

RECORDS
OF THE
ZOOLOGICAL SURVEY OF INDIA

Volume 109 (Part-4)

Year 2009



Zoological Survey of India



सत्यमेव जयते

**INVITATION OF NOMINATIONS FOR THE NATIONAL FELLOWSHIP
AWARDS FOR PITAMBER PANT NATIONAL ENVIRONMENT
FELLOWSHIP AND DR. B.P. PAL NATIONAL ENVIRONMENT
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Records of the Zoological Survey of India

Volume 109(Part-4)

Edited by the Director, Zoological Survey of India, Kolkata



सत्यमेव जयते

**Zoological Survey of India
Kolkata
2009**

CITATION

Editor—Director. 2009. *Rec. zool. Surv. India*, **109**(Part-4) : i-viii, 1-115 (Published by the Director, *Zool. Surv. India*, Kolkata)

Published – December, 2009 (October-December Issue)

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PRICE

India : Rs. 250.00

Foreign : \$ 0.00; £ 0.00

Published at the Publication Division by the Director, Zoological Survey of India, 234/4, A J C Bose Road, 2nd MSO Building, (13th Floor), Nizam Palace, Kolkata-700 020 and printed at East India Photo Composing Centre, Kolkata-700 006.

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

State Fauna/Conservation Areas

Mukhopadhyay, S.K. 1999. Fresh water Oligochaetes. *Fauna of West Bengal, State Fauna Series*, **3**(Part-10) : 95-123. Published by Zool. Surv. India.

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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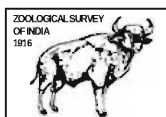
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Rec. zool. Surv. India : **109**(Part-4) : 1-9, 2009

STUDIES ON SOIL MICROARTHROPOD POPULATION IN THREE DIFFERENT GARDEN PLOTS OF 24 PARGANAS, WEST BENGAL—A PRELIMINARY REPORT

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INTRODUCTION

Soil is a stratified mixture of organic materials both of which are decomposition products. The parent material, the soil forming rocks undergo physical and chemical processes of weathering resulting in the formation of mineral constituents of soil. Organic components of soil are formed either by decomposition of dead remains of plants and animals or through metabolic activities of living organisms present in the soil. According to Wallwork (1970) soil is the general habitat which harbours rich and varied communities, for living organisms find in the soil an environment providing food, shelter, anchorage and concealment from the predators. Soil microarthropods occur in all types of soil. They are of immense importance in maintenance of various ecological systems. They play a very important and significant role in soil formation, increasing the porosity of the soil, soil aeration and in the promotion of the soil fertility by breaking down organic matters through the intricate process of digestion. The importance of these organisms in soil zoology and agriculture are enough to warrant more extensive studies on their bionomics and taxonomy.

The population density of soil microarthropods depends on various physico-chemical properties of soil such as porosity and permeability of the soil, soil temperature, soil moisture and the presence of inorganic elements and components, organic matters and the pH of the soil. Application of chemical fertilizers, pesticides, weedicides, etc. in the garden and adoption of various cultural methods like use of resistant varieties of seeds, tilling, raking, weeding and watering of the garden greatly affect the natural microarthropod population of the soil.

A study on the microarthropod population reveals that soil mites and collembolae occur predominantly in all type of soils. They are the major constituents of the soil. The studies on the population densities of the soil mites and other microarthropod organisms in India came to the

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limelight of scientific investigation chiefly through the works of Singh and Mukherjee (1971), Singh and Pillai (1975), Bhattacharya, Joy and Joy (1981), Mazumdar and Deb (1991a, 1991b), Sanyal (1991), Sanyal and Sarkar (1993), Sengupta and Sanyal (1991), Sarkar, Sanyal and Chakraborty (2007).

MATERIALS AND METHODS

A total of 120 litter mixed soil samples were collected from three selected cultivated plots in a garden. Five samples were collected at random from each plot in every month for a period of 8 months i.e. October, 2006 to May, 2007. The samples were drawn by means of stainless steel corers, each measuring 5 cm in diameter, from the sub-soil layer approximately 4-6 inches deep into the soil. The samples were taken in polythene bags, loosely tied by rubber bands and brought to the laboratory for extraction of soil inhabiting microarthropods. The larger insects were sorted out from the samples by handpicking method. The microarthropods were extracted from the soil samples by using a Tullgren funnel extractor as modified by Macfadyen (1953). The mites and other microarthropods extracted were studied after following the usual procedure of cleaning in an equal mixture of 90% alcohol and lactic acid.

Soil moisture, temperature and pH were measured by infra-red moisture meter, soil thermometer and pH meter respectively.

SITE DESCRIPTION

Three plots in a garden containing different plants were selected for study in Dum Dum areas, district 24 Parganas, West Bengal. The soils of the three plots were gangetic alluvial in nature, blackish-grey in colour and dry to semi-wet in texture. The brief characteristics of the plots are given below :

1. **Plot A** : The plot was a cultivated flower garden of about 550 sq. ft. having regular cultivation of seasonal flowers like Hibiscus–*Hibiscus rosa sinensis*, Rose–*Rosa damasciana*, Marigold–*Tagetes patula*, Dopati–*Impatiens balsamina* and Jasmine–*Jasminum sambac*.

2. **Plot B** : It was a plot in a cultivated vegetable garden of about 700 sq. ft. in area growing varieties of vegetables like Gourd–*Lagenaria ciceraria*, Pumpkin–*Cucurbita maxima*, Spinach, Cauliflower–*Brassica oleracea* and Squash–*Sechium edule* throughout the period of study.

3. **Plot C** : This plot was an uncultivated area of about 400 sq. ft. having thick growth of varieties of weeds like *Oxalis corniculata*, *Cleome rutidosperma*, *Portuloca quadrifida*, *Sida acuta* and *Sida mysorensis*.

The cultivated garden plots under study were properly manured with bio-fertilizers like cowdung, rotten oil cakes and decomposed fruit and vegetable peel. Tilling, raking and watering of the plots were done before cultivation. To prevent insect depredation suitable pesticides like Rogor, Sevin, Blitoxin and Phosphamidon in prescribed doses (1 ounce of pesticide in 10 litres of water) were applied.

Table 1 : Arthropod Population and Mean Values of Soil Factors in Plot A (October 2006-May 2007)

Arthropods/sq.m and Soil Factors	October	November	December	January	February	March	April	May
ACARINA	18140.13	14777.07	12433.12	12840.76	29146.49	35465	39439	33936
COLLEMBOLA	12433.12	11312.1	14777.07	8458.59	10496.82	21911	22318	15898
COLEOPTERA	1121.02	509.55	101.91	1222.93	509.55	1222.9	917.2	407.6
ANT	2445.86	305.73	0	1630.57	1324.84	5605.1	5299	3669
SPIDER	407.64	407.64	305.73	1324.84	0	305.73	203.8	0
HEMIPTERA	1019.11	1630.57	509.55	3261.15	509.55	1019.1	1019	305.7
DIPTERA	305.73	0	0	1834.39	203.82	101.91	509.6	203.8
CENTIPEDE	101.91	305.73	101.19	917.19	101.91	1222.9	0	0
Temperature (Degree C)	31.3	29.7	26.1	20.1	22.2	29.1	36.2	36.3
Moisture (%)	31.2	30.2	29.1	25.1	26.3	26.2	23.8	23.5
pH	6.6	6.4	6.3	6.23	6.1	6.7	7.1	7.1

Table 2 : Arthropod Population and Mean Values of Soil Factors in Plot B (October 2006-May 2007)

Arthropods/sq.m and Soil Factors	October	November	December	January	February	March	April	May
ACARINA	16101.91	22012.74	22420.38	17732.48	33019.11	30369.4	31287	30573
COLLEMBOLA	7235.67	12535.03	15388.54	2547.77	6420.38	8662.42	9375.8	11618
COLEOPTERA	101.91	0	305.73	713.38	509.55	1121.01	101.91	0
ANT	1222.93		1324.84	1630.57	5197.45	1630.57	1936.3	1019.1
SPIDER	407.64	203.82	305.73	203.82	509.55	407.64	305.73	203.82
HEMIPTERA	203.82	305.73	509.55	101.92	0	1426.75	305.73	101.92
DIPTERA	203.82	305.73	305.73	713.38	101.91	1630.57	0	0
CENTIPEDE	407.64	0	305.73	305.73	0	713.38	407.64	305.73
Temperature (Degree C)	31.3	29.7	26.1	20.1	22.2	29.1	36.2	36.3
Moisture (%)	31.2	30.2	29.1	25.1	26.3	26.2	23.8	23.5
pH	6.6	6.4	6.3	6.23	6.1	6.7	7.1	7.1

Table 3 : Arthropod Population and Mean Values of Soil Factors in Plot C (October 2006-May 2007)

Arthropods/sq.m and Soil Factors	October	November	December	January	February	March	April	May
ACARINA	26700.64	30471.34	22726.11	15694.27	16305.73	21503.2	26395	34650
COLLEMBOLA	10394.9	18038.22	10598.73	14980.89	16713.38	13248.4	10497	10191
COLEOPTERA	509.55	815.29	0	101.91	203.82	305.73	101.91	407.64
ANT	1732.48	3261.15	0	6114.65	3668.79	5401.27	8662.4	2038.4
SPIDER	101.91	101.91	305.73	0	305.73	305.73	0	407.64
HEMIPTERA	101.91	101.91	101.91	0	0	0	0	0
DIPTERA	509.55	0	203.82	0	203.82	0	203.82	0
CENTIPEDE	101.91	407.64	0	101.91	101.91	203.82	203.82	203.82
Temperature (Degree C)	31.3	29.7	26.1	20.1	22.2	29.1	36.2	36.3
Moisture (%)	31.2	30.2	29.1	25.1	26.3	26.2	23.8	23.5
pH	6.6	6.4	6.3	6.23	6.1	6.7	7.1	7.1

RESULTS

Faunal Composition : Altogether 12408 arthropods belonging to 9 different groups viz., Acarina, Collembola, Hemiptera, Isopoda, Diptera, Spider, Centipede, Ant and Coleoptera were collected. As the population of Lepidoptera, Orthoptera, Diplopoda, Chilopoda and Pseudoscorpion were very low and irregularly distributed, these groups were not considered for calculation. A comparison between arthropods of the uncultivated weed filled plot and the flower and vegetable plots showed that the uncultivated plot was rich in faunal groups in comparison to the cultivated garden plots. In all the 3 plots, Acarina was the most dominant group. It formed 203515.92/m², 196178.36/m² and 194445.85/m² of the total densities of other soil microarthropods obtained from the vegetable garden, flower and the weed growing plot respectively. In the latter the second, third and fourth dominant groups were Collembola (104662.43/m²), Ant (30878.98/m²) and Isopoda (5197.39/m²) respectively.

Similarly, in Plot A, Collembola (117605.09/m²), Ant (20280.24/m²) and Isopoda (15898.08/m²); and in Plot B Collembola (73783.43/m²), Ant (16509.55/m²) and Isopoda (7133.74/m²) occupied first, second and third position according to the order of dominance (Tables-1, 2, and 3).

Edaphic Factors : All the three plots were more or less identical in their edaphic characteristics. The maximum and minimum temperatures recorded were 36°C (April-May) and 20.1°C (January) in all the three plots. The average temperature recorded was 21.71°C. The average moisture content

of the soil recorded was 26.8% when the maximum and the minimum soil moisture content recorded were 31% and 23.2% respectively. the soil pH recorded was within the normal range (6.10-7.00) (Tables-1, 2 and 3).

Population Fluctuation : The total number of arthropods collected showed population maxima in February, March and April in the cultivated flower and vegetables gardens. Arthropods were minimum in number in April in the plot growing weeds whereas in the cultivated flower and vegetable gardens it varied depending upon the types of plant grown as well as the usual cultural practices of tilling and weeding in the respective gardens (Figure-1).

The population of different groups of arthropods showed an irregular trend of fluctuation during the sampling period but there was a tendency to increase their number in February–April in the cultivated plots. The Collembola population recorded was maximum in April and December in the flower and vegetable gardens respectively and in November in the plot growing weeds (Figures-2, 3, 4).

DISCUSSION

The studies of population densities of soil arthropods in different plots reveal that application of insecticides though in minimal doses and concentrations as well as at long intervals may also affect the population densities of soil dwelling organisms in comparison to cultivated fields where the effect is more profound due to extensive applications of insecticides (Joy and Chakraborty, 1991).

The soil mites were usually most abundant in autumn and winter in all the three types of plots when the soil moisture was moderate and least abundant in summer when the soil moisture was low. Similar observations were also made by Sengupta and Sanyal, 1991; Sanyal and Sarkar, 1993 and Sheela and Haq, 1991.

The pH values of the soil samples being within the tolerance range do not seem to have any effect on the soil microarthropod population. This observation is supported by the works of Joy and Bhattacharya (1981) and Sanyal (1991).

Besides, the kitchen garden areas do not remain undisturbed because of frequent human interference in the form of caring of the garden which may force the soil organisms to take refuge either in the horizontal or in the vertical direction from the place of disturbance for concealment and shelter.

These observations are supported by the earlier works of Sanyal (1991) and Sanyal and Sarkar (1993). The study recorded that when there was standing crop in the field, the number of mites and other soil microarthropods were increased. The Acarina population decreased immediately after tillage. It was further observed that when there was no crop in the cultivated fields for a long time, the number of soil microarthropods increased to a good number. Mazumdar and Deb (1991a, 1991b) also reported that microarthropod population was poor in cultivated fields and suggested a crop-dependent association.

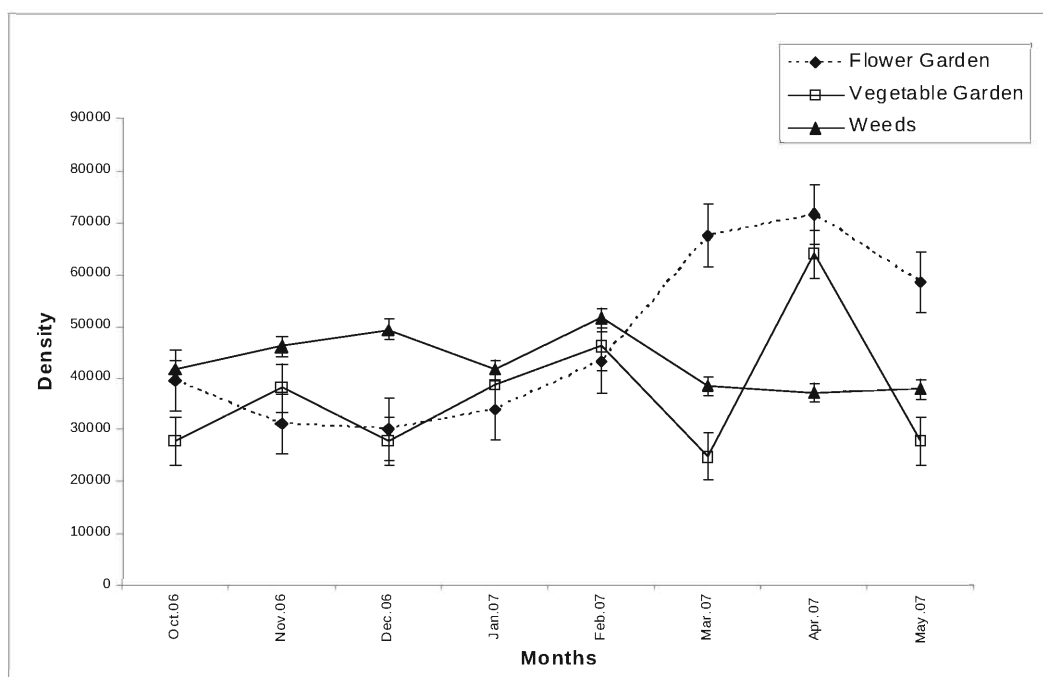


Figure 1. Shows the fluctuation of soil microarthropods at three plots.

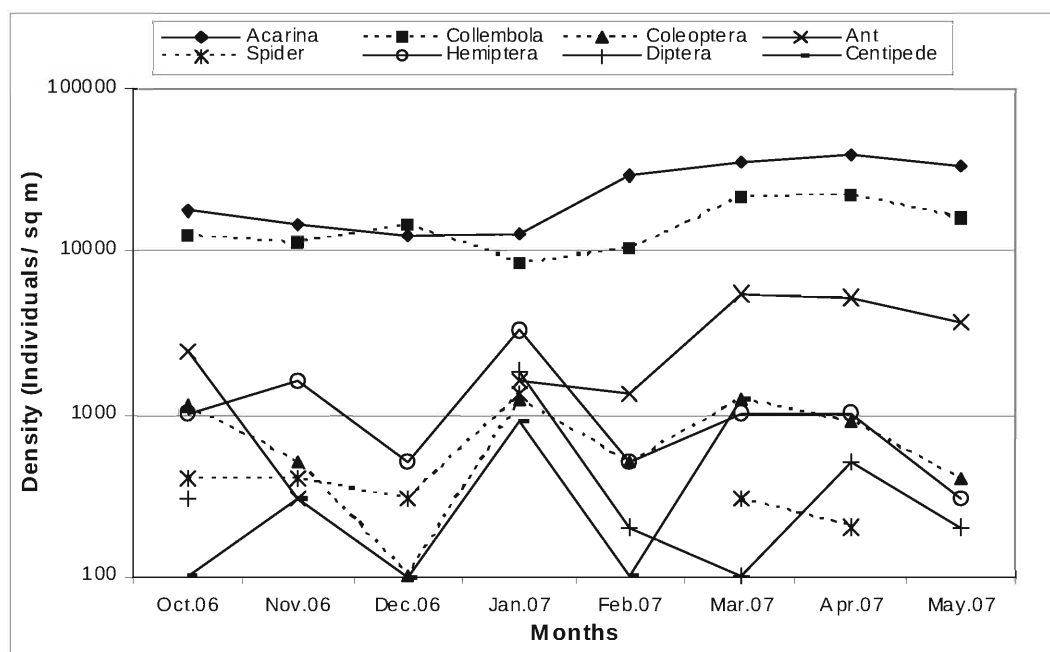


Figure 2. Shows the fluctuation of different groups of microarthropods at plot-A.

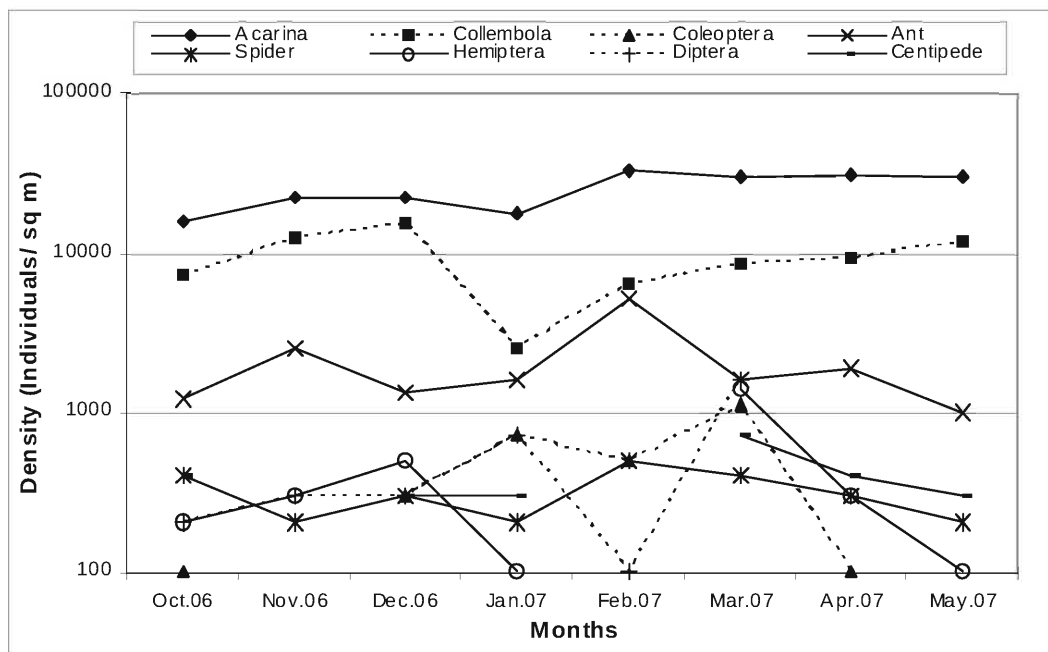


Figure 3. Shows the fluctuation of different groups of microarthropods at plot-B.

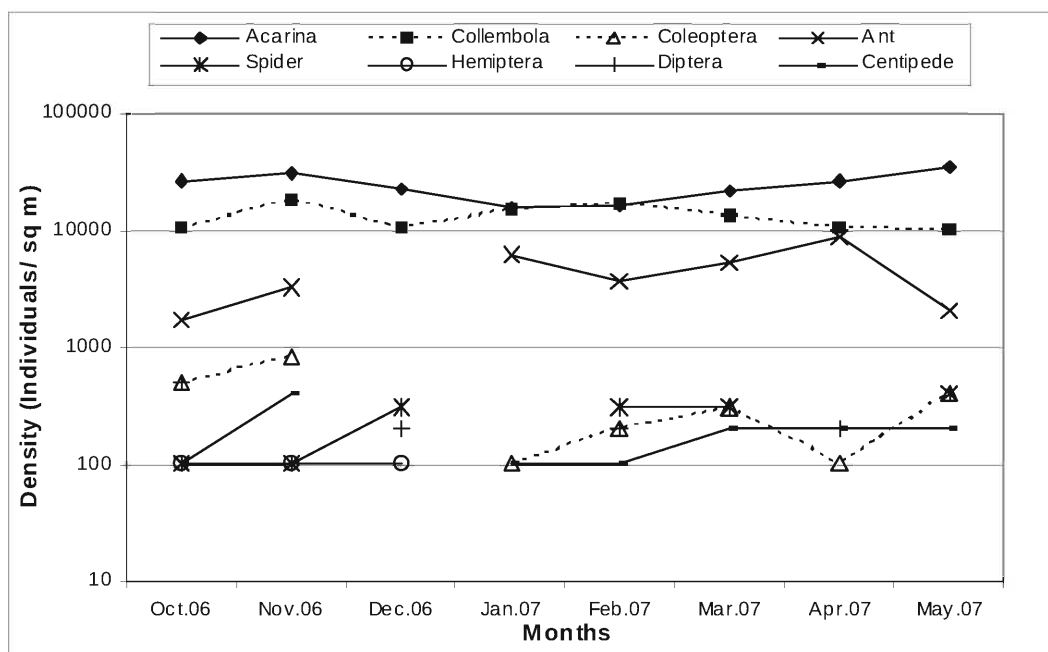


Figure 4. Shows the fluctuation of different groups of microarthropods at plot-C.

SUMMARY

The seasonal abundance of soil inhabiting arthropod fauna and their interrelationship with the edaphic factors like temperature, moisture and pH in flower and vegetable gardens and in a plot growing weeds in West Bengal were studied. The soil arthropods were extracted with the help of modified Tullgren funnel apparatus. Altogether 12408 arthropods belonging to 9 groups were extracted from the soil samples which were collected at random from each of the three plots every month for a period of eight months (October 2006-May 2007). Of the total population Acarina was the most dominant group (47% approx.) which was followed by Collembola and Ant population. The plots where weeds were grown was quantitatively rich in fauna as compared to that of the flower and vegetable gardens where different insecticides and manures were applied and traditional means of garden nurturing that include tilling, raking, weeding, etc. were followed. The arthropod population showed seasonal variation with peak in February-April in almost all the three different plots.

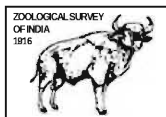
ACKNOWLEDGEMENTS

The authors are thankful to the Director, Zoological Survey of India, Kolkata for providing laboratory facilities. They also express their thanks to the officers and staff of Acarology, ZSI, Kolkata for extending necessary help for work in the laboratory.

REFERENCES

- Bhattacharya, T., Joy, S. and Joy, V.C. 1991. Community structure of soil cryptostigmata under different vegetational conditions at Santiniketan. *J. Soil Biol. Ecol.*, **1** : 27-42.
- Joy, Vadakepuram Chacko and Chakroborty, Partha Pratim 1991. Impact of insecticides on non-target microarthropod fauna in agricultural soil. *Ecotoxicology and Environment safety* **22** : 8-16.
- Macfadyen, A. 1953. Notes on methods for the extraction of soil arthropods. *J. Anim. Ecol.*, **22** : 65-77.
- Majumdar, S. and Deb, D.C. 1991a. Composition and relative abundance of Microarthropods of uncultivated and cultivated fields in the district of West Dinajpur, West Bengal, India. *Journal of Bengal Natural History Society, New Series*, **10**(2) : 56-63.
- Sanyal, A.K. 1991. Influence of agricultural practices on the population of soil mites in West Bengal, India. In : *Advances in Management and Conservation of Soil Fauna* (Eds. G.K. Veeresh, D. Rajagopal and C.A. Viraktamath), Bangalore, 333-340.
- Sanyal, A.K. and Sarkar, B.J. 1993. Ecology of soil oribated mites in three contrasting sites at Botanical Garden, Howrah, West Bengal. *Environment and Ecology*, **11**(2) : 427-434.
- Sarkar, S., Sanyal, A.K. and Chakraborti, S. 2006. Effects of agricultural practices on soil arthropod population in West Bengal—A preliminary report. *Rec. zool. Surv. India*, **107**(Part-4) : 61-69.

- Sengupta, D. and Sanyal, A.K. 1991. Studies on the soil microarthropod fauna of a paddy field in West Bengal, India. In : *Advances in Management and Conservation of Soil Fauna* (Eds. G.K. Veeresh, D. Rajagopal and C.A. Viraktamath), Bangalore, 789-796.
- Sheela, K. and Haq, M.A. 1991. Oribatid mites as bioindicators of soil moisture. In : *Advances in Management and Conservation of Soil Fauna* (Eds. G.K. Veeresh, D. Rajagopal and C.A. Viraktamath), Bangalore : 871-876.
- Singh, Janardan and Pillai, K.S. 1981. Community structure and biocoenology of soil microarthropods in some tropical fields at Varanasi (India). *Trop. Ecol.*, **16**(2) : 81-85.
- Wallwork, J.A. 1970. Ecology of Soil Animals. Macgraw—Hill, Newyork, USA, 3-45.



Rec. zool. Surv. India : **109**(Part-4) : 11-14, 2009

A NEW SPECIES OF *PHILOLEMA* CAMERON (HYMENOPTERA : EURYTOMIDAE) PARASITIC ON SPIDER EGGS (ARACHNIDA : ARANEAE) FROM INDIA

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INTRODUCTION

The genus *Philolema* was raised by Cameron in 1908 based on the type species *Philolema carinigena* Cameron. Boucek (1988 : 106) stated that *Philolema* Cameron would be emerged with *Eurytoma* Illiger. But most of the recent workers (Narendran, 1994; Lotfalizadeh *et al.*, 2007) considered it as a distinct genus. The generic classification in the family Eurytomidae is still very unsatisfactory. In the most recent classification (Lotfalizadeh *et al.*, 2007; Noyes, 2009) this new species comes under *Desantisca* species group of the genus *Philolema*. In *Desantisca* species group all species are parasitic on spider eggs. This species group consists of 4 valid species from the Indian subcontinent namely, *Philolema* (= *Desantisca*) *belgaumensis* (Narendran) from Maharashtra, India, *P.* (= *D.*) *palanichamyi* (Narendran) from Tamil Nadu, India, *P.* (= *D.*) *uloborae* (Narendran) and *P.* (= *D.*) *lankana* (Narendran) from Nugegoda, Sri Lanka (Narendran, 1994; Noyes, 2009). In this paper one new species is described from West Bengal, India based on specimens which emerged from unidentified spider egg sacs.

The Holotype and Paratype are deposited in the 'National Zoological Collections' of the Zoological Survey of India, Kolkata (NZSI).

MATERIALS AND METHODS

The egg sacs of the unidentified spider species are collected from the spider web. They reared in the laboratory from which the parasite emerged out. The specimens are card mounted and studied under Wild Heerbrugg Stereozoom microscope (Made in Switzerland) and drawings were made using the drawing tube of the microscope.

The following abbreviations are used in the text :

F1-F6 = Funicular segments 1 to 6; MV = Marginal vein; PMV = Post marginal vein; OOL = Ocellocular line; POL = Postocellar line; SMV = Submarginal vein; STV = Stigmal vein; T1-T6 = Gastral tergites 1 to 6.

RESULTS

Philolema nadia Narendran and Girish Kumar sp. nov.

(Figs. 1-4)

Holotype : Female : Length 1.86 mm. Black. Mandible blackish brown; antenna brownish black with scape and pedicel black; tegula black; fore and mid tibiae pale brown except at bases and apices yellow; hind tibia dark brown except base and apex yellow; all tarsi yellow with apical tarsal segment yellowish brown; claws brown. Wings hyaline, veins whitish yellow with some brown margins on fore wing veins. Body hairs short, thick and white, originate from each umbilical puncture; hairs sparse on clypeus and supraclypeal area, absent on lateral corner of pronotum, scapula, axilla and mesopleuron (except a line of hairs on carina of mesopleuron anteriorly).

Head : Densely and umbilicately punctate including malar space; interstices narrow; front view as in Fig. 1; scrobe deep, its lateral margins carinate, dorsal margin ecarinate; relative measurement of dorsal width of head : length = 23.5 : 10; POL : OOL = 5 : 2; eye without pubescence. Antenna 11162; scape not reaching front ocellus; antenna (Fig. 2) with sensilla and setae; length: width of antennal segments : scape = 15 : 5.5; pedicel = 4 : 3.2; F1 = 9 : 6; F2 = 6 : 7; F3 = 6.5 : 7.5; F4 = 6.8 : 8; F5 = 7 : 8; F6 = 7 : 7.2; club = 12.3 : 6.5.

Mesosoma : Densely and umbilicately punctate; interstices narrow; punctures weak on lateral corner of pronotum, scapula, axilla, lateral sides of propodeum and mesopleuron; mesopleuron with some transverse striations; relative length of mesosoma (including pronotal collar) strictly in dorsal view : width (excluding tegulae) : maximum height = 26.5 : 14.5 : 19; anterior margin of propodeum ecarinate; scutellum slightly jutting out posteriorly; posterior margin of propodeum concave medially (Fig. 4), propodeum with transverse rows of shallow pits; tegulae with a few irregularly scattered punctures on proximal half. Hind femur broad and flattened. Forewing (Fig. 3) $2.15 \times$ as long as wide; relative lengths of veins : SMV = 32; MV = 7; STV = 5.5; PMV = 8.

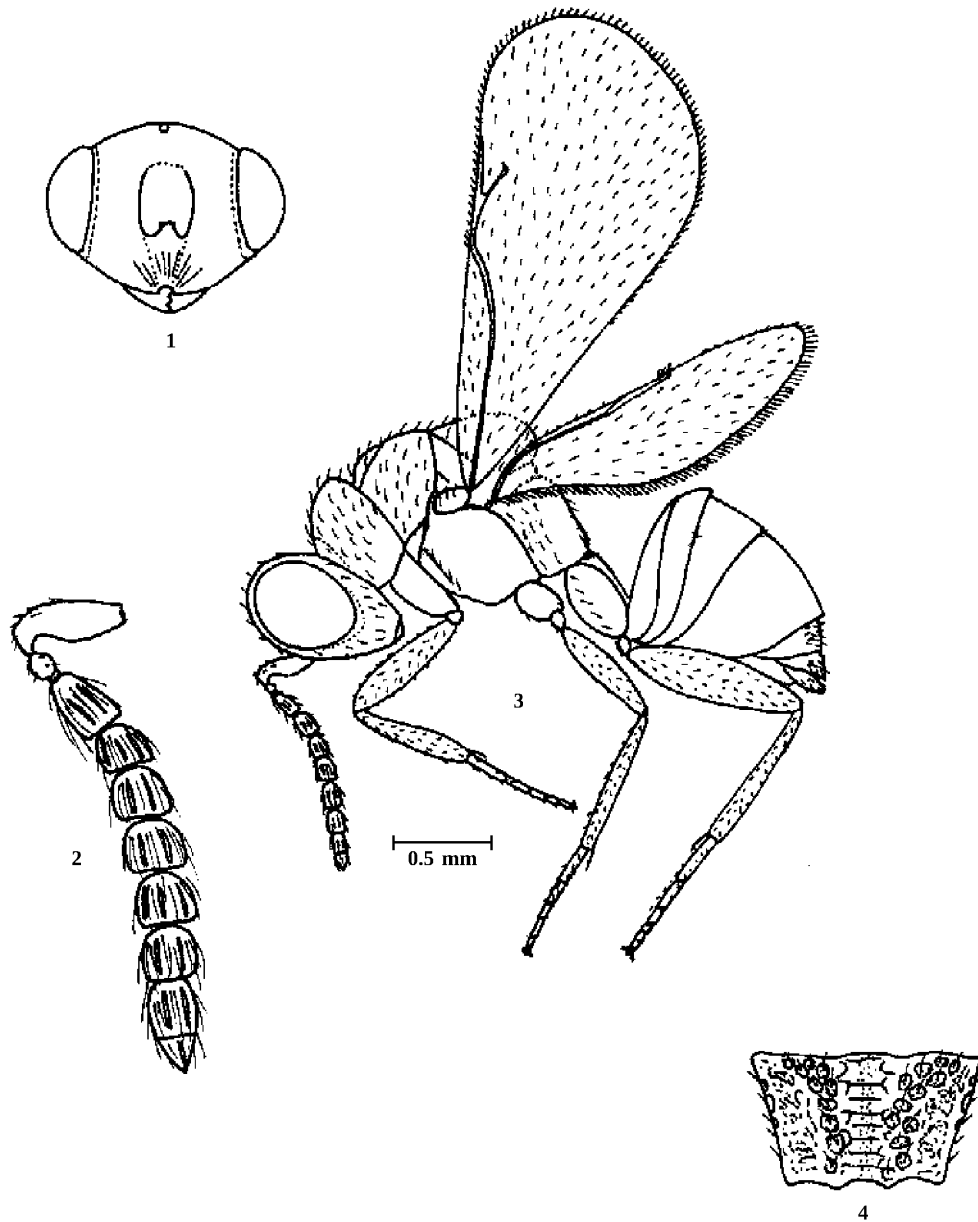
Metasoma : Petiole strongly sculptured, length subequal to length of hind coxa; gaster not compressed from sides; T1 to T4 without hairs, T5 with a bunch of fine lateral hairs and T6 with a bunch of fine apical hairs.

Male : Unknown.

Host : Egg sacs of unidentified spiders.

Biology : Unknown.

Distribution : India : West Bengal.



Figs. 1-4. *Philolema nadia* Narendran and Girish Kumar sp. nov. Female. Fig. 1. Head front view. Fig. 2. Antenna. Fig. 3. Body profile. Fig. 4. Propodeum

Etymology : The species is named after the district from where the type specimens were collected.

Material examined : Holotype Female : India, West Bengal, Nadia Dist., Bahadurpur, 9-xi-2008, coll. S. Talukdar (NZI Reg. No. 11422/H3). Paratype : 1 Female, same data of Holotype (NZSI Reg. No. 11423/H3).

DISCUSSION

This new species comes close to *Philolema* (= *Desantisca*) *uloborae* (Narendran) but distinctly differs from it in having : (1). Antenna brownish black with scape and pedicel black (In *P. uloborae* antenna yellow with club and distal funicular segment brownish tinge); (2). Scrobe deep, its lateral margins carinate (in *P. uloborae* scrobe shallow, its lateral margins ecarinate) and (3). Eye without pubescence (in *P. uloborae* eye pubescent).

SUMMARY

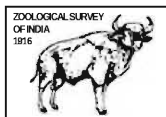
A new species of *Philolema* Cameron viz., *Philolema nadia* Narendran and Girish Kumar sp. nov., emerged from the spider eggs, is described from India and its affinities to the closest relative are discussed.

ACKNOWLEDGEMENTS

We are grateful to the Director, Zoological Survey of India, Kolkata for providing facilities and encouragements. First author is also grateful to the authorities of university of Calicut for providing facilities. Third author is also grateful to Bharatia Vignan and Yuktivadi Samiti, Shyamnagar for their helps to visit the collection locality.

