

Study on Some Freshwater Zooplankton from Nampha In (Lake) Banmaw Township

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Abstract

Zooplankton groups are one of the most common components of the water bodies. Three main groups of zooplanktons were found in Nampha In (Lake): Rotifer, Cladocera and Copepoda. The identification of the freshwater zooplankton from the Nampha In (Lake) Banmaw Township near the Banmaw University was carried out from June to September 2018. During the present study, a total of 25 species of zooplankton were recorded in Nampha In (Lake). Rotifer was found to be dominant group with 15 species followed by Cladocera with eight species and Copepoda with two species respectively. In the present study, all of the rotifer species were found to be female, but males are unknown. In copepod species, male and female species of *Mesocyclops leuckarti* were found during this study.

Keywords: Rotifer, Cladocera, Copepoda, *Mesocyclops leuckarti*

Introduction

Zooplankton are small animals that float freely in the water column of lakes and oceans and whose distribution is primarily determined by water currents and mixing. The zooplankton community of most lakes ranges in size from a few tens of microns to >2 mm (macrozooplankton).

In freshwater ecosystems, three groups of zooplankton, namely Rotifera, Cladocera and Copepoda have been reported. Zooplankton occupies the second trophic level in the food chain, the first being occupied by phytoplankton. In lake ecosystems, these organisms are the main food source for invertebrates, fishes and sometimes for aquatic birds. Some species have been reported as characteristic indicators of water quality and trophic level of lakes (Ipek and Saler, 2013).

Zooplankton are also a valuable food source for planktivorous fish and other organisms. The presence or absence of healthy zooplankton populations can determine some commercial fisheries success in both fresh and salt water bodies. Nampha In (Lake) is located in Nampha village in Banmaw Township, Kachin State. Nampha In (Lake) support high fish meal production of freshwater fishery upon which the inhabitants of the surrounding depend for their food supply.

Correct identification of freshwater organisms is essential to understanding their ecology. Aquatic organisms interact with environment to alter water quality and perform ecology "services" such as decomposition and nutrient cycling. Identification of zooplankton species in food webs is essential part of managing aquatic bodies (Singh *et al.*, 2012).

Thus the present study was to record and identification of the zooplankton species from Nampha In (Lake).

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Materials and Methods



Fig. 1 Showing the map for the collection of specimen(Source: Google earth, 2018)



Figure.2 Plankton Net

Study Area

Nampha In (Lake), Banmaw Township is located in Nampha village near Banmaw University, it is situated at North latitude $24^{\circ} 18' 54''$ and $24^{\circ} 19' 41''$ and East longitude $97^{\circ} 15' 10''$. The Nampha In (Lake) is connected with the Taping River by narrow channel during the flood season.(Fig.1)

Collection of the Specimens

The study was carried out June to September 2018. The samples were collected monthly from the study site of Nampha In (Lake), Banmaw Township. The samples were collected using plankton net with a mouth diameter 12 cm and 50 μ m mesh size. The net was hauled horizontally from the surface water column.

Preservation and Identification

The samples were kept in plastic bottles and volume of filtered sample 150 ml in plastic bottles were preserved by adding 5 ml of 4% formaldehyde solution after collection. The samples were identified under a compound microscope with magnification of 4x10 and 10x10. For species identification the following references used; Edmonson (1966), Pennak (1989) and Shiel (1955), Witty (2004).

Microphotographs were taken with Cannon digital camera attached to compound microscope.

Results

In the present investigation, a total of 25 species of zooplankton including 15 species of Rotifer, 8 species of Cladocera and two species of Copepoda were recorded in Nampha In (Lake) (Table.1). The microphotograph of studied species were also described.(Plate.1,2,3)

Descriptive account of studied species from Nampha In(Lake)

***Asplanchna herriki* de Guerne, 1888**

Non loricated rotifer; body is large rounded and transparent. There is no anterior and posterior spine without attachment disc.

***Asplanchna priodonta* Gosse, 1850**

Non-loricated rotifer; body is large, transparent, sac-shaped. There is no anterior and posterior spine. Without appendages and attachment disc. Corona is circular disc-like structure, ciliated at the margin.

