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RIVER GOMTI'S ICHTHYOFAUNA BIODIVERSITY, THREAT STATUS, AND CONSERVATION PRIORITY

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ABSTRACT

Life cycle features are intimately linked to the food habits of a particular person. Depending on the quantity and kind of food they choose, fish may develop, reproduce, survive, and play an important part in the aquatic ecology. Feeding rivalry among fishes is one consequence of fishes' preference for fish over other common foods. Gut content analysis was used to establish the diets of carp and catfish in this research. Interspecific and intraspecific competition is evident in the fish species' diets based on the wide range of food items they consume. However, it was shown that carp and catfish fishes may be capable of adapting to an omnivorous diet despite preferring phytoplankton over zooplankton and other prey.

1.INTRODUCTION

The river's ichthyofauna is changing rapidly and is always in peril because of human activities such as habitat destruction, pollution, over-exploitation, and others. There is also a significant risk that the introduction of alien species will have a significant impact on native fish species. Anthropogenic activities are most likely to harm the river. Large rivers and other water bodies are affected by these activities, which alter their habitat values. As a result, many aquatic species are vulnerable or perhaps extinct as a result of this. Using fish as bioindicators has been recommended by numerous researchers, and it is widely accepted that fish is an excellent indicator of river ecosystem health. There is a lot of emphasis on stressors and the detrimental impact they have on fish by other researchers. There is evidence that fishes react to environmental changes, whether natural or created by humans. Any water body's local environmental conditions have a significant effect on the long-term viability of its ichthyofauna. The Gomti, a tributary of the Ganga, runs through Lucknow, the state capital of Uttar Pradesh, for roughly 12 kilometers.

Lucknow's primary water supply is the Gomti River. River Fulhar Jheel originates from a natural lake in Uttar Pradesh's wooded area, around 50 kilometers south of the Himalayan foothills. The river, which flows through the state's central and eastern regions, travels a total of 730 kilometers until joining with the Ganga at Varanasi. Tributaries of the Gomti river are the Sai (Reth), Luni (Kalyani), Katana (Sarayan), and Reth rivers. Sewage from 26 drains in the Lucknow region flows into the river. Gomti also collects trash from the Sitapur industry before Lucknow. The Gomti River's extreme pollution is now well-known. Some accounts say the Gomti River is polluted from multiple sources, including effluent from sugar and distillery plants, fertilizer and pesticide runoff, medical waste, and sewage. As well as agricultural and industrial trash, the river is also polluted with a wide range of other pollutants. The situation is becoming worse as the population of Lucknow grows. The Gomti River has seen widespread fish death owing to a variety of human-caused problems, including habitat destruction and sewage contamination. There has been an increase in biomass along the canal as a result of a significant decline, according to a study from the Uttar Pradesh Pollution Control Board (UPPCB). One of the most varied and vulnerable groups of vertebrates is freshwater fish.

Native fish species are being harmed by the introduction of exotic fishes, which have been brought for a variety of reasons. In addition to pollution, the presence of foreign fishes is thought to represent harm to the river's biodiversity. To keep track of all fish varieties, this is a must-have. In addition, it is necessary to keep current a list of previously recognized species. Freshwater fish species in the Gomti River will benefit from this information. For the preservation of freshwater biodiversity, detailed fish assemblage records are essential. The ichthyofauna of many water bodies has been researched by several researchers, yet there is always room for improvement. The Gomti river's ichthyofauna has not been well studied. As a result, this research has been conducted in Lucknow, India, to assess the freshwater fish of the Gomti river.

2.ECOLOGICAL STATUS, CONSERVATION PRIORITY, AND BIODIVERSITY OF THE FISHES OF THE GOMTI RIVER

As one of the newest frontiers in environmental biology, biodiversity and ecosystem function have a lot to learn from each other. Biodiversity encompasses all types of life on the planet in a condensed form. Diversification among species and ecological complexes, as well as variety within and among living creatures, is referred to as "ecological complexity." The three degrees of biodiversity may be summarised as follows:

1. For example, the quantity and diversity of living creatures.
2. The term "genetic diversity" refers to a species' genetic variance.
3. E.g. the range of habitats, biological communities, and ecological processes that take place inside the biosphere.

