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Study of zooplankton diversity in Jayakwadi Dam at Paithan, Dist. Aurangabad, Maharashtra, India

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Abstract :

The present study was undertaken to study zooplankton diversity of Jayakwadi Dam Jayakwadi dam is one of the largest earthen dams in Asia located on Godavari river at the site of Jayakwadi village in Paithan Taluka of Aurangabad district in Maharashtra, India. It is also known as Nathsagar (19,29,6)N-(75,22,12)E. about 50 km from Aurangabad. Zppplanktons are one of the important faunas in water body which act as a bioindicator of pollution and play direct role in the food chain of fishes. It is rich source of nutrients to fishes. The present investigation was carried out during the year of 2020-2021. A total 10 species of zooplankton were recorded from Jayakwadi dam. Among them 4 species of Copepods was dominant species followed by 3 Rotifers species and 2 species of Cladocera and 1 species of Ostracoda. Sequence of species - Copepods > Rotifers > Cladocera > Ostracoda. (4:3:2:1). Copepods observed were - 1] Calcanus finmorchicus 2] Mesocyclops inversus 3] Thermocyclops consimilis 4] Thermocyclops. Rotifers observed were - 1] Keratella chochleris 2] Keratella crassa 3] Branchionus diversiconis. Cladocera obsereved were : 1] Daphnia pulex 2]Daphnia magna. Ostracoda observed : 1] Cypris. Species belonging to the Copepods are dominant to among Zooplankton which indicates the rich nutrient source of food for fishesh and good quality of Water for food chain of fishes.

Key words : Copepods, Rotifers, Cladocera, Ostracoda, diversity, Zooplanton, Jayakwadi Dam.

Introduction :

The zooplankton community consists of an extremely divers assemblage of invertebrate phyla zooplanktons. Zooplanktons are bio indicators of pollution and provide direct link between primary producer and the major mode of energy transfer between phytoplankton and fish.

Zooplanktons are microscopic, free-floating organisms occurred in all natural water bodies. They occupy a transitional place in the aquatic food web (Alaff, 2004).

It is a well suitable device for understanding water pollution status (Contreras, et, al, 2009). Due to their huge density, shorter life span. The zooplankton community fluctuate according to physicochemical parameters of the environment especially rotifer species change with biotic factors. Earlier there was no report on the Zooplanktons in the Jayakwadi dam studying the taxonomic composition and abundance are excellent indicators of tropic status and abundance of zooplankton population will provide a basis for sustainable development of fisheries resources and water quality. The more important types of zooplankton includes the radiolarians, foraminiferans, and dinoflagellates, cnidarians, crustaceans, chordates, and Zooplanktons consume a variety of bacteroplankton, phytoplankton and even other zooplankton. They made up of silica. The remains of these found in ocean or fresh water body. These organisms were found on the surface or upper part of waters.

In the two decades much attention has been paid to tropical countries towards the study of biology, ecology, toxicology of zooplankton due to their important role in the rapidly emerging concepts in Environmental Impact Assessment (EIA) bio indicators of pollution and biological monitoring [1]. Bio diversity of zooplankton is essential to keep one ecosystem healthy because each species plays a specific role recycling of nutrients, food for another and maintaining of soil fertility in the ecosystem and some species may allow natural ecosystem to functional a healthy manner [2]. Abiotic and biotic influences exert a control on the structure and dynamic of zooplankton so as to determine the distribution and abundance of the species [3].

The most significance feature of zooplankton is it's immense diversity over space and time, thus similar aquatic system have dissimilar assemblage of organisms varying in space composition and biomass further in spite of convergent similarities, zooplanktons species have different types of life histories influenced by seasonal variation of abiotic factors, feeding ecology and predation pressure [4].

