

ZOOPLANKTON COMPOSITION IN SOME PONDS OF HAVERI DISTRICT, KARNATAKA

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ABSTRACT

Zooplankton composition of 19 water bodies of Haveri district has been studied in post and pre monsoon season of 2004-2005. A total of 71 species were recorded, 38 of them belonging to rotifera, 22 cladocera, seven copepoda and four ostracoda. Of these, five species i.e. one cladoceran and four rotiferans were reported for the first time from this area. A maximum of 29 species were recorded from Akkialur tank, and only five species were recorded from Makaravalli tank. Frequently recorded rotiferans were *Keratella tropica*, *Habrotrocha bidens*, *Brachionus calyciflorus*, *B. diversicornis*, *Keratella cochlearis*, *Lecane luna*, *L. leontina*, *Fillinia longisetata* and *F. opoliensis*. Common Cladocerans were *Diaphanosoma exicum*, *Ceriodaphnia cornuta*, *Moina micrura*, *M. macracopa*. The regular copepods were *Neodiaptomus strigilipes* *Heliodiaptomus viduus*, *Paracyclops fimbriatus*, *Tropocyclops prasinus* and *Mesocyclops leuckarti*. Common ostracods were *Hemicypris fossucula*, *Ilyocypris gibba* and *Darwinula sp.* The species richness was high in pre-monsoon season compared to post-monsoon season. In Akkialur tank 15 species were found in postmonsoon season whereas 29 species were recorded in premonsoon season. Other tanks also showed the same trend.

KEYWORDS

Cladocerans, copepods, Haveri, Karnataka, rotifers, species composition,

Haveri district covers a geographical area of 4,85,156ha, has one canal, 193 reservoirs (more than 40ha) and 1,601 tanks (less than 40ha). The average annual rainfall is 753mm, and the temperature ranges from 10°C to 44°C. Studies on freshwater biodiversity of Haveri district are scarce. It has been recently separated from Dharwad district. Most of the limnological studies of undivided Dharwad district were limited to the water bodies in and around the Hubli-Dharwad cities (Patil & Gouder, 1985; Hegde & Huddar, 1995). There is only one survey report on water quality of some selected irrigated tanks of this area (Uttangi, 2001).

Zooplanktons occupy an important position in the trophic structure and play a major role in the energy transfer of an aquatic ecosystem. An inadequate knowledge of the zooplankton and their dynamics is a major handicap for better understanding of life processes of fresh water bodies. Pederson *et al.* (1976) have indicated the importance of such studies since eutrophication is bound with the components and production of zooplankton. Discharges of urban, industrial and agricultural wastes have increased the quantum of various chemicals that enter the waters, which considerably alter their physico-chemical characteristics. Phosphorus and nitrogen inputs from domestic wastes and fertilizers accelerate the process of eutrophication, which alter food chain sequences

leading to production of commercially less valuable higher trophic organisms (Rao *et al.*, 1994). One of the main difficulties in studying loss of biodiversity due to eutrophication is the absence of previous records of species composition. The present work was undertaken to study the zooplankton composition of some lentic habitats of Haveri district.

MATERIALS AND METHODS

Zooplankton samples were collected from 19 lentic habitats of Haveri district (14°37'-14°76'N & 75°7'-75°37'E). The collection was made in October 2004 (postmonsoon) and March 2005 (premonsoon). As most of the tanks became dry in March only five samples were collected. The collection was made with horizontal net-tows in the littoral zone using plankton net of 68µm mesh and samples were fixed in 4% formaldehyde. Organisms were identified to the possible taxonomic level (Genus/species), using an optical microscope and a specialized bibliography (Edmondson, 1959; Dhanapathi, 1974, 1976; Dumont & Velde, 1977; Dumont, 1983; Sharma, 1979, 1980, 1983, 1987; Sharma & Michael, 1980, 1987; Rajapaksa & Fernando, 1982; Fernando & Kanduru, 1984; Patil & Gouder, 1982a, 1982b, 1982c, 1989; Hudec, 1987; Sharma & Sharma, 1997). Only qualitative analysis of zooplankton was done. Philodinidae species were identified using fresh samples.

