ZOOPLANKTON

INTRODUCTION:

Zooplankton communities of freshwater constitute an extremely diverse assemblage of organism represented by nearly all the phyla of invertebrates. The most significant feature of zooplankton is its immense diversity over space and time. In an ecosystem 90% of zooplankton species are herbivorous remaining 10% being carnivores since secondary production primarily depends on the biomass of herbivores, non-predatory zooplankton contribute significantly to the secondary productivity of an aquatic ecosystem. The diversity of zooplankton is usually studied by enumeration of different taxa or species in a representative sample collected by towing standard plankton net over an adequate distance. Zooplankton diversity is one of the most important ecological parameters in water quality assessment. The zooplankton study has been a fascinating subject for a long time. Water bodies rich in phytoplankton are also rich in zooplankton diversity.

Zooplankton an important component of secondary production provides a link between the producers and secondary consumers. A scientific appraisal of the spatio-temporal variation of plankton community provides information necessary for a proper understanding of growth and abundance of fish yields and also whether there is any scope for introduction of additional species of commercial value in order to utilize the vacant food niches, if any.

In the last two decades much attention has been paid in tropical countries towards the study of biology, ecology and toxicology of zooplankton due to their important role in fast emerging concepts in environmental management like environmental impact assessment (EIA) bioindication of pollution and biological monitoring. Similarly a number of studies have been conducted on their large scale culture under both the laboratory and field condition as these species form food of fry. Fingerlings of culture organism in fast emerging systems of aquaculture further zooplankton occupy a key position in the ecological pyramids and their role in trophodynamics in noteworthy. The zooplankton of ponds and lakes are dominated by members of 3 groups Rotifera, Cladocera and Copepods.
MATERIAL AND METHODS:

The selection of sampling station A, B, C, is described earlier the plankton samples were collected for the period of August 2006 to July 2008 plankton were collected by filtering 100 liters of water through plankton net made up of bolting silk. The Zoo planktonic samples were preserved in 5% formalin. The preserved samples were brought to the National foundation for environmental services, Karad [Maharashtra] for qualitative and quantitative analysis and the identification was done with the help of methods described by Pennak [1953] Arora [1963] Sehgal [1983], Battish [1992] Murgan et al [1998] and Dhanpathi [2006] The Zooplankton are counted using a counting device like a sedge wick rafter cell.

ZOOPLANKTON ANALYSIS:

SEDGEWICK RAFTER CELL METHOD:

It is a slide of 50mm long, 20.mm wide and 1.mm deep. The volume the cell is 1cm³ or 1ml. Exactly one ml sub sample is kept on the slide. A special cover slip is keep on the cell. The cover slip is kept carefully avoiding the air bubbles. The planktons are allowed to settle for same time and the counting is done under a microscope. All the planktons present in the cell are counted by moving the cell horizontally and vertically covering the whole area. The procedure is repeated by taking another drop.

\[
\text{NO. Of plankton / ml} \quad \frac{\text{Number of organism counted}}{\text{Number of replicates taken}}
\]

It is inconvenient to count the plankton in the complete cell; the cell can be divided into horizontal strips by using a thin glass pensile. Each strip is counted separately and several such strips are counted.
No. of plankton / ml = Number of organisms in all the strips x 1000

\[
= \frac{L \times b \times d \times x \times \text{number of strip counted}}{[1\text{-length, b-breath, d-depth}]}
\]

Finally the Zooplankton can be identified by using laboratory as per the guideline given by Needhan and Needhan [1962] and APHA [1985].

ZOOPLENKTON DIVERSITY IN RESERVOIR.

The group wise diversity of zooplankton population encounted during the present study in August 2006 to July 2008.

Following groups identify the zooplankton in Benetura Reservoir

1. Rotifera
2. Cladocera
3. Copepoda

ROTIFERA

The rotifer groups following zooplankton species identify and observed in Benetura reservoir.

