



Occurrence of *Mesostoma tetragonum* (Müller) (Turbellaria) in the Deepar wetlands of Assam, India

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The class Turbellaria of the Phylum Platyhelminthes includes free living members of the aquatic worm group (Edmondson 1959). They have a dorso-ventrally flattened body and generally bear eyes with the exception of a few species like *Vauclusia conica*, *Kymocarens tibialis* and some cave-dwelling species (Edmondson 1959; Willems et al. 2005). The freshwater turbellarians are slow moving organisms found crawling on submerged vegetation. They generally bear rod shaped bodies known as rhabdoids. All the freshwater turbellarians are more or less elongated, flat and sometimes spindle-shaped animals. They are commonly distributed in diverse freshwater habitats like ponds, lakes, marshes and springs (Edmondson 1959; Tonapi 1980). Since they

prey upon numerous dipteran larvae including mosquitoes, they have great economic importance (Ali & Mulla 1983).

Freshwater turbellarians in India are exiguously known. However, a few stray references can be cited from the publications of Annandale (1912), Kapadia (1947) and Basil & Fernando (1975). There is no report of occurrence of the studied species so far from the northeastern region of India, though there is some fragmentary report on the group appearing as a bio-limnological component (Goswami 1985). The present paper deals with the occurrence of *Mesostoma tetragonum* (Müller) which has been recorded for the first time from the freshwater habitat of the Deepar wetlands, a Ramsar site of Assam, India. It was collected during a scientific reconnaissance on macro-invertebrate fauna in the same wetland. The genus was identified following Edmondson (1959). The same was compared with internet descriptions on Turbellaria, *Mesostoma tetragonum* (Turbellarian taxonomic database: <<http://turbellaria.umaine.edu/turb2.php?action=13&code=6630>>). The distribution of the species was observed through the internet database of Fauna Europaea, version: 2.4, updated on 27 January 2011 (<<http://www.faunaeur.org/distribution.php>>). In the present investigation, the animal demonstrated a characteristic micro habitat condition under the littoral, partly rotten and fragmented mats of *Eichhornia crassipes* during March–May in the studied years from 2006 to 2008.

Study area: The Deepar wetland is a perennial water body situated between 91°36'–91°42'E and 26°06'–26°09'26"N near Guwahati, the capital city of Assam, India. The wetland covers an area of ca. 1.46km². 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 and a part of it is now reserved as a bird sanctuary. The wetland is a Ramsar site of India (Ramsar site no. 1207, as declared on 18 August 2002). *Mesostoma tetragonum* was collected mainly at global positioning system points 26°07.245'N & 91°37.927'E and

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26°06.916'N & 91°39.231'E.

Methodological approach for collection and laboratory rearing of the individual:

At the beginning of the study, *M. tetragonum* appeared accidentally with a live sample of macroinvertebrate fauna, namely *Hydra vulgaris* Pallas, *Dugesia* sp., *Stylaria fossularis* Leidy, *Branchiura sowerbyi* Beddard, and *Eulimnadia* sp. in the Deepar wetlands. Thereafter, the animal was regularly searched for in different littoral macrophytic stands of floating vegetations. However, the actual habitat of the animal could be determined only as the samples were collected from the partly decomposed stands of *Eichhornia crassipes*, a floating macrophyte dominating the littoral zone of the wetland. A partly decomposed submerged part of *E. crassipes* was scraped underwater by the edge line of a 250ml borosil glass beaker. The samples containing living individuals of the turbellarian (which could be seen by the naked eye) were brought to the Limnological Laboratory of the Department of Zoology, Gauhati University, for identification and micro-structural studies. Twelve individuals were reared in the laboratory of Gauhati University for 20 days in 11 capacity sterilized glass beakers during the year 2007. Further, the partly decomposed stems and leaves (under surface) were collected in original wetland water, properly washed in distilled water and examined under Olympus dissecting microscope to eliminate the existence of other fauna. The stems and leaves were kept in the rearing beakers to facilitate the organism to grow on their organic parts. The organism grew well under laboratory conditions. The water from the middle core region of the beaker was pipetted out from time to time and replaced with freshly collected original wetland water. The micro photographs of the animal were taken with the help of a CCD camera fitted with a computerized zoom trinocular microscope. The behaviour of the animal under rearing was studied. The captured individuals were preserved in 4% formaldehyde after fixing in Bouin's fluid for future record.

The 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: The systematic enumeration is based on Edmondson (1959).

Phylum: Platyhelminthes

Class: Turbellaria

Order: Neorhabdocoela

Suborder: Typhloplanoida

Family: Typhloplanidae

Subfamily: Mesostominae

Genus: *Mesostoma* Ehrenberg

Species: *tetragonum* (Müller)

Scientific name: *Mesostoma tetragonum* (Müller)

Observation: The animal has a star fruit shaped ridged body with two lateral folds on 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 the animal is 10–12 mm (Images 1, 2 &3).