In recent years, an increasing number of recommendations and strategies have been developed to aid in the conservation of biological diversity in terrestrial and aquatic habitats across the world. Freshwater fishes are the most abundant and diverse vertebrate species on the planet, yet they are also the most threatened. In terms of freshwater mega biodiversity, India has the ninth-highest concentration of fish species diversity in the world, according to the International Union of Conservation of Nature. According to a study, Indian waterways are home to around 2118 finfish species that dwell in a variety of habitats including marine, brackish, warm, and cold water settings, with 672 of those fishes inhabiting freshwater ecosystems. The Bayreuth (Germany) international conference on the "General state of knowledge on Biodiversity," which took place in October 1991, inspired organizations all over the globe to work on biodiversity conservation and research. The direct research approach of monitoring and collecting information on indicator groups of species may prove to be a one-stop solution to the problems associated with gauging the richness and complexity of the ecosystem in this nation if it is successfully implemented. When it comes to maintaining the region's Ichthyofauna as well as devising conservation measures, it is critical to have a good understanding of the diversity of fish there. Many criteria for this activity are lacking or non-existent, as are guidelines for selecting and surveying various types of ecosystems indicator groups, among other things.

3.IN THE RIVER GANGA, FRESHWATER FISH BIODIVERSITY (INDIA)

As a result of extensive human intervention in India's riverine environment, many freshwater fish species have experienced habitat loss and degradation, placing them in precarious circumstances, particularly in the Ganges basin, which has a high demand for freshwater. This was exacerbated by the introduction of new species and diseases, both of which had a long-term influence on the natural population's survival. Water conservation and management activities in most countries, including India, are hampered by a lack of awareness of the biota in the river system. Thus, conservation planning for freshwater biodiversity is being carried out over the globe via research and study results.

The Ganges River, one of the world's most holy rivers, travels through an area of 1,060,000 square miles, making it the world's fifth-largest river basin in terms of size. A glacial ice cave is known as 'Gaumukh' (30550 N/7070 E) rises to a height of 4,100 meters above sea level in the Garhwal Himalayas and empties into the Bay of Bengal. From the glacier's ancient source in India, the main channel stretches for about 2,550 km in length. It has the fifth-highest annual discharge in the world's water supply, with an average yearly discharge of 18,700 m3 /s. During the monsoon season, the Ganges River supplies more than 25.2 percent of India's water resources. The river has a maximum flow of around 468.7 million cubic meters per second, or 1,625 million tonnes of sediment sent downstream by the river. As a result of the basin, more than 300 million people reside in India, Nepal, and Bangladesh combined. Because all tributaries of the Ganges are controlled by barrages that redirect flow for agricultural purposes, fish catch and species variety have declined, leading to the extinction of many fish species in the region. Furthermore, the Ganges River is home to 29 freshwater fish species, all of which were discovered during this study and have recently been categorized as vulnerable or endangered by the International Union for Conservation of Nature. Rivers must be maintained and restored to their full capacity to sustain the long-term development of the Indo-Gangetic region. Several authors have researched the Ganges' fish species and its tributaries, but the information they provided was primarily focused on the river's systematic, biogeographical, and ecological characteristics, which left them unable to address the most pressing conservation issues at the time. Following the publication of these data, suggestions were

made on how freshwater fish biodiversity should be protected and managed. The investigation also looked at the risks to the species' continuing survival that may be posed by human activities.

