontostyle length. Odontophore rod-like, 1.2 (1.1 – 1.9 times the odontostyle length. Guiding ring at 8.5m (7.5 – 9.5µm) from anterior end. Nerve ring at 98µm (90.5 – 117.5µm) from anterior end. Expanded part of pharynx 3.7 (2.8 – 4.3) times the neck base-width or occupying 42.0% (41.5 – 45.5%) of the pharyngeal length. Cardia bluntly conoid or rounded, 9.5µm (7.5 – 12.5µm) long. Glandularium 91% (83 – 91%) of expanded part of pharynx. Positions of pharyngeal gland nuclei are: D = 58.6 – 63.0%; AS_1 = 44.0 – 48.0%; AS_2 = 45.6 – 50.7%; PS_1 = 63.0 – 68.0%; PS_2 = 66.0 – 69.5%.

Vulva pre-equatorial in position, transverse. Vagina about half of the corresponding body width. Reproductive system mono-opisthodelphic, anterior genital branch completely absent, without any uterine sac; posterior genital branch well developed, ovary reflexed, 71µm (42 - 117µm) long, sperm absent within the gonad.

Prerectum 2.6 (2.3 – 2.8), rectum 1.2 (1.1 – 1.5) anal body-widths long. Tail elongated, continuously tapering from anus to a finely rounded terminus, 11.2 (8.8-12.7) anal body-widths long.

Male : Not found

Type Habitat and Locality : Collected from soil around the roots of guava at Shalipur (West) and Balarampur of Baruipur block on 24. 05. 2004.

Type Specimens : Holotype registration number WN 1019 along with paratypes on the same slide. Paratype registration numbers WN 1020 (2♀,) and WN 1021 (2♀), WN 1022 (1♀) and WN 1023 (2♀), deposited in the National Zoological Collection, Zoological Survey of India, Kolkata, India.

Etymology : The species has been named due to the complete absence of the anterior uterine sac.

Diagnosis and Relationship : Indodorylaimus asaccatus sp. n. is characterized by the absence of males and by complete absence of the anterior uterine sac. Although it shows closeness to the females of *I. kanhobia* Thomber *et al.*, 1980 in total body length and in some body measurements and ratios, the new species differs from *I. kanhobia* by the complete absence anterior uterine sac, shorter odontostyle (11.5 – 14.5µm vs. 18 – 20µm), more anteriorly placed vulva (V = 30.8 – 33.8 vs. 30 – 38), lesser *b* value (4.8 – 5.6 vs. 5.7 – 6.6) and by greater C′ value (8.8 – 12.7 vs. 8 – 9).

Indodorylaimus baqrii sp. n.
(Figures 3, 4 and 5)

Measurements : Shown in Table 2. The measurements given hereafter are based on holotype. Minimum-maximum ranges of measurements of paratypes are given in parenthesis

Females : Body moderate to strongly ventrally curved, particularly in posterior portion, tapering slightly anterior to the pharyngeal base. Cuticular striations and body pores indistinct. Cuticle 2.5µm (1.0 – 2.5µm) at mid body and 5.0m (3.5 – 7.0µm) thick on tail.

Lip region slightly set off by depression, narrower than adjoining body, moderately sclerotized, 5.0µm high and 11µm (8.5 – 11.0µm) wide, lips amalgamated. Amphids cup-shaped, 4.0 – 5.0µm from anterior end. Odontostyle 1.4 (1.1 – 1.7) lip region-widths long, its aperture distinct,

1/3.1 (1/2.6 – 1/3.7) or 31.6% (26.6 – 37.5%) of the odontostyle length. Odontophore rod-like, 1.1 (0.9 – 1.4) times the odontostyle length. Guiding ring 12.0µm (7.5 – 12.0µm) from anterior end. Nerve ring at 130µm (96 - 130µm) from anterior end. Expanded part of pharynx occupying 44.1% (38.5 – 45.2%) of the pharyngeal length. Cardia conoid to rounded, 9.5µm (7.5 – 14.5µm) long. Glandularium 80.0% (80.0 – 97.7%) of cylindrus. Positions of pharyngeal gland nuclei are: D = 57.7 – 63.0%; AS_1 = 39.2 – 41.8%; AS_2 = 38.4 – 46.0%; PS_1 = 56.0 – 56.8%; PS_2 =58.4 – 60.0%. Vulva pre-equatorial in position. Vagina 1/2.6 (1/1.8 – 1/2.7) or 38.4% (37.0-55.5%) of the corresponding body width. Reproductive system mono-opisthodelphic, anterior genital branch reduced to a small sac, 0.6 (0.4 – 1.0) vulval body-width long. Posterior genital branch normal and well developed. Ovary reflexed, 83.0µm (56.0 – 127.5µm) long. Sperms absent in both branches. Intra-uterine eggs present in the posterior branch in two specimens, measuring 27µm X 127 – 130µm.

Prerectum 2.5 (2.0 – 3.3), rectum 1.3 (0.9 – 1.4) anal body diameter long. Tail elongated, uniformly attenuated from anus to a finely rounded terminus, 10.9 (7.0 – 13.0) anal body-widths long.

Male : Not found.

Type Habitat and Locality: Two different populations collected from the soil around the roots of guava (at Mistripara (Holotype), Chandokhali & Dhapdhapi (West) on 27. 07. 2005) and from Litchi (at Shalipur (West) & Madhyam kalyanpur on 24. 04. 04 & 13. 12.04 respectively) from Baruipur block.

Type Specimens: Holotype registration number WN 1025 along with 6 paratypes on the same slide. Paratype registration numbers WN 1026 (8 ♀) and WN 1027 (2 ♀), WN 1028 (6 ♀) WN 1029 (1 ♀) and WN 1030 (3 ♀), deposited in the National Zoological Collection, Zoological Survey of India, Kolkata, India.

Etymology : The new species has been named after eminent nematologist Dr. Q. H. Baqri.

Diagnosis and Relationship : Indodorylaimus baqrii sp. n. is characterized by the absence of males and by the presence of distinct anterior uterine sac (19.5 - 37µm). Further it differs from all other species of the genus *Indodorylaimus*, except *I. kanhobia* Thomber *et al.*, 1980, in having longer body (1.4 – 1.64 mm vs. 0.96 – 1.4mm; in *I. kanhobia*, L = 1.5 – 1.8mm in females). Although the total body length and some body ratios of the new species comes closer to those of *I. kanhobia*, it differs from *I. kanhobia* in having shorter odontostyle (13.5 – 16.5µm vs. 18 – 20µm), wide range of *a* value (30.8 – 48.9 vs. 37 – 44), lesser *b* value (4.9 – 5.4 vs. 5.7 – 6.6), greater C′value (8 – 13 vs. 8 – 9) and in having a shorter tail in comparison with body length, evident from greater *c* value (5.8 – 9.2 vs. 5.3 – 6.8).

Key to the species of *Indodorylaimus* Ali and Prabha, 1974

1. Males present; anterior uterine sac always present.....2
- Males absent; anterior uterine sac either present or absent.....5
2. Anterior uterine sac well developed, 2–3 times or more as long as corresponding body widths.....3
- Anterior uterine sac reduced, shorter than half of the corresponding body width.....4
3. Odontostyle 15 – 17µm; Vulva towards anterior end (V = 33 – 36); males with 4 ventromedian supplements..... *Indodorylaimus saccatus* Ahmad & Jairajpuri, 1984
- Odontostyle 12–13µm; Vulva further back (V = 40 – 44); males with 1 – 2 ventromedian supplements .... *I. africanus* Andrassy, 1987
4. Body shorter (L = 0.9 – 1.2mm); odontostyle 12 –13µm; males with 4 ventromedian supplements ..... *I. elongatus* (Ali & Prabha, 1974) Baqri, 1982
- Body longer (L = 1.4 – 1.8mm); odontostyle 18 – 20µm; males without ventromedian supplements ..... *I. kanhobia* Thomber, Joshi & Farooqui, 1980
5. Anterior uterine sac completely absent; odontostyle 11.5 –14.5µm long..... ..... *saccatus* sp. n.
- Anterior uterine sac reduced, 0.4 – 1.0 vulval body-width long; odontostyle 13.5–16.5m long.....*I. baqrii* sp. n.

Discolaimus tenax Siddiqi, 1964
(Figure 6)

Measurements :

Females (n = 12) : L = 1.13 – 1.51mm; *a* = 35.1 – 42.5; *b* = 3.8 – 4.6; *c* = 38.7 – 57.5; C′= 1.0 – 1.5; V = 50.8 – 55.8%; G1 =10.7 – 16.1%; G2 = 11.0 – 18.3%; expansion of head = 11.0 – 19.5µm; odontostyle = 14.5 – 18.5µm; odontostyle aperture = 4.0 – 9.5µm; odontophore = 21.5 – 29.0µm; maximum body width = 29.5 – 41.5m, length of pharynx = 291.5 – 333.0µm; body width at neck base = 29.5 – 36.0µm; body width at vulva = 29.5 – 41.5µm; expanded part of pharynx = 157.0 – 178.5µm; glandularium = 125.0 – 134.0µm; distance of vulva from anterior end = 625.0 – 794.0µm; vaginal length = 12.0 – 17.0µm; length of anterior gonad = 132.0 – 186.0 µm; length of posterior gonad = 135.0 – 272.0µm; prerectum = 22.0 – 27.0µm; rectum = 17.5 – 24.5µm; tail length = 24.5 – 29.5µm; anal body diameter = 19.5 – 27.0µm.

Description :

Female : Body slender, slightly ventrally curved on fixation. Cuticle marked with fine transverse striations, 1.5mm thick at anterior part at the level of odontostyle and at mid body, 2.5– 3.5µm on tail. Lateral chords about one-third of body width at mid body. Lip region discoidal, expanded, off set from body by a deep constriction, 4.0 – 5.0µm high, 16.5 – 19.5µm wide or 1/1.6 to 1.9 of body width at neck base. Liplets six, surrounding stoma. Amphids stirrup-shaped, 5.0 – 7.0mm from anterior end. Odontostyle 0.8 – 1.0 lip region-width long but in most of the specimens smaller than lip width, its aperture occupying 38.5 – 53.0% of odontostyle length. Guiding ring single, 5.5 – 7.0mm from anterior end. Odontophore simple, rod-like, 1.3 – 1.8 times the odontostyle length. Nerve ring at 95.5 – 100.5mm from anterior end. Expanded part of pharynx 51.5 – 54.8% of total neck length. Glandularium 77.0 – 80.5% of the cylindrus. Cardia round to conoid, 6.5 – 10.0µm long, cardiac disc present. Location of pharyngeal gland nuclei are: D = 56.0 – 60.0%; AS1 = 40.8 – 61.5%; AS2 = 40.8 – 66.0%; PS1 = 72.5 – 81.0%; PS2 = 75.3 – 86.6%. Vulva opening transverse, equatorial to slightly post-equatorial. Vagina extending inward half to about one-third of corresponding body width, unsclerotized. Reproductive system amphidelphic. Both ovaries reflexed, in some specimens posterior ovary very long, almost reflexed up to vulva, anterior ovary 37.0 – 88.5µm and posterior ovary 39.0 – 127.0µm long. One specimen containing one egg in the posterior branch of gonad, measuring 91.0µm X 29.5µm.

Prerectum 1.0 – 1.2 and rectum 0.8 – 1.2 anal body-width long. Tail convex- conoid, 1.0 – 1.5 anal body-width long.

Male : Not found.

Habitat and Locality : Collected from soil around the roots of guava at South Gobindapur on 13. 12. 2004 and at Bosepukur, Dhapdhapi (East), Baruipur block on 27. 07. 2005.

DISCUSSION AND REMARK : Siddiqi (1964) described *Discolaimus tenax* from soil around the roots of *Citrus sinensis* (L.) Osbeck from Uttar Pradesh, India. Further Ahmad and Jairajpuri (1982) reported the species from soils of grasses (*Motha* sp.) with first report of its males at Kanpur, U. P. The present specimens conform well to both of the above. This is the first report of *D. tenax* from West Bengal.

Discolaimium mazhari Baqri and Jairajpuri, 1968
(Figure 7)

Measurements :

Females (n = 02): L = 1.16 – 1.23mm; *a* = 39.6 – 41.8; *b* = 3.8 – 4.0; *c* = 53.0 – 55.9; C′= 1.0; V = 42.4 – 44.0%; G1 = 11.5 – 12.5%; G2 = 11.7 – 12.5%; odontostyle = 13.0 – 14.0µm; odontostyle aperture = 5.5 – 7.0mm; odontophore = 17.0 – 18.0µm; maximum body width = 29.5µm, length of pharynx = 306.0µm; body width at neck base = 29.5µm; body width at vulva = 29.5µm; expanded part of pharynx = 171.5 – 174.0µm; distance of vulva from anterior end = 495.0 – 541.5µm; vaginal length = 12.5µm; length of anterior gonad = 142.0 – 151.0µm; length of posterior gonad = 137.0 – 154.0µm; prerectum = 61.0 – 73.5µm; rectum = 18.0 – 25.0µm; tail length = 22.0µm; anal body diameter = 22.0µm.

Description :

Female : Body cylindrical, almost straight or slightly ventrally curved on fixation. Cuticle smooth and thin, 1.0 – 2.5µm thick at mid body and 2.5 – 3.5µm on tail. Sub cuticle with very faint striations.

Lip region set off by deep constriction from body contour, same as or wider than adjoining body, 5.0µm high, 10.5 – 12.5µm wide or 1/2.3 –

1/2.7 of body width at neck base. Amphids cup-shaped, 5.5µm from anterior end, occupying 5.0 – 6.0mm or about half or slightly more of the corresponding body width.

Odontostyle 1.09 – 1.2 lip region width long, its aperture occupying 46.1 – 50.0% of odontostyle length. Guiding ring at 5.0 – 6.0µm from anterior end. Odontophore simple, rod-like, 1.2 – 1.3 times the odontostyle length. Circum-oesophageal nerve ring at 98.0 – 103.0.5µm from anterior end. Expanded portion of pharynx 56 – 57% of total pharyngeal length. Cardia broadly rounded, 5.0µm long, disc present. Pharyngeal gland nuclei indistinct. Vulva transverse, pre-equatorial. Vagina unsclerotized, 1/2.3 of the corresponding body width. Reproductive system amphidelphic. Both ovaries reflexed, anterior ovary 49.0 – 61.0µm and posterior ovary 49.0 – 59.0µm long. Prerectum 2.7 – 3.3 and rectum 0.8 – 1.1 anal body-widths long. Tail short, rounded or hemispheroid, one anal body-width long.

Male : Not found.

Habitat and Locality : Collected from soil around the roots of guava at Sikharbali, Baruipur block on 23. 09. 2005

DISCUSSION AND REMARK : The present specimens fairly agree with the type specimens of *Discolaimium mazhari* described by Baqri and Jairajpuri (1968) from soil around the roots of cotton (*Gossypium* sp.) from Uttar Pradesh, India except in having a much longer prerectum (prerectum = 15.0 – 19.0µm or less than one anal body-width in type specimens). This is the first report of the species from West Bengal.

SUMMARY

A small female population of *Indodorylaimus asaccatus* sp. n. and *I. baqrii* sp. n. were collected from the soil around the roots of guava (*Psidium guajava* L.) and litchi (*Litchi chinensis* Sonn.) at South 24-Parganas district, West Bengal, India. Both the newly proposed species are characterized by the absence of males because the males are very common and frequent in case of rest of the species of this genus. *Indodorylaimus asaccatus* sp. n. is characterized by the absence of males and by complete absence of the anterior uterine sac. Although it shows similarities with the females of *I. kanhobia* Thomber *et al.*, 1980 in total body length and in some body measurements and ratios, the new species differs from *I. kanhobia* by the complete absence anterior uterine sac, shorter odontostyle (11.5 – 14.5µm vs. 18 – 20µm), more anteriorly placed vulva (V = 30.8 – 33.8 vs. 30 – 38), lesser *b* value (4.8 – 5.6 vs. 5.7 – 6.6) and by greater c' value (8.8 – 12.7 vs. 8 – 9). *Indodorylaimus baqrii* sp. n. is characterized by the absence of males and by the presence of distinct anterior uterine sac.

The new species can be differentiated from all other species of *Indodorylaimus* except *I. kanhobia* Thomber *et al.*, 1980 by its longer body. Although the total body length and some body ratios of the new species overlap with those of *I. kanhobia*, it differs in having shorter odontostyle (13.5 – 16.5µm vs. 18 – 20µm), wide range of *a* value (30.8 – 48.9 vs. 37 – 44), lesser *b* value (4.9 – 5.4 vs. 5.7 – 6.6), greater C' value (8 – 13 vs. 8 – 9) and by greater *c* value (5.8 – 9.2 vs. 5.3 – 6.8).This is the first report of the genus *Indodorylaimus* from West Bengal, India. Few specimens of *Discolaimus tenax* Siddiqi, 1964 and *Discolaimium mazhari* Baqri and Jairajpuri, 1968 were collected from soil around the roots of guava in the same district and are being reported for the first time from West Bengal, India.

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Table 1. Morphometric data on female *Indodorylaimus* ***asaccatus*** sp. n. (All measurements are in µm except L and body ratios, L in mm. Number of paratypes examined given in the parenthesis)

Characters	Holotype female	Paratype females (7)				
		Min	Max	Mean	± SD	SE
L	1.5	1.38	1.73	1.5	0.13	0.06
a	45.3	32.1	46.6	41.7	6.09	2.72
b	5.2	4.8	5.6	5.1	0.32	0.14
c	6.0	5.4	6.7	6.1	0.51	0.23
C′	11.2	8.8	12.7	10.9	1.72	0.77
V %	33.2	30.8	33.8	32.7	1.22	0.55
G1%	0	0	0	0	0	0
G2 %	13	10.2	17.4	13.2	3.74	2.16
Odontostyle length	13.5	11.5	14.5	13.7	1.2	0.54
Odontophore length	17.5	15.5	22.5	17.4	2.89	1.29
Odontostyle aperture	4.0	4.0	5.0	4.1	0.44	0.19
Maximum body width	33.0	30.0	44.0	36.8	6.72	3
Body width below lip region	12.0	9.5	12.0	11.7	1.09	0.49
Body width at neck base	31.5	29.5	44.0	36.1	6.30	2.82
Body width at vulva	33.0	30.0	44.0	36.8	6.72	3
Pharyngeal length	284.0	279.0	306.0	290.4	10.36	4.63
Expanded part of pharynx	120.0	118.0	135.0	126.0	6.24	2.79
Glandularium	109.0	102.0	122.5	112.3	8.46	4.23
Length of cardia	9.5	7.5	12.0	9.4	2.43	1.21
Length of anterior gonad	0	0	0	0	0	0
Length of posterior gonad	194.0	142.0	264.0	195.0	62.55	36.11
Anterior end to vulva	497.0	460.0	534.0	492.8	29.81	13.33
Vaginal length	15.0	14.5	19.5	16.8	1.78	0.8
Tail length	247.0	233.0	257.0	246.4	10.09	4.51
Anal body width	22.0	19.5	29.0	23.0	3.86	1.73
Length of prerectum	59.0	46.5	73.5	60.6	12.55	6.27
Length of rectum	27.0	22.0	44.0	30.0	9.62	4.81

Table 2. Morphometric data on female *Indodorylaimus baqrii* sp. n. (All measurements are in mm except L and body ratios, L in mm. Number of paratypes examined given in the parenthesis)

Characters	Holotype female	Paratype females (7)				
		Min	Max	Mean	± SD	SE
L	1.64	1.4	1.58	1.51	0.05	0.01
a	37.3	30.8	48.9	40.7	4.9	1.36
b	5.3	4.9	5.4	5.1	0.17	0.05
c	6.5	5.8	9.2	6.5	0.86	0.24
c′	11.0	8.0	13.0	10.8	1.28	0.35
V %	33.5	31.5	34.7	33.0	0.81	0.22
G1%	1.6	1.2	2.5	1.8	0.41	0.12
G2 %	13.3	10.8	24.6	14.4	4.20	1.27
Odontostyle length	15.5	13.5	16.5	15.3	1.09	0.3
Odontophore length	17.5	16.0	19.5	17.5	1.05	0.29
Odontostyle aperture	5.0	4.0	5.5	4.8	0.53	0.16
Maximum body width	44.0	32.0	44.0	37.8	4	1.15
Body width below lip region	12.0	11.0	14.5	12.6	1.21	0.49
Body width at neck base	41.0	32.0	49.0	36.9	5.1	1.53
Body width at vulva	44.0	34.5	44.0	36.9	3.67	1.29
Pharyngeal length	306.0	265.0	309.0	292.2	10.91	3.02
Expanded part of pharynx	135.0	112.5	135.0	123.6	5.97	1.72
Glandularium	108.0	101.0	126.0	116.6	8	2.83
Length of cardia	9.5	7.5	14.0	10.8	2.33	0.82
Length of anterior uterine sac	27.0	19.5	37.0	27.6	5.69	1.64
Length of posterior gonad	220.0	169.0	360.0	226.9	61.40	18.51
Anterior end to vulva	551.0	468.0	522.0	501.7	15.98	4.43
Vaginal length	16.5	14.5	19.5	16.8	1.4	0.44
Tail length	252.0	155.0	257.0	233.1	26.98	7.48
Anal body width	23.0	19.5	24.0	21.6	1.44	0.4
Length of prerectum	59.0	49.0	73.5	60.0	7.53	2.27
Length of rectum	32.0	19.5	32.0	27.0	3.41	1.03

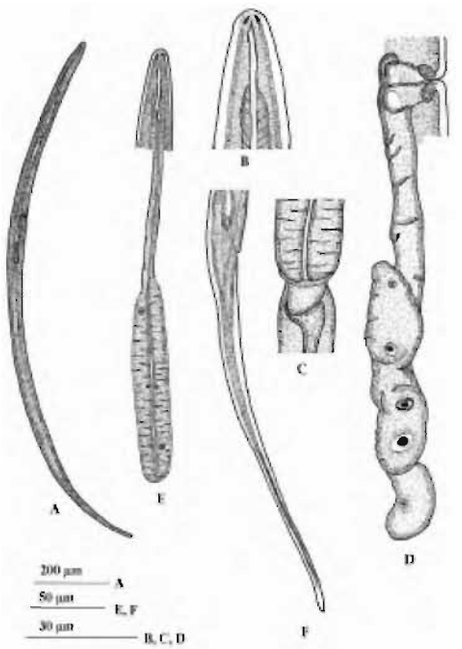

Figure 1. *Indodorylaimus asaccatus* sp. n. Female: A. Entire body, B. Anterior body end showing cephalic region & odontostyle, C. Pharyngo-intestinal junction and cardia, D. Mono-opisthodelphic reproductive system without anterior uterine sac, E. Pharynx showing the gland nuclei, F. Tail end.

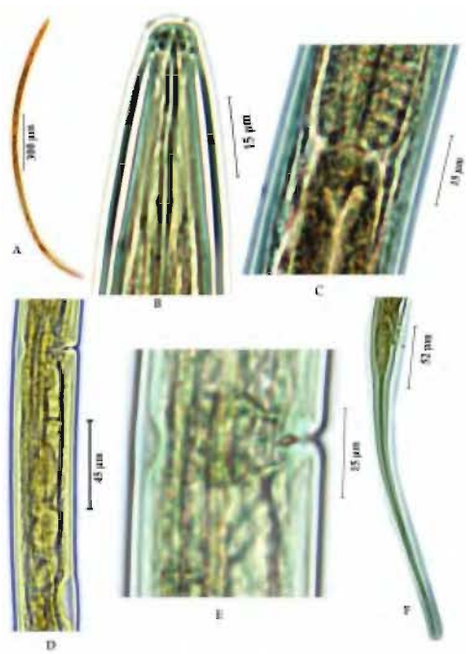

Figure 2. Photomicrographs of *Indodorylaimus asaccatus* sp. n. Female: A. Entire body, B. Anterior body end, C. Pharyngo-intestinal junction showing cardia, D. Mono-opisthodelphic reproductive system without anterior uterine sac, F. Vulval region in enlarged form showing complete absence of anterior uterine sac, F. Tail.

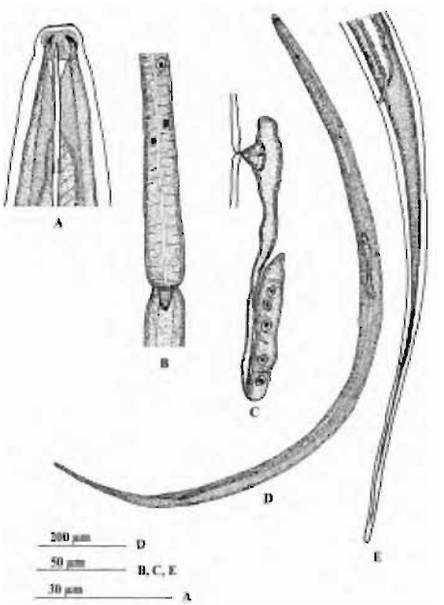

Figure 3. *Indodorylaimus baqrii.* n. Female : A. Anterior body end, B. Part of pharynx, pharyngo-intestinal junction & cardia, C. Mono-opisthodelphic reproductive system with anterior uterine sac, D. Entire body, E. Tail.

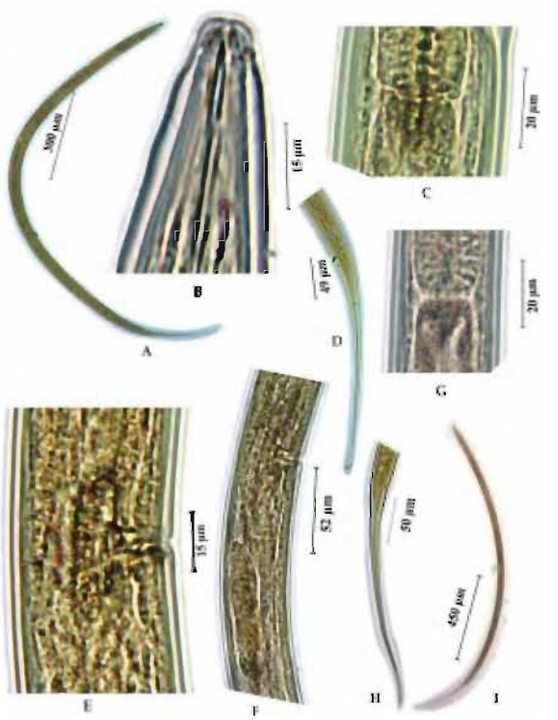

Figure 4. Photomicrographs of *Indodorylaimus baqrii* sp. n. Female: A. Entire body, B. Anterior body end, C. Pharyngo-intestinal junction and cardia, D. Tail, E. Vulva & anterior uterine sac, F. Mono-opisthodelphic reproductive system with anterior uterine sac. Morphological differences of another female: G. Cardia, H. Tail, I. Entire Body shape.

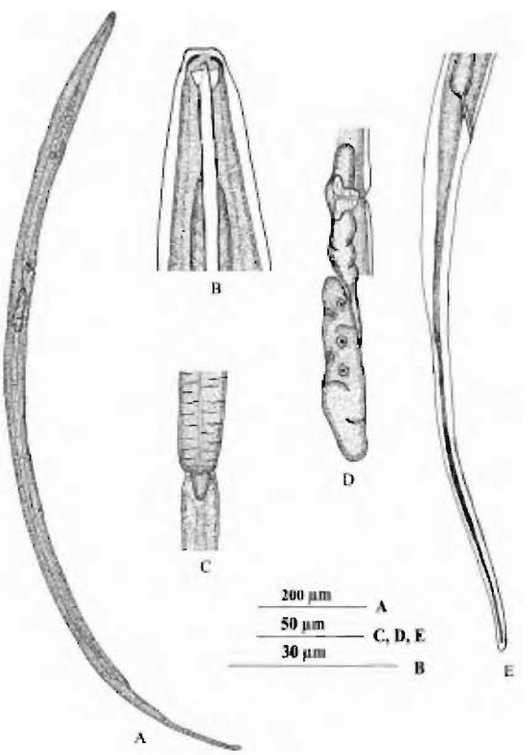

Figure 5. *Indodorylaimus baqrii* n. sp. Another paratype female showing variation in body shape : A. Entire body, B. Anterior body end showing cephalic region, amphid & odontostyle, C. Variation in shape of cardia, D. Monoopisthodelphic reproductive system showing anterior uterine sac, E. Tail.

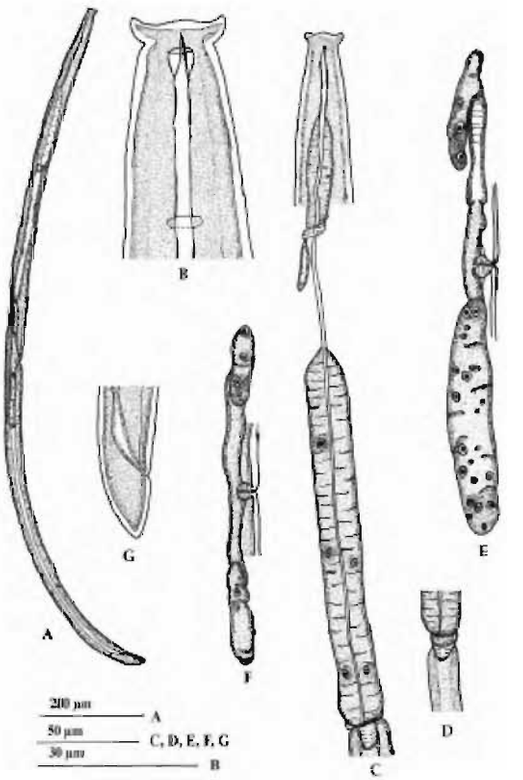

Figure 6. *Discolaimus tenax*. Female. A. Entire body, B. Anterior body end, C. Pharynx showing the pharyngeal gland nuclei, pharyngo-intestinal junction & cardia, D. Different shape of cardia, E & F. Reproductive system, G. Tail.

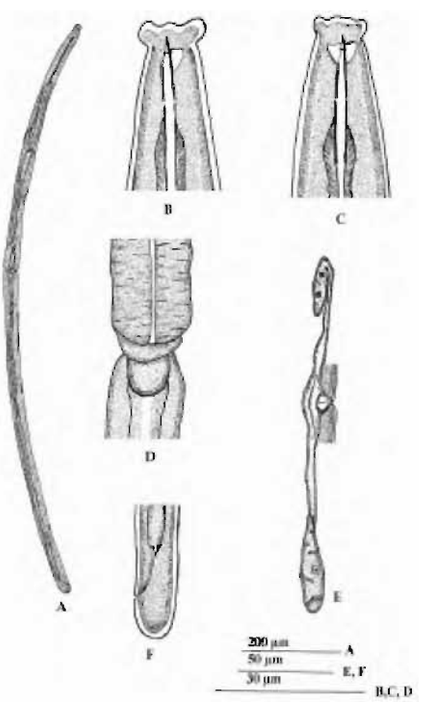

Figure 7. *Discolaimium mazhari*. Female : A. Entire body, B & C. Anterior body end showing lip region, D. Pharyngo-intestinal junction & cardia, E. Reproductive system, F. tail.

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FREE LIVING NEMATODES (ORDER DORYLAIMIDA AND TRIPLONCHIDA) OF WEST BENGAL, INDIA

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INTRODUCTION

Dorylaimid nematodes, associated with different crop plants from West Bengal, India, were comprehensively reported and described by Sukul (1967a; 1972; 1973), Sukul *et al.*, (1975), Baqri and Khera (1975, 1979), Mukherjee and Dasgupta (1981), Baqri. and Jana (1980; 1982 & 1986), Jana and Baqri (1981a & b; 1982; 1984; 1985), Dey and Baqri (1986). Nematodes of jute (Chaturvedi and Khera, 1979) and Paddy (Baqri *et al.*, 1983; Baqri and Ahmad, 2000) have been extensively observed and recorded. Recently, the nematodes associated with guava and litchi plantation in South 24-Parganas district (Sen *et al.*, 2007, 2010, 2011a, b & c; Sen, 2010) and those of banana in West Medinipur district (Gantait, *et al.*, 2009a, b & c; 2010; 2011a & b; Gantait, 2010) have been studied. This has been observed that the nematodes from most of the districts of West Bengal (except Purulia) were reported.

Altogether 119 species under the order Dorylaimida Pearse, 1942 and 2 species under the order Triplonchida Cobb, 1920 have been listed (Table – 1), together with their references (i. e. the publication in which they were first reported or described from West Bengal). The nematodes further may be grouped in to five or six trophic levels; depending on their feeding habits, ranging from saprophytic, mycetophagous, omnivorous, plant parasitic, carnivorous, predatory etc. But such classification is out of scope in the preparation of the present list.