REFERENCES

- Boucek, Z. 1988. Australasian Chalcidoidea (Hymenoptera). A Biosystematic Revision of Genera of Fourteen Families with a Reclassification of species. Wallingford : C.A.B. International, 832 pp.
- Cameron, P. 1908. Descriptions of two new genera and species of reared Chalcididae from Borneo (Hym.). *Dt. Ent. Z.* **1908** : 559-561.
- Lotfalizadeh, H, Delvare, G and Rasplus, J. 2007. Phylogenetic analysis of Eurytomidae (Chalcidoidea : Eurytomidae) based on morphological characters. *Zool. J. Linn. Soc.*, 151 : 441-510.
- Narendran, T.C. 1994. *Torymidae and Eurytomidae of Indian subcontinent (Hymenoptera : Chalcidoidea)*. *Zoological monograph* : 1-500. Published by Dr. T.C. Narendran, Professor of Zoology, Univ. of Calicut.
- Noyes, J.S. 2009. Universal Chalcidoidea Database. The Natural History Museum, London. Website : <http://www.nhm.ac.uk/entomology/Chalcidoidea>.



Rec. zool. Surv. India : **109**(Part-4) : 15-23, 2009

FISH FAUNA OF MAJOR RIVERS OF DARJEELING DISTRICT, WITH SPECIAL REFERENCE TO THEIR CONSERVATION STATUS

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INTRODUCTION

Freshwater fishes represent the most diverse group of Indian vertebrates with minimum of 600 species (Talwar & Jhingran, 1991). In freshwater fish diversity India is eighth in the world and third in the Asia (Kottelat and Whitten, 1996). Recent conservation assessment reveals that 88 species in Western Ghat streams and 82 species in Eastern Himalayas are in threatened category. West Bengal possesses 59 threatened freshwater fish species of India (Menon, 1999 & 2004). Considering the presence of a number of the threatened and endemic species in North Bengal, the region may be described as the 'Hot Spot' of the fish resource of West Bengal (Barman, 2007).

Darjeeling, the north western district of West Bengal, lies between 26°31'N and 27°13'N latitude and between 87°59'E and 88°53'E longitude. This district is full of rivers, canals and jhoras. Rivers like Mechi, Balason, Mahananda and Teesta represent the major water resources of this district. Darjeeling is thickly interspersed with innumerable hill streams, some of which are potential sources of fish supply. The rich ichthyofaunal resources of these hill streams have never been explored before. Previously Shaw and Shebbeare (1937) recorded 131 species of fishes from different water bodies of Darjeeling and Jalpaiguri. The present work is an attempt to illustrate the status of different fish species available in District Darjeeling.

MATERIALS AND METHODS

Present work is based on extensive field survey and fish sampling conducted from September, 2005 to August, 2007.

I. Site descriptions

Surveys and fish sampling were conducted at 5 stations/sites of Darjeeling District according to the probable availability of fish fauna (Figure-I).

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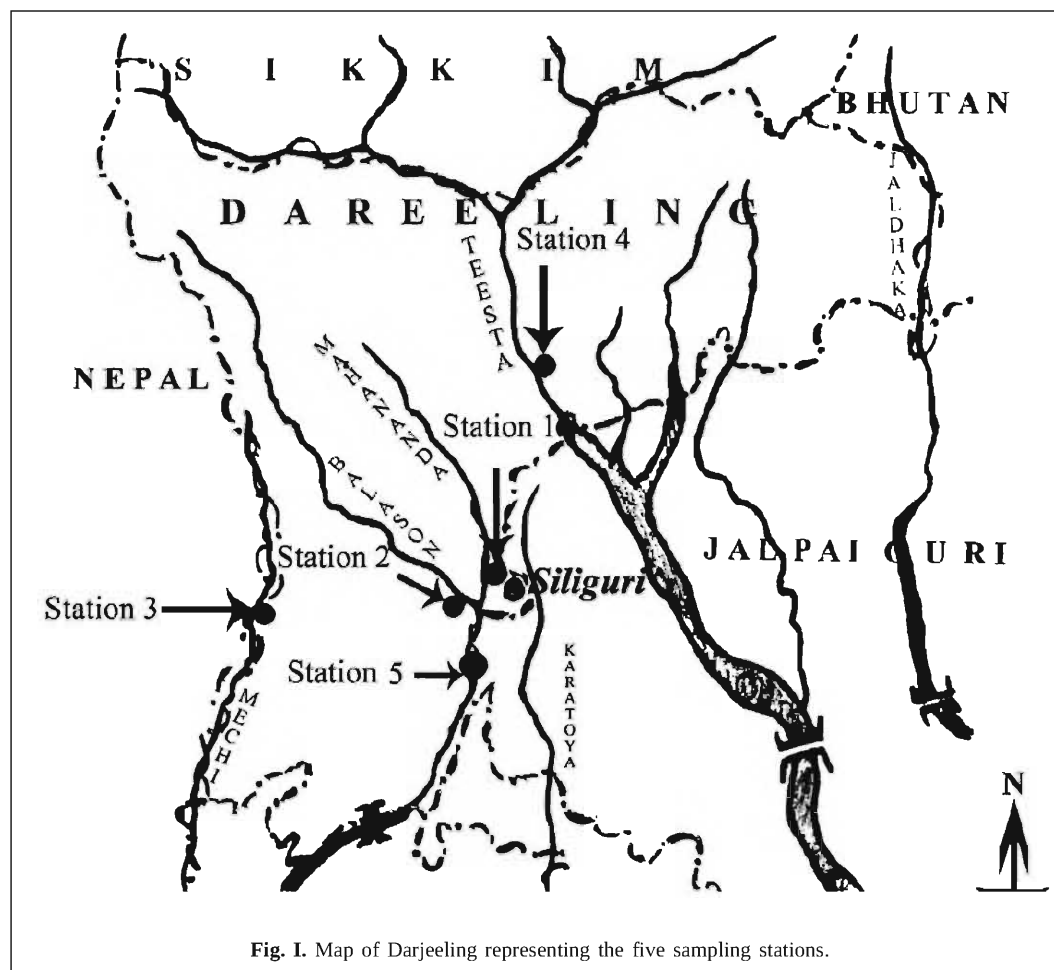


Fig. I. Map of Darjeeling representing the five sampling stations.

Station 1 : It is a fish sampling site at River Mahananda near Siliguri with geographical position $26^{\circ}43'N$ and $88^{\circ}25'E$.

Station 2 : Fish fauna of river Balason were sampled near Matigarah village with geographical position $26^{\circ}41'N$ and $88^{\circ}24'E$.

Station 3 : Mechi river originates from the hills of the border of Nepal. Our sampling was done from this river near Naxalbari ($26^{\circ}44'N$ and $88^{\circ}25'E$).

Station 4 : Fish sampling from river Teesta was done near Teesta Bazar of Kalimpong ($27^{\circ}54'N$ and $88^{\circ}25'E$).

Station 5 : Fulbari Barrage on river Mahananda was chosen as fish sampling site ($26^{\circ}38'N$ and $88^{\circ}24'E$). It is situated at the border between Darjeeling and Jalpaiguri district where water of River Teesta is channelized to river Mahananda as a part of the Teesta River Valley Project. The

reservoir indicates the association of important rivers and canals of District Darjeeling. Therefore, it is not so difficult to assume that fish fauna of the Mahananda reservoir significantly represents a larger section of fishes of this district.

II. Collection and Identification of fishes

The data is based on fish collection from rivers, direct field observations and information sampling. The fishermen used different types of gill nets and cast nets for fishing. Locally known Ber jal, Khapla jal, Porongi jal (Hand lift net) and Bhasal jal (Dip Net) are very commonly used in the different fishing sites of Darjeeling. Questionnaires were administered to collect the information regarding changing pattern of the rivers and fish distribution. Fish sampling involved collection at the water bodies of the above mentioned five stations and related local markets.

Collected samples were preserved in 4-8% formaldehyde solution and a longitudinal incision was made along the abdomen for larger specimens. Collected fish samples were identified after Day (1878), Jayaram (1999) and Talwar & Jhingran (1991). Identification was confirmed by the help of Zoological Survey of India, Kolkata.

RESULTS

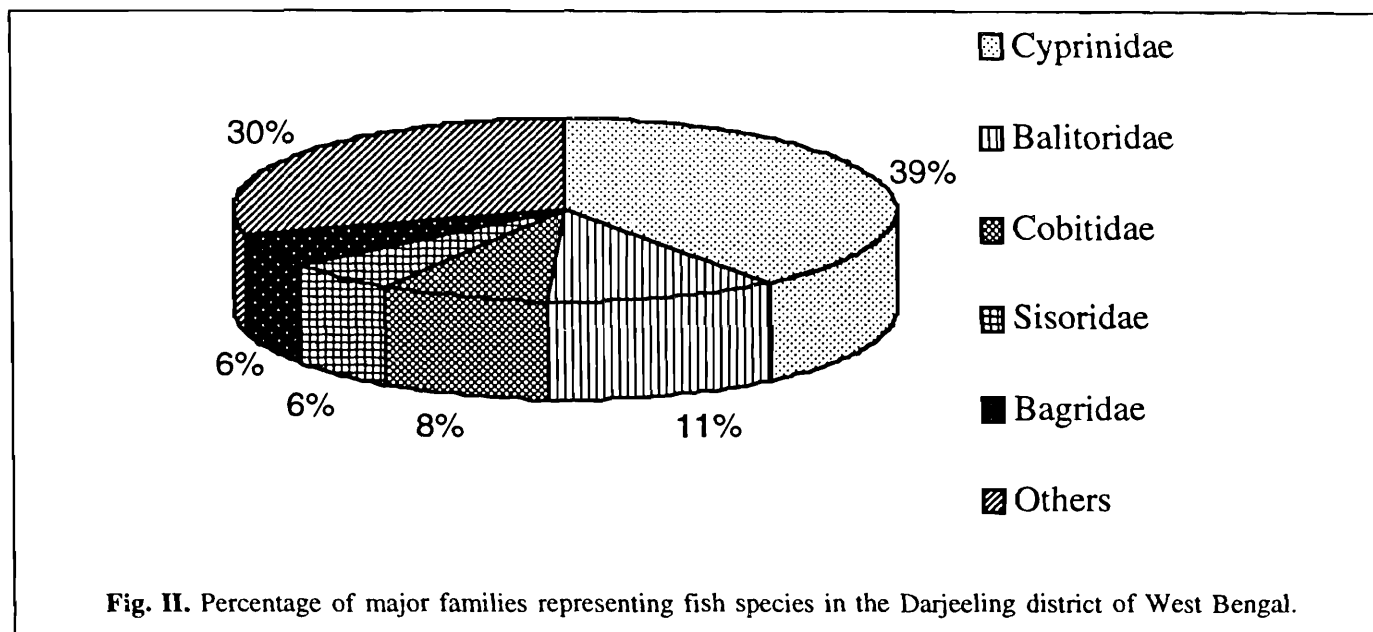
The present work reports a total of 71 species from 48 genera, 20 families and 8 orders. In accordance with Conservation Assessment and Management Plan (CAMP) report (1998), out of 74 species 1 is categorized as Critically Endangered (CR), 8 Endangered (EN), 14 Vulnerable (VU), 1 Data Deficient (DD), 25 Lower Risk near threatened (LR-nt), 4 Lower Risk least concern (LR-lc) and about 18 species are Not Evaluated (NE) yet (Table-1).

DISCUSSION

The survey result shows that among the total fish species collected, Order Cypriniformes holds a major portion of the Darjeeling district's fish fauna. Fishes of the Family Cyprinidae is most abundant (39% of the total fish species) followed by the Family Balitoridae (11%) as loaches are found at the upper course of River Teesta and Mahananda (Figure-II).

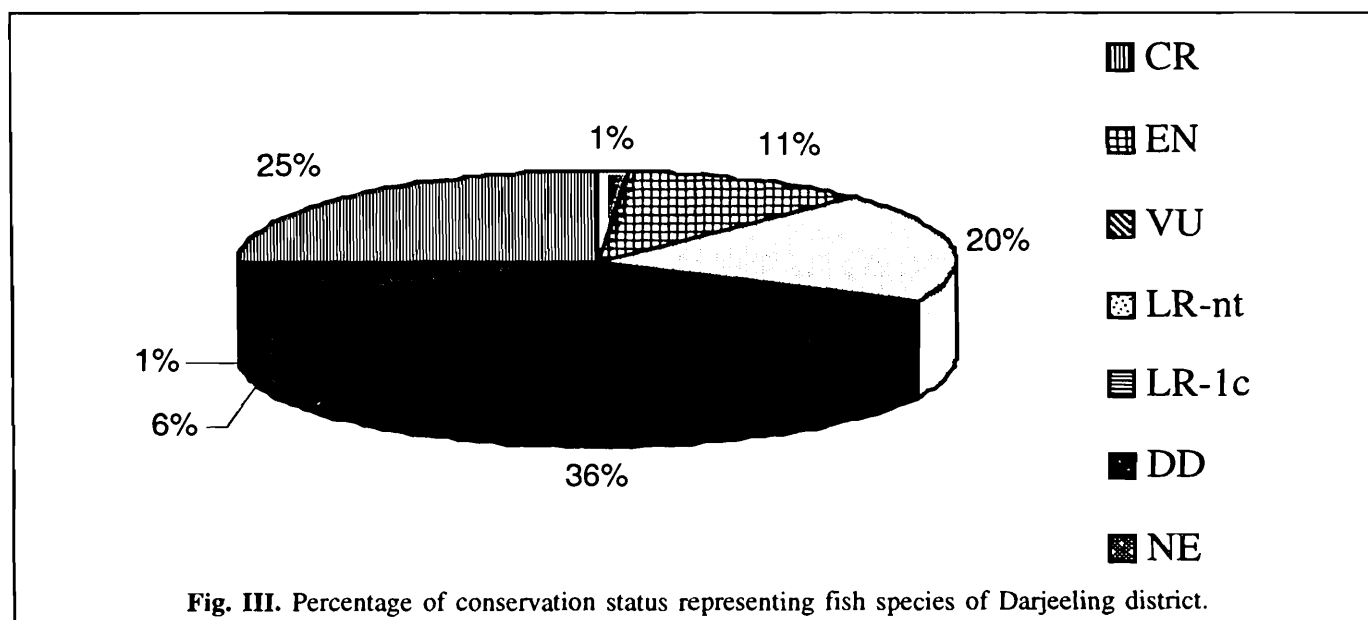
The present study reveals that percentage of fishes under the threatened category have raised almost up to 30%. More precisely, 11% of the total fish species have become Endangered, 20% have become vulnerable and one species namely *Pangasius pangasius* (Ham) is considered as Critically Endangered (on the basis of the report of BCPP-CAMP workshop, 1998). Status of the 25% of the total collected species is yet to be evaluated (Figure-III).

As our survey was concentrated around the southern portion of Darjeeling, upper hill stream and jhoras still remain unexplored. Reviewing the previous references it has been revealed that a major number of hill stream fishes (loaches) of this particular area have declined. The major causes behind this decline may be attributed to consecutive flood of river Teesta causing habitat destruction of loaches and other tiny species. River Teesta has experienced consecutive floods since 1960. This resulted in the destruction of breeding ground of many fish species. Siltation due to catchment



erosion or waste dumping makes the water column shallow, depriving Mahaseers (*Tor* sp.) and other larger fishes their habitat. Fishes like Boroli (*Barilius* sp.) have also shown significant decline as a result of excessive harvesting due to their high food value and demand.

Pollution has also driven significant population decline or loss. Not a single species of *Nandus nandus* was found during our survey period, but this fish was abundant here as recorded by Shaw and Shebbeare (1937).



Hara horai (Misra), a Sisorid fish is actually suggested as endemic to North Bengal (Barman, 2007). Another endemic fish *Aborichthys elongatus* (Hora) of Family Balitoridae can be suggested as endangered according to the BCPP-CAMP report.

Table-I. List of the fishes recorded from Darjeeling district

Order	Family	Scientific Name	Local name	Status	Distribution				
					1	2	3	4	5
Cypriniformes	Cyprinidae	<i>Aspidoparia morar</i> (Ham.)	Chela	LRnt	+	-	-	-	-
		<i>Barilius bendilesis</i> (Ham.)	Joia, Guder	LRnt	-	-	-	+	+
		<i>Barilius vagra</i> (Ham.)	Boroli	VU	+	-	-	+	+
		<i>Barilius shacra</i> (Ham.)	Koksa, Na-born	LRnt	+	-	-	+	+
		<i>Chagunius chagunio</i> (Ham.)	Jerruah	NE	+	+	-	-	+
		<i>Chela laubuca</i> (Ham.)	Bekichela, Dankena	LRlc	-	-	+	-	-
		<i>Crossocheilus latius</i> (Ham)	Lahari	DD	-	-	-	+	-
		<i>Danio aequipinnatus</i> (McClelland)	Chebli, Bhatti	LRnt	-	+	-	+	+
		<i>Danio dangila</i> (Ham.)	Nipati	NE	+	-	-	+	-
		<i>Esomus danricus</i> (Ham.)	Danrika	LRlc	-	+	-	+	+
		<i>Garra annandalei</i> (Hora)	Choak-si, Ghor-poia	NE	+	-	-	-	-
		<i>Garra gotyla</i> (Gray)	Budena	VU	+	-	-	+	+
		<i>Labeo boga</i> (Ham)	Bogabata, Bangan	LRnt	+	-	-	+	+
		<i>Labeo dero</i> (Ham)	Kursa, Katalkusi, Gardi	VU	-	-	-	+	-
		<i>Labeo gonius</i> (Ham.)	Kurchi, Goni	LRnt	+	-	-	+	+
		<i>Labeo pangusia</i> (Ham)	Utti	LRnt	+	-	-	-	-
		<i>Neolissocheilus hexagonlepis</i> (Mc Clelland)	Katli	NE	-	-	-	+	+
		<i>Puntius conchoni</i> (Ham.)	Kanchan-punti	VU	+	+	-	+	+
		<i>Puntius gelius</i> (Ham)	Gilli-punti	NE	+	-	-	-	+
		<i>Puntius sarana sarana</i> (Ham)	Swornopunti	LRnt	+	-	-	+	+
		<i>Puntius phutunio</i> (Ham)	Phutuni-punti	LRlc	+	-	-	-	+

Table-I. (Cont'd)

Order	Family	Scientific Name	Local name	Status	Distribution				
					1	2	3	4	5
Cypriniformes		<i>Puntius terio</i> (Ham)	Teri- punti	LRnt	+	-	-	-	-
		<i>Puntius sophore</i> (Ham)	Punti	LRnt	+	-	-	-	+
		<i>Puntius ticto</i> (Ham)	Tita- punti	LRnt	+	-	-	-	+
		<i>Raiamas bola</i> (Ham.)		VU	+	-	-	-	-
		<i>Schizothorax richardsonii</i> (Gray)	Nak-Katwa, Asala	VU	-	+	-	-	-
		<i>Semiplotus semiplotus</i> (Gray)	Chepti, Badangi	VU	-	-	+	+	+
		<i>Tor putitora</i> (Ham.)	Mahaseer	EN	-	-	-	+	+
	Balitoridae	<i>Aborichthys elongatus</i> (Hora)	Langai	EN	-	-	-	+	-
		<i>Balitora brucei</i> (Gray)	Tita- Kabri	LRnt	+	-	-	+	-
		<i>Schistura beavani</i> (Gunther)	Pola	NE	+	+	+	+	+
		<i>Acanthocobitis botia</i> (Ham)	Pola	LRnt	+	-	-	+	+
		<i>Nemacheilus devdevi</i> (Hora)	Khorika	NE	-	-	-	+	+
		<i>Nemacheilus multifasciatus</i> (Day)	Khorkey	EN	-	-	-	+	-
		<i>Schistura rupecula</i> (Mc Clelland)	Rupali-Khorkey	LRnt	-	-	-	+	-
		<i>Nemacheilus shebbearei</i> (Hora)	Khorika	NE	-	-	-	+	-
	Cobitidae	<i>Pangio pangia</i> (Ham)	Pangya	NE	-	+	-	-	-
		<i>Botia dario</i> (Ham)	Balabotia	NE	-	-	-	+	-
		<i>Lepidocephalichthys annandalei</i> (Chaudhuri)	Poa, Poia	LRnt	-	+	-	-	+
		<i>Lepidocephalichthys berdmorei</i> (Blyth)	Guntel	EN	+	-	-	+	+
		<i>Lepidocephalichthys guntea</i> (Ham.)	Guntel	NE	+	+	-	-	+
		<i>Somileptes gongota</i> (Ham)	Nadiaari Maachh	VU	-	+	-	+	+

Table-I. (Cont'd)

Order	Family	Scientific Name	Local name	Status	Distribution				
					1	2	3	4	5
	Psilorhynchidae	<i>Psilorhynchus sucatio</i> (Ham.)	Chepti	EN	-	-	-	+	-
Siluriformes	Bagridae	<i>Mystus bleekeri</i> (Day)	Tengra, Golsa tengra	VU	+	+	-	+	+
		<i>Mystus cavasius</i> (Day)	Kabasi tengra, Tengra	LRnt	-	+	-	-	-
		<i>Mystus vittatus</i> (Bloch)	Tengra, Golsa tengra	VU	-	+	+	-	+
		<i>Rita rita</i> (Ham.)	Rita, Reta	LRnt	-	+	-	+	+
	Siluridae	<i>Ompok pabda</i> (Ham)	Pabda	EN	+	-	-	-	+
		<i>Ompok pabo</i> (Ham)	Pabda	NE	+	-	-	-	-
	Pangasidae	<i>Pangasius pangasius</i> (Ham)	Pangas	CR	-	+	+	-	-
	Schilbeidae	<i>Pseudotropius atherinoides</i> (Bloch)	Doya, Potasi	EN	-	-	-	+	-
		<i>Silonia silondia</i> (Ham.)	Utti	LRnt	-	-	-	+	+
	Sisoridae	<i>Bagarius bagarius</i> (Ham)	Bagha-ar	VU	+	-	-	+	+
		<i>Hara horai</i> (Misra)	Kala-kabri	EN	-	-	-	+	-
		<i>Hara jerdoni</i> (Day)	Tinkantiya	NE	-	-	-	+	-
		<i>Pseudecheneis sulcatus</i> (McClelland)	Kabri	VU	-	-	-	+	-
	Heteropneustidae	<i>Heteropneustes fossilis</i> (Bloch)	Singhi	VU	-	+	-	-	-
Siluriformes	Chacidae	<i>Chaca chaca</i> (Ham.)	Chega, Chaka	NE	-	-	+	+	-
		<i>Olyra longicaudata</i> (McClelland)	Bot-singhi	NE	+	-	-	+	+
Perciformes	Badidae	<i>Badis badis</i> (Ham.)	Bot-koi	NE	+	-	-	-	+
	Osphronemidae	<i>Polyacanthus fasciatus</i> (Schneider)	Kholisa	LRnt	-	+	-	-	+
		<i>Ctenops nobilis</i> (McClelland)	Koleehona	NE	-	-	-	+	+

Table-I. (Cont'd)

Order	Family	Scientific Name	Local name	Status	Distribution				
					1	2	3	4	5
	Ambassidae	<i>Pseudambassis ranga</i> (Ham.)	Chanda	NE	+	-	-	-	-
	Channidae	<i>Channa orientalis</i> (Bloch & Schneider)	Taki	VU	-	+	+	-	-
		<i>Channa punctatus</i> (Bloch)	Taki	LRnt	-	+	+	-	-
Synbranchiformes	Mastacembelidae	<i>Macrognathus aral</i> (Bloch & Schneider)	Baan-Maachh	LRnt	+	+	-	+	+
		<i>Macrognathus pancalus</i> (Ham.)	Pankal	LRnt	-	-	-	+	+
Tetraodontiformes	Tetraodontidae	<i>Tetraodon cutcutia</i> (Ham.)	Tepa	LRnt	+	-	-	+	-
Clupeiformes	Clupeidae	<i>Gudusia chapra</i> (Ham.)	Khoira	LRlc	-	+	-	-	+
Osteoglossiformes	Notopteridae	<i>Notopterus notopterus</i> (Pallas)	Pholui	LRnt	-	+	+	-	+
Beloniformes	Belonidae	<i>Xenentodon cancila</i> (Ham.)	Kakla	LRnt	+	+	-	+	+

Critically Endangered = CR; Endangered = EN; Vulnerable = VU; Lower Risk - near threatened = LR-nt; Lower Risk - least concern = LR-lc; Data Deficient = DD; Not Evaluated = NE; Present = +; Absent = - ;

CONCLUDING REMARK

The water bodies of District Darjeeling have undergone several major changes during the past few years through deforestation, flood and other activities. These changes have attributed to the changes in the composition of fish fauna. Several species may have become extinct from this region, which is yet to be proven. Conservation status of the freshwater fishes of this region is very poor. Despite the discovery of several new species to date, the rate of increase of pressure on these is so high that extinction may be expected even before discovery. The NBFGR's conservation research strategies should be implemented with immediate effect. Moreover, thorough exploration of hill streams and jhoras may provide ample information about the fish fauna of this district.

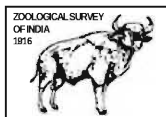
ACKNOWLEDGEMENT

Authors are thankful to University Grants Commission (UGC) for their financial support.

REFERENCES

- Barman, R.P. 2007. A Review of the Freshwater Fish Fauna of West Bengal, India with Suggestions for Conservation of the Threatened and Endemic Species. *Rec. zool. Surv. India. Occ. Paper* No. 263 : 1-48.

- Conservation Assessment and Management Plan (CAMP) Report 1998. Freshwater Fishes of India, National Bureau Fish Genetic Resources, Lucknow and Zoo Outreach Organization Coimbatore : 1-327.
- Day, F. (1878). The fishes of India being a natural history of the fishes known to inhabit the seas and freshwaters of India, Burma and Ceylon. William Dawson, London, xx + 778 pp, 195 pls. 1-366.
- Jayaram, K.C. 1999. *The Freshwater Fishes of the Indian Region*. Delhi, Narendra Publishing House, New Delhi, India : 1-509.
- Kottelet, M. and Whitten, T. 1996. *Freshwater Biodiversity in Asia with Special Reference to Fish*. World Bank Technical Paper No. 343, Washington : 1-59.
- Menon, A.G.K. 1999. *Checklist Freshwater fishes of India*. *Rec. zool. Surv. India, Occ. Paper*. No. 175 : 1-366.
- Menon, A.G.K. 2004. *Threatened fishes of India and their conservation*. *Rec. zool. Surv. India* : 1-170 (Published- Director, ZSI).
- Sen, T.K. 1992. *Fauna of West Bengal Freshwater Fish*. Zoological Survey of India. Calcutta, Part 2 : 101-242.
- Shaw, G.E. and Shebbeare, E.O. 1937. The fishes of Northern Bengal. *Journal of the Royal Asiatic Society of Bengal*, 3 : 1-124.
- Talwar, P.K. and Jhingran, A.G. 1991. *Inland Fishes of India and Adjacent Countries*. Vol. 1 and 2. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Bombay and Calcutta : 1-1063.



Rec. zool. Surv. India : **109**(Part-4) : 25-33, 2009

MEIOFAUNA OF GULF OF MANNAR

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INTRODUCTION

Meiofaunal organisms are mobile metazoans, which are smaller than macrofauna and larger than microfauna. Meiofauna can be defined as those animals, which will pass through a sieve with a mesh size of 0.5 mm but be retained by 0.045 mm sieve. Some reach 1 or 2 mm in length but can pass through the larger sieve because they are long and slender. Being small and less conspicuous, they are often ignored altogether. Meiofauna live in both freshwater and Marine habitats. The meiofauna often extremely abundant in fine particle beaches, sometimes exceed the macro fauna in biomass in coarser sands. They also inhabit complex surfaces and the spaces between them such as are found on seaweeds and other structures.

The meiofauna consists of various representatives of the Gastrottricha, Kinorhyncha, Nematoda, Copepoda, Ostracoda, Mystacocarida, Halacarina and many groups of Turbellaria and Oligochaeta, some Polychaeta and a few specialized species of the Hydrozoa, Nemertina, Bryozoa, Gastropoda, Aplacophora, Holothuroidea and Tunicata.

All of them are small and may have a worm like shape. Meiofauna have been distinguished into the burrowing muddy sediments forms and interstitial sandy sediments forms. Intertidal sediments tend to be dominated by nematodes, which can reach very high densities on finer particles beaches. Nematodes are usually long and thin, a shape well suited for moving through interstices. Slender species inhabit the larger interstitial spaces found on sandy beaches are bulkier epibenthic and shallow burrowing forms are more common in fine sediments.

The present paper gives a taxonomic account and distribution of 36 species belonging to 31 genera, 24 families of nematodes, copepods, foraminiferans, ostracods and polychaetes of Gulf of Mannar.

REVIEW OF LITERATURE

During 1900-1950, which was a period of early meiofaunal research. Many animals were discovered and described. Mare (1942) introduced and defined the term 'Meiobenthos'. The term 'Interstitial fauna introduced by Nichol's (1935) for animals living in the interstitial water of sand

and its equivalent terms Mesopsammon introduced by Remane (1940) are often confused with the term meiofauna. Organism living in the interstitial spaces between particles of all types of sediment are referred to as interstitial if they move through the habitat with a minimum of disturbances of constituent particles. The term meiofauna is derived from Greek Meio meaning “smaller”. In this context it refers to the fauna smaller than what has been defined as the lower size limit for macrofauna.

Nematodes populating North American shores (Cobb, 1914, 1920) and the Archiannelids of the Northern French coast (Giard, 1904), Remane who is described as the “father of Meiofaunal research” was the first to recognize the rich populations in intertidal beaches, subtidal sands, muds and algal habitats. Remane described Gastrotricha, Rotifera, Archiannelids, Kinorhyncha and other taxa.

The free-living marine nematodes usually constitute the most abundant group of organisms in the meiofauna of littoral sediments. The works of Wieser (1953, 1954, 1956), Timm (1961) and Gerlach (1962, 1963, 1964) proved quite useful in the identification of many common genera and species of these marine nematodes.

Total and relative measurements of body are absolutely necessary for identification of marine nematodes. Structure of stoma, cup shaped with minute teeth, structure of tail, types of oesophagus, types of Amphids, are the identification characters. For this the Demanian formula is usually is employed indicating, $a = \text{total body length}/\text{maximum body diameter}$, $b = \text{total body length}/\text{length of tail}$. The position of nerve ring, excretory pore and vulva is expressed in percentage of body or oesophageal length.

Brady (1884) has given an exhaustive and excellent account of the Foraminifera from the dredgings of the Challenger’ expedition which crossed the Indian Ocean far to the south of the Peninsula. Chapman (1895) reported on the Foraminifera obtained by the Royal Indian Marine survey ship S.S. ‘Investigator’ from the Arabian Sea near Laccadive Islands. Stubbings (1939) reported on the distribution and biology of nearly 300 species of Foraminifera from the Marine deposits of the Arabian Sea collected during the Johan Murray’ expedition. Carter (1888) on the specimens dredged up from the Gulf of Mannar. Dakin (1906) recorded 131 species of Foraminifera from the Gulf of Mannar off Ceylon coast. Gnanamuthu (1943) has listed 47 species of littoral Foraminifera from the Krusadai islands in the Gulf of Mannar. The identification of various families and genera is based on the classification adopted by Cushman (1948). K.M.S. Ameer Hamsa (1971) reported Foraminifera of the Palk Bay and Gulf of Mannar. Ganapati and Satyavati (1958) recorded the Report on the Foraminifera in bottom sediments in the Bay of Bengal off the east coast of India.

Sewell (1919, 1924) reported on the copepod fauna of Chilka Lake and more recently Devasundaram and Roy (1954) have discussed briefly the occurrence and seasonal variations of the copepods in the plankton of the Chilka Lake for the period 1950-1951.

There are brief references to Copepoda in the accounts on the brackishwater fauna of Adyar and other estuarine areas around Madras, by Panikkar and Aiyar (1937), Krishnaswamy (1953) and Chako *et al.* (1953).

Sewell (1919) described a new copepod from the Cochin backwater. The first attempt of making a systematic study and ecology of the planktonic copepods of the Cochin backwater was made by George (1958). Pillai (1970) while giving a list of the Pseudodiaptomus Herrick. The following authors also have contributed to our knowledge of the copepods on habiting brackish waters of India : Kasturirangan (1963), Sewell (1948, 1956) and Ummerkutty (1960). All the above studies have recorded a total of 62 species of Calanoid copepods from different estuaries in India as follows.

MATERIALS AND METHODS

The meiofauna along the beach are collected and field studies made during low tide when the inter tidal zone is fully exposed. A Perspex corer having 40 cm long and had an internal cross-sectional area of 10 cm² was used for the collection of the sand samples (Nybakkan, 1997). The corer tube was vertically thrust into the beach sand up to 10-30 cm and the top portion of the corer was tightly closed with a rubber bung. Later the corer was carefully removed from the substratum, without disturbing the entire samples. To each core sample was added 4% solution of formaldehyde as preservative and a few drops of rose Bengal for necessary staining. In the laboratory, the meiofauna was extracted by washing with 10% solution of magnesium chloride. Then the solution was filtered on a 63 µm diameter mesh size plankton cloth and the concentrated organisms were carefully collected in petridishes. Later the organisms were sorted into different groups and numerically counted up to species level.

SAMPLE PROCESSING

Samples were processed in the laboratory using the methods of Higgins & Thiel (1988) to extract the fauna from the sand grains. Each sample in the vial is stirred with filtered sea water. The supernatant was decanted on to a 63 µm sieve and the fauna were preserved in 4% buffered formalin with rose Bengal stain. The Meiofauna collected on a finer sieve is then washed into a petridish, examined and counted under the binocular microscope.

Standard manuals and monographs were followed to identify the meiofaunal species.

LIST OF SPECIES RECORDED

Phy ARTHROPODA

Class CRUSTACEA

Order HARPACTICOIDA

Family LONGIPEDIIDAE

1. *Longipedia weberii* (A. scott)

Family TACHIDIIDAE

2. *Euterpina acutifrons* (Dana)

- Family ECTINOSOMIDAE
3. *Microsetella norvegica* (Boek)
- Family MACROSETELLIDAE
4. *Macrosetella gracilis* (Dana)
- Family CENTROPAGIDAE
5. *Isias tropica* (Sewell)
- Family PARAMESOCHRIDAE
6. *Paramesochra arenicola* (Klie, 1929)
7. *Emertonia pseudogracilis* Krishnaswamy, 1957
- Phy NEMATODA
- Class ADENOPHOREA
- Order ENOPLIDA
- Family ANTICOMIDAE
8. *Anticoma* sp.
9. *Anticoma acuminata* (Eberth, 1863)
- Family OXYSTOMINIDAE
10. *Porocoma striata* Cobb, 1920
- Family MONHYSTERIDAE
11. *Theristus* sp.
12. *Theristus pertenuis*
13. *Theristus tortuosa* Timm, 1961
- Family CHONIOLAIMIDAE
14. *Latronema orcinum* (Gerlach, 1952)
- Family SPHAEROLAIMIDAE
15. *Sphaerolaimus pacificus* Allgen
- Family ONCHOLAIMIDAE
16. *Oncholaimus* sp.
17. *Oncholaimus brachyceus* De Man, 1889
18. *Viscosia viscose*, De Man, 1980
- Family CAMACOLAIMIDAE
19. *Procamacolaimus tubifer* Gerlach, 1953
- Family NEOTONCHIADAE
20. *Neotonchus* sp. W.B. Blome, 1982
- Family TRIPYLOIDIDAE
21. *Tripylodes gracilis*, (Ditlevsen, 1918)

- Family XYALIDAE
22. *Daptonema* sp. (1)
 23. *Daptonema* sp. (2) W. sm. Wetzel, 1993
 Family LINHOMOEIDAE
24. *Metalinhomoeus* sp. Chitwood, 1951
 Family CERAMONONEMATIDAE
25. *Pselionema* sp.
 Family ANOPLSTOMIDAE
26. *Anoplostoma* sp.
 Family RHYNCHONAMTIDAE
27. *Rhynchonema* sp.
 Family THORACOSTOMOPSIDAE
28. *Enoplolaimus* sp.
 Family CHROMADORIDAE
29. *Chromadora* sp.
 Family ROTALIIDAE
30. *Rotalia pulchela* D'Orbigny, 1939
 Family MILIOLIDAE
31. *Quinqueloculina vulgaris* D'Orbigny, 1826
 32. *Trochammina inflata* (Montagu, 1808)
 Family NONIONIDAE
33. *Elphidium reticulosum* Cushman, 1948
 34. *Bullia vittata* Linnaeus, 1767
 OSTRACOD
35. *Conscoecia indica*
 POLYCHAETA
 Order PHYLLODOCIDA
 Family SYLLIDAE
36. *Typosyllis* sp.

