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Physico-Chemical Analysis of Planktons in Water Body of Baglihar Dam

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Abstract - Physicochemical characteristics and plankton diversity are important variables in deciding whether water is appropriate for irrigation or drinking. An essential element of an aquatic ecosystem, zooplankton is crucial for the transfer of energy. A water body's physicochemical characteristics and nutritional status are crucial in determining how much plankton is produced. Plankton is a natural food source for many fish species, especially zooplankton. It also provides the essential quantity of protein for the fast growth of larval carps. The present study's physicochemical characteristics include air and water temperature, pH, total alkalinity, and salinity, free carbon dioxide, total hardness, dissolved oxygen, the chloride ion diversified plankton. The study describes the outcomes of fluctuations in physico-chemical parameters, phytoplankton, zooplankton, and variety of benthic fauna on a monthly basis. To encourage sustainable management and the best possible use of aquatic resources, appropriate limits for the pollution effect indicators must be established. In the Baglihar Dam reservoir, sixteen (16) different benthic species were found as a result of the current study. The benthic fauna consisted of three phyla: Mollusca, Arthropoda, and Annelida. As a result, this study provides pertinent information and advances knowledge of the water quality of the Baglihar Dam Reservoir.

Keywords - Physico-chemical, Plankton, Baglihar Dam, Benthic Fauna, Zooplankton

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INTRODUCTION

Plankton diversity and physicochemical properties are crucial factors in determining whether water is suitable for irrigation or drinking. Water quality evaluation typically entails the measurement of physicochemical, biological, and microbiological factors and reflects on the ecosystem's abiotic and biotic state [1]. Zooplankton are one of the most significant biotic components in an aquatic ecosystem, impacting all functional elements such as food chains, food webs, energy flow, and matter cycling. Zooplankton plays an important function as a bio indicator and is an excellent instrument for determining the state of water pollution. However, there is relatively little evidence on the link between physicochemical characteristics and planktonic fauna [1].

The zooplankton is an important component of an aquatic environment and plays an important role in energy transmission. Freshwater zooplankton is essential to the environment and food chain of ponds, lakes, and reservoirs [2]. Zooplankton consume phytoplankton. They are in charge of consuming millions of tiny algae that would otherwise grow out of control. Inadequate understanding of plankton and their dynamics is a key impediment to a better understanding of the life processes of fresh water bodies [2]. The zooplankton is an important component of an aquatic environment and plays an important role in energy transmission. Freshwater zooplankton is essential to the environment and food chain of ponds, lakes, and reservoirs. Zooplankton consume phytoplankton [2]. They are in charge of consuming millions of tiny algae that would otherwise grow out of control. Inadequate understanding of plankton and their dynamics is a key impediment to a better understanding of the life processes of fresh water bodies [2]. As a result, the physicochemical parameters and nutrient status of a water body play an important role in governing the production of plankton, which is the natural food of many species of fish, particularly zooplankton, and also support the necessary amount of protein for the rapid growth of larval carps [2].

The primary issues affecting standing water bodies have been recognised for at least two decades, but quantifying and categorising them for environmental managers has proven difficult [3]. The condition of Indian freshwater resources and their management has recently been described as a prominent environmental problem, with nutrition enrichment, acidification, and domestic waste, sewage, agricultural, and industrial effluents contamination by toxic substances identified as major impacts [3]. Water is essential for all living species, from microorganisms to humans, but it is a severe

concern today because all water supplies are contaminated as a result of uncontrolled development and industrialisation. Water quality has been assessed using qualitative and quantitative phytoplankton investigations [3].

The first trophic level in the food chain is formed by phytoplanktons, which are the primary producers. Planktonic organism diversity is relatively high in fertile standing water basins. The variety of phytoplankton responds quickly to changes in the aquatic environment, notably in relation to silica and other nutrients. Several phytoplankton species have been used as bio indicators, and it is an excellent technique for studying water pollution [3].

Extensive studies on seasonal change of zooplankton are common in temperate freshwaters, but research on freshwater zooplankton in India is limited. Few studies on zooplankton population abundance in various types of wetlands have been conducted [4]. An early phenomenon in limnology was an interest in the physical elements that impact zooplankton. *Diaphanosomabrachiurum* was widely known to be a warm-water species found only in temperate lakes during the summer, whereas *Diaphnialongiremis* was a cold-water species found only in the chilly hypolimnion in the southern half of its range [5]. The discovery that shallow lakes had higher productivity and fish output than deep lakes sparked interest in the influence of lake morphometry [5].

Changes in numerous abiotic and biotic elements throughout time and space influence phytoplankton in floodplain lakes. The most significant abiotic characteristics are nutrition availability and hydrological conditions [6]. The number and biomass of phytoplankton are connected to the trophic status of each waterbody. In the case of the lower prize, diatom dominance was seen. Fertile water is defined by a larger proportion of cyanophytes, dinoflagellates, and euglenoids [6]. As a result, hydrological processes are critical in determining the productivity and growth of floodplain lakes. Overbank flooding alters the biotic and physicochemical features of aquatic habitats and allows for the flow of substances and organisms between ecosystems. During floods, a floodplain preserves specific organic matter (POM) and can be a significant source of organic compounds for plankton growth. Following a flood event, there was a more homogeneous distribution of phytoplankton as well as a drop in its quantity and biomass [6].

