Vol 5 Issue 1 Oct 2015

ISSN No : 2249-894X

Monthly Multidisciplinary Research Journal

Review Of Research Journal

Welcome to Review Of Research

RNI MAHMUL/2011/38595 **ISSN No.2249-894X**

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Review Of Research
ISSN 2249-894X

Impact Factor : 3.1402(UIF)
Volume - 5 | Issue - 1 | Oct - 2015

CRUSTACEANS IN LENTIC ECOSYSTEM OF DHUKESHWARI TEMPLE POND DEORI WITH REFERENCE TO CULTURAL EUTROPHICATION

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ABSTRACT

The present study was carried out on Dhukeshwari Temple Pond, the freshwater lentic ecosystem in Deori, District Gondia to obtain the baseline data of Crustaceans with reference to Cultural Eutrophication for the period of 2014-15. As like Rotifers, Crustaceans are also one of the most important biotic components in the freshwater ecosystem as they are integral part of the aquatic food chain, in which they dependent on phytoplanktons and detritus, they contribute to minimize the biomass of phytoplankters. Crustacean becomes most important component of the natural purifying system in Eutrophic waters. The Dhukeshwari Temple Pond is under pressure of anthropogenic activities. In the present observation 27 species of Order Cladocera were recorded from the 06 families, with highest diversity with 08 species in Family Chydoridae and Aloniae with 08 species. In Subclass Copepoda, 04 species were recorded from order Calanoida, 01 with order Harpacticoida and 01 with Cyclopoida. 04 species for Class Ostracoda from Cypridae family are also observed. Their role in determination of the trophic status of pond ecosystem is discussed.

KEYWORDS :*Cladocerans, Copepods, Ostracods, Trophic status, Eutrophication.*

INTRODUCTION :

The aquatic productivity is depending on the bottom or surface organisms directly or indirectly. The aquatic fauna are the natural indicators of the water quality (Gannon and Stemberger, 1978). Being rather tolerant to different environmental conditions, many zooplankton species are good indicators of water quality and can be used for the ecological monitoring of water bodies (Reynolds, 1984). The Crustaceans of fresh ecosystems play a vital role within the aquatic food cycle. They contribute to attenuate the plant biomass since the bulk of them ar filter feeders and therefore they'll during this manner greatly improve the water quality . they're ready to consume nice quantities of plant from the open water zone thereby influencing the first production (Gonzalez, 2000). The abundance of Cladocera within the vegetated areas was more than non-vegetated areas (Bonkurt and Guven, 2009). They control algal growth by efficient grazing, therefore, are considered as indicators of water quality. Cladocerans generally contribute largely to zooplankton biomass and act as a key element in the freshwater food webs (Hessen et al., 2003). Abundance of Copepoda

is due to the decreasing of eutrophication level (El Enany, 2009). In addition to providing an important food source for planktivorous fish and aquatic invertebrates they are important grazers on algae and detritus (Balayla and Moss, 2004) and can play an important role in the recycling of nutrients in aquatic ecosystems. Copepods are classified into three groups, the Calanoids, Cyclopoids and Herpacticoids. The Cyclopoids and Calanoids are the best known and most frequently occurred in most ecological niche. Calanoids are generally occurring among other planktonic organism in lentic ecosystem. The cyclopoids are primary littoral benthic species and herpacticoids prefer submerged mosses either at the edges of the small ponds (Sharma, 2001). Copepods were common in fluvial waters while cladocerans in still as well as flowing waters. The copepods inhabited both the oligo- and Eutrophic reservoirs (Prabhavathy and Sreenivasan, 1977). They have been reported to be good indicators of water quality (Khan and Rao, 1981).

The Ostracods separated from the other Crustaceans, have laterally compressed body and bivalve carapace enclosing the undifferentiated head along with trunk and limbs. They play an important role in transferring the energy from producers to consumers and they occupy an intermediate position in aquatic food web by being live food for fishes (Padmanabha and Belangali, 2008).

