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SPECIES COMPOSITION OF ZOOPLANKTON IN A TROPICAL FLOODPLAIN LAKE, ASSAM (N. E. INDIA)

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INTRODUCTION

The floodplain lakes, locally called 'beels', 'jheels', 'mauns', 'chaurs', 'pats', or 'tals' are distributed in Eastern Uttar Pradesh, Northern Bihar, West Bengal and in different parts of North-Eastern India. The beels deserve special mention in the state of Assam which cover (0.12 million ha) about 93% of its total lentic fish-prone area. Little is, however, known about their zooplankton diversity in India in general and Assam in particular. There is so far no published report on these organisms from Assam but the available information is restricted to unpublished works of Lahon (1983), Kar (1984), Goswami (1985), Yadava (1987) and Goswami (1997).

This paper deals with zooplankton composition of a tropical floodplain lake of the Brahmaputra basin, upper Assam with remarks on its nature and composition, temporal variations in species richness and community similarities.

MATERIALS AND METHODS

The present study, a part of general limnological survey, was conducted in Samuajan beel (area : 54 ha; depth : 0.7-2.4 m) located (Long : 94° 56' E; Lat. : 26° 75' N) in the Dhemaji district, Upper Assam. Aquatic macrophytes noticed in the lake included *Eichhornia crassipes* and species of *Potamogeton*, *Hydrilla* and *Nymphaea*.

Qualitative plankton samples were collected from limnetic and littoral regions of Samuajan beel, at regular monthly intervals, during March, 1994 - February, 1995. The collections were obtained by towing a nylobolt plankton net (No. 25) and were preserved in 5% formalin. Various zooplankton taxa were isolated, mounted in Polyvinyl alcohol - lectophenol mixture and were identified following Koste (1978), Fritter and Manuel (1986), Michael and Sharma (1988), Battish (1992) and Segers (1995). Percentage similarities between different zooplankton communities were calculated *vide* Sorensen's index (Sorensen, 1948).

RESULTS AND DISCUSSION

Fifty-three species of zooplankton (including two species of the miscellaneous group) are

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documented from Samuajan beel while its limnetic and littoral communities included 49 species (Table 1) and 51 species (Table 2) respectively. The studied taxocoenosis, therefore, is fairly rich and diversified and broadly corresponded with 57 species reported from Pichhola-Fatehsagar wetland complex, Rajasthan (Vyas, 1989). On the other hand, the qualitative diversity is distinctly higher than other beels from Assam (Lahon, 1983; Goswami, 1985; Yadava, 1987; Goswami, 1997) as well as those elsewhere in India (Rai and Dutta-Munshi, 1982; Yousuf *et al.* 1986; Khan, 1987; Baruah *et al.* 1993; Nandi, *et al.* 1993; Sinha *et al.* 1994; Sanjer and Sharma, 1995).

Zooplankton fauna of Samuajan beel depicted general tropical character (*vide* Green, 1972; Fernando, 1980; Dumont, 1983; Dussart *et al.* 1984; Sharma and Michael, 1987; Sharma, 1991a, 1991b, 1996) and it is comprised broadly of Cosmopolitan > Cosmotropical / Pantropical elements. In addition, *Lecane hastata*, *Ascomorpha ovalis*, *Pleosoma lenticulare*, *Trichocerca elongata*, *Synchaeta oblonga*, *Monommata* sp. and *Bosmina longirostris* are examples of regional distributional importance. Of these, the genus *Monommata* is so far reported only from N. E. India (Sharma, 1996); *A. ovalis* and *P. lenticulare* are recently documented from Central India (Sharma and Naik, 1996); *B. longirostris*, the most common limnetic cladoceran of N. E. region, is characterised by much restricted occurence in other parts of India (Sharma, 1991b). The tropical nature of the studied fauna is, however, supported by relative richness of the lecanid and the brachionid rotifers (Sharma, 1991a, 1996). Further, acidic to slightly alkaline waters (Sharma and Hussain, 1999) of this floodplain lake reflected paucity of *Brachionus* spp. and thus agreed with the findings of Fernando and Zankai (1981), Segers (1995) and Sharma (1996).

