



A Study On Seasonal Variation Of Macrobenthic Fauna In An Artificial Reservoir, Getalsud Located In Ormanjhi Block In Ranchi, Jharkhand

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I. *Abstract:* -

Benthic invertebrates are the microorganism residing in the bottom area of an aquatic body and acts as bio-indicators, biofertilizers and biofilters. Getalsud Dam is an artificial Reservoir located about 35 kms away from the Ranchi city. The Dam was opened in 1971 and has been built on Subernrekha river (23°27'24"N 85°33'19"E). The Dam is being utilized by half of the population of Ranchi for domestic purpose as well as electricity supply. The dam has been neglected for study since last 35 years. Hence the study has been undertaken. The present study was conducted to investigate the seasonal variations of the microbenthic fauna of the Dam. Sampling was done for a period of 1 year from (March 2022 to February 2023). Organisms were collected on a seasonal basis. The Macrobenthic communities showed dependency on habitat conditions. The samples were collected during Pre- monsoon (March-June), Monsoon (July-October) and Post -Monsoon (November-February) periods. The samples were collected from 4 stations in every season and the data was analysed statistically with appropriate tools. The abundance and species richness showed a significant difference between stations. In every season, Station 1 was recorded with the lowest number of individuals and species. Likewise, a significant difference was also recorded between seasons in the rest three sites also. Pre-Monsoon samples comprised the lowest number of microbenthic fauna.

Overall sampling showed 2921 species from different groups. The collected samples consisted species of Mollusca, Decapoda, Diptera, Oligochaeta and Fingerlings. In Mollusca 1140 species were recorded whereas the collected samples of other species included 467 Decapoda, 346 Diptera, 427 Oligochaetes, 547 Fingerlings. In Every season mollusca was the most abundant group.

Keywords:-Macrobenthic, Reservoir, Dipteran, Sediments, Mollusca, Season

I. INTRODUCTION

II. The small animals living among the sediments and stones on the bottom of water bodies are known as Benthic community. This community is supposed to be an extremely diverse group representing most of the phyla from protozoans to many invertebrates (1). These small organisms includes polychaete worms, anthozoans, sponges, crustaceans etc. The size of the microbenthic faunal organisms ranges from 0.5mm-1mm (2, 3). This community has been reported to be a critical component and reliable indicator of the biotic integrity of an aquatic ecosystem (4, 5, 6).

III. On one hand this microbenthic community plays an important role in maintaining the ecosystem functioning such as material cycling in sediments and energy flow in food web. Due to the sedentary nature, these microorganism reflects the ambient conditions of sediments in which a number of pollutants are partitioned (7, 8, 9).

IV. Among all the macrobenthic communities insects comprises the largest diversity of these communities including mayflies, beetles, crane flies etc. These organisms are extremely important players in the processing and cycling of nutrients as well as constitute an essential components in the aquatic environment and plays an important role in ecology both as consumers of planktons and as food for bottom feeders.

V. The community living on or in the bottom of a water body are extremely diverse group represented by most of the phyla from protozoans to vertebrates .these organisms constitute an essential components in the aquatic environment and play an important role in ecology both as consumers of planktons and as food for bottom feeders (10).These community also provides food for economically important fish in aquatic environment ,which are major secondary producers (11).Benthic fauna plays an important role in the ecological processes occurring within the ecosystem and helps in maintaining the water quality (12).Diversity and abundance of benthic fauna are also used in biomonitoring studies as these provide an accurate understanding of transitions in aquatic ecosystem(13).A great role is played by Benthic community that it converts the input of detrital matter into output of benthic food for fishes and crustaceans thus providing better survival chances for many organisms(14).The structure of benthic fauna and their role as principal food sources for fishes has been extensively documented by various workers(15).Other important functions that is performed by benthic faunal community is deposition breakdown incorporation and turnover of organic present in the bottom floor of the aquatic body .They also help in recycling of nutrients to overlying water column .They have also been reported to support large populations of birds (16).

VI. This faunal community includes a set of animals belonging to a variety of invertebrates groups, including polychaetes, mollusca, crustaceans and nemertean worms who act to aerate and remobilize sediments promotes decompose ions and transfer energy to other components of the food web (17).