RESULTS AND DISCUSSION

A total of 71 species were identified (Table 1); 38 of them belonging to Rotifera, 22 to Cladocera, seven to Copepoda and four species to Ostracoda. Of these, five species are new to this region (1 cladoceran and 4 rotifers). The highest number of species was obtained in the samples from Akkialur tank (29 species) and the lowest number was found in the samples of Makaravalli tank (5 species). During postmonsoon season (October 2004) the zooplankton diversity of various tanks (Table 2) was as follows: Akkialur, 15 spp.; Battigeri, 10 spp.; Budappanalli, 21 spp.; Gangibhavi, 10 spp.; Gudgur, 18 spp.; Hanamapur, 12 spp.; Hattimattur, 13 spp.; Heggerikeri, 6 spp.; Hosalli, 22 spp.; Kabbur, 6 spp.; Kadkol, 12 spp.; Krishnapur, 6 spp.; Makaravalli, 5 spp.; Medleri, 17 spp.; Naregal, 17 spp.; Savanur, 9 spp.; Siddapur, 10 spp.; Tadas, 8 spp.; and Timmapur, 20 spp. In premonsoon season (March 2005) species diversity as follows: Akkialur, 29 spp.; Battigerikeri, 19 spp.; Gangibhavi, 14 spp.; Heggerikeri, 12 spp.; and Tadas, 11 spp.

Akkialur tank is largely colonized by submerged and emerging macrophytes, which almost completely occupy its surface area. Chydoridae and Macrothricidae members of cladocerans, littoral rotifers and ostracods favour this kind of environment.

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Table 1. Systematic account of zooplankton

Cladocera	13. <i>Platytias quadricornis</i>
Family: sididae	14. <i>Platytias putulus</i> .
1. <i>Diaphanosoma excisum</i> .	15. <i>Keratella tropica</i> .
2. <i>Diaphanosoma sarsi</i> .	16. <i>Keratella cochlearis</i>
Family: Daphnidae	17. <i>Keratella quadrata</i> .
1. <i>Daphnia carinata</i> .	Family: Lecanidae
2. <i>Ceriodaphnia cornuta</i> .	1. <i>Lecane leontina</i> .
Family: Moinidae	2. <i>Lecane luna</i> .
1. <i>Moina brachiata</i> .	3. <i>Monostyla bulla</i> .
2. <i>Moina macrocopa</i> .	Family: Euchlanidae
3. <i>Moina rectirostris</i> .	1. <i>Euchlanis dilatata</i> .
4. <i>Moina micrura</i> .	2. <i>Euchlanis triquetra</i> .
5. <i>Moina oryzae</i> .	Family: Testudinella
Family: Bosminidae	1. <i>Testudinella patina</i> .
1. <i>Bosminopsis deitersi</i> .	2. <i>Pompholyx sulcata</i> .
Family: Macrothricidae	Family: Notommatidae
1. <i>Macrothrix goeldi</i> .	1. <i>Cephalodella gibba</i> .
2. <i>Macrothrix laticornis</i> .	Family: Asplanchnidae
Family: Chydoridae	1. <i>Asplanchna priodanta</i> .
1. <i>Leydiga acanthocercoides</i> .	2. <i>Asplanchna brightwellii</i> .
2. <i>Alona monacantha monacantha</i> .	Family: Mytilinidae
3. <i>Alona cambouei</i> .	1. <i>Mytilina acanthophora</i>
4. <i>Alona pulchella</i> .	2. <i>Mytilina ventralis</i> .
5. <i>Biapertura karua</i> .	Family: Colurellidae
6. <i>Pleuroxus trigonellus</i> .	1. <i>Lepadella rhomboids</i> .
7. <i>Pleuroxus denticulatus</i> .	Family: Trichoceridae
8. <i>Chydorus sphaericus</i> .	1. <i>Trichocera similes</i> .
9. <i>Chydorus barroisi barroisi</i> .	Family: Filinidae
10. <i>Chydorus reticulatus</i> .	1. <i>Filinia opoliensis</i> .
Copepoda	2. <i>Filinia longiseta</i> .
Family: Diaptomidae	Family: Philodinidae
1. <i>Rhinediaptomus indicus</i> .	1. <i>Callidina bidens</i>
2. <i>Heliodiaptomus viduus</i> .	2. <i>Rotifer tardus</i> .
3. <i>Neodiaptomus stregilipes</i> .	3. <i>Rotatoria neptunia</i>
Family: Cyclopidae	Family: Meliceratidae
1. <i>Tropocyclops prasinus</i> .	1. <i>Lacinularia socialis</i> .
2. <i>Paracyclops fimbriatus</i> .	Family: Trochospharidae
3. <i>Mesocyclops leuckartii</i> .	1. <i>Horella brehmi</i> .
4. <i>Mesocyclops hyalinus</i> .	Ostracoda
Rotifera	Family: Cyprididae
Family: Brachionidae	1. <i>Hemicypris fossilata</i> .
1. <i>Brachionus angularis</i> .	Family: Ilyocypridae
2. <i>Brachionus bidentata</i> .	1. <i>Ilyocypris gibba</i> .
3. <i>Brachionus caudatus</i> .	Family: Darwinulidae
4. <i>Brachionus falcatus</i> .	1. <i>Darwinula sp.</i>
5. <i>Brachionus calyciflorus</i> .	Family: Stenocyprinae
6. <i>Brachionus forficula</i> .	1. <i>Stenocypris hislopi</i>
7. <i>Brachionus bennini</i> .	
8. <i>Brachionus quadridentatus</i> .	
9. <i>Brachionus rubens</i> .	
10. <i>Brachionus plicatilis</i> .	
11. <i>Brachionus urceolaris</i> .	
12. <i>Brachionus diversicornis</i> .	

