Composition and Occurrence of Zooplankton in Thayetkone Fish Ponds, Mandalay

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Abstract

The freshwater zooplankton from Thayetkone Fisheries ponds were studied from September 2008 to July 2010. A total of 31 genera and 29 species were recorded. The highest number of species was found in January and November 2009 and the lowest in July 2010 while the highest number of individuals was recorded in September 2009 and lowest in January 2010. The highest composition of zooplankton species was observed in order Ploima (67.74%), and the lowest in Floscularíaceae and Calanoida (3.23% each). The changes of water favour the occurrence of more species, but less individuals found in this study.

Key works: Composition, freshwater zoolplankton, Thayetkone fish ponds

Introduction

Zooplankton is an important link among the subsistance of food chains in aquatic ecosystem. Evidently their roles are significant and are extensively used in the rearing of larvae and fry of commercially important cultured fishes and crustaceans (Tay *et al.*, 1991).

Zooplankton are known as essential components of the food chain of the freshwater ecosystem because they are the most important grazers of phytoplankton and thus herbaceous material is diverted to animal material through these zooplanktons. In a geographical perspective, production/biomass ratios of single zooplankton species are primarily function of temperature and secondarily of food availability (Mort, 1991).

The production and biomass of zooplankton is, of course, influenced by such factors as temperature, food and feeding and predation upon zooplankton. Freshwater zooplankton have revealed strong links between the genetic structure of aquatic populations and habitat size, diapauses stages, interspecific hybridization selection pressure and ecological divergence of coexisting genotypes in course of time (Mort, 1991).

The patterns of aquatic animal communities observed in nature are the results of interactions among various biotic and abiotic factors. Various direct and indirect interactions occur among fishes, zooplankton and phytoplankton in diverse aquatic communities. The main biological factors affecting population dynamics of zooplanktons are thought to be food quantity and quality (Lampert, 1986; Kleppel, 1993) and predators (Landry, 1976) (Cited from Globec, 1995).

Understanding the importance of species composition of zooplankton in any water body for the successful production of fish and prawns, the present research was conducted in Thayetkone Fish ponds with the following objectives:

- to determine the species composition of zooplankton
- to investigate the occurrence of zooplankton

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Materials and Methods

Study Area

Thayetkone Fish ponds are located in Patheingyi Township and situated at 21° 59' N and 96° 7' E. The farm area is 50.92 hectares. The area of each pond is 30m × 30m with a maximum water depth of 1.8 m. In two ponds, one pond was stocked with *Pangasius pangasius* (Nga-dan) and the other pond with different species of culture fish. A map of Thayetkone Fish ponds is shown in Fig.1.

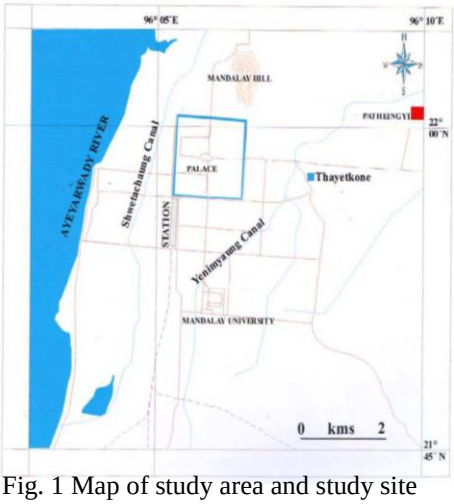


Fig. 1 Map of study area and study site

Study Period

The present study was conducted from September 2008 to July 2010.

Collection of Samples

The samples were collected every two months interval. Specimen collection was made from two points of each pond.

Zooplankton samples were collected with the aid of plankton nylon net (YRK-520E) measuring 19×21.5 cm mouth diameter and 7μm mesh size attached with 30 ml sampling bottle. The net was hauled horizontally through the surface water. The hauling time for each collection was 5 sec and the hauling distance was about 1.25m.

The samples were preserved in 10% formalin for further analysis. Zooplankton samples were taken at the same time of the day in every two-month interval from two points of each pond. The collected samples with proper labels were brought to the Department of Zoology, University of Mandalay for further analysis.

