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Studies on heterogeneity of hydrographic macro invertebrate fauna of Koshi River

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Abstract- The aquatic ecosystem's overall biodiversity can be measured using the hydrographic macroinvertebrates. Numerous researchers have emphasised the significance of bottom fauna as a connection in the energy flow from primary productivity to fish output in the lotic ecosystem's productivity. The results of a thorough investigation of the variety of macro- hydrographic invertebrate fauna in the Koshi River near Saharsa, Bihar have been done in the present study. The current study was worked on for a full year, from November 2021 to October 2022. Twenty different species of macroinvertebrate were identified over the course of the study. This research paper presents a comprehensive study on the hydrographic macro invertebrate diversity and distribution patterns in the Koshi River basin. The Koshi River, a major river system in the region, supports a diverse range of fish species that play important ecological and economic roles. This study aims to document the heterogeneity of hydrographic macro invertebrate fauna, analyze their distribution patterns, and discuss the potential factors influencing fish diversity in the Koshi River.

Key words:mperature, Okra, Spotted bollworm, Lepidoptera,

INTRODUCTION

Indian, Chinese and Nepalese territory are all crossed by the transboundary Kosi or Koshi river. In Tibet and Nepal, it drains the southern and northern Himalayan slopes, respectively. Averaging 74,500 km^2 (28,800 sq mi), the Kosi River drains land in Tibet, Nepal, and Bihar. It is 720 km (450 mi) long. Previous studies suggested that the river's path had changed over the previous 200 years, moving more than 133 km (83 mi) from east to west. The moving was random and fluctuating in character, however, as shown by an analysis of 28 historical maps from the period of 1760 to 1960, which showed a minor eastward trend for a long time.

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The basin has a significant potential for the production of hydropower and is crucial for the irrigation of areas downriver. But the basin is very vulnerable to erosion, sedimentation, and other natural disasters, which could get worse with changes in the climate and other factors. The constant supply of water from the Koshi River and its tributaries is necessary for agriculture, hydropower production, and other important activities. In addition, the freshwater ecosystems in the basin are used for irrigation, drinking water treatment, and fisheries.

Aquatic creatures which literally means "bottom-dwelling", without backbones that are large enough to be seen without a microscope are known as hydrographic macroinvertebrates. Snails, worms, crustaceans, larval stages of water insects like nymphs of the stonefly and

mayfly are among them. Hydrographic macroinvertebrates spend a portion of their life in or near bodies of water. Hydrographic macroinvertebrates are typically found buried in the sand and silt at the bottom or stuck to rocks, vegetation, logs, and sticks. Hydrographic macroinvertebrates are potent water quality predictors. These species are less able to escape the consequences of pollution and sedimentation since they are less mobile than fish. In order to survive, many species of mayfly nymphs, caddisfly larvae, and stonefly larvae need rapid, chilly water that is also well-oxygenated. In general, their presence indicates high-quality water. Hellgrammites, freshwater clams, and water pennies are some more species that are not tolerant to pollution.[1, 2]

They are trustworthy indicators since they live their entire or a large portion of their lives in water, are simple to gather, and have varying levels of pollution tolerance. Macroinvertebrates, unlike fish, have limited mobility, often survive for more than a year, are reasonably simple to identify in the lab, and respond to human disturbance in fairly predictable ways.[3] Macroinvertebrates can actually internalise the impacts of the stressors they are exposed to over time and in combination since they are unable to flee pollution. For many years, biologists have been examining the condition and make-up of hydrographic macroinvertebrate communities.

We can determine the biological health of a waterbody by analysing the variety and number of hydrographic macroinvertebrates there. Generally speaking, macro invertebrate species of a wide diversity and great number, including those that are intolerant of pollution, are supported by waterbodies in robust biological state. Only species that can tolerate pollution, or samples with very limited diversity or abundance, may point to a less healthy waterbody. The most complete indicator of the health of a waterbody is its biological status. The chemical and physical elements of a waterbody are normally in good shape when the biology of the waterbody is. In addition to hydrographic macroinvertebrates, fish and algae populations are examined by scientists to produce reliable estimations of biological state.