Obviously we found higher species diversity in this tank in March.

Rotifer was the richest group with 38 species, which accounts for 53% of total zooplankton group. Taxonomic dominance of rotifers was reported in several water bodies (Nogueira, 2001; Cavalli *et al.*, 2001; Sampaio *et al.*, 2002; Neves *et al.*, 2003). This pattern is common in tropical and subtropical freshwaters, whether in lakes, ponds, reservoirs, rivers, or streams (Neves *et al.*, 2003). This may be due to their special characteristics, i.e., less specialized feeding, high fecundity and frequent parthenogenetic reproduction, constellation of life traits that

make them opportunist and typical r-strategist, favoured in unstable and eutrophic environments (Rocha *et al.*, 1995). This may be also due to a wide spectrum of food particles exploited by this group, which display the ability to consume bacteria, algae and detritus of different sizes, which allows quite distinct diets for the many species simultaneously present in the water body (Starkweather, 1980).

According to Sharma (1998 cited in Arora & Mehra, 2003a) there are 500 species of rotifers in Indian waters, although only 330 species belonging to 63 genera and 25 families have so far been authenticated. In the present study 38 species of rotifers belonging to 13 families were recorded. Of the 13 families, Brachionidae was the most represented with 17 species (3 genera), followed by Philodinidae with three species (3 genera), Lecanidae with three species (2 genera), Testudinellidae with two species (2 genera). Asplanchnidae, Mytilinidae, Fillinidae and Euchlanidae were represented by two species each (1 genera each). Families Notommatidae, Colurellidae, Trichoceridae, Trocosphaeridae and Flosculariidae were represented by one species each. The rotifers, *Keratella quadrata*, *Euchlanis triquetra*, *Brachionus bennini* and *Pompholyx sulcata* are new records from this region. The above species had been reported to occur in Brahmaputra river basin and Delhi segments of river Yamuna (Sharma, 1983; Sharma & Sharma, 2001; Arora & Mehra, 2003a).

Most frequently collected rotifers were: *Keratella tropica* (37%), *Habrotricha bidens* (32%), *Brachionus calyciflorus* (26%), and *B. diversicornis*, *Keratella cochlearis*, *Lecane luna*, *L. leontina*, *Filinia longiseta* and *F. opoliensis* (21% each). The families Brachionidae and Lecanidae were represented by large number species, which is considered typical, and most frequent in tropical environment (Dumont, 1983). Of the seven genera of Brachionidae five genera i.e., *Brachionus*, *Keratella*, *Platytias*, *Anuraeopsis* and *Notholca* are found in India and they form a significant fraction of Rotifer (Sharma, 1987). Of the 38 species of rotifers, 17 species belong to Brachionidae and three species to Lecanidae. *Brachionus* was the prominent genus represented by 12 species i.e., *Brachionus angularis*, *B. caudatus*, *B. plicatilis*, *B. calyciflorus*, *B. diversicornis*, *B. quadridentatus*, *B. falcatus*, *B. bidentata*, *B. forficula*, *B. urceolaris*, *B. bennini* and *B. rubens*. Genus *Brachionus* is one of the most ancient genus of monogonont rotifers and is represented by 46 species in India (Sharma, 1983). The genus *Brachionus* is the index of eutrophic waters (Sladeczek, 1983) and its abundance is considered as a biological indicator for eutrophication (Nogueira, 2001). The species *B. calyciflorus* is considered to be a good indicator of eutrophication (Sampaio *et al.*, 2002). Presence of *B. calyciflorus* in Timmapur, Gudgur, Gangibhavi, Battigeri and Kadkol tanks suggest that these tanks have reached eutrophic stage. Increased nutrients in these tanks may be due to entry of sewage in Timmapur and Kadkol tank, whereas in Gudgur, Gangibhavi and Battigeri tanks it may be due to agricultural run off.

About 600 species of fresh water cladocerans have been reported (Korovchinsky, 1996) to occur throughout the world

Table 2. Occurrence of zooplankton in Haveri district during wet and dry season.