Rotifera (37 species) > Cladocera (8 species) > Rhizopoda (4 species) > Copepoda (2 species) contributed to zooplankton richness in Samuajan beel. Qualitative dominance of Rotifera is in concurrence with the observations by Lahon (1983), Goswami (1985), Yousuf *et al.* (1986), Khan (1987), Yadava (1987), Sanjer and Sharma (1995) and Goswami (1997). This feature is, however, in distinct contrast to poor rotifer diversity (3 species) noticed in 65 wetlands of West Bengal (Nandi *et al.* 1993). The cladoceran richness broadly agreed with that in Chandubi beel, Assam (Yadava, 1987) and Trigamsar, Kashmir valley (Khan, 1987) but is slightly lower than 11 species known from Naranbagh (Khan *lo cit.*) and 13 species from floodplain lake of Bihar (Sanjer and Sharma, 1995). The diversity of Rhizopoda corresponded with the findings of Yadava (1987) and Sanjer and Sharma (*op. cit.*) but is lower than the reports by Lahon (1983) and Goswami (1985). The present study indicated very poor richness (2 species) of Copepoda and the miscellaneous group (2 species) is represented by the facultative planktonic ephemeropteran larvae and aquatic mite.

The species richness of zooplankton exhibited notable monthly variations in both the limnetic and littoral regions. It ranged between 12 - 26 species in the former region and depicted a broadly bimodal pattern (Table 1), with peak richness during monsoon (July, 94) and secondary maxima during early winter (December, 94) while lowest richness is observed in mid-monsoon (September, 94). The qualitative diversity in this region is, however, relatively higher (20-26 species) from March-August, 94. On the other hand, littoral zooplankton communities (Table 2) registered diversity ranging between 18-27 species which, in turn, followed a multimodial pattern; peak and minimum richness are noticed in May, 94 and March, 94 respectively. In addition, annual ranges of zooplankton richness in Samuajan beel are higher than the reports by Rai and Dutta-Munshi (1982), Lahon (1983), Yousuf *et al.* (1986), Yadava (1987) and Goswami (1997).

The present study depicted considerable variations in overall community structure within limnetic and littoral zooplankton. This generalisation is supported (Tables : 3 and 4) by their community similarities (*vide* Sorensen's index) which ranged between 25.8 - 92.0% and 30.0 - 75.7% respectively. The former recorded fewer instances of percentage similarly values > 70.0% or < 30.0% while in a majority of cases (79%), it varied between 40.0 - 60.0%; their maximum and minimum similarities are noticed in the samples collected between March / April and between September / November respectively. Referring particularly to the littoral region, the community similarity ranged between 40.0 - 70.0 % in about 94% instances; maximum percentage similarity is noticed between the samples collected during winter (January / February, 95) while its minimum value is recorded between August, 94 / February, 95. Further, a comparison of monthly species composition of limnetic and littoral zooplankton exhibited notable variations in their community similarities (47.4 - 81.6%). Relatively low similarity values are noticed between the two communities during September, 94 (48.6%), October, 94 (47.4%), August, 94 (50.0%) and February, 95 (48.5%) while during the rest of the months, it ranged between 61.5 - 81.6% and the peak community similarity is noticed between the two regions during March, 94.

SUMMARY

Fifty - three species of zooplankton belonging to Rotifera > Cladocera > Rhizopoda > Copepoda = miscellaneous group are reported from Samuajan beel, upper Assam. Limnetic and littoral communities included 49 and 51 species respectively, depicted broadly tropical character and included several species of regional zoogeographical interest. The monthly qualitative richness of zooplankton in limnetic and littoral regions ranged between 12 - 26 species and 18 - 27 species and registered 25.8 - 92.0 % and 30.0 - 75.8 % community similarities respectively.