Observation and Identification of Species

After stirring the sample, a small amount of sample was taken from the 30 ml samples with a pipette and dropped onto the clean concave slide. All the 30 ml sample was examined to account for the occurrence of species and individuals. Zooplanktons were viewed under a compound microscope with a magnification of 40x, 100x and 1000x. The identification of the zooplankton species was made according to Pennak (1953) and Edmonson (1966). Microphotographs of all the specimens were recorded with DP12 digital camera attached with Olympus Microscope (BX41TF, Japan).

Data Analysis

During the studying period, the data were collected from two ponds by measuring with two points. And then, they were pooled and the mean value was taken to represent for respective area.

Results

A total of (4392) individuals represented with (29) species (31) genera and (12) families under (5) orders were recorded. Among them 22 species of rotifers, six species of cladocerans, two genera and one species of copepods and unidentified species of *Calanoid* sp. were recorded in Thayetkone Fish ponds (Table 1, Plate 1).

Composition and Occurrence of Zooplankton

The composition of zooplankton was found to be highest in phylum Rotifera and class Monogonota (70.97 % each), followed by phylum Arthropoda and class Crustacea (29.03 % each). Order Ploima showed the highest composition (67.74 %) while Floscularіaceae and Calanoida revealed the lowest composition (3.23 % each). Among the families, Brachionidae represented 48.39 % composition and Asplanchnidae, Synchaetidae, Filiniidae, Sididae, Chydoridae, Macrothricidae and Diaptomidae showed the lowest composition each with 3.23 % (Table 1 and Fig. 2).

The highest species of 22 in January and individuals of 499 in July were found, whereas the lowest species (15) in September and 105 individuals in November were recorded. The most abundant individuals were recorded in *Moina micrura* (175 individuals) and *Microcyclops* sp. (326 individuals) and the lowest number of one individual in each of *Keratella cochlearis* and *Macrothrix laticornis* were observed. In September 2009 to July 2010, the highest species of 22 in November and individuals of 1611 in September were recorded, whereas the lowest species (14) in July and 75 individuals in January were found. The most abundant species of *Brachionus falcatus* (357 individuals), *Moina micrura* (302 individuals) and *Microcyclops* sp. (344 individuals) were observed. The rare species of *Mytilina mucronata*, *Euchlanis dilatata*, *Lepadella ovalis* and *Macrothrix laticornis* were found each with one individual (Table 2 and Fig. 3).

Table 1 Percent composition of zooplankton in different phyla, classes, orders and families in Thayetkone Fish ponds during September 2008 to July 2010

Phylum	% composition	Class	% composition	Order	% composition	Family	% composition
Rotifera	70.97 (22 spp.)	Monogonota	70.97 (22 spp.)	Ploima	67.74 (21 spp.)	Asplanchnidae	3.23 (1 sp.)
						Brachionidae	48.39 (15 spp.)
						Lecanidae	6.45 (2 spp.)
						Coluridae	6.45 (2 spp.)
						Synchaetidae	3.23 (1 sp.)
				Flosculariaceae	3.23 (1 sp.)	Filiniidae	3.23 (1 sp.)
Arthropoda	29.03 (9 spp.)	Crustacea	29.03 (9 spp.)	Cladocera	19.35 (6 spp.)	Sididae	3.23 (1 sp.)
						Daphnidae	9.68 (3 spp.)
						Chydoridae	3.23 (1 sp.)
						Macrothricidae	3.23 (1 sp.)
				Cyclopoida	6.45 (2 spp.)	Cyclopiidae	6.45(2 spp.)
				Calanoida	3.23 (1 sp.)	Diaptomidae	3.23 (1 sp.)

Table 2 Bi-monthly occurrence of zooplankton in Thayetkone Fish ponds during September 2008 to July 2010