The study is primarily based on the work conducted on the cultural eutrophication in lentic ecosystem of Dhukeshwari temple pond situated at Deori. The Dhukeshwari temple pond is under environmental stress on account of anthropogenic pressure. The zooplankton assemblage viz. Rotifers, Copepods, Cladoceran and Ostracods were recorded from the study site in the year 2014-15. In the present article, the biodiversity of Crustaceans in the lentic ecosystem of Dhukeshwari Temple pond is depicted with reference to trophic status of pond.

MATERIALS AND METHODS:

The zooplankton samples were collected from the 2 sampling points for the year 2014-2015. The water was filtered through plankton net, made of bolting silk cloth and concentrate was collected in glass bottle, fixed in 4% formalin and specimens were identified according to key from Ward et al., (2013), Arvind Kumar (2015), Tonapi (1980), Murugan et al., (1989) and Sehgal (1983). The photographs were made with Metzer-M-Co-axial trinocular digital research microscope vision plus-5000 DTM.
Study Site: Dhukeshwari Temple pond was constructed about 50 years ago by impounding natural low lying areas nearby Goddesses “Dhukeshwari” Temple (N 210 4’ 29.4405”, E 800 21’ 44.6565”) along the National Highway No. 6, mainly for agricultural and irrigational purposes. Expanding urbanization in the catchments area with consequent increase in anthropogenic activities, culminating in the introduction of untreated domestic sewage and immersion of idols and other socio-cultural practices also contributed to nutrient enrichment of this pond.

RESULT:

In the present study, 27 species of order Cladocera were recorded from the 06 families, with highest diversity with 08 species in family Chydoridae and family Aloniae with 08 species. In subclass Copepoda, 04 species were recorded from order Calanoida, 01 with order Herpacticoida and 01 with Cyclopoida. 04 species from single family for Class Ostracoda were also observed. The systematic list of the species recorded from the Dhukeshwari temple pond is given below in Table 1 and 2 & (PLATE: I – IV).

Table 1: Cladoceran species recorded from Dhukeshwari Temple pond.

Sr.N.	CLASSIFICATION
	Phylum: Arthropoda
	Class: Crustacea
	Order: CLADOCERA
	Family: Sididae
1	*Diaphanosoma sarsi*
	Family: Bosminidae
2	*Bosmina longirostris*
3	*Bosminopsis deitersi*
	Family: Chydoridae
4	*Pleuroxus denticulatus*
5	*Pleuroxus trionellus*
6	*Pseudochydorus globossus*
7	*Chydorus latus*
8	*Chydorus ovalis*
9	*Chydorus sphaericus*
10	*Dunhevedia serrata*
11	*Acroperus harpae*
	Subfamily: Aloniae
12	*Allona affinies*
13	*Alona davidi punctata*
14	*Alona quadrangularis*
15	*Allona Monacantha*
16	*Alona rectangula richardi*
17	*Bipertura karua*
18	*Kurzia longirostris*
19	*Leydigia acanthocercoides*
	Family:Daphniidae
20	*Ceriodaphnia cornuta*
21	*Scapholebris kingi*
22	*Simocephalus exspinosus*
23	*Simocephalus vetulus*
	Family:Macrothricidae
24	*Ilyocryptus sordidus*
25	*Ilyocryptus spinifer*
26	*Macrothrix laticornis*
27	*Macrothrix rosea*

Table 2: Copepodes and Ostracodes from Dhukeshwari Temple Pond.

Sr.N.	CLASSIFICATION
	Phylum: Arthropoda
	Subphylum:Crustacea
	Class:Maxillioida
	Subclass COPEPODA
	Order: Calanoida,
	Family: Diaptomidae
1	*Diaptomus nudus*
2	*Diaptomus oregonensis*
3	*Heliodiaptomus viduus*
4	*Spicodiaptomus chlospinus*
	Order: Herpacticoida
	Family: Canthocamptidae
5	*Canthocamptus staphylinoids*
	Order:Cyclopoida
	Family:Cyclopidae
6	*Mesocyclops leuckart*
	CLASS:OSTRACODA
	Family: Cypridae
7	*Cypris dentata*
8	*Cypris reticulalta*
9	*Cypris subglobossa*
10	*Herpetocypris barbatus*

