

## Peculiarities of Rotifer Fauna in Lake Hawassa, Ethiopia

Dr. B. Sai Ram Pattnaik

Associate Professor, Department of Biology, College of Natural and Computational Sciences,  
Wolaita Sodo University, Ethiopia

**Abstract:** Among the water bodies in Ethiopia, the Lake Hawassa is one of the many freshwater shallow lakes found in the central Ethiopian Rift Valley. The extended littoral vicinity of the Lake was rich of several benthonic and pelagic zooplanktons such as Protozoans, Rotifers, Crustaceans, and several weed bed fauna like annelids, insects as well as fishes.

Rotifers, among all the zooplanktons found abundantly and scattered widely in the lake. The abundance was not only in species but also in population. About eighteen forms of rotifers were recorded in the lake belonging to several orders.

Present study is an attempt to understand their distribution, ecology, diversity and systematic study in this aquatic ecosystem. It was indeed a maiden attempt to bring out first hand information by this visiting investigator for a small period of time paving way for more significant studies to be done in future.

**Key words:** *Brachionus*, *Keratella*, Lake Hawassa, Rotifers, Zooplanktons,

---

### I. Introduction

The Ethiopian rift valley also known as the Afro-Arabian rift valley having the volcano-tectonic basins created long back as a result of faulting later modulated in to lakes. Several fresh water lakes found embedded in this basin, among which Lake Hawassa is a prominent fresh water lake located at a highest topographic position.

### II. Area of Investigation

Hawassa Lake is situated 275 km away from the capital city Addis Ababa of Ethiopia towards the south near the city Hawassa that lies in between 6° 33' - 7° 33' N and 38° 22' - 38° 29' E. The Lake stretches 16km from the north east to south west direction and extends 8 km from north-west to south east direction having an approximate water volume 1.3 billion meter cube (45.9 billion ft<sup>3</sup>). The maximum depth of the Lake is 21.6m (70.9 feet) with mean depth however is 11m (Elias Dadebo, 2000, EFASA-2013).

### III. Sampling

Water samples for plankton analysis were collected between November, 2013 to March 2014 by dipping wide plankton net of mesh size of 45 microns just below the surface of water in open condition. Part of the sample was treated with 5-10% formaldehyde for future observations and another part was treated with boiled water and then fixed in formalin. Hot water treatment gives satisfactory results as well as can fix the organism in its natural position which no other relaxing agent can do (Edmondson, 1959). For the observation of Mastax and Trophi specimens were treated with KOH (or also Sodium hypochlorite) and mounted in glycerin. A mild centrifugation of preserved water sample either cool or gentle hot can also bring good result.

For quantitative analysis, of plankton a sub-sample of one ml. was quickly drawn with a wide mouthed pipette resembling that of a stempel pipette and poured into a counting cell similar to that of Sedgwick rafter cell of one ml. capacity and all the organisms of the aliquot were counted. However, when there was a bloom, counting was done only in selected squares in random from which total numbers per liter of water could be calculated. All the body calculations were made by using Occulometer taken in microns and graphics were made using Camera lucida. The classification and the identification of Rotifera was done as given by Edmondson (1959) and that of Koste (1978).

#### Rotifer species of the Lake

Following rotifer species were obtained from various locations of the lake. They belong to different types of orders and genus.

- |                                   |                                 |
|-----------------------------------|---------------------------------|
| 1. <i>Brachionus calyciflorus</i> | 7. <i>K. tropica</i>            |
| 2. <i>B. caudatus</i>             | 8. <i>K. valga</i>              |
| 3. <i>B. fulcatus</i>             | 9. <i>Lecane luna</i>           |
| 4. <i>B. bidentata</i>            | 10. <i>Lecane papuna</i>        |
| 5. <i>B. quadridentata</i>        | 11. <i>Cephalodella gibba</i>   |
| 6. <i>Keratella cochlearis</i>    | 12. <i>Asplanchna seiboldii</i> |

13. *Asplanchna* sp.  
14. *Polyarthra* sp.  
15. *Filinia longiseta*

16. *Fillinia* sp.  
17. *Testudinella* sp.  
18. *Trichocera elongate*

#### IV. Description of species

##### ***Brachionus calyciflorus***

This species was an exceedingly variable species especially in its true size, length of the occipital spines and the location of postero-lateral spines. There are several forms of this species scattered in the lake and observed throughout the research period.

##### **Measurements:**

Total length: 218;                      Length of lorica: 96;  
Maximum breadth: 87;                Breadth of anterior margin: 41;  
Posterior spines: 45.