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Table 1 : Monthly variations in Species composition of Limnetic Zooplankton

	Mar.	Apr.	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
RHIZOPODA												
Arcella discoides Ehrenberg	+	+	+	+	+	+	+	+	+	+	+	+
Centropyxis aculeata (Ehrenberg)	+	+	+	+	+	+	-	+	+	-	-	+
C. ecornis (Ehrenberg)	+	+	+	+	+	-	-	-	+	+	-	+
Difflugia sp.	+	+	+	+	+	+	-	-	-	-	+	-
ROTIFERA												
Anuraeopsis fissa (Gosse)	-	+	-	+	-	-	-	-	-	-	-	-
Brachionus angularis Gosse	-	-	+	-	+	-	-	-	+	+	+	-
B. falcatus Zacharias	-	-	-	-	+	+	-	-	-	-	-	-
B. patulus (Müller)	+	+	+	+	+	+	-	-	-	-	-	-
B. quadridentatus (Hermann)	-	-	-	-	+	-	-	-	-	-	-	-
Platyias quadricornis (Ehrenberg)	+	+	-	+	+	-	-	-	-	-	-	-
Keratella tropica (Apstein)	-	-	-	-	+	+	+	-	-	+	+	+
Euchlanis dilatata (Ehrenberg)	+	+	+	+	-	-	-	-	+	+	+	+
Dipleuchlanis propatula (Gosse)	-	-	-	+	-	-	+	-	-	-	-	-
Mytilina ventralis (Ehrenberg)	+	+	-	-	-	-	-	-	-	-	+	+
Lecane curvicornis (Murray)	-	-	-	+	-	+	-	-	-	-	-	-
Lecane hastata (Murray)	-	-	-	-	-	-	-	-	+	+	-	-
L. leontina (Turner)	+	+	+	+	+	+	-	-	-	+	-	-
L. papuana (Murray)	-	-	-	-	-	-	-	-	-	+	-	-
L. ploenensis (Voigt)	-	-	+	-	-	-	-	-	-	-	-	-
L. signifera (Jennings)	-	-	-	+	-	+	-	-	-	-	-	-
L. ungulata (Gosse)	-	-	-	-	-	-	-	-	-	+	+	-
L. inopinata Harring & Myers	-	-	+	+	-	-	-	-	-	-	-	-
L. bulla (Gosse)	+	+	+	+	+	-	+	-	-	-	-	-
Cephalodella sp.	+	-	-	-	-	-	-	+	+	-	-	-
Monommata sp.	-	-	-	-	-	-	+	+	-	-	-	-
Ascomorpha ovalis (Bergendal)	+	-	-	-	+	+	+	+	-	+	+	+
Pleosoma'lenticulare Herrick	-	-	+	-	+	-	-	-	-	-	-	-
Trichocerca cylindrica (Imhof)	-	-	-	-	+	+	-	-	-	+	-	-
T. elongata (Gosse)	-	-	+	+	+	+	-	+	+	+	-	-
Asplanchna priodonta Gosse	+	+	-	-	+	-	-	-	-	-	-	-
Polyarthra vulgaris Carlin	-	-	-	+	+	-	-	+	+	-	-	-
Synchaeta oblonga Ehrenberg	-	-	+	-	-	+	-	-	+	+	-	-
Testudinella patina (Hermann)	+	+	+	-	+	+	-	-	-	-	-	-
Filinia opoliensis (Zacharias)	-	-	-	-	+	+	+	+	-	-	-	-
Philodina sp.	-	-	-	-	-	-	-	+	+	-	-	-
Rotaria rotatoria (Pallas)	-	-	-	+	-	-	+	-	-	-	-	-
R. neptunia (Ehrenberg)	-	-	-	-	-	-	-	-	-	+	+	-
CLADOCERA												
Ceriodaphnia cornuta Sars	+	+	+	+	-	-	+	-	+	+	+	-
Scapholeberis kingi Sars	+	+	-	+	+	-	-	+	+	+	+	+

Table 1 (continued)