PLATE I: Cladoceran species in Dhukeshwari Temple Pond Deori (1-9)

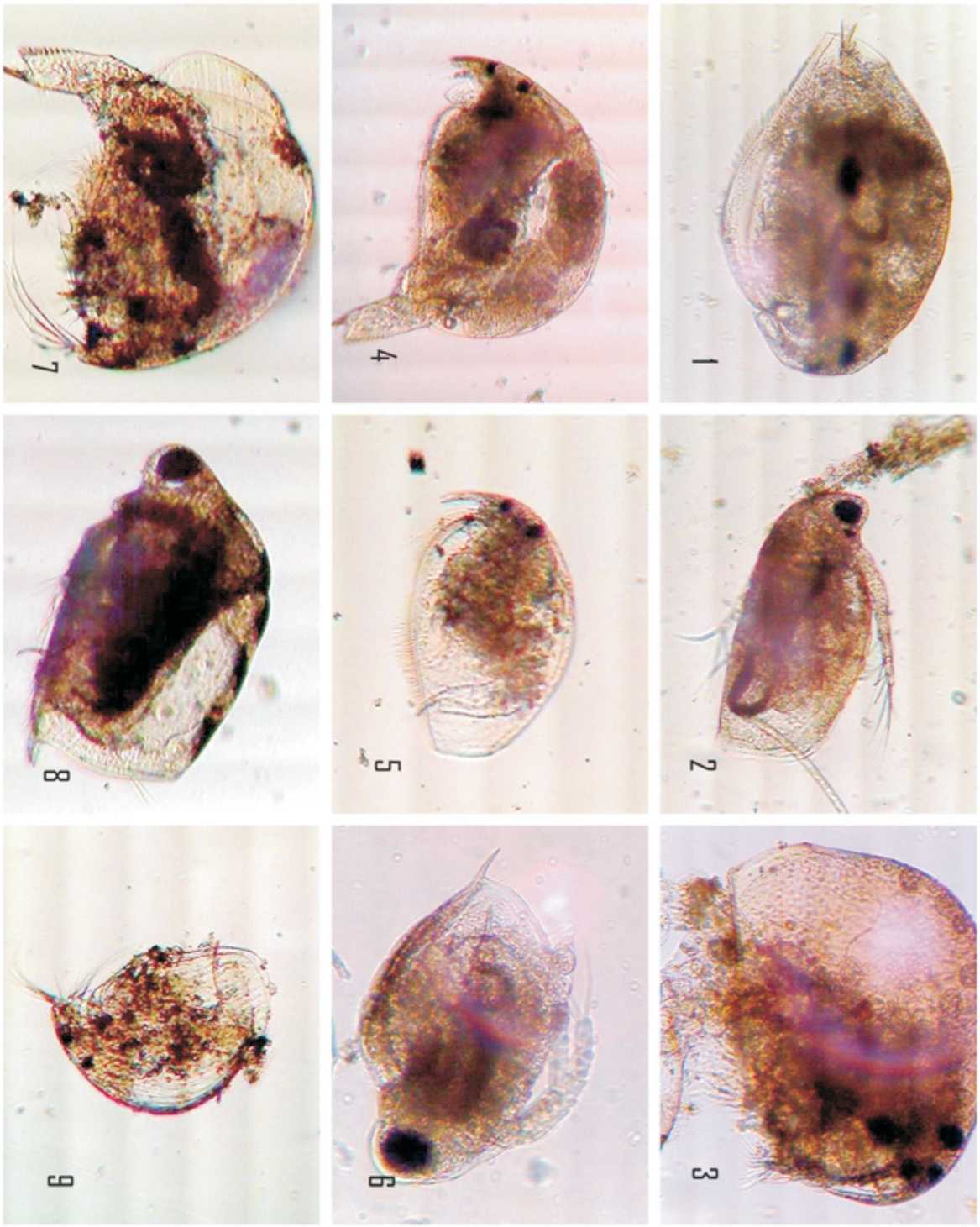

PLATE I: 1. Chydorus latus 2. Simocephalus vetulus 3. Kurzia longirostris 4. Alona quadrangularis 5. Alona rectangula richardi 6. Ceriodaphnia cornuta 7. Leydigia acanthocercoides 8. Scapholebris kingi 9. Bipertura karua.

