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DIVERSITY AND ECOLOGY OF TURBELLARIAN ANIMALS IN DEEPAR WETLAND OF ASSAM, INDIA

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INTRODUCTION

The class Turbellaria of the Phylum-Platyhelminthes includes free living members of the aquatic worm animals. They have vermiform, dorso-ventrally flattened body and generally bear direct or inverted cup eyes. Freshwater turbellarians are slow moving organisms found crawling on submerged aquatic vegetations. They generally bear some epidermal rod shaped bodies known as *rhabdoids*. Turbellarians are commonly distributed in diverse freshwater habitats like ponds, lakes, marshes and springs etc (Edmondson, 1959; Tonapi, 1980). Since they prey upon numerous dipteran larvae including mosquitoes, they have considerable economic importance (Ali and Mulla, 1983).

Freshwater turbellarians in India are exiguously known. However, a few stray references can be cited from the scientific records of Annandale (1912), Whitehouse (1913), Kapadia (1947) and Basil and Fernando (1975). There are also a few previous reports on the group appearing as bio-limnological component (Goswami, 1985; Chetri, 2000, Kalita, 2007). The present paper deals with the occurrence of four turbellarian animals namely, *Mesostoma tetragonum* (Müller), *Bothromesostoma* sp., *Dugesia* sp. and an unidentified rhabdocoel animal which has been recorded for the first time from freshwater habitat of Deepar wetland, a Ramsar Site of Assam. The generic status of all the animal has been confirmed from the literature of the Swedish Natural History Museum, located at Stockholm, Sweden. However, their species status has been compared with Turbellarian Taxonomic Web Database. In the present investigation, *M. tetragonum* (Müller) demonstrates a characteristic microhabitat condition under the littoral, partly rotten and fragmented mats of *Eichhornia crassipes* during March-May, while others appeared as general inhabitant on a variety of littoral macrophytic stands.

MATERIALS AND METHODS

Deepar wetland is a perennial water body situated in between 91°36′ to 91°42′ East longitude and 26°06′ to 26°09′26′′ North latitude near Guwahati, the capital city of Assam, India. The wetland covers an area of *ca* 146.23 ha. Main wetland is subdivided into three major parts, the *Barbeel, Kharbari* and the *Chanabeel*. There are some dendritic extensions at the northern part of the wetland. The wetland receives water from the River Brahmaputra through a canal, the *khanajan* which also acts as both inlet and outlet. Besides, it also regularly receives water from *Basistha* stream through a river offshoot of *Mora Bharalu*. The wetland is a good habitat for different migratory birds for which a part of it is now reserved as Bird Sanctuary. Presently this entire wetland has been declared as Ramsar Site in the year 2002 (Vide Ramsar Site no 1207, on 18thAugust, 2002).

At the beginning of the study, animals appeared accidentally with live sample of macro-invertebrate fauna collected in March, 2005. Thereafter the animals were regularly searched in different macrophytic stands. Three turbellarian species

namely, *Bothromesostoma* sp., *Dugesia* sp. and the unidentified rhabdocoel frequently appeared in the sample. However, the actual habitat of *M. tetragonum* could be determined as soon as the samples were collected from the partly decomposed stands of *Eichhornia crassipes*, a floating macrophytes dominating at the littoral zone of the wetland. Partly decomposed submerged part of *E. crassipes* was scrapped underwater by the edge line of a 250 ml Borosil glass beaker for collection of *M. tetragonum*.

All the samples containing the living individuals of the turbellarian were brought to the Limnological Laboratory of the Department of Zoology, Gauhati University for their identification and micro-structural studies. The micro photographs of the animals were taken with the help of a CCD camera fitted with computerized zoom trinocular microscope. Some of the captured individuals were preserved in 4% formaldehyde after fixing it in Bouin's fluid for future record.

All the species were reared in the laboratory of UGC-SAP (DRS) Project Campus of the Zoology department of Gauhati University in 1 liter capacity sterilized glass beaker during March-July 2006. Each batch of the animals was reared for 20 days. Beakers were half filled with filtered water of the same wetland. Living plant materials were added in to the beaker. Plant materials were selected after physical survey on the habitat of the animals. Plant materials were examined thoroughly with the help of a dissection microscope before introducing into the beaker. Further, the partly decomposed stems and leaves of *E. crassipes* were collected from original wetland water properly washed in distilled water and examined under Olympus dissecting microscope to eliminate existence of other faunae for the rearing of *M. tetragonum* species. The stems and leaves were kept in the rearing beakers to facilitate the animal to grow on their organic parts. The animal grows well in laboratory condition. The water from the middle core region of the beakers were pipette out from time to time and replaced with pure original water.

Water temperature of the habitat was determined with the help of a mercury thermometer while all other chemical parameters were analyzed on the spot following the standard methods of APHA (1975).

Systematic enumeration (after Edmondson, 1959)

Phylum PLATYHELMINTHES

Class TURBELLARIA

Order TRICLADIDA

Family PLANARIIDAE

1. ***Dugesia*** sp.