The variety and density of zooplankton are determined by the nutritional status of the water body, abiotic variables, DO, food chain, soil-water chemistry, and claimed that zooplankton have been employed as bio-indicators to assess aquatic ecosystems and water integrity [7]. The rotifer population was favoured by water temperature, turbidity, clarity, and dissolved oxygen. Interspecific and intraspecific variables control zooplankton distribution and abundance, while phytoplankton availability influences zooplankton via influencing female reproduction. Maximum zooplanktons were seen in the winter, most likely because to low temperatures, high DO concentration, and low velocity [7]. Therefore, Zooplankton has been proposed as a bio-indicator of lake eutrophication, acidification, and agricultural disturbances at the regional level. Rotifers are zooplankton that respond to environmental changes more quickly and are used to test water quality. Zooplanktons are the chosen bio-indicators for identifying anthropogenic pollution dispersion patterns and comprehending the incorporation and transit of waste nitrogen into pelagic and benthic food chains [7].

The physico-chemical characteristics involve [8]:

- Air and water temperature
- pH
- Total alkalinity
- Free carbon dioxide
- Total hardness
- Dissolved oxygen
- Chloride ion
- Plankton diversification

Temperature, light penetration, and water movement all play essential roles in plankton dispersal and lake stratification. These elements interact to impact water quality and, as a result, community. Human activities such as various agricultural practises and irrigation, as well as natural dynamics, can significantly alter lake physicochemical characteristics, affecting water quality and quantity, species distribution and diversity, production capacity, and even disrupting the balance of the lake's ecological system [9].

To gain a basic understanding of a region's biodiversity, studies on planktonic composition and morphometric, physical, and chemical characterization of water bodies are required. As a result, the current effort aims to investigate the physicochemical features and phytoplankton species diversity in order to assess pollution levels [10].

OBJECTIVES OF STUDY

- Physico-chemical Analysis of Water
- Biological Estimation
- Collection, Preservation and Identification of Plankton
- Correlation Coefficient between Physico-chemical parameters and plankton

RESEARCH METHODOLOGY

- **Physico-chemical Analysis of Water**: The physicochemical parameters of water were analysed using a standard method recommended in limnological literature. Temperature, Turbidity, Conductivity, pH,

and Dissolved Oxygen were measured on-site, while Total Solids, Total Hardness, Biochemical oxygen demand, Chemical oxygen demand, Amonical Nitrogen, Total Phosphate, Nitrate, total coliform, and Feecal coliform were measured in the laboratory.

- **Biological Estimation:** The surface water samples were gathered by filtering 100 litres of water through a plankton net with a mesh size of 30 m. After allowing the samples to settle with Lugol's iodine, they were centrifuged and the concentration was produced up to 20 ml with 4% formalin.
- **Collection, Preservation and Identification of Plankton:** Filtering 40 litres of water through a plankton net with a pore size of 64 was used to collect plankton samples. For the zooplankton and phytoplankton studies, the concentration plankton samples were preserved in 4% formalin and Lugal's solution, respectively. The phytoplankton were identified using the keys provided by Prescott (1962), Smith (1950), Agarkar (1975), and Edmondson (1976). (1959). Keys given by Pemak (1978), Sehgal (1083), Needham and Needham (1962), Tonapi (1980), and APHA was used to identify zooplankton (1980).
- **Correlation Coefficient between Physico-chemical parameters and plankton:** Although correlation analysis tells us about the relationship between the two variables, it does not explain its cause and effect. There is a positive correlation between the two variables if they are both moving in the same direction, that is, both are growing or both are dropping. The two variables have a negative correlation if their changes are in the opposite direction.

RESULTS

Karl's Correlation coefficient was used to calculate the correlation coefficient between various physico-chemical parameters and planktons. In order to evaluate the status of water quality in bodies of water and the relationship between physicochemical properties, measurements of species diversity such as species richness and evenness were also investigated. Additionally, this investigation's findings show that several zooplankton species, including various rotifer, copepod, and cladoceran species, were seen in the water body.

CONCLUSION

The study describes the outcomes of fluctuations in physico-chemical parameters, phytoplankton, zooplankton, and variety of benthic fauna on a monthly basis. To encourage sustainable management and the best possible use of aquatic resources, appropriate limits for the pollution effect indicators must be established. All monitoring programs strive to protect the environment and its resources. In the Baglihar Dam reservoir, sixteen (16) different benthic species were found as a result of the current study. The benthic fauna consisted of three phyla: Mollusca, Arthropoda, and Annelida. There may be a connection between the presence of pollution-tolerant benthic species like *Chironomus sp., Physa, and Tubifex tubifex* and the influence of domestic and industrial waste flow into the reservoir. This study contributes to our knowledge of the water quality of the Baglihar Dam Reservoir by providing helpful information.

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