Species	Heggeri		Hosalli	Kabbur	Naregal	Akkialur		Makar-valli	Battigeri		Gangibhavi		Tadas	
	W	D				W	D		W	D	W	D	W	D
Cladocera														
<i>Diaphanosoma excisum</i>	-	+	+	-	-	-	-	-	-	-	+	+	-	+
<i>Diaphanosoma sarsi</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Ceriodaphnia cornuta</i>	-	-	-	-	+	+	-	-	+	+	-	-	+	+
<i>Daphnia carinata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Bosminopsis deitersi</i>	-	-	-	-	-	-	-	-	+	-	-	-	-	-
<i>Macrothrix goeldi</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-
<i>Macrothrix laticornis</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-
<i>Moina oryzae</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Moina macracopa</i>	-	-	+	-	-	-	-	-	+	+	-	-	-	-
<i>Moina brachiata</i>	-	+	+	+	-	-	-	-	+	+	+	+	-	-
<i>Moina rectirostris</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Moina mirura</i>	-	+	+	-	-	+	-	-	-	-	-	+	-	-
<i>Leydigia acanthocercoides</i>	-	-	-	-	+	-	+	-	-	-	-	-	-	-
<i>Alona monacantha monacantha</i>	-	-	-	-	+	-	+	-	-	-	-	-	-	-
<i>Alona cambouei</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Alona pulchella</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-
<i>Biaptura karua</i>	-	-	-	-	-	-	+	-	+	+	-	-	-	-
<i>Pleuroxus trignonellus</i>	-	-	-	-	-	+	+	-	-	-	-	-	-	-
<i>Pleuroxus denticulatus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-
<i>Chydorus sphericus</i>	-	-	-	-	+	-	+	-	-	+	-	-	-	-
<i>Chydorus reticulatus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-
<i>Chydorus barroisi barroisi</i>	-	-	-	-	+	-	+	-	-	-	-	-	-	-
Copepoda														
<i>Rhinediaptomus indicus</i>	-	+	+	-	-	-	-	-	-	-	-	-	-	-
<i>Heliodiaptomus viduus</i>	-	+	+	-	+	-	+	+	-	-	+	-	+	+
<i>Neodiaptomus strigillipes</i>	+	+	+	+	+	-	+	+	+	+	+	-	+	+
<i>Paracyclops fimbriatus</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Tropocyclops prasinus</i>	-	+	+	-	+	+	+	-	+	+	+	+	+	+
<i>Mesocyclops leuckartii</i>	-	+	+	-	+	-	+	-	+	+	+	+	-	-
<i>Mesocyclops hyalinus</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Rotifera														
<i>Brachionus angularis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Brachionus caudatus</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	+
<i>Brachionus plicatilis</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Brachionus calyciflorus</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Brachionus diversicornis</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	+
<i>Brachionus quadridentatus</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Brachionus falcatus</i>	-	-	+	-	-	+	-	-	-	-	-	-	-	-
<i>Brachionus bidentata</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Brachionus urceolaris</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-
<i>Brachionus forficula</i>	-	-	-	-	-	-	+	-	+	-	-	-	-	-
<i>Brachionus rubens</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Brachionus bennini</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Platias quadricornis</i>	-	-	-	-	+	-	-	-	+	-	-	-	-	-
<i>Platias putulus</i>	-	-	-	-	-	+	-	-	-	-	-	-	-	-
<i>Kertella tropica</i>	-	-	-	-	-	-	+	-	-	-	+	+	-	+
<i>Kertella cochlearis</i>	-	-	-	-	-	-	+	-	-	+	-	+	-	-
<i>Kertella quadrata</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-
<i>Euchlanis dialata</i>	-	-	-	-	-	+	-	-	-	-	-	-	-	-
<i>Euchlanis triquetra</i>	-	-	-	-	-	+	-	-	-	-	-	-	-	-
<i>Mytilina ventralis</i>	-	-	-	-	-	-	+	-	-	-	+	+	-	-
<i>Mytilina acanthophora</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-
<i>Pompholyx sulcata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Monostyla bulla</i>	-	-	-	-	+	+	+	-	-	-	-	-	-	-
<i>Lecane luna</i>	-	-	-	-	-	+	+	-	-	+	-	-	-	+
<i>Lecane leontina</i>	-	-	-	-	-	+	+	-	-	+	+	+	-	-
<i>Fillinia longiseta</i>	-	+	-	-	-	-	-	-	-	-	+	+	-	+
<i>Fillinia opoliensis</i>	-	-	-	-	-	-	+	+	-	-	-	-	-	-
<i>Asplancha priodanta</i>	-	-	-	-	-	-	+	-	-	+	-	-	-	-
<i>Asplancha brightwelli</i>	-	-	-	-	-	-	+	-	-	+	-	-	-	-
<i>Horella brehmi</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Callidina bidens</i>	+	-	+	+	-	-	-	+	-	-	-	-	-	-
<i>Rotifer tardus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Rotatoria neptunia</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lacinularia socialis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lepadella rhombiodes</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Triclocera similes</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Cephalodella gibba</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Testudinella patina</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Species	Heggeri		Hosalli	Kabbur	Naregal	Akkialur		Makar-valli	Battigeri		Gangibhavi		Tadas	
	W	D				W	D		W	D	W	D	W	D
Ostracoda														
<i>Hemicypris fossulata</i>	+	+	+	+	+	+	+	-	+	-	-	+	+	
<i>Ilyocypris gibba</i>	+	+	+	-	+	+	+	-	+	-	-	+	+	+
<i>Stenocypris sp.</i>	-	-	-	-	+	-	+	-	-	-	-	-	-	-
<i>Darwinula sp.</i>	+	-	+	+	-	+	+	-	-	-	-	-	-	-
Total species	6	12	22	6	17	15	29	5	10	19	10	14	8	11