BRACHIONUS CALYCIFLORUS

Characters:

Body slightly compressed dorsoventrally anterior dorsal margin with four broad based spines of variable length, medians longer than laterals, mental margin flexible, usually some what elevated with shallow V or U shaped notch, flanked, posterior spines present or absent posterior lateral spines usually absent lorica, smooth or lightly stippled length of lorica 218-225 u.
BRACHIOUS FALCATUS:
Characters:
Lorica firm, lightly stippled, greatly compressed dorsoventrally and composed of dorsal and ventral plates, anterodorsal margin with six spines. Intermediate spines considerably larger than laterals and medians. Median spines mostly equal to laterals but some times smaller, posterior spines widely separated basally, long their width much more than anterior spines. Length of lorica 122-155u.

KERATELLA TROPICA
Characters:
Anterodorsal margin with 6 spines. Medians longest, intermediates shortest mental edge bifurcate posterior. Spines unequal, width of lorica at bases posterior spines smaller than width at occipital margin, three hexagonal plaques on dorsal plate of lorica and a small four sided plague between the posterior border of the lorica and the last hexagonal plaque. Length of lorica 110-115 u.

EUCHLANIS DIALATATA
Characters:
Lorica vase-like broad posteriorly and narrower anteriorly, anterodorsal margin with sharp notch in the middle, anteroventral margin concave postdorsal margin with shallow notch, caudal sense organ with two long hairs length of lorica 290u.

LECANE SPECIES – I
Characters:
Lorica firm, some what elongated in outline, anteriorly narrower than than its posterior end maximum width at transverse ridge present on dorsal as well as ventral plate approximately two thirds from anterior end, two anterolateral ridges present on dorsal plate, anterodorsal as well as anteroventral margins straight length of lorica 93-96 u.
CLADOCERA:

The group cladocera following Zooplankton species identify and observed in Bennetura Reservoir.

1. **DAPHNIA SIMILIS**
   **Characters:**
   - Body thick head without crest, eye and ocellus prominent, antennules small, olfactory setae do not project beyond rostrum, fornix well developed with a distinct posterior angle, secondary extension extends for back carapace more or less straight dorsally, but curved ventrally claws with two distinct combs, anus present before last anal spine. Length of female species 2.50mm.

2. **CERIODAPHINA CORNUTH**
   **Characters:**
   - Head produced in front of antennules into a short cervical, acutely pointed horn-like process, eye quite large, ocellus not prominent, valves reticulated, more or less rounded in outline with the upper and the lower margins arched posteriorly produced into a short and blunt shell spine dorsal and ventral shell margins without spinules, post abdomen with 5-7 anal spines, claws smooth. Length of body 0.55mm.

3. **ALONA RECTANGULAR**
   **Characters:**
   - Oval in form valves with rounded posterodorsal and posteroventral corners, head shield with three connected main pores and rounded posterior margin denticles in groups, distal denticle largest, claw with basal spine. Ocellus as large eye, length of body 0.42-0.43 mm. colour is light yellow.

4. **BIAPERTURA KARUA**
   **Characters:**
   - Oval in form, head shield rounded posteriorly, produced in to pointed rostrum anteroventrally, two main narrowly connected head pores. Eye of moderate size ocellus small eye, ocellus and rostrum equidistant, antennule small with 7 distal sensory bristles, antenna typical. Ventral margin of valves bearing spinules, posteroventral corner of valves of with 3 dentacles, ventral margin with spinules
abdomen with 5 well developed appendages. Color is light brownish length of body 0.42-0.44 mm.

5. MOINA MICRURA.
Characters:

Body elliptical small in size head rounded anteriorly, small supra-oculars depression present, eye large with numerous lenses, ocellus wanting, antennule small movable, more or less spindle shaped bearing 5 sensory hairs distally, antenna well developed, claws small pectinate, hearing spinules on dorsal margin, color is light yellow male species not found length of body 0.31-0.34 mm.