CONCLUSION

Table 1 shows a total of 36 species of meiofauna including 21 species of nematodes belonging to 20 genera, 4 species belonging to 4 genera of foraminiferans, Ostracod such as *Conscoecia indica*, Polychaeta such as *Typosyllis* sp. Nematodes were most abundant group of meiofauna at all the sampling sites, followed by harpacticoid copepods (8 species) and foraminiferans.

Totally five species of nematodes were dominated, which occurred in all the 16 stations i.e., *Daptonema* sp. (1) *Daptonema* sp. (2) *Anoplostoma* sp. (3) *Oncholaimus* sp, (4) *Viscosia viscosa*,

Table-1 : Occurrence and distribution of meiofauna of southeast coast (i-Keelakarai, ii-Sethukarai, iii-Kalimangundu, iv Muthupettai, v-Periapatnam, vi-Ervadi, vii-China Ervadi, viii-Pamban bridge, ix-Rameswaram, x-Thangatchimadam, xi-Single Island, xi-Krusadai Island, xiii-Pullivasal Island, xiv-Poomarichan, xv-Mnauli, xvi-Hare Island, xvii-Nallathani Island.

Sl. No.	Species	Stations																
		i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv	xv	xvi	xvii
1.	1. <i>Longipedia weberii</i>	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+
2.	2. <i>Euterpina acutifrons</i>	+	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-
3.	3. <i>Microsetella norvegica</i>	+		+	-	-	+	+	+	-	-	-	-	-	+	-	-	-
4.	4. <i>Macrosetella gracilis</i>	+	+	-	-	+	-	-	+	+	-	-	-	+	+	-	-	-
5.	5. <i>Paramesochra arenicola</i>	-	-	-	-	+	-	+	-	-	-	-	-	-	-	+	-	-
6.	6. <i>Emertonia pseudogracilis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
7.	7. <i>Isias tropica</i>	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	-
9.	8. <i>Anticoma acuminata</i>	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
10.	9. <i>Porocoma striata</i>	+	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-
11.	10. <i>Theristus tortuosa</i>	+	+	+	-	+	+	-	+	-	-	-	+	-	-	-	-	-
12.	11. <i>Latronema orcinum</i>	-	+	-	-	-	-	+	-	-	-	+	-	-	+	-	-	-
13.	12. <i>Sphaerolaimus pacificus</i>	-	-	+	-	-	-	-	-	-	-	-	+	-	-	+	-	-
14.	13. <i>Oncholaimus brachyceus</i>	-	-	-	-	+	+	-	-	-	-	-	+	-	-	-	-	-
15.	14. <i>Procamacolaimus tubifer</i>	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-
16.	15. <i>Neotonchus</i> sp.	-	-	+	-	-	-	+	-	-	-	-	-	+	-	-	-	-
17.	16. <i>Rotalia pulchella</i> -	+	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-
18.	17. <i>Quinqueloculina vulgaris</i> -	+	-	+	-	+	-	-	+	+		+	-	-	+	-	-	-

Table-1 : (Cont'd.).

Sl. No.	Species	Stations																
		i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv	xv	xvi	xvii
19.	18. <i>Trochammina inflata</i> -	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-
20.	19. <i>Elphidium reticulosum</i> -	+	-	+	-	+	-	-	-	+		+	+	+	-	-	-	-
22.	20. <i>Conscoecia indica</i>	-	-	+	-	-	-	-	-	-	-	+	+	-	+	-	-	-
23.	21. <i>Bullia vittata</i>	-	-	-	-	+	-	+	+	-	-	+	+	-	+	-	-	-
24.	22. <i>Typosyllis</i> sp.	+	-	-	-	+	-	-	-	+	-	-	-	-	+	-	-	-
	23. <i>Tripyloides gracilis</i>	+	-	-	-	-	+	-	+	-	-	+	-	-	+	-	-	
	24. <i>Chromadora</i> sp.	-	-	-	-	-	+	-	-	-	+	-	-	-	-	+	-	
	25. <i>Daptonema</i> sp. (1)	-	+	-	-	-	-	-	+	-	-	+	-	-	+	+	-	
	26. <i>Daptonema</i> sp. (2)	-	+	-	-	-	-	-	+	-	-	+	-	-	+	+	-	
	27. <i>Metalinhomoeus</i> sp.	+	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	
	28. <i>Theristus</i> sp.	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	
	29. <i>Theristus pertenuis</i>	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	
	30. <i>Pselionema</i> sp.	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	+	
	31. <i>Anoplostoma</i> sp.	+	-	-	-	+	-	-	-	-	-	+	+	-	-	-		
	32. <i>Oncholaimus</i> sp.	+	+	-	-	-	-	-	-	+	-	-	-	-	-	+	+	
	33. <i>Anticoma</i> sp.	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	
	34. <i>Rhynchonema</i> sp.	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	
	35. <i>Viscosia viscosa</i> -	+	-	-	-	-	-	+	+	-	-	-	-	-	+	-	+	
	36. <i>Enoplolaimus</i> sp.	+	-	-	-	-	-	-	-	-	-	-	+	-	-		-	

(+ present, - absent)

(5) *Theristus tortuosa*. The foraminiferans species such as four species by (1) *Rotalia pulchella*, (2) *Quinqueloculina vulgaris*, (3) *Trochammina inflata*, (4) *Elphidium reticulosu*. The harpacticoids copepods species such as (1) *Euterpina acutifrons*, (2) *Microsetella norvegica*, (3) *Macrosetella gracilis* were occurred sporadically. The greater diversity is occurred in muddy environment.

The greater diversity was observed at station I and XII, which had a cover of muddy with seagrass environment. At station IX (Rameswaram) is low diversity by human impact.

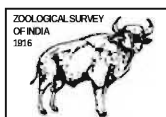
ACKNOWLEDGEMENTS

Our sincere thanks are due to the Director, Zoological Survey of India for permitting to carry out the work. the authors are thankful to Dr. Dr. K. Rema Devi, Officer-in-charge, MBS/ZSI for the facilities provided and also thankful to Dr. C. Raghunathan, Sci 'B' & Dr. G. Chinnadurai, Lecturer for identifying most of the groups to carry out the works and Shri Pabmanabhan Zool. Asstt. for photograph editing the document are duly acknowledged.

REFERENCES

- Ameer Hamsa (1971). Some Foraminifera from the Palk Bay. *Mar. Biol. Assn. India Symp. on Indian Ocean and Adjacent Seas*, Sec. X, Abstr. No. 298.
- Brady, H.B. 1884. Exhaustive and excellent account of the Foraminifera from the dredgings of the 'Challenger' expedition. *Rep. voy. Challenger*, 1884, **9** : 1814.
- Carter, H.J. (1880) Specimens dredged up from the Gulf of Mannar, *Ann. Mag. Nat. Hist.*, **5** : 437 and 6, 35, 129.
- Cernohorsky, W.O. (1984). Systematics of the family Nassariidae (Mollusca : Gastropoda). *Bulletin of the Auckland Institute and Museum*, **14** : 1-356.
- Chapman, F. (1895) Foraminifera obtained by the Royal Indian Marine Survey ship S.S. 'Investigator' from the Arabian sea near the Laccadive Islands. *Proc. zool. soc. lond.*, 1-55.
- Cushman, 1933, US Nat. Mus., Bull., v. 161, pt. II, p. 51, pl. 12, fig. 5.
- Cushman, J.A. 1948 Foraminifera, their classification and Economic use, *Harv. Univ. Press*.
- Dakin, (1906) Formaminifera from the Gulf of Mannar off Ceylon coast. *Ceylon Pearl Oyster Fisheries Rep.* No. **36** : 226.
- DE Man, 1889. *Check-list of the marine species in Europe and a bibliography of guides to their identification Collection Patrimoines Naturels*, **50** : 161-174.
- D'Orbigny, 1826. Voyage dana Amerique meridionale, foraminifers. P. Bertrand. st, Foram cuba, P. 92, pl. 5, figs. 16-18.
- Ellison, R.L., 1984. Foraminifera and Meiofauna on an Intertidal Mud flat, Cornwall, England : Populations : Respiration and Secondary production : and Energy Budget, *Hydrobiologica*, **109** : 131-148.
- Ganapati & Satyavati, (1958). Report on the Foraminifera in Bottom sediments in the Bay of Bengal off the east coast of India. *Andhra Univ. Mem.*, vol. II, Pl. I.

- Gerlach, S.A. 1964. Revision der Choniolaimidae und Selachinematinae (Freilebende Meeres-Nematoden). *Mitt. Hamburg. Zool. Mus. Inst.*, **28** : 23-50.
- Gnanamuthu, C.P. (1943) Littoral Foraminifera from the Krusadai Island in the Gulf of Mannar. *Bull. Madras Govt. Mus.*, 2, No. Pt. 5.
- P. Higgins & Thiel, 1988. Introduction to the study of Meiofauna, *Smithsonian Institution press*, Washington, D.C. London.
- L.R. Kasturirangan, 1963. A key for the Identification of the more common planktonic copepoda of Indian coastal waters. *Coun. scien. Ind. Res.*, **2** : 1-87 pp.
- S. Krishnaswamy, 1957. Studies on the Copepoda of Madras. *Ph.D. thesis, university of Madras*.
- Nybakken, W. 1997. Meiofauna, Marine Biology : A Ecological approach Mass landing marine laboratories, Addison-Wesley educational publishers Inc. 4th Edition, 285-303.
- Santhanam and Srinivasan, 1993. A manual of Marine Zooplankton, *Fisheries college and Research Institute*, 1-16 pp.
- Scott, A. (1909). The Copepoda of the Siboga Expedition, Part-I. Free-swimming, littoral and semiparasitic, *Copepoda. Siboga Expeditie, Monograph*, Leiden, 29a, 1-323.
- Scott, D.B. and Vilks, G. 1991. Benthonic Foraminifera in the surface sediments of the deep-sea Arctic Ocean. *Journal of Foraminiferal Research*, **21** : 20-38.
- Wieser, W. 1953. Free-living marine nematodes I. Enoploidea. K. Fysiogr. Sallsk. Handl. N.F., *Lund.*, **64** : 1-155.
- Wieser, W. 1954. Free-living marine nematodes. III Axonolaimoidea and Monhysteroidea. Fysiogr. Sallsk. Handl. NF. *Lund.*, **67** : 1-115.
- Wieser, W. 1959., Free-living nematodes and other small invertebrates of Puget Sound beaches. *Wash. publ. Biol.*, **19** : 1-179.
- Timm, R.W. 1961. Marine nematodes of the Bay of Bengal. *Proc. Pak. Acad. Sci.*, **1** : 25-88.



Rec. zool. Surv. India : **109**(Part-4) : 35-51, 2009

ON A COLLECTION OF DRAGONFLIES (ODONATA : ANISOPTERA) FROM ANDAMAN AND NICOBAR ISLANDS

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INTRODUCTION

The study of Odonata fauna of Andaman and Nicobar Islands dates back to nineteenth century, with the description of a new species of damselfly *Libellago lineata blanda* by Selys (1853), from Great Nicobar Island. Afterwards many species have been recorded by Selys (1863, 1871, 1877). Fraser (1924) provided the first Odonata list of Andaman and Nicobar Islands and added 9 species to the fauna of this region, which were included in *Fauna of British India* (1933, 1934, 1936). Lahiri (1975) reported 31 species of Odonates from South Andaman with 15 Zygoptera and 16 Anisoptera but no species list was provided in that paper.

Chhotani *et al.* (1983) provided the consolidated list of 34 species from Andaman and Nicobar Islands with 19 species of Anisoptera which included two new species, viz. *Gomphidia ganeshi* and *Oligoaeschna andamani*. Their work was based on the collections from various surveys during 1928 to 1969 made by Col. R.B.S. Sewell, B.S. Lamba, A. Daniel & H.K. Bhowmik and T.D. Soota, covering different areas of Andaman and Nicobar Islands. Later Lahiri and Mitra (1993) added 8 species to this Island fauna, which includes 6 species of Anisoptera. Mitra (1995) recorded 3 species of Zygoptera and 8 species of Anisoptera new to Great Nicobar Island, of which 4 species of Anisoptera were also new record to Andaman and Nicobar Islands. Lahiri (1998) reported eleven Odonate species as new record from Little Andaman Island of which 7 species are Anisoptera. Previously all these species were reported from South Andaman only.

Hämäläinen *et al.* (1999) recorded 9 species newly from Andaman and Nicobar Islands which includes 7 species of Anisoptera. Among these, *Neurothemis ramburii ramburii* (Brauer) and *Zyxomma obtusum* Albarda were recorded as new to India.

Ram *et al.* (2000) studied Odonate fauna of Andaman and Nicobar Islands based on the surveys conducted by the scientists of Andaman and Nicobar Regional Station, ZSI, Port Blair. They reported 7 species of Anisoptera as new to fauna of Andaman and Nicobar Islands. Ram *et al.* (2000) reported *Cratilla metallica* (Brauer) as first record from India, but it was previously recorded by Fraser (1936) from Hasimara, Duars, Bengal, which is distinctly within Indian Territory. Yeh and

Veenakumari (2000) described new species, *Gynacantha andamanae* from South Andaman Island. Mitra (2002a) discussed on the zoogeography of Odonates of Nicobar Islands and provided the list of known Odonates from that Nicobar Island group.

The present study is based on the collection of Odonata specimens made by the scientists of Zoological Survey of India from Andaman and Nicobar Islands during 1970-1988 and 2000 present in the National Zoological Collections, ZSI, Kolkata. The nomenclature followed here is after Fraser (1934 & 1936), Prasad & Varshney (1995) and Mitra (2002b). From this study, *Neurothemis intermedia atlanta* Ris and *Tramea basilaris burmeisteri* Kirby are reported for the first time from Andaman and Nicobar Islands. The consolidated list of 44 species/ subspecies of suborder Anisoptera along with their distribution within Andaman and Nicobar Islands is given in the Table-1.

SYSTEMATIC ACCOUNT

Suborder ANISOPTERA

Superfamily LIBELLULOIDEA

Family LIBELLULIDAE

Genus *Agrionoptera* Brauer

Agrionoptera insignis insignis (Rambur)

1842. *Libellula insignis* Rambur, *Hist. nat. Ins. Neuropteres* : 123.

1865. *Agrionoptera nicobarica* Brauer, *Verh. zool.-bot. Ges. Wien.*, **15** : 978.

1936. *Agrionoptera insignis insignis*, Fraser, *Fauna Brit. India, Odonata*, **3** : 274-276.

1995. *Agrionoptera insignis*, Prasad & Varshney, *Oriental insects*, **29** : 408.

Diagnostic character : Male : Frons creamy yellow at sides, brilliant metallic blue above and over greater part of anterior surface. Prothorax black, anterior lobe and borders of posterior lobe yellow. Thorax bronzed or metallic black, marked with greenish yellow. Legs black. Wings hyaline, with amber yellow streaks in the subcostal and cubital spaces not extending as far as the first antenodal nervure. Abdomen black marked with blood red. Anal appendages black.

Material examined : 1G, Champa Bay, Great Nicobar, 31.xii.1975, Coll. P.K. Maiti.

Distribution : India : Andaman and Nicobar Islands (Nicobar), Assam, West Bengal.

Elsewhere : Indonesia, Japan, Malaysia, Myanmar, Thailand.

Genus *Crocothemis* Brauer

Crocothemis servilia servilia (Drury)

1770. *Libellula servilia* Drury, III. *Exotic Ins.*, **1** : 112-113.

1868. *Crocothemis servilia*, Brauer, *Verh. zool.-bot. Ges. Wien.*, **18** : 737.

1936. *Crocothemis servilia servilia*, Fraser, *Fauna Brit. India, Odonata*, **3** : 345-347.

1983. *Crocothemis servilia servilia*, Chhotani *et al.*, *Rec. zool. Surv. India*, **80** : 488.

2000. *Crocothemis servilia servilia*, Ram *et al.*, *Rec. zool. Surv. India*, **98**(3) : 49.

Diagnostic character : Male : Most parts of head, often dorsum of thorax, abdomen and anal appendages blood-red. Middle lobe of prothorax ridged transversely, beset with stiff red hairs. Wings hyaline, bases of all marked with rich amber-yellow, apices of wings lined narrowly with pale brown. Pterostigma dark ochreous between blackish nervures. Female : Labium pale yellow; Labrum, frons, face and vesicle olivaceous yellow ; Prothorax and thorax olivaceous brown, legs ochreous. Wings similar to male but basal markings paler in tint and the neuration in this part bright yellow instead of bright orange.

Material examined : 1G, Southside of the road from Guest House to MES Camp, Hadoo, Port Blair, March-May, 1971, Coll. B.K. Tikader; 1G, Horticulture-cum-Zoological Garden, Hadoo, Port Blair, South Andaman, 19.iv.1971, Coll. B.K. Tikader; 1G, Delanipur, Port Blair, 22.v.1971, Coll. B.K. Tikader; 1G, Chatham, Port Blair, 31.x.1972, Coll. P.T. Cherian; 1G, Janglighat, Port Blair, 14.xii.1972, Coll. K.S. Pradhan; 1G, Panchwati, Middle Andaman, 06.i.1973, Coll. K.S. Pradhan; 1G, Monglutan, 4 kms, S.W. of Port Blair, 18.xii.1975, Coll. P.K. Maiti; 1G, Wright Myo, Kalatang, South Andaman, 30.i.2000, Coll. G.K. Srivastava.

Distribution : India : Andaman and Nicobar Islands (Middle Andaman, South Andaman and Little Andaman), Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Africa, America, Australia, Bangladesh, China, Iraq, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, Philippines, Singapore, Sri Lanka, Taiwan, Thailand and Turkey.

Remark : This species is recorded for the first time from Middle Andaman.

Genus *Diplacodes* Kirby

Diplacodes trivialis (Rambur)

1842. *Libellula trivialis* Rambur, *Ins. Neurop.*, : 115.
 1891. *Diplacodes trivialis*, Karsch, *Ent. Nachr.*, **17** : 246.
 1936. *Diplacodes trivialis*, Fraser, *Fauna Brit. India, Odonata*, **3** : 336-338.
 1983. *Diplacodes trivialis*, Chhotani *et al.*, *Rec. zool. Surv. India*, **80** : 488-489.
 1995. *Diplacodes trivialis*, Mitra, *Opusc. zool. Flumin.*, **129** : 4.
 2000. *Diplacodes trivialis*, Ram *et al.*, *Rec. zool. Surv. India*, **98**(3) : 49.

Diagnostic character : Male : Labium, labrum and bases of mandible creamy yellow; face, frons and vesicle palest azure blue. Prothorax pale brown to black, a mid dorsal stripe on dorsum. Thorax greenish yellow/olivaceous, sutures finely black; whole thorax pruinose in old adults. Wings hyaline, apices clear. Abdomen segments 1 to 3 greenish yellow, sutures finely black, prominent middorsal and subdorsal stripes, segments 4 to 7 with subdorsal yellow stripes, segments 8 to 10 black, marking obscured due to pruinescence in adults. Anal appendages bright yellow.

Female : Resembles subadult male in colour; abdominal markings broader and continued on to segments 8 to 10, the latter entirely yellow as well as anal appendages. Vulvar scale broad but short 'scoop' shaped.

Material examined : 1G1E, 1 km. south of Circuit House, Malacca village, Car Nicobar, 04.iii.1970, Coll. B.K. Tikader; 2E, Horticulture Garden, HQ, Car Nicobar, 08.iii.1970, Coll. B.K. Tikader; 2G1E, Horticulture Garden, HQ, Car Nicobar, 11.iii.1970, Coll. B.K. Tikader; 1G1E, Kamorta Island, Nicobar, 17.iii.1970, Coll. B.K. Tikader; 4G1E, Kamorta Island, Nicobar, 19.iii.1970, Coll. B.K. Tikader; 1G1E, Kamorta Island, Nicobar, 21.iii.1970, Coll. B.K. Tikader; 1G1E, Kamorta Island, Nicobar, 22.iii.1970, Coll. B.K. Tikader; 1E, Guest House, Kamorta Island, Nicobar, 23.iii.1970, Coll. B.K. Tikader; 1G, 2 km. northeast of Guest House, Kamorta Island, Nicobar, 24.iii.1970, Coll. B.K. Tikader; 1E, Horticulture Garden, Kamorta Island, Car Nicobar, 25.iii.1970, Coll. B.K. Tikader; 2G, In front of Marine Fisheries cold storage, Aberdeen, Port Blair, 28.iii.1970, Coll. B.K. Tikader; 1E, 1 km. northeast of Guest House, Kamorta Island, Nicobar, 30.iii.1970, Coll. B.K. Tikader; 1E, Camp No. 1, Havelock Island, 17.iv.1970, Coll. B.K. Tikader; 1G, Southside of the road from Guest House to MES Camp, Hadoo, Port Blair, 18.iv.1970, Coll. B.K. Tikader; 1d, Camp No. 1, Tugapur, Mayabunder, North Andamans, 11.v.1971, Coll. B.K. Tikader; 1G, Pahelgaon, Tugapur, Mayabunder, North Andamans, 12.v.1971, Coll. B.K. Tikader; 1G, 1d, Forest adjoining to Rest House, Tugapur, Mayabunder, North Andamans, 13.v.1971, Coll. B.K. Tikader; 1G, Near Chiria Tapu village, South Andaman, 29.v.1971, Coll. B.K. Tikader; 1G, Wimberlygunj, South Andaman, 01.xi.1972, Coll. P.T. Cherian; 2G, Kamorta : Chola, 04.xii.1972, Coll. P.T. Cherian; 3G2E, Kassor, near Govt. Hospital, 11.xii.1972, Coll. P.T. Cherian; 2G1E, Aberdeen Bay, Port Blair, 13.xii.1972, Coll. K.S. Pradhan; 1E, Marine Hill, Port Blair, South Andaman, 15.xii.1972, Coll. K.S. Pradhan; 1E, South Andaman, near Cadlegunj paddy field, 16.xii.1972, Coll. K.S. Pradhan; 2G, Humphreygunj, South Andaman, 17.xii.1972, Coll. K.S. Pradhan; 1G1E, Chiria Tapu, South Andaman, 20.xii.1972, Coll. K.S. Pradhan; 1G, Bedanabad, South Andaman, 21.xii.1972, Coll. K.S. Pradhan; 1G, Sawai, Car Nicobar, 24.xii.1972, Coll. K.S. Pradhan; 1E, Kemus, Car Nicobar, 27.xii.1972, Coll. K.S. Pradhan; 4G4E, Arong, Car Nicobar, 27.xii.1972, Coll. K.S. Pradhan; 1G2E, Arong, 27.xii.1972, Coll. K.S. Pradhan; 2G1E, Biglapathi, Car Nicobar, 28.xii.1972, Coll. K.S. Pradhan; 1E, Panighat, South Andaman, 03.i.1973, Coll. K.S. Pradhan; 2E, Yereta, 08.i.1973, Coll. K.S. Pradhan; 2E, Aniket, 16.i.1973, Coll. K.S. Pradhan; 1E, Ferrargunj, South Andaman, 17.i.1973, Coll. K.S. Pradhan; 1E, Manpur, South Andaman, 18.i.1973, Coll. K.S. Pradhan; 1G, Ramnagar, Magarnalla, 14.i.1975, Coll. S.K. Bhattacharya; 1G, Corbyns Cove, South Andaman, Port Blair, 01.iii.1975, Coll. G.K. Srivastava; 1G, Chiria Tapu, South Andaman, 19.iii.1975, Coll. G.K. Srivastava; 1G, Monglutan, 20 kms, S.W. of Port Blair, 18.xii.1975, Coll. P.K. Maiti; 1d, Chotta Inaka, Kamorta, 14.xi.1978, Coll. B. Nandi; 1G, Jungle Ghat, Port Blair, 18.xii.1978, Coll. B. Nandi; 1E, Chouldari, 12.i.1988, Coll. A.N.T. Joseph; 1E, Corbyns Cove Beach, South Andaman, Port Blair, 13.i.1988, Coll. A.N.T. Joseph; 2G1E, Chiria Tapu, Port Blair, South Andaman, 15.i.1988, Coll. A.N.T. Joseph; 3E1G, Netaji Nagar, Little

Andaman, 17.i.1988, Coll. A.N.T. Joseph; 3G, Ramkrishnapur, Little Andaman, 19.i.1988, Coll. A.N.T. Joseph; 1E, 4 km. from Hut Bay, Little Andaman, 21.i.1988, Coll. A.N.T. Joseph; 1E, 3 km. from Hut Bay, Little Andaman, 22.i.1988, Coll. A.N.T. Joseph; 2G, Hut Bay Govt. School, Little Andaman, 23.i.1988, Coll. A.N.T. Joseph; 1G, South Point, Little Andaman, 24.i.1988, Coll. A.N.T. Joseph; 1G, Netaji Nagar, Little Andaman, 25.i.1988, Coll. A.N.T. Joseph; 1E, Vivekananda Puram, Little Andaman, 29.i.1988, Coll. A.N.T. Joseph; 3E1G, New Wandoor, 31.i.1988, Coll. A.N.T. Joseph; 2E, Rut Land Bay, 03.ii.1988, Coll. A.N.T. Joseph; 1E, Jolly Buoy Is., South Andaman, 22.i.2000, Coll. G.K. Srivastava; 1E, Wright Myo, Kalatang, South Andaman, 30.i.2000, Coll. G.K. Srivastava; 1G, Chiria Tapu, South Andaman, 19.ii.2000, Coll. R.N. Tiwari.

Distribution : India : Andaman and Nicobar Islands (North Andaman, Middle Andaman, South Andaman, Little Andaman and Nicobar), Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Australia, Bangladesh, China, Indonesia, Iraq, Japan, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Taiwan and Thailand.

Remark : This species is recorded for the first time from Middle Andaman and Little Andaman.

Genus *Lathrecista* Kirby

Lathrecista asiatica asiatica (Fabricius)

1798. *Libellula asiatica* Fabricius, *Ent. Syst. Suppl.*, : 283.

1890. *Lathrecista asiatica*, Karsch, *Berlin Ent. Zeit.*, **33** : 369.

1909. *Lathrecista asiatica asiatica*, Ris, *Cat. Coll. Selys*, fasc. **9** : 129-132.

1936. *Lathrecista asiatica asiatica*, Fraser, *Fauna Brit. India, Odonata*, **3** : 281-284.

1983. *Lathrecista asiatica asiatica*, Chhotani *et al. Rec. zool. Surv. India*, **80** : 486.

2000. *Lathrecista asiatica asiatica*, Ram *et al., Rec. zool. Surv. India*, **98**(3) : 45.

Diagnostic character : Male : Prothorax blackish-brown, thorax dark coppery brown on dorsum, bright yellow laterally; Abdomen segments 1 and 2 with a broad lateral stripe and a fine middorsal, all sutures on these two segments finely black; segments 3-8 bright crimson red with sutures black; segments 9 and 10 black. Legs dark reddish brown to black. Wings hyaline with apices usually enfumed, sometimes dark reddish brown to proximal end of pterostigma. Female : Resembles the male closely but colour of abdomen is rich olivaceous-brown. Apices of wings tipped with brown to distal end of pterostigma only. Vulvar scale and ninth ventral plate projecting beyond end of abdomen and coated with golden hairs.

Material examined : 1d, 1 km. east of Rangat Jetty, Middle Andaman, 1970, Coll. B.K. Tikader; 1G, Durgapur, 2 km south of Aeruial Bay Jetty, Diglipur, North Andamans, 26.iv.1971, Coll. B.K. Tikader; 2G1E, Pahelgaon, 2 km south of Rest House, Tugapur, Mayabunder, North Andaman,

12.v.1971, Coll. B.K. Tikader; 1G, Forest adjoining to Rest House, Tugapur, Mayabunder, North Andaman, 13.v.1971, Coll. B.K. Tikader; 1G, Near Chiria Tapu village, South Andaman, 29.v.1971, Coll. B.K. Tikader; 1G, Government Agricultural Farm, Sipighat, Port Blair, 04.vi.1971, Coll. B.K. Tikader; 1G, Chiria Tapu, Munda Pahar, South Andaman, 27.x.1972, Coll. P.T. Cherian; 1G, Panighat, South Andaman, 03.i.1973, Coll. K.S. Pradhan; 1E, Ferrarganj, South Andaman, 17.i.1973, Coll. K.S. Pradhan; 1G 1E, Little Andaman, 3 km. away from Hut Bay, 22.i.1988, Coll. A.N.T. Joseph; 1G, Little Andaman, Hut Bay, 27.i.1988, Coll. A.N.T. Joseph.

Distribution : India : Andaman and Nicobar Islands (North Andaman, Middle Andaman, South Andaman, Little Andaman and Nicobar), Arunachal Pradesh, Assam, Bihar, Madhya Pradesh, Maharashtra, Manipur, Nagaland, Orissa, South India and West Bengal.

Elsewhere : China, Fiji, Indonesia, Japan, Malaysia, Myanmar, Philippines, Papua New Guinea, Samoa, Singapore, Sri Lanka, Taiwan and Thailand.

Remark : This species is recorded for the first time from Middle Andaman.

Genus *Neurothemis* Brauer

Neurothemis fulvia (Drury)

1773. *Libellula fulvia* Drury, III. Exot. Ins., 2 : 84-85.

1867. *Neurothemis fulvia*, Kirby, Trans. Zool. Soc. Lond., 12 : 271.

1936. *Neurothemis fulvia*, Fraser, Fauna Brit. India, Odonata, 3 : 353-354.

2000. *Neurothemis fulvia*, Ram et al., Rec. zool. Surv. India, 98(3) : 51.

Diagnostic character : Male : Prothorax, thorax and abdomen reddish-brown, sutures and borders of latter finely black. Legs and anal appendages dark ferruginous. Wings opaque, dark reddish brown from base to about middle of pterostigma, apex of wings also opaque brown enclosing a clear window in each wing at apex. Female : Many forms of females are found, varying from complete isochrome (having tips of fore wings completely clear and that of hind wings bordered with amber yellow but not opaque brown) to several types of heterochromes : having the ground colour of head, thorax and body generally much paler or ochreous. Wings clear amber-yellow, with a dark ray in subcostal and costal areas near the node and form a nodal spot.

Material examined : 3G, Trinkate Island, Nicobar, 20.iii.1970, Coll. B.K. Tikader; 3G, Kamorta Island, Nicobar, 22.iii.1970, Coll. B.K. Tikader; 1G, 2 km. northeast of Guest House, Kamorta Island, Nicobar, 24.iii.1970, Coll. B.K. Tikader; 1E, Magarnalla Agriculture Farm, 15.i.1975, Coll. S.K. Bhattacharya; 1G, Bada Inaka, Kamorta, 15.xi.1978, Coll. B. Nandi; 1G, Little Andaman, Hut Bay Govt. School, 23.i.1986, Coll. A.N.T. Joseph.

Distribution : India : Andaman and Nicobar Islands (South Andaman, Little Andaman and Nicobar), Arunachal Pradesh, Assam, Bihar, Jharkhand, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Tamil Nadu, Tripura, Uttarakhand and West Bengal.

Elsewhere : Australia, Bangladesh, China, Hong Kong, Indonesia, Iraq, Japan, Malaysia, Myanmar, Nepal, Philippines, Seychelles, Sri Lanka, Taiwan and Thailand.

Remark : This species is recorded for the first time from Little Andaman.

***Neurothemis intermedia atlanta* Ris**

1916. *Neurothemis intermedia atlanta* Ris, *Cat. Coll. Selys*, fasc. **16** : 1168.

1924. *Neurothemis intermedia atlanta*, Fraser, *Ind. Mus.*, **26** : 438

1936. *Neurothemis intermedia atlanta*, Fraser, *Fauna Brit. India, Odonata*, **3** : 358-359.

Diagnostic character : Male : Labrum, frons and whole of face brightly tinted with crimson; dorsum of thorax uniform olivaceous to dark reddish-brown without humeral stripe. Abdomen with broad ventro lateral stripe, continuous along whole length of abdomen, segment 8 and 9 with middorsal carina blackish and 9 entirely black except ventral border. Wings hyaline with intense golden amber basal marking to as far distal as outer border of discoidal cell, costal border of wing not tinted with yellow. Anal appendages reddish.

Material examined : 1G, Manas Ghat, South Andaman, 26.iii.1964, Coll. B.S. Lamba.

Distribution : India : Assam, Kerala, Meghalaya, Orissa, Sikkim, Tamil Nadu and Tripura.

Elsewhere : Kampuchea, Myanmar, Nepal and Thailand.

Remark : This species is recorded for the first time from Andaman & Nicobar Islands in the present study.

***Neurothemis intermedia intermedia* (Rambur)**

1842. *Libellula intermedia* Rambur, *Ins. Neurop.*, p. 91.

1889. *Neurothemis intermedia*, Selys, *Ann. Mus. Civ. Genova*, **27** : 454.

1911. *Neurothemis intermedia intermedia*, Ris, *Cat. Coll. Selys*, fasc. **13** : 551, 563-564.

1936. *Neurothemis intermedia intermedia*, Fraser, *Fauna Brit. India, Odonata*, **3** : 357-358.

1983. *Neurothemis intermedia intermedia*, Chhotani *et al.*, *Rec. zool. Surv. India*, **80** : 493.

2000. *Neurothemis intermedia intermedia*, Ram *et al.*, *Rec. zool. Surv. India*, **98**(3) : 51.

Diagnostic character : Female : Prothorax reddish brown, thorax pale greenish yellow, dorsum tinged with ferruginous and with a distinct humeral reddish-brown stripe. Wings uniformly tinted with pale yellow, this diffusely deepened along costal area. Abdomen bright reddish-brown/ochreous with sharply defined ventro-lateral brownish stripe interrupted at apical end of segments 3 to 8, some small dark points at base of segment 10. Anal appendages reddish.

Material examined : 3E, Kamorta Island, Nicobar, 22.iii.1970, Coll. B.K. Tikader; 1E, 2 km northeast of Guest House, Kamorta Island, Nicobar, 24.iii.1970, Coll. B.K. Tikader; 2E, Rut Island, 04.ii.1970, Coll. A.N.T. Joseph.

Distribution : India : Andaman and Nicobar Islands (North Andaman and Nicobar), Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh,

Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Bangladesh, China, Myanmar, Malaysia, Nepal, Sri Lanka and Thailand.

Genus ***Orthetrum*** Newman

Orthetrum chrysis (Selys)

1891. *Libella testacea* race *chrysis* Selys, *Ann. Mus. Civ. Genova*, **30** : 462.

1900. *Orthetrum chrysis*, Ris, *Archiv. fur Natur. Bd.*, : 186.

1936. *Orthetrum chrysis*, Fraser, *Fauna Brit. India, Odonata*, **3** : 310-311.

1983. *Orthetrum chrysis*, Chhotani *et al.*, *Rec. zool. Surv. India*, **80** : 487.

2000. *Orthetrum chrysis*, Ram *et al.*, *Rec. zool. Surv. India*, **98**(3) : 47.

Diagnostic character : Male : Labium, labrum and face yellowish or pale brown; Frons bright scarlet; Thorax dark ferruginous and abdomen bright blood-red. Wings with the basal marking only extending to the first antenodal nervure and not beyond the border of the membrane; pterostigma dark reddish brown.

Material examined : 1G, Pahelgaon, 2 km south of Rest House, Tugapur, Mayabunder, North Andaman, 12.v.1971, Coll. B.K. Tikader.