W - Wet; D - Dry; + - Present; - - Absent

Table 3. Occurrence of zooplankton in Haveri district (during wet season only)

Species	Gudgur	Budappanalli	Hanamapura	Medleri	Savanur	Krishnapur	Hattimattur	Timmapur	Siddapur	Kadkol
Cladocera										
<i>Diaphanosoma excisum</i>	+	+	-	+	+	-	+	-	-	-
<i>Diaphanosoma sarsi</i>	-	+	-	+	-	-	-	-	-	-
<i>Ceriodaphnia cornuta</i>	+	+	-	+	-	-	+	-	-	-
<i>Daphnia carinata</i>	-	-	-	-	-	+	+	+	-	-
<i>Bosminopsis deitersi</i>	-	-	-	-	-	-	+	+	+	-
<i>Macrothrix goeldi</i>	+	-	-	-	-	-	-	+	+	+
<i>Macrothrix laticornis</i>	-	-	-	-	-	-	-	-	-	-
<i>Moina oryzae</i>	-	-	-	+	-	-	-	-	-	-
<i>Moina macracopa</i>	+	+	-	+	-	-	-	-	-	-
<i>Moina brachiata</i>	+	+	-	+	-	-	+	-	-	-
<i>Moina rectirostris</i>	-	-	-	+	-	-	-	-	-	-
<i>Moina mirura</i>	-	+	+	+	+	-	-	-	-	-
<i>Leydigia acanthocercoides</i>	-	-	-	-	-	-	-	+	-	-
<i>Alona monacantha monacantha</i>	-	-	-	-	-	-	-	-	-	-
<i>Alona cambouei</i>	-	-	-	-	-	-	-	-	+	-
<i>Alona pulchella</i>	-	+	-	-	-	-	-	-	-	-
<i>Biaptura karua</i>	-	-	-	-	-	-	-	+	-	-
<i>Pleuroxus trigonellus</i>	-	-	-	-	-	-	-	-	-	-
<i>Pleuroxus denticulatus</i>	-	-	-	-	-	-	-	-	-	-
<i>Chydorus sphericus</i>	-	+	-	-	-	-	-	-	-	-
<i>Chydorus reticulatus</i>	-	-	-	-	-	-	-	-	-	-
<i>Chydorus barroisi barroisi</i>	-	-	-	-	-	-	-	-	-	-
Copepoda										
<i>Rhinediaptomus indicus</i>	+	-	-	+	+	-	+	-	-	-
<i>Heliodiaptomus viduus</i>	+	+	+	+	+	-	+	-	+	+
<i>Neodiaptomus strigilipes</i>	+	+	+	+	+	-	+	-	+	+
<i>Paracyclops fimbriatus</i>	+	-	-	+	+	+	+	+	+	-
<i>Tropocyclops prasinus</i>	-	+	+	+	+	+	+	+	+	+
<i>Mesocyclops leuckartii</i>	+	+	+	+	+	+	+	+	+	+
<i>Mesocyclops hyalinus</i>	-	-	-	-	-	-	-	-	-	-
Rotifera										
<i>Brachionus angularis</i>	-	-	+	-	-	-	-	-	-	-
<i>Brachionus caudatus</i>	-	+	-	-	-	-	-	-	-	-
<i>Brachionus plicatilis</i>	-	-	+	-	-	-	-	-	-	-
<i>Brachionus calyciflorus</i>	+	-	+	-	-	-	-	+	-	+
<i>Brachionus diversicornis</i>	-	-	-	-	-	-	-	+	-	-
<i>Brachionus quadridentatus</i>	-	+	-	-	-	-	-	-	-	-
<i>Brachionus falcatus</i>	-	-	-	+	-	-	-	-	-	-
<i>Brachionus bidentata</i>	-	-	-	-	-	-	-	+	-	-
<i>Brachionus urceolaris</i>	-	-	-	-	-	-	-	+	-	-
<i>Brachionus forficula</i>	-	+	-	-	-	-	-	-	-	-
<i>Brachionus rubens</i>	-	-	-	-	-	-	-	+	-	-
<i>Brachionus bennini</i>	-	-	-	+	-	-	-	-	-	-
<i>Platias qudadricornis</i>	-	-	-	-	-	-	-	-	-	+
<i>Platias putulus</i>	-	-	-	-	-	+	-	-	-	-
<i>Kertella tropica</i>	-	+	-	-	-	-	-	+	+	+
<i>Kertella cochlearis</i>	-	-	+	-	-	-	-	-	-	-
<i>Kertella quadrata</i>	-	-	-	-	-	-	-	-	-	-
<i>Euchlanis dialata</i>	-	-	-	-	-	-	-	-	-	-
<i>Euchlanis triquetra</i>	-	-	-	-	-	-	-	-	-	-
<i>Mytilina ventralis</i>	+	-	-	-	-	-	-	-	-	-
<i>Mytilina acanthophora</i>	-	+	-	-	-	-	-	-	-	-
<i>Pompholyx sulcata</i>	-	-	-	-	-	-	-	-	-	+
<i>Monostyla bulla</i>	-	-	-	-	-	-	-	-	-	-
<i>Lecane luna</i>	-	-	-	-	-	-	-	-	-	+
<i>Lecane leontina</i>	-	+	-	-	-	-	-	-	-	-
<i>Fillinia longiseta</i>	-	-	-	-	-	-	-	-	+	-
<i>Fillinia opoliensis</i>	-	-	-	-	-	-	+	-	-	+