***Brachionus donneri* Brehm, 1851**

Lorica lateral view ovate or rounded, transparent, compressed dorso-ventral. Anterior dorsal margin with six spines, equal, blunted. Anterior ventral margin with four spines, blunted, laterals longer medians spines, two medians spines separated by a U-shaped sinus. Lateral dorsal margin with two pair spines, pair of anterior spines small, blunted, pairs of posterior large, pointed. Posterior margin with two large spines, mace-shaped, ending of rounded, two spines separated by a deep V-shaped, broad.

***Brachionus falcatus* Zacharias, 1898**

Lorica ovate, surface with stippled, compressed dorsal- ventral. Anterior dorsal margin with six spines, unequal, intermediates spines considerably longer than other spines, curved ventrally at the end. Lateral and median spines short, subequal. Posterior lorica margin with two spines very long, slightly curved inward. Foot opening between bases of posterior spines.

***Brachionus quadridentatus* Hermann, 1783**

Lorica barrel-shaped, width broader than length, surface stippled or pustulate. Anterior dorsal margin with six spines, medians a pair, spines longer than laterals and intermediates spines, curved outward. Anterior ventral margin undulate, somewhat elevated toward the centre, with a median sinus. Lateral of posterior lorica margin with two spines, somewhat unequal. Foot opening tubular shaped, with two sides stretched like spines.

***Platylabus quadricornis* (Ehrenberg, 1832)**

Lorica rounded, margin usually with serrate, surface with small tuberculate, slight compressed dorsal-ventral. Dorsal plate with ornamentation pentagonal. Anterior dorsal margin with two spines, stout, tips of the spines usually curved inward. Posterior lorica margin with a pair spines, parallel-sided. Anterior ventral margin slightly convex. Foot opening in ventral plate, about 1/4 of length lorica posterior. Foot three segments, with two toes.

***Platylabus patulus* (O.F. Müller, 1786)**

Lorica sub-rectangular, wider than long, slightly compressed dorsal-ventral. Anterior lorica with ten large spines, unequal. Anterior dorsal margin with 6 spines unequal, pair of central spines longer than others and curved inward. Dorsal plate with a pentagonal ornamentation. Anterior ventral margin with 4 spines, unequal, pair of central spines shorter than laterals. Posterior of lorica unsymmetrical, with two spines, stout, short. Foot opening in ventral plate, somewhat deflected to right, bounded by two short unequal spines.

***Keratella cochlearis* (Gosse, 1851)**

Lorica spoon-shaped, dorsal plate convex, ventral plate flat. Posterior lorica margin with a long, stout spine. Anterior dorsal margin with six spines, median spines longer than

others and curved outward. Dorsal plate with a characteristic median longitudinal line, with symmetrically arranged plaques on either side.

***Keratella tropica* Apstein, 1907**

Lorica strong, slightly long, almost rectangular, anterior wider, compressed dorsal-ventral. Anterior dorsal margin with six spines, median spines longest, stout, curved inward. Median of dorsal plate with 5 polygons ornamentation longitudinal, the last incomplete. Posterior lorica with two spines, unequal, right spine always longer than left.

***Lecane luna* (Muller, 1786)**

Lorica stiff, luna-shaped. It is composed of ventral plates and dorsal plates. The formerly larger than the ventral plate. No anterior and posterior spines. Antero ventral lorica is slightly depressed. Foot is two rudimentary segments. Foot has two pointed toes, which project through hole in ventral plate near posterior end. Two toes are separated and bearing accessory claws and pseudoclaws.

***Lecane leontina* (Turner, 1892)**

Lorica wide, smooth, roof-like shape, dorsal plate narrower than ventral plate, slightly rounded. Lorica surface with 4 longitudinal folds, transverse fold not clearly. Dorsal margin concave. Anterior ventral margin with broad V-shape. Lateral margins smooth, curved. Foot pseudo-segment trapezoidal. Toes very long, broad, parallel-sided, needle-like, with long pseudo-claws.

***Lecane tenuiseta* Harring, 1914**

Head aperture margins parallel, slightly convex; dorsal plate smooth, rounded posteriorly; ventral plate with a series of ridges. Lateral sulci are shallow; posterior segment broad, rounded, it protrudes beyond the dorsal plate. The second foot segment is not protruding. The toes are long, slender, approximately one third of the total body length, terminating in extremely long spine-like claws.