No.	Species	2008-2009						2009-2010					
		Sep	Nov	Jan	March	May	July	Sep	Nov	Jan	March	May	July
1	*Asplanchna priodonta*	2	4	14	10	8	13	10	5	3	21	5	1
2	*Brachionus angularis*	4	4	4	13	33	9	76	21	3	115	93	8
3	*B. calyciflorus*	17	2	2	4	10	2	211	24	4	9	29	0
4	*B. caudatus*	9	1	6	1	4	3	223	4	4	10	12	4
5	*B. diversicornis*	0	2	2	6	3	22	8	3	1	19	2	9
6	*B. falcatus*	21	0	2	0	9	1	287	7	0	22	30	11
7	*B. quadridentata*	3	19	5	4	7	0	1	16	1	0	1	0
8	*B. ruben*	0	4	1	0	0	9	97	8	0	0	0	2
9	*B. plicatilis*	13	2	5	4	1	0	95	0	3	0	1	0
10	*Keratella tropica*	2	2	6	3	3	0	0	0	0	0	0	0
11	*K. cochlearis*	1	0	0	0	0	0	0	2	1	0	0	0
12	*Mytilina mucronata*	0	0	2	0	0	0	0	1	0	0	0	0
13	*Notholca acuminata*	0	0	4	1	1	0	0	0	0	0	0	0
14	*Anuraeopsis fissa*	0	2	1	0	0	0	2	1	2	1	1	0
15	*Euchlanis dilatata*	0	2	0	0	0	0	0	0	1	0	0	0
16	*Platyias quadricornis*	2	0	1	0	0	0	0	2	2	0	0	1
17	*Lecane luna*	1	6	16	0	2	0	0	4	0	0	0	0
18	*Monostyla bulla*	0	0	0	1	2	0	10	5	3	21	5	1
19	*Lepadella patella*	0	3	0	0	0	0	0	0	3	0	1	0
20	*L. ovalis*	0	0	0	0	0	0	0	1	0	0	0	0
21	*Polyarthra vulgaris*	0	6	2	1	3	2	5	4	2	4	9	2
22	*Filinia longiseta*	3	2	4	2	5	3	42	2	0	10	13	2
23	*Diaphanosoma brachyurum*	0	1	8	10	2	34	3	5	2	7	2	1
24	*Moina micrura*	60	4	6	13	10	82	65	12	2	151	35	37
25	*M. brachiata*	0	0	0	0	1	39	0	0	0	26	0	0
26	*Ceriodaphnia rigaudi*	1	12	18	2	3	1	2	8	1	0	0	0
27	*Alona rectangula*	0	0	0	0	0	4	1	1	3	1	1	25
28	*Macrothrix laticornis*	0	0	0	0	0	1	1	0	0	0	0	0
29	*Microcyclops* sp.	88	6	23	33	31	245	208	29	4	59	20	24
30	*Mesocyclops leckurti*	0	0	16	77	8	7	111	3	12	76	35	8
31	*Cyclops* male	0	0	0	0	5	6	43	2	5	31	25	7
32	Cyclopoid nauplius	8	21	12	26	15	16	120	39	11	44	19	43
33	*Calanoid* sp.	0	0	0	5	0	0	0	0	5	2	0	0
	Total number of individuals	235	105	160	216	160	499	1611	204	75	608	334	185
	Total number of species	15	19	22	18	20	17	19	22	20	16	17	14

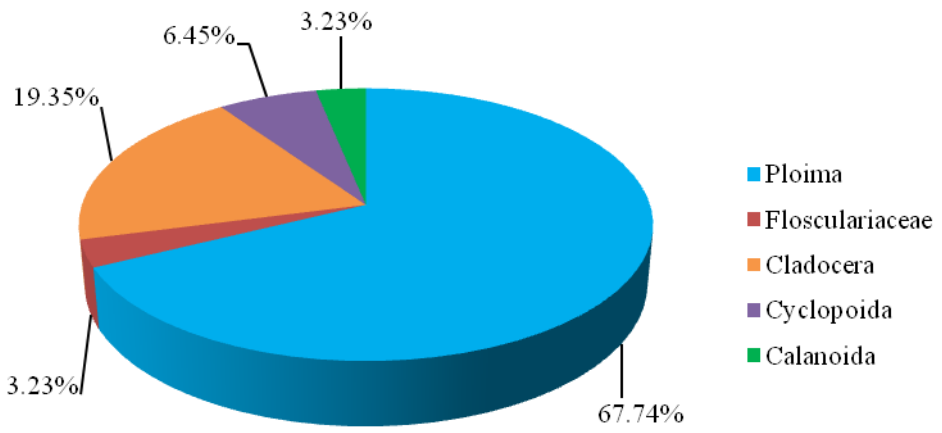


Fig. 2 Composition of zooplankton species in different orders in Thayetkone Fish ponds during September 2008 to July 2010