C. COPEPODA:

The Copepoda groups following zooplankton species identify and observed in Benetura Reservoir.

1. PHYLLODIATOMUS ANNAE:
Characters:

Moderately built body, antennules longer than body length, extending beyond caudal setae, claws slender and pointed, endopod with rounded tip bearing hairs extending to middle of 2nd expodite, left foot exopod with thumb-like terminal process and long pointed almost straight inner process at right angle to the exopod female species slightly larger than male.

2. MESOCYLOPS–HYALINUS:
Characters:

Cephalothorax oval much broader than abdomen. Antennules 17 segmented reaching slightly beyond the metasoma, last two segments longer than the previous three, last segment with smooth hyaline membrane. Inner spines on terminal segment of fifth leg apical in position. Inner terminal spine of endopodite of fourth leg distinctly larger that outer terminal spine but shorter than terminal segment color is white opaque with dark spots.
3. MESOCYCLOPS LEUCKRTI.

Characters:

Body slender cephalothoraxes oval, much border than abdomen, antennules 17. Segmented, reaching slightly beyond metasoma. Last two segments together longer than pervious three last segments with a serrated or notched hyaline plate antenna four jointed, basis of maxilla with conspicuously ribbed outer margin and bears a long seta on distal outer angle second joint longer and bears two long setae. One at its distal end, the other on its inner sides and color is whitish length of body 1.0 to 1.38 mm.

4. ECTOCYCLOPS PHALERATUS:

Characters:

This species can be easily recognized due to its dorsoventrally flattened body with short 11-segmented antennules barely reaching the middle of the cephalothorax and translucent, orange body color. Legs is not demarcated from the fifth meta somal segment its bears two strong inner spines and an outer seta. The caudal rami is short and tapering at the distal ends fine bristles are present in rows on the rami. Length of body 0.75 to 0.82 mm.

5. TROPOCYCLOPS –PRASINUS:

Characters:

This opaque chocolate colored species has long antennules reaching the end of the metasoma. The caudal rami are short, about 3 times longer than wide and without bristles on the inner or outer margins. The inner terminal spine of leg 4 is long, but less than twice the length of the segment bearing it. Length of body 0.55 - 0.58 mm.
RESULT AND DISCUSSION:

Zooplankton diversity observed in Benntura reservoir during the period August 2006 to July 2008. Zooplankton sp. identify the three groups each group five species identify and observed dunng the first year August 2006 to July 2007 following three groups studied. 1) Rotifera 2) Cladocera and 3) Copepod collection of sampling station three A, B, and C. Rotifera dominated the zooplankton population followed by Cladocera and Copepoda. Total 15 different species of zooplankton were identified summer months exhibited higher population of zooplankton. Sampling station A Rotifera, Cladocera and Copepoda group total 15 species identified. The maximum rotifera population was recorded during March, April and May (32 organism/liter) in species Brachionus, Calciforus and minimum rotifer population was reworded during (5-org/lit) month of June. Cladocera were represented by 5 species the maximum population was recorded during Dec and Jan (16 org/lit) in species ceriodaphnia cornuta and moina micrura (15 org/lit) in month of May minimum population was recorded in month of April (2 org/lit) in species Biapertura karua.

Copepoda was represented by 5 species the maximum population was recorded during April and May (15 org/lit) in species Mesocyclops leuckarti & minimum population was recorded during June, August, Nov, and March in species Ectocylops phaleratus. During the second year Aug 2007 to July 2008 total 15 species studied the maximum population of Ratifera group was recorded during month of May (28/org/lit) in species Branchionus calyciflorus as well as Branchies falcatus (22org/lit) and minimum was recorded (5org/lit) in month of July in Euchlanis dialatata. Cladocera were represented 5 species. The maximum population was recorded in month of May (15org/lit) in Moina micrura and minimum (2org/lit) in month of August Biapertura karua.