VII. They regulates and alter the physical ,chemical and biological agents and therefore have a strong structure effects (18).These animals occur in a broad range of physical condition ,from highly variable and various hydrodynamic regions and muddy or sandy sediments of deeper water habitats .they have also been reported to be patchily distributed and also are important part of freshwater ecosystem and are easily affected by environmental changes .These macro invertebrates also serves as valuable indicators of water body degradation and these changes in their compositions and abundances could aid as alarm system and even allows the quantifications of environmental operation (19, 20, 21, 22).

VIII. The distribution patterns and abundances of microbenthic communities have also been reported to be influenced by various environmental factors like turbidity, substrate, sediments texture etc.(Kinne 1966;Mc Lusky and Eliote 2004).

IX. The burrowing activities of some benthic organisms are known to influence the sediments texture composition by increasing the water contents in sediments (Davis 1993).

X. Macrobenthic Communities live on or in the bottom of the water body. are extremely diverse and represented by most of the phyla from protozoan to vertebrates. They also provide food material for economically important fish in aquatic environment where they are major secondary producers.[1]. Macrobenthos are commonly used as bio-monitors to detect pollution impacts in estuaries [2] for their exclusive and unique characteristics. They play an important role in the ecological process occurring within the ecosystem and help in maintaining the water quality. A great role is played by them in nutrients cycling and controlling their outflow from ecosystem. Also macro benthic communities play an important role as connecting link in the food web and in purifying the polluted water. The water and soil quality of the water bodies have a strong effect on the diversity and distribution of macrobenthos[3]. The benthos help in transforming organic matter from sedimentary storage into dissolved nutrients which can be dissolved into overlying waters and used by primary producers to enhance primary productivity. Macrobenthic communities are eaten by other higher tropical organisms like fin and shell fishes as food and recycle the organic matter and debris like an ecological engineer[4]. They also provide a linkage between substratum and water column predators[5]. Macrobenthos are an important role playing community in aquatic ecosystem because they mineralize promote and mix the oxygen flux into the sediments which recycle the

organic matter[6]. Benthic community determines the amount of nutrient release of the sediments [7]. Physical and chemical factors affects the distribution and abundance of microbenthic community like contaminations of sediments environment, current of the water organic contents of the sediments depth, rapid sedimentations and toxicity of sediments causes shift of microbenthic communities towards lower abundance[8]. Freshwater microbenthic communities used for controlling contamination and anthropogenic effects as bioindicators [9] for their specific and spatial attributes.

The Getalsud Dam is located on the north eastern edge of Chotanagpur plateau. It is situated in Rukka block, because of which it is locally known as Rukka Dam. The Dam is located on the Subernarekha river. The reservoir with a catchment area of 717 km² has a full reservoir level of 1,954 ft; It was envisaged to meet the drinking water demands of Ranchi city as well as industrial requirements. The power generation from the Getalsud dam is stopped once the level reaches to 1917 ft to ensure that sufficient water is available for drinking purposes. These Dam provides a small scale fishing opportunity to the local people of Rukka. These Dam also serves as domestic purposes like personal hygiene, washing of clothes, dishes and household materials, bathing of cattle etc.