Table – 1 : List of dorylaimoid nematodes from West Bengal

Sl. No.	Group & Species	Habitat (Associated with)	Distribution	Source	Remarks
Order DORYLAIMIDA Pearse, 1942 Suborder DORYLAIMINA Pearse, 1942 Superfamily DORYLAIMOIDEA De Man, 1876 Family DORYLAIMIDAE De Man, 1876 Subfamily Dorylaiminae De Man, 1876					
1	*D. geraerti* Baqri & Jana, 1986	Brinjal,	Spg	Baqri & Jana, 1986	
2	*Dorylaimus bengalensis* Sen et al., 2011	Guava		Sen, et al., 2011	
3	*Dorylaimus* sp. Sen *et al.*, 2011	Guava	Spg	Sen, Chatterjee & Manna, 2011	
4	*D. innovatus* Jana & Baqri, 1982	Paddy Banana	Bar Med	Jana & Baqri, 1982 Gantait et al., 2009	
5	*D. neominimus* Gantait *et al.*, 2009	Banana	Med	Gantait et al., 2009	
6	*D. stagnalis* Dujardin, 1845	Paddy	Mal	Baqri & Ahmad, 2000	
7	*Ischiodorylaimus* sp.	Paddy	Bar	Baqri et al., 1983	

Sl. No.	Group & Species	Habitat (Associated with)	Distribution	Source	Remarks
8	*Ischiodorylaimu novus* Baqri & Jana, 1986	Paddy	Bar	Baqri & Jana, 1986	
	Subfamily LAIMYDORINAE Andrássy, 1969				
9	*Mesodorylaimus mesonyctius* (Kreis, 1930) Andrassy, 1959	Guava	Spg	Sen, et al., 2011	N. R. S.
10	*M. sushili* Gantait *et al.*, 2007	Banana	Med	Gantait et al., 2007, 2009	
11	*Prodorylaimus jihuai* Ahmad & Ahmad, 2001	Banana	Med	Gantait et al., 2009	N. R. C.
12	*P. sukuli* Baksi & Baqri, 1985	Banana	Med	Gantait et al., 2009	
13	*Calodorylaimus andrassyi* Baqri & Jana, 1982	Paddy	Bar	Baqri & Jana, 1982	
14	*C. simplex* Baqri & Jana, 1982	Paddy	Bar, Mal	Baqri & Jana, 1982 Baqri & Ahmad, 2000	
15	*Laimydorus istvani* Sen, *et al.*, 2011	Guava	Spg	Sen, et al., 2011;	
16	*L. baldus* Baqri & Jana, 1982	Paddy, Guava	KBi, Spg	Baqri & Jana, 1982; Sen, et al., 2011	N. R. D.
17	*L. distinctus* Dey & Baqri, 1986	Paddy	KBi	Dey & Baqri, 1986	
18	*Laimydorus minutus* Gantait *et al.*, 2011	Banana	Med	Gantait *et al.*, 2011	
19	*L. oryzae* Dey & Baqri, 1986	Paddy	Dar	Dey & Baqri, 1986	
20	*L. siddiqii* Baqri & Jana, 1982	Paddy Banana	KBi, Mal, Jal Med	Baqri & Jana, 1982; Baqri & Ahmad, 2000; Gantait *et al.*, 2009	
	Subfamily THORNENEMATINAE Siddiqi, 1969				
21	*Thornenema conura* Dey & Baqri, 1986	Paddy	WDj	Dey & Baqri, 1986	
22	*T. elaboratum* Baqri & Jana, 1986	Banana	Dar	Baqri & Jana, 1986	
23	*T. garhwalicum* Srivastava *et al.*, 2003	Banana	Med	Gantait *et al.*, 2009	N. R. S.
24	*T. mauritianum* (Williams, 1959) Baqri & Jairajpuri, 1967	Paddy	Bar, Mal, Jal	Baqri *et al.*, 1983; Baqri & Ahmad, 2000	
25	*T. nodicaudatum* Dey & Baqri, 1986	Paddy	Dar	Dey & Baqri, 1986	
26	*T. novum* Dey & Baqri, 1986	Paddy	Dar	Dey & Baqri, 1986	
27	*T. pseudosartum* Carbonell and Coomans, 1987	Paddy	Mal	Baqri & Ahmad, 2000	
28	*T. shamimi* (Baqri & Jana, 1980) Carbonell & Coomans, 1987 (= syn. Jairajpuria *shamimi* Baqri & Jana, 1980)	Paddy	Bar	Baqri & Jana, 1980	
29	*Sicaguttur coomansi* (Baqri & Jana, 1980) Carbonell & Coomans, 1986	Paddy	Jal	Baqri & Ahmad, 2000	

Sl. No.	Group & Species	Habitat (Associated with)	Distribution	Source	Remarks
30	*S. sartum* Siddiqi, 1971,	Pea	Spg	Baqri & Jana, 1980	
31	*Lagenonema thornei* Gantait *et al.*, 2010	Banana	Med	Gantait *et al.*, 2010	
	Family APORCELAIMIDAE Heyns, 1965 Subfamily APORCELAIMINAE Heyns, 1965				
32	*Aporcelaimellus adoxus* Tjepkema *et al.*, 1968	Grass	Bar	Jana & Baqri, 1981a	
33	*A. amylovorus* (Thorne & Swanger, 1936) Heyns, 1965	Guava	Spg	Sen, 2010	N. R. S.
34	*A. baqrii* Ahmad and Jairajpuri, 1982	Guava	Spg	Sen, 2010	N. R. S.
35	*A. chauhani* Baqri & Khera, 1975	Banana Okra Litchi	Dar Hug Spg	Baqri & Khera, 1975 Jana & Baqri, 1981a Sen, 2010	N. R. D.
36	*A. conicaudatus* (Altherr, 1953) Monteiro, 1970	Banana	Med	Gantait *et al.*, 2009	N. R. C.
37	*A. coomansi* Baqri & Khera, 1975	Banana Paddy, Banana Litchi	Dar Bar Spg	Baqri & Khera, 1975 Baqri *et al.*, 1983, Jana & Baqri, 1981a Sen, 2010	N. R. D.
38.	*A. heynsi* Baqri & Jairajpuri, 1968	Paddy Banana	Bar, Med	Baqri *et al.*, 1983, Baqri & Ahmad, 2000 Gantait *et al.*, 2009	
39.	*A indicus* Baqri and Jairajpuri, 1968	Litchi, Guava	Spg	Sen, 2010	N. R. S.
40	*A. papillatus* (Bastian, 1865) Baqri Khera, 1975	Litchi	Spg	Sen, 2010	N. R. C.
41	*A. subhasi* Gantait *et al.*, 2006	Banana	Med	Gantait *et al.*, 2006, 2009	
42	*A. tritici* (Bastian, 1865) Andrassy, 1986	Litchi, Guava	Spg	Sen, 2010	N. R. C.
43	*A. tropicus* Jana & Baqri, 1981	Paddy	Bar	Jana & Baqri, 1981a Baqri *et al.*, 1983	
44	*Makatinus siddiqi* Gantait *et al.*, 2011	Banana	Med	Gantait *et al.*, 2011	
	Subfamily Sectonematinae				
45	*Sectonema procta* Jairajpuri and Baqri, 1966	Litchi Banana	Spg Med	Sen, 2010 Gantait *et al.*, 2009	N. R. S.
	Subfamily PARAXONCHIINAE Thorne, 1930				
46	*Paraxonchium* sp.	Guava	Spg	Sen, 2010	N. R. S.

Sl. No.	Group & Species	Habitat (Associated with)	Distribution	Source	Remarks
	Family QUDSIANEMATIDAE Jairajpuri, 1965 Subfamily QUDSIANEMATINAE Jairajpuri, 1965				
47	*Labronema digitatum* Sukul *et al.*, 1975	Wheat	Bir	Sukul *et al.*, 1975	
48	*L. glandosum* Rahman *et al.*, 1986	Banana	Med	Gantait *et al.*, 2009	N. R. S.
49	*Thonus confusus* Jana & Baqri, 1982	Paddy	KBi	Jana & Baqri, 1982	
50	*T. garhwaliensis* Ahmad *et al.*, 1986	Banana	Med	Gantait *et al.*, 2009	N. R. S.
51	*Indokochinema ekramullahi* Jana & Baqri, 1982	Potato	Bir	Jana & Baqri, 1982	
	Subfamily CHRYSONEMATINAE Siddiqi, 1969				
52	*Chrysonemoides distinctus* Jana & Baqri, 1985	Cashew nut	Med	Jana & Baqri, 1985	
	Subfamily DISCOLAIMINAE Siddiqi, 1969				
53	*Discolaimus dhanachandi* Gantait *et al.*, 2009	Banana	Med	Gantait *et al.*, 2009	
54	*D. parweizi* Siddiqi, 2003	Banana	Med	Gantait *et al.*, 2009	N. R. C.
55	*D. tenax* Siddiqi, 1964	Guava	Spg	Sen, 2010	N. R. S.
56	*Discolaimium mazhari* Baqri and Jairajpuri, 1968	Guava	Spg	Sen, 2010	N. R. S.
57	*Discolaimoides bulbiferus* (Cobb, 1906) Heyns, 1963	Jute	Bar, Hug, Npg	Chaturvevi & Khera, 1979	
58	*D. teres* Khan & Laha, 1982	Banana	Med	Gantait *et al.*, 2009	N. R. S.
	Family NORDIIDAE Jairajpuri & A. H. Siddiqi, 1964 Subfamily NORDIINAE Jairajpuri & A. H. Siddiqi, 1964				
59	*Longidorella macramphis* (Altherr, 1950) Altherr, 1950	Jute	Hao	Chaturvevi & Khera, 1979	
	Subfamily PUNGENTINAE Siddiqi, 1969				
60	*Kochinema longicaudatum* Jana & Baqri, 1985	Cashew nut	Med	Jana & Baqri, 1985	
61	*Lenonchium oryzae* Siddiqi, 1965	Coconut Paddy	Npg Mal	Jana & Baqri, 1985 Baqri & Ahmad, 2000	
	Subfamily ACTINOLAIMOIDINAE Jairajpuri & Ahmad, 1992				
62	*Oriverutus lobatus* Siddiqi, 1971	Banana	Med	Gantait *et al.*, 2009	N. R. S.
63	*O. parangulatus* Baqri, 1991	Banana	Med	Gantait *et al.*, 2009	N. R. S.

Sl. No.	Group & Species	Habitat (Associated with)	Distribution	Source	Remarks
	Superfamily ACTINOLAIMOIDEA Thorne, 1939 Family ACTINOLAIMIDAE Thorne, 1939 Subfamily NEOCTINOLAIMINAE Thorne, 1939				
64	*Neoactinolaimus* sp.	Paddy	jal	Baqri & Ahmad, 2000	
65	*N. thornei* Chaturvedi & Khera, 1979	Jute Paddy	Npg Bar	Chaturvedi & Khera, 1979 Baqri *et al.*, 1983	
	Subfamily PARACTINOLAIMINAE Thorne, 1967				
66.	*Paractinolaimus aruprus* Khan *et al.*, 1994	Banana	Med	Gantait *et al.*, 2009	N. R. S.
67	*P. girini* Sukul, 1967	Onion	Ban	Sukul, 1967	
68	*P. macrodentatus* Sukul, 1967	Jute	Ban	Sukul, 1967	
69	*P. shamimi* Gantait *et al.*, 2006	Banana	Med	Gantait *et al.*, 2006, 2009	
	Superfamily LONGIDOROIDEA Thorne, 1965 Family LONGIDORIDAE Thorne, 1965 Subfamily LONGIDORINAE Thorne, 1965				
70	*Paralongidorus citri* (Siddiqi, 1959) Siddiqi *et al.*, 1963	Paddy Mango	Bar Jal	Baqri *et al.*, 1983 Jana & Baqri, 1984	Plant-parasitic
71	*P. dorseri* Sukul, 1972	Insectivo-rous plants	Bir	Sukul, 1972	-do-
	Family XIPHINEMATIDAE Dalmasso, 1969 Subfamily XIPHINEMATINAE Dalmasso, 1969				
72	*X. americanum* Cobb, 1913	Jute Litchi	Hao Spg	Chaturvedi & Khera, 1979 Sen *et al.*, 2010	-do- N. R. D.
73	*X. basiri* Siddiqi, 1959	Citrus	--	Mukherjee & Dasgupta, 1980	-do-
74	*X. index* Thorne & Allen, 1950	Citrus	--	Mukherjee & Dasgupta, 1980	-do-
75	*X. insigne* Loos, 1949	Jute	Npg, Hug	Chaturvedi & Khera, 1979	-do-
76	*X. manasiae* Sen *et al.*, 2010	Litchi	Spg	Sen *et al.*, 2010	-do-
	Superfamily BELONDIROIDEA Thorne, 1939 Family BELONDIRIDAE Thorne, 1939 Subfamily BELONDIRINAE Thorne, 1939				
77	*A. amplicolle* Cobb, 1920	Paddy	Jal	Baqri & Ahmad, 2000	
78	*Axonchium* (*Axonchium*) *coomansi* Sen *et al.*, 2011	Litchi Guava	Spg	Sen *et al.*,2011	N. R. D

Sl. No.	Group & Species	Habitat (Associated with)	Distribution	Source	Remarks
	Subfamily DORYLAIMELLINAE Jairajpuri, 1964				
79	*Dorylaimellus andrassyi* Heyns, 1963	Jute	Ban, Med, Nad	Chaturvedi & Khera, 1979	
80	*D. deviatus* Baqri & Jairajpuri, 1969	Paddy	Mal Bar	Baqri & Ahmad, 2000 Baqri *et al.*, 1983	
81	*D. discocephalus* Siddiqi, 1964	Paddy	Bar	Baqri *et al.*, 1983	
82	*D. Indicus* Siddiqi, 1964	Paddy	Mal Bar	Baqri & Ahmad, 2000	
83	*D. projectus* Heyns, 1962	Paddy	Mal	Baqri & Ahmad, 2000	
84	*D. Purvulus* Thorne, 1939	Jute	Ban, Bar, Hug, Med, Nad, Npg	Chaturvedi & Khera, 1979	
	Subfamily SWANGERIINAE Jairajpuri, 1964				
85	*Paraoxydirus gigas* (Jairajpuri, 1964) Jairajpuri & Ahmad, 1979	Paddy	Mal	Baqri & Ahmad, 2000	
	Superfamily TYLENCHOLAIMOIDEA Filipjev, 1934 Fmaily TYLENCHOLAIMIDAE Filipjev, 1934 Subfmaily TYLENCHOLAIMINAE Filipjev, 1934				
86	*Tylencholaimus obscurus* Jairajpuri, 1965	Banana	Med	Gantait *et al.*, 2009	N. R. S.
87	*T. pakistanensis* Timm, 1964	Paddy Banana	Bar Mal Med	Baqri *et al.*, 1983 Baqri & Ahmad, 2000 Gantait *et al.*, 2009	N. R. S.
88	*Discomyctus cephalatus* Thorne, 1939	Paddy	Jal	Baqri & Ahmad, 2000	
	Subfamily MUMTAZIINAE Andrassy, 1976				
89	*Promumtazium elongatum* Ahmad & Jairajpuri, 1984	Banana Med	Med	Gantait *et al.*, 2009	N. R. S.
	Family LEPTONCHIDAE Thorne, 1935 Subfamily LEPTONCHINAE Thorne, 1935				
90	*Proleptonchus clarus* Timm, 1964	Paddy	Bar Mal	Baqri *et al.*, 1983 Baqri & Ahmad, 2000	
91	*P. caudatus* Jairajpuri & Ahmad, 1992 (= syn. *Picarilaimus caudatus* Sukul, 1973)	Bank of big tank of Lalbandh	Ban	Sukul, 1973	
	Subfamily TYLEPTINAE Jairajpuri, 1964				
92	*Tyleptus projectus* Thorne, 1939	Banana Paddy Guava	Jal Jal Spg	Jana & Baqri, 1981b Baqri & Ahmad, 2000 Sen, 2010	N. R. D.

Sl. No.	Group & Species	Habitat (Associated with)	Distribution	Source	Remarks
	Subfamily Belonenchinae Thorne, 1964				
93	*Basirotyleptus minimus* Jana & Baqri, 1981	Paddy	Dar	Jana & Baqri, 1981b	
94	*B. basiri* Jairajpuri, 1964	Paddy	Mal	Baqri & Ahmad, 2000	
	Family MYDONOMIDAE Thorne, 1964 Subfamily Thorne, 1964				
95	*Dorylaimoides arcuicaudatus* Baqri & Jairajpuri, 1969	Paddy	Bar	Baqri *et al.*, 1983	
96	*D. constrictoides* Goseko *et al.*, 1976	Paddy	Mal	Baqri & Ahmad, 2000	
97	*D. elaboratus* Siddiqi, 1965	Paddy	Bar	Baqri *et al.*, 1983	
98	*D. filicaudatus* Jana & Baqri, 1981	Tea Banana	Dar Med	Jana & Baqri, 1981b Gantait *et al.*, 2009	
99	*D. istvani* Dattaray *et al.*, 2010	*Lagenaria vulgaris*	Npg	Dattaray *et al.*, 2010	
100	*D. leptura* Siddiqui, 1965	Onion	KBi	Jana & Baqri, 1981b	
101	*D. loofi* Baqri & Khera, 1979	Banana	Kbi	Baqri & Khera, 1979	
102	*D. micoletzkyi* (De Man, 1921) Thorne & Swanger, 1936	Jack fruit, Pine apple	Kbi	Jana & Baqri, 1981b	
103	*D. modestus* Siddiqi, 1965	Litchi	Jal	Baqri & Khera, 1979	
104	*D. pakistanensis* Siddiqi, 1964	Banana	Kbi	Baqri & Khera, 1979	
105	*D. parateres* Siddiqi, 1964	Grasses Litchi	Kbi Spg	Jana & Baqri, 1981b Sen, 2010	N. R. D.
106	*D. parvus* Thorne & Swanger, 1936	Paddy Guava	Bar Spg	Baqri *et al.*, 1983 Sen, 2010	N. R. D.
107	*D. paulbuchneri* Meyl, 1956	Paddy	Mal	Baqri & Ahmad, 2000	
108	*D. siddiqi* Baqri & Khera, 1979	Litchi	Jal	Baqri & Khera, 1979	
109	*D. subhasi* Jana & Baqri, 1981	Chilli	Hug	Jana & Baqri, 1981b	
110	*Dorylaimoides* (*Dorylaimoides*) sp. Sen, 2010	Litchi	Spg	Sen, 2010	
111	*Morasia bengalensis* Jana & Baqri, 1981	Paddy	Bar	Jana & Baqri, 1981b Baqri *et al.*, 1983	
	Subfamily CALOLAIMINAE Goseco, Ferris & Ferris, 1976				
112	*Miranema gracile* Thorne, 1939	Paddy	Mal	Baqri & Ahmad, 2000	

Sl. No.	Group & Species	Habitat (Associated with)	Distribution	Source	Remarks
	Superfamily NYGOLAIMOIDEA Thorne, 1935 Family NYGOLAIMIDAE Thorne, 1935 Subfamily NYGOLAIMINAE Thorne, 1935				
113	*Aquatides* sp.	Guava	Spg	Sen, 2010	Predator
114	*A. aquaticus* (Thorne, 1930) Thorne, 1974	Banana	Med	Gantait *et al.*, 2009	-do- N. R. S.
115	*Clavicaudoides caudatus* (Jairajpuri, 1964) Ahmad & Jairajpuri, 1982	Guava	Spg	Sen, 2010	-do- N. R. S.
116	*Laevides laevis* (Thorne, 1939) Thorne, 1974	Guava Banana	Spg Med	Sen, 2010 Gantait *et al.*, 2009	-do- N. R. D.
117	*L. paraaquaticus* (Paetzold, 1958) Ahmad & Jairajpuri, 1982	Paddy	Jal	Baqri & Ahmad, 2000	-do-
	Family NYGELLIDAE Andrassy, 1958 Subfamily NYGELLINAE Andrassy, 1958				
118	*Nygellus* sp.	Guava	Spg	Sen, 2010	-do-
	Family AETHOLAIMIDAE Jairajpuri, 1965 Subfamily AETHOLAIMINAE Jairajpuri, 1965				
119	*Aetholaimus indicus* Jairajpuri, 1965	Litchi	Spg	Sen, 2010	-do- N. R. S.
	Order TRIPLONCHIDA Cobb, 1920 Superfamily TROCHODOROIDEA Thorne, 1935 Family TRICHODORIDAE Thorne, 1935				
120	*Paratrichodorus (Atlantodorus) porosus* (Allen, 1957) Siddiqi, 1974	Tea	Dar	Jana & Baqri, 1984	
121	*P. (Nanidorus) renifer* Siddiqi, 1974	Tea	Dar	Jana & Baqri, 1984	

Distribution abbreviated as: Ban = Bankura, Bar = Bardhaman, Bir = Birbhum, Dar = Darjeeling, Hao = Haora, Hug = Hugli, Jal = Jalpaiguri, KBi = Kooch Bihar, Mal = Maldah, Med = Medinipur, Nad = Nadia, Npg = North 24-Parganas, Spg = South 24-Parganas, WDj = West Dinajpur.

New Records abbreviated as: N. R. D. = New record from the district, N. R. S. = New record from the state, N. R. C = New record from the country.

Remark : To arrange the above nematodes in their systematic position, the classification proposed by Jairajpuri and Ahmad (1992) was followed. But some of the free living nematode species, described by Sukul (1967b, 1973), was not accommodated in this classification. So such species have not been listed under their systematic position and are being mentioned separately with their habitats and localities inside parentheses, which are as follows :

1. *Tobrilus vibratus* Sukul, 1967 (soil around the roots of onion, Bankura district.
2. *Nygostylus annulatus* Sukul, 1973 (soil around the roots of ornamental plants of Santiniketan, Birbhum district.

3. *Nygellus brachyuris* Sukul, 1973 (soil around the roots of Sesamum, Bankura district).

4. *Ooinchus setosus* Sukul, 1973 (soil around the roots of rose, Birbhum district).

SUMMARY

119 species belonging to the orders Dorylaimida Pearse, 1942 and 2 species of the order Triplonchida Cobb, 1920, described and reported from different district of West Bengal, has been listed. Most of these are free-living (saprophytic, mycetophagous, omnivorous, carnivorous, predatory etc.) in nature and some are phytophagous. The dorylaimid nematodes associated with jute and paddy was extensively studied by different authors. The nematodes have been reported from almost all the districts except Purulia.

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ACRIDOIDEA (ORTHOPTERA : INSECTA) DIVERSITY OF DUDHWA NATIONAL PARK, UTTAR PRADESH, INDIA

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INTRODUCTION

Dudhwa National Park is spread around 500 sq km along vvilh a buffer area of almost 100 Sq km. Dudhwa National Park is home to one of the finest Sa! forests in India, some of these trees are more than 150 years old and over 70 feet tall. Dudhwa's birds, in particular, are a delight for any avid bird watcher. The marshlands are especially inviting for about 400 species of resident and migratory birds including the Swamp Partridge, Great Salty Woodpecker, Bengal Florican, plenty of painted storks, sarus cranes, owls, barbels, woodpeckers, minuets and many more. Much of the park's avian fauna is aquatic in nature, and is found around Dudhwa's lakes-especially Banke Tal.

Dudhwa National Park is full of mosaic grasslands and dense sal forests to swampy marshes. Dudhwa National park's terrain is as diverse as the wildlife population of it. While the northern edge of the Park lies along the Indo-Nepal border, the River Suheli is in the southern boundary.

Dudhwa National Park is punctuated by extensive stretches of grasslands. The predominant tree species found in the park are *Shorea nobusta, Terminali.s lomentosa, Adinu cordifolia. Eugenia jambolana, Terminalia belericcu Bombax malabaricum* and *JJalbergia sissoo,* and more.

The Acridids popularly known as '"grasshoppers and locusts" constitutes an interesting and agriculturally important group of insects. They are moderate in size, but range from less than 10 mm to 65 mm. The form of body shape, head and thorax are diverse; antennae are filiform but sometimes ensiform; tarsi three segmented; hind femora long, slender and thick towards base and adapted for leaping; wings are either fully developed or reduced or absent; forewings in the form of leathery tegmina; hind wings fan like; male external genitalia complex, symmetrical and concealed, when not in use, by the enlarged ninth abdominal sternum (Subgenital plate).

The most notable work on Indian grasshoppers was made by Kirby (1914). He wrote "Fauna of British India, including Ceylon and Burma". Later on Bolivar (1914, 1918), Uvarov (1921, 1923, 1925, 1927, 1929, 1940, 1940a. 1940b, l942) have also studied the Orthoptera of Indian subcontinent. Willemese (1955) has studied the Orthoptera of Indo-Malayan region. Lateron Dirsh (1954, 1956, 1958), Dirsh & Uvarov (1953). Banerjee & Kevan (I960), Hollis (1965, 1968, 1971, 1975) Mason (1973) and Ritchie (1981, 1982) have taxonomically revised several genera. Tandon and Shishodia (1969, 1976, 1989) have studied Indian grasshoppers from different states. As regards to Acridoidea fauna of Uttar Pradesh, no body has worked out the group from the state.

The present paper deals with 32 species belonging to 2 families and 25 genera. All the species are reported from the National Park for the first time. Four species are recorded for the first time from Uttar Pradesh. Classification followed here is according to Uvarov (1966) and and Shishodia *et al.* (2010).

ABBREVIATIONS USED : Coll. Name of the Collector.

SYSTEMATIC ACCOUNT

Order ORTHOPTERA

Superfamily ACRIDOIDEA

Family 1. PYRGOMORPH1DAE

Subfamily ORTHACRIDTNAE

Genus 1. ***Chrotogonus*** Serville, 1839

1. ***Chrotogous (Clir.) trachypterus trachypterus*** (Blanchard)

1836. *Ommexecha trachypterum* Blanchard, *Annls. Soc. ent. France,* **5**: 618.

1959. *Chrotogonus (Chr.) trachypterus trachypterus* : Kevan, *Publocoes cult. Co. Diam, Angola,* no. **43** : 147.

Material examined : Dudhwa, Bhadrola Kuan, 1 ♂, 2 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1 ♂, 1 ♀, 2.X.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Assam. Bihar, Chhattisgarh, Delhi, Gujrat, Haryana, Himachal Pradesh, Jammu & Kashmir, Madhaya Pradesh, Maharshtra, Meghalaya, Orissa, Punjab, Rajasthan, Sikkim,Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere* : Afghanistan, Bengladesh, Iran, Nepal, Pakisthan.

Remarks : This species is the pest of various types of crops.

Genus 2. ***Atractomorpha*** Saussure, 1862

2. ***Atractomorpha crenulata*** (Fabricius)

1793. *Truxalis crenulata* Fabricius, *Ent. Syst.,* **2** : 28.

1969. *Atractomorpha crenulata:* Kevan and Chen, *Zool. J. Linn. Soc,* **48** : 187.

Material examined : Dudhwa, Bhadrola Kuan, 2 ♂, 3 ♀, 1 ♂, 1.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1 ♂, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Gujrat. Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Lakshadeep Islands, Madhaya Pradesh, Maharshtra, Manipur. Meghalaya, Nagaland, Orissa, Punjab. Rajasthan, Sikkim, Tamil Nadu, Tripura Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere :* Bangladesh, Cambodia, Malaya, Myanmar, Nepal, Pakistan, Sri Lanka, Sumatra, Thailand, Vietnam.

Remarks : It is a common species, generally found near the marshy land.

Family ACRIDIDAE

Subfamily GOMPHOCERINAE

Genus 3. ***Aulacobothrus*** Bolivar, 1902

3. ***Aulacobothrus luteipes luteipes*** (Walker)

1871. *Stenobothrus luteipes* Walker, *Cat. Derm. Salt. Brit. Mus.,* **5** : 82.

1971. *Dnopherula (Aulacobothrus) luteipes* : Jago, *Proc. Acad. Sci. Philad.,* **123** (8): 243.

1993. *Aulacobothrus luteipes luteipes* : Ingrisch, *Enl. Scand.,* **24** (3) :321.

Material examined : Dudhwa. Bhadrola Kuan, 2 ♂, 2 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station. 2 ♂, 4 ♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Madhaya Pradesh, Maharshtra, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura Uttarakhand, Uttar Pradesh and West Bengal. *Elsewhere :* Bangladesh, China, Europe, Japan, Myanmar, Nepal. North America, Pakistan, Sri Lanka, Taiwan and Thailand.

Subfamily ACRIDINAE

Genus 4. *Acrida* Linnaeus, 1758

4. ***Acrida exaltata*** (Walker)

1859. *Truxalis exaltata* Walker, *Ann. Mag. nal. Hist.,* (3) **4**: 222.

1954. *Acrida exalta* : Dirsh, *Bull. Soc. FouadEnt.,* **38** : 149.

Material examined : Dudhwa, Bhadrola Kuan, 2 ♂, 3 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1 ♂, 2 ♀, 2.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 1 ♂, 1 ♀, 30.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab.

Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere* : Afghanistan, Bangladesh, Iran, Pakistan, Saudi Arabia, South East Tibet, Sri Lanka, Yemen and West Aden.

Genus 5. ***Perella*** Bolivar, 1914

5. ***Perella insignis*** Bolivar

1914. *Perella insignis* Bolivar, *Trab. Mus. Cienc. nal. Madr., Madrid.* 20 : 87

Material examined : Dudhwa Railway Station, 2 ♀, 2.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 1 ♂, 30.x.2006 (Coll. N. Sharma & party).

Distribution : Bihar, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Remarks : The species is endemic to India and is not found common in distribution.

Genus 6. ***Phlaeoba*** Stal, 1860

6. ***Phlaeoba infumata*** Brunner

1893. *Phlaeoba infumata* Brunner, *Annali Mus. civ. Stor. Nat. Giacomo Doria,* **33** : 124.

1914. *Phlaeoba ifumata :* Kirby, *Fauna Brit. India. Orthopt.,* : 103.

Material examined : Dudhwa, Near National Park Entry Gate, 2 ♂, 2 ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 1 ♂, 2 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1♂, 1 ♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Haryana, Himachal Pradesh, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal. *Elsewhere* : Bangladesh, East Nepal, Hainan Islands, Myanmar, S. China, South and North Malacca, Tennasserim, Yunnan.

Genus 7. *Orthochtha* Karsch

7. *Orthochtha indica* Uvarov

1942. *Orthochtha indica* Uvarov, *Ann. Mag. Nat. Hist.* (11)9: 587.

Material examined : Dudhwa Railway Station, 2 ♂, 1 ♀, 2.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 1 ♂, 1 ♀, l.x.2006 (Coll. N. Sharma & party).

Distribution : India : Delhi, Himachal Pradesh, Maharashtra, Madhya Pradesh, Meghalaya and Uttar Pradesh.

Remarks : During the recent surveys undertaken in Uttar Pradesh, this species has been collected only from Dudwa National Park. The species is a new record from Uttar Pradesh.

Subfamily OEDIPODINAE

Genus 8. ***Ceracris*** Walker, 1870

8. ***Ceracris nigricornis nigricornis*** (Walker)

1870. *Ceracris nigriocornis* Walker, *Cat. Derm. Salt. Br. Mus.,* 4 : 791.

1923. *Ceracris nigricornis nigricornis* : Uvarov, *Ent. Mitt. Berl.,* 14 : 13.

Material examined : Dudhwa, Near National Park Entry Gate, 2 ♂, 1 ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 1 ♂, 1 ♀, l.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 2 ♂, 1 ♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Arunachal Pradesh, Assam, Bihar, Haryana, Himachal Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal. *Elsewhere :* Afghanistan, Myanmar, South China, Taiwan, Thailand and Vietnam.

Remarks : This species is forest in habitat and is a new record from Uttar Pradesh.

9. ***Ceracris striata*** Uvarov

1924. *Ceracris slriala Uvarov, Ent. Milt.,* **14:** 16.

Material examined : Dudhwa, Bhadrola Kuan, 1 ♂, 2 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 1 ♂, 1 ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1 ♂, 3 ♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution: India : **Arunachal** Pradesh, Himachal Pradesh, Mizoram and Uttar Pradesh. Tripura

Genus 9. ***Aiolopus*** Fieber, 1853

10. ***Aiolopus tlialassinus tamulus*** (Fabricius)

1798. *Gryllus tamulus* Fabricius, *Ent. Syst, Suppl.* : 195.

1968. *Aiolopus thalassinus tamulus* : *Hollis, Bull. Brit. Mus. nat. Hist.* (Ent.), **22** (7): 347.

Material examined : Dudhwa, Near National Park Entry Gate. 2 ♂, 2 ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 1 ♂, 1 ♀, l.x.2006

(Coll. N. Sharma & party); Dudhwa Railway Station, 1 ♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa. Punjab, Rajasthan, Tamil Nadu. Tripura, Uttarakhand, Uttar Pradesh, West Bengal.

Elsewhere : Australia, Bangladesh, Borneo, Celebes, China, Hainan, Hong Kong, Indonesia, Japan, Java, Lombok, Malaysia, Myanmar, New Guinea, Pakistan, Papua, Philippines, Singapore. Sri Lanka, Sumatra, Taiwan, Thailand and Timor.

Remarks : This species is recorded throughout Oriental region and extends upto Australia.

Genus 10. ***Oedaleus*** Fieber, 1853

11. ***Oedaleus abruptus*** (Thunberg)

1815. *Gryllus abruptus* Thunberg, *Mem. Acad. Sci, St.-Petersb.*, **5** : 233.

1981. *Oedaleus abruptus* : *Ritchie, Bull. Brit. Mus. nut. Hist. (Ent),* **42** (3): 104-107.

Material examined : Dudhwa Railway Station, 1 ♂, 2 ♀, 2.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 1 ♂, 1 ♀, 30.X.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 2 ♂, 1 ♀, l.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Bihar, Chhattisgarh, Delhi, Goa, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Grissa, Pondicherry, Punjab, Rajasthan,- Sikkim,Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal.

Elsewhere : Australia, Bangladesh, China, Myanmar, Nepal, Pakistan, Sri Lanka, Sumatra, Taiwan, Thailand and Vietnam.

Genus 11. ***Gastrimargus*** Saussure, 1884

12. ***Gastrimargus*** *africanus africanus* (Saussure)

1888. *Oedaleus (Gastrimargus) marmoratus var. Africana* Saussure, *Mem. Soc. Phys. Hist. nat. Geneve.*, **30** (1): 39.

1910. *Gastrimargus africanus* : Kirby, *Syn. Cat. Orth.*, **3** : 227.

1982. *Gastrimargus africanus africanus* : Ritchie, *Bull. Brit. Mus. nat. Hist. (Ent.),* **44** (4) : 248.

Material examined : Dudhwa, Near National Park Entry Gate, 1 ♂, 30.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 1 ♂, 2 ♀, l.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1 ♂, 1 ♀, 2.X.2006 (Coll. N. Sharma %, party).

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Maharashtra, Meghalaya, Nagaland, Orissa, Rajasthan, Sikkim,Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Africa, Myanmar, Nepal, Pakistan, Saudi Arabia, Sri Lanka, Thailand, Tibet and Yemen.

Genus 12. ***Trilophidia*** Stal, 1873

13. ***Trilophidia annulata*** (Thunber)

1815. *Gryllus annulatus* Thunberg, *Mem. Acad. Sci. St.-Pelersb.*, **5** : 234.

1965. *Trilophidia annulala :* Hollis, *Trans. R. ent. Soc. London.* **117**(8) : 251.

Material examined : Dudhwa, Bhadrola Kuan, 3 ♂, 2 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 2 ♂, 1 ♀, 30.X.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 3 ♂, 2 ♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Rajasthan, Sikkim,Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal.

Elsewhere : Afghanistan, Bangladesh, Borneo, China, Hong Kong, Japan, Java, Korea, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Sarawak, Singapore, Sri Lanka, Sumatra, Taiwan, Thailand and Vietnam.

Genus 13. ***Acrotylus*** Tieber, 1853

14. ***Acrotylus humbertianus*** Saussure

1884. *Acrotylus humbertianus* Saussure, *Mem. Soc. Phys. Hist. nut. Geneve,* **28** (9) : 189.

1914. *Acrotylus humbertianus :* Kirby, *Fauna Brit. India, Orthoptera* : 153.

Material examined : Dudhwa, Near National Park Entry Gate, 1 ♂, 30.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 1 ♂, 1 ♀, 1 .x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Bihar, Chhattisgarh, Delhi, Goa, Haryana, Himachal Pradesh, Lakshadweep Island, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal. *Elsewhere :* Afghanistan, Bangladesh, Nepal, Pakistan, Sri Lanka.

Subfamily SPATHOSTERN1NAE

Genus 14. ***Spathosternum*** Krauss, 1877

15. ***Spathosternum prasiniferum prasiniferum*** (Walker)

1871. *Heteracris (?) prasinifera* Walker, *Cat. Derm. Salt. Brit. Mm.*, 5 Suppl.: 65.

1936. *Spathosternum prasiniferum prasiniferum* : Tinkham, *Lingman. Sci. Journ. Canton*, **15** : 51.

Material examined: Dudhwa, Bhadrola Kuan, 2 ♂, 5 ♀, 1 .x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 3 ♂, 2 ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 10 ♂, 9 ♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhnd, Uttar Pradesh and West Bengal.

Elsewhere : Bangladesh, Hainan, Myanmar, Nepal, Pakistan, South East China, Sri Lanka, Thailand, Vietnam and West Malaysia.

Remarks : The species is found almost throughout India and is associated with the grassy habitats.