Zooplankton is a good indicator of the changes in water quality because they are strongly affected by

environmental conditions and respond quickly changes in water quality. Therefore plankton has been used recently as an indicator to monitor and realize changes in the ecosystem. Thus water influences zooplankton abundance clustering and biomass. Water quality assessment generally involves analysis of physicochemical parameters and reflects on abiotic and biotic status of the ecosystem [5]. Zooplanktons which form the base of aquatic food chains serve as bio indicators of water pollution and are also used in water quality monitoring [6]. (Solanki V.R. and Raja Sabita [2005]).The zooplankton inhibiting freshwater responds quickly to environmental changes and hence their species indices fluctuate (Avinash, B. Gholap [2014]).[7]. The load of pollutants is reflected in the biotic community of fresh water in the form of their occurrence abundance pattern and diversity as only living organisms are capable of combating pollution (Gurunadha Rao et al 2004) [7].The factors like dissolved oxygen, pH, alkalinity, temperature, light, and grazing affect the zooplankton population (Rajshekhar et al 2010) [8]. The major zooplankton groups of zooplankton were copepods cladocera , ostracoda, and rotifers Although most of the zooplankton species survive under decreased environmental factors their growth and population densities depend on a no. of physicochemical and biological factors (Kedar et al 2008)[8].

The important contribution on Indian copepods are those of (Balki masood 1992) and Babar and choube [1997].[9].Sharma and Pathak (1985) reported the maximum density in April and minimum density of copepods in November [10].Balki Masood [1992] reported that copepods were generally abundantly found in the oligo tropic water bodies where as the cyclopoids were abundant in mesotrophic eutrophic waters [11].

The copepods are generally regards as pollution sensitive taxa as they disappear in polluted waters (Rana1990) [12].the earliest studies on zooplankton diversity have been made by researchers like (Arora 1962), (Chandra Mohan Rao 1976), Zooplanktons are the food for birds feed on zooplanktons .It is small group of heterotrophic animal inhibiting the oceans at all depth and occupy almost every type of ecological environment. (Patole V. M [2009)

Literature Survey :

The literature survey was carried out by using different sources. Different kind of research papers on zooplankton were collected. Different work were all ready done on zooplankton in different places from such places some of them explain the zooplankton well. In seasonal variation of zooplankton community in sina Kolegaon dam Osmanabad district Maharashtra, India. In the present study they provide quantitative information on the seasonal variation of zooplankton and selected physicochemical variables a large man made reservoir in the Osmanabad during the year June 2009 -May 2010.

Variation in zooplankton diversity of Kalisarar dam of Gondia District, Maharashtra.

In the present paper qualitative and quantitative studies of zooplankton in Kalisarar dam of Gondia district were carried out during 2017 to May 2018. Using microscopic studies of zooplankton, this investigation revealed that 11 genera belonging to five groups i.e cladocera (2genera),Copepods (3genera) Ostracoda (1 genera) Protozoa (2genera) and Rotifera (3 genera) were present.

Diversity of Mula dam in the present investigation five different indices as Shannon - Weaver diversity index, Simpson's diversity index, Index of dominance, Index of Evenness' and species' richness were evaluated in zooplankton from Mula dam.

The another work has been carried out on zooplankton diversity of Nagaral dam of Chincholli taluk at Kalaburgi from the study, the physicochemical parameters of the Nagaral dam was positively correlated with the zooplankton Rotifera was the dominant group through out the study period among the groups of zooplankton.

Objectives :

1] To obtain and estimation of zooplankton diversity and abundance in Jayakwadi do.

2] To understand the roles and importance of zooplankton in freshwater ecosystem.

3] To understand the value of scientists of both living and preserved zooplankton samples.

4] To able to recognize the common zooplankton groups on the basis of their Characters.

Materials and Methods :

Study Area :

Jayakwadi dam is one of the largest earthen dams in Asia located on Godavari river at the site of Jayakwadi village in Paithan Taluka of Aurangabad district in Maharashtra,India.It is also known as Nathsagar(19,29,6)N-(75,22,12)E.about 50 km from Aurangabad. It supply water to Aurangabad city and generates.