Species	Gudgur	Budappanalli	Hanamapura	Medleri	Savanur	Krishnapur	Hattimattur	Timmapur	Siddapur	Kadkol
<i>Asplancha priodanta</i>	+	-	-	-	-	-	-	-	-	-
<i>Asplancha brightwelli</i>	-	-	-	-	-	-	-	-	-	+
<i>Horella brehmi</i>	+	+	-	-	-	-	-	-	-	-
<i>Callidina bidens</i>	+	-	-	-	-	-	-	+	-	-
<i>Rotifer tardus</i>	-	-	-	-	-	-	-	+	-	-
<i>Rotatoria neptunia</i>	-	-	-	-	-	-	-	+	-	-
<i>Lacinularia socialis</i>	-	-	-	-	-	-	-	+	-	-
<i>Lepadella rhombioides</i>	-	-	-	-	-	-	-	+	-	-
<i>Tricocera similes</i>	-	-	-	+	-	-	-	-	-	-
<i>Cephalodella gibba</i>	-	-	-	-	-	-	-	+	-	-
<i>Testudinella patina</i>	-	+	-	-	-	-	-	-	-	-
Ostacoda										
<i>Hemicypris fossulata</i>	+	-	+	-	+	-	-	+	+	-
<i>Ilyocypris gibba</i>	+	+	-	-	-	-	+	+	-	-
<i>Stenocypris sp.</i>	-	-	-	-	-	-	-	-	-	-
<i>Darwinula sp.</i>	+	-	+	-	-	-	-	-	-	-
Total species	18	21	12	17	9	6	13	20	10	12

+ - Present; - - Absent

and in India 110 species have been recorded (Patil & Goudar, 1989). Patil and Goudar, (1982 b, 1985) reported 40 species of cladocerans from Dharwad region. Uttangi (2001) reported eight species of cladocerans from 54 tanks of Haveri district. In the present study 22 cladoceran species are recorded and the species *Moina oryzae* is new from this area. Hudec (1987) reported occurrence of this species from Tamil Nadu. Chydoridae was the most frequently represented family with five genera and 10 species, followed by Moinidae (5 species). Families Daphnidae, Macrothricidae and Sididae were represented by two species each, whereas Bosminidae was represented by only one species. The most frequent cladocerans were *Diaphanosoma excicum* and *Ceriodaphnia cornuta* and were found in nine water bodies. The species *Moina micrura* was present in eight water bodies and *M. macracopa* was found in six water bodies. *Moina oryzae* and *M. rectirostris* were found in only Medleri tank. In the littoral zone the members of Chydoridae represent major part of cladocerans, these organisms usually associate with macrophytes, periphyton or sediment (Wisniewski *et al.*, 2002). According to Uttangi (2001) cladocerans prefer to live in clear waters. In the present investigation it was observed that more number of cladocerans species were in clean waters, i.e., Medleri tank and Akkialur tank. In the absence of turbidity, laboratory experiments show irregular and unfair competition between rotifers and *Daphnia*, leading to *Daphnia* dominance. However, inorganic turbidity inhibited the competitive abilities of *Daphnia*, and this competitive inhibition may have led to a decline of cladoceran abundance (Pollard *et al.*, 1998).