Subfamily **OXYINAE**

Genus 15. ***Gesonula*** Uvarov, 1940

16. ***Gesonulapunctifrons*** (Stal)

1860. *Acridium (Oxya) punctifrons* Stal, *Kongl. Freg. Eug. Resa. Omkring Jor den, Insects* : 336.

1951. *Gesonula punctifrons :* Mischenko, *Locusts and grasshoppers of USSR and Adjacent countries*, Catantopinae : 172

Material examined : Dudhwa, Near National Park Entry Gate, 2 ♂, 1 ♀, 30.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi. Goa, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal.

Elsewhere : Bangladesh, Borneo, China, Hainan, Japan, Java, Kalimantan, Malacca, Myanmar, Philippines, Sri Lanka, Sumatra, Taiwan, Thailand and Vietnam.

Genus 16. ***Oxya*** Serville, 1831

17. ***Oxya fuscovittata*** (Marschall)

1836. *Gryllus fuscoviiiatus* Marschall, *Annln. Wien. Mus. Naturg.*, 1:211.

1971. *Oxya fuscovittata* : Hollis, *Bull. Brit. Mus. nat. Hist.* (Ent), **26** (7) : .289.

Material examined : Dudhwa, Bhadrola Kuan, 1 ♂, 1 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 2 ♂, 1 ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1 ♂, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Himachal Pradesh, **Jarnmu** & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhnd, Uttar Pradesh and West Bengal.

Elsewhere : Afghanistan, Bangladesh, Nepal, Pakistan and USSR.

18. ***Oxya hyla hyla*** Serville

1831. *Oxya hyla* Serville, *Amis. Sci. nat.* (zool), **22** : 287.

1971. *Oxya hyla hyla :* Hollis, *Bull. Brit. Mus. nat. Hist.* (Ent), **26** : 282.

Material examined : Dudhwa, Near National Park Entry Gate, 2 ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 2 ♂, 1 ♀, l.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1♂, 1 ♀, 2.X.2006 (Coll. N. Sharma & party).

Distribution : India : Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Gujrat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab,

Rajasthan, Sikkim,Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Afghanistan, Africa, Angola, Bangladesh, Madagascar, Tanzania, Uganda, Zaire, Zambia, Ghana, Guinea, Iran, Kenya, Liberia, Nepal, Pakistan, Persia and Sri Lanka.

19. ***Oxya nitidula*** (Walker)

1870. *Acrdium nitidula* Walker, *Cat. Derm. Salt. Brit. Mus.*, **4** : 631.

1971. *Oxya nitidula* : Hollis, *Bull. Bri. Mus. nat. Hst. (Ent.)*, **26** (7): 315.

Material examined : Dudhwa, Bhadrola Kuan, 2 ♂, 1 ♀, l.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 1 ♀, 30.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Bihar, Chhattisgarh, Goa, Karnataka, Kerala, Madhya Pradesh, Manipur, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura and West Bengal.

Elsewhere : Sri Lanka.

Remarks : During recent surveys undertaken in Uttar Pradesh, this species has been only collected from Dudhwa National Park. The species is a new record from Uttar Pradesh.

20. ***Oxya velox*** (Fabricius)

1787. *Gryllus velox* Fabricius, *Mantissa Insectorum*, **1**:239.

1971. *Oxya velox* : Hollis, *Bull. Brit. Mus. nat. Hist. (Ent.)*, **26** (7): 297.

Material examined : Dudhwa, Bhadrola Kuan, 2 ♂, 1 ♀, 1.x.2006 (Coll. N. Sharma & party). Dudhwa, Near National Park Entry Gate, 1 ♂, 30.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar. Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Rajasthan, Sikkim,Tamil Nadu, Tripura. Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Bangladesh, China, Myanmar, Pakistan, Singapore, Sri Lanka and Thailand.

Subfamily COPTACRIDINAE

Genus 17. ***Eucoptacra*** Bolivar, 1902

21. ***Eucoptacra praemorsa*** (Stal)

1860. *Acridium (Calantops ?) praemorsum* Stal, *Kpnjgl. Freg. Eug. Resa. Omkring Jor den.Insects* : 330.

1914. *Eucoptacra praemorsa* : Kirby. *Faun Brit. Idia, Orihoptera (Acrididae)* : 240.

Material examined : Dudhwa Railway Station, 1 ♂, 1 ♀, 2.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 2 ♂, 1 ♀, l.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 1 ♂, 30.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Sikkim,Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal. *Elsewhere* : China, Myanmar, Taiwan and Tenasserim.

Subfamily CYRTACANTHACRIDINAE

18. Cyrtacanthacris Walker, 1870

22. ***Cyrtacanthacris tatarica*** (Linnaeus)

1758. *Gryllus Locusta talaricus* Linnaeus, *Systema Naturae (l()'h ed.):* 432.

1923. *Cyrtacanthacris tatarica* : Uvarov, *Bull. Eni. Res.*, **14:** 39.

Material examined : Dudhwa, Near National Park Entry Gate, 2 ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1 ♂, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Rajasthan, Tamil Nadu, Tripura, Uttarakhand. Uttar Pradesh and West Bengal.

Elsewhere : Africa, Bangladesh, Central America, Hainan, Indonesia. Madagascar, Mediterranean Region, Myanmar, Nepal, Pakistan, Philippines, Saudi Arabia, Seychelles. Sri Lanka, South West Asia, Sumatra and Thailand.

Subfamily EYEPREPOCNEMIDINAE

Genus 19. ***Eyprepocnemis*** Fieber, 1853

23. ***Eyprepocnemis alacris alacris*** (Serville)

1839. *Acridium alacre* Serville, *Hist. Nat. Ins. Orth.,:* 682.

1958. *Eyprepocnemis alacris alacris* : Dirsh, *Proc. R. ent. Soc. London,* (B) **27** (3-4): 40.

Material examined : Dudhwa, Bhadrola Kuan, 2 ♂, 1 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa,

Near National Park Entry Gate, 1 ♂, 30.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1♂, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Haryana, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharastra, Manipur, Meghalaya, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal. *Elsewhere* : Afghanistan, Bangladesh, Iran, Iraq. Pakistan and Sri Lanka.

Remarks : This species is widely distributed in India.

24. ***Eyprepocnemis roseus*** Uvarov, 1942

1942. *Eyprepocnemis rosesus* Uvarov, *Ann. Mag. not. Hist.*, 9(11): 597.

1958. *Eyprepocnemis rosea* : Dirsh, *Proc. R. ent. Soc. London,* (8) **27**(3-4): 42.

Material examined : Dudhwa, Near National Park Entry Gate, 1 ♂, 30.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 2 ♂, 1 ♀,1.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Haryana, Andhra Pradesh, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Meghalaya, Uttarakhand and Uttar Pradesh. *Elsewhere* : Bangladesh, Myanmar, Pakistan and Thailand.

Genus 20. ***Heteracris*** Walker, 1870

25. ***Heteracris pulchra*** (Bolivar)

1902. *Euprepocnemis pulchra* Bolivar, *Annls. Soc. ent: France,* 70: 630. 1958. *Heteracris pulchra :* Dirsh, *Tijdschr. Ent.*, **101 :** 54.

Material examined : Dudhwa, Near National Park Entry Gate, 1 c5\ 30.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Bihar, Delhi, Orissa, Tamil Nadu, Uttarakhand and West-Bengal. *Elsewhere* : Sri Lanka.

Subfamily CATANTOPINAE

Genus 21. ***Choreodocus*** Bolivar, 1914

26.***Choroedocus robustus*** (Serville)

1839, *Acridium robustus* Serville, *Ins. Orth.*, 647.

1921. *Choreodocus robustus* : Uvarov, *Trans, ent. Soc Land.* (69) : 109.

Material examined : Dudhwa, Bhadrola Kuan, 1♂, 1 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 2 ♂, 1 ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 2 ♂ 2.x.2006 (Coll. N. Sharma & party).

Distribution : Haryana, Arunachal Pradesh, Andhra Pradesh, Assam, Haryana, Himachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Tripura, Uttar Pradesh and West Bengal. *Elsewhere :* Bangladesh.

27. ***Choroedocus illustris*** (Walker)

1870. *Heteracris illustris* Walker, *Cat. Derm,. Salt. Brit. Mm.*, **4** :622, 623.

1921. *Choreodocus illustris* : Uvarov, *Trans. R. ent. Soc. London,* **69** (1&2) : 109.

Material examined : Dudhwa Railway Station, 2♂, 1 ♀, 2.x.2006 (Coll. N. Sharma & parly); Dudhwa, Bhadrola Kuan, 4 ♂, 3 ♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 1 ♂, 2 ♀, 30.x.2006 (Coll. N. Sharma & party).

Distribution : Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu and Uttarakhand. *Elsewhere :* Bangladesh.

Remarks : The species is a new record from Uttar Pradesh.

Genus 22. ***Eupreponotus*** Uvarov, 1921

28. ***Eupreponotus inflatus*** Uvarov

1921. *Eupreponotus inflatus* Uvarov, *Ann. Mag. nut. Hist.*, (9)7: 508.

Material examined : Dudhwa, Bhadrola Kuan, 2 ♂, 2 ♀, 1.x.200.6 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 1 ♂, 2, ♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1 ♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Orissa, Uttarakhand, Uttar Pradesh, and West Bengal.

Genus 23. ***Diabolocatantops*** Jago, 1984

29. ***Diabolocatantops innotabilis*** (Walker)

1870. *Acridium innotabile* Walker, *Cat. Derm. Salt. Brit. Mus.*, **4** : 629.

1953. *Catantops pinguis innotabilis* : Dirsh and Uvarov, *Tijdsch. Ent.*, **96** (3) : 233.

1984. *Diabolocatanlops innotabilis,* Jago, *Trans. Amer. Enlomal. Soc,* **110** (3) : 371.

Material examined : Dudhwa, Near National Park Entry Gate, 2♂, 30.x.2006 (Coll. N. Sharma & party); Dudhwa, Bhadrola Kuan, 2♂, 1.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1♂, 1♀, 2.X.2006 (Coll. N. Sharma & party).

Distribution : India : Haryana, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Lakshadweep Island, Madhya Pradesh, Maharastra, Manipur, Meghalaya, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Afghanistan, Bangladesh, Borneo, Cambodia, China, Hong Kong, Indo-China, Japan, Java, Korea, Malaysia, Myanmar, Nepal, New Guinea, Pakistan, Philippines, Sri Lanka, Sumatra, Tibet and Thailand.

Genus 24. ***Xenocatantops*** Dirsh and Uvarov, 1953

30. ***Xenocatantops humilis humilis*** (Serville)

1839. *Acridium humile* Serville, *Ins. Orth.*, : 662.

1953. *Xenocatantops humilis humilis* : Dirsh, & Uvarov, *Tijdschr. Ent.*, **96:** 237.

Material examined : Dudhwa, Bhadrola Kuan, 8♂, 5♀, 1 .x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 2♂ 1♀, 30.x.2006 (Coll. N. Sharma & party); Dudhwa Railway Station, 1♂, 1♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andaman and Nicobar Islandas, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharastra, Manipur, Meghalaya, Mizoram. Nagaland, Sikkim,Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Bangladesh, Borneo, Indo-China, Java, Lombock, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Sumatra, Thailand, Tibet. Vietnam and Yunan.

31 ***Xenocatantops karnyi*** (Kirby)

1910. *Catantops karnyi* Kirby, *Syn. Cat. Orthopt.*, **3** : 483.

1982. *Xenocatantops karnyi* : Jago, *Tram. Am. ent. Soc*, **108** (3): 455.

Material examined : Dudhwa Railway Station, 2♂, 1♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Delhi, Himachal Pradesh, Maharastra, Orissa, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh. *Elsewhere* : Nepal.

Genus 25. ***Stenocatantops*** Dish and Uvarov

32. ***Stenocatantops splendens*** (Thunberg)

1815. *Gryllus splendens* Thunberg, *Mem. Acad. Sci. St.-Petersh.*, **5** : 236.

1953. *Stenocatantops splendens* : Dirsh and Uvarov, *Tijschr. Ent.*, **96** (3): 237.

Material examined : Dudhwa, Bhadrola Kuan, 1♂, 5♀, 1.x.2006 (Coll. N. Sharma & party); Dudhwa, Near National Park Entry Gate, 1♂, 2♀, 30.x.2006 (Coll. N. Sharma & party): Dudhwa Railway Station, 2♀, 2.x.2006 (Coll. N. Sharma & party).

Distribution : India : Andaman and Nicobar Islandas, Arunachal Pradesh, Assam, Bihar. Chhattisgarh, Delhi, Karnataka, Kerala, Madhya Pradesh, Maharastra, Manipur, Meghalaya, Nagaland, Orissa, Sikkim,Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal. *Elsewhere :* Borneo, China, Celebes, Hainan, Java, Korea, Malaysia, Moluccas Island, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Sumatra, Taiwan, Thailand, and Vietnam.

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ON A NEW TREMATODE PARASITE *EPISTHMIUM SOLANENSIS* N. SP. (ECHINOSTOMATIDAE : ECHINOSTOMATINAE) FROM A BIRD HOST, *BUBULCUS IBIS COROMANDUS* BODDAERT FROM SOLAN, HIMACHAL PRADESH, INDIA

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INTRODUCTION

Birds show a good number of trematode infection in their internal organisms which may not fatal to them, parasitized with symbiotic effect. Nine examples of Bulbul, *Bubuicus ibis coromandus* Boddaert were caught by mist net at Solan Camp during the faunal exploration. Out of which two were been dissected out to examine the faunal biodiversity of helminthes infection, rest were allowed to fly again to the sky. Three trematodes were collected from two , Abird hosts and are identified as *Episthmium (soianensis)*, which are new to science.

MATERIAL AND METHOD

Materials were collected in normal saline{4%), narcotized in 70% alcohol. Stained with borax carmine; measurements are in this communication are in mm.

SYSTEMATIC POSITION

Family ECHINOSTOMATIDAE Poche, 1925

Subfamily ECHINOSTOMATIDAE Faust, 1929

Genus ***Episthmium*** Luhe, 1909

Episthmium solanensis n. sp. (Fig. 1)

Details of Host : Bubuicus ibis coromandus (Boddaert); ***Location*** : Intestine; ***Locality*** ; Solan, *Himachal Pradesh*, India; ***Date of collection*** : 27th March, 2011; ***Collector*** : S. Chakrabarti & Party.

Body of the fluke elongate , 2.688-4.64 in length and 0.656-1.194 in maximum width attained at the level of the acetabulum; cuticle stunned with spines

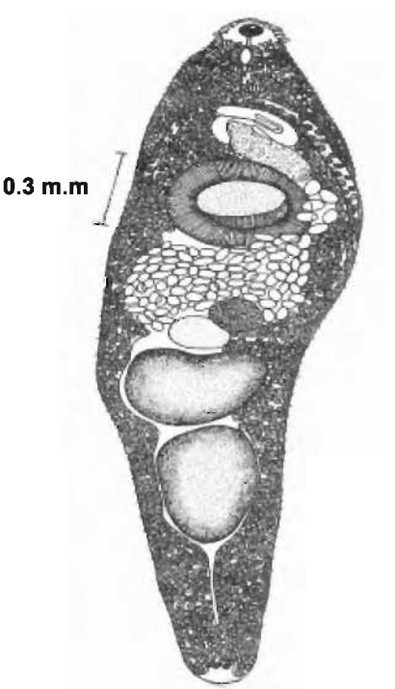

Fig. 1. *Episthmium solanensis* n.sp from *Bubulsus ibis coromandus* of Solan, Himachal Pradesh; holotype, Dorsal view.

which are backwardly directed ; head collar (Fig. 2) reniform with a / crown of 24 spines, dorsally interrupted, there are twelve spines on each side with four forming the corner spines; oral sucker sub-terminal, 0.08-0.096 in diameter; prepharynx small, pharynx well developed, 0.112-0.16 x 0.128-0.16, esophagus small, bifurcates into caeca in front of acetabulum; caeca almost to posterior end of body; acetabulum much larger than oral sucker

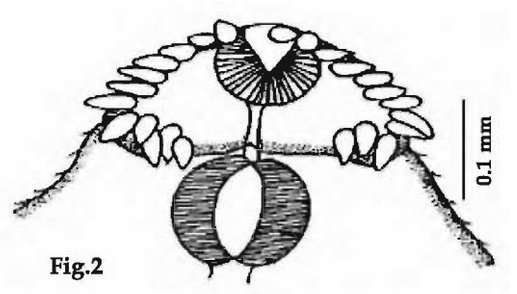

Fig. 2. Same , collar.with spines.

and 0.4- 0.56 x 0.368-0.544, fore body 0.528-0.96, approximately 1 /5th of body length. Testes large, smooth, situated in posterior half of body, anterior one transeversely elongate and posterior one longitudinally elongate, 0.335-0.672 x 0.368-0.688 and 0.448-0.8x0.32-0.528 respectively; cirrus sac (Fig. 3) is strongly muscular, 0.8-1.12x0.112-0.128 , lies dorsal to acetabulum, overlapping its anterior half; seminal vesicle occupying the major portion of cirrus sac, is bent on itself, thereby giving a bipartite appearance; pars prostatica small and opens into the cirrus; genital pore lies immediately in front of acetabulum in the median line; cirrus eversible.

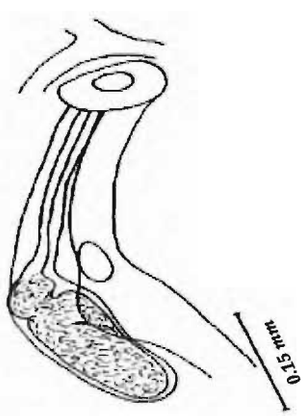

Fig. 3. Same , showing the terminal genitalia.

Ovary small, almost round, placed slightly towards right side anterior to testis, 0.16-0.24x0.16-0.272; receptaculum seminis absent; vitellaria profusely developed extending in lateral fields as far forward as pharynx, usually confluent across median line anterior to genital pore and posterior to testes; uterus occupying the intercaecal space between ovary and acetabulum; eggs oval, *operculate*, 82-54 μ ; excretory vesicle not observed.

DISCUSSION

Luhe, 1909 created the Genus *Episthmium* designating *E.africanum* as its type but the generic status of the genus *Episthmium* Luhe, 1909 has been a matter of controversy. It was considered as a synonym of *Echinochasmus* Dietz, 1909 by Odhner, 1910, Nicoll, 1914, Bhalerao, 1926, Mendhiem, 1943 and Dawas, 1946. Baschkirova, 1941 has considered this genus as a subgenus of *Echinochasmus* but it has been considered as a separate genus by

Luhe,1909, Travassos, 1938, Shigin, 1958, Yamaguti, 1958, Sulgostowska, 1960, Rai, 1963, Odening, 1963, Hodasi, 1967, Karyakarte, 1969 and Gupta et Mehrotra, 1971. In the present study the view that Episthmium as separate genus has been taken.

At present the genus *Episthmium* Luhe, 1909 comprises the following valid species recorded so far from the bursa fabricii or intestine of birds are shown in Table : I

Yamashita, 1937 and Szidat, 1940 suggested that *E. africanum* is identical with *E bursicola*. Yamaguti, 1971 suggested that the contrary seems true because in *E.africanum* the post testicular area is much bigger and the eggs are much larger.

The present species resembles with *E. africanum* (Stiles.1901) Luhe, 1909 in general structure and appearance but differs from it in having a long cirrus sac, larger testes, shorter post ovarian space and the tapering hind body. Eggs are larger and more numerous in the present form.

SUMMARY

Present study deals with eleven valid species under the genus *Episthmium* Luhe, 1909 and with a new creature which is unique in feature and seems as new to science. Three examples of that were collected from Solan, Himachal Pradesh, so it is described as *Episthmium solanensis* n. sp.

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Table: I

Sl. No.	Name of the parasite	Diagnostic characters	Host	Location of the parasite in their host
01	*E.africanum* (Stiles, 1901) Luhe, 1909	3.3-4.0x0.7-0.8 22 collar spines	*Milvus parasiticus* *Numidaptilo rhyncha*	Intestine Bursa fabncii
02	*E.bursicola* (Creplin,1837) Luhe, 1909	2.96x0.75 22 collar spines	*Circaetus gallicus* *Ardea cinerea* *Ardea purpurea*	Intestine Bursa fabricii
03	*E.chauhani* Rai, 1962	2.68-4.12x0.92 -1.56 24 coilar spines	Bubulcas ibis	Bursa fabricii
04.	*E.gaiiinum* Tubangui et Musilungan,1941	1.1x0.4	*Gailus gailus domesticus*	Intestine
05.	*E.ghanense* Hodasi,1967	1.4-2.4x0.4-0.5	*Gailus gailus domesticus*	Intestine
06	*E.intermedium* Skrjabin,1919	2.68-3.48x0.88-1.04 24 coilar spines	*Batauria aeruginosus*	Bursa fabricii
07	E.mathevossianee(Shakhtaktinskia, 1953) Sulgostowska, 1960	1.65-1.85X0.56-0.58	*Coiymbus* cristatus, *Natta rufinaAythya fuliguia*	Bursa fabricii
08	*E.oscari* Travassos, 1922	6x2	*Galius domesticus*	Intestine
09	*E.prosthovitellatum* (Nicoll, 1914) Price,1931	2.0-2.4x0.75-0.9 24 collar spines	*Hyeracidea* sp.	Intestine
10.	*E.proximum* Travassos, 1922	7x2	*Ardea cocoi* *Euxenuramaguari* sp.	Bursa fabricii
11.	*E. skrjabini* (Oshmarin et Skrjabin,1947) Skrjabin et Baschkirova,1956	0.79x0.306 22 collar spines	*Coiymbus stellatus*	Intestine
12	*E. solanensis* (Present species)	2.688-4.64x 0.656-1.194 24 collar spines	*Bubulcus ibis coromondus*	Intestine

Table: II : Comarison between *E. africanum* (Stiles, 1901) Luhe, 1909 and *E. solanensis* (present species

Sl. No	Name of the Parasite	Length of the parasite	Width of the parasite	No of collar spines	Length and nature of the cirrus sac of the parasite	Length and width of the testes of the parasite	Measurement of the post ovarian space of the parasite	Eggs of the para site
01	*E. africanum* (Stiles, 1901) Luhe, 1909	3.3-4.0	0.7-0.8	22	Mucular 0.4-0. 9x 0.01-0.11	0.221-0.421 x0.214-0.413 & 0.243-0.4 x0.11-0.22	0.82	64-34u
02	*E. solanensis* n. sp	2.688-4.64	0.656-1.194	24	Strongly muscular 0.8-1. 12x 0.112-0. 128	0.335-0.672x 0.368-0.688 &0.448-0.8x 0.32-0. 528	0.43	82-54u

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ABORICHTHYS WAIKHOMI, A NEW SPECIES OF FISH (TELEOSTEI : NEMACHEILIDAE) FROM ARUNACHAL PRADESH, INDIA

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INTRODUCTION

The fishes of the genus *Aborichthys* Chaudhuri are small loaches generally found in torrential hill streams in the Darjeeling Himalayas, north eastern India and upper Myanmar. They are characterized in having elongated and compressed body; anus situated far forwards; pelvic fins extend considerably beyond the anal opening; dorsal fin inserted slightly behind pelvic fins; oblique narrow stripes on body; rounded caudal fin, which is usually marked with concentric black rings and a black spot at the upper corner of caudal base (Chaudhuri, 1913; Hora, 1925). While describing *Aborichthys rossamai*, Sen (2009) remarked that it is very much similar to genus *Schistura* McClelland and except for the forward position of the anus other characters of the genus are lacking in it. Menon (1987) considered *Aborichthys* as a subgenus of *Noemacheilus* van Hasselt. However, Talwar and Jhingran (1991), Jayaram (1999) and Viswanath *et al.* (2007) considered *Aborichthys* as valid genus. So far five species are described under the genus. They are *A. kempi*, *A, elongatus*, *A. garoensis*, *A. tikaderi* and *A. rosammai*. During field survey conducted by the Zoological Survey of India in the Namdapha National Park and Tiger Reserve, Arunachal Pradesh in 2009, six specimens of an undescribed *Aborichthys* were collected from the hill streams of Noa-Dihing river (Figs. 1-2). The species is herein described as *Aborichthys waikhomi* sp. nov.

MATERIALS AND METHODS

The specimens were preserved in 10% formalin. Measurements and counts followed Jayaram (1999). Measurements were made to the nearest 0.1 mm on the left side of specimens whenever possible. The type specimens are deposited in the Zoological Survey of India at Estuarine Biology Regional Centre, Gopalpur-on-Sea and Arunachal Pradesh Regional Centre, Itanagar. Abbreviations used are: HL, Head length; EBRC/ZSI/F, Estuarine Biology Regional Centre/Zoological Survey of India/Fish; Max, Maximum; Min, Minimum; *n*, number of specimens examined; SD, Standard deviation; SL, Standard length; V/APRC/ZSI/P, Vertebrate/Arunachal Pradesh Regional Centre/ Zoological Survey of India/Pisces.

Aborichthys waikhomi sp. nov
(Figs. 3-4)

Material Examined : Holotype; 65.0 mm SL, India, Arunachal Pradesh, Bulbulia stream near Bulbulia, a tributary of Noa-Dihing river, Namdapha, (27°31'56.4"N; 96°27'32.2"E), 06-xi-2009, coll. J.K. De and Party (EBRC/ZSl/F-7414). *Paratypes:* 2 ex., 59.0-68.0 mm SL, same data as Holotype (V/APRC/ZSI/P-519); 3 ex,, 61.0-66.5 mm SL, India, Arunachal Pradesh, a stream of Noa-Dihing river near Hornbill camp, Nampdapha, Arunachal Pradesh, India (27°32'25.48"N; 96°26'35.34"E), 05-xi-2009, coll. J.K. De and Party, (EBRC/ZSI/F-7415).

Present Address : Zoological Survey of India, 27, J. L. Nehru Road, Kolkata 700 016

Diagnosis : A species of *Aborichthys* distinguished from its congeners by the combination of the following characters: 12-16 oblique black bands, narrower than interspaces at caudal peduncle; anus situated closer to caudal fin base than to tip of snout; dorsal fin insertion equidistant between snout tip and base of caudal fin; barbels much longer than eye diameter; incomplete lateral line terminating before pelvic fins; truncated caudal fin with irregular black blotches; a distinct black blotch on upper angle of caudal fin base.

Description : Morphometric data are given in Table 1. Body elongated and compressed. Head depressed, longer than caudal fin. Snout slightly rounded. Eye small, situated on dorsal side, not visible from ventral surface, its diameter smaller than interorbital space. Mouth inferior, semicircular; lips fleshy, upper lip continuous, lower interrupted in middle. Nostrils close to each other, closer to eye than tip of snout. Barbels three pairs; well developed, longer than eye diameter. Scale minute, embedded; lateral line incomplete, terminating before the origin of pelvic fin. Anus situated distinctly nearer to base of caudal fin than the snout tip. All fins greatly removed from one another. Dorsal fin small, with 2 simple and 7 branched rays, devoid of a spine, less than length of head; origin of dorsal fin equidistant between snout tip and caudal base. Pectoral with one simple and 9-10 branched rays, shorter than head. Pelvic fin with one simple and 6 branched ray, shorter than pectoral; its origin slightly in front of dorsal fin origin, extending considerably beyond anal opening. Anal fin base short, with 2 simple and five branched rays not reaching base of caudal, r Caudal fin with 15-16 branched rays, more or less truncated (Fig. 5f).

Colour : Body yellowish with 12 to 16 black oblique bands directed backwards from occiput to caudal base usually forked in front of dorsal fin, narrower than interspaces on caudal peduncle region. Upper surface and sides of head marked with irregular black blotches. Dorsal fin with 2 or 3 irregular series of spots; pectoral and pelvic fins with few black markings; anal dull white; caudal fin with irregular black blotches; upper extremity of caudal base marked with a distinct broad black spot. In life dorsal and caudal fins orange.

Distribution : Presently known from streams of Noa-Dihing river, upper Brahmaputra basin in the Namdapha National Park and Tiger Reserve, Changlang district, Arunachal Pradesh, India (Figs. 1-2).

Etymology : Named for Prof. Waikhom Vishwanath, Manipur University in acknowledgement of his encouragement at this work.

Discussion : *Aborichthys waikhomi* is similar to *A. elongatus* and *A. kempi* in having vent situated distinctly nearer to caudal fin base than snout tip and a black blotch at upper end of base of caudal fin. However, it can be easily distinguished from the *A. elongatus* in having 12-16 oblique black bands on body from occiput to the caudal base alternating with broader interspaces in the caudal peduncle (vs. only posterior part of body marked with several broad bands, alternating with narrower interspaces), truncated caudal fin with irregular black blotches (vs. rounded with 2 short whitish bands in the middle), incomplete lateral line (vs. complete), barbels longer than eye diameter (vs. more or less equal), longer pectoral fins and more forward position of anus (Table 2). It is distinguished from *A. kempi* in having truncated caudal fin with irregular black blotches (vs. rounded with two broad black concentric curves), 12-16 oblique bands on body (vs. 18 to 21), more distinct bands on posterior-third of body (vs. indistinct), longer head; anus more nearer to caudal fin base than snout and more posteriorly placed pelvic and anal fins (Table 2). The new species is similar with *A. rosammai* in having a truncated caudal fin and anus situated distinctly nearer to caudal fin base than snout tip. However, it differs from the latter in having irregulars black blotches on caudal fin (vs. dull white), 12-16 black bands on body (vs. 10-11), a black spot at upper end of base of caudal fin (vs. absent), smaller eye (diameter 14.1-17.8% of HL vs. 20.0-25.0), incomplete lateral line (vs. complete) and more anteriorly placed pelvic and anus (Table 2). *A. waikhomi* can be easily distinguished from *A. garoensis* and *A. tikaderi* in having anus situated distinctly nearer to caudal fin base than snout tip (vs. nearer to snout tip), dorsal fin origin equidistant between snout tip and caudal fin base (vs. nearer to snout tip) and truncate caudal fin (vs. rounded).

All the known species of *Aborichthys* are endemic in theBrahmaputra drainage except A. *kempi* which was reported from the Putao plains in upper

Table 1 : Morphometric data of holotype (EBRC/ZSIF-7414) and 5 paratypes (V/APRC/ZSI/P-519; EBRC/ZSIF-7415) of *Aborichthys waikhomi* sp. nov.

	Range				
	Holotype	Min.	Max.	Mean	SD
Standard Length (mm)	65.0	59.0	68.0	64.1	3.4
In % of standard length					
Head length	21.5	21 0	22.0	21.4	0.39
Body depth	12.8	12.8	15.8	14.6	1.15
Caudal penduncle length	16.9	16.9	18.8	17.6	0.69
Caudal penduncle height	12.3	12.0	13.8	12.9	0.65
Predorsal length	50.8	49.2	50.8	50.1	0.72
Prepectoral length	16.9	16.9	20.3	18.5	1.29
Prepelvic length	46.1	46.1	50.0	47.9	1.45
Preanal length	75.4	75.4	77.9	76	1.05
Preanus length	53.1	53.1	57.6	55.8	1.68
Dorsaf fin height	15.7	15.7	17.3	16.5	0.61
Pectoral fin length	16.9	16.9	18.0	17.4	0.47
Pelvic fin length	15.4	13.8	15.6	14.9	0.64
Anal fin height	13.8	12.8	14.6	13.6	0.74
Caudal fin length	16.1	16.1	19.1	17.0	1,12
Distance between anus to caudal fin base	43.4	39.3	43.4	41.9	1.43
In % of head length					
Head height at occiput	42.8	42.8	58.8	54.8	6.04
Head wide	65.0	65.0	71.4	69.1	2.65
Eye diameter	15.7	14.1	17.8	15.4	1.32
Snout length	32.8	32.8	42.3	37.7	3.44
Inter orbital space	17.8	16.9	25.0	20.3	2.93
Mouth width	34.3	28.6	38.7	32.9	3.44
Caudal peduncle length	78.6	78.6	84.5	82.2	3.06
In % of caudal peduncle length					
Cauda peduncle height	72.7	67.6	76.2	73.3	3.04
In % of distance between anal and pelvic fin origins					
Distance between anus and anal fin origin	75.7	68.7	77.8	72.5	3.53

Myanmar. Chaudhuri (1919) and Hora (1925) remarked that the Burmese specimens of *A. kempi* differ considerably from the Assamese regarding colouration and proportions, but the material available did not justify their specific separation. Kottelat (1990) suggested that new collections, or at least access to the existing collection, would be greatly desirable for solving the problem of specific identity of the Burmese specimens. The uplift of the Indo-Burman mountain range not only separated the Upper Brahmaputra from the Ayeyarwaddy of Myanmar led to the formation of a large number of mountains and hill streams, each of which evolved its own fish fauna (Vishwanath et *al.* 2010). The fishes of *Aborichthys* seem to be in the process of adaptation in the torrential hill streams of these two drainages. Menon (1987) remarked that the gradual shifting of vent forward provides the fish with a longer tail for life in swift current. Hora (1925) opined that *A. garoensis* is a highly specialized form and throw a great deal of light on the evolution of the genus. However, the present status of these fishes and their distribution in Myanmar is yet to be studied. A detail survey and phylogenetic study of the species *of Aborichthys* in both the drainage systems would be of great interest.

Comparative materials: Aborichthys elongatus: Type, 1 ex., 74.0 mm SL, India, Reang River, below Darjiling, no date, coll. G.C. Shaw (ZSI F 10087/1). *Aborichthys garoensis:* Type, 2 ex., 85.0-89.5 mm SL, India, Assam, Tura, Garo Hills, Alt. 1200-1500 ft.,

no date, coll. Dr. S.W. Kemp (ZSI F 10669/1). *Aborichthys kempi:* Type 3 ex., 68.5-74.5 mm SL, India, Abor country, Egar stream between Renging and Rotung, i-1912, coll. Dr. S.W. Kemp (ZSI F 7721/1); Type, 1 ex., 53.0 mm SL, India, Abor country, Yambung, Eastern side of Dihang R., no date, coll. Dr. S.W. Kemp (ZSI F 7769/1). *Aborichthys tikaderi:* Holotype, 94.0 mm SL, India, Arunachal Pradesh, Namdapha Wildlife Sanctuary, 18-xii-1983, coll. S. Biswas and Party (ZSI FF2135); Paratype, 2 ex., 100.0-109.0 mm SL, same data as Holotype (ZSI FF 2136).

SUMMARY

A new freshwater fish *Aborichthys waikhomi* is described here from the streams of Noa-Dihing river, Brahmaputra basin in Arunachal Pradesh, India. It is distinguished from all other known species of *Aborichthys* in having truncate caudal fin with irregular black blotches and 12-16 oblique black bands on body, which are narrower than interspaces in caudal peduncle. The fishes of *Aborichthys* seem to be in the process of adaptation in the torrential hill streams. A detail survey on the fish fauna of the Brahmaputra and the Ayeyarwaddy drainages may provide better understanding on the status and zoogeographical distributions of these fishes.

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Table 2 : Comparison of morphometric characters of *Aborichthys waikhomi* sp. nov., *A. elongatus*, *A. kempi* and *A. rosammai*. (Mean values are shown in parenthesis).