Distribution : India : Andaman and Nicobar Islands (North Andaman and South Andaman), Assam, Himachal Pradesh, Maharashtra, Orissa, Western Ghats and West Bengal.

Elsewhere : Australia, China, Hong Kong, Indonesia, Japan, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan and Thailand.

Orthetrum pruinsum neglectum (Rambur)

1842. *Libellula neglecta* Rambur, *Ins. Neurop.*, : 86.

1886. *Orthetrum pruinsum*, Kirby, *Proc. Zool. Soc. Lond.*, : 327.

1909. *Orthetrum pruinsum neglectum*, Ris, *Cat. Coll. Selys*, fasc. **9** : 181, 239-240.

1936. *Orthetrum pruinsum neglectum*, Fraser, *Fauna Brit. India, Odonata*, **3** : 311-313.

2000. *Orthetrum pruinsum neglectum*, Ram *et al.*, *Rec. zool. Surv. India*, **98**(3) : 47.

Diagnostic character : Male : Labium, labrum and face ochreous to pale reddish brown; frons dark brown to blue-black anteriorly. Prothorax and thorax reddish brown to dull purple according to the amount of pruinescence present. Wings hyaline, enfumed pale brown towards apices with a reddish brown basal marking extending distalwards in hind wing; pterostigma reddish brown to black, covering 2 cells. 2 rows of cells between IR_{iii} and R_{spl} . Abdomen vermilion red to purplish-red due to pruinescence. Anal appendages red.

Material examined : 1G, Pahelgaon, Tugapur, Mayabunder, North Andaman, 12.v.1971, Coll. B.K. Tikader; 2d, Chiria Tapu near Guest House, 22.x.1972, Coll. P.T. Cherian; 2d, Chiria Tapu village, 23.x.1972, Coll. P.T. Cherian; 1G, Humphreygunj, South Andaman, 17.xii.1972, Coll. K.S. Pradhan; 1G, Manpur, South Andaman, 18.i.1973, Coll. K.S. Pradhan; 1G, Herbertabad, South Andaman, 18.i.1973, Coll. K.S. Pradhan.

Distribution : India : Andaman and Nicobar Islands (North Andaman, South Andaman and Nicobar) Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Jammu-Kashmir, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, South India, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Afghanistan, Bangladesh, China, Hong Kong, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Philippines, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam.

Remark : This species is recorded for the first time from Andaman Islands (North and South Andaman) in this study. Previously it was recorded from Nicobar Islands only.

***Orthetrum sabina sabina* (Drury)**

1770. *Libellula sabina* Drury, III, *Exot. Ins.*, **1** : 114-115.

1889. *Orthetrum sabina*, Kirby, *Trans. Zool. Soc. Lond.*, **12** : 302.

1936. *Orthetrum sabina*, Fraser, *Fauna Brit. India, Odonata*, **3** : 300-302.

1983. *Orthetrum sabina sabina*, Chhotani *et al.*, *Rec. zool. Surv. India*, **80** : 488.

1991. *Orthetrum sabina sabina*, Tsuda, *A distributional list of world Odonata* : 172.

1995. *Orthetrum sabina sabina*, Mitra, *Opusc. zool. Flumin.*, **129** : 4.

2000. *Orthetrum sabina sabina*, Ram *et al.*, *Rec. zool. Surv. India*, **98**(3) : 47.

Diagnostic character : Male : Labium yellow, middle lobe brownish to black; labrum, face and frons yellowish. Frons very deeply notched forming two triangular facets in front. Prothorax bright yellow marked with black, its anterior and middle lobe blackish brown posteriorly. Thorax greenish yellow, sutures of thorax finely black. Abdomen greenish yellow marked with black; segment 1 to 3 enormously swollen dorso ventrally and laterally, segments 4 to 6 very narrow, cylindrical; segments 7 to 9 all dilated but compressed laterally; segment 10 very small. Anal appendages creamy white with a row of very small black spines below superiors. Female : Exactly similar to the male both in colour and shape of abdomen. Anal appendages pale yellow, shortly conical.

Material examined : 1G, In front of marine fisheries cold storage, Aberdeen, P.B., 28.ii.1970, Coll. B.K. Tikader; 3E, Kamorta Island, Nicobar, 18.iii.1970, Coll. B.K. Tikader; 1G, Kamorta Island, Nicobar, 22.iii.1970, Coll. B.K. Tikader; 1G, 1 km. NE of Guest House, Kamorta Island, Nicobar, 30.iii.1970, Coll. B.K. Tikader; 1E, locality not known, 1970, Coll. B.K. Tikader; 1G, South side of the road from Guest House to MES camp, Haddoo, Port Blair, 18.iv.1971, Coll. B.K. Tikader; 1G, Tugapur, Mayabunder, N. Andaman, 11.v.1971, Coll. B.K. Tikader; 1G, Pahengaon, Tugapur, Mayabunder, N. Andaman, 12.v.1971, Coll. B.K. Tikader; 1G 1E, Near Chiria Tapu village, South Andaman, 29.v.1971, Coll. B.K. Tikader; 1E, Government Agricultural Farm, Sipighat, Port Blair, 04.vi.1971, Coll. B.K. Tikader; 1G, Rangat, M. Andaman, 30.i.1972, Coll. Saha; 2G1E, 12.xii.1972, Coll. K.S. Pradhan; 1G 2E, Aberdeen Bay, 13.xii.1972, Coll. K.S. Pradhan; 1G, Janglighat, Port Blair, 14.xii.1972, Coll. K.S. Pradhan; 2G 3E, Marine Hill, Port Blair, 15.xii.1972, Coll. K.S. Pradhan; 2G, Cadlegunj, 16.xii.1972, Coll. K.S. Pradhan; 2G, Humphreygunj, South Andaman, 17.xii.1972, Coll. K.S. Pradhan; 1G 1E, Manglutan, W. of

Humphreygunj, 17.xii.1972, Coll. K.S. Pradhan; 2G, Chiria Tapu, South Andaman, 20.xii.1972, Coll. K.S. Pradhan; 1E, Bedanabad, South Andaman, 21.xii.1972, Coll. K.S. Pradhan; 1G 1E, Sawai, Car Nicobar, 24.xii.1972, Coll. K.S. Pradhan; 1E, R.G. Temple, Port Blair, 01.i.1973, Coll. K.S. Pradhan; 3G, S. Point, Port Blair, South Andaman, 02.i.1973, Coll. K.S. Pradhan; 1G, Shantipur, Middle Andaman, 05.i.1973, Coll. K.S. Pradhan; 5G, Panchwati, M. Andaman, 06.i.1973, Coll. K.S. Pradhan; 2G, Yereta, 08.i.1973, Coll. K.S. Pradhan; 5G, Mayabunder, N. Andaman, 10.i.1973, Coll. K.S. Pradhan; 3G, Aniket, South Andaman, 16.i.1973, Coll. K.S. Pradhan; 1G, Ferrarganj, South Andaman, 17.i.1973, Coll. K.S. Pradhan; 2G, Manpur, S. Andaman, 18.i.1973, Coll. K.S. Pradhan; 1E, Gopalpur, Chouldari, South Andaman, 01.i.1975, Coll. S.K. Bhattacharya; 1G, Podarek Plantation, Forest Check post, Magarnalla, 12.i.1975, Coll. S.K. Bhattacharya; 1G 2E, South Point, Port Blair, 17.xii.1975, P.K. Maiti; 1E, Rajendra Nagar, Gt. Nicobar, 30.xii.1975, Coll. P.K. Maiti; 1E, Wrightmyo, Kalatang Forest, Base of Mt. Harriet, South Andaman, 28.ii.1975, Coll. G.K. Srivastava; 1E, Corbyns Cove, Port Blair, South Andaman, 01.iii.1975, Coll. G.K. Srivastava; 1G 1E, Bamboo Flat, South Andaman, 02.iii.1975, Coll. G.K. Srivastava; 1G, Humphreygunj within 2 km. radius, 13.iii.1975, Coll. G.K. Srivastava; 1G, Monglutan, 4 kms, S.W. of Humphreygunj, South Andaman, 14.iii.1975, Coll. G.K. Srivastava; 1G, Forest Rest House compound, Chiria Tapu, South Andaman, 07.i.1976, Coll. P.K. Maiti; 2G, Jungli Ghat, Port Blair, 18.xii.1978, Coll. B. Nandi; 1G, Near Airport, Port Blair, 20.xii.1978, Coll. B. Nandi; 1G 1E, Port Blair, 12.i.1988, Coll. A.N.T. Joseph; 1G 1E, Corbyns Cove Beach, Port Blair, 13.i.1988, Coll. A.N.T. Joseph; 1G 1E, Chiria Tapu, Port Blair, South Andaman, 15.i.1988, Coll. A.N.T. Joseph; 1G, Vivekananda Puram, Little Andaman, 18.i.1988, Coll. A.N.T. Joseph; 1d, 4 km. from Hut Bay, Little Andaman, 21.i.1988, Coll. A.N.T. Joseph; 2G, Ross Is., South Andaman, 24.i.2000, Coll. G.K. Srivastava; 1E, Sippighat, South Andaman, 27.i.2000, Coll. G.K. Srivastava; 1G, Chiria Tapu, South Andaman, 02.ii.2000, Coll. G.K. Srivastava.

Distribution : India : Andaman & Nicobar Islands (North Andaman, Middle Andaman, South Andaman, Little Andaman and Nicobar), Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Asia Minor, Australia, Bangladesh, China, Cyprus, Indonesia, Iran, Myanmar, Nepal, Philippines, Singapore, Somaliland, Sri Lanka, Syria and Thailand.

Remarks : This species is recorded for the first time from Middle Andaman and Little Andaman.

Genus *Pantala* Hagen

Pantala flavescens (Fabricius)

1798. *Libellula flavescens* Fabricius, *Ent. Syst. Suppl.*, : 285.

1861. *Pantala flavescens*, Hagen, *Syn. Neur. N. Amer.*, : 142.

1936. *Pantala flavescens*, Fraser, *Fauna Brit. India, Odonata*, **3** : 414-416.

2000. *Pantala flavescens*, Ram et al., *Rec. zool. Surv. India*, **98**(3) : 54.

Diagnostic character : Male : Large species; Eyes reddish brown above. Prothorax rich ochreous with transverse belt of dark reddish brown between anterior and middle lobes. Thorax olivaceous or ferruginous coated thickly with yellowish downy hair. Wings hyaline, with base of hind-wing pale golden yellow up to anal loop and with a narrow apical brown spot limited to posterior border of wing; pterostigma bright ochreous; membrane white. Abdomen bright ochreous, dorsum tinted with bright brick red, sides of segments 1 to 4 pale yellow. Anal appendages ochreous. Female : Very similar to male except eyes olivaceous brown, wings evenly and deeply enfumed and always without apical brown spot, abdomen not constricted at segment 3, stouter and more robust.

Material examined : 1G, Chiria Tapu, South Andaman, 17.i.1972, Coll. M.S.D; 2E, Chiria Tapu near Guest House, 22.x.1972, Coll. P.T. Cherian; 1E, Chiria Tapu near Guest House, 23.x.1972, Coll. P.T. Cherian; 3E 1G, 11.xii.1972, Coll. K.S. Pradhan; 1G, Car Nicobar, Agricultural garden, Malaca, 26.xii.1972, Coll. K.S. Pradhan; 1G, South Point, Port Blair, 02.i.1973, Coll. K.S. Pradhan; 1G, Bakul Tala, Middle Andaman, 07.i.1973, Coll. K.S. Pradhan; 1G, Aniket, South Andaman, 16.i.1973, Coll. K.S. Pradhan; 1E, Horticulture-cum-Zoological Garden, South Andaman, 27.xii.1974, Coll. S.K. Bhattacharya; 1G, Magarnalla, Campbell Bay, 07.i.1975, Coll. S.K. Bhattacharya; 1E1G, Rajendra Nagar, Gt. Nicobar, 30.xii.1975, Coll. P.K. Maiti; 1E, Marine Hill, Port Blair, 6.xi.1978, Coll. B. Nandi; 1E, Chotto Inaka, Kamorta, 14.xi.1978, Coll. B. Nandi; 1G, Diltawan Tank, Port Blair, 20.xi.1978, Coll. B. Nandi.

Distribution : India : Andaman and Nicobar Islands (North Andaman, Middle Andaman, South Andaman, Little Andamans and Nicobar), Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Goa, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : America, Africa, Argentina, Bangladesh, China, Cuba, Ethiopia, Florida, Malaysia, Myanmar, Nepal, Singapore, Somaliland, Sri Lanka, Uruguay, Venezuela, Yunnan.

Genus *Potamarcha* Karsch

Potamarcha congener (Rambur)

1842. *Libellula obscura* Rambur, *Ins. Neurop.*, : 64.
 1842. *Libellula congener*, Rambur, *Ins. Neurop.*, : 70.
 1890. *Potamarcha obscura*, Karsch, *Berlin Ent. Zeit.*, **33** : 371.
 1891. *Potamarcha congener*, Selys, *An. Soc. Espan.*, **20** : 221.
 1936. *Potamarcha obscura*, Fraser, *Fauna Brit. India, Odonata*, **3** : 289-291.
 1983. *Potamarcha congener*, Chhotani et al., *Rec. zool. Surv. India*, **80** : 487.
 1995. *Potamarcha congener*, Prasad and Varshney, *Oriental Insects*, **29** : 410.
 2000. *Potamarcha congener*, Ram et al., *Rec. zool. Surv. India*, **98**(3) : 48.

Diagnostic character : Male : Face and frons olivaceous yellow. Prothorax dark brown, thorax black and pruinose in adult. Wings hyaline, tipped with brown at extreme apices. Two rows of

cells between IR_{iii} and R_{spl} ; arc lying between second and third antenodal nervures; only 1 cubital nervure. Pterostigma dark reddish brown, covering 2 to 4 cells. Anal appendages black.

Material examined : 3G, 2 km of Wrightmyo, South Andaman, 27.ii.1970, Coll. B.K. Tikader; 1G, Camp no. 1, Tugapur, Mayabunder, North Andamans, 11.v.1971, Coll. B.K. Tikader.

Distribution : India : Andaman and Nicobar Islands (North Andaman, Middle Andaman, South Andaman and Little Andaman), Andhra Pradesh, Arunachal Pradesh, Assam, Goa, Himachal Pradesh, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Sikkim, South India, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Australia, Bangladesh, China, Hong Kong, Indonesia, Kampuchea, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Taiwan, Thailand and Vietnam.

Remark : This species is recorded for the first time from North Andaman.

Genus *Tholymis* Hagen

Tholymis tillarga (Fabricius)

1798. *Libellula tillarga* Fabricius, *Ent. Syst. Suppl.*, : 285.

1867. *Tholymis tillarga*, Hagen, *Stett. Ent. Zeit.*, **28** : 220.

1936. *Tholymis tillarga*, Fraser, *Fauna Brit. India, Odonata*, **3** : 411-413.

1983. *Tholymis tillarga*, Chhotani *et al.*, *Rec. zool. Surv. India*, **80** : 489.

2000. *Tholymis tillarga*, Ram *et al.*, *Rec. zool. Surv. India*, **98**(3) : 55.

Diagnostic character : Female : Abdomen olivaceous brown, broad at base then tapering gradually to the end. Wings hyaline, hind wing with very pale golden brown fascia. Borders of anal loop running on the posterior border of hind wing apex of loop open.

Material examined : 1E, Ramkrishnapur, Hut Bay, Little Andaman, 21.xi.1978, Coll. B. Nandi; 1d, Little Andaman, 3 km away from Hut Bay, 22.i.1988, Coll. A.N.T. Joseph.

Distribution : India : Andaman and Nicobar Islands (North Andaman, Middle Andaman, South Andaman, Little Andaman and Nicobar), Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Himachal Pradesh, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, South India, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : America, Australia, Bangladesh, Cameroon, China, Ethiopia, Indonesia, Japan, Kampuchea, Laos, Madagascar, Malaysia, Malawi, Micronesia, Mozambique, Myanmar, Nepal, Philippines, Somali, Sri Lanka, Taiwan, Tanzania, Thailand and Vietnam.

Remark : This species is recorded for the first time from Little Andaman.

Genus *Tramea* Hagen

Tramea basilaris burmeisteri Kirby

1839. *Libellula chinensis* Burmeister, *Handb. Ent.*, **2** : 852.

1889. *Tramea burmeisteri*, Kirby, *Trans. Zool. Soc. Lond.*, **12** : 316.

1936. *Tramea basilaris burmeisteri*, Fraser, *Fauna Brit. India, Odonata*, **3** : 432-434.

Diagnostic character : Female : Face and frons bright chrome yellow; labrum reddish brown, less broadly black. Prothorax yellowish; thorax olivaceous, bluish-green laterally with black markings, humeral suture finely black, lateral stripes expanded in their upper parts to form elongate spots. Abdomen olivaceous green with black markings-apical annules or rings on segments 4-7; segment 8 black with triangular yellow basal spot on each side; 9 and 10 black with medial lateral spot. Anal appendages as long as last three segments of abdomen. Wings tinted with yellow, deepening in tint to nearly as far as level of pterostigma; two large black spots within golden yellow areola at baso-anal area of hind wing, two portions of the black area are separated.

Material examined : 1E, Marine Hills, Port Blair, South Andaman 15.xii.1972, Coll. K.S. Pradhan.

Distribution : India : Andaman and Nicobar Islands (South Andaman), Andhra Pradesh, Bihar, Himachal Pradesh, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Rajasthan, South India, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : Japan, Malaysia, Myanmar, Nepal, Thailand, Tibet and Vietnam.

Remark : This species is recorded for the first time from Andaman & Nicobar Islands in the present study.

Genus *Trithemis* Brauer

***Trithemis aurora* (Burmeister)**

1839. *Libellula aurora* Burmeister, *Handb. Ent.*, **2** : 859.

1868. *Trithemis aurora*, Brauer, *Verh. zool.-bot. Ges. Wein.*, **18** : 177, 735.

1936. *Trithemis aurora*, Fraser, *Fauna Brit. India, Odonata*, **3** : 383-385.

1983. *Trithemis aurora*, Chhotani *et al.*, *Rec. zool. Surv. India*, **80**: 491.

2000. *Trithemis aurora*, Ram *et al.*, *Rec. zool. Surv. India*, **98**(3) : 52.

Diagnostic character : Male : Face and front of frons ochreous, changing to reddish above, vesicle and dorsum of frons metallic violaceous. Prothorax reddish-brown, thorax dull purple due to pruinescence. Abdomen swollen dorsoventrally at base, then slightly constricted at segment 3 and again dilated fusiformly, depressed and broad. Wings hyaline with crimson reticulation, broad amber yellow fascia at base of wing, dark brown rays in sub-costal and cubital space. Anal appendages red. Female : Thorax pale olivaceous on sides, darker on dorsum. Abdomen subcylindrical, sides parallel, ochreous with black markings. Wings hyaline with bright yellow to brown reticulation, basal marking pale and without ray in sub-costal and cubital space. Anal appendages black.

Material examined : 2E, Kamorta Island, Nicobar, 22.iii.1970, Coll. B.K. Tikader; 1E, 2 km. northeast of Guest House, Kamorta Island, Nicobar, 24.iii.1970, Coll. B.K. Tikader; 1G, Near Chiria Tapu village, South Andaman, 29.v.1971, Coll. B.K. Tikader; 1E, Tugapur, North Andamans, 10.i.1973, Coll. K.S. Pradhan; 1G, Little Andaman, 4 km. from Hut Bay, 21.i.1988, Coll. A.N.T. Joseph ; 1G, Wright Myo, Kalatang, South Andaman, 30.i.2000, Coll. G.K. Srivastava.

Distribution : India : Andaman and Nicobar Islands (North Andaman, Middle Andaman, South Andaman, Little Andaman and Nicobar), Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : China, Indonesia, Japan, Kampuchea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam.

Remark : This species is recorded for the first time from Nicobar Islands in this present study, previously its distribution was from Andaman Islands only.

SUMMARY

The paper deals with some collection of 15 species of Anisoptera from Andaman and Nicobar Islands. In this present study, *Neurothemis intermedia atlanta* Ris and *Tramea basilaris burmeisteri* Kirby have been recorded for the first time from Andaman & Nicobar Islands (South Andaman). Also *Orthetrum pruinatum neglectum* (Rambur) is recorded newly from Andaman Islands (North and South Andaman) and *Trithemis aurora* (Burmeister) is recorded newly from Nicobar Islands. Distributions of *Potamarcha congener* (Rambur) from North Andaman, four species [*Crocothemis servilia servilia* (Drury), *Diplacodes trivialis* (Rambur), *Lathrecista asiatica asiatica* (Fabricius) and *Orthetrum sabina sabina* (Drury)] from Middle Andaman and four species [*Diplacodes trivialis* (Rambur), *Orthetrum sabina sabina* (Drury), *Neurothemis fulvia* (Drury) and *Tholymis tillarga* (Fabricius)] from Little Andaman are newly recorded. A consolidated list of 44 species of Anisoptera, so far recorded from these Islands is provided along with distribution within Andaman & Nicobar Islands.

ACKNOWLEDGEMENTS

The authors express sincere gratitude to Dr. Ramakrishna, Director, Zoological Survey of India for providing all necessary facilities to carry out the work. Authors also grateful to Dr. T. K. Pal, Scientist-F, Dr. A. Bal, Scientist-E, Entomology Div. ZSI and senior scientists and colleagues for their encouragement and kind cooperation.

REFERENCES

- Chhotani, G., Lahiri, A.R. and Mitra, T.R. 1983. Contribution to the Odonate (Insecta) fauna of Andaman and Nicobar Islands with description of two new species. *Rec. zool. Surv. India*, **80** : 467-494.
- Fraser, F.C. 1924. Report on a collection of dragonflies from the Andaman Islands. *Rec. Indian Mus.*, **26** : 409-414.
- Fraser, F.C. 1933. *Fauna of British India including Ceylon and Burma. Odonata*. Vol. I, Taylor & Francis. London.
- Fraser, F.C. 1934. *Fauna of British India including Ceylon and Burma. Odonata*. Vol. II. Taylor & Francis. London.

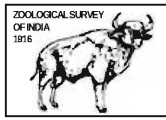
- Fraser, F.C. 1936. *Fauna of British India including Ceylon and Burma. Odonata*. Vol. III. Taylor & Francis. London.
- Hämäläinen, M., Prasanth-Mohanraj and Veena Kumari, K. 1999. Additions to the Odonate fauna of the Andaman and Nicobar Islands, Indian Ocean. *Notul. Odonatol.*, **5** : 27-29.
- Lahiri, A.R. 1975. Report on the faunistic survey (Odonata) of the South Andaman Islands. *Rec. zool. Surv. India*, **68** : 365-366.
- Lahiri, A.R. 1998. New records of Odonata (Insecta) from Little Andaman Island. *Fraseria* (N.S.), **5** : 57-59.
- Lahiri, A.R. and Mitra, B. 1993. New records of dragonflies (Insecta:Odonata) from Bay Islands. *J. Andaman Sci. Assoc.*, **9**(1&2) : 96-99.
- Mitra, T.R. 1995. Additions to the Odonate fauna of Great Nicobar Islands, Indian Ocean. *Opusc. zool. flumin.*, **129** : 1-6.
- Mitra, T.R. 2002a. Note on zoogeography of Odonata (Insecta) of Nicobar Islands, Indian Ocean. *Rec. zool. Surv. India*, **100**(3-4) : 183-188.
- Mitra, T.R. 2002b. Geographical distribution of Odonata (Insecta) of Eastern India. *Memoirs zool. Surv. India*, **19** (1) : 1-208.
- Prasad, M. and Varshney, R.K. 1995. A check-list of the Odonata of India, including data on larval studies. *Oriental Insects*, **29** : 385-428.
- Ram, R., Chandra, K. and Yadav, K. 2000. Studies on the Odonate fauna of Andaman and Nicobar Islands. *Rec. zool. Surv. India*, **98**(3) : 25-60.
- Selys Longchamps, E. de. 1853. Synopsis des calopterygines. *Bull. Acad. r. Belg.* (I) **20** (Annexe) : 1-73.
- Selys Longchamps, E. de. 1863. Synopsis des agrionines. Quatrième légion: Platycnemis. *Bull. Acad. r. Belg.* (II) **16** : 147-176.
- Selys Longchamps, E. de. 1871. Synopsis des cordulines. *Bull. Acad. Belgique, Sci.* (II) **31** : 519-565.
- Selys Longchamps, E. de. 1877. Synopsis des agrionines, 5me légion: Agrion (suite et fin) : les trois grands genres Telebasis, Agriocnemis et Hemiphebia. *Bull. Acad. r. Belg.* (II) **43** : 97-195.
- Yeh, W.C. and Veenakumari, K. 2000. Description of *Gynacantha andamanae* Spec. Nov. from South Andaman Island, Indian Ocean (Anisoptera : Aeshnidae). *Int. J. Odonatology*, **3**(2) : 163-167.

Table-1. Consolidated list of species of Anisoptera with distribution within Andaman and Nicobar Islands

SPECIES	DISTRIBUTION (Within A & N Islands)				
	NA	MA	SA	LA	N
Superfamily AESHNOIDEA					
Family GOMPHIDAE					
<i>Gomphidia ganeshi</i> Chhotani, Lahiri & Mitra	-	-	+	-	-
<i>Gomphidia t-nigrum</i> Selys	+	-	-	+	-
Family AESHNIDAE					
<i>Anaciaeschna jaspidea</i> (Burmeister)	-	-	-	-	+
<i>Anax guttatus</i> (Burmeister)	-	-	+	-	-
<i>Gynacantha andamanae</i> Yeh & Veenakumari	-	-	+	-	-
<i>Gynacantha bayadera</i> Selys	-	-	+	-	+
<i>Gynacantha dravida</i> Lieftinck	-	-	-	+	+
<i>Gynacantha subinterrupta</i> Rambur	-	-	-	-	+
<i>Oligoaeschna andamani</i> Chhotani, Lahiri & Mitra	-	-	+	-	-
Superfamily LIBELLULOIDEA					
Family CORDULIIDAE					
<i>Epoptalmia vittata vittata</i> Burmeister	-	-	+	-	-
Family LIBELLULIDAE					
<i>Agrionoptera insignis insignis</i> (Rambur)	-	-	-	-	+
<i>Acisoma panorpoides panorpoides</i> Rambur	-	-	-	-	+
<i>Brachydiplax chalybea chalybea</i> Brauer	+	-	+	-	+
<i>Brachythemis contaminata</i> (Fabricius)	+	-	-	-	+
<i>Camacinia gigantea</i> (Brauer)	-	-	-	-	+
<i>Cratilla lineata</i> (Brauer)	-	+	+	-	-
<i>Cratilla metallica</i> (Brauer)	+	-	-	-	-
<i>Crocothemis servilia servilia</i> (Drury)	-	+	+	+	-

SPECIES	DISTRIBUTION (Within A & N Islands)				
	NA	MA	SA	LA	N
<i>Diplacodes trivialis</i> (Rambur)	+	+	+	+	+
<i>Indothemis carnatica</i> (Fabricius)	+	-	-	-	-
<i>Lathrecista asiatica asiatica</i> (Fabricius)	+	+	+	+	+
<i>Lyriothemis cleis</i> Brauer	+	-	-	-	-
<i>Nesoxenia lineata</i> (Selys)	+	-	+	-	+
<i>Neurothemis fluctuans</i> (Fabricius)	+	-	+	+	+
<i>Neurothemis fulvia</i> (Drury)	-	-	+	+	+
<i>Neurothemis intermedia atlanta</i> Ris	-	-	+	-	-
<i>Neurothemis intermedia intermedia</i> (Rambur)	+	-	-	-	+
<i>Neurothemis ramburii ramburii</i> (Brauer)	-	-	+	-	-
<i>Orthetrum chrysis</i> (Selys)	+	-	+	-	-
<i>Orthetrum pruinsum neglectum</i> (Rambur)	+	-	+	-	+
<i>Orthetrum sabina sabina</i> (Drury)	+	+	+	+	+
<i>Pantala flavescens</i> (Fabricius)	+	+	+	+	+
<i>Potamarcha congener</i> (Rambur)	+	+	+	+	-
<i>Rhyothemis phyllis phyllis</i> (Sulzer)	-	-	-	-	+
<i>Rhyothemis variegata variegata</i> (Linnaeus)	-	-	-	+	+
<i>Tholymis tillarga</i> (Fabricius)	+	+	+	+	+
<i>Tramea basilaris burmeisteri</i> Kirby	-	-	+	-	-
<i>Tramea limbata similata</i> (Rambur)	-	-	+	-	+
<i>Tramea virginia</i> (Rambur)	+	-	+	-	+
<i>Trithemis aurora</i> (Burmeister)	+	+	+	+	+
<i>Trithemis festiva</i> (Rambur)	+	-	+	+	-
<i>Trithemis pallidinervis</i> (Kirby)	-	-	+	-	-
<i>Zyxomma obtusum</i> Albarda	-	-	-	-	+
<i>Zyxomma petiolatum</i> Rambur	-	+	+	-	-

NA – North Andaman, MA – Middle Andaman, SA – South Andaman, LA – Little Andaman,
N – Nicobar



Rec. zool. Surv. India : **109**(Part-4) : 53-55, 2009

ON A NEW RECORD OF A THREADFIN FISH *FILIMANUS PERPLEXA* FELTES (PISCES : PERCIFORMES : POLYNEMIDAE) FROM INDIA

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INTRODUCTION

The threadfin fish family Polynemidae (Perciformes : Pisces) comprises 8 genera consisting of about 40 species throughout the world (Motomura, 2004). Talwar and Kacker (1984) and Talwar (1991) stated that only 12 species are known to occur in the coastal marine waters of our country. These are represented by one species of *Eleutheronema* Bleeker, two or three species of *Filimanus* Myers, one species of *Leptomelanosoma* Motomura and Iwatsuki, five species of *Polydactylus* Lacepede and two species of *Polynemus* Linnaeus (Motomura, 2004). The genus *Filimanus* Myers comprises six species in the world (Feltes, 1991). This genus can be well distinguished from *Polydactylus* Lacepede in having narrow tooth bands in premaxillaries, palatines and ectopterygoids, and the space between the tooth bands in jaws at symphysis is almost twice the width of tooth bands; basisphenoid is not in contact with prootic bone. Presence of *Filimanus heptadactyla* in Indian waters is doubtful and the reports of this species are mostly based on misidentification of *Polydactylus mullani* (Hora) or *Filimanus similis* Feltes. Hence, this genus in Indian waters is represented by only two species, viz., *Filimanus similis* Feltes and *Filimanus xanthonema* (Valenciennes). Motomura (2004) has rightly observed that many authors (Marathe and Bal, 1958; Nayak, 1959; Kagwade, 1970) have misidentified *F. similis* Feltes, *Polydactylus mullani* Hora and *Polydactylus sextarius* (Bloch & Schneider) as *F. heptadactyla*. During the study of polynemid fishes of Indian coast, the authors came across two specimens of unidentified fishes collected from the Great Nicobar Island of Andaman and Nicobar group of Islands, India during 1992. These were determined as *Filimanus perplexa* Feltes and presented here as a new record to the Indian coast.

A brief description of the species is presented here under with a discussion comparing its related threadfin fish species occurring in the world.

Filimanus perplexa Feltes

1991. *Filimanus perplexa* Feltes, *Copeia*, **1991**(2) : 307, fig. 5 (type locality : northwest of Denpasar, Bali, Indonesia).

2004. *Filimanus perplexa* : Motomura, *FAO species catalogue for fishery purposes*, (3) : 25, fig. 51, pl. If.

Material examined : Reg. No. ZSI-F. 9998/2, 2 ex., 108-114 mm SL, Locality : Campbell Bay, Great Nicobar Is.; Collected by Dhandapani and party; Date of collection : 27 Oct., 1992.

Diagnostic features : D VIII + I, 11; A III, 14-15; P 13 + vii; total GR 51-52; LL 49-51; Ltr 6/9. Depth 3.0 to 3.1, head 3.0 to 3.1 in standard length; eyes 4.6 to 5.2 in head. Maxilla extends beyond posterior margin of adipose eyelid. Lip on lower jaw well developed. Teeth villiform in narrow bands on jaws, palatine and ectopterygoids. Width of tooth bands on upper and lower jaws less than space separating tooth bands at symphysis. Vomerine tooth patch inconspicuous. Posterior margin of preopercle serrated. Upper jaw length about twice in head length, less than pectoral fin base (including base of free filaments). Pectoral fin insertion well below midline of body. Upper

A photograph of *Filimanus perplexa* Feltes from Great Nicobar Island

pectoral fin rays all unbranched, its tip just reaching to level of pelvic fin tip. Free pectoral filaments 7 (asymmetrically 6 and 7 in one specimen); first filament shortest, reaching to level of anal fin origin; third and fourth filaments longest, reaching beyond caudal fin base. Airbladder simple. Colour : golden yellow; base of pectoral filaments white, light brown on posterior portion.

Distribution : Known only from Sumatra, Java, Bali, Indonesia and Thailand.

DISCUSSION

Feltes (1991) revised the genus *Filimanus* Myers, 1936 with the description of two new species and so, recognized only six species under this genus in the world. Only *F. hexanema* (Cuvier) and *F. perplexa* Feltes have 13 to 15 anal fin rays and free pectoral filaments extending beyond midpoint of anal fin base (Motomura, 2004). Other species of this genus have less number of anal fin rays and shorter pectoral filaments. *F. hexanema* differs from *F. perplexa* in having 6 pectoral filaments which are mostly white in colour and not reaching beyond caudal fin base. The former is also a deeper species, its depth being 29 to 32 per cent of standard length (32 to 37 per cent in *F.*

perplexa). In the above described specimens, the body depth contained between 32 to 33 per cent of standard length and the pectoral filaments usually 7, which extend beyond caudal fin base with their posterior part brown in colour which led us to designate them as *F. perplexa* Feltes.

Other polynemids having longer free pectoral filaments that reaching beyond anal fin base are *Parapolynemus verikeri* (Saville-Kent), *Pentanemus quinquarius* (Linnaeus), all *Polynemus* species and two *Polydactylus* species, *P. macrophthalmus* (Bleeker) and *P. longipes* Motomura, Okamoto and Iwatsuki. Anal fin base is distinctly longer with 24 to 30 rays in *P. quinquarius*, which is known to occur along the west coast of Africa. Other three genera, *Polynemus* Linnaeus, *Polydactylus* Lacepede and *Parapolynemus* Feltes, differs from the genus *Filimanus* in having wider tooth bands and narrower gap between maxillary tooth bands at symphysis. Further, *Parapolynemus verikeri* have 10 to 12 anal fin rays and 30 to 43 gill rakers and similarly, *P. longipes* and *P. macrophthalmus* have 10 to 11 anal fin rays and 25 to 32 gill rakers. All the *Polynemus* species have higher lateral line scale count (more than 65) and lower total gill raker count (24 to 34), whereas *F. perplexa* is known to have 47 to 55 gill rakers. However, in *Polynemus* species the pectoral fin insertion is at midline of body.

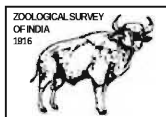
The distribution of this species in the Andaman Sea is known by a single specimen from Phuket, Thailand. This report extends its distributional range westward to the Great Nicobar Island, India.

ACKNOWLEDGEMENTS

The authors are thankful to the Director, Zoological Survey of India, Kolkata and to Sri A. K. Singh, Scientist-E and In-charge Spirit Building, Z.S.I., Kolkata for necessary facilities, permission and ninspiration.