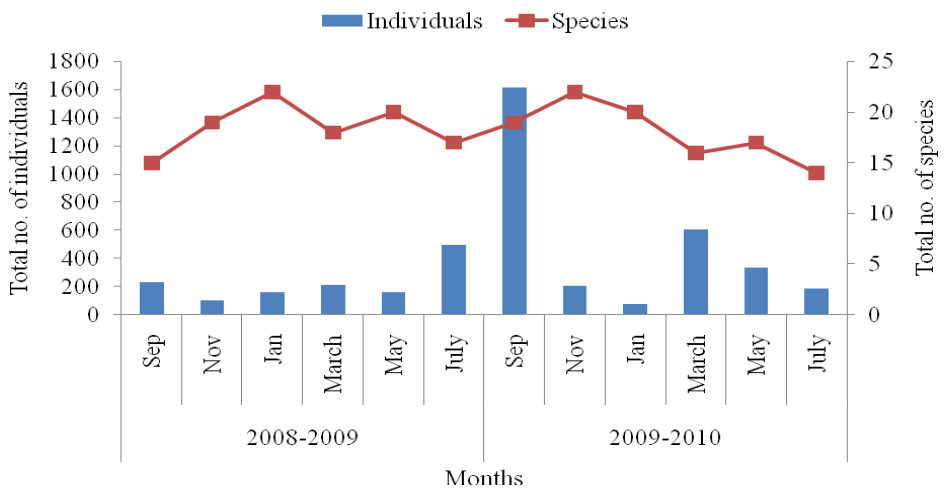
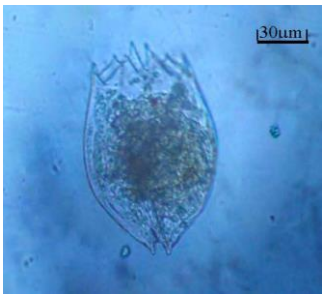


Fig. 3 Bi-monthly comparison on number of individuals and species of zooplankton in Thayetkone Fish ponds during September 2008 to July 2010