	A. waikhomi EBRC/ZSIF2351-2352; V/APRC/2SI/P519	*A. elongatus* 2SIF10087/1, Type	*A. kempi* ZSI F 7721/1, Type; ZSI F 7769/1, Type	*A. rosammai* (after Sen, 2009)
n	6	1	4	5
In % of Standard length	21.0-22.0(21.4)	18.2	18.8-21.7(20.1)	22.1-22.3(22.2)
Head length	46.1-50.0(47.9)	47.6	44.3-45.9 (45.2)	51.1-55.4(53.2)
Prepelvic length	75.4-77.9 (76.0)	73.0	73.1-74.5(73.9)	73.5-79.4(77.1)
Preanal length	53.1-57.6(55.8)	59.4	54.8-57.7 (56.0)	59.4-60.1 (59.7)
Preanus length	16.9-18.0(17.4)	13.9	15.7-18.9 (17.7)	15.0-20.0(17.3)
Pectoral fin length	39.3-43.4(41.9)	39.9	43.6-45.2 (44.2)	39.6-41.6(40.6)
Distance between anus to caudal fin base				
In %of Head length				
Head wide	65.0-71.4(69.1)	52.6	64.3-70.5(67.8)	-
Eye diameter	14.1-17.8(15.4)	18.5	15.7-20.0(17.7)	20.0-25.0 (-)
Inter orbital space	16.9-25.0(20.3)	18.5	21.4-25.2(23.5)	
In %of Caudal peduncle length				
Caudal peduncle height	67.6-76.2 (73.3)	57.1	65.6-80.0(71.8)	66.7-100(-)
In % of Distance between anal and pelvic fin origins				
Distance between anus and anal fin origin	68.7-77.8 (72.5)	60.2	58.7-66.7(63.6)	-
Bands on body	12-16 bands; distinct throughout body; narrower than interspaces on caudal peduncle region	Several bands; absent in the predorsal; broader than interspaces on caudal peduncle region	18-21 bands, in distinct on caudal peduncle region	10-11 bands, coalesced on caudal peduncle region
Barbels	3 pairs; longer than eye diameter	3 pairs; almost as long as eye diameter	3 pairs; longer than eye diameter	3 pairs; longer than eye diameter
Lateral line	Incomplete	Complete	Incomplete	Complete
Bands on Caudal fin	Several irregular black blotches	2 short whitish bands	2 black broad concentric curves	Absent
Black spot at upper extremity of Caudal base	Present	Present	Present	Absent
Shape of caudal fin	Truncated	Rounded	Rounded	Truncated

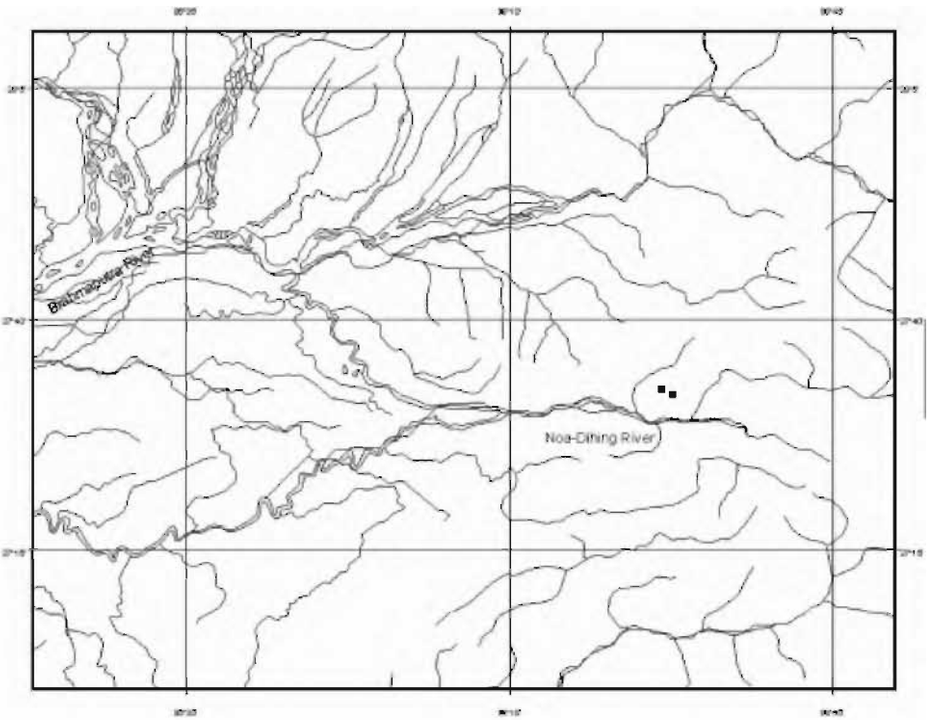

Fig. 1. Map showing type locality of *Aborichthys waikhomi* sp. nov. (■)

Fig. 2. A view of Bulbulia stream near Bulbulia, Namdapha, Arunachal Pradesh, India. Type locality of *Aborichthys waikhomi* sp. nov.

Fig. 3. *Aborichthys waikhomi* sp. nov. (Holotype, EBRC/ZSI/F-7414, 65.0 mm SL). a. lateral view, b. dorsal view and c. ventral view. Scale bar indicates 10 mm.

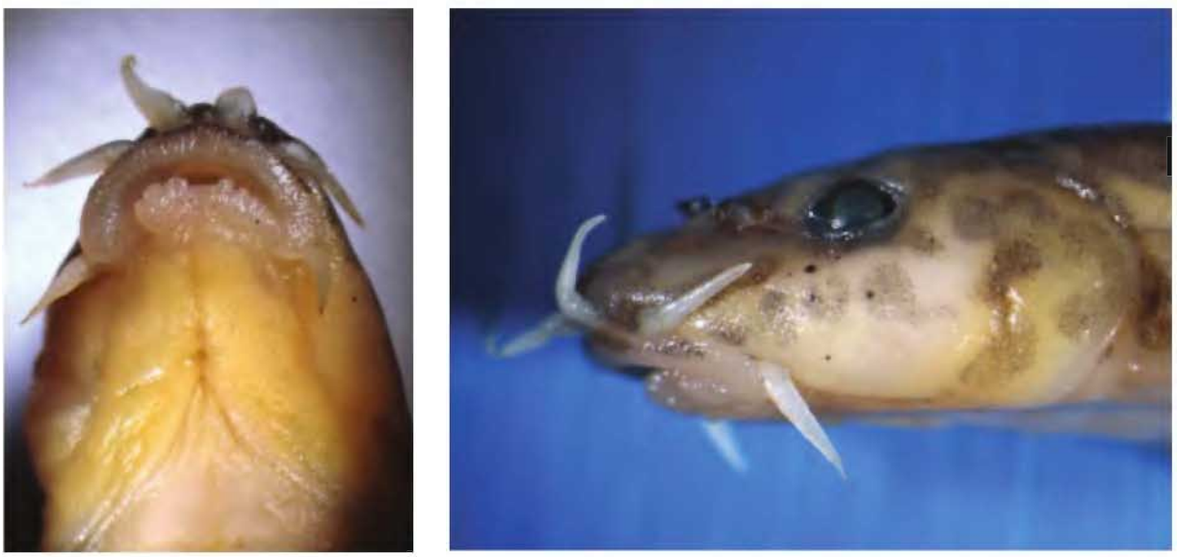

Fig. 4. *Aborichthys waikhomi* sp. nov. (Holotype, EBRC/ZSI/F-7414, 65.0 mm SL) close up view of head. a. ventral view; b. lateral view.

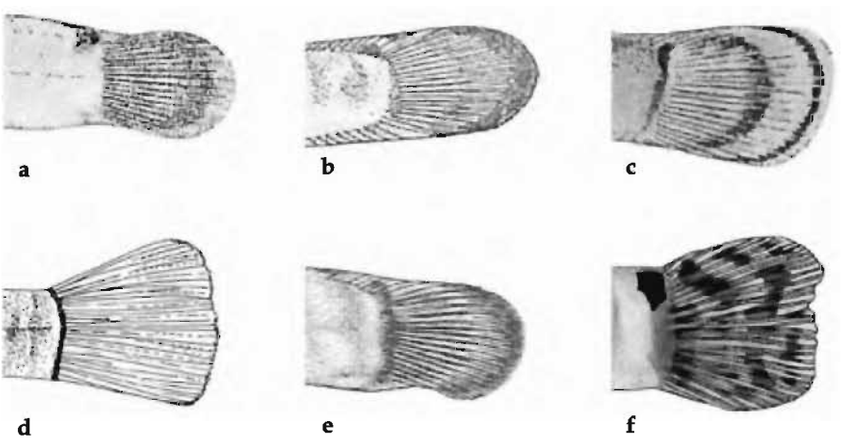

Fig. 5. Illustrations of caudal fin shapes of *Aborichthys* : a. *A. elongatus* (from Hora, 1921); b. *A. garoensis* (from Hora, 1925); c. *A. kempi* (from Chaudhuri, 1913); d. *A. rosammai* (from Sen, 2009); e. *A tikaderi* (from Barman, 1984) and f. *A. waikhomi* sp. nov.

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ANURAN FAUNA OF RAJIV GANDHI NATIONAL PARK, NAGARAHOLE, CENTRAL WESTERN GHATS, KARNATAKA, INDIA.

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INTRODUCTION

There are about 6780 species of amphibians in the World (Frost, 2011). Approximately 314 species are known to occur in India and about 154 from Western Ghats (Dinesh *et al.*, 2009; Biju, 2010). However the precise number of species is not known since new frogs are being added to the checklist. Amphibian number has slowly started declining largely due to the anthropogenic activities. Habitat degradation and improper agricultural activities are the major threats to amphibians. However, survey on amphibian diversity is limited to certain parts of Western Ghats in Karnataka (Krishnamurthy and Hussain, 2000; Aravind *et al.*, 2004; Gururaja *el al.*, 2007; Kuromoto *et al.*, 2007; Biju and Bossuyt, 2009). Therefore, anuran species diversity analysis has been under taken for the first time in Rajiv Gandhi National Park, Nagarahole (12°15'37.69"E 76°17'34.4"N), one of the hot spots for wildlife in the Nilgiri Biosphere Reserve of Western Ghats in Karnataka State. The national park covers an area of 643.4 sq km with a core zone of 192 sq km. The terrain is undulating with an altitude ranging from 701 to 959 m asl. Monsoon is erratic, but it generally rains from June to September with an annual rainfall of about 1,440mm and temperature range is 14°C-33° C. The water sources in this park include the Lakshmmantirtha river, Sarati Hole, Nagar Hole, Balle Halla, Kabini river, four perennial streams, 47 seasonal streams, four small perennial lakes, 41 artificial tanks, several swamps, Taraka dam and the Kabini reservoir. The predominant vegetation in the Nagarhole National Park is of southern tropical mixed deciduous both moist and dry with small patches of semi evergreen and evergreen type (Lal Ranjit, 1994). Diversity, distribution pattern, habitat specificity, abundance and global threat status of the anurans recorded in the study area are discussed.

MATERIALS AND METHODS

Anuran species diversity survey was under taken for the first time during January 2009 to December 2009. The survey team comprised of a group of 6-9 men including local people and forest department officials having thorough knowledge about the area. We surveyed in all important water bodies and perennial rivulets, streams and through patches of forest during day and early night hours. The methodology adopted in the present study was in accordance with the standard methods like quadrat method and visual encounter survey (VES). Seasonal samplings were done randomly from different habitats by using handpicking and pit fall trap methods. Micro-habitats such as grass, water, leaf litter, shrubs, canopy cover, bare ground, tree trunk, under boulders, under logs were searched for specific habitat type to understand their ecological niche and distribution pattern. Morphometric details of the recorded anurans were gathered using digital caliper (Mitutoya, Japan) photographed, and identified using the keys given in Boulenger (1890) ; Dutta (1997), Radhakrishnan (1997), Das (2000) and Daniel (2005). The systematic classification is based on Frost

(2011). Taxonomic features, habitat preference, distribution pattern, abundance in the study area and threat status of the species studied are recorded.

RESULTS AND DISCUSSION

Based on the systematic analysis a total of 26 species of anurans belonging to 14 genera 8 families have been recorded in the study area. They include 4 each in the genus *Raorchestes*, and *Fejervarya*, 3 species in the genus *Hylarana* and 2 each in *Nyctibatrachus, Rhacophorus, Microhyla*. and *Duttaphrynus*, 1 each in *Hoplobatrachus, Indirana, Euphlyctis, Micrixalus, Clinotarsus, Pseudophilautus* and *Polypedate*. The systematic account, taxonomic features, habitat preference and distribution pattern of the species studied are given bellow.

SYSTEMATIC ACCOUNT

Order DORYLAIMIDA Pearse, 1942

Class AMPHIBIA Gray

Order ANURA Fischer von Waldheim

Family BUFONIDAE Gray

Genus : ***Duttaphrynus*** Frost, Grant, Faivovich, Bain, Haas, Haddad, de sa, Channing, Wilkinson Donnellan, Raxworthy, Campbell, Blotto, Moler, Drewes, Nussbaum, Lynch,Green and Wheeler

1. *Duttaphrynus melanostictus* (Schneider, 1799)

1799. *Bufo melanostictus* Schneider, *Hist. Amph., Nat,* 216.

2001. *Bufo melanostictus melanostictus* - Khan, *Pakistan J. Zool.*, **33** : 297.

Measurements : SVL: 110.0 mm to 148.0 mm. (n=4, M-2, F-2).

Habitat : Found under logs of dry deciduous forest; Recorded months: February, April, May, July, August, October and December.

Distribution in India : Throughout India (Dutta, 1997).

Out side India : Recorded from South Asia (Frost, 2011) .

Remarks : Very common; Status: Least Concern (LC).

2. *Duttaphrynus microtympanum* (Boulenger, 1882)

1882. *Bufo microtympanum* Boulenger, *Cat. Batr. Sal. Coll. Brit. Mus.*, Ed. **2** : 307.

Measurements : SVL: 50.0 mm to 80.0 mm. (n=5, M-3, F-2).

Habitat : Found under boulder of dry deciduous forest; Recorded months: January, March, June, August and October.

Distribution in India : Maharashtra, Kerala, Tamil Nadu (Dutta, 1997).

Remarks : Endemic to Western Ghats; Very rare; Status: Vulnerable (VU).

Family DICROGLOSSIDAE Anderson

Sub-family DICROGLOSSINAE Anderson

Genus ***Euphlyctis*** Fitzinger

3. *Euphlyctis cyanophlyctis* (Schneider, 1799)

1799. *Rana cyanophlyctis* Schneider, *Hist. Amph. Nat.,*: 137.

1997. *Euphlyctis cyanophlyctis seistanica* - Dutta, *Amph. India, Sri Lanka* : **115**.

Measurements : SVL: 26.0 mm to 32.0 mm. (n=6, M-3, F-3).

Habitat : Found in slow moving stream of semi evergreen forest; Recorded months: April, June, August, September and December.

Distribution in India : Throughout India (Dutta, 1997).

Out side India : Iran, Pakistan, Nepal, Afghanistan, Sri Lanka, Malaysia and Vietnam (Frost, 2011).

Remarks : Very common south Asian species; Status: Least Concern (LC).

Genus ***Fejervarya*** Bolkay

4. *Fejervarya caperata* Kuramoto, Joshy, Kurabayashi and Sumida, 2007

2007. *Fejervarya caperata* Kuramoto, Joshy, Kurabyashi and Sumida, *Current Herpetology*, **26**(2) : 81-105.

Measurements : SVL: 28.0 mm to 34.0 mm. (n= 4, M- 2, F- 2).

Habitat : Found in semi aquatic margins of semi evergreen forest; Recorded months: July, August, September, October and November.

Distribution in India : Mangalore and Kodagu (Kuramoto *et .al.*, 2007).

Remarks : Endemic to Western Ghats; Common; Status: Not evaluated (NE).

5. ***Fejervarya granosa*** Kuramoto, Joshy, Kurabayashi and Sumida, 2007

2007. *Fejervarya granosa* Kuramoto, Joshy, Kurabyashi and Sumida, *Current Herpetology*, **26**(2) : 81-105.

Measurements : SVL: 27.0 mm to 32.0 mm (n=6, M-3, F-3).

Habitat : Found on the forest floor of semi evergreen forest; Recorded months: July, August, and September.

Distribution in India : Chickmagalur and Kodagu (Kuramoto *et al.*, 2007).

Remarks : Endemic to Western Ghats; Common; Status: Not evaluated (NE).

6. ***Fejervarya kudremukhensis*** Kuramoto, Joshy, Kurabayashi and Sumida, 2007

2007. *Fejervarya kudremukhensis* Kuramoto, Joshy, Kurabyashi and Sumida, *Current Herpetology*, **26**(2) : 81-105

Measurements : SVL: 40.0 mm to 50.0 mm (n=8, M-5, F-3).

Habitat : Found along the sides of streams of semi evergreen forest; Recorded months: June, July, August, September and December.

Distribution in India : Chickmagalur and Madikeri (Kuramoto *et al.*, 2007).

Remarks : Endemic to Western Ghats; Rare; Status: Not evaluated (NE).

7. ***Fejervarya mudduraja*** Kuramoto, Joshy, Kurabayashi and Sumida, 2007

2007. *Fejervarya mudduraja* Kuramoto, Joshy, Kurabyashi and Sumida, *Current Herpetology*, **26**(2) : 81-105

Measurements : SVL: 44.0 mm to 51.0 mm (n=8, M-5, F-3).

Habitat : Found along the sides of streams of semi evergreen forest; Recorded months: June, July, August, September, October and November.

Distribution in India : Chickmagalur and Kodagu (Kuramoto *et al.*, 2007).

Remarks : Endemic to Western Ghats; Very common; Status : Not evaluated (NE).

This species was placed earlier in the assemblage of *Fejervarya limnocharis* species complex. *F. caperata., F.granosa., F. kudremukhensis* and *F. mudduraja* are regarded as cryptic species that are difficult to identify by morphological traits alone (Kuramoto *et al.*, 2007).

Genus ***Hoplobatrachus*** Peters

8. ***Hoplobatrachus tigerinus*** (Daudin, 1802)

1802. *Rana tigerina* Daudin, (An. XI), *Hist. Nat. Rain. Gren. Crap.*, Quarto : 62

1992. *Hoplobatrachus tigerinus* Dubois, *Bull. Mens. Soc. Linn. Lyon*, **61**: 315.

Measurements : SVL: 65.0 mm to 108.0 mm (n=4, M-2, F-2).

Habitat : Found in ponds of semi evergreen forest; Recorded months: May, June, July, August, September, October and December.

Distribution in India : Throughout India (Dutta, 1997).

Out side India : Nepal, Bhutan, Pakistan and Sri Lanka (Frost, 2011).

Remarks : Very common; Status: Least Concern (LC).

Family Micrixalidae Dubois, Ohler and Biju
Sub-family Micrixalinae Gunther

Genus ***Micrixalus*** Boulenger

9. ***Micrixalus saxicola*** (Jerdon, 1854)

1854. *Polypedates saxicola* Jerdon, "1853" *J. Asiat. Soc. Bengal*, **22** : 533.

1888. *Micrixalus saxicola* Boulenger, *Proc. Zool. Soc. London* : 205.

Measurements : SVL: 23.0 mm to 31.0 mm (n=4, M-2, F-2).

Habitat : Found on the fallen logs near stream of moist deciduous forest at 890 m asl ; Recorded months: August, September and November.

Distribution in India : Western Ghats of Kerala and Karnataka, South India at 400-1400 m asl (Dutta, 1997, Radhakrishnan, 1997; Krishnamurthy and Hussain, 2000; Chanda, 2002).

Remarks : Endemic to Western Ghats; Common; Status: Vulnerable (VU).

Family MICROHYLIDAE Gunther

Sub-family MICROHYLINAE Gunther

Genus ***Microhyla*** Tschudi

10. ***Microhyla ornata*** (Dumeril and Bibron,1841)

1841. *Engystoma ornatum* Dumeril and Bibron, *Erp. Gen.*, **8** : 745.

1927. *Microhyla (Diplopelma) ornata* Bourret, *Fauna Indochine*, Vert., **3** : 263.

Measurements : SVL: 23.0 mm to 28.0 mm (n=8, M-5, F-3).

Habitat : Near the margins of small stream of moist deciduous forest; Recorded months: June, July, August and September.

Distribution in India : Throughout India including Andaman and Nicobar Islands (Dinesh *et al.*, 2009).

Outside India : Recorded in Japan, China, Pakistan, Nepal, Sri Lanka and Malaysia (Frost, 2011).

Remarks : Very common; Status: Least Concern (LC).

11. ***Microhyla rubra*** (Jerdon, 1854)

1854. *Engystoma rubrum* Jerdon, "1853", *J. Asiat . Soc. Bengal*, **22** : 534.

1987. *Microhyla (Diplopelma) rubra* Dubois, *Alytes*, **6** : 4.

Measurements : SVL: 28.0 mm to 32.0 mm (n=4, M-3, F-1).

Habitat : Found in wet mud near small stream of semi evergreen forest; Recorded months: August, September and October.

Distribution in India : Goa, Karnataka,Tamil Nadu and (Dinesh *et al.*, 2009).

Out side India : Sri Lanka, (Frost, 2011).

Remarks : Rare; Status: Least Concern (LC).

Family NYCRIBATRACHIDAE Blommers-Schlosser

Sub-family NYCTIBATRACHINAE Blommers-Schlosser

Genus ***Nyctibatrachus*** Boulenger

12. ***Nyctibatrachus aliciae*** Inger, Shaffer, Koshy, and Bakde, 1984

1984. *Nyctibatrachus aliciae* Inger, Shaffer, Koshy and Bakde, *J. Bombay nat. Hist. Soc.* **81** : 414.

Measurement : SVL: 24.0 mm to 26.0 mm (n= 6, M -4, F-2).

Habitat : Found in slow moving small streams of semi evergreen forest: Recorded months; August, September and October.

Distribution in India : Tamil Nadu (Kalakad-Mundanthurai Tiger Reserve), Karnataka and Kerala (Ponmudi Hills, Athirimala, Wayanaad) in the Western Ghats Region of southwestern India, 300-1000 m elevation (Dutta, 1997, Inger *et al.*, 1984; Krishnamurthy and Hussain, 2000; Chanda, 2002; Frost, 2011).

Remarks : Endemic to Western Ghats; Rare; Status: Endangered (EN).

13. ***Nyctibatrachus major*** Boulenger, 1882

1882. *Nyctibatrachus major* Boulenger, *Cat. Batr. Sal. Coll. Brit. Mus., Ed.* **2** : 114.

Measurement : SVL: 42.0 mm to 44.0 mm (n=5, M-2, F-3).

Habitat : Found in slow moving streams of semi evergreen forest; Recorded months: July, August, September and October.

Distribution in India : Kerala and Tamil Nadu (Dutta, 1997; Pillai, 1978); Karnataka (Krishnamurthy and Hussain, 2000).

Remarks : Endemic to Western Ghats; Rare; Status: Vulnerable (VU).

Family RANIDAE Rafinesque

Sub -family RANINAE Rafinesque

Genus ***Clinotarsus*** Mivart

14. ***Clinotarsus curtipes*** (Jerdon, 1853)

1853. *Rana curtipes* Jerdon, *J. Asiat. Soc. Bengal*, **22** : 532.

2005. *Clinotarsus curtipes* Krishna and Krishna, *Herpetol. Rev.*, **36** : 21.

Measurements : SVL: 51.0 mm to 54.0 mm (n=8, M-3, F-5).

Habitat : Found below the leaf litter of the forest floor in dry deciduous forest; Recorded months: June, July, August, September and October.

Distribution in India : It has been recorded from many protected areas in Kerala, Karnataka, Tamil

Nadu, Maharashtra and Goa (Dutta, 1997; Biju, 2001).

Remarks : Endemic to Western Ghats; Very common; Status: Near Threatened (NT).

15. ***Sylvirana aurantiaca*** (Boulenger, 1904)

1904. *Rana aurantiaca* Boulenger, *J. Bombay nat. Hist. Soc.* **15** : 430.

2006. *Sylvirana aurantiaca* Frost, Grant, Faivovich, Bain, Haas, Haddad, de sa, Channing, Wilkinson, Donnellan, Raxworthy, Campbell, Blotto, Moler, Drewes, Nussbaum, Lynch, Green and Wheeler, *Bull. Am. Mus. Nat. Hist.*, **297**: 370.

Measurements : SVL: 35.0 mm to 45.0 mm. (n=5, M-3, F-2).

Habitat : Found in slow moving streams of semi evergreen forest; Recorded months: May, June, July and October.

Distribution in India : Maharashtra, Kerala , Karnataka and Tamil Nadu (Frost, 2011).

Outside India : Recorded in Sri Lanka (Frost, 2008).

Remarks : Endemic to Western Ghats ; Common ; Status: Vulnerable (VU).

16. ***Hylarana malabarica*** (Tschudi, 1838)

1838. *Rana malabarica* Tschudi, *Classif. Batr.* **40** : 80.

2007. *Hylarana malabarica* Che, Pang, Zhao, Wu, and Zhang, *Mol. phylogenet. Evol.*, **43** : 1-13, by implication.

Measurements : SVL: 65.0 mm to 78.0 mm (n=3, M-2, F-1).

Habitat : Found on the forest floor of dry deciduous forest; Recorded months: October and November.

Distribution in India : Maharashtra, Kerala, Goa, Madhya Pradesh and Orissa (Dutta, 1997; Biju, 2001), Karnataka (Krishnamurthy and Hussain, 2000).

Remarks : Endemic to India; Rare; Status: Least Concern (LC).

17. ***Sylvirana temporalis*** (Gunther, 1864)

1864. *Hylorana temporalis* Günther, *Rept. Brit. India* : **427.**

2006. *Sylvirana temporalis* Frost, Grant, Faivovich, Bain, Haas, Haddad, de Sa, Channing, Wilkinson, Donnellan, Raxworthy, Campbell, Blotto, Moler, Drewes, Nussbaum, Lynch, Green, and Wheeler, *Bull. Am. Mus. Nat. Hist.*, **297**: 370.

Measurements : SVL: 61.0 mm to 78.0 mm. (n=8, M-5, F-3).

Habitat : Found along the streams of semi evergreen forest; Recorded months: July, August and September.

Distribution in India : Kerala, Maharashtra, Tamil Nadu and Karnataka (Dutta, 1997; Biju, 2001).

Outside India : recorded in Sri Lanka (Frost, 2011).

Remarks : Endemic to Western Ghats ; Common; Status: Near Threatened (NT).

Family RANIXALIDAE Dubois

Sub-family RANIXALINAE Dubois

Genus ***Indirana*** Laurent

18. ***Indirana beddomii*** (Gunther, 1876)

1876. *Polypedates beddomii* Günther, "1875", *Proc. Zool. Soc. London* : 571.

1987. *Indirana beddomii* Dubois, "1986", *Alytes*, **5** : 175-176.

1989. *Rana (Discodeles) beddomii* Daniel and Sekar, *J. Bombay Nat. Hist. Soc.*, **86** : 194.

Measurements : SVL: 18.5 mm to 24.0 mm (n=3, M-1, F-2).

Habitat : Found under rocks near small streams of semi evergreen forest; Recorded months: June, August and September.

Distribution in India : Maharashtra, Karnataka, Kerala and Tamil Nadu (Daniel, 1975; Dutta, 1997; Chanda, 2002; Krishnamurthy and Hussain, 2000). This species complex has been described over a wide distribution in the Western Ghats in India.

Remarks : Endemic to Western Ghats; Rare; Status: Least Concern (LC).

Family RHACOPHORIDAE Hoffman

Sub-family RHACOPHORINAE Hoffman

Genus ***Raorchestes*** Biju, Yogesh, Dubois, Dutta and Bossuyt

19. ***Raorchestes charius*** (Rao, 1937)

1937. *Philautus charius* Rao, *Proc. Indian Acad. Sci., Ser. B*, **6** : 405.

2001. *Philautus charius* Bossuyt and Dubois, *Zeylanica*, **6** : 48.

2010. *Raorchestes charius* Biju, Yogesh, Dubois, Dutta and Bossuyt, *Current Science*, **98** : 1119-1125.

Measurements : SVL: 27.0 mm to 29.0 mm. (n=5, M-2, F-3).

Habitat : Found on bushy plants of moist deciduous forest at 878 m asl. Recorded months: July, August and September.

Distribution in India : Found in Western Ghats of Karnataka. It was reported that this species is restricted to Chikmalagur at an elevation between 800 - 1,200 m asl , in Karnataka State, in the southern Western Ghats of India (Biju and Bossuyt, 2009).

Remarks : Endemic to Western Ghats; Rare; Status: Endangered (EN). This is the second record in the Western Ghats region.

20. ***Raorchestes glandulosus*** (Jerdon, 1854)

1854. *Ixalis? glandulosa* Jerdon, "1853", *J. Asiat. Soc. Bengal*, **22** : 532.

2001. *Philautus glandulosus* Bossuyt and Dubois, *Zeylanica*, **6** : 15.

2010. *Raorchestes glandulosus* Biju, Yogesh , Dubois, Dutta and Bossuyt, *Current Science*, **98**: 1119-1125.

Measurements : SVL: 32.0 mm to 36.0 mm (n=6, M-4, F-2).

Habitat : Found on small forest tree of semi evergreen forest; Recorded months: July, August, October and November.

Distribution in India : It has been recorded in many protected areas including the Nilgiri Biosphere Reserve (which includes Silent Valley National Park and Wayanad Wildlife Sanctuary), Parambikulum Wildlife Sanctuary, Ponmudi Wildlife Sanctuary and Periyar Wildlife Sanctuary in Kerala, Kudremukh National Park in Karnataka, Indira Gandhi National Park and Kalakad Wildlife Sanctuary both in Tamil Nadu (Biju and Bossuyt, 2009).

Remarks : Endemic to Western Ghats; Common; Status: Vulnerable (VU).

21. ***Raorchestes luteolus*** (Kuramoto and Joshy, 2003)

2003. *Philautus luteolus* Kuramoto and Joshy, *Curr. Herpetol.*, **22** : 52.

2010. *Raorchestes luteolus* Biju, Yogesh , Dubois, Dutta and Bossuyt, *Current Science*, **98** : 1119-1125.

Measurements : SVL: 25.0 mm to 28.0 mm. (n=8, M-5, F-3).

Habitat : Found on the *Cannaceae* and *Colocasia* plants of moist deciduous forest at 895 m asl.; Recorded months: July, August and September.

Distribution in India : Recorded previously in three known sites in the Western Ghats of the southern part of Karnataka State , India at an altitudinal range of 920 - 1,120m asl. (Kuramoto and Joshy, 2003).

Remarks : Endemic to Western Ghats; Common; Status: Data Deficient (DD). Biju and Bossuyt, (2009) reexamined the type series of *Philautus neelanethrus* and considered this as new synonym of *P. luteolus* and again the genus *Philautus* is named as *Raorchestes* (Biju *et al.*, 2010).

22. ***Raorchestes tuberohumerus*** (Kuramoto and Joshy, 2003)

2003. *Philautus tuberohumerus* Kuramoto and Joshy, *Curr. Herpetol.*, 22: 55.

2010. *Raorchestes tuberohumerus* Biju, Yogesh , Dubois, Dutta and Bossuyt, *Current Science*, **98**: 1119-1125.

Measurements : SVL: 18.0 mm to 22.0 mm. (n=5, M-2, F-3).

Habitat : Found on herbaceous plants of moist deciduous forest; Recorded months: August, September and October.

Distribution in India : Recorded from Kodagu and Chikmagalur districts in Western Ghats parts of Karnataka (Biju and Bossuyt, 2009).

Remarks : Endemic to Western Ghats; Rare; Status: Data Deficient (DD).

Genus ***Pseudophilautus*** Biju, Yogesh , Dubois, Dutta and Bossuyt

23. ***Pseudophilautus wynaadensis*** (Jerdon, 1854)

1854. *Phyllomedusa ? wynaadensis* Jerdon "1853", *J.Asiat. Soc. Bengal*, **22** : 533.

1870. *Ixalus wynaadensis* Jerdon, *Proc. Asiat. Soc. Bengal*, : 85.

2001. *Philautus* (*Philautus*) *wynaadensis* Bossuyt and Dubois, *Zeylanica*, **6** : 15.

2010. *Pseudophilautus wynaadensis* Biju, Yogesh , Dubois, Dutta and Bossuyt, *Current Science*, **98** : 1119-1125.

Measurements : SVL: 31.0 mm to 34.0 mm. (n=6, M-2, F-4).

Habitat : Found on bushy plants of moist deciduous forest; Month of collection: July, August, and September.

Distribution in India : Recorded in Western Ghats parts of Kerala (Biju and Bossuyt, 2009) This species is restricted to tropical forests in the vicinity of Coorg in Karnataka, Wayanad and Ponmudi Hills in Kerala, in the southern Western Ghats of India. It has been recorded at elevations of 900 to 1,200m asl.

Remarks : Endemic to Western Ghats; Rare; Status: Endangered (EN). This species was recently revalidated (Bossuyt and Dubois, 2001). It was previously considered to be a synonym of *Philautus variabilis*. Specimens recorded as *P. temporalis* and *P. leucorhinus* from the Western Ghats of India are now named as *Pseudophilautus wynaadensis* (Biju et. al., 2010).

Genus ***Polypedates*** Tschudi

24. ***Polypedates pseudocruciger*** Das and Ravichandran, 1998

1998. *Polypedates pseudocruciger* Das and Ravichandran, "1997", *Hamadryad*, **22** : 89.

Measurements : SVL: 50.0 mm to 80.0 mm (n=2, M-2).

Habitat : Found on the tree of evergreen forest at 856 m asl. Recorded months: August and October.

Distribution in India : It has been reported from a number of protected areas in Western Ghats regions of Tamil Nadu, Karnataka and Kerala. It is recorded from elevations of 200 - 950m asl. (Biju, 2001; Frost, 2011).Remarks: Endemic to Western Ghats; Common; Status: Least Concern (LC).

Genus ***Rhacophorus*** Kuhl and Van Hasselt

25. ***Rhacophorus lateralis*** Boulenger, 1883

1883. *Rhacophorus lateralis* Boulinger, *Ann. Mag. Nat. Hist., Ser.* 5, **12** : 162.

1931. *Rhacophorus (Rhacophorus) lateralis* Ahl, Das *Tierreich*, **55** : 165.

Measurements : SVL: 39.0 mm to 52.0 mm (n=4, M-3, F-1).

Habitat : Found on the trees of evergreen forest. Recorded months: August, September and October.

Distribution in India : Karnataka and Kerala (Das, 2000; Dinesh *et al.*, 2009)

This species is restricted to two small areas of the southern Western Ghats of India in Kerala (Wayanad Wildlife Sanctuary and its surroundings) and Karnataka (Kodagu and its surroundings) at an elevation of approximately 800m asl.(Frost, 2011).

Remarks : Endemic to Western Ghats; Rare; Status: Endangered (EN).