Jayakwadi Dam	

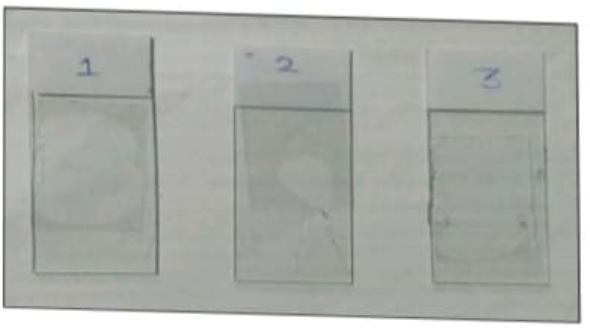
Jayakwadi dam with its floodgates closed

Location of Jayakwadi Dam in India

Official name	Jayakwadi-I D02995
Location	Jayakwadi, Maharashtra India
Coordinates	19°29'8.7"N 75°22'12"E
Construction began	1965
Opening date	1976[1]
Construction cost	4,700 cr [2]
Owner(s)	Government of Maharashtra
Dam and spillways	
Type of dam	Earthen dam
Impounds	Godavari River
Height	41.30 m (135 ft)
Length	9,998 m (32,802 ft)
Reservoir	
Creates	Nath Sagar Jalashay
Total capacity	2.909 km^3 (1.027×10^{11} cu ft)
Catchment area	21,750 km^2 (8,398 sq mi)
Surface area	350 km^2 (135 sq mi)
Power Station	
Installed capacity	12 MW

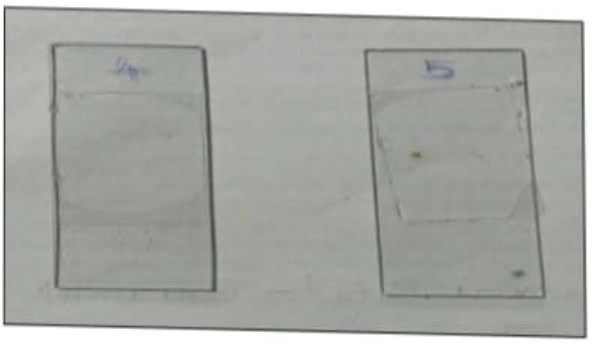
Zooplanktons Collection :

1) Zooplanktons collection were made employing net a circular metalic frame of area 0.0625 mArea.
2) The filtering come was made up of nylon bolting silk plankton net used for collection of zooplankton.
3) Care was taken to avoid trapping of floating debris while handling net.
4) Collected samples were transferred to labeled vial bottles containing 4% formalin.



Copepods :

1) Mesocyclops inversus, 2) Calcanus finmorchicus, 3) Thermocyclops consimilis



Rotifer :

1) Keratella crassa (Rotifer), 2) Daphnia pulex (Cladocera)

Results and Discussion :

A total 10 species of zooplankton were recorded from Jayakwadi dam. Among them 4 species of Copepods was dominant species followed by 3 Rotifers species and 2 species of Cladocera and 1 species of Ostracoda.

Sequence of species -Copepods > Rotifers > Cladocera > Ostracoda. (4:3:2:1) Copepods :

Freshwater copepods constitutes one of the major zooplankton communities occurring in all types of water bodies. They serve as food to several fishes and

play a major role in ecological pyramids. In the present study ---species were recorded. Copepods showed higher population density in summer and lower in winter. This pattern of seasonal fluctuation of copepods has been observed by Mahor (2011) in Trigha reservoir of Gwalior.

Abundance of copepods is due to the lake which is rich in organic matter supporting higher number of cyclopoids, this suggesting their preponderance in hither tropic State of water. Similar observation are made by somani and Pejavar (2004) in Masuda lake.

Scientific Classification :

Kingdom –Animalia

Phylum – Arthropoda

Subphylum – Crustacea

Class – Hexanauplia

Subclass - Copepoda (H. Milne -Edwards 1840) Order -Calanoida.

Rotifers :

Rotifers plays a vital role in the trophic tiers of fresh water impoundments and serve as living capsule of nutrition (Suresh kumar et al. 1999). In the present study rotifers with -----

Species were recorded as zooplankton groups. Taxonomic dominance has been recorded in several water bodies (Kudari et al. 2005, kanagasabhapati and Rajan, 2010).

This pattern is common in lakes, ponds, reservoir and drivers (Never et al. 2003. The population density of rotifers was not rich. The number of rotifers increased in summer which may be due to higher population of bacteria and organic matter of dead and decaying vegetation (Majagi and Vijaykumar, 2009).