***Dipleuchlanis propatula* (Gosse, 1886)**

Lorica is stiff, oval shaped. There is no anterior and posterior spines project from the lorica. Without appendages and attachment disc. The lorica is composed of two plates: ventral plate and dorsal plate. These two plates are not rigidly united at the edges. Dorsal plate flat and ventral plate arched. Dorsal plate narrower than the ventral plate one on each side of the lateral region. There is a transverse furrow at the ventral region. The foot is rudimentary in the lorica. The two toes are present, which are pointed and project from the posterior margin of the lorica.

***Filinia terminalis* (Plate, 1886)**

Without lorica, body is thin, flexible and sac-shaped. There is no appendages and attachment disc. Two antero-lateral spines equal in length; with one terminal posterior spine.

***Testudinella patina* (Hermann, 1783)**

Lorica margin almost circular, thin, transparent, compressed dorsal-ventral, surface with stippling. Anterior dorsal margin rounded. Ventral plate convex. Foot opening near middle of ventral plate, annulated. Toes reduced by a circling of ciliate.

***Diaphanosoma brachyurum* (Lieven) 1848**

Eye not filling end of head, pigment small, colour hyaline. No rostrum, fornix or ocellus. Antennule small, truncate; olfactory setae terminal, with slender flagellum. Dorsal ramous of antennae 2-jointed; ventral 3-jointed. Reflex antenna not reaching posterior margin of valves.

***Ceriodaphnia cornuta* (Sars,1885)**

Body broadly rounded or oval in shape. Head small and depressed, anterior margin rounded sometimes with a horn-like process; ventral margin produced into a short, sharply pointed rostrum in front of the antennules. Antennules short and broad, with a long lateral setae and a group of sensory setae on the apex. Eye quite long and ocellus absent. Valve with hexagonal reticulations, broadly rounded dorsally and ventrally; dorsal margin with a distinct cervical depression separating the anterior and posterior part of the body. Postero-dorsal corner of valves projected, forming 2 sharply pointed processes. Post-abdomen short and broad, dorso-distal corner broadly rounded, armed with 5 or 6 slightly curved and sharply pointed denticles, dorsal and lateral surface with scattered rows of short spinules. Claw quite long (almost as dorsal distal margin), slightly curved dorsally with a series of setules along the concave surface.

***Moinodaphnia macleayi* (King, 1853)**

Body compressed and elliptical in shape, with a small knob shaped posteriorly. Valves tumid in postero-dorsal region; ventral margin broadly rounded with a series of short marginal spines. Head slightly narrow and rounded anteriorly with distinct cervical depression separating the head and the posterior part of the body. Chitinous fringe of head well developed. Eye relatively large situated near to the anterior margin, ocellus small. Antennules long and slender, attached to the postero-ventral surface of the head, with a long lateral seta and a group of sensory setae on the apex. Post-abdomen broad on the pre-anal margin, with a very narrow post-anal projection. Anal denticles absent, lateral surface armed with 9–10 well developed ciliated spines and scattered groups of short spinules. Claw quite long – as long as post-anal margin, with a series of short setules along the concave surface.

***Moina micrura* Kurz, 1874**

Small, body transparent, head relatively very large, with deep cervical sinus. Supraocular depression small or absent; no rostrum ocellus absent. Postabdomen extended into conical postanal part, bearing ciliated spines and bident. Terminal portion of postabdomen small with 4 to 6 spines. Claws pectinate.

***Macrothrix laticornis* (Jurine)1820**

Body round-ovate. Head evenly rounded. Ocellus present. Rostrum short ventral margin of valves ordinarily with long, movable spines, which project in several directions. Antennules broader distally; a setiferous projecton on posterior margin near apex; anterior margin with several fine incisions and clusters or rows of hairs; olfactory setae conspicuously unequal. Postabdomen not bilobed, with numerous fine spines and hairs; anus terminal. Claws small.

***Bosmina longirostris* (O. F. Muller,1785)**

Body oval-shaped, antennules fused with the rostrum, forming a proboscis like structure. Has only eye, ocellus absent. Antennules not diverging at apex, curving backward. Olfactory setae on side, usually near base. The ventral margin of valves smooth, valves elongated forming a long tail spine. Postabdomen broadly and near perpendicularly, postero-

ventral corner rounded with several spines. Claw slightly curved, the base of claw has 3–4 spines increasing in length proximally. The middle region of claw armed 7–10 spinules.

