



Quantitative Estimation Of Copepoda Of Fresh Water Ecosystem In Washim Region, Ms, India

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ABSTRACT:

Planktonic communities play a crucial role in assessing the quality of water bodies. These communities consist of two main types: Zooplankton and Phytoplankton. Zooplankton, in turn, can be classified into four primary groups: Rotifera, Cladocera, Ostracoda, and Copepoda. This study mainly focuses on Copepoda in Washim region. Copepods are abundant and serve as key components in marine food webs, acting as major grazers of phytoplankton and contributing to microbial loops. Smaller copepods utilize various reproductive and feeding strategies to maximize their population size, which helps them counteract the high predation losses they face. During the study, a total of ten genera and two species of Copepoda were identified across four sampling sites. As a pollution indicator species, the study is concentrated solely on Copepoda rather than other types of zooplankton.

Keywords: Copapoda, Quantitative Estimation, Washim District



INTRODUCTION:

Zooplankton (from the Greek "zoo," meaning animal, and "plankton," meaning wandering) are a vast array of diverse, floating, and drifting animals with limited ability of locomotion. Most of them are microscopic, existing as either unicellular or multicellular organisms, with sizes ranging from just a few microns to over a millimeter. Along with size variations, these organisms also differ in their morphological characteristics and taxonomic classification. Zooplankton play a crucial role in studying the faunal biodiversity of aquatic ecosystems. The term "copepod" is derived from the Greek words "kope" (meaning oar) and "pods" (meaning foot), referring to how their antennae and legs move like oars while swimming. Copepods are small crustaceans in the subclass Copepoda, which are widely distributed and ecologically significant, including species such as water fleas. There are over 12,500 species of copepods, though not all inhabit saltwater. Despite being classified as plankton, copepods vary in size, ranging from less than a millimeter to nearly a foot in length. Zooplankton communities serve as an important food source for many freshwater fish, making it essential to identify the types of zooplankton present in the local water bodies of Washim town. A substantial amount of literature exists on zooplankton research. Turner (2004) explored the significance of small planktonic copepods and their role in pelagic marine food webs. Bhuiyan *et al.* (2008) investigated the occurrence and abundance of copepods in a fish pond in Rajshahi, Bangladesh, in relation to physico-chemical conditions. Deniz and Gonulio (2014) examined the temporal changes in copepod abundance and species composition in the coastal waters of Shamus in the southern Black Sea.

MATERIAL AND METHODS:

DESCRIPTION OF STUDY AREA:



Our study area is Washim district, Maharashtra, India. It is also referred to as Basim, an Arabic name meaning "the one that smiles." Washim is particularly renowned for its ancient Balaji Temple. Washim district was officially formed on July 1, 1998, after being separated from Akola district. Washim is located in the eastern region of Vidarbha (20.1390° N, 77.1025° E). Akola lies to its north, Amravati lies to its north-east, Hingoli lies to its south, Buldhana lies to its west, Yavatmal lies to its east. Washim

district covers an area of 5,150 square kilometers. Rainfall is generally in Monsoon during the month from June to September. Climate is Hot and Dry summers and cold winters with the seasonal variation in the temperature being pretty large. Six talukas are there viz. Washim, Karanja, Risod, Malegaon, Manora and Mangrulpir.

SAMPLING STATIONS: Four different perennial water bodies located in the Washim region were selected for the study.

METHOD OF COLLECTION:

Zooplankton collection primarily involves filtering water through a net and collecting the filtered water in bottles. The success of the sample collection largely depends on factors such as the choice of gear, the mesh size of the netting material, the timing of water collection, the depth of the study area, and the sampling strategy. The gear selected should align with the specific objectives of the investigation. The most common method for collecting zooplankton is using a net, as it filters a large volume of water and is suitable for both qualitative and quantitative studies. Plankton nets come in various types and sizes, and sometimes combinations of nets with different mesh sizes are used. Mesh sizes vary from very fine to coarse, with a 0.2mm monofilament nylon mesh commonly used for taxonomic and productivity studies. Proper fixation and preservation of zooplankton samples are crucial, as poorly fixed or preserved samples make subsequent analysis difficult. Improper fixation can lead to issues such as whitish precipitates and ruptured exoskeletons.

Buffered formalin is commonly used as a fixative and preservative for zooplankton samples. Other preservatives include 70% ethanol or 40% isopropanol. Glycerin is often added to formalin to prevent specimen shrinkage, avoid drying, and help preserve the colors of the zooplankton.

ANALYSIS OF THE SAMPLE:

The basic analysis involves clearing the specimens. Fixed specimens must be free of any attached materials such as detritus or precipitates. This is done by carefully removing the extraneous substances with fine forceps or needles without damaging the specimen. The specimens are then immersed in clearing fluids like lactic acid, glycerin, or propylene glycol. Lactic acid is commonly used as a clearing agent, but care should be taken not to leave the specimens in it for too long, as prolonged exposure can cause the disintegration of the zooplankton's body tissue. After clearing, examining the external features of the specimens becomes easier.

RESULT AND DISCUSSION:

Copepods were predominantly represented by species from the genera *Cyclops* and *Mesocyclops*. The presence of copepods is an indicator of pollution. The population of copepods is influenced by water temperature and the availability of food organisms. Copepods make up the largest division of crustaceans, with over 6,000 species. They are usually very small, often less than a millimeter in length. Most copepods are free-swimming and abundant in both freshwater and marine environments, where they form part of the plankton and serve as food for fish.