4.RIVER GOMTI BENTHIC DIVERSITY ABOUT THE CURRENT ENVIRONMENT

Even though it is common information, many individuals do not take into account the detrimental consequences of dumping pollutants into our seas and waterways. When the waste load exceeds the ability of the aquatic ecosystem to absorb it, pollution becomes a significant problem. The aquatic environment has a high absorption capacity. Aquatic pollution has emerged as a significant issue for humanity, given that living resources constitute a critical source of animal sustenance. By degrading the quality of rivers in industrialized regions, we have significantly restricted our capacity to extract food from polluted environments. In the Indian city of Lucknow, there has been an increase in urbanization and industrialization. The city has a population of 3.68 million inhabitants. Every day, the city of Lucknow creates over 325 million gallons of sewage and industrial waste. Raw sewage from the nearby regions of Sakata, Pata, and Nagaria, as well as sewage from Gaooghat, is treated at one treatment plant in Gaooghat with a daily capacity of 42 million liters per day, which includes sewage from Gaooghat. As of now, there are five pumping stations along the River Gomti, which dumps a significant quantity of the city's untreated sewage into the water body.

Pollution, which has a significant impact on aquatic life and has the potential to destabilize the ecosystem, causes a tremendous lot of stress. Each of the trophic levels of the aquatic food chain is interconnected in such a manner that energy may be transferred from one to the next. A consequence of this is that any change that occurs at any one level will have a ripple impact across the ecosystem. Benthic organisms have long been recognized for their use in pollution monitoring systems, which try to measure the overall health of a river's water quality and quantity. For several reasons, the benthos is used as an indicator of ecosystem change to detect changes in the environment. A toxic substance may accumulate in the benthos for a lengthy period as a result of the benthos' long life history. In the third and last category, species found inside the in-fauna symbolize not only the current condition of affairs but also those of days gone by. They live near sediment, which increases their exposure to a variety of toxic substances. In history, this was the first time that a particular species of benthos was designated as an indicator organism. Oligochaetes, which may be found in and on the river's bottom, are a great indication of the benthic habitat of the waterway. This led to the present investigation of the zoo-benthic diversity of the River Gomti in Lucknow, which is still ongoing today.

5.RELATIONSHIP BETWEEN LENGTH AND WEIGHT, AS WELL AS THE CONDITION FACTOR OF SELECTED RIVER GANGA FISH SPECIES

Managers and researchers in the fisheries sector often rely on biometric connections to transform data collected in the field into meaningful indicators. The length-weight relationship (LWR) of fishes is essential in both fisheries and fish biology because it provides a quantitative correlation between length and weight in a single measurement. Because of this, as well as other life-cycle events like metamorphosis, growth, and the onset of maturity, the LWR may be used to discriminate between different taxa of plants. The LWR varies in response to these life-cycle events as well as other factors. Aside from that, LWR may be used to generate yield equations that can be used to calculate fish landings and compare populations across time and distance. This parameter set can be used to determine the weight of each fish based on its length, construct condition indexes (CI), compare the life histories and morphology of populations belonging to different geographical locations, and analyze ontogenetic allometric changes. These parameters can be used to determine the weight of each fish based on its length, construct condition indices (CI), and compare the life histories and morphology of populations belonging to different geographical locations. Conservation of commercially important fish species may be possible as a consequence of the empirical relationship between fish length and weight discovered by researchers.

Fulton's condition factor is often used by researchers in the fields of fisheries and fish biology (K). The weight-to-length connection is used to calculate this variable, which is used to describe the "condition" of a fish. The K value of a fish shows the state of the fish's sexual development, the availability of food sources, the age of the fish, and the gender of the fish in certain species. In addition, FishBase is reliant on these relationships. Aside from providing critical information on temperature and climatic changes, data on length and weight may also give important information on the development of human subsistence habits across time. There are

regression data available for the majority of freshwater species in Europe and North America, but there are no comparable data available for the majority of tropical fish. Currently, there is only a little amount of study on LWRs and fish condition indices in the Ganga basin. There have been no previous reports of length-weight and condition factors for many of these species in the rivers that were considered for this study. There are four fish species for which there is no information in the Fish Base database on their LWR or condition factor (S. seenghala, C. Garcia, P. taste, and C. nama). This study provides a baseline of information on a range of essential ornamental and food fish species, which will be useful in management and conservation efforts in the future.