REFERENCES

- Feltes, R.M., 1991. Revision of the polynemid fish genus *Filimanus*, with the description of two new species. *Copeia*, **1991**(2) : 302-322.
- Kagwade, P.V., 1970. The polynemid fishes of India. *Bull. Cent. Mar. Fish. Res. Inst.*, (18) : 1-69.
- Marathe, V.B. and Bal, D.V., 1958. A brief comparative account of the axial skeleton of six polynemids from Bombay waters. *J. Univ. Bombay*, **26**(B) : 139-151.
- Motomura, H., 1904. Threadfins of the world. An annotated and illustrated catalogue of polynemid species known to date. Family Polynemidae. *FAO species catalogue for fishery purposes*. No. 3. FAO, Rome : 117 p, 151 figs., 6 pls.
- Nayak, P.D., 1959. Occurrence of hermaphroditism in *Polydactylus heptadactylus* Cuv. & Val. *J. mar. biol. Assoc. India*, **1** : 257-259.
- Talwar, P.K., 1991. Pisces. In : Animal Resources of India, *Zool. Surv. India* : 577-630.
- Talwar, P.K. and Kacker, R.K., 1984. *The Commercial Sea Fishes of India*. Handbook. Zoological Survey of India, (4) : 997 p.



Rec. zool. Surv. India : **109**(Part-4) : 57-66, 2009

AN ACCOUNT OF THE AMPHIBIAN AND REPTILIAN FAUNA OF SUNDERBAN, WEST BENGAL

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INTRODUCTION

The comprehensive account on amphibians and reptiles of Sunderban have been found practically unknown until the report of Mukherjee (1975) on 2 species of amphibians and 14 species of reptiles. Acharji and Mukherjee (1964); Saha (1983) and Talukdar (1982) have also reported few species of reptiles from Sunderban. Similarly Mandal and Nandi (1989) have reported 7 species of amphibians and 56 species of reptiles in their study on Sunderban. Agarwal and Ghose (1995) have reported 7 species of amphibians and 17 species of reptiles in their study on Sunderban tiger reserve; Chanda (1995) has reported 7 species of amphibians and Sanyal *et al.*, (1995) have reported 17 species of reptiles from Sunderban. Recently Chowdhury and Vyas (2005) have reported 41 species of reptiles from Sunderban.

This will be the first report comprising totally 22 species of amphibians and reptiles of Sunderban based on the studies of collections made by different survey parties of Sunderban field research station, Zoological Survey of India. In the present paper author made an attempt to identify 5 species of amphibians belonging to 4 Genera and 17 species of reptiles belonging to 16 Genera.

ABBREVIATIONS USED

Coll.—Name of Collector.

Ex.(s)—Number of example.

KN—Registration No.

BR—B. Rana.

DBR—D.B. Ramnagar.

DM—Dilip Mondal.

HKB—H.K. Bhowmik.

HQ—Head Quarter.

JKD—Dr. J. K. De.

KNR—K.N. Reddy.

MS—Mahadev Sumanta.

NCB—N.C. Banerjee.

NCN—Dr. N.C. Nandi.

NPD—N.P. Debnath.

RAK—Dr. R.A. Khan.

SCS—S.C. Saren.

UD—Uttam Das.

VAR—Dr. Varadaraju.

**SYSTEMATIC LIST OF AMPHIBIANS AND REPTILES
REPORTED FROM SUNDERBAN**

Phylum CHORDATA

Class AMPHIBIA

Order ANURA Fischer

Family I BUFONIDAE

1. Genus *Duttaphrynus* Frost *et al.*, 2006

1. *Duttaphrynus melanostictus* (Schneider, 1799)

Family II DICROGLOSSIDAE

Subfamily DICROGLOSSINAE

2. Genus *Euphlyctis* Fitzinger, 1843

2. *Euphlyctis cyanophlyctis* (Schneider, 1799)

3. *Euphlyctis hexadactylus* (Lesson, 1834)

3. Genus *Fejervarya* Bolkey, 1915

4. *Fejervarya limnocharis* (Gravenhorst, 1829)

4. Genus *Hoplobatrachus* Peters, 1863

5. *Hoplobatrachus tigerinus* (Daudin, 1803)

Class REPTILIA

Order TESTUDINES

Suborder CRYPTODIRA

Family III CHELONIDAE

5. Genus *Lepidochelys* Fitzinger, 1843

6. *Lepidochelys olivacea* (Eschscholtz, 1829)

Order SQUAMATA

Suborder SERPENTS

Family IV COLUBRIDAE

6. Genus *Ptyas* Fitzinger, 1843

7. *Ptyas mucosus* (Linnaeus, 1758)

7. Genus *Oligodon* Boie, 1827

8. *Oligodon arnensis* (Shaw, 1802)

8. Genus *Lycodon* Boie, 1826

9. *Lycodon aulicus* (Linnaeus, 1758)

9. Genus *Amphiesma* Dumeril & Bibron, 1854

10. *Amphiesma stolatum* (Linnaeus, 1758)

10. Genus *Xenochrophis* Gunther, 1864

11. *Xenochrophis piscator* (Schneider, 1799)

11. Genus *Atretium* Cope, 1861

12. *Atretium schistosum* (Daudin, 1803)

12. Genus *Boiga*, Fitzinger, 1826

13. *Boiga trigonata* (Schneider in Bechstein, 1802)

13. Genus *Enhydris* Sonn & Latr, 1802

14. *Enhydris enhydris* (Schneider, 1799)

14. Genus *Cerberus* Cuvier, 1829

15. *Cerberus rhynchops* (Schneider, 1799)

Family V ELAPIDAE

15. Genus *Bungarus* Daudin, 1803

16. *Bungarus caeruleus* (Schneider, 1801)

16. Genus *Naja* Laurenti, 1768

17. *Naja naja kaouthia* (Lesson, 1831)

18. *Naja naja* (Linnaeus, 1758)

Family VI HYDROPHIDAE

17. Genus *Enhydrina* Gray, 1849

19. *Enhydrina schistosum* (Daudin, 1803)

18. Genus *Hydrophis* Latreille, 1802

20. *Hydrophis caeruleus* (Shaw, 1802)

Family VII VIPERIDAE

19. Genus *Vipera*, Laurenti, 1768

21. *Duboida russelli* (Shaw & Nodder, 1797)

20. Genus *Trimeresurus*, Lacepede, 1804

22. *Trimeresurus erythrurus* (Cantor, 1839)

SYSTEMATIC ACCOUNT

Class AMPHIBIA

Family I BUFONIDAE

1. Genus *Duttaphrynus* Frost *et al.*, 2006

1. *Duttaphrynus melanostictus* (Schneider, 1799)

Common name : Common Indian Toad.

Material examined : 2 eggs., (Reg. No., KN-1301), Fraserganj, 20.xii.1983, coll. by NCN; 1 ex., (Reg. No. KN-1300), Kakdwip, 23.iii.1987, coll. by NCB.

Measurements : Total length from Snout to vent : 8.0-11.0 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Myanmar; Sri Lanka; China; Malaysia; Indonesia; Philippines.

Family II DICROGLOSSIDAE

Subfamily DICROGLOSSINAE

2. Genus *Euphlyctis* Fitzinger, 1843

2. *Euphlyctis cyanophlyctis* (Schneider, 1799)

Common name : Skipper Frog.

Material examined : 2 eggs., (Reg. No. KN-1316), Hardwood point, 8.ix.1983, coll. by SCS; 3 eggs., (Reg. No. KN-1304), Sajnakhali, 22.iv.1985, coll. by RAK; 11 eggs., (Reg. No. KN-1302), Fraserganj, 20.xii.1983, coll. by NCN; 4 eggs., (Reg. No. KN-1303), Devlbari, 14.ii.1987, coll. by NCN; 3 eggs., (Reg. No. KN-1365), Kishori Mohanpur, 25.ii.1991, coll. by KNR.

Measurements : Total length from snout to vent : 3.0-5.8 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Pakistan; Afghanistan; South Arabia; Sri Lanka.

3. *Euphlyctis hexadactylus* (Lesson, 1834)

Common name : Indian Green Frog.

Material examined : 7 eggs., (Reg. No., KN-1370), Sandeshkhali, 21.vii.2006, coll. by VAR.

Measurements : Total length from snout to vent : 0.8-1.6 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Sri Lanka; Afghanistan; Bangladesh; Bhutan; Myanmar; Nepal; Pakistan; South Arabia.

3. Genus *Fejervarya* Bolkay, 1915

4. *Fejervarya limnocharis* (Gravenhorst, 1829)

Common name : Paddy Field Frog.

Material examined : 5 egs., (Reg. No. KN-1315), Sandeshkhali, 25.vi.1986, coll. by NCN; 1 ex., (Reg. No. KN-1312), Sattcherii, 11.xii.1983, coll. by JKD; 2 egs., (Reg. No. KN-1359, Nat Nikharighat, 21.ii.1990, coll. by NPD.

Measurements : Total length from snout to vent : 2.0-4.7 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Sri Lanka; China; Malaysia; Indonesia; Philippines; Bangladesh; Burma; Japan; Java; Myanmar; Nepal; Pakistan; Sumatra; Thailand; Vietnam.

4. Genus ***Hoplobatrachus*** Peters, 1863

5. ***Hoplobatrachus tigerinus*** (Daudin, 1803)

Common name : Common Indian Bullfrog.

Material examined : 1 ex., (Reg. No. KN-1310), Baramollakhali, 4.xi.1993, coll. by KNR; 2 egs., (Reg. No. KN-1355), Ghutihara, 8.ix.1983, coll. by SCS; 1 ex., (Reg. No. KN-1311), Chamaguri, 9.x.1984, coll. by JKD.

Measurements : Total length from snout to vent : 4.2-14.5 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Nepal; Myanmar; China; Indonesia; Bangladesh; Indo-China; Pakistan; Sri Lanka.

Class REPTILIA

Family III CHELONIDAE

5. Genus ***Lepidochelys*** Fitzinger, 1843

6. ***Lepidochelys olivacea*** (Eschscholtz, 1829)

Common name : Olive Ridley turtle.

Material examined : 2 egs., (Reg. No. KN-1367), Bhagbatpur, 28.v.1983, coll. by NCN.

Measurements : 2.8-2.9 inches.

Distribution : India; West Bengal; Orissa; Andaman and Nicobar Islands.

Elsewhere : Pacific; Indian and South Atlantic oceans.

Family IV COLUBRIDAE

6. Genus ***Ptyas*** Fitzinger, 1843

7. ***Ptyas mucosus*** (Linnaeus, 1758)

Common name : Indian Rat Snake.

Material examined : 1 ex., (Reg. No., KN-1324), Kumrakhali, 9.vii.1985, coll. by SCS; 1 ex., (Reg. No. KN-1358), Canning, 15.xi.1994, coll. by NPD.

Measurements : Total length : 30.0-60.0 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Throughout South and South-East Asia.

7. Genus *Oligodon* Boie, 18278. *Oligodon arnensis* (Shaw, 1802)

Common name : Common Kukri Snake.

Material examined : 1 ex., (Reg. No. KN-1352), Dabua, 31.viii.1995, coll. by KNR.

Measurements : Total length : 16.0 inches.

Distribution : India; Gujarat; Peninsular India; Western Himalaya; West Bengal.

Elsewhere : Pakistan; Nepal; Bangladesh; Sri Lanka.

8. Genus *Lycodon* Boie, 18269. *Lycodon aulicus* (Linnaeus, 1758)

Common name : Common Wolf Snake.

Material examined : 1 ex., (Reg. No. KN-1350), Canning Matla, 23.vii.1993, coll. by UD; 1 ex., (Reg. No. KN-1333), Matla, 16.v.1985, coll. by NCB; 1 ex (Reg. No. KN-1338), Gosaba, 21.viii.1987, coll. by NCN; 1 ex. (Reg. No., KN-1338), Mathakhali, 3.ii.1992, coll. by DBR.

Measurements : Total length : 7.0-19.0 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Pakistan; Nepal; Sri Lanka; Bangladesh; Myanmar.

9. Genus *Amphiesma* Dumeril & Bibron, 185410. *Amphiesma stolatum* (Linnaeus, 1758)

Common name : Striped Keelback.

Material examined : 1 ex., (Reg. No. KN-1332), Kakdwip, 23.ii.1980, coll. by HQ; 1 ex., (Reg. No. KN-1319), Kakdwip, 1.vii.1982, coll. by DBR.

Measurements : Total length : 20.0-24.0 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Pakistan; Nepal; Bhutan; Bangladesh; Sri Lanka.

10. Genus *Xenochrophis* Gunther, 186411. *Xenochrophis piscator* (Schneider, 1799)

Common name : Checkered Keelback.

Material examined : 1 ex., (Reg. No. KN-1321), Fraserganj, 20.xii.1983, coll. by NCN; 1 ex., (Reg. No. KN-1361), Sahebkhali, 24.xii.1992, coll. by HKB; 1 ex., (Reg. No., KN-1362), Rajabaririver, 21.vi.1991, coll. by KNR; 1 ex., (Reg. No. KN-1363), Namkhana, 23.xii.1991, coll. by NPD.

Measurements : Total length : 14.0-31.0 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Pakistan; Nepal; Myanmar; Malaysia; China; Taiwan.

11. Genus *Atretium* Cope, 186112. *Atretium schistosum* (Daudin, 1803)

Common name : Olivaceous Keelback.

Material examined : 1 ex., (Reg. No. KN-1314), Sandeshkhali, 23.iv.2006, coll. by VAR.

Measurements : Total length : 24.0 inches.

Distribution : India; Anaimalais; Wynaad; Karnataka; Uttar Pradesh; Orissa.

Elsewhere : Sri Lanka; Bangladesh; Nepal.

12. Genus *Boiga* Fitzinger, 182613. *Boiga trigonata* (Bechstein, 1802)

Common name : Indian Gaama.

Material examined : 1 ex., (Reg. No. KN-1347), Akhaynagar, 27.viii.1982, coll. by MS.

Measurements : Total length : 10.2 inches.

Distribution : India; Gujarat; Vadodara; Panchmahals and Dangs; Peninsular India; Rajasthan; Western and Eastern Himalayas.

Elsewhere : Throughout Most South Asia except Andaman and Nicobar Islands.

13. Genus *Enhydryis* Sonn & Latr, 180214. *Enhydryis enhydryis* (Schneider, 1799)

Common name : Common Indian Water Snake.

Material examined : 1 ex., (Reg. No. KN-1330), Ukil Bazar, 11.v.1986, coll. by NCN; 2 eggs., (Reg. No., KN-1327), Chadalkhali, 24.vi.1986, coll. by RAK; 1 ex., (Reg. No. KN-1345), Matla, 22.ix.1981, coll. by SCS; 1 ex., (Reg. No. KN-1325), Gosaba, 12.ii.1980, coll. by HQ; 1 ex., (Reg. No. KN-1323), Kakdwip, 15.vi.1982, coll. by NCB; 2 eggs., (Reg. No. KN-1318), Mitakhali, 18.v.1987, coll. by DBR.

Measurements : Total length : 7.0-16.5 inches.

Distribution : India; Madhya Pradesh; Uttar Pradesh; Andhra Pradesh; Bihar; Orissa; West Bengal; Assam.

Elsewhere : Bangladesh; Nepal; Myanmar.

14. Genus *Cerberus* Cuvier, 182915. *Cerberus rhynchops* (Schneider, 1799)

Common name : Dog-Faced Water Snake.

Material examined : 1 ex., (Reg. No. KN-1351), Sajnakhali, 2.iii.1997, coll. by KNR; 1 ex., (Reg. No. KN-1343), Neit Nikarighat, 27.vi.1988, coll. by SCS; 2 eggs., (Reg. No. KN-1342), Phuldubin, 11.ix.1984, coll. by JKD; 2 eggs., (Reg. No. KN-1328), Chotamallakhali, 10.iv.1993,

coll. by KNR; 1 ex., (Reg. No. KN-1326), Purandar, 18.iii.1987, coll. by NCN; 1 ex., (Reg. No. KN-1331), Canning, 11.vi.1985, coll. by RAK; 1 ex., (Reg. No. KN-1308), Dharakhali, 9.iv.1985, coll. by RAK; 1 ex., (Reg. No., KN-1307), Fatikpur, 11.v.1985, coll. by NCN; 1 ex., (Reg. No. KN-1305), Ukilghat, 16.v.1986, coll. by NCN; 1 ex., (Reg. No. KN-1313), Ghutihara, 22.vi.1987, coll. by NPD; 1 ex., (Reg. No., KN-1309), 2.i.1993, coll. by HKB; 1 ex., (Reg. No. KN-1322), Kakdwip, 12.iii.1980, coll. by NCB; 1 ex., (Reg. No. KN-1346), Baghbatpur, 23.xii.1992, coll. by NPD.

Measurements : Total length : 7.5-28.2 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Pakistan; Bangladesh; Sri Lanka; Australia.

Family V ELAPIDAE

15. Genus *Bungarus* Daudin, 1803

16. *Bungarus caeruleus* (Schneider, 1801)

Common name : Common Indian Krait.

Material examined : 1 ex., (Reg. No., KN-1422), Kshetra Mohanpur, 12.ii.1980, coll. by HQ.

Measurements : Total length : 25.0 inches.

Distribution : India; Gujarat; West Bengal; Peninsular India; Rajasthan; Punjab; Haryana; Uttar Pradesh; Madhya Pradesh; Orissa; Maharashtra; Andhra Pradesh; Karnataka; Tamil Nadu; Kerala.

Elsewhere : Pakistan; Bangladesh; Nepal; Sri Lanka.

16. Genus *Naja* Laurenti, 1768

17. *Naja naja kaouthia* (Lesson, 1831)

Common name : Monoocellate Cobra.

Material examined : 1 ex., (Reg. No. KN-1336), Neil Nikarighat, 16.vii.1991, coll. by NPD; 1 ex., (Reg. No., KN-1349), Golbari, 31.viii.1995, coll. by KNR; 1 ex., (Reg. No. KN-1337), Dighirpara, 25.iii.1990, coll. by DM; 1 ex., (Reg. No., KN-1340), Sanjaypally, 1.xi.1994, coll., by BR; 1 ex., (Reg. No. KN-1348) Sandeshkhali, 31.viii.1995, coll. by KNR.

Measurements : Total length : 12.0-16.0 inches.

Distribution : India; Whole of North-Eastern India; West Bengal; Bihar; Eastern Uttar Pradesh; Eastern Himalayas.

Elsewhere : Bangladesh; Nepal; China; Most of South East Asia.

18. *Naja naja* (Linnaeus, 1758)

Common name : Spectacled Cobra.

Material examined : 1 ex., (Reg. No. KN-1360), Sandeshkhali, 5.vii.1992, coll. by NPD.

Measurements : Total length : 19.5-28.5 inches.

Distribution : India; Gujarat; Peninsular India; Kashmir; Punjab; Rajasthan; United Provinces; Haryana; Bihar; West Bengal; Orissa; Madhya Pradesh; Andhra Pradesh; Maharashtra; Goa; Karnataka; Tamil Nadu; Kerala.

Elsewhere : Pakistan; Bangladesh; Nepal; Bhutan; Sri Lanka.

Family VI HYDROPHIDAE

17. Genus *Enhydrina* Gray, 1849

19. *Enhydrina schistosum* (Daudin, 1803)

Common name : Beaked Sea Snake.

Material examined : 1 ex., (Reg. No. KN-1423), Sagar Island, 12.ii.1980, coll. by HQ; 1 ex., (Reg. No. KN-1424), Jambudweep, 22.xii.1983, coll. by NCN.

Measurements : Total length : 26.0-37.0 inches.

Distribution : India; Gujarat; Coastal waters of Goa; Tamil Nadu; Orissa; West Bengal.

Elsewhere : Pakistan; Bangladesh; Sri Lanka; Indo-Pacific water (Thailand, Malaysia and Singapore).

18. Genus *Hydrophis*, Latreille, 1802

20. *Hydrophis caeruleus* (Shaw, 1802)

Common name : Many toothed sea snake.

Material examined : 1 ex., (Reg. No. KN-1364), Haldibari, 10.xi.1980, coll. by RAK.

Measurements : Total length : 11.0 inches.

Distribution : India; Coasts of Goa; Maharashtra; Karnataka; Tamil Nadu; West Bengal; Gujarat.

Elsewhere : Pakistan; Bangladesh; China; Myanmar; Malaysia; Thailand to Australia.

Family VII VIPERIDAE

19. Genus *Vipera* Laurenti, 1768

21. *Vipera russelli* (Shaw & Nodder, 1797)

Common name : Russell's Viper.

Material examined : 1 ex., (Reg. No. KN-1425), Hazra, 27.xi.1981, coll. by DBR.

Measurements : Total length : 35.5 inches.

Distribution : India; They have been recorded from all over India.

Elsewhere : Indo-Australian Archipelago; Tropical area of Asia; Taiwan; Java; North and Tropical Africa.

20. Genus *Trimeresurus* Lacepede, 1804

22. *Trimeresurus erythrurus* (Cantor, 1839)

Common name : Naga Hill Pit Viper.

Material examined : 1 ex., (Reg. No. KN-1366), Haldibari, 20.ii.1991, coll. by SCS.

Measurements : Total length : 20.5 inches.

Distribution : India; West Bengal; Himalayas; Assam.

Elsewhere : Vietnam; Japan; Malaysia; China.

SUMMARY

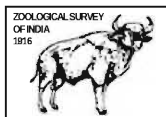
The paper dealt with amphibian and reptilian fauna collected from Sunderban by different survey parties of Zoological Survey of India. It reports 5 species of amphibians in 2 families and 4 genera and 17 species of reptiles in 5 families and 16 genera.

ACKNOWLEDGEMENTS

The author wishes to thank Director, Zoological Survey of India, Kolkata for providing facilities for this study.

REFERENCES

- Acharji, M.N. and Mukherjee, A.K. 1964. Report on a collection of snakes from lower Bengal (Reptilia : Ophidia). *J. Zool. Soc. India*, **16**(1-2) : 76-81.
- Agarwal, V.C. and Ghose, R.K. 1995. Fauna of Sunderban tiger reserve. *Fauna of Tiger Reserve (Sunderbans, Palamau, Simlipal and Manas)*. *Fauna of Conservation Areas*, **8** : 1-46.
- Chanda, S.K. 1995. Anura : Amphibia : *Est. Ecos. Ser. Hooghly-Matla Estuary*. *Zool. Surv. India*, **Part 2** : 389-400.
- Chowdhury, B.R. and Vyas, P. 2005. Reptilia : *The Sunderbans. A Pictorial Field Guide*. 72-79. Rupa and Co. New Delhi.
- Mandal, A. K. and Nandi, N.C. 1989. Fauna of Sunderban mangrove ecosystem, West Bengal. *Fauna of Conservation Series*. **3** : 43-45.
- Mukherjee, A.K. 1975a. The Sunderbans of India and its biota. *J., Bombay nat. Hist. Soc.*, **72**(1) : 1-20.
- Saha, S.G. 1983. Annual bites and deaths from snake bite at Harendra Nagar Subsidiary Health Centre, District 24-Parganas, West Bengal. *J. Hamadryad*, **8**(1) : 15.
- Sanyal, D.P. Dattagupta, B. and Sur, S. 1995. Reptilia : *Est. Ecos. Ser. Hooghly-Matla Estuary*. *Zool. Surv. India*, **Part 2** : 1-46.
- Talukdar, S.K. 1982. On a small collection of reptiles from the Sunderbans, West Bengal. *Indian J. Zool.*, **20**(4) : 184-186.



Rec. zool. Surv. India : **109**(Part-4) : 67-76, 2009

ACRIDOIDEA DIVERSITY OF PATNA BIRD SANCTUARY, UTTAR PRADESH, INDIA

NARENDER SHARMA

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INTRODUCTION

Patna Bird Sanctuary is about 6 kms. from Jalesar tehsil of Etah district of Uttar Pradesh on the Jalesar-Sikandrarao road, was declared as full fledged sanctuary in 1990 having an area of 108 hectare. The sanctuary extends between 78° 45' 00'' east longitude and 27° 34' 60'' north latitude with an altitude of 168m msl. It is about 60 kms from Aligarh. The average year temperature varies from 47°C in peak summers to 4° C in winters. It is a typical rainfed wetland of the gangetic plains, being a natural, freshwater, shallow depression. The shallow parts of the sanctuary dry up during summer, leaving some puddles in the deeper zones. After the abundant Indian monsoon fills the lake to its brim, approx. 200 different species of birds can be sighted during this time of the year. Though on paper it's the smallest bird sanctuary in Uttar Pradesh covering a wetland area of a mere 1 sq. km., Patna vies with the best when it comes to its avifauna. Date palm *Phoenix silvestris* in the central part of the sanctuary is one of the most conspicuous features of this sanctuary. Aquatic vegetation consists of *Hydrilla verticillata*, *Ceratophyllum demersum*, *Vallisneria spiralis*, *Pontamogeton crispus*, and *Najas* sp., while surface vegetation consists of *Salvinia*, *Azolla* and *Eichhornia crassipes*. On the fringes of the wetlands, *Ipomea carnea* grows in excess and *Ipomea aquatica* is also spreading.

Short-horned grasshoppers are included in the Superfamily Acridoidea. 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). Later on Bolivar (1914, 18), Uvarov (1921, 1927, 1940, 1940a, 1942) have also studied the Orthoptera of Indian

subcontinent. Willemese (1955) has studied the Orthoptera of Indo-Malayan region. Later on Henry (1940), Dirsh (1954, 1958), Dirsh & Uvarov (1953), Banerjee and Kevan (1960), Hollis (1965, 1968, 1971, 1975), Mason (1973) and Ritchie (1981, 1982) have taxonomically treated several genera. Tandon (1975, 1976) and Tandon & Shishodia (1977) have studied Indian grasshoppers from different states. Shishodia & Hazra (1985, 1986) have studied the Acridoidea fauna of Silent Valley (Kerala), and Namdhapa (Arunachal) Pradesh. Bhowmik (1986) gave an account of the Acridoidea Fauna of West-Bengal, specially of North-Bengal. Further, Hazra *et. al.* (1993) have studied Acridoidea Fauna of West-Bengal.

The present paper deals with 18 species belonging to 2 families and 15 genera. All the species are reported from the sanctuary for the first time. Three species have been recorded from Uttar Pradesh for the first time. Classification followed here is according to Uvarov (1966).

ABBREVIATIONS USED

Coll.—Name of the Collector, ex (s)—Number of example (s).

SYSTEMATIC ACCOUNT

Order ORTHOPTERA

Superfamily ACRIDOIDEA

Family PYRGOMORPHIDAE

Genus 1. *Chrotogonus* Serville, 1839

1. *Chrotogonus* (Chr.) *trachypterus trachypterus* (Blanchard)

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

1959. *Chrotogonus* (Chr.) *trachypterus trachypterus* : Kevan, *Publcoes cult. Co. Diam. Angola*, 43 : 147.

Material examined : 1 ex., 7.ix.05, Near Sanctuary Main Gate; 3 exs., 7.ix.05, Near Lake; 2 exs., 8.ix.05, Grassy Fields near Temple, Coll.: N Sharma & party.

Distribution : India : Uttar Pradesh, Andhra Pradesh, Bihar, Goa, Himachal Pradesh, Karnataka, Kerala, South east of Maharastra, Madhaya Pradesh, Orissa, Tamil Nadu, and West Bengal.

Elsewhere : Sri Lanaka, Bangladesh and Pakistan.

Remarks : In general, it is widely distributed in the northern part of India. It is found on dry conditions on bare ground habitat and is a pest of various types of crops.

Genus 2. *Atractomorpha* Saussure, 1861

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 : 2 exs., 7.ix.05, Near Lake; 2 exs., 8.ix.05, Near Sanctuary Main Gate; 3 exs., 8.ix.05, Grassy Fields near Temple, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Andaman & Nicobar, Andhra Pradesh, Bihar, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Lakshadweep Madhaya Pradesh, Orissa, Rajasthan, Tamil Nadu, West Bengal.

Elsewhere : Bangladesh, Malaya, Myanmar, Pakistan, Sri Lanka, N. Sumatra, Thailand and S. Vietnam.

Remarks : The species is very common in the sanctuary area.

Genus 3. ***Poecilocerus*** Serville 1831

3. ***Poecilocerus pictus*** Fabricius

1775. *Poecilocerus pictus* Fabricius, *Syst. Ent.*, p. 289.

1831. *Poecilocerus sonneeratii*, Serville, *Ann. Sci. Nat.* xxxii, 1831, p. 276.

Material examined : 1 ex., 8.ix.05, Grassy Fields near Temple, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Tamil Nadu.

Elsewhere : Baluchistan, Pakistan.

Remarks : In the sanctuary, this species found to be rare and only one example could be collected from grassy fields.

Family ACRIDIDAE

Subfamily HEMIACRIDINAE

Genus 4. ***Spathosternum*** Krauss, 1877

4. ***Spathosternum pr. prasiniferum*** (Walker)

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

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

Material examined : 3 exs., 7.ix.05, Grassy Fields near Lake; 3 exs., 7.ix.05, Near Sanctuary Main Gate; 4 exs., 8.ix.05, Near Lake; 3 exs., 8.ix.05, Grassy Fields near Temple, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Andhra Pradesh, Arunachal Pradesh, Bihar, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Madhaya Pradesh, Kerala, Maharastra, Orissa, Rajasthan, Tamil Nadu.

Elsewhere : Myanmar, S.E. China, Thailand and Vietnam.

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

Genus 5. ***Hieroglyphus*** Krauss, 1877

5. ***Hieroglyphus nigrorepletus*** Bolivar

1912. *Hieroglyphus nigrorepletus* Bolivar, *Trab. Mus. Cienc. nat. Madr.*, **6** : 56.

1973. *Hieroglyphus nigrorepletus* : Mason, *Bull. Brit. Mus. nat. Hist. (Ent.)*, **28**(7) : 526.

Material examined : 2 exs., 7.ix.05, Near bank of Lake; 3 exs., 8.ix.05, Grassy Fields near Temple, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Assam, Bihar, Kashmir, Karnataka, Maharashtra, Orissa, Punjab, West Bengal.

Elsewhere : Bangladesh and Pakistan.

Remarks : The species varies greatly in body size and in form of tegmina-brachypterous forms being very frequent. Its degree of colouration also variable. It is a serious pest of paddy.

Subfamily OXYINAE

Genus 6. *Oxya* Serville, 1831

6. *Oxya fuscovittata* (Marschall)

1836. *Gryllus fuscovittatus* Marschall, *Annls. Wien. Mus. Naturg.*, **1** : 211.

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

Material examined : 3 exs., 7.ix.05, Grassy Fields near Entry Gate; 2 exs., 8.ix.05, Near Lake; 3 exs., 8.ix.05, Grassy Fields near Temple, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Andhra Pradesh, Rajasthan, Madhya Pradesh, Jammu & Kashmir, Orissa and West Bengal.

Elsewhere : Afghanistan, Pakistan, USSR (South West).

Remarks : It is one of the most commonest species of the genus in India, but not so common as *velox* or *hyla*. In the sanctuary area, the species is associated to the paddy and grass adjoining the cultivated fields.

7. *Oxya hyla hyla* Serville

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

1971. *Oxya hyla hyla* : Hollis, *Bull. Brit. Mus. nat. Hist. (Ent.)*, **26**(7) : 282.

Material examined : 3 exs., 7.ix.05, Grassy Fields near Temple; 1 exs., 8.ix.05, Near Main Sanctuary Gate; 2 exs., 8.ix.05, Grassy Fields near Lake, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Himachal Pradesh, Karnataka, Madhya Pradesh, Meghalaya, Orissa, Rajasthan, Tamil Nadu, Tripura, and West Bengal.

Elsewhere : South Africa, Afghanistan, Bangladesh, Madagascar, Nepal, Pakistan, Persia and Sri Lanka.

Remarks : It is a highly variable subspecies as regards its size and appearance. The length of tegmen, shape of male cercus and dentation on lateral ridges of subgenital plate are also variable.

Subfamily EYEPREPOCNEMIDINAE

Genus 7. *Choreodocus* Bolivar, 1914

8. *Choreodocus illustris* (Walker)

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

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

Material examined : 2 exs., 7.ix.05, Near Sanctuary Main Gate; 5 exs., 7.ix.05, Near Lake; 3 exs., Grassy Fields near Temple, 8.ix.05, Coll.: N Sharma.

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

Remarks : This species was found very common in the sanctuary area.

9. *Choreodocus robustus* (Serville)

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

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

Material examined : 3 exs., 7.ix.05, Near Lake; 2 exs., 8.ix.05, Near Sanctuary Main Gate; 3 exs., 8.ix.05, Grassy Fields Near Temple, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Arunachal Pradesh, Assam, West Bengal.

Elsewhere : Bangladesh.

Remarks : The species is unique in having non spotted tegmina, larger size and general green-yellowish appearance and particularly, reddish colouration of posterior tibiae and metatarsi.

Genus 8. *Heteracris*

10. *Heteracris littoralis* (Rambur)

1828. *Gryllus littoralis* Rambur, *Faune Entomol. Andal., Orthop.*, **2** : 78.

1958. *Heteracris littoralis* : Dirsh, *Tijdschr. Ent.*, **101** : 54.

Material examined : 1 exs., Grassy Fields Near Temple, 8.ix.05, Coll. : N. Sharma.

Distribution : India : Uttar Pradesh, Uttarakhand, Bihar, Rajasthan.

Elsewhere : Azerbaijan, S. Europe, Egypt, Greece, S. W. Asia.

Remarks : This species was found to be rare. Size medium; fastigium of vertex parabolic with obtuse apex and a little depressed; tegmina with numerous medium size dark brown patches; wings base clear; hind femur with 2-3 black, linear line on the dorso-external carina, with white yellow ring before the apex. This species is a new record from Uttar Pradesh.

Genus 9. *Eyprepocnemis*

11. *Eyprepocnemis alacris alacris* (Serville)

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

1958. *Eyprepocnemis alacris alacris* : Dirsh, *Proc. R. ent.Soc. Lond.*, (**27**) B : 40.

Material examined : 1 exs., Near Lake, 7.ix.05; 1 exs., Grassy Fields near Temple, 8.ix.05, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Maharastra, West Bengal.

Elsewhere : Pakistan, Sri Lanka and Myanmar.

Remarks : The species is unique in having a very pointed apex of male cercus which differentiates it from allied Indian species. This typical subspecies is the commonest in the genus and it is widely distributed in all habitats. It is available both in plains as well as in Hills. This species is a new record from Uttar Pradesh.

12. *Eyprepocnemis rosea* Uvarov, 1942

1942. *Eyprepocnemis rosesus* Uvarov, *Ann. Mag. nat. Hist.*, **9**(11) : 597.

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

Material examined : 1 exs., Grassy Fields near Water Body, 1 exs., Grassy Fields near Temple, 8.ix.05, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Arunachal Pradesh, Assam, Andhra Pradesh, Himachal Pradesh, and Meghalaya.

Remarks : Medium sized insects, wings at the base with pinkish tinge in colour; posterior tibiae with red in colour. This species is a new record from Uttar Pradesh.

Subfamily CATANTOPINAE

Genus 10. *Catantops* Schaum 1853

13. *Catantops pinguis 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.

Material examined : 2 exs., Near Sanctuary Main Gate, 7.ix.05; 1 exs., Near Lake, 2 exs., Grassy Fields near Temple, 8.ix.05, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Arunachal Pradesh, Assam, Himachal Pradesh, Kerala, Orissa, Tamil Nadu.

Elsewhere : Myanmar, Java, Malaya, New Guinea, Philippines, Sri Lanka, Sumatra, Yunan and Thailand.

Remarks : This species is distinguishable by its parallel-sided frontal ridge and colouration in details specially of wings. It is one of the commonest species found in all habitats in India.

Subfamily ACRIDINAE

Genus 11. *Acrida* Linnaeus, 1758

14. *Acrida exaltata* (Walker)

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

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

Material examined : 2 exs., Near Lake, 7.ix.05; 1 exs., Near Sanctuary Main Gate, 3 exs., Grassy Fields near Temple, 8.ix.05, Coll. : N. Sharma & party.

Distribution : India (Throughout India).

Elsewhere : Afghanistan, Aden, Arabia, Bangladesh, S.E. Iran, Nepal, Pakistan, Sri Lanka, S.E. Tibet and Yemen.

Remarks : The species is one of the commonest grasshoppers of India and available both in open grasslands including agricultural fields as well as in moist, deep tropical woods.

Genus 12. ***Phlaeoba*** Stål, 1860

15. ***Phlaeoba infumata*** Brunner

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

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

Material examined : 2 exs., Near Sanctuary Entry Gate, 2 exs., Near Lake, 7.ix.05; 1 ex., Near Lake, 2 exs., Grassy Fields near Temple, 8.ix.05, Coll. : N. Sharma & party.