Copepods play a crucial role in lake ecosystems and food chains. Unlike algae or phytoplankton, zooplankton are microscopic animals that do not produce their own food. They help control algae populations by consuming millions of tiny algae, preventing excessive growth.

Copepods are also an essential food source for planktivorous fish and other organisms. As suspension feeders, they primarily feed on phytoplankton and protozoans, though some species are predatory. Copepods are strong

swimmers and exhibit diurnal migration. They serve as an important link in food webs, connecting small algal cells to larger fish and even whales. Various species of copepods were recorded in the water samples, including *Mesocyclops*, *Cyclops*, *Calanus*, *Macrocyclus*, *Diaptomus*, *Tropocyclops*, *Orthocyclops*, and *Eucyclops*. These species are listed in Table No. I.

Sr. No	Phylum	Class	Family	Genus	species
1	Arthropoda	Crustacean	Cyclopidae	<i>Mesocyclops</i>	<i>leukarti</i>
2	Arthropoda	Maxillopod	Macrocyclus	<i>Mesocyclops</i>	<i>albidus</i>
3	Arthropoda	Maxillopod	Cyclopidae	<i>Mesocyclops</i>	<i>varicans</i>
4	Arthropoda	Crustacean	Cyclopidae	<i>Tropocyclops</i>	<i>prassinus</i>
5	Arthropoda	Maxillopod	Cyclopidae	<i>Orthocyclops</i>	<i>modestus</i>
6	Arthropoda	Maxillopod	Cyclopidae	<i>Eucyclops</i>	<i>prionophorous</i>

Table No. 1: Record of Copepods in Washim region from four sampling sites.

The data from the present investigation reveal the number of zooplankton species recorded across four sites: the Fish Farm of R.A. College, Deotalav, Padmatirth Talav, and Ekburji Dam. Copepods, with their unique feeding behavior, are the most abundant among zooplankton species and hold a significant role in the aquatic food chain. They feed directly on primary energy sources, such as phytoplankton, detritus, and bacteria, and, in turn, serve as prey for secondary consumers like fish. Therefore, their primary role in the aquatic ecosystem is to convert plant matter into animal substances. Among the recorded copepods, some species dominated in specific seasons, while others disappeared, indicating varying growth patterns. *Cyclops* and *Diaptomus* showed a positive correlation with pH, free CO₂, and bicarbonates, but a negative correlation with temperature, dissolved oxygen (DO), and carbonates. *Mesocyclops*, on the other hand, showed a positive correlation with temperature, pH, CO₂, carbonates, and bicarbonates, but a negative correlation with dissolved oxygen (DO). From this study, it was observed that copepods were abundant in the pond, making it favorable for planktivorous fish culture. The following species thrive in tropical waters and are essential as fish food organisms in aquaculture and fish nurseries.

During the study, a total of six copepod species were observed across the four water bodies, with the highest abundance found at the Fish Farm, followed by Ekburji Dam, Deotalav, and Padmatirthtalav. The Fish Farm had a high abundance of *Cyclops*, and several species were identified, including *Mesocyclops*, *Calanus*, *Cyclops*, *Microcyclops*, *Tropocyclops*, *Eucyclops*, *Orthocyclops* and others. In Ekburji Dam, the identified copepod species included *Orthocyclops modestus*, *Tropocyclops prassinus mexicanus*, *Microcyclops vericans*, *Mesocyclops*, *Calanus*, and *Eucyclops*. In Ekburji reservoir, *Diaptomoid nauplius* and *Mesocyclops sp.* were recorded by Tandale *et al.* (2011).

The copepods identified in Deotalav include *Macrocylops*, *Microcylops*, *Tropocylops prassinus mexicanus*, *Calanus*, *Cyclops*, and *Orthocylops modestus*. A similar study was conducted by Manjare (2015) in the water tanks of Kolhapur District, Maharashtra, and Paturej *et al.* (2012).

In Padmatirthtalav, the copepods observed and identified include *Microcylops vericans*, *Mesocylops*, *Calanus*, *Cyclops*, and *Eucyclops*, with a similar study by Bhuiyan *et al.* (2008).

CONCLUSION:

Copepods are abundant and play a crucial role as links in marine food webs. They act as major grazers of phytoplankton, forming part of the microbial loop. Small copepods employ various reproductive and feeding strategies that help maximize their population size, counteracting heavy predation losses. The presence or absence of a healthy zooplankton population can significantly affect the success of commercial fisheries in freshwater bodies. Ensuring that the lower levels of the food chain remain healthy is vital for protecting higher-order organisms, such as fish. Consequently, small copepods can become highly abundant and exert a significant feeding impact on their prey, though such data are still scarce.

The qualitative analysis of zooplankton across the three aquatic ecosystems revealed that copepods, especially in their nauplius and copepodite forms, were dominant. In the fish farm pond, the analysis showed a low level of biodiversity in the samples collected during the vegetative season and at the end of the season. By the end of the season, the biological potential of the pond, particularly in terms of zooplankton, had significantly declined.

It is recommended that fertilizers be applied to earthen ponds to increase nutrient availability, similar to what is done in concrete tanks, to support natural food production.

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