	Mar.	Apr.	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Bosmina longirostris (Müller)	-	-	+	+	+	+	-	-	-	-	-	-
Moina micrura Kurz	+	+	+	-	+	+	+	-	-	-	-	-
Chydorus sphaericus (Müller)	+	+	+	+	+	-	+	+	-	+	+	+
Alona costata Sars	+	+	-	-	-	-	-	+	-	+	+	-
A. rectangula Sars	+	+	-	-	-	-	-	+	-	+	-	-
Pleuroxus similis Vavra	+	+	+	+	-	-	-	+	+	+	-	+
COPEPODA												
Cylops sp.	+	+	+	+	+	+	+	+	+	+	+	+
Diaptomus sp.	+	+	+	+	+	+	-	+	-	+	-	-
Nauplius larvae	+	+	+	+	+	+	+	+	+	+	+	+
MISCELLANEOUS GROUP												
Aquatic mites	-	-	-	-	-	+	+	+	-	-	-	-
Ephemeropteran nymphs	-	+	-	-	-	-	+	+	+	-	+	+
Total Number of Species	23	23	22	24	26	20	14	18	16	22	15	12

+ = present - = absent

Table 2 : Monthly variations in Species composition of Littoral Zooplankton

	Mar.	Apr.	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
RHIZOPODA												
Arcella discoides Ehrenberg	+	+	+	+	+	+	+	+	+	+	+	+
Centropyxis aculeata (Ehrenberg)	+	+	-	+	+	-	+	-	+	-	+	+
C. ecornis (Ehrenberg)	+	+	-	+	+	+	+	+	+	-	-	-
Difflugia sp.	+	-	+	+	+	+	+	+	+	+	+	-
ROTIFERA												
Anuraeopsis fissa (Gosse)	+	-	+	-	-	-	-	-	-	-	-	+
Brachionus angularis Gosse	-	-	+	-	-	-	-	+	+	+	+	+
B. falcatus Zacharias	-	-	-	-	+	+	-	-	-	-	-	-
B. patulus (Müller)	-	+	+	+	+	+	+	-	-	-	-	-
B. calyciflorus (Pallas)	-	-	-	-	-	-	-	-	-	-	-	+
B. plicatilis (Müller)	-	-	-	-	-	-	-	-	-	-	+	+
B. quadridentatus (Hermann)	+	-	+	+	+	-	-	-	-	-	+	-
Platyias quadricornis (Ehrenberg)	-	+	+	-	+	-	-	-	-	-	-	-
Keratella tropica (Apstein)	-	-	-	-	+	+	+	+	+	+	+	+
Euchlanis dilatata (Ehrenberg)	+	+	+	-	-	-	-	-	-	-	+	+
Dipleuchlanis propatula (Gosse)	-	-	-	-	-	-	+	-	-	-	-	+
Mytilina ventralis (Ehrenberg)	+	-	+	-	-	-	-	-	-	-	+	+

Table 2 (continued)