Distribution : India (Widely distributed).

Elsewhere : S. China, Malacca, Myanmar, E. Nepal.

Remarks : The species is associated with crops of paddy, sorghum, maize, millets etc. and is generally found throughout the year in moist areas.

Genus 13. ***Ceracris*** Walker, 1870

16. ***Ceracris striata*** (Brunner)

1989. *Ceracris fasciata* Ingrisch, *Spixiana*, **11**(3) : 235.

Material examined : 2 exs., Near Lake, 7.ix.05; 1 ex., Near Sanctuary Main Gate, 2 exs., Near Lake, 3 exs., Grassy Fields near Temple, 8.ix.05, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Uttarakhand, Tripura.

Elsewhere : S. China, Myanmar and Thailand.

Subfamily OEDIPODINAE

Genus 14. ***Aiolopus*** Fieber, 1853

17. ***Aiolopus thalassinus 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 : 2 exs., Grassy Fields Near Sanctuary Main Gate, 1 ex., Near Lake, 7.ix.05; 1 ex., Grassy Fields near Main Gate 2 exs., Grassy Fields near Temple, 8.ix.05, Coll. : N. Sharma & party.

Distribution : India : Uttar Pradesh, Andaman & Nicobar Islands, Bihar, Delhi, Himachal Pradesh, Karnataka, Madhya Pradesh, Rajasthan, Tamil Nadu, Uttarakhand, West Bengal.

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

Remarks : The subspecies is one of the serious pests of agricultural fields, specially of paddy fields. Hundreds of them are noticeable from the seedling stage to ripening stage of paddy. This species is recorded throughout Oriental region and extends upto Australia.

Genus 15. ***Trilophidia*** Stål, 1873

18. ***Trilophidia annulata*** (Thunberg)

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

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

Material examined : 2 exs., Grassy Fields Near Sanctuary Main Gate, 3 exs., Grassy Fields near Temple, 7.ix.05; 2 exs., Near Lake, 2 exs., Grassy Fields near Main Gate, 8.ix.05, Coll. : N Sharma & party.

Distribution : India : Uttar Pradesh, Andhra Pradesh, Bihar, Goa, Himachal Pradesh, Karnataka, Madhya Pradesh, Orissa, Sikkim, Tamil Nadu, and West Bengal.

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

Remarks : In India, the genus is represented by this species only. So its geographical isolation along with the colouration of inner surface of posterior femur and unique form of the lophi of epiphallus easily identify the species.

ACKNOWLEDGEMENTS

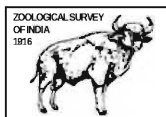
The author is grateful to Director, Zoological Survey of India, Kolkata and Incharge Division of Entomology B, Zoological Survey of India, Kolkata for providing facilities and encouragement.

REFERENCES

- Banerjee, S.K. & Kevan, D. K. MCE. 1960. A preliminary revision of the genus *Atractomorpha* Saussure, 1862 (Orthoptera : Acridoidea : Pyrgomorphidae). *Treubia*, **25** : 165-189.
- Bhowmik, H.K. 1986. Grasshoppers fauna of West Bengal, India (Orthoptera : Acrididae). *Technical Monograph*, **14** : 1-180.
- Bolivar, I. 1914. Estudios entomologicos, segunda parte. *Trab. Mus. Cienc. nat. Madr.*, **20** : 1-110.
- Bolivar, I. 1918. Contribution al conocimiento de la fauna indica Orthoptera (Locustidae vel Acridiidae). *Revta R. Acad. Cienc. Exact. Fish nat. Madr.*, **16** : 278-89, 374-412.
- Dirsh, V.M. 1954. Revision of the species of the genus *Acrida* Linn. (Orthoptera : Acrididae). *Bull. Soc. Faunad. Ler. d' ent., Cairo*, **38** : 107-160, 8 maps.
- Dirsh, V.M. 1958. Revision of the genus *Eyprepocnemis* Fiebr, 1853 (Orthoptera : Acridoidea). *Proc. R. ent. Soc. Lond.*, **B, 27** : 33-45, 27 figs.
- Dirsh, V.M. and Uvarov, B.P. 1953. Preliminary diagnosis of new genera and new synonymy in Acrididae. *Tijdschr. Ent. Amsterdam*, **96** (3) : 231-237.

- Hazra, A.K., Tandon, S.K., Shishodia, M.S., Dey., A. and Mondal, S.K. 1993. The Acridoidea (Insecta : Orthoptera) of West Bengal. *Fauna of West Bengal, State Fauna Series*, **3**(Part-4) : 287-234 (Zoological Survey of India).
- Henry, G.M. 1940. New and little known South Indian Acrididae (Orthoptera). *Trans. R. ent. Soc. Lond.*, **90** : 497-540, 18 figs.
- Hollis, D. 1965. A revision of the genus *Trilophidia* Stal (Orthoptera : Acridoidea) *Trans. R. ent. Soc. Lond.*, **117**(8) : 245-262, 33 figs.
- Hollis, D. 1968. A revision of the genus *Ailopus* Fibr (Orthoptera : Acridoidea). *Bull. Br. Mus. Nat. Hist. (Ent.)*, London, **22**(7) : 307-355, 102 text figs.
- Hollis, D. 1971. A preliminary revision of the genus *Oxya* Audinet-Serville (Orthoptera : Acridoidea). *Bull. Br. Mus. Nat. Hist. (Ent.)*, London, **26**(7) : 269-343.
- Hollis, D. 1975. A review of the subfamily Oxyinae (Orthoptera : Acridoidea). *Bull. Br. Mus. Nat. Hist. (Ent.)*, London, **31**(6) : 191-234.
- Kirby, W.F. 1914. The fauna of British India, including Ceylon and Burma, Orthoptera (Acrididae). ix + 296pp, London.
- Mason, J. B. 1973. A revision of the genera *Hieroglyphus* Krauss, *Parahieroglyphus* Carl and *Hieroglyphodes* Uvarov (Orthoptera : Acridoidea). *Bull. Br. Mus. Nat. Hist. (Ent.)*, London, **28**(1) : 507-560, 12 text figs., 4 maps.
- Nawab, A. 2000. Plant species composition and structure of Hastinapur Wildlife Sanctuary, U.P. India. M.Sc. Dissertation, Aligarh Muslim University, Aligarh, India.
- Ritchie, J.M. 1981. A taxonomic revision of the genus *Odealeus* Fiber (Orthoptera : Acrididae). *Bull. Br. Mus. Nat. Hist. (Ent.)*, London, **42**(3) : 83-183.
- Ritchie, J.M. 1982. A taxonomic revision of the genus *Gastrimargus* Saussure (Orthoptera : Acrididae). *Bull. Br. Mus. Nat. Hist. (Ent.)*, London, **44**(3) : 239-329.
- Shishodia, M.S. and Hazra, A.K. 1985. Insecta : Orthoptera. *Rec. zool. Surv. India*, **82**(1-4) : 15-32. (In : Special issue of fauna of Namdhapa Biosphere Reserve, Arunachal Pradesh.
- Shishodia, M.S. and Hazra, A.K. 1986. Orthoptera fauna of Silent Valley, Kerala. *Rec. zool. Surv. India*, **84**(1-4) : 191-228.
- Tandon, S.K. 1975. On the genus *Chondracris* Uvarov (Insecta, Orthoptera) : Acridoidea : Acrididae : Cyrtacanthacridinae in India. *Dr. B.S. Chauhan Comm.* : 395-402.
- Tandon, S.K. 1976. A check-list of the Acridoidea (Orthoptera) of India, Part-I. Acrididae. *Rec. zool. surv. India, Misc. Publ. Occ. Paper No.*, **3** : 1-48.
- Tandon, S.K. and Shishodia, M.S. 1977. The Acridoidea (Insecta : Orthoptera) of Goa. *Rec. zool. Surv. India*, **72** : 295-307.
- Uvarov, B.P. 1921. Records and description of Indian Acrididae. *Ann. Mag. nat. Hist.* London, **7**(9) 480-509.

- Uvarov, B.P. 1927. Distributional records of Indian Acrididae. *Rec. Indian Mus. Calcutta*, **29** : 233-239.
- Uvarov, B.P. 1940. Twenty-eight new generic names in Orthoptera. *Ann. Mag. nat. Hist. London*, (11) **5** (26) : 173-176.
- Uvarov, B.P. 1940a. Twenty-four new generic names in Orthoptera. *Ann. Mag. nat. Hist. London*, (11) **6**(31) : 112-117.
- Uvarov, B.P. 1942. New Acrididae from India and Burma. *Ann. Mag. nat. Hist. London*, (11) **9**(56) : 587-607.
- Uvarov, B.P. 1966. Grasshoppers and locusts, *A hand book of general Acridology*. I Cambridge University Press. xi + 484 pp.
- Willemse, C. 1955. Synopsis of the Acridoidea of the Indo-Malayan and adjacent regions. (Insecta, Orthoptera) part II, Fam. Acrididae, Subfam. Catantopinae, part two. *Publties. natuurh. Genoot. Limburg*, Reeks, **10** : 227-500.



Rec. zool. Surv. India : **109**(Part-4) : 77-78, 2009

OBSERVATIONS ON SOME BEHAVIOURAL ASPECTS OF THE POTTER WASP *XENORHYNCHIUM NITIDULUM* (FABRICIUS) (HYMENOPTERA : VESPIDAE : EUMENINAE)

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INTRODUCTION

In a study on eumenid wasp *Xenorhynchium nitidulum* (Fabricius), we observed the presence of more than one female in a nest without division of labour and also reuse of cells in a nest by other female wasps and young adults. These studies on *X. nitidulum* is based on direct observations on certain nests at different sites within the campus of Bharathiar University, Coimbatore district, Tamil Nadu, India and from Kanjikode, Palakkad district, Kerala state, India from January 2004 to January 2007.

OBSERVATIONS

Initially the wasp *Xenorhynchium nitidulum* (Fabricius) hovers several times round the area to be selected, and inspects the substratum. Usually the cell sites are locations like window sills, door frames, tube light frames and walls.

The wasp after site selection for cell building brings moist mud pellets directly from wet ground surface. The wasp places these pellets one by one and forms a barrel shaped cell (Plate 1). But at this instance it was observed that till the cell building proceeded half way the wasp constructed the cell from outside. Then the other half of the cell was completed by the wasp sitting inside the cell. In this way the adult female wasp measured the depth and surface area of the cell. In about 30- 33 pellets, the cell was completed. Construction of a single cell was completed within one and half hours. After the completion of one cell, the wasp flew to the nearby areas and after gathering the resinous exudations from the *Acacia arabica* trees, gave a nice resinous coating on the whole surface area of the cell (Plate 3).

The female wasp then laid an egg at the bottom of the cell. In the same cell the mother wasp also resides. From the first day to the third day till the egg hatched and to a grub, the mother wasp stayed in the same cell. After hatching of the egg on the third day, the mother wasp immediately

started to feed the grub by progressive provisioning (Plate 2). After hatching for up to eight days the mother wasp fed the grub twice a day. Everyday the mother wasp was seen feeding the grub in the morning between 9 am to 11 am and in the evening between 3 pm to 4.30 pm. The mother wasp used to collect pod borers from the pods of the nearby *Acacia arabica* trees. After eight days, the mother wasp started to dump more caterpillars (9- 12 caterpillars) as mass provisioning and closed the cell. Then, it started to construct the next cell. In this way, the wasp constructed up to 25 cells in a nest.

In a time of 10 to 12 days, the grub grew well and attained maturity. Then it started pushing the faecal pellets to one corner of the cell and knitted a papery envelop throughout the inner surface by using its saliva and underwent pupation. Pupation lasted to 10-12 days and in a few days the young adult emerged its way out by gnawing through thus opening the cell. The whole life cycle of the wasp was completed in a period of 32-35 days. All these activities were recorded by dislocating the nest and by dissecting various cells of various nests at different localities from the study sites during the study period from January 2004 to January 2007. The young ones that emerged from the cells stayed in the same cell of the nest (Plate 4). It was also noticed that the parent male, female and other female wasps also stayed in the cells of the same nest (Fig. 5). Copulation took place on the nest itself. The male mounted on the female by fanning the wings with the antennae lowered along with the females.

The mother wasp was always seen in the nest other than the times it went for foraging, cell construction and provisioning.

SUMMARY

In the wasp *Xenorhynchium nitidulum* (Fabricius), only single female is responsible for cell construction and brood rearing of that particular nest. Observations of different cells in a nest in different nesting sites indicate that the larvae are progressively provisioned at least in the early larval stages, i.e. from 5- 8 days and then mass provisioning is given. Female sit facing outward in uncapped cells and sting defensively. The wasp gives a resinous coating on the whole surface area of the nest. The courtship behaviour was observed on the nest.

ACKNOWLEDGEMENTS

The first author is grateful to the Head of the Department of zoology, Bharathiar University, Coimbatore. The authors are also grateful to Dr. Ramakrishna, Director, Zoological Survey of India, Kolkata for facilities and encouragements.

PLATE-I



The female *Xenorhynchium nitidulum* (Fabricius) in the process of cell construction.

PLATE-II



The female *Xenorhynchium nitidulum* (Fabricius) in the process of feeding its young grub.

PLATE-III



The female *Xenorhynchium nitidulum* (Fabricius) in the process of coating resinous material.

PLATE-IV

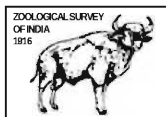


The young adult and mother wasp in a nest.

PLATE-V



The parent male, female and other female wasps seen in different cells of a nest.



Rec. zool. Surv. India : **109**(Part-4) : 79-86, 2009

SOME BACTERIVOROUS NEMATODES FROM UTTARAKHAND, INDIA

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INTRODUCTION

Nematodes are biologically diverse and versatile, occupying an enormous range of habitats with variable feeding habits. They constitute nearly 90% of all Metazoan in number and have 26646 recorded species with 8359 species parasitic in vertebrates, 10681 species free-living, 4105 species parasitic in plants and 3501 species parasitic in invertebrate hosts (Hugot *et al.*, 2001). Further, soil-inhabiting nematodes predominate over all other soil animals, both in numbers and species. On the basis of feeding habits these soil inhabiting nematodes are classified as plant feeders, bacterial feeders, fungal feeders, predators and omnivores (Yeates *et al.*, 1993). Earlier most of the researches were focused on plant feeders because of the economic losses to agriculture. Though free-living nematodes (bacterial and fungal feeders) accounts to a large number of species, they have remained ignored for a long time due to their apparent low economic value. However, recent researches proved that these groups are important components of food chains and possess several attributes that make them useful ecological indicators (Freckman, 1988; Bongers, 1990; Neher, 2001). The Bacterivorous (bacterial feeders) nematodes occur in several orders like Rhabditida, Alaimida, Monhysterida, Aerolaimida, Enoplida, etc.

A few papers on bacterivorous nematodes from Uttarakhand are of Siddiqi & Husain (1967) who recorded two species from Nainital and Dehradun districts; Khera & Chaturvedi (1977) recorded several species from the Tea Plantations of Dehradun; Jairajpuri & Khan (1982) recorded 3 species from Nainital & Dehradun Districts. Recently, Rizvi recorded these nematodes from Corbett Tiger Reserve (CTR), district Nainital (Rizvi, 2008) and from the Western Doon Shivalik (WDS) region of district Dehradun (Rizvi, 2007). The present paper reports 5 new records of bacterivorous nematodes from Uttarakhand, belonging to 3 orders, namely, Rhabditida (2 species); Aerolaimida (2 species) and Alaimida (1 species). Out of these 5 species, 4 are being recorded from district Dehradun and 1 species from district Chamoli.

MATERIALS AND METHODS

Soil samples collected from soil around roots of Sugarcane, Mango, Litchi, Deodar, Sal and Pine from Dehradun, were processed by sieving and decantation technique. The nematodes were fixed, dehydrated and mounted in anhydrous glycerine. Measurements were made with an ocular micrometer on Leica WILD MPS 32. Photomicrographs taken with BX51DIC Olympus microscope and DP20 digital camera.

OBSERVATIONS

Order RHABDITIDA

Suborder RHABDITINA

Superfamily RHABDITOIDEA

Family RHABDITIDAE

Subfamily PELODERINAE

Genus *Caenorhabditis* (Osche, 1952) Dougherty, 19531. *Caenorhabditis elegans* (Maupas, 1899) Dougherty, 1953

(Fig. 1)

1899. *Rhabditis elegans* Maupas, Arch. zool. expt. gen., **8** : 480.1953. *Caenorhabditis elegans* Dougherty, Thapar Comm. Vol., : 70.*Material examined* : (n = 5) Female : L = 0.70-1.1 mm; a = 19-21; b = 6-8; c = 8-10; V = 52-55.

Male : (n = 2) L = 0.53-0.65 mm; a = 16-18; b = 4.2-4.8; c = 22-25.

Description : Body tapering slightly at extremities. Lips with the usual circles of six labial papillae and four cephalic papillae. Stoma 15 µm long, 4 µm wide; denticles on metarhabdions not clearly visible. Pharyngeal collar surrounds about half the stoma. Pharyngeal corpus with prominent basal swelling. Pharyngeal corpus without a median bulb. Basal bulb with valve plate. Lateral fields marked by four incisures. Nerve ring located at the middle of isthmus. Excretory pore opposite to anterior end of bulb. Vulva median, ovaries paired, opposed, reflexed. Female tail conical and long, 88-110 µm. Phasmids located at one-fourth-one-third of the tail.

Male tail peloderan with 9 pairs of bursal papillae. Spicules straight to slightly curved, 40-48 µm long. Gubernaculum straight to slightly curved, 28-30 µm long.

Remarks : The measurements are in agreement with the earlier workers. This species is being recorded for the first time from district Dehradun, Uttarakhand.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Germany, France, Bulgaria, Italy, England, Denmark, Soviet Union, China, Algeria and United States.

Habitat and Locality : Soil around roots of Pine, *Pinus* sp from FRI forest, Dehradun.

Suborder CEPHALOBINA

Family CEPHALOBIDAE

Subfamily ACROBELINAE

Genus *Zeldia* Thorne, 19372. *Zeldia punctata* (Thorne, 1925) Thorne, 1937

(Fig. 2)

1925. *Acrobeles punctata* Thorne, Trans. Amer. Micr. Soc., **44** : 200.1935. *Acrobeles glaphyrus* Steiner, Proc. Helm. Soc. Wash., **2** : 41.1937. *Zeldia punctata* Thorne, Proc. Helm. Soc. Wash., **4** : 15.1972. *Zeldia minor* Allen & Noffsinger, Proc. Helm. Soc. Wash., **39** : 220.

Material examined : (n = 2) Female : L = 0.75-0.85 mm; a = 18.6-21; b = 3.5-4.1; c = 11.5-12.5; V = 58-60.

Description : Body straight or slightly curved ventrally upon fixation. Cuticle without punctuation. Cuticle annulated, annules 1.8-1.9 μm at midbody and 2.6 μm on tail. Lateral fields marked by five incisures. Outer incisures widely spaced, three inner incisures very closely placed and not visible clearly. Lip region 10-12 μm wide, 2.5 μm high. Labial probolae with rounded margins and shallow grooves. Cephalic probolae six, flap-like, edges crenate anteriorly projecting margins at the primary cephalic axils. Amphidial apertures elongate oval. Cheilostome wall prominent. Gymnostom smaller than stegostom. Pharyngeal corpus cylindrical, six or eight times isthmus length. Basal bulb valvated, 22-25 $\times$ 18-22 μm . Excretory pore opposite nerve ring. Cardia conoid, 3.0-3.5 μm long. Gonad single, prodelphic. Ovary reflexed, with additional flexures near the tip. Post-uterine sac 15-20 μm long. Vulval lips depressed, radially ridged. Rectum, 24-25 μm long. Tail 0.065-0.068 mm long, conoid, with pointed terminus. Phasmids anterior to middle of tail.

Male : Not found.

Remarks : This species is being recorded for the first time from Uttarakhand. Soil around root zone of Deodar is a new habitat record.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Namibia, Hungary, Poland, Spain and U.S.A.

Habitat and Locality : Soil around roots of Deodar from Chakrata, district Dhradun.

Order ARAEOLAIMIDA

Superfamily PLECTOIDEA

Family PLECTIDAE

Subfamily PLECTINAE

Genus *Plectus* Bastian, 1865

3. *Plectus cirratus* Bastian, 1865

(Fig. 2)

1865. *Plectus cirratus* Bastian, Linn. Soc. Lond. Trans., 25 : 95.

Material examined : (n = 2) Female : L = 0.90-0.93 mm, a = 21-22; b = 4.1-4.3; c = 7.9-8.1; V = 51-52.

Description : Female : Body arcuate ventrally upon fixation. Cuticle thick finely striated. Lip region slightly set off, 9-10 μm wide. Setae behind the lip region. Amphid opening circular. Stoma 21-30 μm long, 4-5 μm wide. Pharyngeal corpus cylindrical with a valvular terminal bulb. Cardia long, surrounded by intestine. Vulva median. Ovaries two, opposed reflexed. Tail, 0.113-0.114 mm long, tapering terminus with spinneret.

Male : Not found.

Remarks : All measurements are in agreement with earlier workers except for slightly posteriorly situated vulva (41-50% of body length). This species is being recorded for the first time from Uttarakhand and also for the first time from rice fields.

Distribution : India : Uttarakhand, Uttar Pradesh, Sikkim.

Elsewhere : South Africa, Hungary and USA.

Habitat and Locality : Soil from rice fields, Sahiya, district Dehradun.

Genus *Chiloplectus* Andrassy, 1984

4. *Chiloplectus indicus* Tahseen *et al.*, 2004

(Fig. 3)

2004. *Chiloplectus indicus* Tahseen *et al.*, *Nematology*, **6** : 760-763.

Material examined : (n = 3) Female : L = 0.48-0.52 mm, a = 17-20; b = 3.5-3.7; c = 8.7-9.0; V = 53.2-53.

Description : Female : Body arcuate towards posterior extremity. Cuticle thick, strongly annulated. Lateral Fields with three incisures. Lip region strongly set off, with conical lips, separated from each other by a distinct gap, with inner setose projections pointing towards oral aperture. Cephalic setae 2-3 μ m long, originating from second to third annule. Cervical setae 7-9 in number. Stoma with cuticularized cheilostome. Amphidial apertures plectoid, located anterior to middle of stoma, at 5-6 annules from base of lips. Pharynx with corpus, slightly narrower isthmus and a basal bulb with post bulbar extension leading to a small cardia. Basal pharyngeal bulb with a six pairs of denticulate ridges in grinder. Reproductive system didelphic, amphidelphic, genital tract weakly developed. Ovaries small, reflexed. Vagina straight with weak sphincter muscles. Vulval lips protruding. Tail 55-75 μ m long, ventrally curved, gradually narrowing towards tip with a subterminal mid dorsal spur and three pairs of caudal setae.

Male : Not found.

Remarks : *Chiloplectus indicus* is being recorded for the first time from Uttarakhand (district Chamoli) at an altitude of 10,000 ft. Soil around roots of thumer is a new habitat record. All the measurements are in agreement with Tahseen *et al.*, (2004) except for smaller body length and slightly smaller tail length (L = 0.695-1.041 mm; Tail = 0.068-0.105 mm).

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

Habitat and Locality : Soil around roots of thumer, *Taxus baccata* and silver oak from Ghangharia, district Chamoli.

Order ALAIMIDA

Family ALAIMIDAE

Genus *Alaimus* de Man, 1880

5. *Alaimus primitivus* de Man, 1880

(Fig. 3)

1880. *Alaimus primitivus* de Man, *Tijds. Nederland Dierk. Vereen*, **5** : 10.

Material examined : (n = 5) Female : L = 0.8-1.2 mm; a = 42-58; b = 3.7-4.3; c = 7.1-8.4; V = 39-55.

Description : Female : Body tapering uniformly at both extremities. Cuticle smooth. Lip region rounded. Pharynx in two parts, anterior narrow tubular and posterior slowly expanding to form an

elongated basal swelling. Vulva a transverse slit. Ovary reflexed about half way to vulva. Gonad mono-opisthodelphic. Tail long and narrow, 0.11-0.14 mm.

Male : Not found.

Remarks : This species is being recorded for the first time from Uttarakhand. Sugarcane fields and Pine plantations are new habitat records.

Distribution : India : Uttar Pradesh, Sikkim and Uttarakhand.

Elsewhere : U.S.A. South Africa, Germany, Belgium, Hungary, Poland, Sweden and Australia.

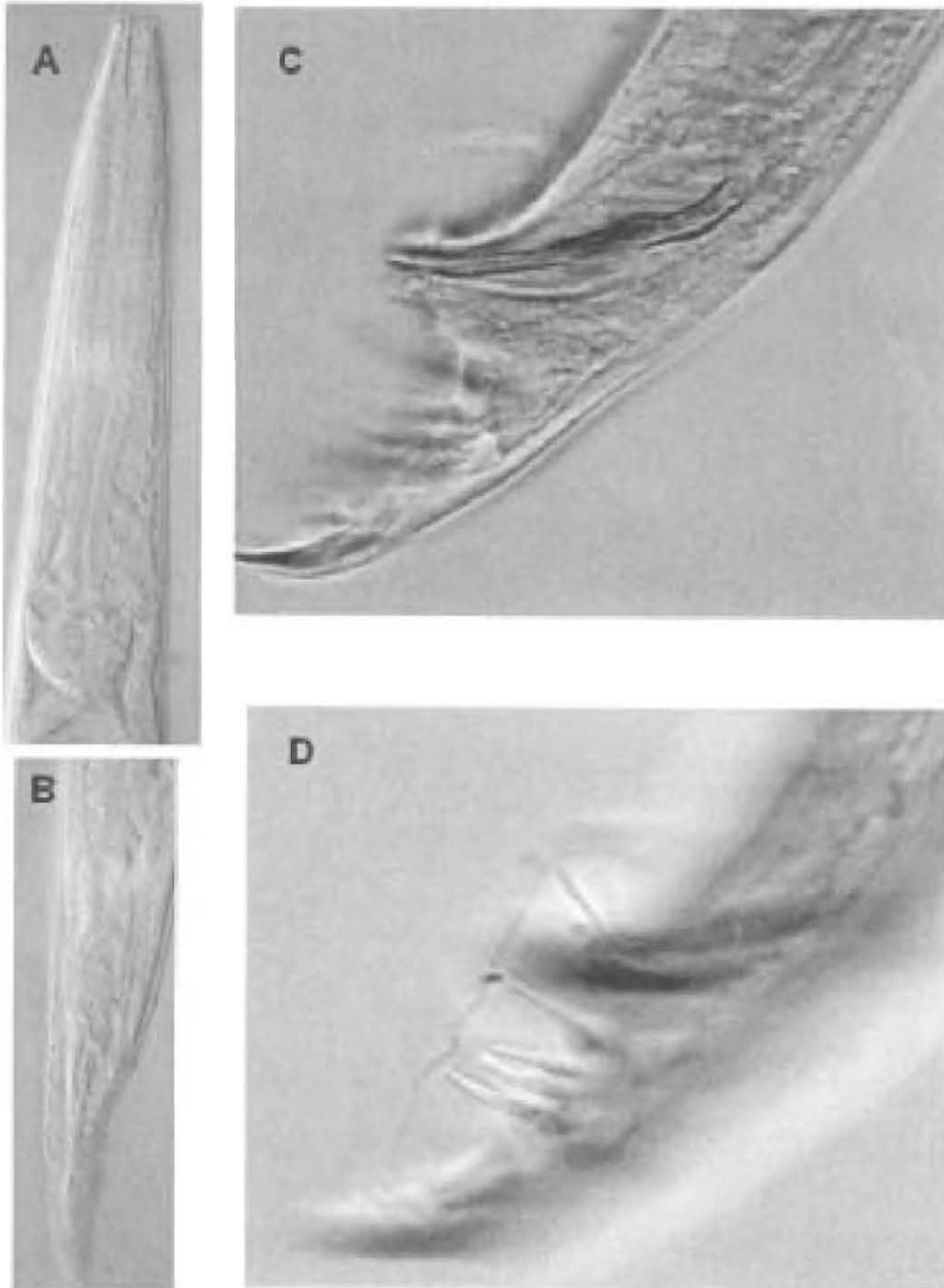
Habitat and Locality : Soil around roots of Sugarcane, Mohand Rao, Doiwala and Pine from FRI, Dehradun.

ACKNOWLEDGEMENTS

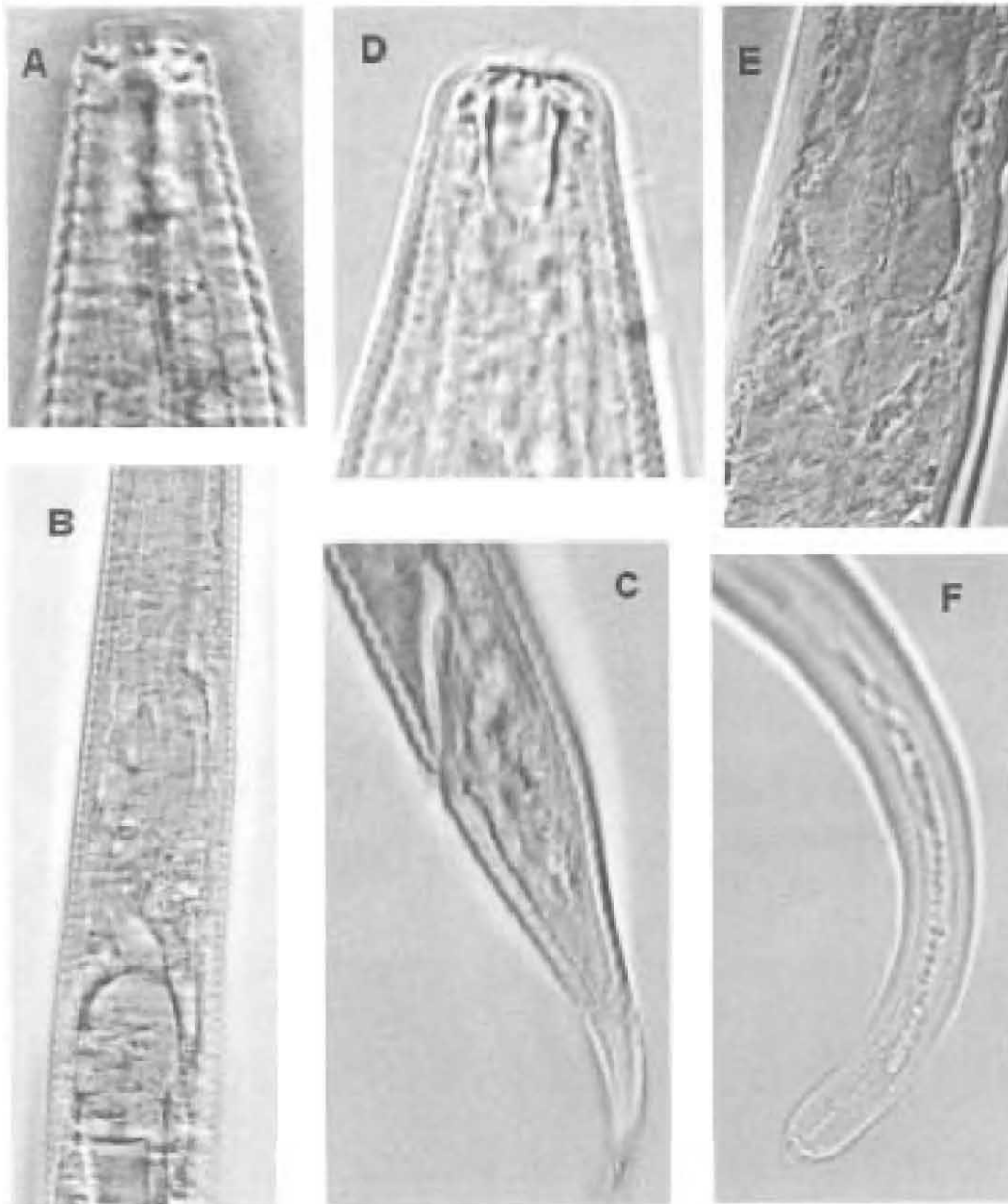
The Authors are grateful to the Director, Zoological Survey of India, Kolkata for providing necessary facilities. Sincere thanks are due to Dr. Mukhtar Ahmad, Head, and Shri R.S. Bhandari, Forest Entomology Division, Forest Research Institute, Dehradun for providing the Instrumentation Laboratory Facilities. Special thanks are due to Shri C. Radhakrishnan, Add. Director, Zoological Survey of India, Western Ghats Field Research Station, Calicut, for his valuable suggestions.

REFERENCES

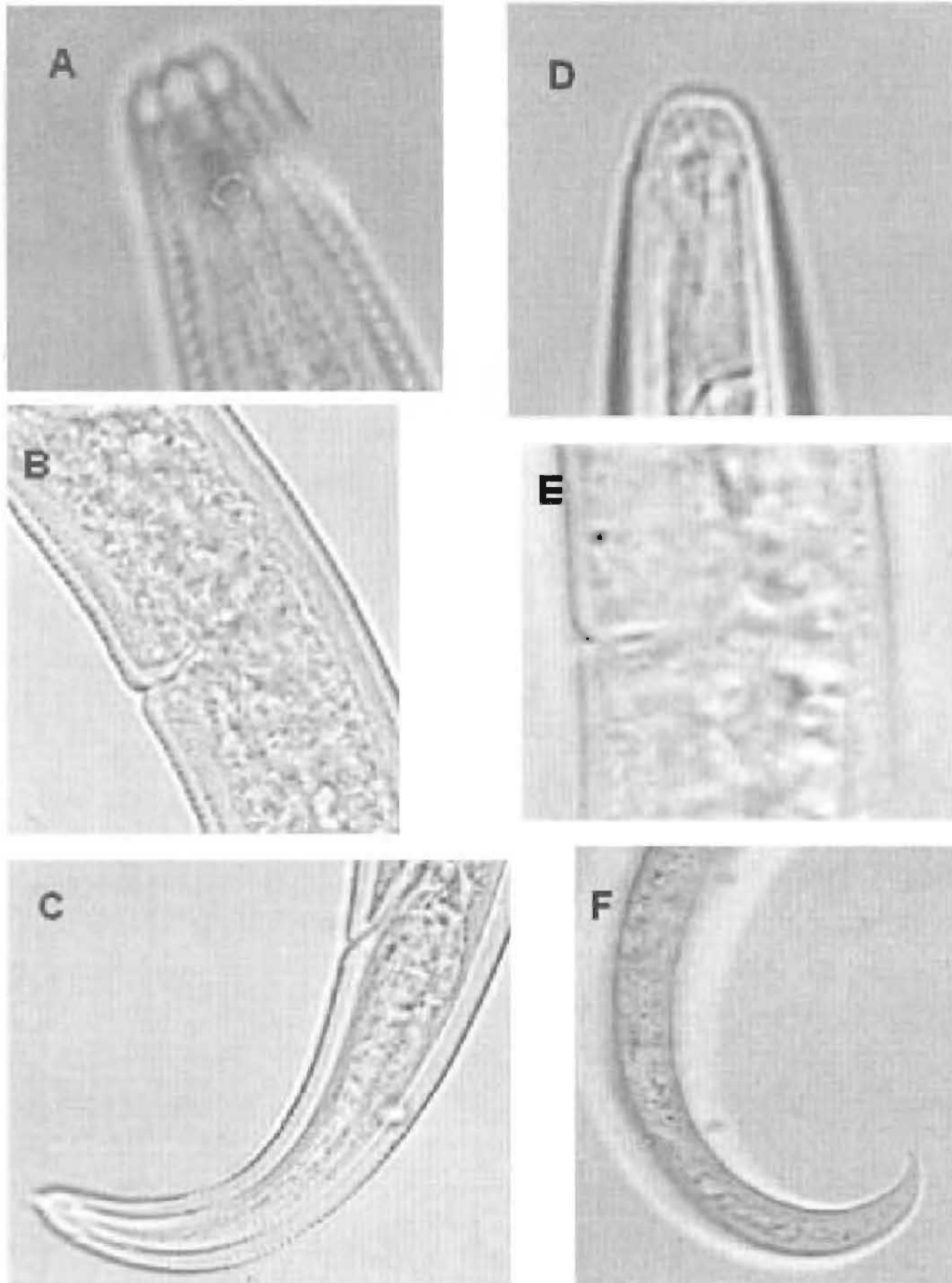
- Bongers, T. 1990. The maturity index : an ecological measure of environmental disturbance based on nematode species composition. *Oecologia*, **83** : 14-19.
- Freckman, D.W. 1988. Bacterivorous nematodes and organic matter decomposition. *Argic. Ecosys. Environ.*, **24** : 195-217.
- Hugot, J.P., Baujard, P. & Morand, S. 2001. Biodiversity in Helminth nematodes as a field study : an overview. *Nematology*, **3**(3) : 199-208.
- Jairajpuri, M.S. & Khan, W.U. 1982. *Predatory Nematodes (Mononchida)*. Associated publishing Company, New Delhi, 131 pp.
- Khera, S. & Chaturvedi, Y. 1977. Nematodes from Tea Plantations of Dehradun, India. *Rec. zool. Surv. India*, **72** : 125-152.
- Neher, D. 2001. Role of nematodes in soil health and their use as indicators. *J. Nematol.*, **33** : 161-168.
- Rizvi, A.N. 2007. Nematoda : In : *Fauna of Western Doon Shivaliks*, Zoological Survey of India, Kolkata : 5-12.
- Rizvi, A. N. 2008. Plant and Soil Nematodes; In : *Fauna of Conservation Areas 35 : Fauna of Corbett Tiger Reserve (Selected Groups)* Zoological Survey of India, Kolkata, **35** : 119-123.
- Siddiqi, M.R. & Husain, Z. 1967. Studies on the Genus *Alaimus* de Man, 1880, with description of six new species from India. *Proc. Helminth. Wash. Soc.*, **34** : 158-167.
- Tahseen, Q., Baniyamuddin, M., Hussain, A. & Ahmad, W. 2004. Description of two new species of Plectinae (Nematoda : Araeolaimida) from India. *Nematology*, **6** : 755-764.
- Yeates, G.W., Bongers, T., De Goerde, R.G.M., Freckman, D.W. & Georgieva, S.S. 1993. Feeding habits in soil nematode families and genera—An outline for soil ecologists. *J. Nematol.*, **25** : 101-313.