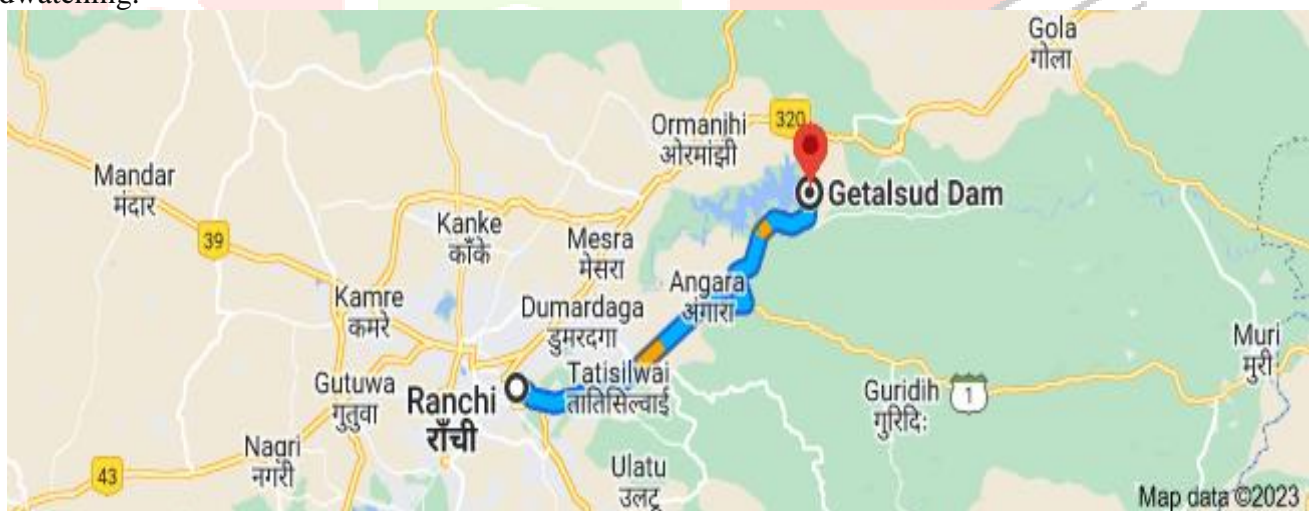
In this study we have chosen some representative sampling sites as the study area. This study aimed to describe the density and diversity of macrobenthos.

Materials and Methods

Study Area

Study Area

Getalsud Reservoir is a large man made water body located in Ranchi district of Jharkhand, India It is also known as Rukka Dam. The reservoir was created by constructing a Dam on the Subernarekha River. Getalsud Reservoir was built in the early 1980s primarily to provide drinking water to Ranchi city and nearby areas. It has a capacity of around 27 million cubic meters and covers an area of about 6.5 square kilometers. The reservoir is surrounded by hills and forests, which adds to its scenic beauty. Apart from providing drinking water to the region, Getalsud Reservoir also supports fisheries and aquaculture activities.it is a popular spot for boating and picnics, and several local festivals and fairs are held here every year. The reservoir is also home to a variety of aquatic birds, making it a good destinations for birdwatching.



Sample Collection

For collection of macrobenthos four different sites were marked. The first area was near the pool where human activities were very high. The second area was near the forest which had a very peaceful environment, Only aquatic birds and a few animals were present in these areas . The third area was near the cemetery where there was low human activity along with some animals. The fourth area was near the village where there was a small fish farming area and agricultural farm with irrigation system. And because of different areas we got information about different environment. We collected macrobenthos using Ekman's dredge, mesh size net and a scoop. We fixed the collected macrobenthos in 4% formalin and lugol's solution. Identification of macrobenthos was done with the help of FRESHWATER ZOOLOGY KEY BOOK and laboratory of ZSI KOLKATA and YUGANTAR BHARTI RANCHI and was later grouped them according to their class.

Results and Discussion

The whole year was categorised into three parts, Pre-monsoon (March-June), Monsoon (July-October) and Post-monsoon (November-February). Macroinvertebrates were collected from this artificial reservoir in all three seasons. We found different numbers of macroinvertebrates in all four areas due to different environmental conditions in each season. During the three sampling occasions, we found the highest number of Mollusca, which was 1140, and the lowest number of Diptera, which was 346. During Pre-monsoon, we found fewer species due to the high temperature in this season. As the temperature changed during this season, there was a decrease in the level of nutrients in the water and water. Due to the changes in water parameters, the aquatic food web was affected, leading to a lesser number of species. Mollusca was present in good numbers because they are supposed to adapt to changes in the environment due to their hard shell cover. Fingerlings were also found during this season. Regarding the fish found in Getalsud Dam, *Pangas* and *Tilapia* were found in the highest numbers, whereas *Rohu*, *Catla* and other fishes were found in smaller numbers. Cage culture and pen culture are also practiced for *Pangas* and *Tilapia* in the dam because the temperature of the dam is suitable for their production.

During the monsoon season, the temperature was recorded to be consistent, which led to the right amount of water nutrients, resulting in all species being present in the correct numbers. In this season, Mollusca (538) were found in the highest numbers, followed by Fingerlings (304), Decapoda (285), Oligochaetes (207), and Diptera (173). During the post-monsoon season, which is generally a winter season, the temperature remained consistent. Different aquatic birds, including migratory birds, were present in the reservoir during this season. Mollusca (330) were found in the highest numbers during this season, followed by fingerlings (192), Oligochaetes (154), Decapoda (134) and Diptera (132).

