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STUDY OF MORPHOMETRIC PARAMETERS AND MERISTIC COUNTS OF MAHSEER IN NARMADA RIVER OF JABALPUR DISTRICT

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Abstract: This study on Mahseer fish (*Tor tor*) from the Narmada River presents a comprehensive analysis of morphometric and meristic parameters. The morphometric data reveal a consistent and proportional increase in body measurements such as total length, fork length, and fin lengths across different sampling sites, suggesting variations in growth patterns and potential environmental or genetic influences. The meristic counts, including fin rays and scales, are crucial for species identification and understanding population dynamics. Previous research supports the observed positive correlation between body length and morphometric parameters, indicating that as Mahseer grow, their body proportions and features also increase. This data is essential for assessing the health, development, and ecological adaptability of Mahseer, providing a foundation for further research and conservation efforts.

INTRODUCTION

Morphometric studies involve the measurement and analysis of various physical dimensions and proportions of organisms. These studies are fundamental in biological research for several reasons. Morphometric measurements such as total length, standard length, body weight, and condition factor are key parameters used to distinguish between species or variants within a species (Naeem *et al*., 2010). These measurements provide quantitative data that help researchers identify and classify specimens accurately, contributing to taxonomic clarity and understanding of species diversity (Bagenal, 1978).

The study of morphometrics in Mahseer is crucial for understanding how these fish adapt to diverse habitats ranging from fast-flowing rivers to calm lakes. For instance, Mahseer inhabiting swift currents may develop streamlined bodies to reduce resistance and enhance swimming efficiency, while those in slower waters might exhibit broader, more robust forms to support different foraging behaviors and predator avoidance strategies. This ability to adapt morphologically to varying water conditions ensures that Mahseer can exploit a wide range of ecological niches, enhancing their survival and reproductive success. The physical diversity observed within a single species underscores the Mahseer's evolutionary

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flexibility, enabling it to thrive in a variety of aquatic environments **(**Hora and Mukerji, 1936; Nautiyal and Lal 1988; Johal and Tandon 1989**;** Bhatt, 1997**).**

Additionally, morphometric differences can shed light on the ecological roles that various Mahseer populations play within their environments. Variations in mouth size and shape, for example, might indicate specialization in different types of prey, ranging from small invertebrates to larger aquatic organisms. These physical traits are not only vital for the fish's survival but also influence the structure of the aquatic community by regulating prey populations and contributing to the overall health of the ecosystem. Larger, more powerful Mahseer might be more adept at preying on sizeable, elusive targets, while smaller individuals could specialize in feeding on abundant, smaller prey items. This dietary specialization can help maintain a balanced ecosystem by preventing the overpopulation of certain species and promoting biodiversity. Morphometric data reveal variations in body shape, size, and proportions among individuals within a species. Variations in morphometric traits can be associated with adaptations to (Naeem *et al*., 2010).

MATERIAL AND METHODS

A. Study Area

The study area, which extends from Bedhaghat 23.1306° N, 79.8024° E, Tilwaraghat 23.1079° N, 79.8758° E, Gwarighat 23.1100° N, 79.9277° E and Lametaghat 23.1118° N, 79.8356° E opens up to the Narmada river. It is segmented into four sites with proportionate distances along a 20 Km stretch.

B. Sample Collection and Analysis:

Fish samples were collected from all designated zones within the study area with the assistance of locally hired professional fishermen and fish anglers. This approach ensured that the samples were representative of the local fish populations and that the collection methods were tailored to the specific conditions of each site. The collection tools included gill nets, cast nets, and drag nets (Mahajal), which are effective in capturing different sizes and species of fish.

Once collected, the fish samples were carefully preserved in a solution of 10% formalin to maintain their physical integrity. These preserved specimens were then stored in specimen jars for further analysis. The study of morphometric (size and shape) and meristic (countable features such as fin rays and scales) parameters of the fish was conducted on these preserved samples, providing detailed insights into the population structure, health, and biodiversity of the fish communities within the Narmada River.

C. Morphometric and Meristic Count

The selected morphometric and meristic parameters of the fish samples were meticulously measured using precise and reliable instruments to ensure the accuracy of the data. The weight of each fish was determined using an electronic balance (Wensar Weighing Scales Limited, model no. PGB 200), which provides high-precision measurements, crucial for scientific analysis where even slight variations in weight can be significant. Morphometric parameters, such as total length, standard length, and other linear dimensions, were measured using a digital vernier caliper for smaller dimensions, providing accuracy to the nearest millimeter, and a meter tape for larger measurements, ensuring that even minute variations in size were accurately recorded.