Approximately 1200 marine and freshwater species of calanoids, 1000 cyclopoidas and 1200 harpacticoids have been recorded so far worldwide. About 120 species of freshwater free-living copepods are known from India. Patil and Goudar (1982c, 1989) reported seven species of copepods in Dharwad district. In the present study same species have been found. Among the calanoids, *Neodiaptomus strigilipes* was the most frequent species and was observed in 17 water bodies. *Heliodiaptomus viduus* was found in 15 water bodies. *Rhodiaptomus indicus* was recorded in six water bodies. In case of cyclopoida,

Paracyclops fimbriatus was the most frequent species and was found in 16 water bodies. *Tropocyclops prasinus* and *Mesocyclops leuckarti* occurred in 15 water bodies. *Mesocyclops hyalinus* was rare and found only in the Hosalli tank.

Ostracods are bivalve crustaceans are found in both freshwater and marine water. There are over 1700 species of known ostracods of which about one-third are in fresh water forms. They inhabit a wide variety of freshwaters, i.e., lakes, pools, swamps, streams, cave water, heavily polluted areas, etc. (Edmondson, 1959). Patil and Goudar (1989) reported occurrence of seven species of ostracods in Dharwad district. In the present study only four species of ostracods were found. *Hemicypris fossucula* belonging to the family Cyprididae was found in 13 water bodies. *Ilyocypris gibba* belonging to the family Ilyocyprididae was found in 11 water bodies. *Darwinula sp.* belonging to the family Darwinulidae and *Stenocypris hislopi* belonging to the family Stenocyprinae were found in six and two water bodies respectively.

The present study reveals that zooplankton species richness was high in pre-monsoon period when compared to post-monsoon season. Arora and Mehra (2003b) while analyzing seasonal dynamics of rotifers in relation to physico-chemical conditions of the river Yamuna, made the similar observations. In summer season, the absence of inflow of the water brings stability to the water body. The availability of food is more due to the organic matter production and decomposition. The above factors contribute for high species diversity in that season. Increased anthropogenic activities, siltation, sewage contamination, and high nutrients problems due to the indiscriminate use of fertilizers in the agricultural catchment area are the major cause for the eutrophication. The study indicates that five water bodies have already reached the eutrophication stage and the fates of other ponds are also not encouraging.

Many of the above water bodies attract variety of birds and considered as stopover sites for migratory birds (Uttangi, 2001).

If the water bodies have to be preserved for their intended use, protect its biota; a sustainable and holistic management planning is necessary for conservation of these tanks.