26. ***Rhacophorus malabaricus*** Jerdon, 1870

1870. *Rhacophorus malabaricus* Jerdon, *Proc. Asiat. Soc. Bengal*, 84.

1931. *Rhacophorus (Rhacophorus) malabaricus* Ahl, Das *Tierreich*, **55** : 159.

Measurements : SVL: 72.0 mm to 86.0 mm. (n=4, M-2, F-2).

Habitat : Found on the trees of ever green forest; Recorded months: September, October and November.

Distribution in India : Kerala, Karnataka, Tamil Nadu and Goa. It has been recorded from numerous protected areas including Indira Gandhi National Park in Tamil Nadu, Periyar Tiger Reserve, Wynaad Wildlife Sanctuary and Parambikulam Wildlife Sanctuary, all in Kerala, and Kudremukh National Park and Nagarhole Wildlife Sanctuary, both in Karnataka (Dutta, 1997; Krishnamurthy and Hussain, 2000).

Remarks : Endemic to Western Ghats; Rare; Status: Least concern (LC).

SUMMARY

It is for the first time a systematic anuran species diversity survey has been undertaken in Rajiv Gandhi National Park (Nagarahole), Central Western Ghats, Karnataka, India. As per the survey nearly 26 species of anurans belonging to 14 genera, 7 subfamilies and 8 families have been recorded. The list include, 2 species in the family Bufonidae, 6 species in the family, Dicroglossidae, 1 species of Micrixalidae, 2 species of Microhylidae, 2 species of Nyctibatrachidae, 4 species of Ranidae, 1 species of Ranixalidae and 8 species belonging to the family Rhacophoridae. Of these nearly 20 species are endemic to Western Ghats of India and Sri

Lanka. *Duttaphrynus melanostictus, Euphlyctis cyanophlyctis, Hoplobatrachus tigerinus, Microhyla ornata* and *Microhyla rubra* are reported earlier from other part of south and southeast Asia. The species *Hylarana malabarica* is endemic to Indian subcontinent and has been reported from many parts of India including Western Ghats. As per the IUCN threat status the species that are recorded in the study area belong to 4 endangered, 2 near threatened, 5 vulnerable, 2 data deficient and 9 least concerned species. The remaining 4 species restricted to Western Ghats, whose population density, threat and conservation status are not evaluated. While conducting the survey it was possible to record out side the study area in the nearby semi evergreen, moist deciduous forests and coffee plantations anurans like *Euphlyctus hexadactylus, Ramanella triangularis, Raorchestes akroparallagi, Raorchestes chromasynchysi* and *Raorchestes ponmudi*.. Hence, it is evident from this preliminary survey that there are many more cryptic species yet to be studied for their habitat preference, distribution pattern, abundance and conservation status.

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Duttaphrynus melanostictus

Fejervarya granosa

Duttaphrynus microtynpanum

Fejervarya kudremukhensis

Euphlyctis cyanophlyctis

Fejervarya mudduraja

Fejervarya caperata

Hoplobatrachus tigerinus

Micrixalas saxicola

Nyctibatrachus major

Microyia ornata

Clinotarsus curtipes

Microyia rubra

Hylarana aurantiaca

Nyctibatrachus aliciae

Hylarana malabarica

Hylarana temporalis

Raorchestes luteolus

Indirana beddomil

Raorchestes tuberohumerus

Raorchestes charius

Pseudophilautus wynadensis

Raorchestes glandulosus

Polypedates pseudocruciger

Rhacophorus Lateralis

Rhacophorus malabarica

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FOUR NEW RECORDS OF GERROIDEA (HEMIPTERA : HETEROPTERA) FROM MADHYA PRADESH, INDIA

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INTRODUCTION

Aquatic insects contribute significantly to freshwater ecosystems, forming food for many organisms, particularly in the food webs associated with wetland environments. Many fishes, amphibians, shorebirds, waterfowl, and other animals forage heavily on both the aquatic and terrestrial stages of aquatic insects, which are essential to their survival. It is estimated that about 3% of the total insects are aquatic, spending at least a part of their life cycles in the water, and these comprise about 25,000 to 30,000 species (Cheng, 1976). Gerroidea is a superfamily of Gerromorpha, commonly called as semi-aquatic bugs or shore-inhabiting bugs, which can be easily recognized by their piercing and sucking mouth parts and the long antennae.

In the present study four species of the superfamily Gerroidea were recorded for the first time from Madhya Pradesh. *Microvelia albomaculata* Distant and *Rhagovelia* (*Neorhagovelia*) *sumatrensis* Lundblad belongs to the family Veliidae and *Rhagadotarsus* (*Rhagadotarsus*) *kraepelini* Breddin and *Naboandelus signatus* Distant were confined to the family Gerridae. *M. albomaculata* Distant, *R.* (*Neorhagovelia*) *sumatrensis* Lundblad, *R.* (*Rhagadotarsus*) *kraepelini* Breddin and *N. signatus* Distant belong to four different subfamilies namely, Microveliinae, Rhagoveliinae, Rhagadotarsinae and Trepobatinae respectively, of which latter two subfamilies are the new report to the state.

Family VELIIDAE

Subfamily MICROVELIINAE

Genus ***Microvelia*** Westwood 1834

Microvelia albomaculata Distant, 1909

1909. *Microvelia albomaculata* Distant, *Ann. Mag. nat. Hist.*, **3**(8): 499.

1910. *Microvelia albomaculata* Distant : *Fauna of British India, Rhynchota*, **5**: 138.

1994. *Microvelia albomaculata* Distant: Bal & Basu, *State Fauna Series, 3: Fauna of West Bengal*, Part **5**: 511-534.

Material examined : 3 ♂, 2 ♀ exs., Jabalpur, CZRC, ZSI Res. Colony, 25.ix.2010, Coll. E.E. Jehamalar.

Diagnosis : (Fig. 1) Length : male 1.4 mm, female 1.6 mm; Colour: piceous; body with grayish pubescence pronounced to inner margin of eyes; rostrum reaches little beyond the base of prosternum; 1st antennal segment slightly longer than 2nd, 4th antennal segment long, 2nd and 3rd subequal in length; hemelytra largely spotted with grayish white, clavus with a long spot, corium with five spots, two near base in longitudinal manner and three on the apex in a transverse manner, membrane with two spots, a single large spot on subapex and very small spot on inner subapex.

Distribution : Madhya Pradesh (Jabalpur) and West Bengal. ***Elsewhere:*** Bangladesh.

Remarks : In few specimens the two vertical spots on the corium unites and forms a single long basal spot. The length is shorter than the length mentioned in the original description by Distant, 1909.

Subfamily RHAGOVELIINAE

Genus ***Rhagovelia*** Mayr, 1865

Subgenus ***Neorhagovelia*** Matsuda, 1956

Rhagovelia (Neorhagovelia) sumatrensis Lundblad, 1936

1934. *Rhagovelia femorata* var. *sumatrensis* Lundblad, *Arch Hydrobiol. Suppl.*, **4**: 287.

1936. *Rhagovelia sumatrensis* Lundblad, *Ark. Zool.*, **28**(21): 19.

Material examined : 2 exs., Hoshangabad, Joga, 14.xii.1965 (♂ 1 apt ex.), Coll. H. P. Agrawal, 1.i.1966 (1 apt. ♀ ex.), Coll. H. Khajuria; 3 exs., Hoshangabad, Gupt Mahadev, 5.vi.1999 (1 apt. ♀ & 1 apt. ♂), 12.vi. 1999 (1 apt. ♀), Coll. K. Chandra.

Diagnosis : (Fig. 2) Colour Black; Length 2.8 mm; 6th abdominal segment of female shining; mesosternum with slanting curved fascia formed by shining pubescence; anterior region of pronotum with orange brown transverse band; mid coxa ochraceous; basal half of mid femur with 3-4 spines in male; posterior margin of pronotum straight; basal inner margin of hind femur of males with 14-18 teeth and females with 3-6 teeth and distal region of hind femur with 7-8 teeth in males and 5-6 teeth in females after long curved middle spine; hind trochanter with 4-6 denticles; eyes ash with red tinge.

Distribution : Andaman & Nicobar Islands, Madhya Pradesh (Hoshangabad) and Sikkim

Elsewhere : Africa, Indochina, Indonesia, Peninsular Malaysia and South China.

Remarks : These species usually found in forest streams. One specimen with the ochraceous band on anterior pronotum centrally interrupted. Females with the apex of connexivum produced.

Family GERRIDAE

Subfamily TREPOBATINAE

Genus ***Naboandelus*** Distant 1910

Naboandelus signatus Distant 1910

1910a. *Naboandelus signatus* Distant, *Ann. Mag. nat. Hist.*, **5**(8): 150.

1994. *Naboandelus signatus* Distant: Bal & Basu, *State Fauna Series 3: Fauna of West Bengal*, Part **5**: 511-534.

2002. *Naboandelus signatus* Distant : Thirumalai, *Rec. zool.Surv. India*, **100**(1-2) : 71.

Materials examined : 2 exs., Sehore District, Gond Raja Kila about 28 km west of Budni, 30.xii.1964, Coll. H. Khajuria & Party.

Diagnosis : (Fig. 3) Length: 2.3 mm; Width: 1.2 mm (across middle of mesonotum) lateral margins of head ochraceous or stramineous; pronotum with a stramineous or ochraceous spot; apex of pronotum convex; 1st antennal segment longer than head.

Distribution : Chandigarh, Karnataka, Madhya Pradesh (Sehore); Pondicherry, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.

Elsewhere : Myanmar.

Remarks : This species found in lentic and lotic ecosystems. This species is found to be very small than the already reported gerrid species from the state. It is note the species showed in the photograph with wings broken and not a brachypterous form.

Subfamily RHAGADOTARSINAE

Genus ***Rhagadotarsus*** Breddin, 1905

Rhagadotarsus (Rhagadotarsus) kraepelini Breddin, 1905

1905. *Rhagadotarsus kraepelini* Breddin, *Mitt. Naturhist. Mus. Hamb.*, **22**: 137.

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1910b. *Nacebus dux* Distant: *Fauna of British India, Rhynchota*, **5**: 166.

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2002. *R. (Rhagadotarsus) kraepelini* Breddin: Thirumalai, *Rec. zool. Surv. India*, **100**(1-2): 70.

Materials examined : 1 ♂ Mactopterous ex., Sehore District, 28 Km west of Budni, 30.xii.1964, Coll. H. Khajuria & Party.

Diagnosis : (Fig. 4) Length: 4.2 mm (male); Colour: piceous black; Coxa trochanter and base of femur ochraceous; lateral margin of fore coxa with tuft of short thick hairs; apex of 7th abdominal segment excavated; base of head reddish brown; anterior lobe of pronotum with a central ochraceous horizontal band; base of corium ochraceous; subapex of pronotal plate convexed; body beneath black and covered with grayish white pubescence; pronotum with obscure longitudinal ridge and subapix with horizontal ridge.

Distribution : Andhra Pradesh, Arunachal Pradesh, Karnataka, Kerala, Madhya Pradesh (Sehore), Pondicherry, Tamil Nadu and West Bengal.

1

Microvelia albomaculata Distant

2

Rhagovelia (N.) sumatrensis Lundblad

3

Naboandelus signatus Distant

4

Rhagadotarsus (R.) kraepelini Breddin

Elsewhere : China, Indonesia, Malaysia, Myanmar, Philippines and Taiwan.

Remarks : This species found on fresh and brackish water bodies. Base of its head is reddish brown, which has not been mentioned in the earlier literature.

SUMMARY

In the present study, four species of superfamily Gerroidea are reported from the backlog collections and local collection of Central Zone Regional Centre, Zoological Survey of India, Jabalpur. Thirumalai *et al.* (2007) have reported 15 species of Gerroidea pertaining to 8 subfamilies under 3 families from the state of Madhya Pradesh. By the present record of four species, two subfamilies are also added to the superfamily Gerroidea to the state. The present record is the best example to the scientific community that how the collection and preservation of zoological specimens were important, because two species recorded here were collected during the year 1964, after that these species have not been encountered from further surveys. Thirumalai and Sharma (2008) and Chandra *et al.* (2010) have reported only one species of *Microvelia* from Jabalpur District and presently one more species *Microvelia albomaculata* Distant has been added to the fauna of Jabalpur.

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A NEW SPECIES OF *CALLISCELIO* ASHMEAD (PLATYGASTRIDAE : HYMENOPTERA : INSECTA) FROM INDIA

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INTRODUCTION

Genus *Calliscelio* (Platygastridae: Hymenoptera) was erected by Ashmead in 1893, based on the type species *Calliscelio laticintus*. A total of 66 species are known globally (Johnson, 2011), out of which 10 species (Narendran and Ramesh Babu, 1996-97; Masner *et al.*, 2009) have been recorded from the Indian Region. This paper describes yet another species of *Calliscelio*, namely *C. rugosus*, new to science. Adequate illustrations are provided and affinities with the already known species are discussed in detail.

The present work is a part of the ongoing systematic studies on Scelioninae (Platygastridae) of South Western Ghats, Kerala. Specimens for this study were sorted from Prof. T. C. Narendran Collection of Parasitic Hymenoptera, maintained at the Systematic Entomology Lab, University of Calicut, Kerala. Studies were made using Leica M 205 A stereomicroscope and imaging done with Leica DFC 500 camera. The images were processed using the extended focus Montage software by Leica. The holotype and other material mentioned in this paper are deposited at the Western Ghat Regional Centre, Zoological Survey of India, Calicut, Kerala.

ABBREVIATIONS

OOL- Ocellocular Length; OD- Ocellar Diameter; POL- Posterior Ocellar Length; PM- Post Marginal vein; STG- Stigmal vein; M- Marginal vein; A1- A12- antennal segments; T1- T6-tergites of metasoma; HL- Head Length; HW Head Width; L- Length; W- Width.

NEW DESCRIPTION

Calliscelio rugosus sp. nov.

(Figs. 1-8)

Holotype : Female: Length: 1.97mm; head black, mesosoma honey brown except posterior scutellum being more blackish; basal one- fourth of metasoma, including T1 and basal 1/3rd of T2 yellowish brown, but anterodorsal horn on basal T1 blackish brown; rest of metasoma brownish black; eyes silvery; antennal radical and A1-A5 yellowish brown, A6-A12 blackish brown; legs including coxae yellowish brown; forewings slightly infuscate, veins brown.

Head: (HL: HW= 42: 43); slightly transverse dorsally; frons smooth medially and densely hairy towards orbits; gena hairy; eyes glabrous; clypeus narrow with pointed lateral corners; minimal distance between inner orbits infront of median ocellus less than eye height (19: 24); vertex on either side of median ocellus, ocellar triangle and a short patch anterior to median ocellus with coriaceous sculpture; occiput with same sculpture as that on vertex; lateral ocelli almost touching inner orbits; OOL: OD: POL= 1: 2.5: 12; occipital carina complete and crenulate; temples bulging laterally; malar sulcus distinct; mandibles tridentate; antenna 12 segmented with a distinct 6 segmented club; A1 longer than length of following 6 segments combined; A3 longer than A2 and A4; relative proportions of antennal segments (L:W) being: (31: 5); (6: 3); (8: 4); (5: 3); (4: 3); (3: 3); (3: 5); (5: 6); (5: 7); (6: 7); (5: 7); (5: 6).

Mesosoma : (In dorsal view L: W= 47: 37); not as wide as head dorsally; cervical collar foveolate;

mesoscutum and mesoscutellum not smooth but with fine coriaceous microsculpture; notauli distinct, narrow, extending throughout, nonfoveolate; humeral sulcus non-foveolate; mesoscutellum with dense setae; scutoscutellar sulcus extremely narrow medially, foveolate and wider laterally; anterior margin of mesoscutellum crenulated; metascutellum with a transverse row of pits and carina throughout; propodeum medially excavate; metascutellar plate overlapping propodeum medially, extending to anterior T1; lateral triangular area of propodeum coriaceous and densely setose; anterior margin of pronotum between forecoxa and cervix smooth; netrion prominent with foveolate anterior border; mesopleural carina distinct, with a few longitudinal rows of cell-like sculpture beneath; meso and metapleura without pubescence, traces of a row of cell-like sculpture near mesepimeral sulcus anteriorly and posteriorly separating mesepisternum with mesepimeron; metapleural carina indicated; metapleuron near hind coxae bare, but with some irregular fovea; forewing narrow (L:W= 133: 33); PM distinctly longer than M, nearly 2x length of STG, also (M: STG: PM= 4: 17: 12); setae on SM, M and PM long erect and distinct; *basalis* present as a colouration.

Metasoma : (L:W= 122: 38) In dorsal view more than 2x as long as head and mesosoma combined; T1 with a distinct horn anteriorly on its dorsomedian; rest of T1, including lateral margins with strong longitudinal striations and without interspersed reticulations; 6- 7 lateral setae distinct; horn on T1 with closely placed irregular transverse wrinkles, non-foveolate and non- reticulate; area lateral and lower to horn with fine irregular foveae; T2 longest of all segments, 1.5x length of T1 and 1.4x length of T3; T2 longitudinally striate, median striae reaching nearly three-fourth (0.74) of length of T2, interstices smooth; tergites from T3 onwards smooth dorsally ; metasoma widest at middle of T3; T3 2.1x longer than T4; T4 onwards pilose; T6 elongate, with dense pilosity as compared to preceding segments; relative proportions of length to metasomal tergites T1 to T5 being (23: 16); (36: 35); (25: 38); (12: 32); (8: 2).

Male : Unknown.

Host : Unknown.

Etymology : The species is named *'rugosus'* (in Latin = 'wrinkled'), after the irregular wrinkles on the dorsal horn on T1.

Material Examined : Holotype. Female (ZSI/WGRS/A01). INDIA: Kerala, Thiruvananthapuram District, Neyyar Dam (8°29' North Latitude and 77°17' East Longitude), Coll: Santhosh on 05-xi-2007.

Paratypes : 2 Females (ZSI/WGRS/A 02 & ZSI/WGRS/A 03), 1 Female (ZSI/WGRS/A 04). INDIA: Kerala, Malappuram District, Calicut University Campus (11° 13' Latitude and 75° 48'. Longitude), Coll. T. C. Narendran on 12-ix-2007.

DISCUSSION

Of the 10 species of *Calliscelio* known from Indian Region, *Calliscelio agaliensis* Narendran and Ramesh Babu stands apart in having a black horn-like triangular elevated area anteriorly on dorsomedian of T1. Rest of T1 being yellow, this black patch remain much distinct. *Calliscelio rugosus* sp. nov. resembles *C. agaliensis* in possessing such a raised black median triangular area on T1. It keys to couplet No.8 in the key to Indian species by Narendran and Ramesh Babu (1996-1997). However this new species differs from *C. agaliensis* in: 1) Head black (yellow in C. *agaliensis*) 2). Horn on T1 with non-foveolate transverse wrinkles (in *C. agaliensis* horn on T1 smooth); 3) metascutellar plate with an irregular transverse row of pits and a median longitudinal carina (in *C. agaliensis* metascutellar plate transparent and with six longitudinal carina); 4) medial striae almost reaching posterior margin of T2 (medial striae just reaching only half of T2 in *C. agaliensis*).

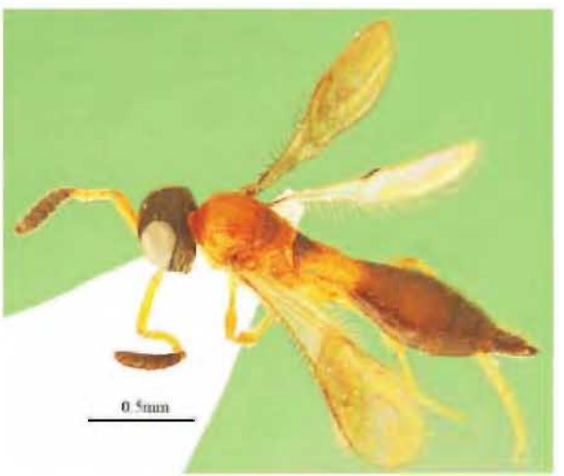
The following key couplet can separate *Calliscelio rugosus* sp. nov. from *Calliscelio agaliensis* Narendan & Ramesh Babu

1. Metascutellar plate extended as a transparent lamina with six longitudinal carinae; head yellowish brown; horn on T1 smooth ..... *C. agaliensis* Narendran & Ramesh Babu

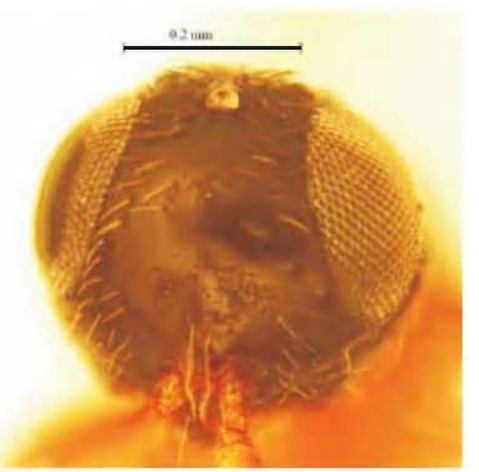
- Metascutellar plate with transverse row of pits and carina throughout; head black; horn on T1 with dense transverse wrinkles .....*C. rugosus* sp. nov.

EXPLANATION OF FIGURE

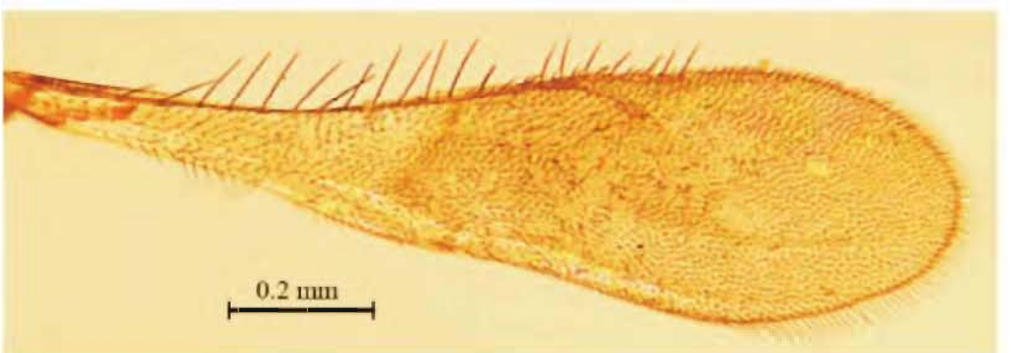
Figs. 1-8: *Calliscelio rugosus* sp. nov. - Female



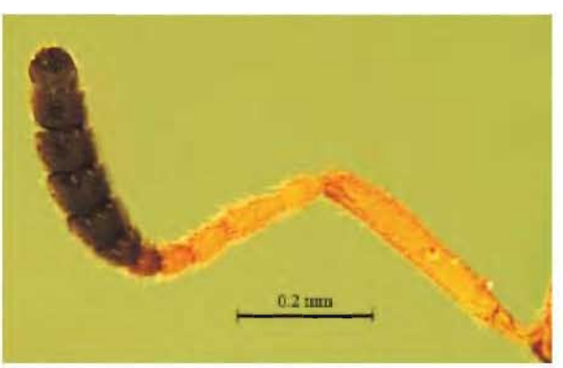
1. Body (profile)



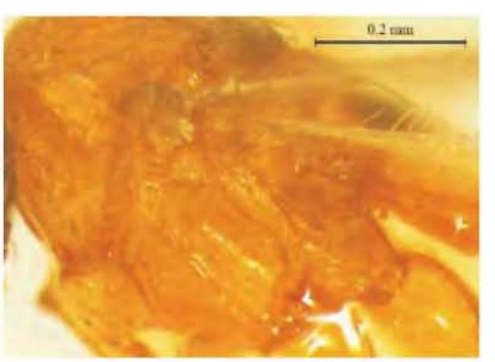
2. Head (front view)



3. Forewing



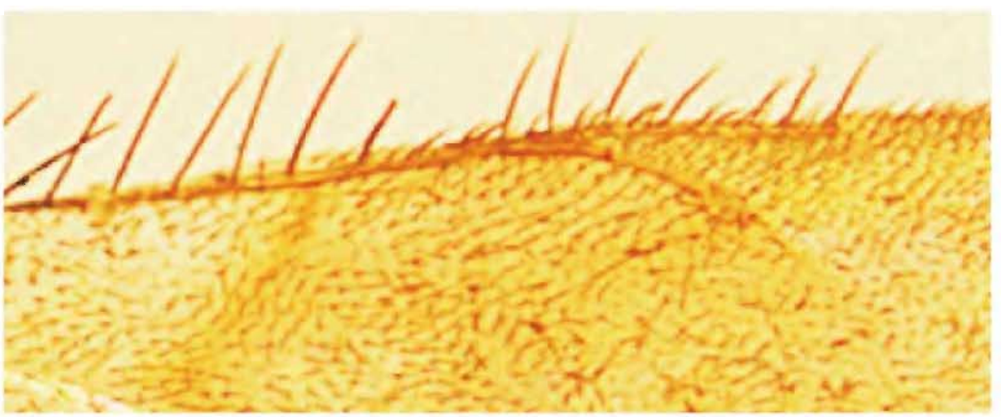
4. Antenna



5. Mesosoma (lateral view)

6. Mesosoma (dorsa view)

7. Metascutellar plate and T1 horn



8. Forewing venation

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TAXONOMIC STUDIES ON LAMELLICORN SCARABAEIDS (COLEOPTERA) OF SIMBALBARA WILDLIFE SANCTUARY, SIRMOUR, HIMACHAL PRADESH, INDIA

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INTRODUCTION

Scarabaeid beetles comprise a speciose group and are a conspicuous component of the beetle fauna of World. Adults of these beetles are noticeable due to their relatively large size, bright colors, often elaborate ornamentation, and interesting life histories. Life histories of scarab beetles are incredibly diverse and include adults that feed on dung, carrion, fungi, vegetation, pollen, fruits, compost, or roots. On the other hand some scarab beetles live in the nests of ants (myrmecophiles), in the nests of termites (termitophiles), or in the nests of rodents or birds. Dung beetle is a common name applied to beetles in the subfamilies Scarabaeinae and Aphodiinae, while most species in the subfamilies Melolonthinae, Dynastinae, Rutelinae, and Cetoniinae feed on plant products and are agricultural pests of various commercial crops. The dung beetles as a whole performs a series of ecological functions such as nutrient cycling, soil aeration (Mittal, 1993), seed dispersal (Estrada & Coates-Estrada, 1991 & Larsen, 2004) and regulation of enteric parasites and dung breeding dipterans pests (Borenmissza, 1970 & Fincher, 1981).

The family Scarabaeidae includes about 27,800 species worldwide. Within Scarabaeidae, two subfamilies; Aphodiinae and Scarabaeinae consists of approximately 6,850 species while other subfamilies; Orphninae, Melolonthinae, Dynastinae, Rutelinae, Cetoniinae, Trichiinae and Valginae include approximately 20,950 species (Ratcliffe & Jameson 2001).

Major taxonomic studies on scarab beetles of India had been carried out by; Arrow, (1910, 1917 & 1931) and Balthasar (1963a, 1963b, 1964). Further information regarding the scarab diversity in north-west India have been published by Mittal (1981, 1989), Mittal and Pajini (1977) and Chandra (1988, 2005). Chandra (1988) studied diversity and distribution of Pleurostict Scarabaeidae of northwest India and reported 108 species belonging to 4 subfamilies; Rutelinae, Cetoniinae Dynastinae and Melolonthinae. Recently, Chandra (2005) published an account of the scarab beetles of Himachal Pradesh and reported 167 species belonging to 50 genera and 8 subfamilies with their distribution in different districts of the state wherein 67 species were included from district Sirmour.

While studying beetle specimens from Simbalbara Wildlife Sanctuary (SWLS), 27 species of scarabaeid beetles, belonging to 14 genera, 7 tribes and 5 subfamilies of family Scarabaeidae were identified and recorded for the first time from SWLS. This first attempt to inventorise the scarab beetle fauna of SWLS also provides some new information about the diversity and distribution of scarab beetles of Himachal Pradesh. Three species

of dung beetles; *Gymnopleurus* (*Gymnopleurus*) *cyaneus* (Fabricius), *Garreta dejeani* Castelnau and *Paragymnopleurus sinuatus* (Olivier) of Scarabaeinae and two species of chafer beetles; *Lepidiota albistigma* Burmeister and *Schizonycha ruficollis* (Fabricius) of Melolonthinae are additions to the beetle fauna of Himachal Pradesh.

MATERIAL AND METHODS

Study area

Simbalbara Wildlife Sanctuary (SWLS) is situated in Sirmour district of Himachal Pradesh, India and lies in between 30°24.21′ and 30°27.338′ N latitudes and 77°27.18′ and 77°32.056′E longitudes with altitudinal range of 350m to 700m.This small sanctuary stretches over an area of 19 sq. km and lies in the confluence of the plains and the main Shivalik range. The area receives a mean annual rainfall of about 1260 mm. while the relative humidity varies from 100% during monsoon to 26% in summer (Pendharkar, 1993).

Specimens for the study were collected, during July-August, 2007 by applying light trap and hand picking methods. Thereafter they were pinned and identified using available literature (Arrow 1910, 1917, 1931; Balthasar 1963a, 1963b) and matched with the reference collection present in Zoological Survey of India (ZSI), Jabalpur. Thereafter they were, deposited in National Zoological Collections of ZSI, Jabalpur. The details of material examined, registration number of identified species, systematic account, and distribution of the species are provided along with the species photographs (Plate 1, 2 & 3).

SYSTEMATIC ACCOUNT

Order COLEOPTERA Linnaeus, 1758

Suborder POLYPHAGA Emery, 1886

Family SCARABAEIDAE Latreille, 1802

Subfamily Scarabaeinae Latreille, 1802

Tribe **Gymnopleurini** Lacordaire, 1856

1. *Gymnopleurus* (*Gymnopleurus*) *cyaneus* (Fabricius, 1798)

1798. *Copris cyaneus* Fabricius, *Ent. Syst. Suppl.*,: 34.

1931. *Gymnopleurus cyaneus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 49.

1963. *Gymnopleurus* (*Gymnopleurus*) *cyaneus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera: Lamellicornia), Coprinae, I: 207.

Material examined: Sirmour, SWLS: ZSI/CZRC/A-15554, 02.viii.2007 (1♂1♀); ZSI/CZRC/A-15555,10.viii.2007 (1♀), coll. Vinay Bhargav.

Geographical distribution : India: Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. *Elsewhere:* Sri Lanka.

Remarks : New record from Himachal Pradesh.

2. *Garreta dejeani* Castelnau, 1840

1840. *Gymnopleurus dejeani* Castelnau, *Hist. Nat.*, **II**: 70.

1931. *Gymnopleurus dejeani*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 59.

1963. *Gymnopleurus* (*Garreta*) *dejeani*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera : Lamellicornia), Coprinae, **I**: 227.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15553, 08.viii.2007 (1♀), ZSI/CZRC/A-15554, 18.vi.2007 (1♀), coll. V. Bhargav.

Geographical distribution : India: Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra and Uttarakhand.

Remarks : New record from Himachal Pradesh.

3. *Garreta opacus* Redtenbacher, 1848

1848. *Gymnopleurus opacus* Redtenbacher *Hugel's Kaschmir*, IV, **2**: 516.

1931. *Gymnopleurus opacus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 58.

1963. *Gymnopleurus* (*Garreta*) *opacus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera: Lamellicornia), Coprinae, **I**: 227.

2005. *Gymnopleurus opacus*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 146.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15551, 16.vi.2007 (1♂1♀), coll. V. Bhargav.

Geographical distribution: India: Himachal Pradesh, Madhya Pradesh, Punjab and Uttrakhand.

4. ***Paragymnopleurus sinuatus*** (Olivier, 1789)

1789. *Scarabaeus sinuatus* Olivier, *Entom.*, I, **3**: 160, tf.21, fig. 189.

1931. *Gymnopleurus sinuatus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 63.

1963. *Gymnopleurus* (*Paragymnopleurus*) *sinuatus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera: Lamellicornia), Coprinae, **I**: 218.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15556, 05.viii.2007 (2ex.); ZSI/CZRC/A-15557, 07.viii.2007 (2ex.); ZSI/CZRC/A-15558, 08.viii.2007 (2ex.); ZSI/CZRC/A-15559, 03.viii.2007 (1ex.); ZSI/CZRC/A-15560, 09.viii.2007 (2ex.); ZSI/CZRC/A-15561, 12.vii.2007(1 ex.); coll. V. Bhargav.

Geographical distribution : India: Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal.

Remarks : New record from Himachal Pradesh.

Tribe **Coprini** Leach, 1815

5. ***Heliocopris bucephalus*** (Fabricius, 1775)

1775. *Scarabaeus bucephalus* Fabricius, *Syst. Ent.*, : 24.

1931. *Heliocopris bucephalus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 88.

1963. *Heliocopris bucephalus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera : Lamellicornia), Coprinae, **I**: 303.

2005. *Heliocopris bucephalus*, Chandra, *Zool. Surv. India, Fauna of Western Himalaya*, (part 2): 146.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15545, 02.viii.2007 (1♂), coll. V. Bhargav.

Geographical distribution : ndia : Bihar, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal. *Elsewhere*: Myanmar, Malay, Peninsula and Java.

6. ***Catharsius* (*Catharsius*) *molossus***
(Linnaeus, 1758)

1758. *Scarabaeus molossus* Linnaeus, *Syst. Nat.* ed.: 347.

1931. *Catharsius molossus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 94.

1963. *Catharsius* (*Catharsius*) *molossus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera : Lamellicornia), Coprinae, **I**: 307.

2005. *Catharsius molossus*, Chandra, *Zool. Surv. India, Fauna of Western Himalaya*, (part 2): 146.

Material examined : Sirmour, SWLS, ZSI/CZRC/A-15549, 02.viii.2007 (2♂); ZSI/CZRC/A-15550, 03.viii.2007 (4♂); Coll. V. Bhargav.

Geographical distribution : India : Andaman and Nicobar Island, Arunachal Pradesh, Assam, Bihar, Haryana, Himachal Pradesh, Karnataka, Kerala Madhya Pradesh, Meghalaya, Orissa, Sikkim, Uttar Pradesh, Uttarakhand and West Bengal.

7. ***Catharsius* (*Catharsius*) *sagax***
(Quenstedt, 1806)

1806. *Copris sagax* Quenstedt, *Schonh. Syn. Ins.*, **I**: 43.

1931. *Catharsius sagax*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 96.

1963. *Catharsius* (*Catharsius*) *sagax*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera : Lamellicornia), Coprinae, **I**: 309.

2005. *Catharsius sagax*, Chandra, *Zool. Surv. India, Fauna of Western Himalaya*, (part 2): 146.

Material examined: Sirmour, SWLS: ZSI/CZRC/A-15562, 02.viii.2007 (1♀), ZSI/CZRC/A-15563, 03.viii.2007 (1♀), ZSI/CZRC/A-15564, 08.viii.2007 (1♀), ZSI/CZRC/A-15565, 09.viii.2007 (1♀), ZSI/CZRC/A-15566, 03.viii.2007 (1♂), ZSI/CZRC/A-15567, (1♂), coll. V. Bhargav.