All measurements and counts were conducted in the laboratory under controlled conditions, adhering to established protocols and methodologies outlined by authoritative sources, including Day (1875–78), Talwar and Jhingran (1991), and Jayaram (2010). These references provided a standardized framework for the collection and analysis of morphometric and meristic data, ensuring consistency, reliability, and comparability across the study. The rigorous application of these standardized methods ensures that the data collected is both accurate and suitable for further statistical analysis, contributing to the robustness of the study's findings.

RESULTS AND DISCUSSION

The study of Mahseer fish from the Narmada River involved detailed morphometric and meristic analyses. The morphometric data, summarized in Table 1, show a consistent and proportional increase in various body measurements, such as total length, fork length, and fin lengths, across different sampling sites. This data helps in understanding growth patterns and potential morphological differences among Mahseer populations, which could be influenced by environmental or genetic factors.

Table 1. Morphometric measurements of mahseer fish species from Narmada River (Mean±S.D.)

Morphometric Measurement	Range	Mean±S.D
Weight (g)	890–1885	1352.5±21.63
Total Length cm	38–51	44.5±2.51
Fork Length	24.5–30	27.25±2.26
Standard Length	32.4–44.2	38.3±2.14
Pelvic Fin Length	3.5–4.2	3.7±0.55

Pelvic spine length	2.9–3.9	3.4±0.55
Pectoral fin length	3–3.9	3.45±0.33
Caudal fin length	5.2–6.7	5.85±0.34
Length of Dorsal fin base	2.2–3.8	3.25±0.56
length of anal fin base	1.4–2.5	1.9±0.36
Dorsal fin length	4.4–5.8	4.95±0.47
Upper jaw length	2.2–3.7	2.95±0.66
Lower jaw length	1.2–2.5	1.95±0.45
length of caudal peduncle	4.7–5.9	5.20±0.41
Body Depth	8–9.5	8.75±0.53
Maxillary barbless	2 pair	2 Pair
Snout Length	1.4–2.7	2.25±0.55
Eye diameter	0.9–1.5	1.25±0.18
Head Length	3.9–5.4	4.6±0.52
Depth of Caudal Peduncle	2.3–3.7	2.95±0.56

Additionally, meristic counts, as outlined in Table 2, were recorded for features such as fin rays and scales, which are crucial for species identification and understanding population dynamics. These counts provide insights into the anatomical characteristics of Mahseer and help differentiate this species from others. The study's findings are valuable for further research and conservation efforts.

Table 2. Meristic Counts of mahseer fish species from Narmada River (Mean±S.D.)

Counts	**Mahseer (Range)**
Dorsal fin ray	12(3/9)
Anal fin ray	8(2–3/5)
Caudal fin ray	19
Pectoral fin ray	19
Pelvic fin ray	9
lateral line scale	22–26
Above Lateral line Scale	$4_{1/4}$
Below lateral line scale	$2_{1/2}$

The study of morphometric parameters in fish reveals a significant correlation with body length, as evidenced by Ujjania *et al*. (2012). Their research indicates that as fish length increases, there is a corresponding increase in various morphometric parameters, such as body depth, head length, and fin dimensions. This positive growth relationship underscores the importance of these measurements in assessing the overall health and development of fish. Such data is crucial for understanding the growth patterns, health status, and ecological adaptability of fish species in their natural habitats.

Badkur and Prashar (2015) found a positive correlation between various morphometric parameters and the total length of mahseer (*Tor tor*) in the Narmada River. This observation is consistent with earlier studies by Nautiyal and Lal (1988), Bhatt (1997), and Johal *et al*. (2003), which also demonstrated that as the length of *Tor putitora* increases, specific morphometric parameters like body proportions also increase, indicating overall growth and changes in body structure.

CONCLUSION

Environmental factors, including temperature and water movement, can influence these parameters, impacting growth and developmental traits. Understanding these relationships is crucial for fish taxonomy, ecological studies, and conservation efforts, providing valuable information on fish growth patterns and population dynamics. The study on mahseer (*Tor tor*) in the Narmada River highlights a distinct relationship between fish length and morphometric parameters. As fish length increases, morphometric dimensions such as body size and proportions show a strong positive correlation with total length, indicating that larger fish exhibit proportionally larger morphometric features. In contrast, meristic counts like fin rays and scales remain constant across various length groups, suggesting that these traits are stable and less affected by size changes.

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