Overall, Mollusca were found in the highest numbers during all seasons, indicating their abundance. Diptera were found in the lowest numbers, possibly due to their role in the food web and the changes in the environment. Four different stations were selected for sampling, and each station had a different environment condition. In the 1st area, where anthropogenic activities were high, macroinvertebrates were found in lower numbers due to the usage of the area as a boating and picnic spot. In the 2nd area, which was located near the forest, aquatic birds were found in large numbers and macroinvertebrates were present in satisfactory numbers. In 3rd area, located near the cemetery, a muddy area was found where mollusca and crustaceans were found in good numbers. The 4th area was located near the village, where agriculture and fish farming is practiced, and all species were found in the good numbers.

In all seasons, Mollusca (38.96 %), Fingerlings (18.69%), Decapoda (15.96%), Oligochaetes (14.59%) and Diptera (11.82%) were found in the highest percentages. The Simpson diversity index and Shannon diversity index show that all species were present in abundance numbers and good diversity and macroinvertebrates abundance was satisfactory.

Biological indices:-

The Macroinvertebrate invertebrates fauna was analysed for species diversity, which showed great variation (Table 2). The range of the Simpson index value is from 0.62 to 0.77. The highest species diversity in terms of the Simpson index was recorded during the monsoon and post monsoon periods, while the lowest was recorded during the pre-monsoon period. The value of "D" indicates the highest biodiversity. The range of the Shannon index was between 0.76 to 1. The highest value of the Shannon index was recorded during the post-monsoon and monsoon periods, while it was lower during the pre-monsoon period. During the present study, it was found that the Shannon and Simpson diversity indices that macroinvertebrates is less abundant in the reservoir during the pre-monsoon (summer) period but more abundant during the monsoon (rainy season) and post-monsoon (winter) periods. We observed a high correlation between macroinvertebrate diversity and water parameters during the present study. This study revealed the water quality status and Macroinvertebrate structure of the Getalsud reservoir. On the basis of examination of various observations on physico-chemical parameters of water variation of Macroinvertebrate community. It can be said that ecosystem of artificial reservoir Getalsud is adequate for Macroinvertebrates and other aquatic fauna.

Table 1: Population density (individuals) of various microbenthic groups

	MOLLUSCA	DECAPODA	OLIGOCHAETES	DIPTERA	FINGERLINGS
PRE-MONSOON					
(March-June)	272	48	66	41	51
MONSOON					
(July-October)	538	285	207	172	304
POST-MONSOON					
(November to February)	330	134	154	132	192
TOTAL	1140	467	427	346	547
PERCENTAGE	38.96%	15.96%	14.59%	11.82%	18.69%