PLATE II: Cladoceran species in Dhukeshwari Temple Pond Deori (10-18)

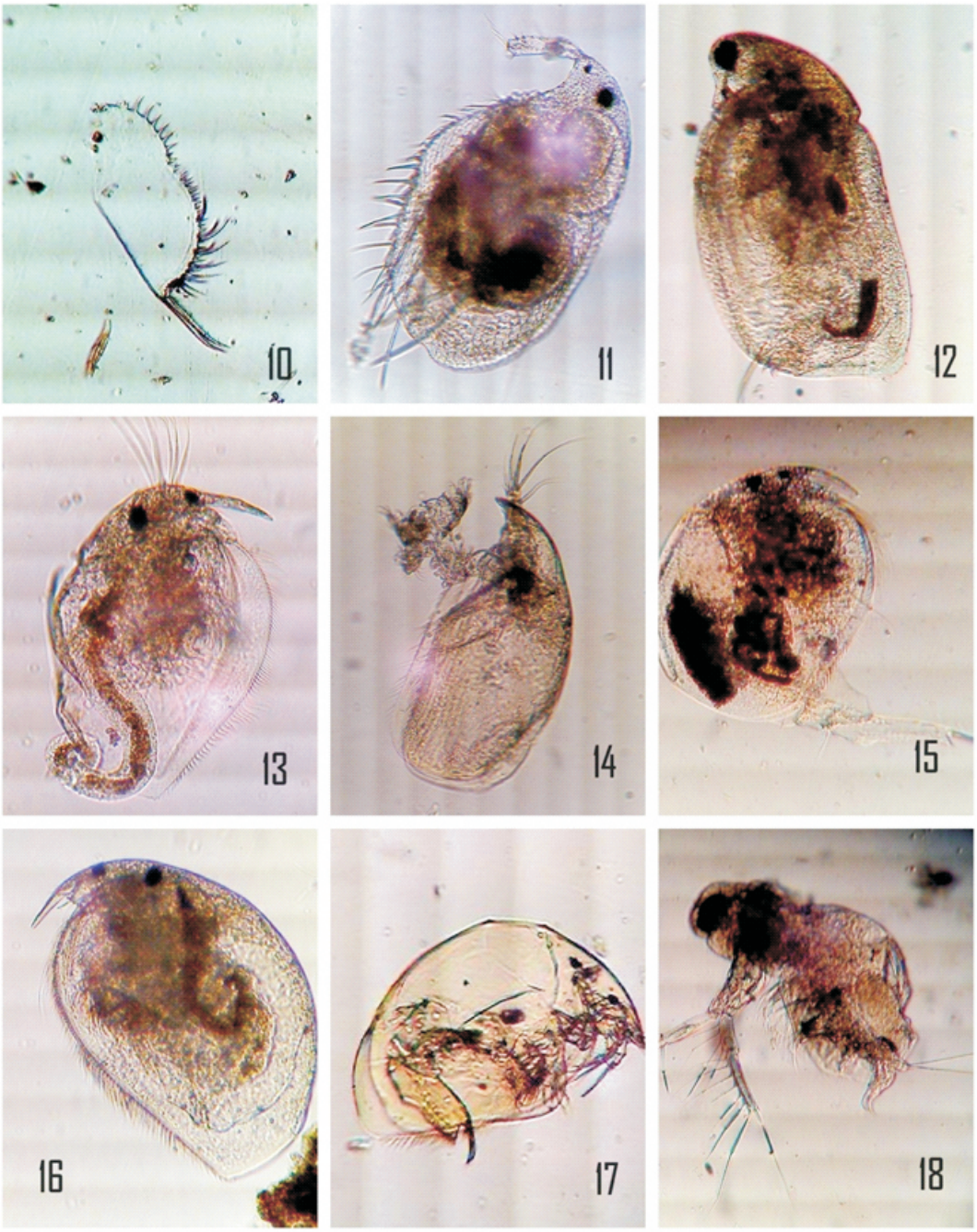

PLATE II: 10. Ilyocryptus sordidus 11. Macrothrix laticornis 12. Simocephalus exspinosus 13. Pleuroxus denticulatus 14. Alona affinies 15. Chydorus sphaericus 16. Pleuroxus trionellus 17. Allona Monacantha 18. Diphanosoma sarsi.

PLATE III: Cladoceran species in Dhukeshwari Temple Pond Deori (19-27)