Geographical distribution: India : Andhra Pradesh, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal. *Elsewhere*: Bhutan.

8. ***Copris* (*Copris*) *repertus*** Walker, 1858

1858. *Copris repertus* Walker, *Ann. Mag. Nat. Hist.*, (3) **II**: 208.

1931. *Copris repertus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 116.

1963. *Copris* (*Copris*) *repertus*, Balthasar, *Monographie der Scarabaeidae und Aphodiidae der Palaearktischen und Orientalischen Region* (Coleoptera : Lamellicornia), **I** : 351.

2005. *Copris repertus*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 147.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15546, 03.viii.2007 (2♂2♀); ZSI/CZRC/A-15547, 08.viii.2007, (1♀), coll. V. Bhargav.

Geographical distribution : India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh and Tamil Nadu. *Elsewhere*: Sri Lanka and Myanmar.

Tribe **Onthophagini** Burmeister, 1846

9. *Digitonthophagus* (*Onthophagus*) *bonasus* (Fabricius, 1775)

1775. *Scarabaeus bonasus* Fabricius, *Syst. Ent.*, : 23.

1931. *Onthophagus bonasus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 116.

1963. *Digitonthophagus* (*Onthophagus*) *bonasus*, Balthasar, *Monographie der Scarabaeidae und Aphodiidae der Palaearktischen und Orientalischen Region* (Coleoptera : Lamellicornia), **II**: 231.

2005. *Onthophagus bonasus*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 148.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15533, 12.vi.2007 (1♂); ZSI/CZRC/A-15534, 18.vi.2007 (2♂); ZSI/CZRC/A-15535, 20.vi.2007 (2♂); ZSI/CZRC/A-15536, 20.vi.2007 (1♂); coll. V. Bhargav.

Geographical distribution : India : Bihar, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal. *Elsewhere*: Myanmar, Pakistan, Thailand and Vietnam.

10. *Onthophagus* (*Onthophagus*) *dama* (Fabricius, 1798)

1798. *Copris dama* Fabricius, *Ent. Syst. Suppl.*,: 32.

1931. *Onthophagus dama*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 279.

1963. *Onthophagus* (*Onthophagus*) *dama*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera: Lamellicornia), Coprinae, **II**: 325.

2005. *Onthophagus dama*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 148.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15541, 10.viii.2007 (1♂), Coll. V. Bhargav.

Geographical distribution : India: Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh and Uttarakhand. *Elsewhere*: Bhutan and Sri Lanka.

11. *Onthophagus* (*Onthophagus*) *griseosetosus* Arrow, 1931

1931. *Onthophagus griseosetosus* Arrow, *Faun. Brit. India* (Lamellicornia: Coprinae), **3**: 192.

1963. *Onthophagus* (*Onthophagus*) *griseosetosus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera: Lamellicornia), Coprinae, **II**: 374.

2005. *Onthophagus griseosetosus*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 149.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15541, 12.viii.2006 (1♂), coll. V. Bhargav.

Geographical distribution: India: Himachal Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu and Uttarakhand.

12. *Onthophagus* (*Proagoderus*) *pactolus* (Fabricius, 1787)

1787. *Scarabaeus pactolus* Fabricius, *Man. Ins.*, **I**: 12.

1931. *Onthophagus pactolus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 203.

1963. *Onthophagus* (*Proagoderus*) *pactolus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera : Lamellicornia), Coprinae, **II**: 466.

2005. *Onthophagus pactolus*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 148.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15529, 08.vi.2007 (2♂); ZSI/CZRC/A-15530, 14.vi.2007 (1♂); ZSI/CZRC/A-15531, 15.vi.2007 (1♂); ZSI/CZRC/A-15532, 22.vi.2007 (1♂); coll. V. Bhargav.

Geographical distribution: India: Haryana, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh and Uttarakhand.

13. ***Onthophagus* (*Onthophagus*) *ramosus*** (Wiedmann, 1823)

1823. *Copris ramosa* Wiedmann, *Zool. Mag.* **II**, 1: 13.

1931. *Onthophagus ramosus* Arrow, *Faun. Brit. India* (Lamellicornia: Coprinae) **3**: 236.

1963. *Onthophagus* (*Onthophagus*) *ramosus* Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera: Lamellicornia), Coprinae, **II**: 497.

2005. *Onthophagus ramosus* Chandra, *Zool. Surv. India, Fauna of Western Himalaya*, (part 2): 148.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15548, 06.viii.2007 (1♂), coll. V. Bhargav.

Geographical distribution : India: Bihar, Haryana, Himachal Pradesh, Karnataka, Kashmir, Madhya Pradesh, Maharashtra, Orissa, Punjab, Uttarakhand, Uttar Pradesh and Tamil Nadu. *Elsewhere*: Thailand.

14. ***Onthophagus* (*Onthophagus*) *ramosellus*** Bates, 1891

1891. *Onthophagus ramosellus* Bates, *Entom. Suppl.*, **XXIV**: 11.

1931. *Onthophagus ramosus*, Arrow, *Faun. Brit. India* (Lamellicornia: Coprinae) **3**: 236.

1963. *Onthophagus* (*Onthophagus*) *ramosellus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera: Lamellicornia), Coprinae, **II**: 497.

2005. *Onthophagus ramosellus*, Chandra, *Zool. Surv. India, Fauna of Western Himalaya*, (part 2): 148.

Material examined: Sirmour, SWLS: ZSI/CZRC/A-15537, 02.viii.2007 (1♂), coll. V. Bhargav.

Geographical distribution: India: Bihar, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand and West Bengal. *Elsewhere*: Pakistan.

Tribe **Onitini** Laporte, 1840

15. ***Onitis philemon*** Fabricius, 1801

1801. *Onitis philemon* Fabricius, *Syst. Eleut.*, **I**: 30.

1931. *Onitis philemon*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 393.

1963. *Onitis philemon*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis Region* (Coleoptera: Lamellicornia), Coprinae, **II**: 41.

2005. *Onitis philemon*, Chandra, *Zool. Surv. India, Fauna of Western Himalaya*, (part 2): 150.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15542, 05.viii.2007 (1♂), ZSI/CZRC/A-15543, 07.viii.2007 (1♀), ZSI/CZRC/A-15544, 18.vi.2007 (1♂), coll. V. Bhargav.

Geographical distribution : India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Tamil Nadu,Uttar Pradesh, Uttaranchal and West Bengal. *Elsewhere*: Myanmar, Pakistan, Sri Lanka, Thailand and Vietnam.

II. **Subfamily : RUTELINAE** MacLeay, 1819

Tribe **Anomalini** Streubel, 1839

16. ***Anomala cantori*** (Hope, 1840)

1840. *Euchlora cantori* Hope, *Mag. Nat. Hist.*, **IV**: 284.

1855. *Anomala secera*, Burmeister, *Handb. Entom.*, **IV**, 2: 504.

1917. *Anomala cantori*, Arrow, *Faun. Brit. India* (Lamellicornia : Rutelinae), 2: 220.

2005. *Anomala cantori*, Chandra, *Zool. Surv. India, Fauna of Western Himalaya*, (part 2): 153.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15501, 03.viii.2007 (1♀), ZSI/CZRC/A-15501, 07.viii.2007 (1♀), coll. V. Bhargav.

Geographical distribution: India: Assam, Himachal Pradesh, Haryana, Madhya Pradesh and West Bengal. *Elsewhere* : Myanmar.

17. ***Anomala dimidiata*** (Hope, 1831)

1831. *Euchlora dimidiata* Hope, *Gray's Zool. Misc.*,: 23.

1917. *Anomala dimidiata*, Arrow, *Faun. Brit. India* (Lamellicornia: Rutelinae), 2: 232.

2005. *Anomala dimidiata*, Chandra, *Zool. Surv. India, Fauna of Western Himalaya*, (part 2): 153.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15503, 06.vi.2007 (1ex.); ZSI/CZRC/A-15504, 08.vi.2007 (1ex.); ZSI/CZRC/A-15505, 09.vi.2007 (1ex.); ZSI/CZRC/A-15506, 10.vi.2007 (1ex.), ZSI/CZRC/A-15507, 12.vi.2007 (4ex.); coll. V. Bhargav.

Geographical distribution: India: Assam, Haryana, Himachal Pradesh, Manipur, Meghalaya, Punjab, Sikkim and Uttar Pradesh and West Bengal. *Elsewhere*: Nepal.

18. ***Anomala polita*** Blanchard, 1851

1851. *Anomala polita* Blanchard, *Cat. Coll. Ent. Mus. Paris,*: 182.

1917. *Anomala polita*, Arrow, *Faun. Brit. India* (Lamellicornia: Rutelinae), **2**: 138.

2005. *Anomala polita*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 153.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15509, 04.viii.2007 (1♀), Coll. V. Bhargav.

Geographical distribution : India: Haryana, Himachal Pradesh, Madhya Pradesh and Uttar Pradesh.

19. *Anomala rufiventris* Redtenbacher, 1848

1848. *Anomala rufiventris* Redtenbacher, *Hügels's Kaschmir*, IV, **2**: 526.

1917. *Anomala rufiventris*, Arrow, *Faun. Brit. India* (Lamellicornia: Rutelinae), 2: 138.

2005. *Anomala rufiventris*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 153.

Material examined: Sirmour, SWLS: ZSI/CZRC/A-15508, 10.vi.2007 (1♀), Coll. V. Bhargav.

Geographical distribution: India: Assam, Himachal Pradesh, Manipur, Sikkim and Uttarakhand. *Elsewhere*: Bhutan.

20. ***Popillia cupricollis*** Hope, 1831

1831. *Popillia cupricollis* Hope, *Gray's Zool. Miscell.,*: 23.

1917. *Popillia cupricollis*, Arrow *Faun. Brit. India*, (Lamellicornia: Rutelinae), 2: 73.

2005. *Popillia cupricollis*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 152.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15511, 08.viii.2007 (1♀), coll. V. Bhagarv.

Geographical distribution: India: Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Punjab, Sikkim and Uttarakhand.

Elsewhere : Nepal.

21. ***Popillia cyanea*** Hope, 1831

1831. *Popillia cyanea* Hope, *Gray's Zool. Miscell.* : 23.

1917. *Popillia cyanea*, Arrow, *Faun. Brit. India*, (Lamellicornia: Rutelinae), **2**: 62.

2005. *Popillia cyanea*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 152.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15510, 10.xii.2009 (1♀), coll. V. Bhagarv.

Geographical distribution: India : Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Punjab, Sikkim, Uttaranchal and West Bengal. *Elsewhere*: Nepal.

III. Subfamily CETONIINAE Leach, 1815

Tribe **Cetoniini** Leach, 1815

22. ***Clinteria spilota*** (Hope, 1831)

1831. *Cetonia spilota* Hope, *Gray's Zool. Misc.*, : 25.

1910. *Clinteria spilota*, Arrow, *Faun. Brit. India*, (Lamellicornia: Cetoniinae), **1**: 184.

2005. *Clinteria spilota*, Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 155.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15522, 10.vi.2007 (2♀), coll. V. Bhargav.

Geographical distribution: India: Haryana, Himachal Pradesh and Uttar Pradesh.

23. ***Oxycetonia albopunctata*** (Fabricius, 1775)

1798. *Cetonia versicolor* Fabricius, *Syst. Suppl.*, : 51.

1910. *Oxycetonia albopunctata*, Arrow, *Faun. Brit. India*, (Lamellicornia : Cetoniinae), **1**: 166.

Material examined : Sirmour, SWLS: ZSI/CZRC/A-15520, 22.vi.2007 (1♀) 20.vi.2007; ZSI/CZRC/A-15521, (1♀), Coll. V. Bhargav.

Geographical distribution : India: Assam, Himachal Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu, and West Bengal. *Elsewhere*: Bhutan, Mauritius, Madagascar, Pakistan and Sri Lanka.

IV. Subfamily MELOLONTHINAE MacLeay, 1819

24. ***Holotrichia longipennis*** Blanchard, 1850

1850. *Holotrichia longipennis* Blanchard, *Cat. Coll. Ent.*, I: 140.

2005. *Holotrichia longipennis* Chandra, *Zool. Surv. India*, *Fauna of Western Himalaya*, (part 2): 151.

Material examined: Sirmour, SWLS: ZSI/CZRC/A-15513, 04.viii.2007 (1♂); ZSI/CZRC/A-15514, 02.viii.2007 (1♀), coll. V. Bhargav.

Geographical distribution: Himachal Pradesh and Uttar Pradesh.

25. ***Schizonycha ruficollis*** (Fabricius, 1781)

1781. *Melolontha ruficollis* Fabricius, *Spec. Ins.*, **7**: 39.

1850. *Schizonycha ruficollis*, Blanchard, *Cat. Coll. Ent.*, **1**: 151.

Material examined : Sirmour, SWLS: 04.viii.2007 (1ex.), coll. V. Bhargav.

Geographical distribution : India: Bihar, Himachal Pradesh, Madhya Pradesh, Orissa, Uttar Pradesh, Uttaranchal and West Bengal.

Remarks : New record from Himachal Pradesh.

26. ***Lepidiota albistigma*** Burmeister, 1855

1855. *Lepidiota albistigma* Burmeister, *Handb. Ent.*, IV, **2**: 295.

Material examined: Sirmour, SWLS: ZSI/CZRC/A-15513, 03.viii.2007 (1♀), coll. V. Bhargav.

Geographical distribution: India: Haryana, Himachal Pradesh and Uttar Pradesh.

Remarks : New record from Himachal Pradesh.

V. Subfamily DYNASTINAE MacLeay, 1819

27. ***Xylotrupes gideon*** (Linnaeus, 1767)

1767. *Scarabaeus gideon* Linnaeus *Syst. Nat. 12th ed.*, 10 (2): 541.

1910. *Xylotrupes gideon*, Arrow, Arrow, *Faun. Brit. India*, (Lamellicornia: Dynastinae), I: 262.

2005. *Xylotrupes gideon*, Chandra, Insecta: Coleoptera: Scarabaeidae, *Zool. Surv. India, Fauna of Western Himalaya*, (part 2): 154.

Material examined: Sirmour, SWLS: ZSI/CZRC/A-15515, 02.viii.2007 (1♂1♀); ZSI/CZRC/A-15516, 03.viii.2007 (2♂2♀); ZSI/CZRC/A-15517, 03.viii.2007 (1♂); ZSI/CZRC/A-15518, 04.viii.2007 (1♂1♀); ZSI/CZRC/A-15519, 08.viii.2007 (1♀); coll. V. Bhargav.

Geographical distribution : India: Assam, Andaman, Himachal Pradesh, Maharashtra, Sikkim, Kerala and West Bengal.

Elsewhere : Sri Lanka and Indo-Malayan sub region.

SUMMARY

Altogether, 27 species of the scarab beetles belonging to 14 genera, 7 tribes and 5 subfamilies of family Scarabaeidae were studied from Simbalbara Wildlife Sanctuary. *Gymnopleurus* (*Gymnopleurus*) *cyaneus* (Fabricius), *Garreta dejeani* Castelnau and *Paragymnopleurus sinuatus* (Olivier) of Scarabaeinae and *Lepidiota albistigma* Burmeister and *Schizonycha ruficollis* (Fabricius) of Melolonthinae are additions to the beetle fauna of Himachal Pradesh. While *G. cyaneus* Fabricius, *G. dejeani* Castelnau and *P. sinuatus* (Olivier) of Scarabaeinae, *L. albistigma* Burmeister and *S. ruficollis* (Fabricius) of Melolonthinae and *Anomala dimidiata* Hope and *Popillia cyanea* Hope of Rutelinae, are newly recorded from Sirmour district.

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PLATE - 1

1. *Gymnopleurus (Gymnopleurus) cyaneus* (Fabricius)

2. *Garreta dejeani* Castelnau

3. *Garreta opacus* Redtenbacher

4. *Paragymnopleurus sinuatus* (Olivier)

5. *Heliocopris bucephalus* (Fabricius)

6. *Catharsius (Catharsius) molossus* (Linnaeus)

7. *Catharsius (Catharsius) sagax* (Quenstedt)

8. *Copris (Copris) repertus* Walker

9. *Digitonthophagus (Onthophagus) bonasus* (Fabricius)

PLATE - 2

10. *Onthophagus (Onthophagus) dama* (Fabricius)

11. *Onthophagus (Onthophagus) griseosetosus* Arrow

12. *Onthophagus (Proagoderus) pactolus* (Fabricius)

13. *Onthophagus (Onthophagus) ramosus* (Wiedmann)

14. *Onthophagus (Onthophagus) ramosettus* Bates

15. *Onitis philemon* Fabricius

16. *Anomala cantori* (Hope)

17. *Anomala dimidiata* (Hope)

18. *Anomala polita* Blanchard

PLATE - 3

19. *Anomala rufiventris*
Redtenbacher

20. *Popillia cupricollis*
Hope

21. *Popillia cyanea*
Hope

22. *Clinteria spilota*
(Hope)

23. *Oxycetonia albopunctata*
(Fabricius)

24. *Holotrichia longipennis*
Blanchard

25. *Schizonycha ruficollis*
(Fabricius)

26. *Lepidiota albistigma*
Burmeister

27. *Xylotrupes gideon*
(Linnaeus)

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RECORDS OF SOME SPECIES OF *COPIDOSOMA* RATZEBURG (HYMENOPTERA : ENCYRTIDAE) FROM INDIA, WITH DESCRIPTION OF A NEW SPECIES

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INTRODUCTION

Species of the genus *Copidosoma* Ratzeburg, so far as their biology is known, are polyembryonic parasitoids of lepidopterous larvae. From a single parasitoid egg laid in the body of the host larva, a large number, sometimes exceeding a thousand, adult parasitoids are produced. Recently, Manickavasagam & Kanagarajan (2003) record the emergence of 1893 adults of *C. floridanum* (Ashmead) from a single larva of *Helicoverpa armigera* (Hübner). A brief review of polyembryony in *Copidosoma* was given by Guerrieri & Noyes (2005; see additional references noted in this paper).

Kazmi & Hayat (1998) published the first revision of the Indian species of *Copidosoma*. These authors recognized 26 species (including two introduced species) from India. Later, one more species, *C. dasi* Hayat was added (Hayat, 2003; Hayat, 2006b). In a recent revision of the European species of *Copidosoma*, Guerrieri & Noyes (2005) recognized 56 valid species from Europe. In recent years, some already known species were recorded from India by Hayat (2006a), Hayat *et al.* (2007) and Hayat & Khan (2008).

In surveys made in Uttarakhand and Western Uttar Pradesh during 2009 a large number of specimens of *Copidosoma* were collected. On the request made by the second author to the Director of the Zoological Survey of India, the first author was permitted to visit Aligarh to study *Copidosoma* present in the collection of the Department of Zoology, A.M.U. Aligarh.

This study resulted in the identification of 6 known species of *Copidosoma*, and recognition of one new species. Data pertaining to the known species are recorded, and the new species is described.

Hayat (2006b) is followed for terminology. The following abbreviations are used for the depositories :

NPC – National Pusa Collections, Division of Entomology, Indian Agricultural Research Institute, New Delhi, India.

NZSI – National Zoological Collections, Zoological Survey of India, Kolkata, India.

ZDAMU – Insect Collections, Department of Zoology, Aligarh Muslim University, Aligarh, India.

1. ***Copidosoma clavatum*** Myartseva

1982. *Copidosoma clavatum* Myartseva, 26, female, Holotype female: Turkmania, Kara-Kala.

1998. *Copidosoma clavatum* Myartseva : Kazmi & Hayat, 296, 304-305, female, Indian record.

2006b. *Copidosoma clavatum* Myartseva : Hayat, 73, 76, female, key, figures.

2008. *Copidosoma clavatum* Myartseva: Hayat & Khan, 126, female, Orissa and West Bengal records.

Material examined : INDIA: Kerala: Kottayam, Chengalam, 2 females (on slides, EH. 850, EH. 851), 26.ii.1993, Coll. S.B. Zeya. (NZSI, Registration No. 12350/H3 and 12351/H3).

Hosts : Unknown.

Distribution: India: Andhra Pradesh, Kerala, Orissa, Tamil Nadu, West Bengal. (Turkmania).

2. ***Copidosoma eurystomum,*** sp. nov. (Figs.1-8)

Female : Length, 1.08-1.29 mm, n=7 (1.19 mm) [The numbers in parentheses refer to the holotype measurements or ratios]

Body completely black; frontovertex dull bluish-green, face with some purple shine; mesoscutum largely bluish-green, bronzy purple anteriorly; scutellum bluish-green with bronzy purple in anterior half medially; tegulae dark brown; gaster with some faint violet shine. Antenna black. Fore wing hyaline; infuscate dark around marginal and postmarginal veins; hind wing hyaline. Legs dark brown to black; mid tibial spur white.

Head (Fig. 2) width 1.82x -2.02x (2.0x) as broad as frontovertex width; ocellar triangle with apical angle strongly obtuse; posterior ocelli separated from eye margins by about 1.5x diameters of an ocellus, and less than one ocellus diameter to occipital margin; malar space 0.52x – 0.59x (0.59x) eye length; mouth fossa 1.17x – 1.28x (1.22x) frontovertex width; frontovertex with regular polygonal reticulations, on side of facial impression slightly obliquely drawn-out, and on malar space elongate reticulate; setae brown; eyes setose, setae hyaline and each clearly longer than a facet. Mandible large (Figs.2, 3) 3-dentate, ventral tooth longest, dorsal tooth small and receding. Antenna (Fig.1) with scape cylindrical, about as long as pedicel and F1-4 combined; pedicel nearly as long as F1-3 combined; funicle segments quadrate (F1) to broader than long (F2-6), F4-6 individually longer than F3; clava 2-segmented; in one specimen (holotype), there is indication of a partial second suture; truncate part of clava slightly less than two third length of clava; clava at least about as long as preceding four segments combined. *Relative measurements* (holotype, slide): Head frontal width, 44; head frontal height, 38; frontovertex width, 22; mouth fossa width, 27; eye length, 21; malar space, 12.5; antennal scape length, 22.

Thorax : Mesoscutum with fine, reticulate sculpture; scutellum with a similar sculpture, but fades in about posterior half; setae brown; each side of propodeum with a few hyaline setae. Fore wing about 2.2x as long as broad; marginal vein about 2x as long as postmarginal vein and subequal to stigmal vein; setation and venation as in Fig. 4. Hind wing about 4x as long as broad. Mid tibial spur shorter than basitarsus (9:13). *Relative measurements* (holotype, slide): Thorax length, 56; mesoscutum length, 23.5; mesoscutum width, 41; scutellum length, 26.5; scutellum width, 24; fore wing length, 118; fore wing width, 53; hind wing length, 85; hind wing width, 21; mid tibia length, 44; mid basitarsus length, 13; mid tibial spur length, 9.

Gaster : Ovipositor not exserted; ovipositor 0.86x -0.89x (0.87x) mid tibial length; third valvula 0.42x - 0.49x (0.49x) ovipositor length; ovipositor as in Fig.6; hypopygium as in Fig.5. *Relative measurements* (holotype, slide): ovipositor length, 38.5; third valvula length, 19 [Mid tibia length, 44; mid basitarsus length, 13; mid tibial spur length, 9].

Male : Similar to female except for the antenna (Fig. 7) and genitalia (Fig. 8). Antennal clava unsegmented. Phallobase 3.75x-4.0x as long as broad, and slightly more than 2.5x as long as mid basitarsus (28:11).

Material examined : *HOLOTYPE*, female (on slide, EH.1329): INDIA: Uttar Pradesh: Aligarh, Dhorau, 7.iii.2009, Coll. F.R. Khan. (Deposited in NPC).

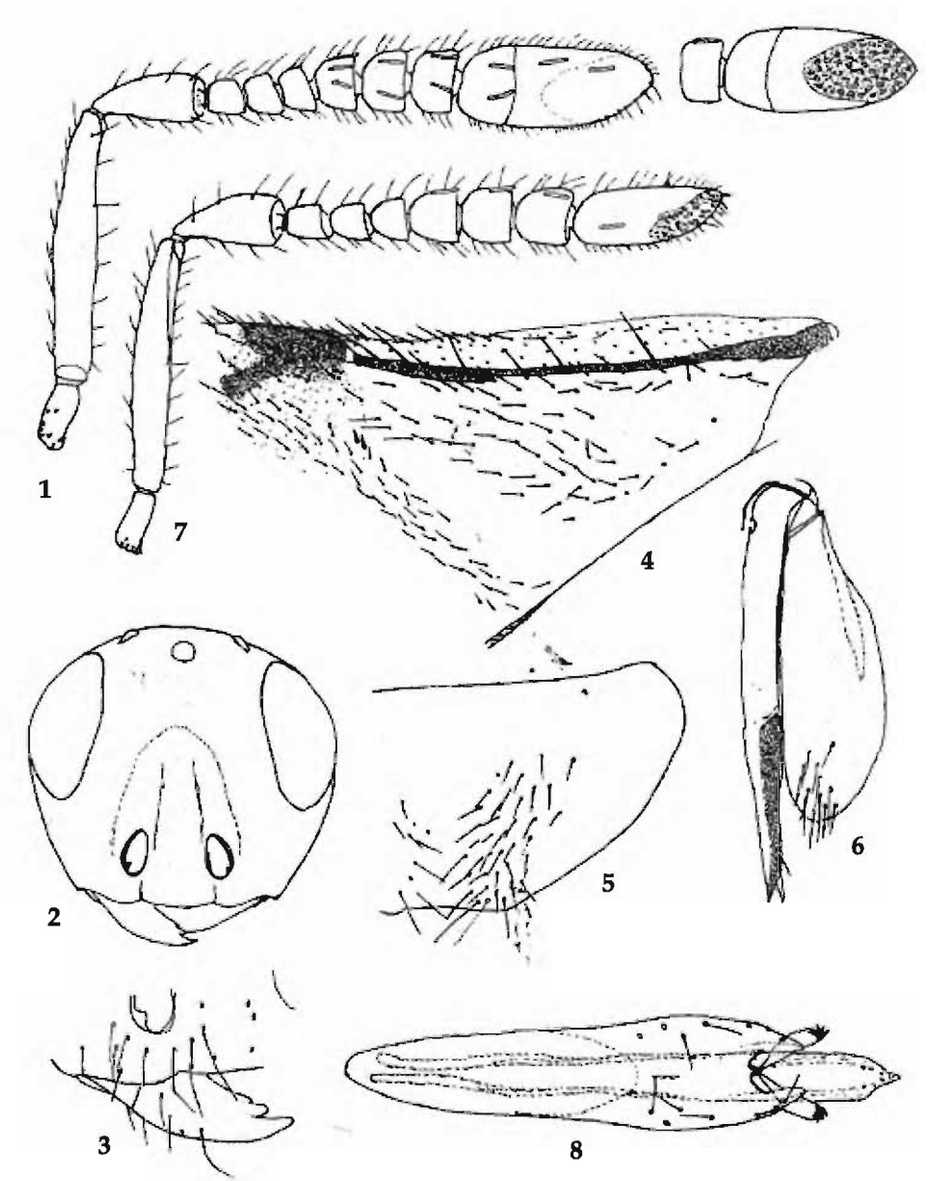
PARATYPES : 7 females, 14 males. INDIA: Uttar Pradesh: Aligarh, Dhorau, 3 females, 13 males (2 females and 2 males on slides, Nos. EH.1324, EH.1328, EH.1330, EH.1333), with same data as holotype; Aligarh, Harduaganj, 1 female, 1 male (on slides, Nos. EH.1331; EH.1332), 8.iii.2009, Coll. F.R.Khan. Rajasthan: Jodhpur, Sardar Samund lake, 2 females (on slides, Nos. EH.1343, EH.1344), 30.i.2001, Coll. S.I. Kazmi; Jodhpur, Khosia Meta, 1 female (on slide, EH. 1345), 20.i.2006, Coll. S.I. Kazmi. The paratypes are distributed as follows: 2 males in NPC; 1 female; 2 males, in NZSI, Reg. No. 12352/H3; 12353/H3 & 12354/H3; remaining paratypes in ZDAMU, Reg. No. HYM/CH/623.

Distribution : India: Rajasthan, Uttar Pradesh.

Hosts : Unknown.

Etymology : Greek. *eury*=wide, broad; *stoma*=mouth; refers to the very broad mouth fossa.

Remarks : This species is very close to *C. primulum* (Mercet) and was initially regarded as conspecific with Mercet's species . Dr. J.S. Noyes (BMNH) to



Figs. 1-8. *Copidosoma eurystomum* sp.nov., female except Figs. 7 and 8: 1, antenna; 2, head frontal aspect; 3, mandible; 4. Fore wing basal part showing venation and setation; 5, hypopygium, left half; 6, genitalia, left half; 7, antenna, male; 8, genitalia, male.

whom Hayat sent some figures was also of the same opinion. But it differs from the *primulum* in having the ovipositor clearly shorter than mid tibia; fore wing proximal to the linea calva with relatively more setae arranged in 5 lines; and phalobase 3.75x-4x as long as broad. In *primulum*: the ovipositor is 1.31x as long as mid tibia; fore wing proximal to the linea calva with setae arranged in 3 lines; and phallobase about 3.33x as long as broad.

3. ***Copidosoma floridanum*** (Ashmead)

1900. *Berecyntus floridanus* Ashmead, 365, female. U.S.A.: Florida, Biscayne Bay.

1988. *Copidosoma floridanum* (Ashmead): Noyes, 70, female, redescription, synonymy, taxonomy, figures.

1998. *Copidosoma floridanum* (Ashmead): Kazmi & Hayat, 298, 321-324, female, male, redescription, synonymy, figures; Indian records.

2005. *Copidosoma floridanum* (Ashmead): Guerrieri & Noyes, 104, 120-121; female, male, diagnosis, synonymy; hosts, distribution, key, figures, European and Indian records.

2006a. *Copidosoma floridanum* (Ashmead): Hayat, 303, female, Kanpur record, host. 2006b. *Copidosoma floridanum* (Ashmead): Hayat, 75, 79-80, key, hosts, distribution.

2007. *Copidosoma floridanum* (Ashmead): Hayat *et al.*, 40, female, male, Himachal Pradesh and Uttar Pradesh records.

This is a cosmopolitan species, with twelve other names as its junior synonyms (Noyes, 1988; Kazmi & Hayat, 1998; Guerrieri & Noyes, 2005).

Material examined : (Specimens on slides): INDIA: Tamil Nadu: Ooty, Doddabetta, 9 females (on 9 slides, Nos. EH.839-EH.847), 6.iii.1993, Coll. S.B. Zeya. Uttar Pradesh: Dehra Dun (now in Uttarakhand), F.R.I., 1 female (on slide, EH.859), 12.x.1979, Coll. S.I. Farooqi. Meghalaya: Jowai, Thaldskin, 1 female (on slide, EH. 1326), 22.x.2008, Coll. F.R.Khan. Assam: Guwahati, Sansari, 1 female (on slide, EH. 1335), 29.x.2008, Coll. F.R. Khan. Uttarakhand: Dehra Dun, Malsi, 1 female (on slide, EH. 1336), 4.xi.2009, Coll. F.R. Khan.

(Specimens on cards): INDIA: Orissa: Sambalpur, Buddharaja, 5 females, 11.xii.2007. Sikkim: Gangtok, Syari, 1 female, 1.vi.2008. West Bengal: Islampur, Gudish Basti, 2 females, 7.vi.2008; Islampur, Rasoolpur, 1 female, 9.vi.2008. Meghalaya: Ri Bhoi, Um Sam Lem, 1 female, 21.x.2008; Ri Bhoi, Lumdaitkhla, 1 female, 25.x.2008. Uttar Pradesh: Aligarh, Dhorau, 1 female, 7.iii.2009; Aligarh, Harduaganj, 1 female, 1 male, 8.iii.2009; Aligarh, Jawan, 3 females, 6.xi.2009. Uttarakhand: Udham Singh Nagar, Tanda, 3 females, 22.x.2009; Kashipur, Parmanandpur, 3 females, 24.x.2009; Kashipur, Pipalia , 1 female, 1 male, 24.x. 2009; Nainital, Nainagaon, 3 females, 25.x.2009; Haldwani, Gora Padao, 3 females, 26.x.2009; Ranikhet, Ardee Estate, 2 females, 27.x.2009; Ranikhet, Chaubatia, 2 females, 27.x.2009; Almora, Matela, 1 female, 1 male, 28.x.2009; Almora, Matikhola, 4 females, 28.x.2009; Ramnagar, Ghatti, 3 females, 30.x.2009; Ramnagar, Sauni, 1 female, 1 male, 30.x.2009; Roorkie, Chhiddarwala, 1 female, 2.xi.2009; Dehra Dun, Jeewangarh, 1 female, 3.xi.2009; Dehra Dun, Laxmipur, 3 females, 3 males, 3.xi.2009; Dehra Dun, Udaibagh, 1 female, 1 male, 3.xi.2009; Dehra Dun, Malsi, 4 females, 1 male, 4.xi.2009; Dehra Dun, F.R.I., 2 females, 4.xi.2009 (All Coll. F.R. Khan).

(Specimens in alcohol): 129 females, 44 males from the following districts of Uttarakhand: Udham Singh Nagar, Kashipur, Nainital, Ranikhet, Almora, Ramnagar, Roorkie, and Dehra Dun.

The following specimens deposited in NZSI: 3 females, 1 male (on cards) (NZSI, Reg. No. 12360/H3, 12361/H3) and 32 females, 2 males (Dehra Dun) (in alcohol in a vial), Reg. No. 12358/H3. Rest of the Material in ZDAMU.

Hosts : *Argyrogramma signatum; Helicoverpa armigera* (Noctuidae); [?] cabbage aphids; [?] sugarcane aphids.

Distribution : Cosmopolitan. India: Assam (new record), Bihar, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Meghalaya (new record), Orissa, Sikkim, (new record), Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal.

4. ***Copidosoma gracilis*** (Kaul & Agarwal)

1986. *Litomastix gracilis* Kaul & Agarwal, 20-23, female. Holotype female: India, Simla.

1989. *Copidosoma gracile* (Kaul & Agarwal): Hayat, 279, taxonomy.

1998. *Copidosoma gracilis* (Kaul & Agarwal): Kazmi & Hayat, 298, 319-320, female, male, key, figures, redescription, Uttarakhand, Himachal Pradesh, Kerala records.

2006b. *Copidosoma gracilis* (Kaul & Agarwal): Hayat, 74, 79, female, key, figures. 2007. *Copidosoma gracilis* (Kaul & Agarwal): Hayat, *et al.*, 40, female, Himachal Pradesh record.

Material examined : INDIA: Uttarakhand: Dehra Dun, Udaibagh, 2 females, 3.xi.2009, Coll. F.R.Khan; Dehra Dun, Laxmipur, 1 female, 3.xi.2009; Udham Singh Nagar, Fatehpur, 1female (on slide EH. 1347), 22.x.2009, Coll.F.R.Khan. Two females in ZDAMU; two females in NZSI, Registration No. 12355/H3 & 12356/H3.

Hosts : Unknown.

Distribution : India : Himachal Pradesh, Kerala, Uttarakhand.