***Bosminopsis deitersi* Richard, 1897**

Valves separated distinctly at head and body (a distinct cervical depression separating the anterior and posterior of valves). Body oval-shaped, dorsal margin distinctly raised, maximum height near posterior end of the body. Head rounded anteriorly, rostrum long with two lateral branches near the apex and long olfactory setae. Eye rather large. Valves with faint polygonal reticulations, dorsal margin broadly rounded with cervical depression, ventral margin rounded slightly, serrated and with a long and sharply pointed marginal spine on the postero-ventral corner. Post-abdomen relatively small and tapering distally, dorsal-distal margin with 2 groups of denticles followed by fine groups of spinules proximally, lateral surface with 5 or 6 groups of short spinules. Claw serrated and slightly concaved dorsally, with a large serrated basal spine.

***Chydorus sphaericus* (O. F. Muller, 1785)**

Body round in shape. The surface of the valves smooth or with indistinct polygonal cells. Rostrum long and pointed. Antennules cylindrical-shaped, short and reaching about 1/2 the length of the rostrum. Ocellus smaller than eye and situated near eye. Plate of labrum serrated, anterior margin rounded. Post-abdomen short, pre-anal corner highly prominent, the upper edge straight and tapering 7–10 denticles, lateral surface with groups of short fine setules arranged in a row. Claw curved dorsally with a striation along interior margin. Exopodite of first leg with 3 setae, first seta into short rod-shaped, second seta longer than third seta and hook-shaped with serratae surrounded on inner margin along proximally.

***Mesocyclops leuckarti* (Claus, 1857)**

Female: Elliptical-shaped body, the anterior longer than the posterior. The seminal receptacle pocket hammer-shaped (or T-shaped), handle of “hammer” dilated and almost sac-like. Furca generally slightly elongated and nearly parallel, about 3–3.5 times as long as wide, outer margin smooth. First antenna 17-segmented, extending to the posterior margin of fifth thoracic, the apical-segment with a comb-shaped hyaline lamella and a deep-indent situated about one-third the length of the apical-segment.

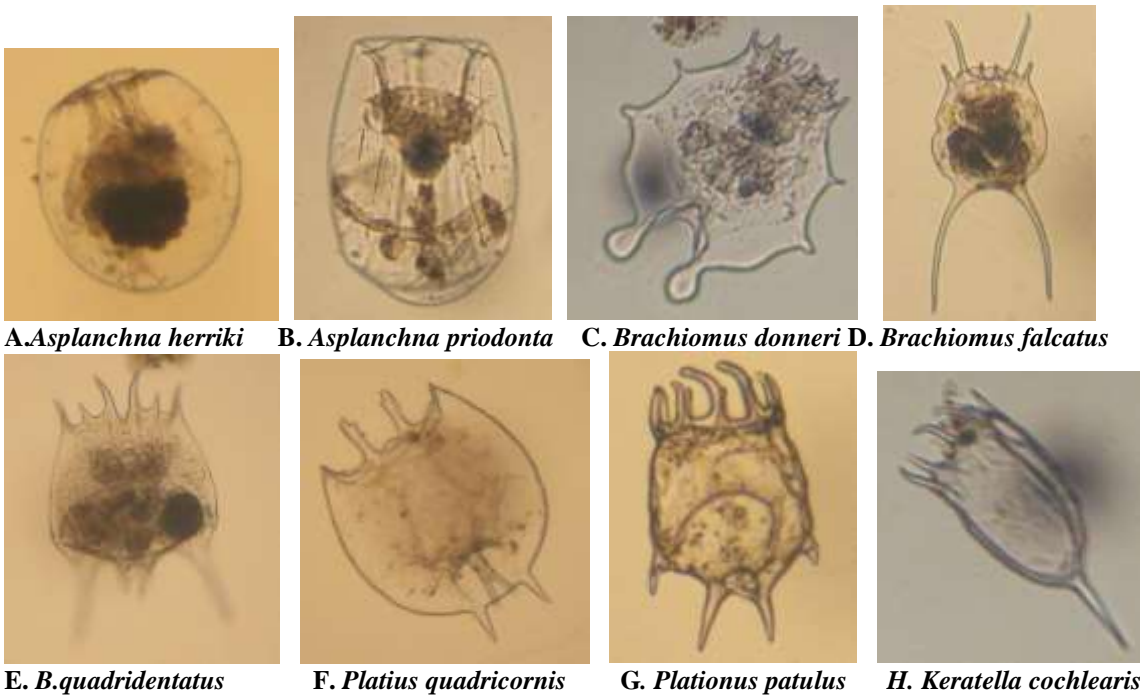
Male: First antennae curved at the terminal. Sixth foot with a long outer marginal seta, a short middle seta and an inner marginal spine. The other structures are similar to the female.