REFERENCES

- Arora, J. and N.K. Mehra (2003a).** Species diversity of planktonic and epiphytic rotifers in the backwaters of the Delhi segment of the Yamuna river, with remarks on new records from India. *Zoological Studies* 42(2): 239-247.
- Arora, J. and N.K. Mehra (2003b).** Seasonal dynamics of the rotifers in relation to physical and chemical conditions of the river Yamuna (Delhi), India. *Hydrobiologia* 491: 101-109.
- Cavalli, L., A. Miquelis and R. Chappaz (2001).** Combined effects of environmental factors and predatory prey interactions on zooplankton assemblages in five high alpine lakes. *Hydrobiologia* 455: 127-135.
- Dhanapathi, M.V.S.S.S. (1974).** Rotifers from Andhra Pradesh, India-I. *Hydrobiologia* 45(4): 357-372.
- Dhanapathi, M.V.S.S.S. (1976).** Rotifers from Andhra Pradesh, India-III. *Hydrobiologia* 48(1): 9-16.
- Dumont J.H. (1983).** Biogeography of rotifers. *Hydrobiologia* 104: 19-30.
- Dumont J.H. and Isabella Van De Velde (1977).** Report on a collection of cladocera and copepoda from Nepal. *Hydrobiologia* 53(1): 55-65.
- Edmondson, W.T. (1959).** Freshwater biology, 2nd edn. John Wiley & sons, New York, USA.
- Fernando, C.H. and A. Kanduru (1984).** Some remarks on the latitudinal distribution of cladocera on the Indian sub continent. *Hydrobiologia* 113: 69-76.
- Hegde, G.R. and B.D. Huddar (1995).** Limnological studies of two fresh water lentic ecosystems of Hubli-Dharwad Karnataka. pp. 35-43. In: Irfan A. Khan (eds), *Frontiers in plant science*, The book syndicate publication, Hyderabad.
- Hudec, I. (1987).** *Moina oryzae* n. sp. (Cladocera: Moinidae) from Tamil Nadu (South India). *Hydrobiologia* 145: 147-150.
- Korovchinsky, N.M. (1996).** How many species of Cladocera are there? *Hydrobiologia* 321: 191-204.
- Neves, I.F., O. Rocha, K.F. Roche and A.A. Pinto (2003).** Zooplankton community structure of two marginal lakes of the River Cuiaba (Mato Grosso, Brazil) with analysis of rotifera and cladocera diversity. *Brazil Journal of Biology* 63(3): 329-343.
- Nogueira M.G. (2001).** Zooplankton composition dominance and abundance as indicators of environmental compartmentalization in jurumirim reservoir (Paranapanema River), Sao Paulo, Brazil. *Hydrobiologia* 455: 1-18.
- Patil C.S. and B.Y.M. Gouder (1982a).** Fresh water fauna of Dharwad (India) II: Rotifera. *Journal of Karnatak University Science* 27: 93-114.
- Patil C.S. and B.Y.M. Gouder (1982b).** Fresh water fauna of Dharwad (India) II: Cladocera. *Journal of Karnatak University Science* 27: 115-126.
- Patil C.S. and B.Y.M. Gouder (1982c).** Fresh water copepods of Dharwad (Karnataka state, India). *Journal of Karnatak University Science* 27: 130-141.
- Patil C.S. and B.Y.M. Gouder (1985).** Ecological study of fresh water zooplankton of a subtropical pond (Karnataka state, India). *Int. Revue. ges. Hydrobiol.* 70(2): 259-267.
- Patil, C.S. and B.Y.M. Gouder (1989).** Freshwater invertebrates of Dharwad, Prasaranga, Karnatak University, Dharwad.
- Pederson, G.L., E.B. Wezch and A.H. Litt (1976).** Plankton, secondary production and biomass, their relation to trophic state of lake. *Hydrobiologia* 50: 129-144.
- Pollard, A.I., M.J. Gonzalez, M.J. Vanni and J.L. Headworth (1998).** Effect of turbidity and biotic factors on the rotifer community in an Ohio reservoir. *Hydrobiologia* 387/388: 215-233.
- Rajapaska, R. and C.H. Fernando (1982).** The cladocera of Srilanka (Ceylon) with remarks on some species. *Hydrobiologia* 94: 49-69.
- Rao, V.N.R., R. Mohan, V. Hariprasad and R. Ramasubramanian (1994).** Sewage pollution in the high altitude Ooty lake, Udthagamandalam - cause and concern. *Poll. Research* 13(2): 133-150.
- Rocha, O., S. Sendacz and T. Matsumura-Tundisi (1995).** Composition, biomass and productivity of zooplankton in natural lakes and reservoirs in Brazil, Pp. 151-166. In: J.G. Tundisi, C.E.M. Bicudo and T. Matsumura-Tundisi (Eds.), *Limnology in Brazil*. ABC/SBL, Rio de Janeiro, 376pp.
- Sampaio, E.V., O. Rocha, T. Matsumura-Tundisi and J.G. Tundisi (2002).** Composition and abundance of zooplankton in the limnetic zone of seven reservoirs of the Paranapanema River, Brazil. *Brazil Journal Biology* 62(3): 525-545.
- Santos-Wisniewski, M.J., O. Rocha, A.M. Guntzel and T. Matsumura-Tundisi (2002).** Cladocera chydoridae of high altitude water bodies (Serra Da Mantiqueira), in Brazil. *Brazil Journal Biology* 62(4A): 681-687.
- Sharma, B.K. (1979).** Rotifers from West Bengal III. Further studies on the Euratoria. *Hydrobiologia* 64(3): 239-250.
- Sharma, B.K. (1980).** Contributions to the rotifer fauna of Orissa, India. *Hydrobiologia* 70: 225-233.
- Sharma, B.K. (1983).** The Indian species of the genus Brachionus (Euratoria: monogononta). *Hydrobiologia* 104: 31-39.
- Sharma, B.K. (1987).** Indian Brachionidae (Euratoria: Monogononta) and their distribution. *Hydrobiologia* 144: 269-275.
- Sharma, B.K. and R.G. Michael (1980).** Synopsis of taxonomic studies on the Indian Rotatoria. *Hydrobiologia* 73: 229-236.
- Sharma, B.K. and R.G. Michael (1987).** Review of taxonomic studies on freshwater Cladocera from India with remarks on biogeography. *Hydrobiologia* 145: 29-33.
- Sharma B.K. and S. Sharma (1997).** Lecanid rotifers (Rotifera: Monogononta: Lecanidae) from Northeastern India. *Hydrobiologia* 356: 159-163.
- Sharma B.K. and S. Sharma (2001).** Biodiversity of rotifers in some tropical flood plains lakes of the Brahmaputra river basin, Assam (N.E. India). *Hydrobiologia* 446/447: 305-313.
- Sladeczek, V. (1983).** Rotifers as indicators of water quality. *Hydrobiologia* 100: 169-201.
- Starkweather, P.L. (1980).** Aspects of feeding behaviour and trophic ecology of suspension-feeding rotifers. *Hydrobiologia* 73: 63-72.
- Uttagi, J.C. (2001).** Conservation and management strategy for the water fowls of minor irrigation tank habitats and their importance as stopover site in the Dharwad district, pp. 179-221. In: B.B. Hosetti and M. Venkateshwaralu, (Eds.), *Trends in wildlife and management*. Daya Publishing house, New Delhi, India.

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