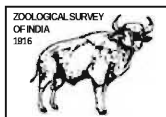
Figs. 1. Photomicrographs of *Caenorhabditis elegans*; A. Female anterior end. B. Female posterior end. C. Male spicule. D. Male caudal papillae



Figs. 2. Photomicrographs of *Zeldia punctata* (A-C) & *Plectus cirratus* (D-F); A. Female anterior end. B. Pharyngeal bulb. C. Tail. D. Female anterior end. E. Pharyngeal bulb. F. Tail.



Figs. 3. Photomicrographs of *Chiloplectus indicus* (A-C) & *Alaimus primitivus* (D-F); A. Female anterior end. B. Vulval region. C. Tail. D. Female anterior end. E. Vulval region. F. Tail.



Rec. zool. Surv. India : **109**(Part-4) : 87-104, 2009

ON A COLLECTION OF CHALCIDOIDEA (HYMENOPTERA : INSECTA) FROM ORISSA, INDIA

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INTRODUCTION

The super family Chalcidoidea (popularly called “Chalcids”) forms one of the largest, species rich and taxonomically difficult group of insects belonging to the Order Hymenoptera (Ants, bees and wasps). As per the current estimates, about 22,000 species of Chalcids have been described and catalogued world wide and recent estimates suggest that there may be more than 500000 species in existence (Noyes, 2003). Chalcids are distributed in all zoogeographical regions of the world and majority of them are parasitoids attacking a large range of insect orders in their various stages of development and groups of species in several families are phytophagous, associated with different plant families. Chalcids attack insect hosts in 15 different orders and are also associated with spider egg sacs and some acari and other arachnids. By parasitizing a wide range of insects, chalcids play a vital in the terrestrial ecosystems in controlling the populations of insect pests. Many species of them have been utilized successfully in biological control programmes all over the world and majority of successful biological control projects of insect pests have used Chalcids to achieve substantial or complete control (Greathead, 1986). The great diversity in their morphology, biological intricacy and specialization combine to make them one of the most marvelously rewarding group of insects to study. Though Chalcids are mainly beneficial, more than 80 species of them are also known to be pests of agriculture. Members of some of the families like Eurytomidae and Torymidae make galls and attack seeds of crop plants.

When compared to the other parts of the world, knowledge on the Chalcid fauna of India and adjacent countries is far from satisfactory. In recent years intensive studies on Indian fauna have been undertaken by Boucek *et al.* (1979), Subba Rao & Hayat, 1985, 1986, Noyes and Hayat, 1994, Hayat, 1998, 2006, Narendran, 1989, 1994, 1999, 2007, Sureshan, 2003 and Sureshan and Narendran, 2003, 2004. The present study is based on a collection of chalcidoidea made from southern coastal districts of Orissa. viz. Ganjam, Puri, Kurdha, Nayargarh, Cuttack, Jagatsinghpur,

Jajpur and Kendrapara during the years 2005 to 2007. The specimens were identified following recent literature on Chalcidoidea (Boucek, 1988, Gibson *et al.*, 1993, Narendran 1989 (Chalcididae) Narendran, 1994 (Torymidae and Eurytomidae) Sureshan, 2003, Sureshan & Narendran 2004, Boucek and Rasplus, 1991, Graham, 1969 (Pteromalidae). The classification of Chalcidoidea and terminology given by Boucek (1988) is followed in the present work. A total of 45 species of Chalcidoidea belonging to 28 genera and 4 families are reported from the state of Orissa and almost all of them were recorded for the first time from the state. The collections are deposited in Zoological Survey of India, Estuarine Biological Station, Gopalpur-on-Sea, Orissa.

Following abbreviations are used in the text: F-Female, F1-F6-Funicular segments 1 to 6; M-Male, MV-Marginal vein; OOL-Ocellocular distance; PMV-Post marginal vein ; POL-Postocellar distance; SMV-Submarginal vein; STV-Stigmal vein; T1-T4-Gastral tergites 1 to 4.

SYSTEMATIC ACCOUNT

Family PTEROMALIDAE

Subfamily PTEROMALINAE

1. *Anisopteromalus calandrae* (Howard)

1881. *Pteromalus calandrae* Howard. *Ann. Report U.S. Dept. Agr. for.*, 1880 : 273. M, USA (Texas).

1937. *Neocatolaccus indicus* Ayyar & Mani, *Rec. Indian. Mus.*, **39** : 126: F, India (Coimbatore).

2003. *Anisopteromalus calandrae* (Howard) : Sureshan, *Rec. zool. Surv. India. Occ. Paper No.*, **205** : 16.

Diagnostic characters : Length 2.1-3.1 mm. Head and thorax bluish black, gaster brownish black; head finely reticulate, POL 1.6x OOL; antennae with scape not reaching median ocellus; pronotal collar not carinate, edge sharp; gaster elongate, as long as or longer than head and thorax combined.

Material examined : 1F, Jajpur dist., Krishnadaspur, Mantuka village, 10.iii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, Orissa (present record) Tamil Nadu, West Bengal; Pakistan and Myanmar. Cosmopolitan.

Remarks : Common parasite of beetles (Coleoptera) associated with stored products. Recorded hosts include *Sitophilus oryzae*, *Sitophilus granarius*, *Tribolium castaneum*, and *Callosobruchus* sp.

2. *Callitula peethapada* Narendran & Mohana

2001. *Callitula peethapada* Narendran & Mohana. *Uttar Pradesh J. Zool.* 21 (1) : 31. F, India (Kerala).

Diagnostic characters : Female : Length 1.4-2.1 mm. Head and thorax metallic green with bronzy reflection dorsally; gaster brown with a broad yellowish spot dorsally at base; head 1.4x as wide as thorax, POL 1.6x OOL; anterior margin of clypeus shallowly emarginate, antennal scape reaching well beyond level of vertex, terminal stylus of club long; pronotal collar anteriorly margined; gaster elongate, ovate, 0.84x as long as head and thorax combined.

Material examined : 1F, Kendrapara dist., Girango village, 12.iii.07, coll. P.M. Sureshan.

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

3. *Callitula rugosa* (Waterston)

1915. *Trigonogastra rugosa* Waterston. *Bull. Ent. Res.*, **5** : 326, M, F. Sri Lanka.

1978. *Callitula rugosa* (Waterston) : Boucek *et al.*, *Oriental Ins.*, **12**(4) : 437.

2003. *Callitula rugosa* (Waterston) : Sureshan, *Rec. Zool. Surv. India. Occ. Paper No.*, **205** : 19.

Diagnostic characters : Female : Length 1.5-1.8 mm. Head and thorax dark green, almost black, gaster brownish black, antennae brown except scape yellowish brown; POL 1.5x OOL; anterior margin of clypeus slightly emarginate; Forewing with MV 2x STV; gaster as long as thorax, not collapsing, T1 occupying more than 1/3 length, T2 large, occupying 0.2x length of gaster.

Material examined : 1F, Jajpur dist., Panchapandava, 15.iii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, Orissa (present record); Sri Lanka.

Remarks : Parasitoid of *Ophiomyia phaseoli* (Diptera : Agromyzidae).

4. *Callitula travancorensis* Sureshan

2002. *Callitula travancorensis* Sureshan. *Rec. zool. Surv. India*, **100**(1-2) : 26. F, India (Kerala).

Diagnostic characters : Length 1.1-1.4 mm. Head and thorax black, gaster mostly yellowish brown; clypeus weakly emarginate; POL 1.7x OOL; terminal stylus of antennal club short. Pronotal collar finely but sharply carinate. Forewing with basal cell closed, speculum narrow, almost closed below. Gaster short, petiole wider than long, T1 reaching more than one third length of gaster.

Material examined : 3F, Puri dist., Ashram, 22.i.06; 1F, Jajpur dist., Panchapandava, 15.iii.07, coll. P.M. Sureshan.

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

5. *Dinarmus acutus* (Thomson)

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

2003. *Dinarmus acutus* (Thomson) : Sureshan, *Rec. zool. Surv. India, Occ. Paper No.*, **205** : 34.

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

Material examined : 3F, Ganjam dist., Gopalpur, 9.viii.05; 1F, Jajpur dist., Ratnagiri, 17.iii.07; 1F, Udayagiri, 17.iii.07; 1F, Kendrapara, Girango village, 12.iii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, Maharashtra, Orissa (present record); Europe.

Remarks : Common species parasitizing bruchid beetles.

6. *Dinarmus maculatus* (Masi)

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

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

2003. *Dinarmus maculatus* (Masi) : Sureshan, *Rec. zool. Surv. India, Occ. Paper No.*, **205** : 35.

Diagnostic characters : Female : Length 2.5-3 mm. Metallic blue with bronzy patches on vertex and thorax, gaster darker; anterior margin of clypeus almost straight, not projecting ; POL sub equal to OOL; antennal scape reaching up to middle of median ocellus; third anellus as long as first and second combined; forewing with PMV as long as or slightly longer than MV; gaster cordiform.

Material examined : 2M, Jajpur dist., Sukuapoda, near Lalitagiri, 15.iii.2007, 1F, Udayagiri, 17.iii.07. 2M, Ponosora village, Panchapandava, 15.ii.07; 1F, Ganjam dist., Ramba, 20.vi.2005, 1F, 2M, Kendrapara dist, Indupur, Dhumata, 13.iii.07, coll. P.M. Sureshan.

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

Remarks : Common species, parasitic on Bruchid beetles.

7. *Dinarmus colemani* (Crawford)

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

2003. *Dinarmus colemani* (Crawford) : Sureshan, *Rec. zool. Surv. India, Occ. Paper No.*, **205** : 35.

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

Material examined : 1F, Jajpur dist., Panchpandava, 15.iii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, Bihar, Delhi, Karnataka, Tamil Nadu, Orissa (present record); Bangladesh.

Remarks : Uncommon species, parasitoid of *Callosobruchus chinensis* and other bruchid beetles in stored products.

8. *Metastenus indicus* Sureshan & Narendran

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

Diagnostic characters : Length 1.6-1.8 mm. Black; antennae testaceous; POL little greater than OOL; antennae inserted below centre of face; both mandible with three teeth; anterior margin of pronotal collar not carinate; propodeum with nucha short, finely reticulate, plicae very fine, almost indistinct. Gaster little longer than head plus thorax combined.

Material examined : 1F, Puri dist., Kushabadra, 22.i.2006, 6F, 1M, Kendrapara dist., Indupur, Dhumata, 13.iii.07; 1F, Giango village, 12.iii.07, 2M, Jajpur dist., Ratnagiri, 17.iii.07, coll. P.M. Sureshan.

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

9. *Norbanus acuminatus* Dutt & Ferriere

1961. *Norbanus acuminatus* Dutt & Ferriere. *Ind. Jr. Agric. Sci.*, **31** : 141. F, India (Barrackpore).

Diagnostic characters : Length 2.5-5 mm. Head and thorax bluish black, gaster brown with greenish coppery tinge. Head engraved reticulate, POL almost as long as OOL, anterior margin of clypeus weakly emarginate, antennae with second anellus twice as long as first, clava almost as long as two preceding segments combined; gaster elongate, ovate, 1.2x as long as head plus thorax combined.

Material examined : 1F, Ganjam dist., Gopalpur, 4.i.2005, coll. P.M. Sureshan.

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

Remarks : Parasitoid of *Nupserha bicolor* Thoms. (Coleoptera).

10. *Notoglyptus scutellaris* (Dodd & Girault)

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

1988. *Notoglyptus scutellaris* (Dodd & Girault) : Boucek, *Australasian chalcidoidea* : 466.

Diagnostic characters : Length 1.3 mm. Head, thorax and petiole dark green, gaster brown; antennae with scape yellow, remainder brown; clypeus separated from face by obscure sulcus, anterior margin nearly straight, slightly reflexed; pronotal collar finely carinate, scutellum coriaceous with distinct discal fovea; propodeum with nucha not bordered by carina anteriorly; gastral petiole length 1.2x width with weak median carina, gaster length 1.3x width.

Material examined : 1F, 3M, Kendrapara dist., Manpur, 14.iii.2007, 1F, 1M, Ganjam dist., Gopalpur, 8.x.2005; 1M, Puri dist., Baligaro, 24.xi.2005, 1F, Ganjam dist., Gopalpur, 16.viii.2005, coll. P.M. Sureshan.

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

11. *Oniticellobia longigastra* Sureshan & Narendran

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

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

Material examined : 1F, Kendrapara dist., Bhuinpur, 14.iii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, West Bengal, Orissa (Present record).

12. *Oxysychus nupserhae* (Dutt & Ferriere)

1961. *Neocatolaccus nupserhae* Dutt & Ferriere. *J. Agric. Sci.*, **31** : 139. India (Bharatpur).

2003. *Oxysychus nupserhae* (Dutt & Ferriere) : Sureshan, *Rec. zool. Surv. India. Occ. Paper No.* **205** : 67.

Diagnostic characters : Length 3.6 mm. Head and thorax dark blue, almost black, gaster aeneous with coppery shine, head swollen, POL greater than OOL; antennae with third anellus little longer than others, propodeum without median carina; forewing with MV almost half of SMV, STV half of MV, Gaster oval, longer than head plus thorax combined.

Material examined : 2F, 3M, Orissa : Kendrapara dist., Near Dangmal (Rajnagar), banks of river Hansina, 11.iii.2007; 1M, Jajpur dist., Balchandrapur, Rukatipato village, near river Virupa, 16.iii.2007; 1F, Krishandasapur, Mantuka village, 10.iii.07, coll. P.M. Sureshan.

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

Remarks : Parasitic on Cerambycid beetle *Nupserha bicolor* girdling the stem of jute.

13. *Propicroscytus mirificus* (Girault)

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

1981. *Propicroscytus indicus* Subba Rao. *Proc. Ind. Acad. Sci. (B)* **90** : 474-475. India : Punjab. Syn.? by Boucek, 1988 : 410.

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

Material examined : 2F, 5M, Kendrapara dist., Nr Dangmal (Rajnagar), banks of river Hansina, 11.iii.2007, 2M, Manpur, Indupur, 1F, Dhumata, 13.iii.07, 14.iii.07, coll. P.M. Sureshan.

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

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

14. *Propicroscytus oryzae* (Subba Rao)

1973. *Obtusiclava oryzae* Subba Rao. *Bull. Ent. Res.* 62 : 627. Sri Lanka (Peradeniya).

2003. *Propicroscytus oryzae* (Subba Rao) : Sureshan, *Rec. zool. Surv. India, Occ. Paper No.*, **205** : 78.

Diagnostic characters : Closely resembles *P. mirificus* (Girault) and mainly segregated by the body color. Head and thorax usually metallic green, dorsum usually with distinct green iridescence in certain lights.

Material examined : 2M, Jajpur dist., Ratnagiri, 17.iii.07, 1M, Ponosora village, Panchapandava, 15.ii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, Orissa, Maharashtra, Andhra Pradesh, Arunachal Pradesh; Sri Lanka, China, Indonesia, Thailand.

Remarks : Parasitic on *Orseolia oryzae* (Wood–Mason), paddy gall fly. Commonly occurring in paddy field and adjacent grassy vegetations.

15. *Pteromalus puparum* (Linnaeus)

1758. *Ichneumon puparum* Linnaeus. *Syst. Nat.* 10th Edt., 567, Sweden.

1795. *Pteromalus puparum* Linnaeus : Swederus. *Akad. Handl.*, **16** : 203.

2003. *Pteromalus puparum* (Linnaeus) : Sureshan, *Rec. zool. Surv. India. Occ. Paper No.*, **205** : 84.

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

Material examined : 1F, Jajpur dist., Udayagiri, 17.iii.07, coll. P.M. Sureshan.

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

Remarks : Parasitic in the pupae of various butterflies.

16. *Pteromalus semotus* (Walker)

1834. *Eutelus semotus* Walker. *Ent. Mag.*, **2** : 367. F. England.

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

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

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

Material examined : 2F, Puri dist., Ashram, 22.i.06; 2F, Kendrapara dist., Nr Dangmal (Rajnagar), banks of river Hansina, 11.iii.2007; 9F, 2M, Indupur, Dhumata, 13.iii.07, 9F, Bhuinpur, 14.iii.07, 4F, Girango village, 12.iii.07, 1F, Jajpur dist., Udayagiri, 17.iii.07, Sukuapoda, nr. Lalitagiri, 15.iii.07, 1F, Jajpur dist, Ratnagiri, 17.iii.07, coll. P.M. Sureshan.

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

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

17. *Sphegigaster brunneicornis* (Ferriere)

1930. *Trigonogastra brunneicornis* Ferriere. *Bull. Ent. Res.*, **21** : 356-357. F. Sri Lanka (Peradeniya).

1979. *Sphegigaster brunneicornis* (Ferriere) : Boucek *et al.*, *Oriental Ins.*, **12**(4) : 458.

Diagnostic characters : Female : Length 2-2.5 mm. Body dark green, almost black. Antennal scape, pedicel and anelli yellow, otherwise reddish brown. Antennae with F1 longer than pedicel, narrowed basally, funicular segments longer than wide except F6 sub quadrate; pronotum distinctly carinate; gaster (without petiole) not longer than thorax.

Material examined : 1F, Puri dist, Ashram, 22.i.2006; 2F, Kendrapara dist., Nr Dangmal (Rajnagar), banks of river Hansina, 11.iii.2007; 1F, Kendrapara dist., Manpur, 14.iii.2007, 1F, Indupur, Dhumata, 13.iii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, Maharashtra, Orissa (present record); Sri Lanka.

Remarks : Common species parasitic on pupae of Diptera (Agromyzidae).

18. *Sphegigaster stepicola* Boucek

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

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

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

Material examined : 1F, Kendrapara dist., Balchandrapur, Rukatipato village, nr.river virupa, 16.iii.2007; 1M, Jajpur dist., Udayagiri, 17.iii.07, 1F, Panchpandava, 15.iii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, Delhi, Bihar, Uttar Pradesh, Orissa (present record); Austria, Czechoslovakia, USSR, Algeria.

Remarks : Parasitic on *Melanagromyza soyae* (Soya bean fly), *Melanagromyza* sp. and *Phytomyza* sp. (Agromyzidae : Diptera) mining the leaves of *Helianthus* and *Vigna catjang*.

19. *Toxeumorpha minuta* Sureshan & Narendran

2000. *Toxeumorpha minuta* Sureshan & Narendran. *J. Bombay. nat. Hist. Soc.*, **97**(3) : 406. M, F. India (Kerala).

Diagnostic characters : Length 1.2 mm. Black. Antennae brown with scape paler; POL 1.4x OOL; antennae inserted along the lower margin of eyes, scape not reaching median ocellus, pedicel longer than F1, third anellus as long as first and second combined; propodeum with plicae complete, callus with black bristles similar as on other areas of thorax; forewing with basal vein setate; gaster with T1 and T2 covering most of the length.

Material examined : 1F, Puri dist., Kushabadra, 22.i.2006, coll. P.M. Sureshan.

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

20. *Trichomalopsis apanteloctena* (Crawford)

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

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

2003. *Trichomalopsis apanteloctena* (Crawford) : Sureshan, 2003. *Rec. zool. Surv. India., Occ. Paper No.*, **205** : 97.

Diagnostic characters : Length 1.6-2.5 mm. Lower margin of clypeus rather deeply incised medially, striae on clypeus extending to lower margin of eyes and to malar sulcus; both mandibles

with four teeth; occipital carina sharp, in posterior-dorsal view strongly curved medially. Antennae with combined length of pedicel plus flagellum length 0.8-0.93x head width in female and 0.95-1.05x in male. Gaster 1.7-2x as long as broad.

Material examined : 9F, Puri dist., Baligaro, 24.xi.2005, 26.xi.2005; 6F, Ashram, 22.i.06; 3F, Ganjam dist., Gopalpur, 16.viii.2005, 1F, Jagatsinghpur dist., Kujango, Tonda island, 28.xi.2005; 1F, Cuttack dist., Bidarnasi, 26.xi.2005, coll. P.M. Sureshan.

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

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

21. *Trichomalopsis nigra* Sureshan & Narendran

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

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

Material examined : 1F, Orissa : Ganjam dist., Ramba, 20.vi.2005, coll. P.M. Sureshan.

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

Remarks : Associated with paddy field and grasses.

22. *Trichomalopsis ovigastra* Sureshan & Narendran

2001. *Trichomalopsis ovigastra* Sureshan & Narendran. *Journal Bombay Nat, Hist, Soc.*, **98**(3) : 402. M, F. India (Kerala).

Diagnostic characters : Length 1.8-2.4 mm. Dark brownish green with metallic reflection; temples rounded; pronotal collar regularly margined even on sides; forewing with PMV as long as MV; median area of propodeum broad, 1.3x as broad as long, plicae not very sharp. Gaster oval, ovipositor sheaths strongly protruding.

Material examined : 3F, Orissa : Jagatsinghpur dist., Kujang, Tonda island, 28.xi.2005, 5F, Puri dist., Ashram, 22.1.2006, coll. P.M. Sureshan.

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

23. *Trichomalopsis thekkadiensis* Sureshan & Narendran

2001. *Trichomalopsis thekkadiensis* Sureshan & Naraendran. *Journal Bombay nat, Hist, Soc.*, **98**(3) : 398. M, F. India (Kerala).

Diagnostic characters : Length 1.6-2.7 mm. Bluish green with metallic reflection. Temple strongly converging behind eyes; pronotal collar irregularly margined; propodeum with plicae

very sharp, reaching up to tip of nucha, nucha more constricted, median carina strong; T1 of gaster reaching only one third length.

Material examined : 1F, Puri dist., Ashram, 22.i.06, coll. P.M. Sureshan.

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

Subfamily SPALANGINAE

24. *Spalangia nigroaenea* Curtis

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

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

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

Material examined : 3M, 3F, Ganjam dist., Gopalpur, 26.viii.2005, 2F, Kendrapara dist., Indupur, Dhumata, 13.iii.07, coll. P.M. Sureshan.

Distribution : India : Delhi, Karnataka, Maharashtra; Pondicherry; cosmopolitan.

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

25. *Spalangia simplex* Perkins

1910. *Spalangia simplex* Perkins. *Fauna Hawaiiens*, **2** : 657. Hawaii : Honolulu.

1998. *Spalangia simplex* Perkins : Ahmad, *Shashpa*, **5** : 12.

Diagnostic characters : Black. Pronotal collar anteriorly rounded. Mesoprescutum with a distinct cross-line (similar to those on pronotum and scutellum) and a round fovea behind it on disc.

Material examined : 3F, 1M, Puri dist., Ashram, 22.i.2006; 2M. Cuttack dist., Matta Moto, 25.xi.2005, coll. P.M. Sureshan.

Distribution : India (Uttar Pradesh, Tamil Nadu, Orissa (present record); East Africa, Malaysia.

Subfamily DIPARINAE

26. *Netomocera nigra* Sureshan & Narendran

1990. *Netomocera nigra* Sureshan and Narendran. *Oriental Ins.*, **24** : 223. India (Kerala).

Diagnostic characters : Length 1.73-2.36 mm. Black, gaster ventrally brown. POL 3.5x OOL; antennal toruli at the level of anterior margin of eyes, funicular segments of equal length; club broad, as long as four preceding segments combined; forewing with MV 2x as long as PMV and 3x STV; gaster (without petiole) short, oval, 1.7x as long as its maximum width; petiole longitudinally rugose, as long as broad, T1 exceeding well beyond middle of gaster.

Material examined : 1F, 2M, Kurdha dist., Barbara forest, Rajin R.F., Andhori nalla, 13.x.06; 1F, Kurdha dist., Barbara forest. Batpada chowk, 11.x.2006. coll. P.M. Sureshan.

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

Subfamily HERBERTIINAE

27. *Herbertia indica* Howard

1959. *Herbertia indica* Burks, *Proc. Ent. Soc. Wash.*, **61**(6) : 252. Sri Lanka.

1986. *Herbertia indica* Burks : Farooqi & Subba Rao. *Oriental Ins.*, **20** : 289.

Diagnostic characters : Female : Length 1.1-1.5 mm. Black, metallic violaceous reflection on face and gaster dorsally; legs whitish except coxae, trochanter and femora bluish black; head and thorax granulate reticulate; antennae inserted on lower face, scape not reaching middle of face, extending 0.75x eye height, F1 shorter than pedicel, club as long as three preceding segments combined; forewing with MV slightly greater than 2x as long as PMV; gaster broad and short, T1 covering most of the gaster.

Material examined : 1F, Puri dist., Ashram, 22.i.06, coll. P.M. Sureshan.

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

Remarks : Uncommon species parasitic on leaf mining dipterous larvae.

Subfamily PANSTENONINAE

28. *Panstenon oxylus* (Walker)

1834. ?. *Pteromalus assimilis* Nees. *Hym. Ichn. aff. Mono. illust.*, **2** : 116-117. (Type lost). Syn. by Thomson. 1878. *Hym. Scand. Ptero.*, 176-177.

1839. *Miscogaster oxylus* Walker. *Mon. Chalciditum*, **1** : 196. Lectotype, UK, Designated, Graham, 1969 : 94.

1846. *Panstenon oxylus* (Walker) Syn. Walker, *List. Hym. coll. Birt. Mus.*, **I** : 29.

Diagnostic characters : Length 1.6-2.4 mm. Metallic green, head brownish with slight violaceous tinge, finely reticulate, anterior margin of clypeus truncate; eyes large; malar space about two fifths the length of an eye; pronotal collar weakly margined or not margined, notauli tending to be less slightly impressed; frenal line of scutellum fine and weak; gaster usually sunken dorsally, petiole without hairs, 2x as long as broad.

Material examined : 4F, Cuttack district, Bidarnasi, 26.xi.2005; 1F, Jagatsinghpur dist., Kujango, Tonda island (Chilka lagoon), 28.xi.2005; 1F, Paradip, 26.xi.2005; 2F, Puri dist., Ashram, 22.i.06, coll. P.M. Sureshan.

Distribution : India : Orissa (Present record), China, Finland, Japan, Korea, Sweden, United Kingdom.

Subfamily ORMOCERINAE

Tribe SYSTASINI

29. *Systasis dalbergiae* Mani

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

Diagnostic characters : Length 1.5-1.8 mm. Body bright metallic green, antennae dark brown; OOL 1.25x ocellar diameter, face rugously punctate between scape and inner orbital border, just below antennae transversely reticulate; both mandibles tridentate; antennae with pedicel much longer than F1, all funicular segments sub equal.

Material examined : 1F, Kendrapara dist., Indupur, Dhumata, 13.iii.07, coll. P.M. Sureshan.

Distribution : India : Karnataka, Orissa (present record).

30. *Systasis dasyneurae* Ahamd & Mani

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

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

Material examined : 1F, Jajpur dist., Panchapandava, 15.iii.07, coll. P.M. Sureshan.

Distribution : India : Uttar Pradesh, Madhya Pradesh, Orissa (present record).

Family CHALCIDIDAE

Subfamily CHALCIDINAE

31. *Brachymeria bengalensis* (Cameron)

1897. *Chalcis bengalensis* Cameron : *Mem. Manchester Soc.*, **XLI** (4) : 39. India (Barrackpore).

1989. *Brachymeria bengalensis* (Cameron) : Narendran, *Oriental Chalcididae* : 261.

Diagnostic characters : Hind femur red (often with black patch of varying size on outer disc) with a yellow spot or patch at apex. Apex of scutellum distinctly and well emarginate with dense silvery pubescence.

Material examined : 1F, Ganjam dist., Gopalpur, 15.x.2005, coll. P.M. Sureshan.

Distribution : India : Assam, Delhi, Rajasthan, Uttar Pradesh, West Bengal, Orissa (present record); all over Oriental region and Japan.

Remarks : A common *Brachymeria* species parasitic on *Earias viettla* (= *fabia*) Fabricius. (Lepidoptera : Noctuidae).

32. *Brachymeria euploae* (Westwood)

1837. *Chalcis euploae* Westwood. *Trans. ent. Soc. London*, **2**, VI. 6. India.

1989. *Brachymeria euploae* (Westwood) : Narendran, *Oriental Chalcididae* : 251.

Diagnostic characters : Apex of scutellum rounded or entire or at the most very weakly or slightly emarginate; hind femur always black with apex yellow. Antennal club more than twice preceding segment; gaster globose or subglobose.

Material examined : 1F, Orissa, Jajpur dist., Ratnagiri, 17.i.2007, coll. P.M. Sureshan.

Distribution : India : W. Bengal, Uttaranchal, Tamil Nadu, Kerala, Karnataka, Orissa (present record); North Borneo, Sumatra, Java, and Philippines.

Remarks : Common *Brachymeria* species parasitizing various Lepidoptera.

33. *Brachymeria minuta* (Linnaeus)

1767. *Vespa minuta* Linnaeus. *Systema naturae*, **12**(1) : 952. Europe.

1989. *Brachymeria minuta* (Linnaeus) : Narendran, *Oriental Chalcididae*, : 259.

Diagnostic characters : Hind femur not more than one and four fifth times as long as wide with a distinct tooth at inner basal side, dorsal margin not angulate, usually black with apex yellow.

Material examined : 1F, Jajpur dist., Ratnagiri, 17.iii.07, coll. P.M. Sureshan.

Distribution : India : Karnataka, Sikkim, Tamil Nadu, Uttar Pradesh, W. Bengal, Orissa (present record); cosmopolitan.

Remarks : Common. Parasitoid of various Diptera, sometimes secondarily.

34. *Kriechbaumerella rufimanus* (Walker)

1860. *Halticella rufimanus* Walker : *Ann. Mag. nat. Hist.*, **6** : 357. Lectotype M, Sri Lanka.

1989. *Kriechbaumerella rufimanus* (Walker) : Narendran, *Oriental Chalcididae* : 71.

Diagnostic characters : Pre-orbital carina distinct, post orbital carinae indistinct, genotemporal furrow absent; apex of scutellum bilobed; gaster shorter than thorax, first tergite smooth and shiny in female, in male microsculptured or shagreened. Hind femur black, liver brown or testaceous.

Material examined : 1F, Jajpur dist., Ratnagiri, 17.iii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, Uttar Pradesh, Rajasthan, Tamil Nadu, Karnataka, Assam, Orissa (present record); Nepal, Sri Lanka, Indonesia, Pakistan, Java, Philippines.

Subfamily DIRHININAE

35. *Dirhinus anthracia* Walker

1846. *Dirhinus anthracia* Walker : *List. Hym. Coll. Brit. Mus.*, **7**, 85. M, Philippines.

1989. *Dirhinus anthracia* Walker : Narendran, *Oriental Chalcididae* : 294.

Diagnostic characters : Head below apex of each horn without distinct additional tooth, anterior and dorsal (inner) edge of horn converging in acute to right angle, anterior and lateral edges forming acute angle of about 60°; antennae fore and mid legs testaceous or rufous; antennae of female thick; scutellum anteriorly with a median impunctate strip; striae on first gastral tergite reaching only one-third length.

Material examined : 1F, Jajpur dist., Ponosora village, 15.iii.07; 1F, Kendrapara dist., Potamundi, 11.iii.07, 1M, Ganjam dist., Gopalpur, 26.08.05, coll. P.M. Sureshan.

Distribution : India : Madhya Pradesh, Manipur, Punjab, Tripura, Uttar Pradesh, Orissa (present record); Oriental region. Africa, Australian and Mediterranean region.

Remarks : Common species parasitic on various Diptera and Lepidoptera.

36. *Dirhinus bakeri* (Crawford)

1914. *Parenia bakeri* Crawford. *Proc. U.S. natn. Mus.*, **45** : 459. F, Philippines, Manila.

1989. *Dirhinus bakeri* Crawford : Narendran, *Oriental Chalcididae* : 297.

Diagnostic characters : Forewing pubescence reduced especially with no hairline recurrent from stigmal or if a hair line partly developed, then petiole at least slightly transverse, in female area of four carinae on petiole 1.5-2 x as broad as long, dense striae on first tergite forming broad area with convex hind margin and taking up more than quarter of tergite length.

Material examined : 1M, Nayargarh dist., Kusapola village, 14.x.2006, 3F, Ganjam dist., Gopalpur, 26.viii.2005, coll. P.M. Sureshan.

Distribution : India : Kerala, Orissa (present record), Uttar Pradesh, Karnataka, T. Nadu, Sikkim); Sri Lanka, Malaysia, Philippines and Japan.

Remarks : Common parasite of various Diptera and Lepidoptera.

Subfamily EPITRANINAE

37. *Epitranus albipennis* Walker

1874. *Epitranus albipennis* Walker in Smith 1874. *Trans. ent. Soc. London*, 400. F, Japan : Hyogo.

1989. *Epitranus albipennis* Walker : Narendran, *Oriental Chalcididae* : 315.

Diagnostic characters : Body mainly red brown, eyes large, in dorsal view maximum diameter about two-third the breadth of vertex; POL clearly more than twice OOL; hind femur behind basal tooth with comb of at least 20 narrow regular teeth.

Material examined : 2F, Jajpur dist., Ratnagiri, 17.iii.07, coll. P.M. Sureshan.

Distribution : India : Uttar Pradesh, Kerala, Orissa (present record), W. Bengal, Andhra Pradesh); Malaysia, Indonesia, S. China, Taiwan, Philippines, Borneo and Japan.

Remarks : Parasitoid of Pyralid moth.

38. *Epitranus erythrogaster* Cameron

1888. *Epitranus erythrogaster* Cameron : *Manchester phil. Soc.*, **26** : 119. Lectotype F, Japan (Nagasaki).

1989. *Epitranus erythrogaster* Cameron : Narendran, *Oriental Chalcididae* : 323.

Diagnostic characters : Malar space hairy, frons with fine structure, scrobal part mainly reticulate to finely cross striate, clypeal roof more pilose, more extensively concave, antennae long and slender, thorax black.

Material examined : 2F, Jajpur dist., Panchapandava, 15.iii.07, coll. P.M. Sureshan.