	Mar.	Apr.	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Lepadella patella (Muller)	-	-	+	+	+	-	-	-	-	+	+	+
Lecane hastata (Murray)	+	+	+	-	+	+	-	-	+	+	-	-
L. leontina (Turner)	+	+	+	-	-	-	-	+	+	+	-	-
L. papuana (Murray)	+	-	-	-	-	-	-	-	+	+	-	-
L. ploenensis (Voigt)	-	-	-	+	+	-	-	+	-	-	-	-
L. signifera (Jennings)	+	+	-	-	-	-	-	-	-	-	-	-
L. bulla (Gosse)	+	-	+	+	+	-	+	+	+	-	-	-
Cephalodella sp.	+	-	-	-	-	-	-	+	+	-	-	-
Monommata sp.	-	-	-	-	-	-	-	+	+	-	-	-
Ascomorpha ovalis (Bergendal)	+	-	-	+	+	+	+	+	+	+	+	+
Pleosoma lenticulare Herrick	-	+	+	+	-	+	-	+	+	-	-	+
Trichocerca cylindrica (Imhof)	-		-	-	-	-	+	-	-	-	-	+
T. elongata (Gosse)	-	-	+	-	+	-	-	+	+	+	-	-
T. porcellus (Gosse)	-	-	-	-	-	-	-	+	-	+	-	-
Asplanchna priodonta Gosse	+	-	-	-	+	-	-	-	-	-	-	-
Polyarthra vulgaris Carlin	-	-	-	+	+	+	+	+	+	-	-	-
Synchaeta oblonga Ehrenberg	-	-	+	-	-	-	-	-	+	+	-	-
Testudinella patina (Hermann)	+	+	+	+	+	+	+	-	-	-	-	+
Filinia opoliensis (Zacharias)	-	-	-	-	+	+	+	-	-	-	-	-
Philodina sp.	+	+	-	-	-	-	+	+	+	-	-	-
Rotaria rotatoria (Pallas)	-	-	-	-	+	+	-	-	-	-	-	-
R. neptunia (Ehrenberg)	-	-	-	-	-	-	-	-	-	-	+	+
CLADOCERA												
Ceriodaphnia cornuta Sars	+	+	+	+	-	+	-	-	+	+	+	-
Scapholeberis kingi Sars	+	+	-	+	+	-	-	+	+	+	+	+
Bosmina longirostris (Muller)	-	+	+	+	+	+	+	-	-	-	-	-
Moina micrura Kurz	+	-	+	+	+	+	+	-	-	-	-	-
Chydorus sphaericus (Muller)	+	+	+	+	-	+	+	+	-	+	+	-
Alona costata Sars	+	+	+	-	-	-	+	-	+	+	-	-
A. rectangula Sars	+	-	+	-	-	-	-	-	-	+	-	-
Pleuroxus similis Vavra	+	+	+	+	-	-	-	+	+	+	+	+
COPEPODA												
Cylops sp.	+	+	+	+	+	+	+	+	+	+	+	-
Diaptomus sp.	-	-	+	+	+	+	+	-	-	-	-	-
Nauplius larvae	+	+	+	+	+	+	+	+	+	+	+	+
MISCELLANEOUS GROUP												
Aquatic mites	-	-	-	-	-	-	+	-	+	-	-	-
Ephemeropteran nymphs	-	-	-	-	-	-	+	-	+	+	+	+
Total Number of Species	26	19	27	22	25	19	23	20	26	21	18	21

+ = present - = absent

Table 3 : Percentage similarities (*vide* Sorensen index) between limnetic Zooplankton

	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
March	-	92.0	66.7	64.0	61.5	47.8	40.0	54.4	43.9	55.3	53.6	57.9
April		-	66.7	68.0	57.7	43.9	40.0	50.0	43.9	51.1	53.6	57.9
May			-	70.8	68.0	59.0	36.8	38.0	56.4	53.3	41.0	44.4
June				-	57.7	52.2	40.0	45.5	48.8	46.8	39.0	47.4
July					-	75.0	38.1	43.5	41.9	48.9	37.2	40.0
August						-	44.4	45.0	32.4	41.9	37.8	35.3
September							-	52.9	25.8	37.8	51.6	50.0
October								-	57.1	53.7	45.7	56.3
November									-	57.9	37.5	48.3
December										-	68.4	57.1
January											-	68.9
February												-

Table 4 : Percentage similarities (*vide* Sorensen index) between littoral Zooplankton

	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
March	-	66.6	63.1	54.9	40.7	44.9	53.8	53.1	62.9	56.0	60.9	41.7
April		-	61.2	60.5	43.5	53.6	54.5	48.8	52.2	46.5	47.5	41.0
May			-	65.4	55.4	52.0	49.1	44.0	47.3	65.4	42.5	41.7
June				-	65.3	68.2	68.1	54.5	57.1	47.8	58.5	42.8
July					-	68.1	56.0	46.9	46.1	40.8	45.4	35.6
August						-	66.7	47.6	46.8	40.9	41.0	30.0
September							-	44.4	60.0	42.6	42.8	37.2
October								-	68.1	55.5	51.3	40.0
November									-	69.4	54.5	44.4
December										-	63.4	42.8
January											-	75.7
February												-