Order NEORHABDOCOELA

Family TYPHLOPLANIDAE

Subfamily MESOSTOMINAE

2. ***Mesostoma tetragonum*** (Müller)

3. ***Bothromesostoma*** sp.

OBSERVATIONS

The *Dugesia* sp. (Figure 2) has a flatten body with slightly arrow shaped head. The head bears one pair of eyes. While, *Bothromesostoma* sp. (Figure 3) and the unidentified rhabdocoel animal (Figure 4) have spindle shaped body. Eyes were not observed in the matured *Bothromesostoma* sp. The unknown rhabdocoel has one pair of eyes. *Mesostoma tetragonum* (Figure 1) has a star fruit shaped ridged body with two lateral out-pouching in each side. Eyes are prominent. Individuals are transparent bearing some whitish rod shaped bodies of radiating or branching nature lying beneath its outer loose surface. Some of the internal body parts like paired ovary, copulatory duct, copulatory bursa, seminal receptacle, seminal vesicle, uterus etc. can be observed from its ventral surface. The average length of all the animals is 8-12 mm.

Figure 1: *Mesostoma tetragonum*

Figure 2: *Dugesia* sp.

Figure 3: *Bothromesostoma* sp.

Figure 4: Photograph of unknown Rhabdocoel

In laboratory, rearing *M. tetragonum* demonstrates a skewing movement through both of its dorsal and ventral surfaces. The lateral folds constituting the ridges help in its movement. Individuals of this species bear eggs at both the sides of their ventro-lateral parts. Individual eggs are oval and dark brown in colour. The eggs are arranged in rows inside the ovary. It is observed that the number of eggs is not equal at both the sides. However, individuals in laboratory rearing demonstrate the increase in number of eggs at a rate of 2 in each ovary per day to a maximum egg production of 26 numbers. The average number of eggs in each ovary has been estimated as 18 ± 3. Mature individuals release their eggs in the water, which immediately sink into the bottom. Eggs are *ca* 0.2-0.3 mm in diameter and non sticky. However, during the laboratory rearing the eggs did not hatch. Observed individuals demonstrate response to light and they become more active at dusk and in morning hours than in day times. Mature *Bothromesostoma* sp. also bears eggs. However, their mode of release and development could not be observed during laboratory rearing.

The water quality of its occurring zone indicates the circum-neutral towards acidic (average pH 6.59 ± 0.20); turbidity 16.25 ± 4.68 NTU; dissolved oxygen 7.28 ± 0.64 mg/l; free carbon-di oxide 9.21 ± 0.87 mg/l; total alkalinity 40.08 ± 5.32 mg/l and total hardness 40.17 ± 4.43 mg/l. Average water temperature during its occurrence has been recorded as 27.3° C ± 2.72° C (Table-1).

DISCUSSION

The present diversity of *Mesostoma tetragonum*, *Bothromesostoma* sp. and the unidentified rhabdocoel in Deepar wetland creates a new occurrence record in the north eastern region of India. However, the ignorance of these faunae in some previous works might be due to the general ignorance of Turbellaria group in the samples (Dey, 1981; Lahon, 1983; Goswami, 1985; Chetri, 2000). The occurrence of *M. tetragonum* in some European countries like Bulgaria, Czech Republic, Danish mainland, Estonia, French mainland, Germany, Lithuania, Poland, etc. and in East Palaeartic region have already been well established (Source: Internet version of *Fauna Europaea*, 2004). Acidic pH, organic turbidity, moderately high FCO_2, low alkalinity and hardness, moderately high temperature ranges and productive dissolved oxygen range of water support the development of these faunae along with many other enmeshed faunae (Jhingran, 1997). Host specificity of *M. tetragonum* in the floating *E. crassipes* stand is unique in its studies. However, all free living freshwater turbellarins are commonly distributed in diverse freshwater habitats like ponds, lakes, marshes, springs etc. (Edmondson, 1959; Tonapi, 1980) and their economic importance

Table-1: Water parameters studied at the habitat of turbellarian species in Deepar wetland during 2005 and 2006

Water parameters	Average	SD	Max	Min
Turbidity (NTU)	16.25	4.68	25	12.5
pH	6.59	0.20	6.85	6.57
Dissolved oxygen (mg/l)	7.28	0.64	8.48	7.0
FCO_2 (mg/l)	9.21	0.87	10.62	8.6
Total alkalinity (as $CaCO_3$) mg/l	40.08	5.32	48.50	36.5
Total hardness (as $CaCO_3$) mg/l	40.17	4.43	47	35
Calcium (as $CaCO_3$) mg/l	27.42	3.18	32	24.25
Magnesium (as $CaCO_3$) mg/l	12.67	1.40	15	10.75
Water Temperature (°C)	27.3	2.72	29.7	24.4

Table-2: Comparison of water parameters recorded by Basil and Fernando (1975) of the habitat of *Mesostoma* and present record at the habitat of turbellarian species.