##### ***Brachionus caudatus Barrois and Daday***

The species was having distinct Lorica having four anterior projections, two dorsal and two marginal of almost equal size in length. The posterior spines were long and slightly curved inwards to inner side.

##### **Measurements:**

Total length: 230;                      Length of lorica: 119;  
Maximum breadth: 87;                Breadth of anterior margin: 59;  
Posterior spines: left: 38,            right: 40

##### ***Brachionus falcatus***

Six unequal anterior projections were present, the marginal of which were slightly longer than the medians while the intermediate projections were very long and curved ventrally at their distal ends.

##### **Measurements:**

Total length: 240;                      Intermediate spines: 47;  
Posterior spines: 95;                Maximum Breadth: 85;  
Length f Lorica: 100;

##### ***Brachionus bidentata***

The Lorica was ornamented with well developed dorsal, ventral and basal plates. Six Occipital spines were present of which the marginals and intermediates were of equal length. The posterior spines were very small.

##### **Measurements:**

Total length: 108;                      Anterior spine: 15;  
Breadth of anterior margin: 47;      Maximum Breadth: 58;

##### ***B. quadridentata***

The Lorica was abit broader than length and stippled. Six anterior spines, two marginal, two median and two intermediate were observed. Median spines were comparatively longer than the others. Two small posterior spines were present.

##### **Measurements:**

Total length:189;                      Maximumbreadth:138;  
Posterior spine:26;                    Anterior laterals:16;  
Anterior margins:56;                Median spines:20.

##### ***Keratella cochlearis (Gosse)***

The lake was well distributed with these species. The Lorica contains symmetrically arranged plaques on either side of a median longitudinal line and a stout median posterior spine of variable length, were the important identifying characters.

##### **Measurements:**

Total length: 141;                      Breadth of anterior margin: 28  
Maximum breadth: 43;                Length of lorica: 51;  
Posterior spine: 28.

***Keratella tropica* (Apstein)**

Presence of three hexagonal plaques on the dorsal plate and a small four sided one between the posterior border of lorica and a hexagon at last were the important characters to identify this species.

**Measurements:**

Total length: 188;                      length of lorica: 79;  
Maximum breadth: 32;                  anterior margin: 41;  
Posterior spines: left 29,              right,58.

***K. valga***

On the dorsal plate of the lorica, three median plaques were present. The posterior one is pentagonal terminating in a short median line. The species was not frequent but occurs with every new spell of rain.

**Measurements:**

Total length: 88;                      Length of lorica: 56;  
Maximum breadth: 31;                  Occipital margin: 14;  
Posterior margin: 18;                  Anterior median spines: 10;

***Lecane luna* (Muller)**

More abundant in the Lake. Lorica nearly round. Dorsal and ventral plates were having crescent shaped. Ventral plate was narrower than the dorsal with a transverse fold in front of the foot. First foot joint was indistinct; the second was large and sub square. Toes parallel sided with a distinct claw and small basal spicule.

**Measurements:**

Total length: 115;                      Length of lorica: 76;  
Maximum breadth: 69                  Caudal median spines: 11;

***Lecane papuna***

The species was also found in the month of December and January especially during winter months. presence of median spine and well shaped Lorica was the identifying features of the species.

**Measurements:**

Total length: 103;                      Length of lorica: 67;  
Maximum breadth: 75                  Median spines: 11;

***Cephalodella gibba* Ehrenberg**

Body was slender and compressed with Lorica fairly flexible and weakly developed. Foot was prominent, toes long, stout at the base and gradually taper into acute points.

**Measurements:**

Total length: 129;                      Toes: 34;  
Breadth: 31;                              Foot: 20;

***Asplanchna sieboldii***

Body spherical, soft and elongated. The length and breadth was nearly equal. Horse-shoe shaped vitellarium with 28 nuclei. Trophy was incudate with transparent mastax.

**Measurements:**

Total length: 540;                      maximum breadth: 311.

***Asplanchna intermedia* (Hudson)**

The species was similar to *A. intermedia* having enlarged, transparent, thin and sacciform body. Trophi was incudate with rami possessing horn like projections at four margins of the base. Well developed digestive system and germo-vitellarium with 36 nuclei.

**Measurements:**

Length of body: 850;                      breadth: 399;



### Indicators of trophic nature

Species of the genus *Brachionus* are sensitive to changes in the water quality. Consequently their use as standard bioassay organisms had been universally recognized (APHA, 1998). Species belonging to *Brachionus*, *Filinia*, *Polyarthra* and *Testudinella* withstand heavy concentration of chemicals. In the present investigation it was clearly understood that bioassay along with the chemical analysis was also essential to determine the actual nature of water to discriminate the quality of water. *Filinia* especially when present indicates a lot of municipal deposition in water. Hence, it should also be used along with *Brachionus* in analysis related to ecological bioassay.