6.GOMTI-GUJARTAL FISH DIVERSITY IN JAUNPUR

Many aquarists believe that the "Biodiversity" idea provides a scientific basis for their goal to maintain natural ecosystems. It is generally necessary to have a broad aquaregime network to conserve fish variety, although this does not always restrict the usage of resources elsewhere. Over the last 30 years, freshwater biodiversity has deteriorated at a greater rate than either terrestrial or marine species. A fundamental understanding of fish variety is essential for fishermen, fish growers, and planners. The aquatic ecosystem's "ichthyological diversity" includes a wide range of fish species. It is also crucial (whether for agricultural, fisheries, forestry, or evolutionary processes) for ecosystem stability, environmental quality protection at large, and an appreciation of the inherent value of all species on the planet to have a high level of biodiversity.

Several previous research has shown a link between biomass output and species abundance. When it comes to an ecosystem's species variety, there is a direct correlation between the quantity of living and nonliving organic matter present. When it comes to species diversity, however, it is less dependent on the qualities of one environment than on the interactions across ecosystems, such as the movement of living animals across water bodies. Such transfer has the effect of increasing genetic diversity via a substantial exchange of "information." Because the freshwater environments they inhabit are critical to their survival, the genetic imprinting of different populations of lotic and lentic fish species is necessary.

The idea of functional diversity is more closely linked to ecosystem stability and stressors, physical and chemical elements that influence population dynamics in aquatic ecosystems, while species diversity is a population feature. However, little research has been done in India and the North-East in particular on how fish populations change, how ichthyol variety is influenced by climate change, or how fish species are conserved within aquatic ecosystems in general, as compared to other parts of the globe.

There is a long history of specializing in the management of habitats that sustain fishing. Many of the freshwater fisheries management practices have been influenced by the tendency toward limited automation in gears and crafts and the rearing of fish in huge monocultures.

6.1 Why is Aquatic Biodiversity Important?

In addition to their economic and aesthetic worth, aquatic biodiversity plays a significant role in sustaining and supporting the general health of the ecosystem. Since the dawn of time, humans have relied on aquatic resources for a variety of reasons, from food to medicine to materials to leisure activities like fishing and tourist attractions. Food, materials, and breeding grounds for aquatic creatures are all dependent on the wide variety of aquatic environments and resources.

Freshwater and marine ecosystems are suffering from a decline in aquatic biodiversity due to a variety of factors including overexploitation, pollution from urban regions and agricultural areas as well as habitat loss and change via damming. Thus, precious aquatic resources are more vulnerable to both natural and man-made environmental changes, as a consequence. As a result, if we are to keep nature in balance and ensure that resources will be available for future generations, we must implement conservation policies to save aquatic life.

Precious Heritage: The Status of Biodiversity in the United States, a report by the Nature Conservancy, demonstrates the ongoing loss of aquatic biodiversity in the United States. As an example of the devastation an ecosystem can suffer from a lack of biodiversity, the Great Lakes National Program Office (GLNPO) at the US Environmental Protection Agency (EPA) has a report prepared by The Nature Conservancy entitled "The Conservation of Biological Diversity in the Great Lakes Ecosystem: Issues and Opportunities."

6.2 Threats to Aquatic Biodiversity

Species are disappearing at an alarming pace as a result of human activity. Species extinction is expected to occur at a rate of 1 to 11 percent every decade between 1975 and 2015. There is a greater danger of extinction for aquatic species than there is for mammals and birds. Massive resource depletions have a ripple effect across the environment, affecting everything from food and medicine to industrial materials.