***Tropodiptomus oryzanus* Kiefer, 1937**

Cephalothorax relatively short, seed-shaped. Posterior-lateral angles of last thoracic segment larger, both lateral margin in aculeus-shape, larger and relatively expanded at the inner face. Abdomen only 2 segments, genital segment long and large. Furca rami with fine lanugos on inner margin, plumose-setae of furca expanded at basal end. Fifth foot: first basal segment large and short, with 1 larger spine in nearly outer margin. First exopodite segment long, third apical segment relatively long with 2 apical setae, end claw long with serratae on each side, endopodite not separated segments, often ending in two 2 setae.

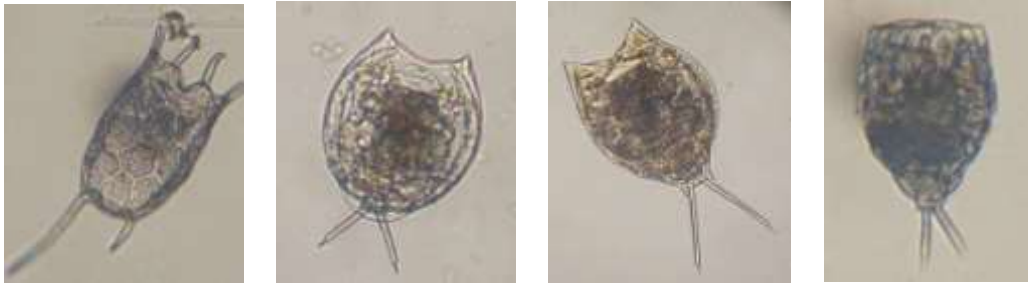
Table .1 Lists of zooplankton species recorded from Nampha In (Lake)

Class	Order	Family	Species		
Monogononta	Ploima	Asplanchnidae	<i>Asplanchna herricki</i>		
			<i>Asplanchna priodonta</i>		
		Brachionidae	<i>Brachionous donneri</i>		
			<i>Brachionous falcatus</i>		
			<i>Brachionous quadridentatus</i>		
			<i>Platylabus quadricornis</i>		
			<i>Platylabus patulus</i>		
			<i>Keratella cochlearis</i>		
			<i>Keratella tropica</i>		
			<i>Lecane luna</i>		
		<i>Lecane leontina</i>			
		<i>Lecane tenuiseta</i>			
		Branchiopoda	Flosculariceae	Euchlanidae	<i>Dipleuchlanis propatula</i>
				Filiniidae	<i>Filinia terminalis</i>
Cladocera	Testudinellidae		<i>Testudinella patina</i>		
	Sididae		<i>Diaphanosoma brachyurum</i>		
	Daphnidae		<i>Ceriodaphnia cornuta</i>		
	Moinidae		<i>Moinodaphnia macleayii</i>		
			<i>Moina micrura</i>		
	Macrothricidae		<i>Macrothrix laticornis</i>		
	Bosminidae		<i>Bosmina longirostris</i>		
			<i>Bosminopsis deitersi</i>		
Copepoda	Cyclopoida	Chydoridae	<i>Chydorus sphaericus</i>		
		Cyclopidae	<i>Mesocyclops leuckarti</i>		
		Calanoida	<i>Tropodiptomus oryzanus</i>		