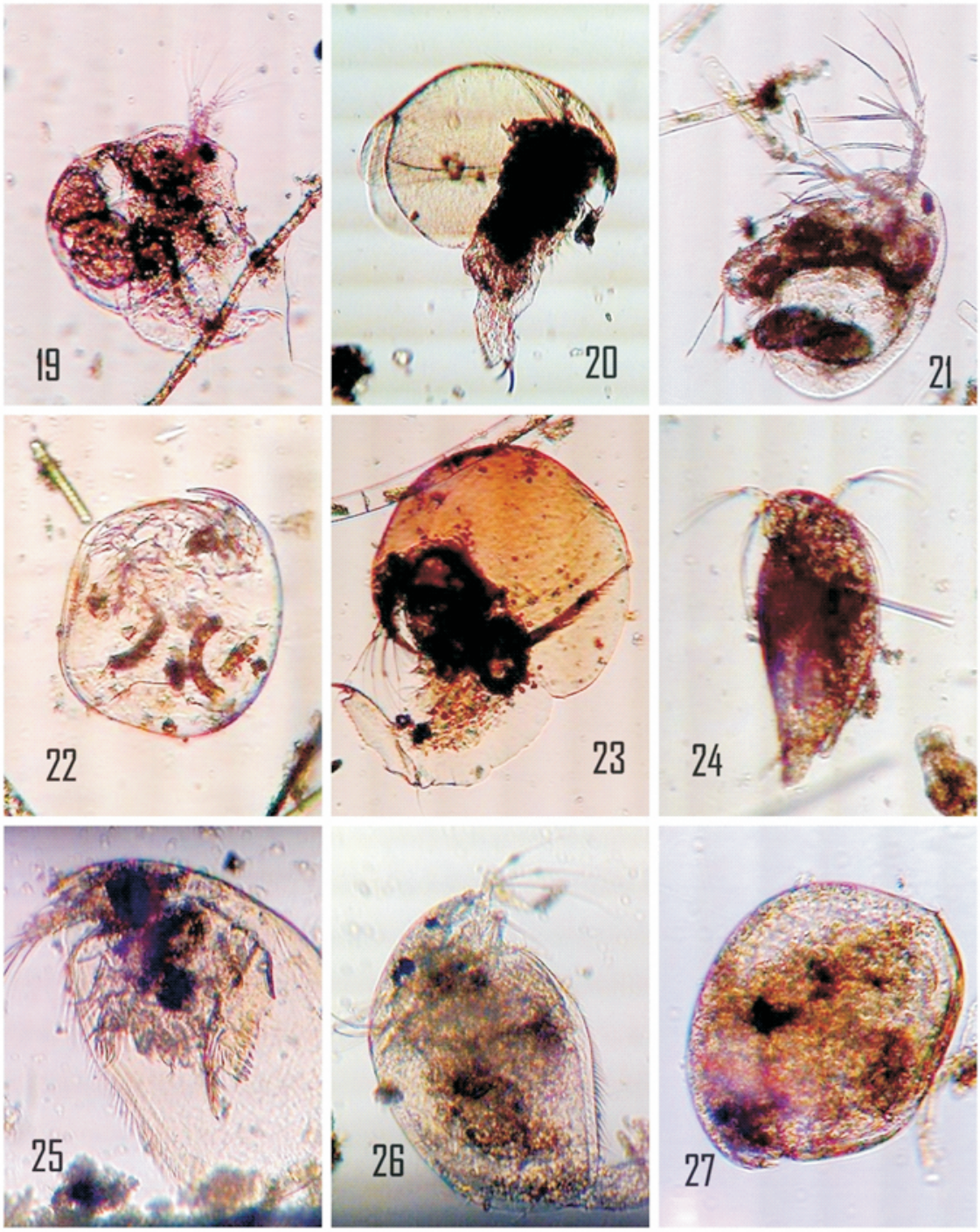

PLATE III: 19. Bosminopsis deitersi 20. Dunhevedia serrata 21. Macrothrix rosea 22. Pseudochydorus globossus 23. Bosmina longirostris 24. Acroperus harpae 25. Ilyocryptus spinifer 26.Alona davidi punctata 27. Chydorus ovalis

PLATE IV: Copepod & Ostracod species in Dhukeshwari Temple Pond Deori (1-9).