### Dormancy

Dormancy is a pattern or phenomenon, a type of adaptation to escape from some adverse situation or rather a style of safeguarding its own race from extinction exhibited by several species to overcome and withstand certain environmental conditions for brief period.

During the present investigation period it was found that some species were observed in specific conditions only. The species belonging to *B. calyciflorus*, *Keratella*, *Lecane*, *Asplanchna* and *K. pejerli* were found to show some sort of dormancy in fresh water ponds of India, exhibited the same pattern in the present lake. The difference only was in the number and size of the species as well as the population. The presences of mictic eggs or resting eggs which undergo parthenogenesis in certain rotifers, for most of them remain virgin due to lack of a male partner were characteristics of rotifers which carry these eggs for most of the seasons in a year. Most monogonont rotifers are short-lived and complete their life cycle in 8-14 days, on average, at 22°C (Pattnaik, 2010).

### Seasonal dynamics

The abundance of zooplanktons has a direct relation with the hydrography, physico-chemico factors and availability of phytoplanktons. Rotifers too no exception to this principle. Biotic factors such as quality and quantity of food, interference competition, predation and ecological conditions induce rotifer communities favoring one species over another. They are more susceptible to the environmental changes due to their small size and permeable integument. The temperature and pH tend to be positively related to species diversity while conductivity and salinity tend to be negatively related. Most of the planktonic rotifers appeared to have potentially cosmopolitan in distribution. The species like *B. calyciflorus*, *B. quadridentata*, *Keratella cochlearis* are cosmopolitan in distribution. Presence of *B. calyciflorus*, *B. quadridentata* in most of the Indian, Ethiopian and African lakes once again confirmed that both these species are cosmopolitan in nature (Pattnaik, 2014).

### References

- [1]. Bamstedt, U., Gifford, D. J., Irigoien, X., Atkinson, A. and Roman, M. (2000). Feeding. In: Zooplankton Methodology Manual, pp. 323–330, (Harris, R.P., Wiebe P.H., Lenz J., Skjoldal H. R. and Huntley M., eds). Academic Press, San Diego.
- [2]. Brook Lemma (2003). Ecological changes in two Ethiopian lakes caused by contrasting human intervention. *Limnologica* 33:44-53.
- [3]. Carlson, R.E. (1977). A trophic state index for lakes. *Limnology and Oceanography* 22:361–369.
- [4]. Carney, H.J. and Elser, J.J. (1990). Strength of zooplankton-phytoplankton coupling in relation to lake trophic state. in *Large Lakes: Ecological Structures and Functions*, pp. 615–631, (Tizler M.M. and Serruya C. eds). Springer-Verlag, New York.
- [5]. Elias Dadebo (2000). Reproductive biology and feeding habits of the cat fish *Clarias gariepinus* Burchell in Lake Hawassa, Ethiopia. *SINET: Ethiopian Journal of Science* 17:53-69.
- [6]. Gulati, R.D., Siewertser, K. and Postema, G. (1982). The zooplankton: its community structure, food and feeding, and role in the ecosystem of Lake Vetchen. *Hydrobiologia* 95:127–163.
- [7]. Girma Tilahun and Ahalgren, G. (2010). Seasonal variations in phytoplankton biomass and primary production in the Ethiopian rift valley lakes Ziway, Hawassa and Chamo-the basis for fish production. *Limnologica* 40: 330-342.
- [8]. Girum Tamire, Seyoum Mengistou. (2013) Zooplankton community grazing rates in a small crater lake: Lake Kuriftu, Ethiopia. *SINET: Ethiop. J. Sci.* 36 (1)1–8.
- [9]. Golterman, H.L., and Clymo, R.S., 1969. Methods for chemical analysis of fresh waters. I.B.P. Hand Book No.8, 172.
- [10]. Pattnaik, B.S.R., (2014): Species diversity of Lake Hawassa, *International Journal of Scientific Research*, Volume: 3 | Issue: 11 | November 2014 • ISSN No 2277 – 8179; pages: 33-35.
- [11]. Proceedings of EFASA-V<sup>th</sup> Annual Conference, Hawassa University, Ethiopia-2013.
- [12]. Zinabu Gebremariam, Elizabeth Kebede, Zerihun Desta (2002). Long-term changes in chemical features of waters of seven Ethiopian rift valley lakes. *Hydrobiologia* 477: 81-9