Littoral habitat of the Deepar wetlands is rich in macro-invertebrates. However, the occurrence of *M. tetragonum* in this wetland constitutes a new record in the region. In laboratory rearing the animal demonstrated a skewing movement through both of its dorsal and ventral surfaces. The lateral folds constituting the ridges help in its movement. All the individuals bear eggs at both sides of their ventral aspect as noticed during their collection. Individual eggs are oval and dark brown in colour. The eggs are arranged in rows inside the ovary. It was observed that the number of eggs is not equal at both sides. However, the laboratory rearing of *M. tetragonum* exhibited that the increase of eggs in each ovary was at the rate of



Image 1. *Mesostoma tetragonum* (dorsal view)

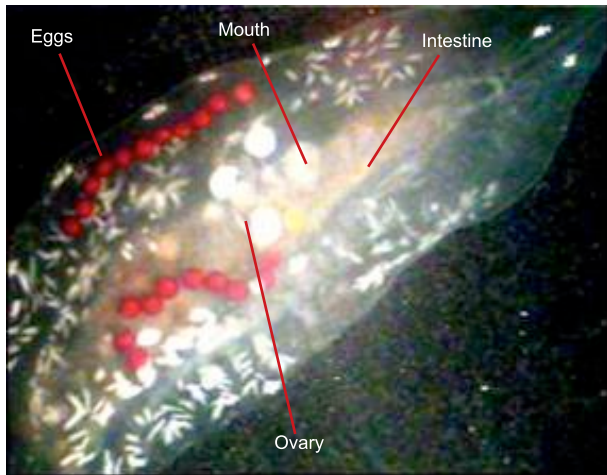


Image 2. *Mesostoma tetragonum* (ventral view)



Image 3. *Mesostoma tetragonum* (lateral view)

two per day, producing eggs in each individual ranging from 14–26. During rearing the individuals consumed *Daphnia* sp.

Individuals release their eggs in the water which were observed at the bottom of the rearing beaker. Eggs are ca. 1–1.2 mm in diameter and non sticky. However, during the laboratory rearing, the eggs did not hatch. Observed individuals demonstrated a response to light and they became more active at dusk and in the early morning hours than during the daytime.

The water quality of its occurring zone indicated 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 dioxide 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 was recorded as 27.3 ± 2.72 °C (Table 1).

Discussion: There were no previous record of occurrence of *Mesostoma tetragonum* in Deepar wetland as had appeared from the works of Day (1981), Lahon (1983), Goswami (1985), and Chetri (2000). This species was probably ignored due to ignorance of the Turbellaria group in the samples. Acidic pH, Organic Carbon, turbidity, moderately high FCO₂, low alkalinity and hardness, moderately high temperature ranges and productive dissolved oxygen range (7–8.5 mg/l) of water support the development of this fauna along with many other invertebrate fauna. All free living freshwater turbellarians are commonly distributed in diverse freshwater habitats like ponds, lakes, marshes, springs etc. (Edmondson 1959;

Table 1. Water parameters studied at the habitat of *M. tetragonum* 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

Tonapi 1980). Their importance in the ecosystem is yet to be clearly understood. However, the economic importance of some turbellarians is understood from the work of Ali & Mulla (1983) since they prey upon numerous dipteran larvae including mosquitoes.

Freshwater turbellarian fauna including the genus *Mesostoma* have not been studied in Indian freshwaters, excepting some details of taxonomy and distributional ecology of triclad planarians (Whitehouse 1913; Basil & Fernando 1975). The present ecological setup of the habitat quality of *M. tetragonum* exhibits strong dissimilarity in most of water quality parameters from what Basil & Fernando (1975) recorded from the 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. Thus, *Mesostoma* can emerge in both highly alkaline water as well as in water with

Table 2. Comparison of water parameters recorded by Basil & Fernando (1975) of the habitat of *Mesostoma* and present record at the habitat of *M. tetragonum*.

	Water parameters	Observations of Basil & 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)	1.53–14.35	7.28±0.64
4	Free Carbon–di oxide (mg.l ⁻¹)	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)

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 animal. From the spatial distribution point of view, *M. tetragonum* does not explain cosmopolitan distribution since there is deficiency of occurrence data in Afro-tropical region, Australian region, North East Asia, Nearctic region, Neotropical region, northern Africa and Oriental Region. However, this species bears a long history of occurrence in European countries/ regions since reported by Müller in 1773 (source: <<http://www.faunaeur.org/distribution.php>>).

Macrophytic preference of macro-invertebrates has been studied by a number of workers (Das 1975; Goswami 1985; Jhingran 1997; Bhattacharya 1998; Pal et al. 1998; Kalita & Goswami 2006 a, b; Kalita 2008). The Deepar wetlands bear 30 different macrophytes (Kalita 2008). However, present observations distinctly demonstrate the preference of *E. crassipes* mat only by *M. tetragonum* which also indicates host specificity of the species. This fauna is recorded in the wetlands during pre-monsoon months only. However, their status of existence in the wetlands in the rest of the months is not clearly understood.

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