Scientific Classification :

Kingdom - Animalia

Subkingdom - Eumetazoa

Clade - Parahoxozoa

Phylum - Rotifera (Cuvier, 1798)

Ostracoda :

Ostracoda represent very low diversity and population density as compared to other groups of zooplankton. In the present study 1species of Ostracoda were recorded. The population density higher in summer and less in monsoon. This result has also obseved by Sukhad and Patil (2004).in fort lake Belgaum and Kedar et al. (2008).Occurance of some species of Ostracoda has been reported (Patil C. S et al. 1989).

Scientific Classification :

Kingdom – Animalia

Phylum – Arthropoda

Subphylum – Crstacea Subclass -Oligostraca

Class – Ostracoda (Latreille 1802)

Cladocera :

Cladocerans are the most useful and nutritive group of crustaceans for higher members of fishes in the food chain. In the present study 2 species were recorded. The population of cladocera is higher than Ostracoda. It is higher in summer and lower in winter. Abundance has also been earlier reporter by Dushyantkumar Sharma (2012).in Thaiga Reservoir Gwalior (MP) Cladocera is an order of small crustaceans commonly they are called by water fleas. It has been reported that density and biomass of cladocerans was primarily determined by food supply (Smitha, PG.et al 2007).

Scientific Classification :

Kingdom - Animalia

Phylum - Arthropoda

Subphylum - Crustacea

Class - Branchiopoda

Subclass - Phyllopoda

Super order - Cladocera

Checklist of Zooplankton from Jayakwadi dam.

Copepods :

1. Calcanus finmorchicus
2. Mesocyclops inversus
3. Thermocyclops consimilis
4. Thermocyclops

Rotifers :

1. Keratella chochleris
2. Keratella crassa
3. *Branchionus diversiconis*

Cladocera :

1. *Daphnia pulex*
2. Daphnia magna

Ostracoda :

1. *Cypris sp.*

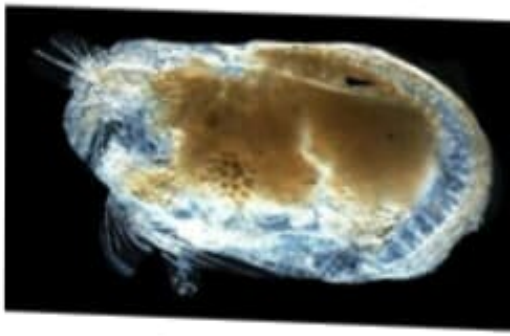
Mesocyclops inversus.(copepod).

Thermocyclops (copepods)

lcanus finmorchicus(copepods).

rmocyclops consimilis (copepod)

Branchionus diversicornis (roti



Cypris sp. (Ostracoda)

Daphnia pulex(Cladocera)

In the present investigation all the data obtained from weekly analysis of water sample from four predetermined sites of Jayakwadi dam.

The zooplankton of Jayakwadi dam consists of Copepods, Rotifers, cladocera, and Ostracoda. The total 10 species were recorded from form the dam during the present study, in which 4 Species of copepods, 3 species of Rotifers 2 species of cladocera and one species of Ostracoda contributed to zooplankton diversity in the reservoir. The total Zooplankton population was dominated by copepods.

In the present investigation 4 species of copepods has been identified in dam :

1] Mesocyclops inversus, 2] Calcanus finmorchicus, 3] Thermocyclops, Thermocyclops consimilis

In the present investigation 3 species of rotifers has been identified in dam 1] *Keratella chochleris,* 2] *Keratella crassa,* 3] *Branchionus diversiconis.*

Two species of Cladocera has been recorded from Jayakwadi dam, 1] Daphnia pulex, 2] Daphnia magna.

One species of Ostracoda has been recorded from Jayakwadi dam .i.e. Cypris sp.

In Jayakwadi dam Copepod population is maximum in rainy season followed by winter season and least in summer season through the year.

Conclusion :

Depending on the study it can be concluded that the diversity and density of zooplankton from Jayakwadi dam exhibited by four major group (copepods, rotifers, cladocera, Ostracod a.) Monthly distribution of zooplankton in Jayakwadi dam was Copepods > rotifers > cladocera > Ostracoda. These planktons are good indicator of water quality in Jayakwadi dam and their ecological significance is suggesting to control the nutrient load which is a key source to eutrophication process.

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