Copepoda group the maximum population was recorded in month May (15org/lit) in phyllodiaptomus annae mesocylops leuckarti and Ectocylops phaleratus. The minimum was recorded in month of July (2org/lit) Tropocylops prasinus.

Sampling station ‘B’ identify the three groups and different species of zooplankton maximum population was recorded during the year Aug 2006 to July
2007 in month of May (22org/lit) in species Branchionous falcatus and minimum population was recorded during July and sept (2org/lit) Lecane. Species - II

The cladocera group the maximum population was recorded during the month of May (12org/lit) Daphnia similis was alona rectangular. The minimum recorded June, July, Sept, and November in different species

The Copepoda group the maximum population in month of December and May (10 org / lit) mesocyclops halinus and minimum population was recorded in month of June, July and August in Tropocyclops prasinus and other species. During the second year study period at sampling station B August 2007 to July 2008 Rotifera group higher population was recorded in month of May (25 org/lit) in Branchionus calycflorus and minimum population was recorded during July, August and November (2 org/lit) in Keratalla. Tropica and other species.

Cladocera represented was higher population was recorded April and May (15 org/lit.) in ceriodaphania cornuta and Alona rectangular. The minimum population was recorded in month of June , Octo, November and January (2 org/lit. ) in Alona rectangular, moina micrura and etc. The copepoda group the maximum population was recorded in month of May (18 org/lit. ) in Ectocyclops phaleratus . The minimum population was in month of July (1 org /lit ) in Ectocyclops phaleratus.

Sampling Station ‘C’ identify the three groups in study period August 2006 to July 2007 The rotifera group maximum population was recorded in month April (22 org/lit) in Branchionus calycflorus. The minimum population was recorded in month of July (2 org/lit) in Branchionus flacatus and Euglanis dialatata. The Cladocera the maximum population was recorded in month of Feb., March, April, and May (15 org./lit. ) in alona rectangular Monia microura and other species, The minimum population was recorded in month of sep. and October (2 org/lit. ) in moina microura. The copepoda group the maximum of April and may (15 org/lit. ) in mesocyclops leuckarti and Ectocyclops phaleratus, the minimum population was recorded in month of July and Sept. (2 org/lit. ) in Ectocyclops phaleratus.

During the second year study period August 2007 to July 2008. The rotifera group maximum population was recorded in month of May (22 org/lit.) in Branchious flacatus.
The minimum population was recorded in month August (2 org/lit.) in lacane species. I.
The cladocera group the maximum population was recorded in month of May (18 org/lit. ) in Alona Rectangular. The minimum was recorded June, July (2 org/lit) in Biaperatura Karua.
The copepoda group, the maximum population was recorded in month of March (15 org/lit.) mesocyclops leuckarthi and minimum was recorded in month of June and July (2 org/lit.) in Tropocyclops prasinus.


Sampling station B same to the three groups identify first Rotifera total no. of plankton (361) recorded in August 2006 to July 2007. And Aug 2007 to July 2008 recorded in (275) plankton while other group same station Cladocera total number of plankton (190) was recorded in Aug 2006 to 2008. And (265) plankton was recorded in August 2007 to 2008 the third group Copepoda was recorded the (154) plankton in Aug 2006 to July 2007. And (197) plankton recorded in August 2007 to July 2008.

Third sampling station ‘C’ Rotifera Group. Total number of plankton (431) was recorded in Aug 06 to July 2007 and (300) planktons was recorded in Aug 2007 to 2008. The Cladocera group total plankton (223) was recorded in Aug 2006 to July 2007 and (244) plankton was recorded in Aug 2007 to July 2006.

The third group copepods, total number of plankton (217) was recorded in Aug (2006) to July 2007. And (228) plankton was recorded in Aug 2007 to July 2008.

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<tr>
<td>Rotifera</td>
<td>86 %</td>
<td>65 %</td>
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<td>Cladocera</td>
<td>41 %</td>
<td>47 %</td>
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<tr>
<td>Copeopda</td>
<td>35 %</td>
<td>44 %</td>
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