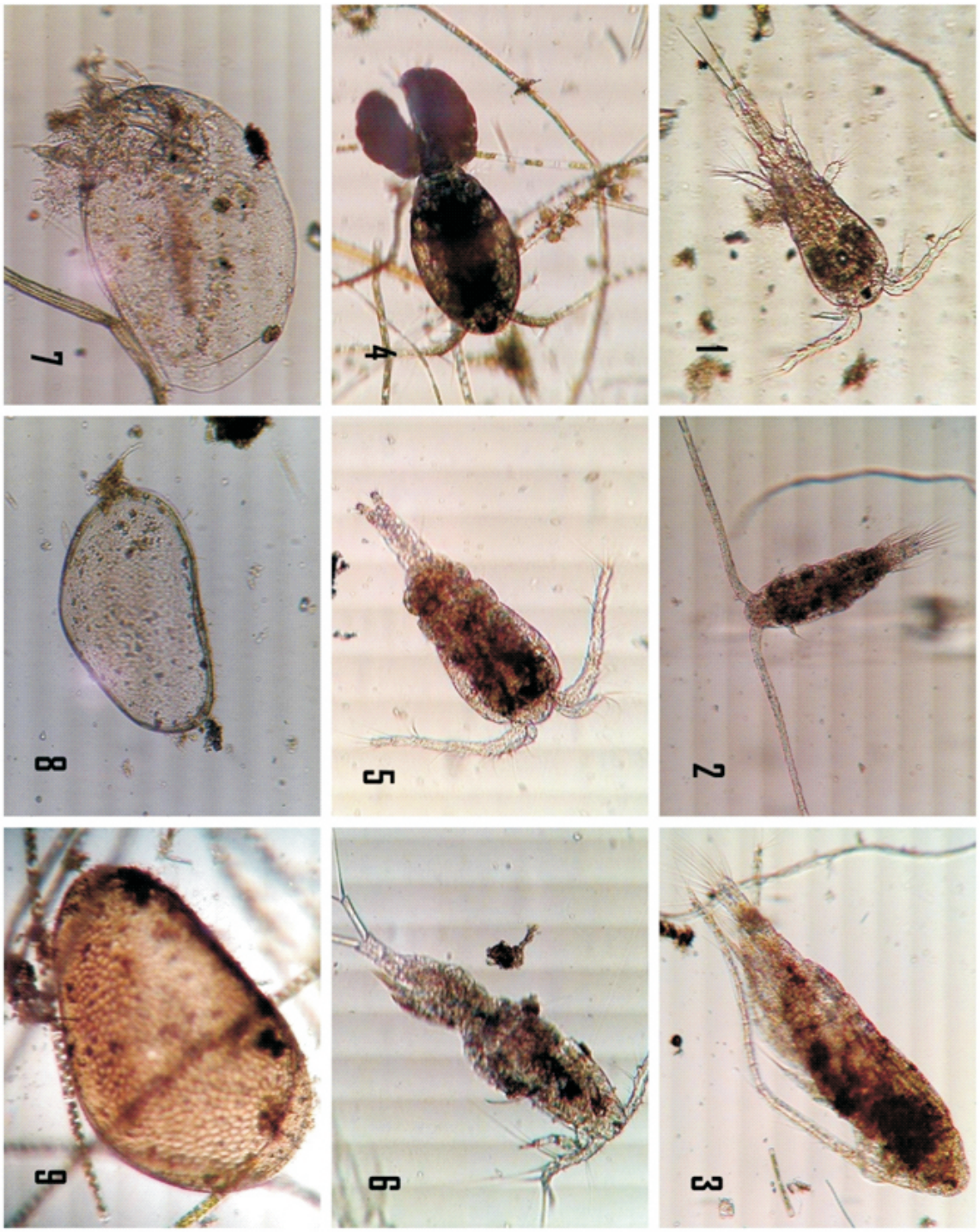

PLATE IV: 1. Spicodiaptomus chlospinus, 2. Diaptomus nudus male, 3. Diaptomus oregonensis, 4. Mesocyclops leuckart, 5. Heliodiaptomus viduus, 6. Canthocamptus staphylinoids, 7. Herpetocypris barbatus.8. Cypris dentata, 9. Cyrpis subglobosa,

DISCUSSION:

In the present investigation, the Crustacean assemblage forms the major part of zooplankton community constituted by the crucial group like Cladocera, Copepoda and Ostracoda and the diversity within groups. These groups are most important and useful as food for fishes. They are sensitive to environmental accelerations, therefore these organisms used as important tool to evaluate the trophic status of ecosystems. In the present study, 27species of order Cladocera were recorded from the 06 families, with highest diversity with 08 species in family Chydoridae and family Aloniae with 08 species. In subclass Copepoda, 04 species were recorded from order Calanoida, 01 species with order Herpacticoida and 01 species with Cyclopoida. 04 species from single family for Class Ostracoda were also observed.

Burns and Schallenberg (2001) made some observations on the consumer effects of protozoa by Cladoceran and Copepods in the lakes of Newzealand reported that copepods are more effective consumers of protozoa than Cladocersns, particularly in Eutrophic conditions. Many works done India on Crustacea, some of them are Shah and Pandit (2013), Ghantaloo et al., (2012), Gulam Mohideen (2006), Gulam Mohideen et al., (2008), Ahmad and Parveen, (2013), and so on. Michael (1973) and Murugan (1989) carried out an extensive study on the ecology of cladoceran species from Madurai. Bhat et al., (2015) reported 11 spp of Cladocera, 5 species of Copepoda and 3 species of Ostracoda during ecological investigation of zooplankton abundance in the Bhoj Wetland at Bhopal.