A. *Asplanchna herricki* B. *Asplanchna priodonta* C. *Brachionous donneri* D. *Brachionous falcatus*

E. *Brachionous quadridentatus* F. *Platylabus quadricornis* G. *Platylabus patulus* H. *Keratella cochlearis*



I. Keratella tropica

J. Lecane luna

K. Lecane leontina

L. Lecane tenuiseta



M. Dipleuchlanis propatula

N. Filinia terminalis

O. Testudinella patina

Plate.1 Microphotograph of Rotifer Species



P. Diaphanosoma brachyurum

Q. Ceriodaphnia cornuta

R. Moinodaphnia macleayi



S. Moina micrura



T. Bosmina longirostris



U. Bosminadeitersi



V. Macrothrix laticornis



W. Chydorus sphaericus

Plate.2 Microphotograph of Cladocera Species

X. *Mesocyclops leuckarti*, femaleY. *M.leuckarti*, maleZ. *Tropodiaptomus oryzanus*

Plate.3 Microphotograph of Copepoda Species

Discussion

Zooplankton groups are one of the most common components of the water bodies. Three main groups of zooplanktons were found in Nampha In (Lake): Rotifer, Cladocera and Copepoda.

In the present study, a total of 25 species of zooplankton including 15 species of Rotifer, 8 species of Cladocera and two species of Copepoda were recorded in Nampha In (Lake). (Table.1)

A total of 15 species of Rotifera belonging to two orders Ploima and Flosuclariceae. The order Ploima includes four families, Asplanchnidae, Brachionidae, Lecanidae, and Euchlanidae whereas the order Flosculariceae includes two families; Filiniidae and Testudinellidae in this study.

In the family Brachionidae includes seven species that occupied about half of the studied rotifer species. They were dominated over other rotifer species.

A total of 10 species of Crustacean zooplankton includes three orders; Cladocera and Cyclopoida and Calanoida were recorded in the present study. Family Sididae, Daphnidae, Moinidae, Macrothricidae, Bosminidae and Chydoridae were belonging to order Cladocera. Family Cyclopoidae and Diaptomidae include one species each was observed in this study.

In comparison with the number of zooplankton species to that of Su Nanda Aung (2013) in Occurrence of some freshwater zooplankton in Eastern part of Paleik In, 14 species of rotifer, five species of Cladocera and two species of copepods were recorded in this study. Among the zooplankton groups, 3 species of Cladocera, *Moinodaphnia macleayii*, *Bosmina longirostris*, *Bosminopsis deitersi*, and Rotifer species *Keratella tropica*, *Plationus patulus* and *Lecane luna* were the same with the present study.

Comparision with Eindra Htoo Kyaw (2015) recorded 29 species of Zooplankton in the study of Zooplankton diversity in relation to water quality in Taungthaman Lake in her study. Eight species of rotifers, two species of Cladocera and one species of Copepoda were the same and the rest of the species are different with the present study. This may due to the difference in source of water and physico-chemical characteristic of water between the studied area.

The ability of rotifers and cladocerans to reproduce asexually(parthenogenetically) enables them to react quickly to both unfavourable and favourable conditions (Morris and Mischke, 1999).

In the present study, all of the rotifer species were found to be female, but males are unknown. Pennak (1989) stated that the vast majority of rotifers encountered under natural

conditions are females. Males are definitely known for relatively few species; they are much smaller than the females, degenerate, seldom live for more than 2 or 3 days.

In Cladocera, all collected specimens were found to be female but a few were male species in the present study. Edmonson (1966) mention that the males are smaller than the females and usually of similar form. They are distinguished by larger antennules; the postabdomen is usually somewhat modified.

Reproduction in free living copepods is similar in spite of wide varying species differences in sexual behaviour and periodicity of breeding. Ovisacs usually contain from 5 to 40 eggs each and are attach to the genital segment ventrally, laterally or subdorsally. In some species the clutch size varies seasonally, with the largest numbers of eggs being produced in the spring months. Possibly this variation is correlated with temperature and food conditions (Pennak, 1989).

In copepod species, male and female species of *Mesocyclops leuckarti* were found during this study. Edmonson (1966) stated that females are easily recognized with carrying egg sacs. In the male, urosome has five segments and the first antennae of right and left are genniculate.

Therefore, the presence or absence of healthy zooplankton populations can determine some commercial fisheries success in both fresh and salt water bodies. Zooplankton are also a valuable food source for planktivorous fish and other organisms.

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