5. ***Copidosoma indicum*** Kazmi & Hayat

1998. *Copidosoma indicum* Kazmi & Hayat, 298, 320-321, female. Holotype female: India, Tamil Nadu, Shembaganum. [Also from Kerala and Karnataka].

2006b. *Copidosoma indicum* Kazmi & Hayat: Hayat, 75, 79, female, key, figures.

Material examined : INDIA: Karnataka: Bangalore, Nandi Hills, 1 female (on slide, No. EH.1334), 11.iii. 2010, Coll. F.R. Khan. In ZDAMU.

Host : Unknown.

Distribution : India: Kerala, Karnataka, Tamil Nadu.

6. ***Copidosoma transversum*** Kazmi & Hayat

1998. *Copidosoma transversum* Kazmi & Hayat, 324-325, female. Holotype female: India, Kerala, Nelliampathy [Also from Mudigere, Periyar Anim. Sanc., Mudumalai Anim. Sanc., Aligarh].

2006b. *Copidosoma transversum* Kazmi & Hayat: Hayat, 75, 80, key, figures.

2007. *Copidosoma transversum* Kazmi & Hayat: Hayat *et al.*, 40, female, Himachal Pradesh record.

Material examined : INDIA: Uttar Pradesh, Aligarh, 2 females (on two slides, EH. 856, EH. 857), 15.ix.1978, Coll. M. Hayat & M. Verma. In ZDAMU; 2 females (on cards) from Himachal Pradesh (Hayat *et al.*, 2007b) deposited in NZSI, Registration No. 12357/H3.

Hosts : Unknown.

Distribution : India: Himachal Pradesh, Karnataka, Kerala, Tamil Nadu, Uttar Pradesh.

7. ***Copidosoma varicorne*** (Nees)

1834. *Encyrtus varicornis* Nees, 214, female. Lectotype female [designated by Graham, 1969: 295-295]. ? Germany.

1921. *Paralitomastix varicornis* (Nees): Mercet, 439, female.

1988. *Litomastix* (*Paralitomastix*) *varicornis* (Nees): Graham, 27.

1998. *Copidosoma varicorne* (Nees): Kazmi & Hayat, 295, 298-299, female, redescription, taxonomy, key, figures, Aligarh and Coimbatore record.

2005. *Copidosoma varicorne* (Nees): Guerrieri & Noyes, 105, 135, female, male, taxonomy, synonymy, redescription, figures, hosts, distribution.

2006b. *Copidosoma varicorne* (Nees): Hayat, 72, 75, female, key, figures, distribution, hosts.

2008. *Copidosoma varicorne* (Nees): Hayat & Khan, 126, female, West Bengal record.

Material examined : INDIA: Karnataka: Bangalore, GKVK, 1 female, 11.iii.2010, Coll. F.R. Khan. (NZSI, Registration No. 12359/H3).

Hosts : *Anarsia ephippias, A. sagmatica; Dichomeris eridontis* (Gelechiidae); *Eucosma* sp. (Tortricidae).

Distribution: India: Andhra Pradesh, Kerala, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal (Pakistan; Palaearctic; Afrotropical).

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A REPORT ON THE OCCURRENCE OF THE WATER-STRIDER, *HALOBATES MICANS* ESCHSCHOLTZ, 1822 (HEMIPTERA : GERRIDAE) FROM NAGAPATTINAM COASTAL WATERS, SOUTHEAST COAST OF INDIA

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INTRODUCTION

The water-striders, *Halobates micans* (Hemiptera: Gerridae) was described in 1822 by Eschscholtz based on the material procured from unspecified locality some where along the Southeast coast of India. The allotype of this species was designated by Eschscholtz, which was collected from Nagapattinam coastal waters. There are 8 families, about 106 genera and approximately 1200 species of water-striders are distributed worldwide. The family Gerridae alone contains 56 genera with about 450 species belongs to 8 subfamilies. Of these, only a small percentage, 13 genera with about 100 species, are found in marine environment. The Gerridae and Veliidae are particularly difficult to delineate at the family level (China and Usinger, 1949). The specimens studied by them were collected from the sea surface.

They are wingless and exclusively marine, spending all stages of their life cycle on the sea-air interface (Zaitesev, 1971). There are only nine species of *Halobates* that are truly pelagic (Cheng, 1982; Cheng *et al.*, 1990; Andersen and Foster, 1992). These open ocean species have some characteristic that allow them to move on the ocean surface film (Cheng and Shulenberger, 1980). In spite of 80 genera and 275 species accommodated in 16 major families of aquatic and semi aquatic Hemiptera known from India (Thirumalai, 2002). During a recent survey in the Nagapattinam coastal waters, about 100 specimens of *H. micans* were collected and the details are depicted below. In addition, a geographical distribution of *Halobates* spp. known so far from the Indian marine habitats is also provided.

MATERIAL AND METHODS

The specimens were collected from Nagapattinam coastal waters (Lat. 10°48'0N; Long. 79°50'24E) during routine survey at high tide in January, 2010. They were preserved in a 70% ethanol solution and identified using the key presented by Herring (1961) and White, 1883.

SYSTEMATIC ACCOUNT

Phylum ARTHROPODA
Class INSECTA
Order HEMIPTERA
Family GERRIDAE

Genus ***Halobates***

H. micans Eschscholtz, 1822

Diagnosis : Body blackish with grayish pubescence and yellow markings; head with 2 triangular yellow markings meeting in the midline, ventral part of body in male with yellow markings, not extensive but conspicuous, lateral margin of proctiger of male roundly produced but not pointed, right styliform process curved outward, in female, the yellow colouration on the ventral part of body more extensive than in male.

DISCUSSION

Water-striders of the genus *Halobates* comprise the only known true oceanic insects. The genus comprises of 43 species of which 5 are distributed in all tropical oceans and the remaining 38 have been recorded from the near-shore, sheltered coastal waters of the tropical Indo-Pacific (Anderson and Foster, 1992). Of these 5 species viz., *H. galatea*, *H. flaviventris*, *H. formidabilis*, *H. trynae* and *H. micans* are known to occur in the Indian marine habitats. But *H. elephanta* Andersen & Foster, 1992, *H. germanus* White, 1883, *H. hayanus* White, 1883, *H. proavus* White, 1883 and *H. micans* Eschscholtz, 1822 are also recorded from Indian open sea species; the remaining species are known from India and apparently near-shore species preferring habitats that are sheltered from winds and wave action.

The present reports on the new arrival of *H. micans* from the coastal waters of Nagapattinam, further confirms the observation made by Andersen and Foster (1992) that *H. micans* inhabits sea surface of near-sea shore. Besides, a recent report on the distribution of *Halobates* in the open oceans (Pathak *et al.*, 1988) does not include *H. micans* a pointer to the fact that the species in all probability is not an open ocean habitat. The sea skaters, *Halobates* Eschscholtz (Gerridae: Halobatinae) include the only known oceanic insects: five pelagic species are distributed in all tropical oceans and further 40 species have been recorded from sheltered coastal waters of the Indo-Pacific (Andersen and Weir, 2003). *H. micans* is non-randomly distributed across the ocean surface (Cheng and Shulenberger, 1980; Cheng and Holdway, 1995). Cheng (1985) reported considerable variation in the ability of *Halobates* species to survive in different salinities. Sea birds and sea turtles have also been reported as Halobates predators (Senta *et al.*, 1993; Witherington, 2002). Bull *et al.* (1977), Cheng *et al.* (1984) and Schulz-Baldes (1989) have suggested that *H. micans* could be used as a bioindicator of cadmium distribution in the surface waters. During a recent faunistic survey in the Kannur district of Kerala, 7 specimens of *H. galatea* were collected from a group of 18 specimens observed in a mangrove habitat at Dharmadam (Radhakrishnan and Thirumalai, 2004).

Fig. 1 : Dorsal view of *H. micans*

Fig. 2 : Ventral view of *H. micans*

Table - 1 : Marine water-striders classification, number of marine species habitat preference and geographical distribution.

Genus	Habitat preference	Geograpical distribution
Halobates, group White, 1883	Nearshore seas, mangrove and lagoons	Mainland coast, islands of tropical, subtropical Indian and Pacific Ocean
Halobates, group White, 1883	Open ocean	Atlantic, Indian and Pacific Ocean
H. elephanta Andersen & Foster, 1992	Coastal	Andaman sea and Arabian sea
H. flaviventris Eschscholtz, 1822		Bay of Bengal (Tamil Nadu)
H. formidabilis Distant, 1910	Coastal	Andaman sea and Bay of Bengal
H. galatea Herring, 1961	Coastal	Arabian sea
H. germanus White, 1883	Oceanic	Arabian sea and Bay of Bengal
H. hayanus White, 1883		Andaman sea
H. micans Eschscholtz, 1822	Coastal	Andaman sea, Bay of Bengal (Tamil Nadu) and Indian Ocean
H. proavus White, 1883	Coastal	Andaman sea (Nicobar Island)
H. trynae Herring, 1964	Coastal	Bay of Bengal (Andaman Nicobar)

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STUDIES ON THE FAMILY GEKKONIDAE (REPTILIA) FROM KARNATAKA AND TAMIL NADU

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INTRODUCTION

Since the publication of Malcolm Smith's work (Fauna of British India Volume 11, Sauria 1935) the lizards of the family Gekkonidae were studied by Murthy (1985 & 1990) and Tikader and Sharma (1992), Daniels and Daniels (1992), Daniels (2001), Ishwar et.al (2001), Daniel (2002), Sharma (2002), Kalaiarasan (2003), and Mukherjee et.al (2005), have described a new species of *Cnemaspis (Cnemaspis anaikattiensis)* along with studies on some of the geckos of Western Ghats.

During the faunistic survey of the western Ghats part of Karnataka and Tamil Nadu during 2006-2008, undertaken by the Southern Regional Centre, Zoological Survey of India, 107 specimens of geckos belonging to three genera i.e. *Cyrtodactylus, Cnemaspis* and *Hemidactylus* of the family Gekkonidae were collected and studied. The study of these specimens revealed 14 species under 4 genera. In addition, the collections of geckos already available in the Southern Regional Centre, Zoological Survey of India were also examined for comparative study. Altogether 16 species of geckos from 5 genera were studied and identified.

Following is the systematic list of 27 geckonid species based on collections from Karnataka and Tamil Nadu States.

Key to the abbreviation : SVL-Snout to Vent Length; TL-Length of Tail; ex.-example; exs.-examples; Coll-Collector / Collected by.

SYSTEMATIC LIST

Phylum CHORDATA

Class REPTILIA

Order SQUAMATA

Sub order SAURIA (LACERTILIA)

Family GEKKONIDAE

Genus 1. ***Cyrtodactylus*** Gray

1. *Cyrtodactylus collegalensis* (Beddome)*
2. *Cyrtodactylus dekkanensis* (Gunther)
3. *Cyrtodactylus albofasciatus* (Boulenger)

Genus 2. ***Cnemaspis*** Strauch

4. *Cnemaspis indica* (Gray)*
5. *Cnemaspis beddomei* (Theobald)*
6. *Cnemaspis jerdoni* (Theobald)*
7. *Cnemaspis sisparensis* (Theobald)*
8. *Cnemaspis ornata* (Beddome)*
9. *Cnemaspis mysoriensis* (Jerdon)*
10. *Cnemaspis kandianus* (Kelaart)*
11. *Cnemaspis goaensis* Sharma
12. *Cnemaspis wynadensis (Beddome)*
13. *Cnemaspis littoralis* (Jerdon)
14. *Cnemaspis gracilis* (Beddome)*\

Genus 3. ***Dravidogecko*** Smith

15. *Dravidogecko anamallensis* (Gunther)**

Genus 4. ***Hemidactylus*** Oken

16. *Hemidactylus maculatus* (Dum. & Bibr.)*
17. *Hemidactylus triedrus* (Daudin)*
18. *Hemidactylus brooki* (Gra.y)*
19. *Hemidactylus prashadi* Smith
20. *Hemidactylus gracilis* Blanford

21. *Hemidactylus reticulatus* Beddome**

22. *Hemidactylus frenatus* Schlegel*

23. *Hemidactylus leschenaulti Dum.* & Bibr.*

24. *Hemidactylus flaviviridis* Ruppell

25. *Hemidactylus giganteus* Stoliczka

Genus 5. ***Hemiphyllodactylus*** Bleeker

26. *Hemiphyllodactylus typus aurantiacus* (Beddome)

Genus 6. ***Eublepharis***

27. *Eublepharis macularius* (Blyth)

*Specimens collected during the 2006-2008 Western Ghats Survey.

**Not collected during the survey text added.

1. *Cyrtodactylus collegalensis* (Beddome) Collegal Rock Gecko (PLATE la)

1870. *Gymnodactylus collegalensis* Beddome Madras *Month. J. Med Sc.* ii. p. 173.

1985. *Cyrtodactylus collegalensis* Murthy. *Rec. Zool. Surw. India, Occ. Pap.*, **72** : p. 17.

Material examined : 1 ex., (SVL. 34 mm; Tail damaged), Anaimalais Upper Aliyar, 30.xii.67. T.S.N. Murthy, Coll.; 1 ex., (SVL. 34 mm; Tail damaged), Meenumutty, New Amarambalam Reserve Forest, 14, iii, 79. T.S.N. Murthy, Coll.; 1 ex. (SVL. 28 mm; Tail damaged), Mudumalai-1 Nilgiri Biosphere Reserve, ca 1100 m. 12.x.87,M.Vasanth,Coll.; lex., (SVL. 45 mm; Tail damaged), Chokanparai, Alagar Kovil, Theni. 27.1.07 R. Aengals Coll.

Diagnosis : A conspicuously and handsomely coloured gecko : light brown or greyish above, with large, rounded or oval black edged, paired spots upon the back. Tail with much smaller spots irregularly arranged. Dorsal pholidosis composed of small granular scales intermixed with larger keeled scales.

Distribution : INDIA : Hills of southern India. *Elsewhere* : Sri Lanka.

2. *Cnemaspis indica* (Gray) Nilgiri Dwarf Gecko (PLATE I b)

1846. *Goniodactylus indicus*, Gray. *Ann. Mag. Nat. His.*, 18 : p. 429.

1985. *Cnemaspis indica.* Murthy. *Rec. zool. Surv. India, Occ. Pap.*, 72 : p. 19.

Material examined : 3 exs., (SVL. 30-35 mm; TL. 25-30 mm), Doddabetta Nilgiris, 13.iii.78. T.S.N. Murthy, Coll.; 1 ex., (SVL. 32 mm; TL. 35 mm), Meenumutty New Amarambalam, 23.ii.79. T.S.N. Murthy, Coll.; 2 exs., (SVL. 27-32 mm; TL. 35-40 mm), SayivalaNew Amarambalam, 15.iii.79. K.R. Rao Coll.; 1 ex, (SVL. 32 mm; TL. 30 mm), SayivalaNew Amarmbalam, 15.iii.79. K.R.Rao, Coll.; 8 exs., (SVL. 20-32 mm; TL. 22-32 mm), Lakkidi, Nilgiri Biosphere Reserve, 24.viii.90. G. Thirumalai, Coll.; 2 exs., (SVL. 22-25 mm; Tail damaged), Italar, NBR, 28.viii.90. G. Thirumalai, Coll.; 3 exs., (SVL. 23-30 mm;TL. 20-30 mm), Emerald, Nilgiri Biosphere Reserve, 24.iii.91. G. Thirumalai, Coll.; 1 ex., (SVL. 23 mm; TL. 15 mm), Sim's park, Conoor, 18.iv.92. T.S.N. Murthy, Coll.; 1 ex., (SVL. 24 mm; TL. 30 mm), Pykara, 23.iv.92. T.S.N. Murthy, Coll.; 1 ex., (SVL. 30 mm; TL. 32 mm), Upper Bhavani, 7.H.93. Dr. G Thirumalai, Coll.; lex., (SVL. 30 mm; TL. 32 mm), Thammanayakanahalli, 10.xii.05. S. Prabakaran Coll.

Diagnosis : Head covered with small, granular, keeled scales; back with much larger, rounded, pointed or keeled tubercles; ventral scales smooth. Body is greenish brown with a row of orange yellowish spots traversed from the head to tail and also similar spots traversing in the lateral side of the body. A light vertebral line is present.

Distribution : INDIA : Tamil Nadu and Karnataka.

3. *Cnemaspis beddomei (Theobald)* Beddomei's Dwarf Gecko (PLATE I c)

1870. *Gymnodactylus marmoratus* (not of Dum. & Bibr.) Beddome, *Madras Month. J. Med. Set.* i.31 (type loc. Travancore; London).

1876. *Gymnodactylus beddomei* Theobald, *Cat. Rept. Brit. Ind.*, p. 88.

1935. *Cnemaspis beddomei*, Smith, *Fauna of British India*, **2** : p. 71.

Material examined : 2 exs., (SVL. 17-36 mm; Tail damaged), Chokanparai, Alagarkovil, 27107, R. Aengals, Coll.; 2 exs. (SVL. 22-30 mm; Tail damaged), Koliyamuthi, Topslip, 5.ii.07. R. Aengals, Coll.

Diagnosis : Head short; back with smaller but enlarged tubercles and belly with keeled scales;

brown above, spotted with pale and darker markings and pale brownish below; dark bars on the lower lip and the throat. The tail is barred with light and dark and swollen at the base.

Distribution : INDIA : Tamil Nadu and Kerala.

4. *Cnemaspis jerdoni* (Theobald) **Jerdon's Dwarf Gecko** (PLATE, I d)

1868. *Gymnodactylus jerdoni.* Theobald, *Cat. Rept. Asiat. Soc. Mus.*, p. 31.

1935. *Cnemaspis jerdoni.* Smith, *Fauna of British India,* **2** : p. 74.

Material examined : 1 ex., (SVL. 30 mm; TL. 32 mm), Mdukulimadu, Top Slip, 23.xii.07. R. Aengals Coll.

Diagnosis : Head covered with small granular scales; back with small uniform scales; ventral scales rather large, imbricate, smooth; flanks with spines; dorsally greyish brown above with lighter and darker spots. Two or three jet black spots on the nape. Tail with conspicuous dark bands above.D

Distribution : INDIA : Southern India. *Elsewhere* : Sri Lanka.

5. *Cnemaspis sisparensis* (Theobald) **Sispara Dwarf Gecko** (PLATE I e)

1870. *Gymnodactylus maculatus* Beddome, *Madras Month, J. Med. Sci,* ii, p. 173. (type loc. Sholakal, at the foot of the Sispara Ghat, Nilgiri Hills. London).

1876. *Gymnodactylus sisparensis* Theobald, *Cat. Kept, Brit. India.* P. 86.

1935. *Cnemaspis sisparensis,* Smith; *Fauna of British India,* 2 : p. 69.

Material examined : 1 ex., (SLV. 35 mm; Tail damaged), Sayivala, New Amrambalam. 15.iii.79. K.R. Rao Coll.; 1 ex. (SVL. 20 mm; TL. 24 mm), Naduvattam. Gudalur Nilgiri Biosphere Reserve, 1630 m. 27.iii.91. G Thirumalai, Coll.; 1 ex., (SVL. 36 mm; Tail damaged), Iyappan temple, 13.xii.07. R. Aengals Coll.; 3 exs., (SVL. 15-35 mm; Tail damaged), Konaje Village, Kollur Range, 16.xii.07. R.Aengals, Coll.; 3 exs., (SVL. 20-30 mm;TaiI damaged), Vattai muri, 16.xii.07. R.Aengals Coll.; 1 ex., (SVL. 30 mm; TL. 34 mm), Thirthahalli, 19.xii.07. R. Aengals Coll.; 8 exs., (SVL. 15-32 mm; TL. 20-38 mm), Kavaladurga tank, 19.xii.07. R. Aengals Coll.

Diagnosis : Back with larger, rounded or pointed keeled tubercles, ventrals as large as dorsal; digits longer; males with 7-8 femoral pores; brownish with a series of dark brown oblong spots arranged in three longitudinal lines. Tail with lighter and darker bars above.

Distribution : Nilgiris, Tamil Nadu, Kavalai, Silent Valley and New Amarambalam Reserve Forest, Kerala.

6. *Cnemaspis ornata* (Beddome) **Ornate Dwarf Gecko** (PLATE II a)

1870. *Gymnodactylus ornatus* Beddome, *Madras Month. J. Med. Sci,* i, p. 32 (type loc. Tinnavelly; London). *1935. Cnemaspis ornata,* Smith, *Fauna of British India,* 2 : p. 70.

Materials examined : 2 exs. (SVL. 25-32 mm; TL. 22-27 mm), Kuliratti, Kalakad l.iii.85. R.S. Pillai, Coll.; 3 exs., (SVL. 25-32 mm; Tail damaged), Chokanparai, Alagarkovil. 27.L07. R. Aengals. Coll.

Diagnosis : Head covered with small, granular, conical scales; back with much larger, conical or strongly keeled tubercles; ventrals smooth. Digits longer; tail cylindrical; male with 6-9 preanal pores. Brown above and pale brownish on the undersides. Dorsal pattern consists of a row of white blackedged ocelli down the centre of the back and a light blackedged band on the shoulders.

Distribution : INDIA : Tamil Nadu and Kerala.

7. *Cnemaspis mysoriensis* (Jerdon) **Mysore Dwarf Gecko** (PLATE II b)

1853. *Gymnodactylus mysoriensis,* Jerdon, *J. Asiatic. Soc. Beng.* 22 : p. 469 (type locality Bangalore; type lost). 1935. *Cnemaspis mysoriensis,* Smith, *Fauna Brit. Ind.,* : p. 72.

Material examined : 2 exs., (SVL. 25-30 mm; TL. 30-35 mm), Woodhouse, Bangalore, 8.xii.07, R. Aengals, Coll.; 1 ex., (SVL. 15 mm; Tail damaged), Peacock Kere, Kallahallarange, 9.xii.07. R.Aengals, Coll.; 1 ex, (SVL. 15 mm; TL. 05 mm), Lakshmana theartham, Kallahalla range, 10.xii.07, R. Aengals, Coll.

Diagnosis : Head covered with small, granular, keeled scales; on the back similar but intermixed with a few large ones which may turn conical in shape on the sides; ventral scales smooth, imbricate, larger than the dorsals. Brown above and brownish white below; back with a midstripe and prominent

dark brown spots; throat suffused with brown. Digits with dark bars and tail much longer than the head and body.

Distribution : INDIA : Karnataka, Kerala and Tamil Nadu.

8. *Cnemaspis kandianus* (Kelaart) Kandy Dwarf Gecko (PLATE II c)

1853. *Gymnodactylus kandianus*, Kelaart, *Prod. Fauna Zool.*, p. 186 (type loc. hills round kandy, Ceylon).

1935. *Cnemaspis kandiana*, Murthy. *Rec. zool. Surv. India, Occ. Pap.*, **72** : p. 20.

Material examined : 1 ex, (SVL. 24 mm; TL. 30 mm), Panumpuzha, New Amarambalam, 27.ii.79, T.S.N. Murthy, Coll,; lex., (SVL. 22 mm; Tail damaged), Sethumadai. Anaimalais, 18.ii.92. G. Thirumalai, Coll.; 7 exs, (SVL. 15-30 mm; TL. 12-32 mm), Chinnakulli bridge, Kargudi range, 23.xii.07. R. Aengals Coll.

Diagnosis : Back with transversely arranged variegations and a faint vertebral stripe or spots. Throat dark brown; ventral light brown. Spine like tubercles on the flanks white. Tail slightly longer than the head and body.

Distribution : India : Hills of Southern India and Andaman Islands. *Elsewhere* : Sri Lanka and Islands west of Sumatra

9. *Cnemaspis gracitis* (Beddome) Indian Forest Gecko (PLATE II d)

1870. *Gymnodactylus gracilis*, Beddome, *Madras Month. J. Med. Sci.* i, p. 32. (type loc. Palaghat hills, Madras presidency)

1935. *Cnemaspis gracilis*, Smith, *Fauna of British India*, **2** : p. 74.

Material examined : 1 ex., (SVL. 28 mm; TL. 32 mm), 23.ii.79. Meenumutty New Amrambalam, Coll. T.S.N. Murthy, Coll. 1 ex. (SVL. 28 mm; TL. 32 mm), Medicare, 25.xii.05, S. Prabakran, Coll.; 3 exs., (20-26 mm; Tail damaged), Pojakal nullah, Hagarhole, 9.xii.07. R. Aengals Coll.; 2 exs., (SVL. 28-30 mm; TL. 30-35 mm), Mudan Kero, Medikare, 11 .xii.07, R. Aengals, Coll.; 6 exs., (SVL. 28-30 mm; TL. 30-34 mm), Mashihole, 16.xii.07. R. Aengals, Coll. 5 exs., (SVL. 15-30 mm; TL.25-33 mm), Minehole, Nalur, Thirthahalli, 20.xii.07. R. Aengals Coll.

Diagnosis : Head covered with minute keeled scales which are largest on the snout; upper labials 7-8, as many lower labials; mental is large, becomes like a spine posteriorly, sub triangular, broader than the rostral; post-mentals are small, in 2 or 3 pairs, the first paid is generally in contact with one another just behind the mental shield. Grey brown above with lighter and darker spots. Nape often with two or three jet black vertebral spots and usually a series of light vertebral spots down the back. Tail with dark bands and slightly longer than the head and body.

Distribution : INDIA : Hills of southwestern India.

Elsewhere : Sri Lanka.

10. *Dravidogecko anamallensis* (Gunther) Anamallai Dravid Gecko (PLATE II e)

1875. *Jecko anamallensis*, Gunther, *Proc. Sool. Soc.* p. 226 (type loc. Anaimalai Hills, South India; London).

1985. *Dravidogecko anamallensis*, Murthy. *Rec. Zool. Surv. India, Occ. Pap.*, **72** : p. 22.

Material examined : I ex., (SVL. 38 mm; TL. 34 mm), Kodaikanal, 3.H.72. T.S.N. Murthy. Coll.; 1 ex., (SVL. 40 mm; Tail damaged), Kuliratti. (Kalakad) 26.1.84, R.S. Pillai, Coll.

Diagnosis : Greyish-brown above and marbled with light dots; brownish-white below, granulated body, clawed digits, undivided sub digital lamellae and eyes with vertical pupil. Males have both the preanal and femoral pores; toes with rudiments of web. Tail cylindrical and swollen at the base.

Distribution : Anamalais hills of Western Ghats.

11. *Hemidactylus maculates* (Dum. & Bibr.) Giant spotted gecko (PLATE III a)

1836. *Hemidactylus maculatus*, (in part) Dum and Bibr, *Erp. Gen.* Hi,, p. 358. (type loc. India (Bombay) : Paris.

Material examined : 1 ex. (SVL. 48 mm; TL. 65 mm), Courtallam 30.X.75. R.S. Pillai, **Coll.**

Diagnosis : Dorsally brown with large darker spots which unite sometimes to from undulating cross-bars on the back and dirty whitish below; five distinct dorsal cross-bars on the back are more pronounced in the young. Head with two dark stripes on each side; Tail of the young and adult banded with light and dark brown.

Distribution : INDIA : Maharashtra, Kerala and Tamil Nadu.

12. *Hemidactylus triedrus* (Daudin) **Termite Hill Gecko** (PLATE III b)

1802. *Gecko triedrus* Daudin, *Hist. Nat. Kept.* 4 : p. 155. 1935. *Hemidactylus triedrus*, Smith, *Fauna of British India.* **2** : p. 88.

Material examined : I ex., (SVL. 30 mm; TL. 20 mm), Boeligutta Mudumalai, 26.ix.88, G. Thirumalai, Coll.; 1 ex., (SVL. 25 mm; Tail damaged), Valugai Odai, , Mundanthurai, 24.i.07, R. Aengals. Coll.; 1 ex., (SVL. 65 mm; *L* Tail damaded) Watrap, Pudupatty, 26107, R. Aengals. Coll.; 2 exs., (SVL. 32-42 mm; Tail damaged), Hansapuram, 28.i.07, R. Aengais, coll.; 3 exs., (SVL. 42-48 mm; TL. 50-56 mm) Puduputty village, 31.i.07, R. Aengals, Coll.; 1 ex., (SVL. 70 mm; TL. 75 mm), Lakshmana theertham, 10.xii.07 R. Aengals. Coll.

Diagnosis : Head rather large and the anout obtusely pointed; the body heavily tuberculated and it can be easily recognized by three white edged olive green cross bars and pinkish white below; greenish above eye. The tail is marked withy regular black and light rings.

Distribution : INDIA: Tamil Nadu, Andhra Pradesh, Karnataka, Kerala and Maharashtra. *Elsewhere* : Sri Lanka and West Pakistan.

13. *Hemidactylus brooki* (Gray) **Spotted Indian House Gecko** (PLATE III c)

1845. *Hemidactylus brooki* Gray, *Cat, Liz Brit., Mus.* p. **153.** (type loc. Borneo; London).

Material examined : 1 ex., (SVL. 34 mm; TL. 40 mm), Ooty Nilgiris, 4.iii.78, T.S.N. Murthy, Coll.; 1 ex., (SVL. 36 mm; TL. 39 mm) Nedungayam, New Amarambalam, 24.iii.79, K.R. Rao, Coll.; 1 ex., (SVL. 24 mm; Tail damaged), Anaimalais, 10.iv.92, T.S.N. Murthy, Coll.; 4 exs., (SVL. 46-48 mm; TL. 48-50 mm), Kagglahalli, Harohalli range 1 l.xii.2005 S. Prabakaran, Coll.; 1 ex., (SVL. 36 mm; Tail damaged), Periyar Dam, 26.i.07. R. Aengals, Coll.; 3 exs., (SVL. 34-44 mm; TL. 38-42 mm), Chenbagathoppu, 27107. R. Aengals, Coll.; 1 ex., (SVL. 40 mm; TL. 41 mm), Nagarhole, 9.xii.07. R. Aengals. Coll.; 1 ex.,(SVL. 32 mm;TL. 35 mm), Nagerhole, 11 .xii.07. R. Aengals, Coll.; 1 ex., (SVL. 45 mm; Tail damaged), Bonegar, Medikare, 11 .xii.07, R. Aengals, Coll.; 2 exs., (SVL. 48-50 mm; TL. 50-52 mm), Sudar tank, Siringere range, 18.xii.07. R. Aengals Coll. 1 ex., (SVL. 35 mm;TL. 45 mm), Thirthahalli, 20.xii.07. R. Aengals, Coll.

Diagnosis : Back with conical tubercles arranged in regular rows; 5-6 lamellae under first toe and seven to ten under fourth toe, Light grey above, with dark brown spots more or less regularly arranged somewhat like broken transverse bands on the back; a dark streak along the side of the head and dirty whitish below.

Distribution : The whole of India.

Elsewhere : Sri Lanka and known from Borneo and South China through most of tropical Asia and North Africa.

14. *Hemidactylus reticulatus* Beddome **Reticulate Gecko** (PLATE III d)

1870. *Hemidactylus reticulatus* Beddome, *Madras Month. J. Med. Sci.* I, p.33 (type loc. Kollegal, Mysore State; London).

Material examined : 1 ex., (SVL. 32 mm; TL. 37 mm), Kodaikanal, 7.iv.80. T.S.N. Murthy, Coll.; 3 exs., (SVL. 37-42 mm; TL. 25-35 mm), Vaigaidam, 17.iii.87. K.V. Lakshminarayana Coll.

Diagnosis : Back with erect, keeled granules and enlarged, pointed and keeled tubercles; lamellae on the fourth toe 10; brown above with a characteristic pattern of darker lines arranged in a network on the back; belly whitish and throat mottled with brown. Most of the dorsal tubercles whitish.

Distribution : INDIA : Tamil Nadu, Karnataka and Andhra Pradesh.

15. *Hemidactylus frenatus* Schlegel (in Dum. & Bibr.) **Southern House Gecko** (PLATE III e)

1836. *Hemidactylus frenatus*, Schlegel, Dum and Bibr. *Erp. Gen.*, **3** : p.366.

Material examined : 1 ex., (SVL. 67 mm; TL. 72 mm), Meenumutty, NARF Kerala, 14.iii.79. T.S.N. Murthy, Coll.; 1 ex., (SVL. 53 mm; TL. 55 mm), SayivalaNew Amanambalam, 15-iii, 79. K.R. Rao, Coll.; 1 ex., (SVL. 35 mm; TL. 40 mm), Anaikatti, Coimbatore, 8.iv.92. T.S.N. Murthy, Coll.; 2 exs., (SVL. 40-45 mm; TL. 35-38 mm), Keelkodaiyar, 20-i-07, R. Aengals, Coll.; 1 ex., (SVL. 34 mm; TL. 36 mm), Karaiyar, 24.i.07. R. Aengals. Coll.; 1 ex.,

(SVL. 32 mm; TL. 34 mm), Periyar Dam, 26107. R. Aengals. Coll.; 1 ex., (SVL. 44 mm; Tail damaged), Chunnambu Odai, 30107. R. Aengals, Coll.; 2 exs., (SVL. 32mm;TL. 38 mm), Uthamapalayam, 31107. R. Aengals. Coll.; 1 ex., (SVL. 45 mm; TL. 50 mm), Wood house Bangalore, 9.xii.07, R. Aengals.Coll.; 2 exs., (SVL. 50-55 mm; TL. 40-45 mm), Devarkatte, 10.xii.07. R. Aengals Coll.; 1 ex., (SVL. 40 mm; TL. 55 mm), Konage village, 14.xii.07. R. Aengals Coll.; 1 ex., (SVL. 36 mm; TL. 40 mm), Sudartank, Siringer range 18.xii.07. R. Aengals, Coll.; 2 exs., (SVL. 60-62 mm; TL. 45-65 mm), Thirthahalli, 20.xii.07, R. Aengals. Coll.

Diagnosis : Body smooth; sometimes dark brownish dorsally with distinct darker marking often arranged as longitudinal stripes on the back and whitish below. Head is marked with dark and Hght lines; the flanks are spotted with dark; the tail is coral red during life.

Distribution : INDIA : Peninsular India, West Bengal, Andaman and Nicobar Islands.

Elsewhere : Bangladesh.

16. ***Hemidactylus leschenaulti*** *& Dum. & Bib*
Bark Gecko (PLATE III f)

1836. *Hemidactylus leschenaulti* Dum. & Bibr., *Exp. Gen. Hi,* p. 364 (type loc. ceylon; Paris).

Material examined: 1 ex., (SVL. 38 mm; TL. 46 mm), Ooty, Nilgiris, 18.iii.80. T.S.N. Murthy, Coll.; 1 ex., (SVL. 55 mm; TL. 60 mm), Valparai, Anaimalais, 26.iii.80, T.S.N. Murthy, Coll.; 1 ex., (SVL. 42 mm; TL. 40 mm), Sengaltheri, 8.ii.86. M. Vasanth, Coll; 1 ex., (SVL. 90 mm; TL. 75 mm), Karaiyar, Mundarthurai, 24107. R. Aengals coll. 1 ex., (SVL. 55 mm; TL. 60 mm), Periyar Dam, 26107, R. Aengals, Coll., 2 exs., (SVL. 45-75 mm; TL. 45-54 mm), Chenbagathoppu, 27107. R. Aengals, Coll.