Distribution : India : Karnataka, Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh, West Bengal, Orissa (present record); All over Oriental region, S, Japan.

Remarks : Most common species. Parasitic on Pyralid moths.

39. *Epitranus observator* Walker

1862. *Epitranus observator* Walker. *Trans. ent. Soc. Lond.*, (3)**1** : 349-350. F. Uganda.

1989. *Epitranus observator* Walker : Narendran, *Oriental Chalcididae* : 314.

Diagnostic characters : Head red, thorax black, pubescence on thorax longer and denser; pronotal collar carina broadly interrupted, head stout with almost round temples.

Material examined : 1F, Ganjam dist., Gopalpur, 20.viii.05, coll. P.M. Sureshan.

Distribution : India : Bengal, Orissa (present record), Africa, Sri Lanka, Thailand and Malaysia.

Family TORYMIDAE

Subfamily TORYMINAE

40. *Podagrion charybdis* Fernando

1957. *Podagrion charybdis* Fernando. *Ceylon j. Sci.*, **25** : 217, F, M. Sri Lanka (Syntypes lost?).

1994. *Podagrion charybdis* Fernando : Narendran, *Zool. Monograph*, **68**, 79.

2009. *Podagrion charybdis* Fernando; Sureshan, *Jr. Threat. Taxa*, **1**(4) : 234-235.

Diagnostic characters : Length 3.1-3.3 mm. Head and thorax metallic greenish blue; antennae testaceous, club brown, almost equal to preceding five segments combined; propodeum with an inverted V shaped carina, base of V not reaching base, join with irregular longitudinal rugae at the base; hind femora with 6 teeth, second tooth small, forewing with speculum and basal cell closed below, gaster including petiole slightly longer than thorax and 0.81x as long as head plus thorax, ovipositor 2.63x as long as gaster and 1.2x length of body.

Material examined : 44F, 12M, Kendrapara dist., Dhumata village, Idupur, ex. Ootheca of mantid *Tenodera fasciata* (Olivier), coll. P.M. Sureshan, 13.iii.2007.

Distribution : India : (Orissa) Sri Lanka.

Remarks : Reported for the first time from India after the original description from Sri Lanka (Sureshan, 2009).

41. *Odopodia reticulata* Sureshan

2007. *Odopodia reticulata* Sureshan. *Zoos' print journal*, **22**(8) : 2787-2789, F, India (Orissa).

Diagnostic characters : Length 2.35 mm. Black with bright metallic greenish blue reflection on face and thorax; pronotum distinctly raised reticulate, mesoscutum, scutellum (except for a central oval shiny spot posteriorly) moderately reticulate; Forewing with a narrow cross band at stigmal area. Propodeum smooth, median area raised, with distinct median carina and several irregular longitudinal carinulae on either side, gaster with hind margin of T1 and T2 distinctly incised in the middle.

Material examined : 2F, Orissa : Puri dist., Baligaro, 24.xi.2005, coll. P.M. Sureshan.

Distribution : India (Orissa).

42. *Torymoides anamalaianus* (Mani & Kurian)

1972. *Holaspis anamalaianus* Mani & Kaul : *Oriental Ins.*, **6**(3) : 313. M, F. Inida (Devikulam).

1994. *Torymoides anamalaianus* (Mani & Kaul) : Narendran, 1994 : 44, 47.

Diagnostic characters : Female length : 2 mm scape, thorax, gaster, coxae, femora metallic green, length of ovipositor equal to thorax, POL 2x OOL, first four funicular segments of antenna width and length sub equal; ovipositor equal to length of gaster.

Material examined : 6F, 2M, Orissa, Kurdha dist., Tangi R.F., Kiapalla-Dhani south, 15.x.06, 2F, 3M, Nayargarh dist., Tangi R.F., Kusapola village, 14.x.06, coll. P.M. Sureshan.

Distribution : India : Uttar Pradesh, Kerala, Tamil Nadu, Orissa (present record).

Remarks : Sureshan (2007) reported the species first time from Orissa.

43. *Palmon orchesticus* (Masi)

1926. *Pachytomoides orchesticus* Masi, *Konowia*, 5 : 1-20, 264-279. Taiwan.

1957. *Podagrion iago* Fernando, *Ceylon J. Science (Biol. Sci.)* 1 : 7-18. (Narendran, 1994. syn.).

1995. *Palmon orchestius* (Masi) : Grissell, 1995. *Mem. Ent. Int.*, 2 : 158-160.

Diagnostic characters : Length 3.1 mm. Head and thorax metallic green with thorax darker, hind coxa yellow with blackish patch on dorsal side of basal half. Antennal club length exceeding preceding 5 or 6 segments but not exceeding 7 segments; hind femur with 8-9 teeth (7 teeth reported) 4 large primary teeth and 4 or 5 smaller secondary teeth, forewing with MV not longer than 3x PMV, Ovipositor 3 to 5x longer than the body.

Material examined : 1F, Orissa : Kurda dist., Rajin R.F., Andhori nalla, 13.x.06, coll. P.M. Sureshan.

Distribution : India : Kerala, Andhra Pradesh, Orissa; Sri Lanka, Taiwan.

Remarks : Sureshan (2007) reported the species first time from Orissa.

Family EURYTOMIDAE

Subfamily EURYTOMINAE

44. *Acantheurytoma spinifera* Cameron

1911. *Acantheurytoma spinifera* Cameron, *Societas ent.*, 26 : 23. Borneo.

1981. *Odonteurytoma tanjorensis* Mukerjee : 25 : 45, Syn. by Narendran, 1994 : 202.

Diagnostic characters : Length : 4.3 mm. Black, fore and mid femora, fore and mid tibiae, all trochanters reddish brown; maximum diameter of eye 2-3x malar space in profile; anterior width of head 1.62x distance between front ocellus and clypeal margin; frons concave, preorbital carinae profoundly raised, running up to vertex, vaguely joining each other behind front ocellus, front ocellus situated inside scrobe. Gastral petiole shorter than half length of hind coxa, with a tooth on either side on dorsal region.

Material examined : 1F, Kendrapara dist., Indupur, Dhumata, 13.iii.07, coll. P.M. Sureshan.

Distribution : India : Kerala, Orissa (present record), Tamil Nadu, East Malaysia (N. Borneo).

Remarks : Parasitic on sphecoid wasp larva.

Subfamily RILEYINAE

45. *Burasium naso* Boucek

1983. *Buresium naso* Boucek. *Ent. Scand.*, **14** : 187. F, India (Delhi).

Diagnostic characters : Length 3-4.2 mm. Body reddish brown with antennae distally, gaster dorsally beyond middle of T4, all femora and tibiae darkened or infusate. Forewing with two conspicuous infuscations one at parastigma and another attached to PMV and STV; inter antennal projection forming round headed tooth projecting abruptly between upper margins of antennal sockets, gaster with T4 with a deep transverse depression just behind base.

Material exmined : 1F, Ganjam dist, Gopalpur, 16.viii.05, coll. P.M. Sureshan.

Distribution : India : Delhi, Orissa (present record), Pakistan and Thailand.

Remarks : Only known from Delhi (Type locality) and Orissa in India.

SUMMARY

The present paper deals with the report of 45 species of Chalcidoidea (Hymenoptera) belonging to 28 genera under 4 families (Pteromalidae, Eurytomidae, Chalcididae and Torymidae) from Orissa. The study is based on specimens collected from the coastal districts of South Orissa during the year 2005-07.

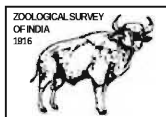
ACKNOWLEDGEMENTS

I am grateful to the Director, Zoological Survey of India, Kolkatta and the Officer in charge, Zoological Survey of India, Estuarine Biological Station, Gopalpur-on-Sea, Orissa for the facilities provided for undertaking the work.

REFERENCES

- Boucek, Z. 1988. Australasian Chalcidoidea (Hymenoptera). C.A.B. International Wallingford, U.K. pp. 832.
- Boucek, Z. & Rasplus J.Y. 1991. Illustrated key to West-Palearctic genera of Pteromalidae (Hymenoptera : Chalcidoidea) *Inst. Natnl. De la Recher. Agro. Paris*, 140 pp.
- Boucek, Z. Subba Rao, B.R. & Farooqi, S.I. 1979. A Preliminary review of Pteromalidae (Hymenoptera) of India and adjacent countries. *Oriental Insects*, **12**(4) : 433-467.
- Gibson, G.A.P., Huber, J.T. & Woolley, J.B. (Eds.). 1993. Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera). xi + 794 pp. National Research Council of Canada, Ottawa, Canada.
- Graham, M.W.R. de. V. 1969. The Pteromalidae of North-Western Europe (Hymenoptera : Chalcidoidea). *Bull. Brit. Mus. Nat. Hist. (Ent.) Suppl.*, **16** : 1-908.
- Greathead, D.J. 1986. Parasitoids in classical biological control. Pages. 289-318 in Wage, J. and D. Greathead (eds.) *Insect parasitoids. Academic press, London*, 389 pp.

- Hayat, M. 1998. Aphelinidae of India (Hymenoptera : Chalcidoidea) a taxonomic revision. *Memoirs on Entomology International*, **13** : 432.
- Hayat, M. 2006. Indian Encyrtidae (Hymenoptera : Chalcidoidea). Aligarh Muslim University, 496.
- Mani, M.S. 1989. The fauna of India and the adjacent countries. Chalcidoidea (Hymenoptera) part. I & II. *Zool. Surv. India*, 1067 pp.
- Narendran, T.C. 1989. Oriental Chalcididae (Hymenoptera : Chalcidoidea). *Dept. Zool. Uni. of Calicut*, 440 pp.
- Narendran, T.C. 1994. Torymidae and Eurytomidae of Indian subcontinent (Hymenoptera : Chalcidoidea) *Dept. Zool. Univ. of Calicut*, 500 pp.
- Narendran, T.C. 1999. Indo-Australian Ormyridae (Hymenoptera : Chalcidoidea). *Dept. Zoology, Uni. of Calicut*, 227.
- Narendran, T.C. 2007. Indian Chalcidoid Parasitoids of the Tetrastichinae (Hymenoptera : Eulophidae). *Rec. Zool. Surv. India. Occ. Paper No.*, **272** : 386 + 5 plates.
- Noyes, J.S. (2003). Universal Chalcidoidea database. <http://www.nhm.ac.uk/jdsml/research-curation/projects/chalcidoids>. Last updted April 2009.
- Noyes, J.S. and Hayat, M. 1994. Oriental Mealybug Parasitoids of the Anagyrini (Hymenoptera : Encyrtidae). CAB International, Wallingford, 554 pp.
- Subba Rao, B.R and M, Hayat. (Edt.) 1985. The Chalcidoidea (Insecta : Hymenoptera) of India and the adjacent countries, part. I. Review of families and keys to families and genera. *Oriental Insects*, **19** : 161-310 & 15 pp.
- Subba Rao, B.R and M, Hayat. (Edt.) 1986. The Chalcidoidea (Insecta : Hymenoptera) of India and the adjacent countries part. II. A catalogue. *Oriental Insects*, **20** : 1-430.
- Sureshan, P.M. 2003. Pteromalinae (Pteromalidae : Chalcidoidea : Hymenoptera) of Indian subcontinent. *Rec. Zool. Surv. India. Occ. Paper No.*, **205** : 1-170.
- Sureshan., P.M. 2007. Descriptions of a new species of *Odopoia* Walker from India and record of two species of Torymidae from Orissa (Hymenoptera : Chalcidoidea) *Zoos' print journal*, **22**(8) : 2787-2789.
- Sureshan, P.M. 2009. *Podagrion charybdis* Fernando (Hymenoptera : Chalcidoidea : Torymidae) parasitic on ootheca of *Tenodera fasciata* (Olivier) (Insecta : Mantodea) first record from India and Redescription. *Journal of Threatened taxa*, **1**(4) : 234-235.
- Sureshan, P.M. & Narendran, T.C. 2003. A checklist of Pteromalidae (Hymenoptera : Chalcidoidea) form the Indian subcontinent. *Zoos' print Journal*, **18**(5) : 1099-1110.
- Sureshan, P.M. & Narendran, T.C. 2004. Key to the genera of Pteromalidae of India and the adjacent countries (Hymenoptera : Chalcidoidea) *Rec. Zool. Sur. India. Occ. Paper No.*, **229** : 1-56.



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Short Communication

***HOLOSTEMMA ADA-KODIEN* SCHULT (FAMILY : ASCLEPIADACEAE), A NEW LARVAL FOOD PLANT OF THE BLUE TIGER, *TIRUMALA LIMNIAE* CRAMER (INSECTA : LEPIDOPTERA : NYMPHALIDAE)**

INTRODUCTION

While conducting the studies on the butterfly fauna of Kerala, many larvae of Blue Tiger (*Tirumala limniace* Cramer) butterflies were observed feeding on the plants of *Holostemma ada-kodien* Schult during November 2005 at Narikuni area of the Kozhikode district, Kerala. Three larvae were reared in captivity fed with *Holostemma* plants. The adults emerged after 10-12 days subsequent to pupation.

Holostemma ada-kodien Schult. (Asclepiadaceae) is a common climber found along the moist deciduous forests and the sacred groves of midland hills of north Kerala. It is a medicinal plant and locally called *adapathiyam kizhangu*. Its tuber is locally used in traditional medicine for treatment of arthritis and rheumatic pain. Existing literature showed that the Blue Tiger, *Tirumala limniace* is known to feed on *Asclepias curassavica*, *Calotropis gigantea*, *Hoya sp.*, *Tylophora indica*, and *Wattakaka volubilis*, all belonging to the family Asclepiadaceae (Wynter-Blyth, 1957 and Kunte, 2000). Among these, *Wattakaka volubilis* is the most favoured host plant of the Blue Tiger in our locality. The present record of *T. limniace* feeding on *Holostemma ada-kodien* forms a new addition to the existing list of larval food plants known for the Blue Tiger.

The Blue Tiger is one of the commonest danaine species and constitute one of the important participants in the large scale mixed danaine migrations during November. Narikuni area happens to fall in the migratory path of the danaine butterflies in Kerala and *T. limniace* can be seen migrating during November, every year, along with the Dark Blue Tiger (*Tirumala septentrionis*), Double-branded Crow (*Euploea sylvestris*) and the Common Crow (*Euploea core*).

ACKNOWLEDGEMENTS

The authors are grateful to the Director, Zoological Survey of India, Kolkata for encouragement and facilities.

REFERENCES

- Kunte, K. 2000. *Butterflies of Peninsular India*. University Press (India) Limited, Hyderabad : 1-254.
- Wynter-Blyth, M.A. 1957. *Butterflies of the Indian Region*. Bombay Natural History Society, Bombay : 1-523.

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Rec. zool. Surv. India, **109**(Part-4) : 107-109, 2009

Short Communication

A NOTE ON THE STATUS, OCCURRENCE AND DISTRIBUTION OF WILD BUFFALO, *BUBALUS BUBALIS* (LINNEAUS) IN WESTERN ORISSA AND CHHATTISGARH

The wild Buffalo has now been one of the most highly endangered species of mammals, due to its utility in different ways by human being. The population of this animal is on continuous decline, despite the implementation of Wildlife Protection Act 1972. Several workers, such as Moone (1930), Daniel and Grubb (1966), Divekar (1979), Divekar and Bhusan (1988), Choudhury (1994) have conducted important surveys to study the status and population of this species. Studies undertaken by Gee (1953), Inverarity (1985), Lall (1953), Naronha (1954) are not less important however, they have mainly focused on the morphological features and behavioural characters. Moone (1930) stated that the wild Buffalo had been extinct in coastal districts of Orissa for over 25-30 years back. He opined that the animal was present in Raipur and that there were 40-50 animals, which frequented a locality within ten miles of C.P. Border and a small herd of about 15 individuals, forty miles further east. He added that the first named buffalos might join with the herds in the south of Raipur district. Behura and Guru (1964) reported the existence of two herds of this animal, one each in Kalahandi and Koraput district. During the faunastic survey of Orissa (1970-1983) the survey parties of Zoological Survey of India however, could not see any trace of this wild animal. Daniel and Grubb (1966) estimated 400-500 individuals in Peninsular India. Godwin and Holloway (1972) gave an estimation of 2000 animals in India including Nepal (400-500 individuals in Peninsular India, including 200-250 in Bastar and Chandrapura). Daniel *et al.* (1979) reported that no wild Buffalo was left in Orissa and Maharashtra. Tikadar (1983) has shown its distribution in grass jungle of Nepal terai, extending to the plains of Brahmaputra in Assam and Arunachal Pradesh. He also reported this species to occur in Raipur and Bastar district of Chhattisgarh, Western Orissa and Maharashtra. He mentioned its population to be less than 1000. As per Red Data Book (ZSI, 1994), this species has been reported to occur in Assam (Manas, Pabha, Kaziranga, Loakhowa and Lakhimpur), Orissa (Koraput district), Chhattisgarh (West, North, South Bastar and southern Raipur district) and Maharashtra (Eastern Chandrapura). Choudhury (1994) estimated a population of 3000-3500 in north-east India. Alfred, Ramakrishna and Pradhan (2006) have shown its distribution in Arunachal Pradesh, Meghalaya, Orissa, Madhya Pradesh and Eastern Maharashtra. Alfred and De (2006) stated the occurrence of this species in Assam, Arunachal Pradesh, Madhya Pradesh, Maharashtra, Meghalaya, Orissa and probably West Bengal.

The author conducted a survey of forest ranges in Koraput district from 23-28 December, 2003 but could not get any clue of this animal.

The picture in Chhattisgrah is different. Though their population has been on decline for the last several years, yet they still occur in protected areas of Chhattisgrah in different localities. About 200-250 individual existed upto 1968. In 1986-87, the number of Buffalo was estimated to be around 127 in Indravati National Park and 25 animals in Bhairamgrah Sanctuary, whereas in Pamed Sanctuary and Udanti Sanctuary their number was 58 and 40 respectively. Divekar and Bhusan (1988) reported 39 Buffalos in Indravati National Park and 15 in Bhairamgrah Sanctuary. In Pomed Sanctuary and Udanti Sanctuary, their number was 25 individual in each Sanctuary. Ranjitsinghji *et al.* (2004) have conducted the latest survey of this state and estimated 42-46 Buffalo in Udanti and 25-30 individual in Indravati National Park, the total number being less than 75. The population is split in to three clusters with little or no interbreeding. These clusters remain confined to south-eastern part of the Indravati National Park.

Thus, it is very difficult to say whether wild Buffalo still exist in Orissa. It is quite possible, as also opined by Moone (1930) that the borders of Orissa might be visited by some individuals from across the border. But it is certain that their number is declining very fast and if ultimate effective measure is not taken the animal may vanish forever.

ACKNOWLEDGEMENTS

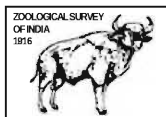
The author is thankful to the Director, Zoological Survey of India for providing facilities and to the Forest Department Orissa for help.

REFERENCES

- Anonymous, 1994. Red Data Book on Indian Animals (Part-I). Vertebrate : 1-534. (Published by Director, Zool. Surv. India, Kolkata).
- Alfred, J.R.B., Ramakrishna and Pradhan, M.S. 2006. Validation of threatened Mammals of India. 1-568 (Published by the Director, Zool. Surv. India, Kolkata).
- Alfred, J.R.B. and De, J.K. 2006. Checklist of Indian ungulates (Class : Mammalia : Order : Perissodactyla and Artiodactyla) : 1-39 (Published by the Director, Zool. Surv. India, Kolkata).
- Choudhury Anwaruddin. 1994. The decline of wild water Buffalo, *Bubalus arnee* in north-east India. *Oryx*, **28**(1) : 70-73.
- Daniel, J.C. and Grubb, B.R. 1966. The Indian wild Buffalo, *Bubalus bubalis* (Linn) in Peninsular India : A preliminary survey. *J. Bombay Nat. Hist. Soc.*, **63**(1) : 33-53.
- Das *et al.* 1993. *Fauna of Orissa* (Mammalia). *State Fauna Series, I. Rec. Zool. Surv. India* : 143-180.
- Divekar, H.K. 1976. A survey of the state of wild Buffalo in West Bastar, Madhya Pradesh. *J. Bombay nat. Hist. Soc.*, **73**(2) : 382-385.

- Divekar, H.K. and Bhusan, B. 1988. Status survey of Wild Asiatic Buffalo, *Bubalis bubalis* in Raipur and Bastar district of Madhya Pradesh. Technical report. *Bombay nat. Hist. Soc.*, 35.
- Divekar, H.K. *et al.* 1984. Status and ecology of wild Buffalo, *Bubalus bubalis* (Linn) in Chandrapur district of Maharashtra. *J. Bombay nat. Hist. Soc.*, **80** : 405-409.
- Gee, E.P. 1953. Wild Buffalo and tame. *J. Bombay nat. Hist. Soc.*, **51**(3) : 727-730.
- Inverarity, J.P. 1895. The Indian Wild Buffalo. *J. Bombay nat. Hist. Soc.*, **10** : 41-52.
- Lall, S. 1953. Wild Buffalo and tame. *J. Bombay nat. Hist. Soc.*, **51**(3) : 726-727.
- Moore, H.F. 1930. The distribution of Wild Buffalo in Orissa. *J. Bombay nat. Hist. Soc.*, **34** : 242-244.
- Noronha, R.P. 1954. More notes on the Indian Buffalo. *J. Bombay nat. Hist. Soc.*, **52**(1) : 202-204.
- Ranjitsinghji, M.K. *et al.* 2004. Status and conservation of the Wild Buffalo, *Bubalus bubalis* in Peninsular India. *J. Bombay Nat. Hist. Soc.*, **101**(1) : 64-70.
- Tikadar, B.K. 1983. Threatened Animals of India. 1-307. (Published by the Director, Zool. Surv. India, Kolkata).

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Rec. zool. Surv. India, **109**(Part-4) : 111-112, 2009

Short Communication

NEW RECORD OF *VESPA SOROR* DU BUYSSON (HYMENOPTERA : VESPIDAE) FROM INDIA

INTRODUCTION

The species *Vespa soror* du Buysson is so far reported from China, Laos, Myanmar, Thailand and Vietnam (Das & Gupta, 1989 and Carpenter & Kojima, 1997). Kundu *et al.* (2006) listed the vespidae fauna of Arunachal Pradesh state. Thus this short communication is intended to report the extended distribution of this species in India.

***Vespa soror* du Buysson (Plate-I)**

1905. *Vespa ducalis* var. *soror* du Buysson, *Ann. Soc. Ent. France*, 73 : 490, 519. F, W, Key, des. Lectotype (designated by van der Vecht, 1957) : F, China : Kiangsi (PARIS), Indochina : Tonkin : Bac Kan.
1957. *Vespa mandarinia soror* van der Vecht. *Zool. Verh.*, 34 : 16. F, W. lectotype design., des. Indochina : Tonkin : Hoa Binh; Annam; Haut-Laos : Xieng-Khouang (Tranninh). Additional citation : Van der Vecht, 1959. *Zool. Meded.*, 36 : 221. F, W, des. Myanmar: Schwego, Myo; China : Yunnan; Fuzhou, Fugian; Indochina : Laos.
1991. *Vespa soror* du Buysson. In Archer, *Ent. Mon. Mag.* 127 : 163. Elevated to species rank. Additional citation : Carpenter & Kojima, 1997. *Nat. Hist. Bull. Ibaraki Univ.* 1 : 72. Checklist including Syn. & Distribution.

Diagnosis : Female. Size 23-26 mm. Fore wing 22-24 mm. Head, anterior border of pronotum, scutellum, postscutellum and two marks on propodeum yellow. Area around ocelli black; gastral segment 1 and 2 yellow with reddish brown stripes in the middle; 3rd to 6th tergites wholly black. Head strongly widened, produced behind the eyes; temple in profile 2x as wide as eye; posterior ocelli 3x farther from occiput than from eye; clypeus coarsely punctate, strongly emarginated apically, lateral lobes large and broadly rounded.

Variations : In some specimens colour of head, scutellum, postscutellum and first two gastral segments brownish yellow.

Discussion : This species comes close to *Vespa mandarinia* Smith in having head strongly widened and produced behind the eyes; temple in profile more than 1.8x as wide as eye and posterior ocelli 3x or more than 3x farther from occiput than from eye. But it distinctly differs from *V. mandarinia* in having: (1). Area around ocelli with black markings. (in *V. mandarinia* area around ocelli without black markings); (2). Scutellum, postscutellum, two marks on propodeum

and often with anterior border of pronotum yellow or orange red. (in *V. mandarinia* thorax usually black, reddish); (3). 1st and 2nd gastral tergites yellow and usually with reddish brown or black stripes in the middle, 3rd to 6th tergites wholly black. (in *V. mandarinia* abdomen reddish brown with narrow yellow apical bands on 1st to 5th tergites, last tergite yellowish brown); (4). Gena proportionately thinner (in *V. mandarinia* gena proportionately wider).

Material examined : 1F, India : Arunachal Pradesh; Upper Subansiri dist.; Daporijo, 28.x.1966, Alt. 150m, Coll. S.K. Tandon & G.S. Arora, Reg. No. 5949/H3. 1F, India: Arunachal Pradesh; West Siang dist.; Likabali, 17.x.1981, Coll. S.K. Gupta & Party, Reg. No. 10890/H3. 1F, India : Arunachal Pradesh; Papumpare dist.; Itanagar, 21.viii. 2002, Coll. G. Lollen, Reg. No. 10891/H3. All specimens are deposited at the 'National Zoological Collections' of the Hymenoptera Section, Zoological Survey of India, Kolkata (NZSI).

Distribution : India : Arunachal Pradesh.

Elsewhere : China, Laos, Myanmar, Thailand and Vietnam.

Remarks : This is the first report of the species from India.

ACKNOWLEDGEMENT

The authors are grateful to the Director, Zoological Survey of India, Kolkata for providing facilities and encouragements. The first author is also grateful to James M. Carpenter, American Museum of Natural History, New York for providing some valuable reprints of his papers.

REFERENCES

- Archer, M.E. 1991. The number of species that can be recognized within the genus *Vespa* (Hym., Vespinae). *Ent. Mon. Mag.*, **127** : 161-164.
- Buysson, R. du. 1905. Monographie des guepes ou *Vespa*. *Ann. Soc. Ent. France*, **73**(3) : 485-556.
- Carpenter, J.M. and Kojima, J. 1997. Checklist of the species in the subfamily Vespinae (Insecta : Hymenoptera : Vespidae). *Nat. Hist. Bull. Ibaraki Univ.*, **1** : 51-92.
- Das, B.P. and Gupta, V.K. 1989. The social wasps of India and the adjacent countries (Hymenoptera : Vespidae). *Oriental Ins. Monogr.*, **11** : 1-292.
- Kundu, B.G., Ghosh, S.N. and Roychowdhury, S. 2006. Insecta : Hymenoptera : Aculeata (Vespidae and Apidae). *Fauna of Arunachal Pradesh : State Fauna Series*, **13**(2) : 427-448.
- Van der Vecht, J. 1957. The Vespinae of Indo- Malayan and Papuan areas (Hymenoptera : Vespidae). *Zool. Verh.*, **34** : 1-83.
- Van der Vecht, J. 1959. Notes on Oriental Vespinae, including some species from China and Japan (Hymenoptera : Vespidae). *Zool. Meded.*, **36**(13) : 205-232.

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PLATE -I



Vespa soror du Buysson, Female



Rec. zool. Surv. India, **109**(Part-4) : 113-114, 2009

Short Communication

A NOTE ON THE OCCURRENCE OF *SICAMUGIL CASCASIA* (PISCES : MUGILIDAE) IN THE FRESHWATER ZONE OF THE HOOGHLY ESTUARY

INTRODUCTION

During a recent survey in the stretch between Nababgunj and Monirampore (Barrackpore) in the freshwater zone of the Hooghly estuary thirteen (13) specimens of *Sicamugil cascasia* (Plate-1a), a small mullet, could be collected from set barriers operated near Monirampore during the months of August, 2005, June, 2006 and August, 2006. Day (1889), stated that the species is distributed in the upper reaches of Ganga and Jamuna, as low down as Patna. Jhingran and Talwar (1991) also stated that the species is purely a freshwater one and the lowest point on the Ganga river system where they were recorded was Patna. The present author, however, could record the species from about 20 km above Barauni (Bihar) down to Manikchwak in the district of Malda, West Bengal during an extensive investigation on the environment and fishery of the river Ganga instituted by the Central Inland Fisheries Research Institute between 1994-'96. The species, however, was not recorded earlier from the Nababgunj-Barrackpore (Monirampore) freshwater stretch of the Hooghly estuary.

Keywords : Mullet, *Sicamugil cascasia*, Freshwater zone, Hooghly estuary.

GENERAL DESCRIPTION

Place of collection : Near Monirampore (Barrackpore); *Date of collection* : 31.viii.2005, 26.vi.2006 and 19.viii.2006; *Gear* : Set barrier; Collected by Shri A.K. Jana, Technical Assistant.

Colour in fresh condition : Slightly greenish yellow on the back and upper sides of the body. Silvery white on the lower sides and belly. Scattered black dots on the body. A large yellow blotch at the caudal base. Yellow dot at the base of the pectoral (Plate-Ia).

Description of the specimens : *The largest specimen* : TL-46 mm; SL-38 mm; weight in fresh condition : 1.137 g; *The smallest specimen* : TL-30 mm; SL-24 mm; weight in fresh condition : 0.285 g.

Head a little wide, dorsally flattened; Length of head (Mean) 4.45 (4.10-4.88) in Total length; adipose eye-lid absent; pre-orbital with serrated lower margin, provided with 3 minute denticles posteriorly. Opercle with a spine. The proportion of the space between 1st and 2nd dorsal : total length = 1 : 4.57 (Mean value), 1st dorsal inserted almost at the middle, nearer to the tip of the snout and provided with 4 spinous rays of which 2nd one is the largest. Anal fin origin opposite to 2nd dorsal origin. Anal fin with three spinous and 8-9 soft rays. Caudal fin lunate. Scales ctenoid (Plate-Ib); Lateral line absent.

DISCUSSION

Though Jayaram (1981) and Jhingran and Talwar (1991) opined that the species is a freshwater one and found only in the upper reaches of the river Ganga, Sen (1992) stated that the species was found in the Sundarbans complex of estuarine water. This is, however, not substantiated by Talwar, *et al.* (1992) who while giving an account of estuarine and marine fishes of West Bengal did not enlist *Sicamugil cascasi*. David (1954) did not mention about the presence of the species in the Nababgunj-Barrackpore stretch of the Hooghly estuary. Menon, *et al.* (1972) also did not make any mention about the species in the upper reaches of Hooghly. Recent survey conducted by CIFRI, Barrackpore during 1995-'96 did not reveal its presence in the Hooghly estuary. The present author could not record the species in any of the stretches from down stream of freshwater to high saline zone save and except the ones reported in the present communication. The water salinities in the Barrackpore-Nababgunj stretch, when these small mullets were collected, were 0.04, 0.06 and 0.05‰ respectively, thus demonstrating a freshwater condition.

ACKNOWLEDGEMENTS

The author is indebted to Dr. K.K. Vaas, Director CIFRI, for his keen interest in these studies and providing necessary facilities. Thankful acknowledgement is also due to Shri R.N. Misra, Acting Head, Estuarine Division for encouragement. The author acknowledges the assistance rendered by Shri A.K. Jana, Technical Assistant. Thanks are also due to Shri Sujit Choudhury, Photographer for his help.

REFERENCES

- David, A. (1954) : A preliminary survey of the fish and fisheries of a five mile stretch of the Hooghly river near Barrackpore. *Indian J. Fish.* **1**(1 & 2) : 231-255.
- Day, F. (1889) : The fauna of British India including Ceylon and Burma, Fishes, Vol. II, (Published by Govt. of India, New Delhi, 1963).
- Menon, A.G.K.; Rama Rao, K.V. and Sen T.K. (1972) : The Hooghly and its fisheries in the past, the present and the future with special reference to the Farakka barrage on the Ganga. *Sci. & Cult.*, **38**(8) : 338-343.
- Sen, T.K. (1992) : Freshwater Fish. State Fauna Series 3, *Fauna of West Bengal*, Part-2, *Zoological Survey of India* : 101-242.
- Sinha, M., De, D.K. and Jha, B.C., Eds., (1998) : The Ganga-Environment and Fishery, Central Inland Capture Fisheries Research Institute (Presently, Central Inland Fisheries Research Institute), (ICAR), Barrackpore, West Bengal, 142 p.
- Talwar, P.K. and Jhingran, A.G. (1991) : Inland fishes of India and Adjacent Countries (Vol. 2). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, Bombay and Calcutta.
- Talwar, P.K., Mukherjee, P., Saha, D., Paul, S.N. and Kar, S. (1992) : Marine and estuarine fishes. State Fauna Series 3, *Fauna of West Bengal*, Part-2, *Zoological Survey of India* : 243-342.

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PLATE-Ia



Sicamugil cascasia (Hamilton-Buchanan) (enlarged)

PLATE-Ib



A ctenoid scale of *S. cascasia* (enlarged)

INSTRUCTION TO AUTHORS

Frequency of Publication : Quarterly – 4 parts in one volume.

Publication time : Within 3 months after final acceptance.

Categories of published material : Full paper, Interesting Case Reports, Field Reports, Taxonomic description and distributions, Description of new taxa, Short Communications, Checklists.

Instruction of submission : The article to be organized as :—

1. Title; 2. Author/Authors along with address clearly mentioning the corresponding author and Affiliation, e-mail address; 3. Introduction; 4. Materials and Methods; 5. Systematic accounts; 6. Results; 7. Discussion; 8. Summary; 9. Acknowledgement, 10. References; 11. Tables and Figures with appropriate title and legends on separate sheets.

For short communication, the combination of some of the above sections is recommended.

Format of Manuscript :

Submission of a manuscript implies that the report is original, unpublished and is not being considered/disqualified for publication elsewhere.

Manuscript in English should be computer-typed, double-spaced with 1.5-inch right-hand margins on one side in A4 paper (210 × 297 mm). Font size 10-12 points, Times New Roman. Text should be justified. Footnotes should be avoided. All units of measurement are in metric. All manuscript sheets must be numbered successively. No portion of the article should be underlined except Latin names of genera and species, if not typed in italics. Submit in triplicate with a CD in MS Word, photo/map/chart/drawings in jpg/psd (photoshop).

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.

Materials and Methods should provide the reader with all the information necessary to repeat the work. For modification of published methodology, only modification needs to be described with reference to the original source.

Under material examined the following format should be followed strictly for *e.g.* :

Material Examined : Holotype : Female : India, Kerala, Calicut University campus, 3-xii-1994, coll. T.C. Narendran and Party (Reg. No.)

Results to be presented by referring to tables and figures (if any) and without discussion.

Discussion should include a concise statement of the findings, a discussion of the variety of the observations, a discussion of the findings in the light of other published works dealing with the same or allied subjects.

Summary : A short write up to be given describing the article and its importance/need.

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Title of periodicals should be abbreviated as in the latest edition of World list of Scientific Periodicals, London.

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Examples :

Journal : Raghunathan, M.B. and Valarmathi, V. 2007. Zooplankton investigation from a paddy field in Tamil Nadu. *Rec. zool. Surv. India*, **107**(1) : 55-62.

Nandi, N.C., Das, S.R., Bhuinya, S. and Dasgupta, J.M. 1993. Wetland Faunal Resources of West Bengal, I, North and South 24-Parganas Districts. *Rec. zool. Surv. India, Occ. Paper No.*, **150** : 1-50.

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

State Fauna/Conservation Areas

Mukhopadhyay, S.K. 1999. Fresh water Oligochaetes. *Fauna of West Bengal, State Fauna Series*, **3**(Part-10) : 95-123. Published by Zool. Surv. India.

Radhakrishna, C. 2007. Amphibia. In : *Fauna of Kudermukh National Park, Karnataka, Conservation Area Series*, **32** : 20-25, Published by Zool. Surv. India.

Book

Gupta, S.K. 1985. *Handbook on Plant Mites of India* : 1-520. Published by Zool. Surv. India.

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