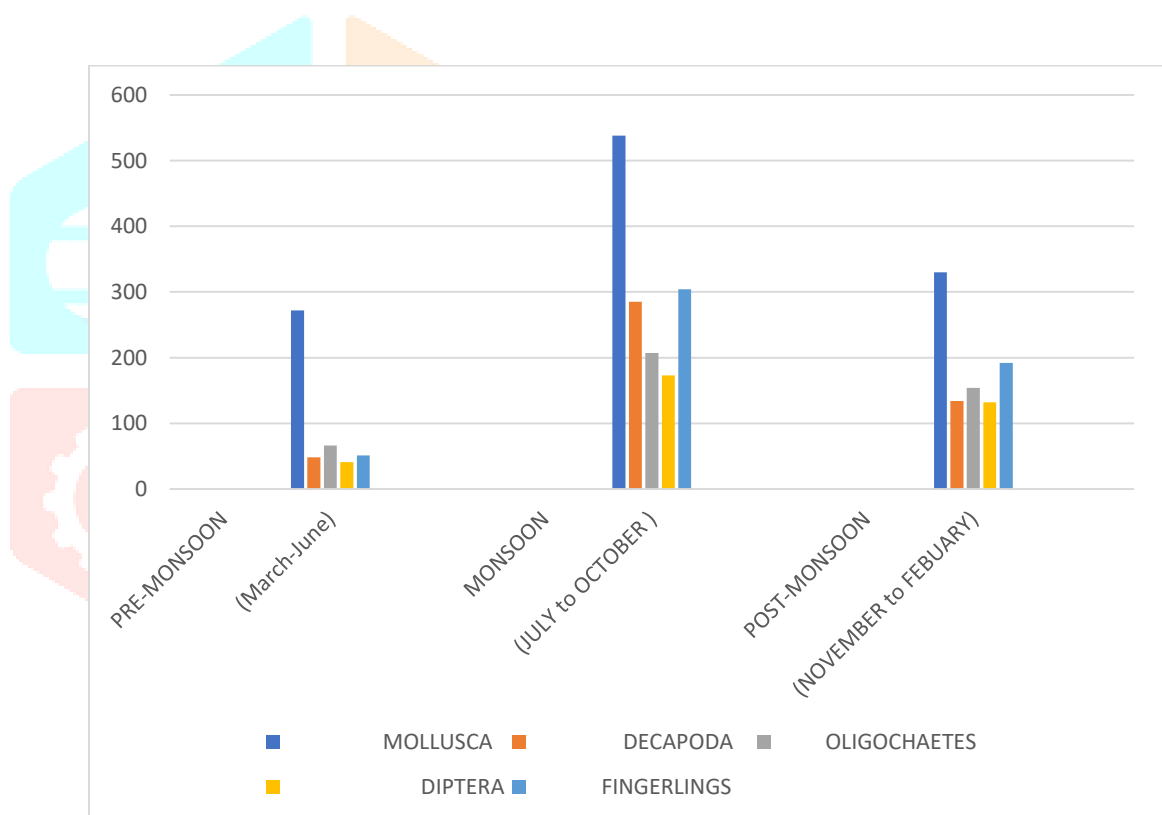


Fig 1: Population density of various group of macrobenthic invertebrates in Getalsud Dam

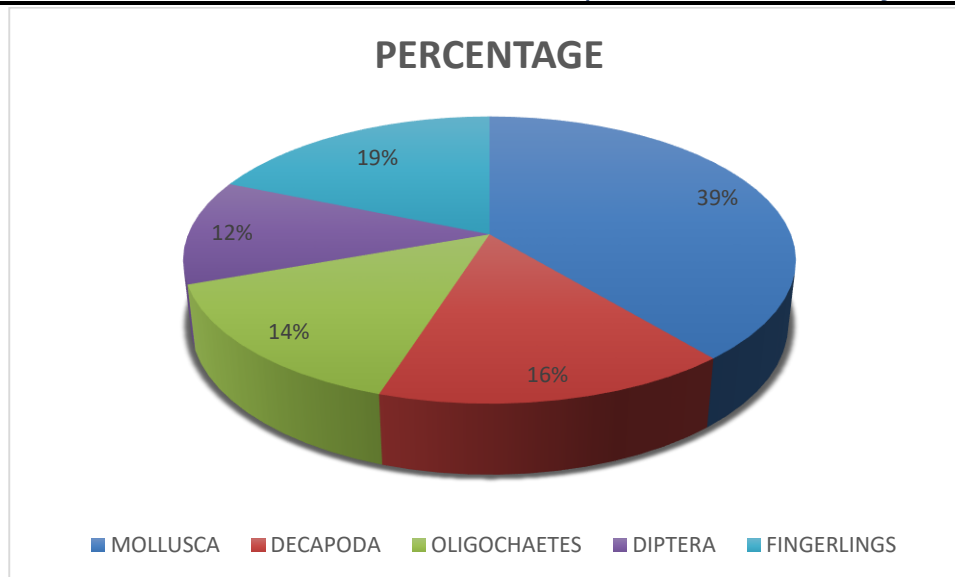


Fig 2 : % Composition of macrobenthic invertebrates in Artificial Reservoir, Getalsud Dam

Table 2: Values of diversity indices showing species diversity at different season during the period of study

	Simpson diversity index	Shannon diversity index
PRE-MONSOON		
(March-June)	0.62	0.76
MONSOON		
(July-October)	0.77	0.92
POST-MONSOON		
(November to February)	0.77	1

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