Diagnosis : Body scales granular, minute and intermixed with small tubercles irregularly scattered; scales on the ventral small and imbricate; 10-11 lamellae under fourth toe; males with 10-17 femoral pores on each side. Grey above and whitish below; back with conspicuous wavy cross-bars; A dark streak from the eye extending on to the sides of the body.

Distribution : INDIA ; Throughout India. *Elsewhere*: Sri Lanka.

SUMMARY

In India, occurrence of 89 species of geckonids is well documented (Sharma 2002). Out of these 19 species have been recorded from Karnataka and Tamil Nadu eariier (Murthy, 1985 & 1990). Western Ghats region comprising of Tamil Nadu, Karnataka, Kerala, Maharashtra and Goa shows the presence of 27 species. During the faunistic survey of Western Ghats part of Karnataka and Tamil Nadu 107 examples belonging to 4 genera of the family Gekkonidae were studied in detail. The present article reports in brief an account of sixteen geckonid species reported from Karnataka and Tamil Nadu states.

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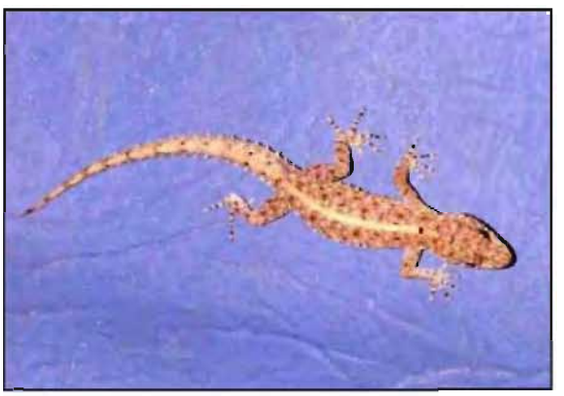
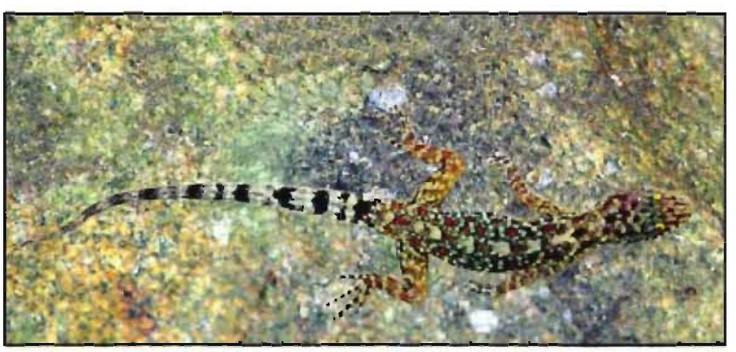
PLATE - I. GECKOS OF SOUTHERN INDIA

a. *Cyrtodactylus collegalensis* (Beddome)

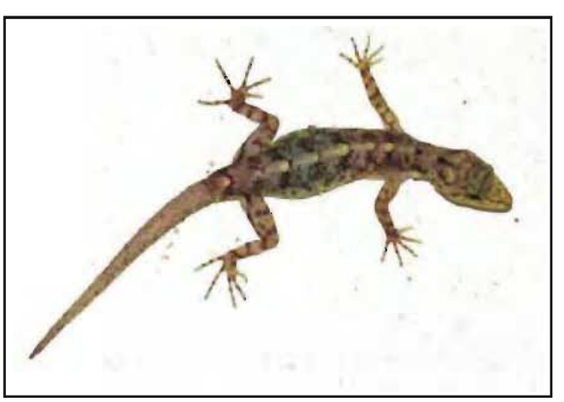


b. *Cnemaspis indica* (Gray)



c. *Cnemaspis beddomei* (Theobald)

d. *Cnemaspis jerdoni* (Theobald)



e. *Cnemaspis sisparensis* (Theobald)

PLATE - II. GECKOS OF SOUTHERN INDIA

a. *Cnemaspis ornata* (Beddome)

b. *Cnemaspis mysoriensis* (Jerdon)

c. *Cnemaspis kandianus* (Kelaart)

d. *Cnemaspis gracilis* (Beddome)

e. *Dravidogecko anamallensis* (Gunther)

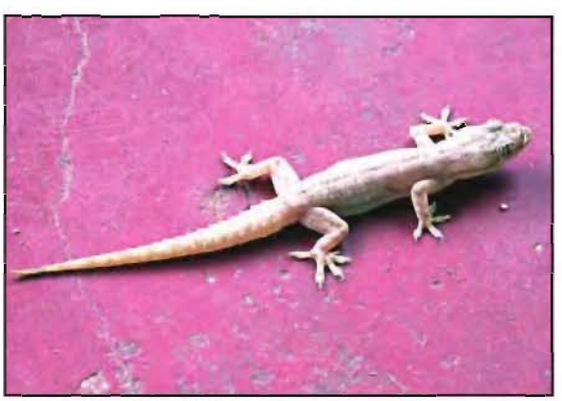
PLATE - III. GECKOS OF SOUTHERN INDIA

a. *Hemidactylus maculatus* (Dum.& Bibr.)

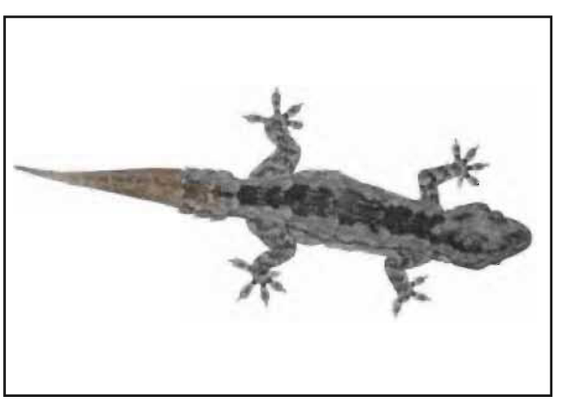
b. *Hemidactylus triedrus* (Daudin)

c. *Hemidactylus brooki* (Gray)

d. *Hemidactylus reticulatus* (Beddome)



e. *Hemidactylus frenatus* (Schlegel)



f. *Hemidactylus leschenaulti* (Dum.& Bibr.)

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NEW RECORD OF THE GENUS *COCHLISCHNOGASTER* DONG AND OTSUKA (HYMENOPTERA: VESPIDAE: STENOGASTRINAE) FROM THE INDIAN SUBCONTINENT

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INTRODUCTION

The hover wasps, Stenogastrinae, are a group of primitively eusocial wasps endemic to the Oriental region. They occupy an intermediate position between the solitary Eumeninae and the social Polistinae and Vespinae (Pickett and Carpenter, 2010). Members of this group exhibit considerable diversity in social behaviour and nest architecture. They usually inhabit shady parts of tropical forests and generally construct their delicate nests near water streams. The adult wasps do not fold their wings when at rest.

The subfamily Stenogastrinae consists of seven genera, viz. *Liostenogaster* van der Vecht, *Stenogaster* Guerin-Meneville, *Eustenogaster* van der Vecht, *Anischnogaster* van der Vecht, *Metischnogaster* van der Vecht, *Parischnogaster* von Schulthess and *Cochlischnogaster* Dong and Otsuka (Carpenter and Kojima, 1996; Carpenter and Starr, 2000; Carpenter, 1988, 2001). The taxonomy of Stenogastrinae has not been well studied in the Indian subcontinent. There are three genera, namely *Liostenogaster*, *Eustenogaster* and *Parischnogaster*, so far reported from Indian subcontinent (Das and Gupta, 1989; Carpenter and Kojima, 1996). In this paper, we are reporting the genus *Cochlischnogaster* Dong and Otsuka for the first time from Indian subcontinent, recording the species *C. dadugangensis* Dong and Otsuka.

The genus *Cochlischnogaster* was erected by Dong and Otsuka in 1997 with *C. dadugangensis* Dong and Otsuka as its type species. This genus is distinguished by the remarkable spoon-shaped filament on the apex of the male antenna. Dong and Otsuka (1997) described two species, namely *C. dadugangensis* and *C. menglunensis*, both from Yunnan (China). *Cochlischnogaster menglunensis* is known only from the female, and the characters used by Dong and Otsuka (aside from the male antenna) to distinguish the genus do not actually do so. Hence Carpenter (2001) considered *C. menglunensis* as of uncertain placement. Carpenter and Starr (2000) described another species, namely *Chalogaster spatulata*, in the new genus *Chalogaster* from Vietnam and Thailand. Later, Carpenter (2001) synonymised the genus *Chalogaster* Carpenter and Starr under *Cochlischnogaster* Dong and Otsuka.

MATERIAL AND METHODS

The specimen was collected by using a triangular sweep net at the sides of a water stream of the dense forest of Namdhapa National Park, Arunachal Pradesh, India. The specimen was studied and photographed by using a Leica Stereo microscope with LAS software version 3.6.0., and drawing was made by using the drawing tube of the same microscope.

The identified specimen was properly registered and deposited at the 'National Zoological Collections' of the Hymenoptera Section of Zoological Survey of India, Kolkata.

Abbreviations used for the terms: F1-F2 = Flagellar segments 1 and 2; H = Head; M = Mesosoma; OOL = Ocellocular length; POL = Postocellar length; T1-T2 = Metasomal terga 1 and 2.

RESULTS

Cochlischnogaster dadugangensis Dong and Otsuka
(Fig. 1; Images 1-14)

1994. *Cochlischnogaster daduogangensis* Dong and Otsuka, 451. *Nomen nudum.*

1997. *Cochlischnogaster dadugangensis* Dong and Otsuka, 205, 210, figs. 10-24, ♀, ♂, nest. Yunnan: Xishuanbanna, Dadugang, Holotype ♀ (Institute of Zoology, Academia Sinica, Kunming).

1997. *Cochlischnogaster dadugangetsis* Dong and Otsuka, 210. Incorrect original spelling.

Redescription: *Male*: Body length (H+M+T1+T2) 11.4 mm; forewing length 9 mm. Head black, mesosoma black to blackish brown and metasoma brown with yellow and white maculations. Yellow maculations as follows: two broad vertical lines at the sides and a minute spot at the middle of clypeus, broad spots below antennal sockets extending up to clypeus, a minute faint spot on scape ventrally, hind margin of pronotum, short lines anteriorly along the notauli, anterior half of tegulae, two small spots laterally on scutellum, most of metanotum, small mesepisternal spot dorsally, a faint spot above propodeal spiracle, a small spot posteriorly and a line ventrally on forecoxa, all femora ventrally and dorsally at apex, foretibiae and midtibiae mostly and hindtibiae ventrally, foretarsi and midtarsi largely. Sides of terga II-VII and sterna II-VII brownish yellow. White maculations as follows: pale white at the spatulate process of apical antennal segment, yellowish white at propleura, a faint transverse band at the posterior apex of tegum II, Terga III-VII each with a broad white basal band. Vestiture pale short hairs on clypeus and frons, denser on genae, longer hairs on mandible, longer and more scattered hairs on vertex, dorsum of mesosoma, propodeum and legs, denser on coxae and femora; midtibiae and hind tibiae and tarsi with numerous very long, fine, erect hairs; very dense, short hairs on mesepisterna dorsally and posteriorly, metapleurum and propodeum anteriorly; metasoma with fine scattered short hairs on terga and a few longer hairs on sterna.

Head: 1.16x wider than long (Image 3); clypeus with shallow punctures, coarser on frons; clypeus with apex convex, roundly angled; frontoclypeal suture distinct, strong; occipital carina fused with hypostomal carina; maxillary palpi with the length of segment 2 approximately equal to that of segment 3; labial palpi with first segment subequal in length to combined lengths of segment 2-4; eyes exceptionally large and occupying almost all of side view of head (Image 5), only very narrowly separated from clypeus; antennal sockets far apart from each other and separated from clypeus by long supraclypeal area; antennae (Fig. 1; Image 6) with scape and pedicel roundly flattened, flagellomeres rounded; scape 0.9x F1, F1 1.67x F2, terminal antennal flagellomere spatulate (Image 7); Ocelli (Image 4) large, ratio of width to distance from eye about 0.7x for anterior ocellus and 1.03x for either posterior ocellus; POL 0.48x OOL (Image 4).

Cochlischnogaster dadugangensis Dong and Otsuka Male.

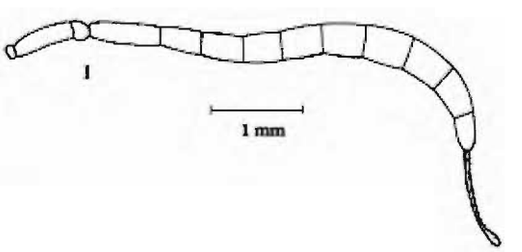

Fig. 1. Antenna.

Mesosoma: Ventral angle of pronotum, notauli, dorsal groove of mesepisterna, median groove of propodeum crenulate, pronotum with striae anteriorly above, weak striae dorsally on metapleuron and propodeum, dense striae anterodorsally on mesepisterna. Pronotum without dorsal carina and pretegular carinae; mesoscutum with notauli strongly impressed (Image 8); parapsidal and admedian lines deeply impressed; scutellum (image 9) without median carina; length of metanotum along midline about equal to that of scutellum (25:28); propodeum smooth, with valvulae reduced posteriorly, without raised

lamellae above orifice; forewing (Image 11) with second sub-marginal cell rectangular, third sub-marginal cell elongate, nearly attaining wing apex. Hindwing (Image 12) with two closed cells, without pigmented area posterobasally, posterior fringe of hairs very short. Forefemora in dorsal view curving anteriorly; foretibiae lacking spatulate setae; foretarsomeres not ventrally produced into spines; midtibiae with single spur; apical midtarsomeres flattened and expanded (Image 13), distitarsi rounded.

Metasoma : Metasomal segment I about 1.62x the length of the mesosoma, apical bulb of segment I about three times as broad as main part of petiole, scarcely narrowed behind; metasomal segment II not petiolate basally; sternum VII flattened. Genitalia as in Image 14; parameral spines not dilated, with rounded median inner process, bent in towards each other near the base, then arching out apart; digitus with small, sharply recurved point apically; cuspis plus lamina volsellaris broad medially; aedeagus apically strongly compressed, apex dilated in lateral view with pair of small projections located laterobasally.

Material examined : 1 Male, India: Arunachal Pradesh, Changlang district, Namdhapa National Park, Firmbase, 11.xi.2009, coll. J.K. De & Party, NZSI Regd. No. 12718/H3.

Distribution : India (new record): Arunachal Pradesh. *Elsewhere*: China (Yunnan).

Discussion : Even though the males of *Cochlischno gaster dadugangensis* Dong and Otsuka and *C. spatulata* (Carpenter and Starr) are very similar, they can be readily distinguished by the colour of the clypeus. In *C. dadugangensis* the clypeus is mostly black, with two broad vertical yellow lines at the sides (cf. Image 3, and Dong and Otsuka, 1997: fig. 17), while in *C. spatulata* the clypeus is mostly yellow (Carpenter and Starr, 2000). From what can be seen in the figures of the male genitalia in Dong and Otsuka (1997: figs. 21-22), the median process on the parameral spine is smoothly rounded in *C. dadugangensis* (cf. Image 14, and Dong and Otsuka, 1997: fig. 22) while it is truncate in *C. spatulata* (Carpenter and Starr, 2000: fig. 7B). The digitus of *C. dadugangensis* and *C. spatulata* are quite differently shaped (cf. Image 14 and Carpenter and Starr, 2000: fig. 7C).

Remarks : New record of the genus *Cochlischnogaster* Dong and Otsuka from Indian subcontinent; the species *C. dadugangensis* Dong and Otsuka.

SUMMARY

The hover wasp genus *Cochlischnogaster* Dong and Otsuka is newly recorded from India, with the species *C. dadugangensis* Dong and Otsuka reported. The redescription of male with illustrations was also provided.

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PLATE - I

Cochlischnogaster dadugangensis Dong and Otsuka Male.

Image 1. Body dorsal view;

Image 2. Body lateral view;

Image 3. Head frontal view;

Image 4. Head dorsal view;

Image 5. Head lateral view;

Image 6. Antenna;

PLATE - II

Cochlischnogaster dadugangensis Dong and Otsuka Male.

Image 7. Apical antennal articles;

Image 8. Mesoscutum in oblique dorsal view;

Image 9. Mesosoma dorsal view;

Image 10. Mesosoma lateral view;

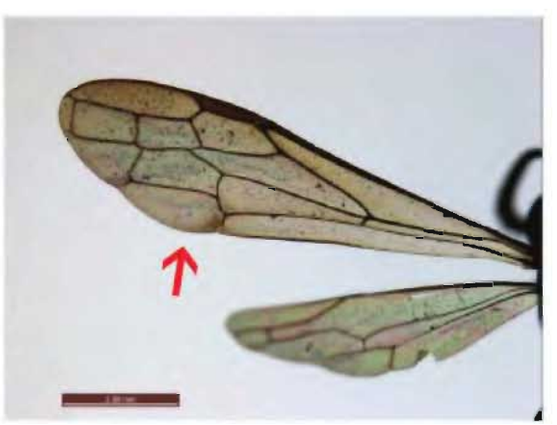

Image 11. Forewing;

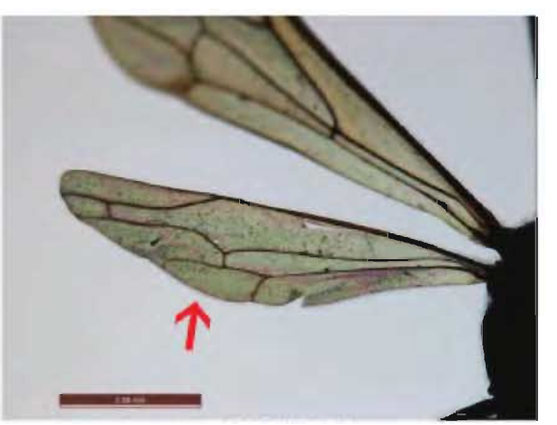

Image 12. Hindwing;

PLATE - III

Cochlischnogaster dadugangensis Dong and Otsuka Male.

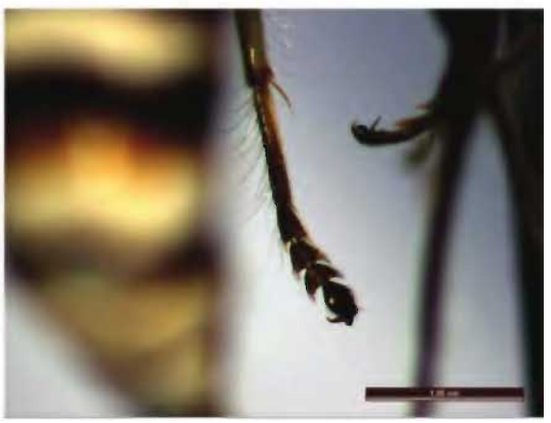

Image 13. Midtarsus;

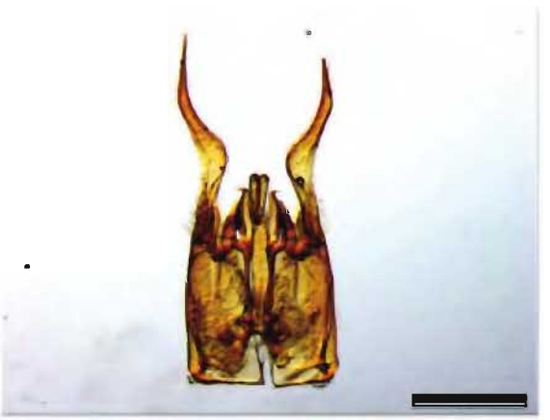

Image 14. Genitalia.

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DESCRIPTION OF A NEW SPECIES OF THE GENUS *EUBORELLIA* BURR,1909 (INSECTA: DERMAPTERA) FROM NAINITAL DISTRICT OF UTTARAKHAND STATE

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INTRODUCTION

The present paper is based on the study of a new species of *Euborellia* Burr, 1909 collected from Nainital district of Uttarakhand state (Western Himalayan Ecosystem). Gangola(1968) has described two new species viz;*Euborellia kumaonensis* collected from Nainital district and *Euborellia askotensis* from Pithoragarh district of Uttarakhand but on the basis of the description and figures provided in his paper, the fate of the systematic position of these species is uncertain. Srivastava (2003) has provided detailed description of 08 species of *Euborellia* which includes 04 new species. Out of these, 02 species viz; *Euborellia annulipes* (Lucas,1847) and *Euborellia compressa* (Borelli, 1907) are apterous, having sides of abdominal segments carinate. The first one has the genital parameres with external apical angle rounded while the second species has external apical angle acute with a little projection. The new species described here comes close to these two species in being apterous with sides of abdominal segments carinate but differs in the structure of parameres having external apical angles neither round nor acute. Besides the structure of the distal lobe is also different from these two species. Moreover, there are marked differences in the shape of pronotum, metanotum and in having crenulated inner margin of forceps. Another distinguishing character which differentiates this species is its smooth and almost quadrate ultimate tergite which is transeverse with weak punctuation in *E. annulipes* and also transeverse with almost smooth in *E. compressa*. The other remarkable characters include its smooth abdomen which is punctulated in *E. annulipes* and its truncated penultimate sternite which is subtrunkate in *E. compressa.*

Euborellia nainitalensis, sp. nov. (Fig.1-8)

Description :

Male : Body smooth, general color ranging from light brown to blackish brown, antennae brown with two apical segments light blackish brown,Pronotum, Meso- and Metanotum brown, legs light brown, femora with deep brownish bands at about middle, abdominal tergites, ultimate tergite and forceps blackish brown.

Head smooth, pentagonal, slightly broader than long, frons tumid, frontal sutures faint, median suture distinct, hind margin slightly emarginated posteriorly in the middle. Eyes black, prominent, much smaller than, post-ocular area. Antennae 15+ (broken) segmented, first stout, shorter than the distance between antennal bases, expanded apically, 2nd short, about as long as broad, 3rd long and slender, 4th slightly shorter than preceeding, gently expanded apically, 6th and onwards gradually slightly thinning, increasing in length distally with slight expansion towards apices. Elytra and wings absent. Pronotum smooth, quadrangular, anteriorly a little less wide than head, posterior margin very slightly wider than its length, anterior margin feebly convex, lateral margins gently sinuate and slightly reflexed towards middle, sides slightly diverging

posteriorly, hind margin briefly rounded with a faint emargination in the middle, median sulcus fine but distinct, passing through a faint depression in the middle posterior zone of prozona. Prozona well differentiated with metazona. Both lateral zones of prozona more tumid than metazona. Meso and metanotum transverse, both shorter in length than pronotum. Mesonotum with hind margin truncate. Metanotum with hind margin briefly and steeply undulated forming deep emargination at hind mid point. Legs typical of the genus, femora with deep brownish bands in middle. Abdomen smooth, gently narrowed anteriorly. Sides of abdominal segments 6^{th} - 9^{th} acute angled posteriorly and carinate. Penultimate Sternite smooth with hind margin truncate. Ultimate tergite almost quadrate, smooth, convex above, gently expanded in middle, sloping anteriorly and posteriorly, hind margin scarcely emarginated, laterally oblique, minute tubercles present above the roots of forceps. Median sulcus distinct. Forceps with branches subcontiguous and stout at base, trigonal upto about basal half, straight upto about two-third, afterwards depressed gradually, tapering apically, incurving in apical one third, asymmetrical with right branch more strongly incurved ending in apices hooked and pointed, inner margin crenulated.

Genitalia with parameres quadrangular, as long as broad, externalapical angles gently dilated at its apices without any marked convexity or concavity, distal lobes with characteristic chitinous pads, oblique median membrane and virga discernible.

Table : Showing the differences of *Euborellia nainitalensis* (sp. nov,) with its closely related species (*E. annulipes* and *E. Compressa*).

Parts of the body	***E. annulipes***	***E. Compressa***	***Euborellia naintalensis* (sp. nov.)**
Head	Weakly transverse, about as long as broad.	Triangular, longer than broad.	Pentagonal, slightly broader than long.
Pronotum	About as long as broad, anteriorly as wide as head, Lateral margins widened posteriorly.	Slightly longer than broad, anteriorly as wide as head, Lateral margins straight, gently widened posteriorely.	Square shaped anteriorlya little less wide than head, lateral margins gently sinuate towards middle, posteriorly slightly wider than the length of the pronotum.
Metanotum	Hind margin broadly emarginate	Hind margin broadly emarginate	Hind margin briefly and steeply undulated froming deep emagination at hind mid point.
Abdomen	Spindle-shaped, Punctulated.	Elliptical or slender, tergites smooth.	Gently narrowed anteriorly, tergites smooth.
Legs	Yellow, Femora banded with black	Clear yellow	Light brown, banded with deep brownish bands.
Ultimate tergite	Transeverse and weekly punctate	Transeverse and almost smooth.	Squarish and smooth.
Forceps	Trigonal upto basal one-third	Trigonal upto basal one-third	Trigonal upto basal half.
Genitalia	Parameres with external apical angles round.	Parameres with external apical angles acute with a little projection.	Parameres with external apical angles gently dialated.

Fig. 1. *Euborellia nainitalensis* sp. nov. (Dorsal view)

Fig. 2. Male Genitalia

Fig. 3. Carina on sides of 6th -9th abdominal segments

Fig. 4. Figure showing antennal segments

Fig. 5. Penultimate sternite

Fig. 6. Pro., Meso. and Metanotum

Fig. 7. Abdominal segments 6^{th}-9^{th}(Ventral view)

Fig. 8. Ultimate tergite with forceps

Length of Body: 12 mm.

Length of Forceps: 02 mm.

Holotype ♂, INDIA: Uttarakhand, Kumaon Hills, Nainital Dist., from the hills surrounding Sat- Tal lake, thickly wooded with pine trees, 26.v.1948, Coll. H. S. Pruthy.

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Short Communication

NEW RECORD OF *SCARITES SEMIRUGOSUS* CHAUDOIR (INSECTA: COLEOPTERA: CARABIDAE) FROM KARNATAKA, INDIA

INTRODUCTION

Scaritine Ground beetles are dark in color; body pedunculate and nearly cylindrical, sometimes slightly flattened; legs digitate and with variable spurs which are suitable for digging; eyes well developed but not so much externally protruding. *Scarites* can be differentiated from other genera of the group by hooked maxillae, one supraorbital seta, head without central tubercle, and extended buccal fissure. *Scarites* is represented by nearly 55 species in Indian Subcontinent. These beetles are generally found on moist, sandy or loose soil and make deep burrows in the soil and rest there during day times and come out in the night. The Present paper records *Scarites semirugosus* Chaudoir known to occur already in several Indian states (Andrewes, 1929, 1930 & Saha, 2000) except from Karnataka State.

SYSTEMATIC ACCOUNT

Order COLEOPTERA

Suborder ADEPHAGA

Family CARABIDAE Latreille, 1802

Subfamily SCARITINAE Bonelli, 1810

Tribe SCARITINI Bonelli, 1810

Subtribe SCARITINA Sloane, 1905

Genus ***Scarites*** Fabricius, 1775

Scarites semirugosus Chaudoir, 1855

1855. *Scarites semirugosus* Chaudoir, *Bull. Soc. Imp. Nat. Mosc.* **1**: 90.

1855. *Scarites rugipennis* Chaudoir, *Bull. Soc. Imp. Nat. Mosc.* **1**: 81.

1929. *Scarites semirugosus*, Andrewes, *Faun. Brit. India incl. Ceylon and Burma* (Coleoptera: Carabidae) Vol. **1** (Carabinae): 228, 237, f. 39 (12), 240.

DIAGNOSTIC CHARACTERS

Lateral truncature of head nearly straight, very slightly emarginate; preocular angle round and very slightly projecting outwards. Clypeus and frons striated. Frontal impression moderately shallow with striations on its outer sides. Surface of head with fine irregular striations, sparsely distributed punctures and shiny. One supraorbital seta on posterior half margin of the eye, supraorbital groove deeper at posterior margin of eye (Crescent depression like structure). Eyes moderately convex. Mandibles obliquely striated and nearly equal to head in length, basal tooth of right mandible thick and not bifid. Genae coarsely punctuate, nearly equal to eye, not projecting beyond it and sharply turns towards neck. Antennae monoliform, dilating towards apex; Joint 1 Scapiform, 1-4 glabrous and round surface, 5-11 pubescent and flat surface, 2nd & 3rd equal, 4th is nearly 2/3 of 3rd one, 5-10 slightly longer than wide, 11th nearly 0.5 times longer than wide. Mentum rugose striate, bordered at sides (not narrowly). Prothorax ¼ wider than head, nearly 1/5 wider than long; Base produced and with thick border, fine transverse depression in front of base; hind angle rounded and with a tooth having one pore and seta, front angle slightly rounded and not produced, sides nearly straight in middle. Median line moderately deep with some transverse crenulations on posterior extreme, front transverse line fine in middle with fine crenulations and deep on both extremes with moderate crenulations. Basal foveae with striations and granulations. Elytral surface shiny but dull in apical region, slightly dilated posteriorly; As wide as prothorax, nearly twice longer than wide; Striae impunctate, moderately deep and not crenulate, irregularly provided with microsculptures, nearly transverse line irradiating from stria and runs in adjacent intervals; striae faint in apical region, striae

3 & 4 join in apical region and this joint stria further joins 2nd stria before apex, 6th stria discontinued atleast two places in basal half region, 7th stria discontinued at many places giving punctate appearance, 5 & 6 striae bend slightly outward in basal region; Intervals moderately punctuate with very fine punctures, less punctuate in basal region, 7th interval form very slight carina near shoulder, last interval with granulation throughout; Basal margin granulate. Each elytron with 2 setae in posterior half region. Anterior Seta is placed in 3rd interval and very close to 3rd stria. Posterior seta is placed at the juncture of 2nd & 3-4 combined striae. Protibiae with 5 denticulation, Mesotibiae with 2 spurs. Abdomen moderately punctuate at sides. Sternum smooth but slightly punctuate on sides. Metepisterna 2.7 as long as wide. Reddish spot on either sides of last two abdominal segments.

Length : 23 mm.

Material Examined : 1 ex., INDIA: Karnataka, North Kanara, Kadatoka, 26.ix.2009, Coll. Dr. V.D. Hegde.

Distribution : INDIA: Maharashtra, Meghalaya, Tamil Nadu and West Bengal, Karnataka. *Elsewhere* : MYANMAR, MALAYSIA, THAILAND, PHILIPPINES.

Habitat : Araecanut Plantation.

Scarites semirugosus Chaudoir

Remarks : This species is recorded for the first time from Karnataka state.

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Short Communication

FIRST RECORD OF *DEIPHOBE INCISA* WERNER, 1933 (INSECTA : MANTODEA) FROM JHARKHAND, INDIA AND MORPHOLOGY OF MALE GENITALIA

INTRODUCTION

In continuation of the recent compilation on the mantid fauna of old Bihar (present Bihar and Jharkhand states) (Sureshan & Sambath, in press), the present paper deals with the discovery of the species *Deiphobe incisa* Werner for the first time from Jharkhand, India. The genus *Deiphobe* Stal, 1877 belongs to the tribe Miomantini of subfamily Mantinae and family Mantidae. Seven *Deiphobe* species are known to occur in India out which one species *D. infuscata* (Saussure, 1871) is reported from Jharkhand and Bihar (Mukherjee *et al.*, 1995). According to Ehrmann (2002) the genus *Deiphobe* is classified under the tribe Rivetinini of subfamily Miomantinae of family Mantidae. *D. incisa* is so far reported from Madhya Pradesh, Maharashtra, Punjab, Rajasthan and Uttar Pradesh in India and also from Myanmar and Nepal and the species is reported here for the first time the state of Jhakhand. *D. incisa* differs from *D. infuscata* in having supra anal plate little trapezoid and incised , metazona longer than fore coxa, fore femora internally yellowish brown with a black spot on claw groove and another blackish band on femoral brush. In *D. infuscata* supra anal plate incised feebly, metazona shorter than fore coxa and fore femora without

1. body dorsal view;

2. head and part of prozona dorsal view;

3. head front view;

4. male genitalia dorsal view.

Fig. 1. *Deiphobe incisa* Werner, male Supra anal plate

black spot on claw groove. The morphology of the male genitalia of *D. incisa* is also described here, studies of which is always important for the better understanding of very closely related species in taxonomic studies.

Deiphobe incisa Werner

1933. *Deiphobe incisa* Werner , *Proc. Zool. Soc. London*. 900.

General morphology : (Photo. 1) General colour brown. Head (Photo. 2, 3) blackish brown, frontal sclerite with blackish patches in centre and sides, narrow, upper margin straight. Eyes round, brown, ocelli pinkish brown, vertex almost blackish. Pronotum slender, with a median faint black line; margins of prozona denticulate, that of metazona smooth; disc of prontoum with scattered faint granules; median carina of prozona weakly indicated, that of metazona indicated only in the base and apex; metazona with a distinct black band ventrally near coxal joint. Fore coxae denticulate, internally with faint blackish bands near base, internal apical lobes divergent; femora externally with faint blackish longitudinal patches, internally pale yellowish brown with faint blackish line on disc on upper margin; external spines black at tips only, 4 in number; internal spines 14, discoidal spines 4, all spines black at tips only; claw groove with a black spot, femoral brush with blackish band, tibia with 13 internal spines and 8 external spines all black at tips only.

Forewing with costal area yellowish green, opaque, discoidal area brown, slightly greenish above, semi opaque, anal fold blackish; anal area with five veins; stigma colorless. Hind wing basal area colorless, discoidal area violet black with whitish transverse veinules, with a round whitish spot distally; Supra anal plate (Fig. 1) little trapezoid, incised, carinate dorsally, strongly in the basal half and weakly in the distal half; cerci cylindrical.

Male genitalia (in dorsal view) (photo 4) Titillator (TI) shows 90° bend towards left with no coiling and tip blunt. Phalloid apophysis (PA) slightly bend towards right, chitinization of upper margin with minute teeth. The right plate (RP) bears a strong chitinization that is bend on the left and it tip is directed posteriorly., the basal part of the chitinization bears irregular row of strong teeth. The posterior end of hypophallus (H) bears a very sharp knife like lobe with an additional small sharp tooth basally and whole margin of the knife end bears minute teeth. The anterior end has a strong chitinous structure with is blunt at tip.

Measurements (in mm) : Male : Total length 83 (from anterior end of head to tip of abdomen); prozona 7.5 ; metazona 16, Fore coxa 14, femur 18, tibia 7, tarsus 10, forewing 53.

Material examined : 1 Male, India: Jharkhand, East Singbhum dist., Dalma Wild life sanctuary, Pindrabera, N 22°57′ 620″ E 86°11′ 783″ 19.iii.2009, coll. S.Sambath. (Reg.No. A.1337) (deposited in Zoological Survey of India, Gangetic Plains Regional Centre, Patna, Bihar).

Distribution: India: Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, Jharkhand (current study).

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Introduction section should clearly describe the objectives of the study and provide enough background information to make it clear why the study was undertaken. Lengthy literature review is discouraged. Some earlier references of work may be cited.

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Radhakrishna, C. 2007. Amphibia. In : *Fauna of Kudermukh National Park, Karnataka, Conservation Area Series,* **32** : 20-25, Published by Zool. Surv. India.

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