MATERIALS & METHODS:

Study Area: In the eastern region of the Indian state of Bihar, in the Saharsa District, is Saharsa, a city and municipal corporation. It is located close to the Kosi River's eastern banks. It serves as the divisional headquarters of the Kosi Division and the administrative centre for the Saharsa District.

Collection of samples: From the Koshi River, hydrographic macroinvertebrates were gathered. Bring the bottom sediment you've gathered as soon as you can to the lab. The residue was then placed in an enamel tray with a little amount of sugar solution (approximately 250 ml and 10 gms of sugar). The benthic species were picked up using a dropper and forceps, preserved in 70% alcohol, and identified using standard keys as a result of an increase in water density.

Table 1- Sampled species from Koshi River near Saharsa, Bihar

Sl. No.	ANNELIDA
1.	*Pristine aquiseta,*
2.	*Tubifex tubifex,*
3.	*Limnodrillus sp.*
4.	*Dero sp.*
	INSECTS
1.	*Tabanus larvae,*
2.	*Odonata nymphs,*
3.	*Chironomous tentum,*
4.	*Chironomous tendipetiformes,*
5.	*Limnophora larvae,*
6.	*Berosus larvae,*
7.	*Hydrocanthus iricolor,*
8.	*Pelocoris femoratus*
9.	*Notonecta sp*
10.	*Culex larva*
	GASTROPODA
1.	*Vivipara bengalensis,*
2.	*Faunus ater,*
3.	*Bellamya sp*
4.	*Pila globosa*

RESULTS & DISCUSSION

Numerous aquatic invertebrates are constrained to habitats with tight habitat requirements and little seasonal variation. They are essential for secondary production and the dynamics of energy flow in aquatic ecosystem maintenance. The majority of aquatic ecosystems are home to an abundance and diversity of invertebrates, which are also relatively simple to collect and study. Benthic macroinvertebrates have a significant impact on the nutrient cycle, primary productivity, material degradation, and movement. Annelids, insects, and gastropods were among

the benthic macroinvertebrates that were gathered for the current piece of research. There were 20 species total, divided into four main groups. There are 6 species of Annelida, 10 species of insects, and 4 species of gastropods. The Koshi River included more *Limnodrillus* and *Dero* species than any other Annelid species. Insects such as *Chironomous* larvae, an indicator species that reveals how dirty the ecosystem is, were abundant in Koshi River. *Odonata, Notonecta, Gerris* spp. and *Chironomid* larvae were also dominant.

Life and water are inextricably linked in a certain way. It is essential for the existence of all living things because it is the source of all life. Rivers are important freshwater systems with varying physicochemical compositions that are essential for the survival of aquatic life. A severe threat to both civilization and the survival of flora and animals has been posed by the alteration of the quality and appearance of natural water resources. Additionally, *Melania* spp. from Santhal Pargana, Bihar, was described by Arvind and Chandan (1999)[4] as a useful bioindicator of sewage-borne severe pollution and hypereutrophication. Numerous aquatic invertebrates are constrained to habitats with tight habitat requirements and little seasonal variation. Others are more adaptable and can endure in a variety of environment types.[5] The bottom fauna of some contaminated rivers were researched by Purdy (1926)[6], who came to the conclusion that *Limnodrillus* favours heavily polluted environments. Additional research has revealed a connection between elevated Oligochaet and Chironomid population densities and organically polluted lotic habitats.[7]

CONCLUSION

According to the study, the number of indicator species including *Chironomous* larvae and *Limnodrillus*, in the Koshi River suggests that the ecosystem is contaminated. Aquatic ecosystems that support life are threatened by anthropogenic use of freshwater for a variety of purposes, making planned development the only option accessible to emerging nations to prevent environmental deterioration or resource depletion

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