Planktons are considered as indicator of the trophic status of a water body because of their specific qualitative features and their capacity to reproduce in large number under environmental conditions that are favorable to them. (Vollenweider & Frei, 1953). Zooplankton represents the link between primary producers and secondary consumer, so it significantly influencing the food web structure (Marazzo and Valentin, 2001). Zooplankton occurrence, distribution and abundance are of extreme importance in aquatic systems since they are sensitive to disturbances including eutrophication due to anthropogenic impacts such as urbanization, domestic, and industrial pollutants and sewage disposal which can alter ecosystem components (Vidjak et al., 2006).

In the present investigation the crustacean faunal assemblage was subdominant in zooplankton population. A high diversity of Cladocerans can be found in the littoral zone of stagnant waters. The habitat is often negatively influenced by human activities, and especially the loss of temporary waters may lead to a decrease of diversity or even local extinction of some species (Forro et al., 2008). Patil and Gouder (1989) archangel (1973), and Mustaq (1990) ascertained that some Cladoceran species will flourish well in contaminated waters and therefore is sensible biological indicators of pollution. in step with sensitivity of organism to water waste material pollution Bosmina longirostris, Chydorus sphearicus and nauplius larvae (Copepods) square measure pollution tolerant teams of creature (Saad et al., 2013).Crustacean species lik e Ceriodaphnia corunata and Cypris spp will survive in high abounding macrophytes atmosphere (Ahmad, 2012).