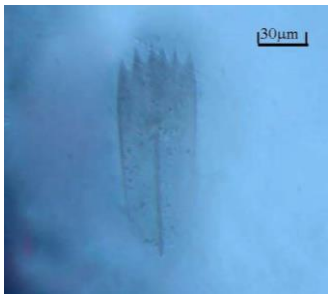
A. *Asplanchna priodonta*

B. *Brachionus caudatus*

C *Brachionus quadridentata*



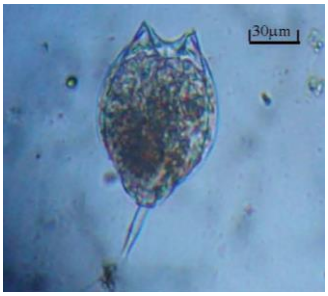
D. *Brachionus ruben*



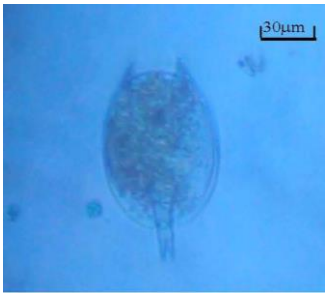
E. *Notholca acuminata*

F. *Euchlanis dilatata*

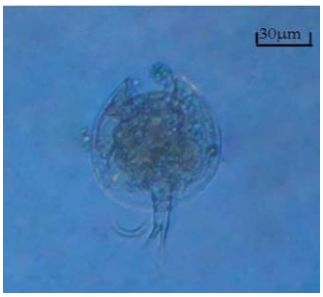
G. *Brachionus quadridentata*



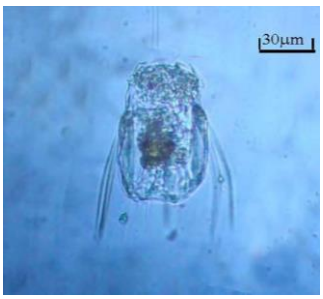
H. *Brachionus ruben*



I. *Lepadella patella*

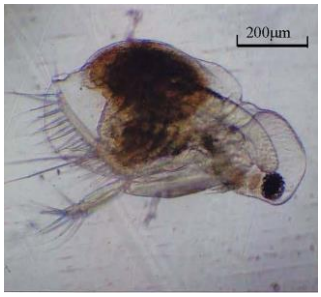


J. *Lepadella ovalis*

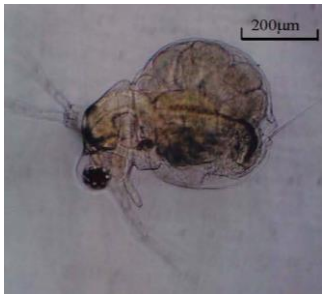


K. *Polyarthra vulgaris*

L. *Filinia longiseta*



M. *Diaphanosoma brachyurum*



N. *Moina micrura*

O. *Moina branchiata*

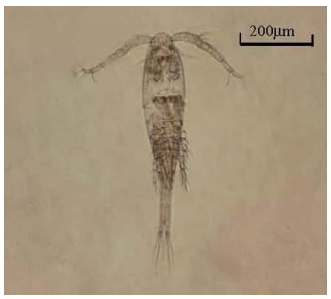
Plate 1 Recorded species of zooplankton in Thayetkone Fish pond

P. *Ceriodaphnia rigaudi*

Q. *Alona rectangula*

R. *Macrothrix laticornis*

S. *Microcyclops* sp.



T. *Mesocyclops leckurti*

U. *Calanoid* sp.

Plate 1 Continued

Discussion

A total of 4392 individuals and 29 species of zooplankton from Thayetkone Fish ponds was recorded. Among them, 22 species of rotifers, six species of cladocerans and two genera and one species of copepods and unidentified species of *Calanoid* sp. were included.

In the present study, rotifers were included under two orders, Ploima and Flosculariaceae. The order Ploima was represented with five families: Asplanchnidae Brachionidae, Lecanidae, Coluridae and Synchaetidae and order Flosculariaceae with one family: Filiniidae. In cladocerans, four families: Sididae, Daphnidae, Chydoridae and Macrothricidae were included. The copepods were represented with two families: Cyclopiidae and Diatomidae.

The zooplankton species in Taungthaman lake was studied by Win Maw Oo (2008) and she reported 23 species of zooplankton including 16 species of rotifers, four species of cladocerans and three species of copepods. Among them, 12 species of rotifers, three genera and one species of cladocerans and all species of copepods are the same with the present work. *Brachionus calyciflorus* was reported to be more abundant species in Taungthaman lake by Win Maw Oo (2008). *Brachionus angularis*, *Moina micrura* and *Microcyclops* sp. were dominant species in Thayetkone Fish ponds in the present study.

The number of zooplankton species in a tropical freshwater lake studied by Chattopadhyay and Barik (2009) is 27 including 18 species of rotifers, 5 species of cladocerans and 4 species of copepods. Among them, *Brachionus angularis*, *Keratella tropica*, *Moina micrura* and *Mesocyclops leckurti* species and *Asplanchna* and *Mocrothrix* genera are the same with the present study.

Pahari *et al*. (1998) observed seven species and two genera of copepods in a fresh water habitat in Midnapore. They are the same genus as with the present study. The numerically dominant species were *Microcyclops varicans* and *Mesocyclops thermocyclopoides* and *Calanoid* copepods showed peak population in March or April in their study. In the present study, *Microcyclops* sp. and *Mesocyclops leckurti* achieved peak population in July and September. *Calanoid* population was observed in small number in Thayetkone Fish ponds. The increased growth of copepods was induced by high temperature. Higher temperature will influence generation time of copepods. Temperature will therefore influence the initial number of copepod eggs spawned as a direct effect and indirectly if the phytoplankton production is enhanced by higher temperature (Huntley and Boyd 1984; cited from Sundby, 2000). Webber and Myers (2005) commented that copepods are much more tolerant to oxygen deficiency. The maximum density of *Mesocyclops* species was recorded in March and April. This species also show preference for high temperature, pH and nutrients (cited from Sharma *et al.*, 2010).

In 2008-2009, the highest number of species was found in January in Thayetkone. In this month, low temperature (23°C) was observed. In 2009-2010, the highest number of species was observed in November in Thayetkone when temperature was 28°C. The highest number of individuals was observed in September in Thayetkone when there was highest rainfall (115 mm). Thus, environmental parameters seem to interact with one another to structure the zooplankton communities. Galindo *et al.* (1994) pointed out that a decrease in richness in ponds with longer flood-period may be related to the presence of predators. The relationship between period length and species turnover in the region changes beyond that threshold, and species richness (alpha diversity) becomes similar among ponds in periods of high rainfall.

The results suggest that the population of zooplanktons depends on different environmental factors. This is determined mostly by water chemistry and available plants substrates.

Acknowledgements

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