Even though freshwater and marine ecosystems suffer comparable stressors, there are significant disparities in the intensity of these threats. New dams and water diversions have been highlighted as the main threats to freshwater habitats due to agricultural and urban runoff. The Environmental Defense Fund has recognized the need for sustainable fisheries as the most important issue in maintaining marine biodiversity. Overfishing is the biggest danger to marine habitats.

Development in urban areas and resource-based businesses such as mining and forestry, which damage or degrade natural ecosystems, are also dangers to aquatic variety. The biodiversity of aquatic organisms is also endangered by pollution of air and water, sedimentation and eroding, and climate change.

7.TEMPORAL AND ENVIRONMENTAL FACTORS THAT INFLUENCE FISH COMMUNITY STRUCTURE IN TROPICAL STREAMS FROM TWO DIFFERENT REGIONS

Freshwater ecosystems are among the most vulnerable environments on the planet because of the rising human strain and worsening water quality. The impact of natural and anthropogenic causes on aquatic biodiversity has been studied extensively in recent years, both on a global and local scale. To better understand diversification trends, these studies look at both local and global factors. However, little research has examined fish faunal patterns in tropical streams in southeast Asia, such as India, and the significance of environmental and human-induced effects on community assemblages. In light of the present human alterations to freshwater ecosystems, this understanding is particularly pertinent today. It was our goal to find out what environment variables are similar to these two distinct ecoregions in India's central and northeastern regions that influence fish community structure, therefore we looked at the patterns of diversity and Spatio-temporal dynamics in fish communities there. Our research focused on the correlations between various environmental variables and fish diversity indices, and we developed prediction models based on multiple linear regression.

Ecological variables influencing diversity and distribution patterns cannot be determined since the processes behind community assembly and the conditions that contribute to habitat degradation might vary from place to region. Environmental variables such as temperature and climate change, as well as physio-chemical parameters, have been shown to have a significant role in a wide range of studies. More recently, freshwater ecosystems have been more threatened than terrestrial ones, and fish are now being recognized as significant markers of ecosystem health. Habitat deterioration, invasive species, and human activities like dams, pollution, and stream alteration are among the primary drivers of biodiversity loss. These causal causes need to be evaluated individually to address biodiversity decrease concerns. The interaction between geographical and temporal variables drives abundance and richness patterns, according to studies on local and regional factors. Studies of various scales and with different functional units (species/functional features) and levels of disruption will provide different results, but it's impossible to generalize without considering the variables mentioned above. Species richness is influenced by a wide range of environmental variables at various spatial scales in freshwater ecosystems, according to research (for example, in Amazonian streams and European streams). Some studies have shown that regional variables influence local factors, which in turn influence local species assemblages more strongly than other factors. Understanding patterns of community organization across biological areas may be aided by standardized procedures for collecting information on fish diversity and abundance coupled with data on local and regional environmental characteristics.

Small and medium-sized stream environments in nations like India and China lack detailed information on freshwater fishes, such as species occurrence and distribution. According to recent estimates, India has more than 2,200 freshwater fish species in its waters, making it one of the most endemism-rich nations in the world. Many studies on fish variety in the Indian subcontinent have focused on large rivers, but little attention has been paid to lower-order streams. It's been shown that lower, higher-order streams in the Himalayas and the Western Ghats, two biodiverse regions, contain a wide range of biodiversity and environmental factors. Other than in a few isolated studies, data from many other places is scarce. For the most part, freshwater fish research focuses on species that are essential to the fishing industry. Concerns about environmental degradation

affecting aquatic habitats are growing across the world. To build appropriate management and conservation strategies for tropical aquatic ecosystems within India, local and regional variables must impact community structure be understood. It is our goal to describe the variety of stream fish populations across two different landscapes, as well as to identify environmental factors that influence their distribution patterns. The following questions guide our investigation of freshwater fish ecosystems in lower-order streams: Are there differences in variety amongst landscapes that are located in the same general geographic area? 2) Do these environments share the major factors of species richness and diversity? 3) Do seasonal variations influence the richness and variety of fish communities?

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