Crustaceans of fresh ecosystems play a vital role within the aquatic organic phenomenon. They contribute to a high reduction of the plant biomass since the bulk of them square measure filter feeders and therefore they'll during this method greatly improve the water quality . Crustaceans square measure ready to consume nice quantities of plant from the open water zone thereby influencing the first k "Select Samples". production (Gonzalez, 2000). The abundance of Cladocera in the vegetated areas was higher than un-vegetated areas (Benkurt and Guven, 2009). Cladocerens are able to utilize bacteria as food source efficiently (Wylie and Currie, 1991).

Cyclopoids and Cladocerans were found to be associated with increasing productivity. The ratio of Calanoids to Cyclopoids plus Cladocerans was found to be good indication of trophic condition and

valuable index of pollution (Khan and Rao, 1981). The abundance of Copepoda is due to the decreasing of eutrophication level (El Enany, 2009). Balamurugan et al., (1999) reported six species of copepods belonging to order Cyclopoida from water body with heavily loaded organic enrichment due to influx of sewage. Species of Cyclops recorded more due to the abundance of diatoms and blue green algae (Meshram, 1996). Kurasawa (1975) noticed the dominance of Copepoda in oligotrophic lakes but Cyclopoid Copepods were dominant in Eutrophic lakes of tropical region. Bhandarkar and Paliwal (2010) reported 9 species of copepods from various water bodies in Lakhani, in which 1 species of Diaptomidae and 8 species of Cyclopidae reveals that the water bodies of Lakhani are Eutrophic. Harpacticoid Copepods are almost exclusively littoral inhabiting macro vegetation, mosses in particular, and the littoral sediments (Sharma, 2001). Gulati (1978) stated that if the food supply is high or increasingly up for stretch of time, Cladocera build up in high number and biomass to dominate Lake Zooplankton.

Anil Kumar et al., (2004) observed that copepods were mainly dominated by Mesocyclops species and Cladocerans, the pre-dominancy of rotifer and copepods indicate the nutrient availability in some ponds of Durg-Bhillai city, Chattisgarh. Ostracodes are important indicators of the structure and function of freshwater ecosystems and their ecological status (Mezquita et al., 1999). Ostracod diversity is one of the most important ecological parameters in water quality and meiobenthic biodiversity assessment, because it is strongly affected by environmental conditions (Selcuk Altinsacli et al., 2015). They have received much less attention than the Claodcerens and Copepods (Pennak, 1978). They inhabit a wide variety of environments and found almost everywhere in all types of freshwaters, like lakes, ponds, swamps, cave water and even heavily polluted areas etc. In the present investigation, Ostracoda is represented by Cypris sps. Ramulu et al., (2011) observed and indicate that the increase in water quality increases the population density of Ostracods in perennial tank Warangal due to pollution load of domestic sewage. Further studies on diversity of these species would be helpful in evaluating their bioindicator role.

In conclusion, Crustacean faunal assemblage was subdominant in zooplankton population. From the present study it is disclosed that the higher the diversity of Crustaceans may be due to higher the organic matter and nutrient availability in the habitat of lentic ecosystem of Dukeshwari Temple Pond Deori. The Crustaceans diversity indicates trophic status of the water body as they have specific qualitative features and capacity to reproduce under favorable ecological conditions. The species diversity of Crustaceans in general and Cladoceran diversity in particular can be linked with natural purifying system in fluctuated water.

ACKNOWLEDGEMENTS:

The author is grateful to the Director, University Grant Commission (WRO) Pune for sanction of the Minor Research Project (MRP) No. 47-683/13 (WRO) under XII plan. I am thankful to Dr. W. R. Bhandarkar, Ex-Director; Centre for Higher learning and Research in Zoology, Bramhapuri, Gondwana University for his valuable guidance. I am also thankful to Dr. D. K. Bisen, Principal, M. B. Patel College, Deori and Dr. Ashok Kale, Principal, M. B. Patel College Sakoli for their consistent encouragement during study period.

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