Sl. No.	Water parameters	Observations of Basil and Fernando, 1975	Present record in Deepar wetland
1	Water basin type	Quarry pool	wetland
2	Water temperature (°C)	30.0-41.0	27.3 ± 2.72
3	Dissolved oxygen (mg/l)	1.53-14.35	7.28 ± 0.64
4	Free carbon-di oxide (mg/l)	0.79-7.9	9.21 ± 0.87
5	Total alkalinity (ppm)	152.0-394.0 mostly 250-394	40.08 ± 5.32 ($mg.l^{-1}$)
6	pH	7.8-8.6	6.59 ± 0.20
7	Turbidity	Clear water (0-33 cm and mostly nil)	Moderately turbid (16.25 ± 4.68 NTU)

is understood from Ali and Mulla (1983) since they prey upon numerous dipteran larvae including mosquitos.

The present ecological setup of the habitat quality of these species exhibits strong dissimilarity in most of water quality parameters to what Basil and Fernando (1975) recorded for a *Mesostoma* sp. in southern part of India (Table-2). For example, total alkalinity, dissolved oxygen, pH and water turbidity in both the habitat patterns (when compared) clearly indicate the differences to which it lies in the fact that species of *Mesostoma* can emerge in both highly alkaline water as well as in water with low alkalinity and acidic pH, high and moderate range of water temperature and wide fluctuation of dissolved oxygen. The habitat range from quarry pool to wetland basin also signifies high range spatial character in distribution of the group in India.

SUMMARY

Four turbellarian animals namely, *Mesostoma tetragonum* (Müller), *Bothromesostoma* sp., *Dugesia* sp. and an unknown rhabdocoel has been recorded in the aquahabitat of Deepar wetland (91°36′ to 91°42′ East longitude and 26°06′ to 26°09′26′′North latitude) of Assam, India. The studied wetland is a Ramsar Site of India and has considerable macro-invertebrate diversity. All these animals except *Dugesia* sp. has been recorded for the first time from the region. Animals are found on the aquatic parts of littoral macrophytes. However, *Mesostoma tetragonum* is collected from the littoral stands of partly decomposed *Eichhornia crassipes* during March 2005 to April 2008. Some of the relevant ecological aspects are also studied.

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REFERENCES

Ali, A. and Mulla, M.S. 1983. Evaluation of the planaria,*Dugesia dorotocephala* as a predator of chironomid midges and mosquitoes in experimental ponds. *Mosquito News*, **43**: 46-49.

American Public Health Association,1975. *Standard Methods of the examination of water and waste water*, 14th ed. APHA, AWWA, WWCF, USA., 1193 pp.

Annandale, N. 1912. *Caridinicola*, new type of Temnocephaloidea. *Rec. Ind. Mus.*, **7**(2): 243 - 252.

Basil, J.A. and Fernando, R.S. 1975. Ecological notes on the Indian freshwater Microturbellaria: *Mesostoma* sp., *J. Bom. nat. Hist. Soc.*, **72**(3): 875-876.

Chetri, G. 2000. Limnology of Deepar Beel with special reference to its bio-diversity and pollution status., Ph.D. Thesis, Gauhati University.

Dey, S.C. 1981. Studies on the hydrobiological conditions of some commercially important lakes (Beels) of Kamrup district of Assam and their bearing on fish production, North Eastern Council (Govt. of India)

Edmondson, W.T. (Ed) 1959. *Freshwater Biology*. 2nd ed. John wiley 7 Sons, INC. New York, 323-365.

Goswami M.M. 1985. *Limnological investigations of a tectonic lake of Assam, India and their bearing on fish production.*, Ph. D. Thesis, Gauhati University, 395 pp.

Jhingran V.G., 1997. *Fish and Fisheries of India*. Hindustan Publishing Corporation (India) Delhi, 3rd Ed. (corrected reprints) pp. xxiii+728.

Kalita, G. 2007. *Ecology and distribution of macro-invertebrate enmeshed fauna in Deepar wetland of Assam, India*, unpublished Ph.D. thesis, Gauhati University, 207 pp.

Kapadia, G.A. 1947. Note on the occurrence of *Bipalium* in Junagadh Kathiawar, *J. Bom. Nat. Hist. Soc.*, **47**(1): 178-180.

Lahon B. 1983. *Limnology and fisheries of Lake Sone in the Cachar district of Assam* (India), Ph. D. Thesis, Gauhati University. 351 pp.

Tonapi, G.T. 1980. *Fresh water animals of India an ecological approach*, Oxford & IBH Publishing Co. New Delhi, 341 pp.

Turbellarian Taxonomic Web Database. http://turbellaria.umaine.edu/turb2., http://www.developmentalbiology.com/styler/turbellaria/turb2.

Whitehouse, R.H. 1913. Freshwater planaria (Zoological records of the Abor Expedition 1911-12, Part III, No. 22). *Rec. Ind. Mus.*, **8**: 317-321.

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