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Morphometric and meristic analysis of *Oreochromis mossambicus* from Nira river of Baramati tehsil of Maharashtra

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Abstract
The ichthyology encompasses a vast array of disciplines, each contributing to our understanding of the diverse aquatic ecosystems that these creatures inhabit. Among these disciplines, morphometric and meristic analyses stand out as fundamental tools for researchers seeking to unravel the intricate details of fish morphology and taxonomy. This present study carried out to analyze morphometric including total length (TL), fork length (FL), standard length (SL), pre-anal length (PAL), pre-pectoral length (PPL), pre-pelvic length (PVL), pre-dorsal length (PDL), head length (HL), body depth (BD), eye diameter (ED) and pre-orbital length (POL); and meristic characters including dorsal fin rays (DFR), anal fin rays (AFR), pectoral fin rays (PCFR), caudal fin rays (CFR) and pelvic fin rays (PVFR) of *Oreochromis mossambicus* from the Nira river of Baramati tehsil of Maharashtra.

Keywords: *Oreochromis mossambicus*, morphometric, meristic, fin rays, etc.

Introduction
The study of fishes, ichthyology, encompasses a vast array of disciplines, each contributing to our understanding of the diverse aquatic ecosystems that these creatures inhabit. Among these disciplines, morphometric and meristic analyses stand out as fundamental tools for researchers seeking to unravel the intricate details of fish morphology and taxonomy. These analyses offer quantitative insights into the shape, size, and countable characteristics of fishes, shedding light on their evolutionary history, ecological adaptations, and taxonomic relationships (Sidiq *et al*., 2021) [8].

Morphometric Analysis serves as a cornerstone in the field of fish morphology, focusing on the quantitative measurement and analysis of the external features of fishes. By meticulously measuring various anatomical landmarks on the body, such as the lengths of fins, the depths of the body, and the angles of specific structures, researchers can capture the subtle nuances of fish morphology with precision (Kosai *et al*., 2014 [4]; Kumaladewi *et al*., 2022) [5]. These measurements, obtained through standardized techniques, form the basis for geometric morphometric analyses, where mathematical algorithms are employed to analyze the spatial coordinates of the selected landmarks. Through statistical techniques like principal component analysis (PCA) and cluster analysis, researchers can discern patterns of morphological variation within and between fish populations, unlocking insights into species differentiation, adaptive evolution, and ecological diversification (Simon *et al*., 2010 [9]; Azad *et al*., 2020) [3].

Meristic Analysis, in contrast, focuses on the enumeration and analysis of discrete, countable characteristics of fishes. These characteristics, often referred to as meristic traits, include counts of structures such as scales, fin rays and vertebrae. Meristic analysis entail meticulous counting of these traits from specimens collected in the field or preserved in museum collections. By comparing the frequency distributions of meristic characters among different populations or species, researchers can discern patterns of variation and identify diagnostic traits for taxonomic classification (Mukherjee *et al*., 2021 [6]; Kumaladewi *et al*., 2022) [5].

This present study was conducted for analysis of morphometric and meristic characters of *Oreochromis mossambicus* from the Nira river of Baramati tehsil of Maharashtra.

Methodology
Model organism
The *Oreochromis mossambicus* is selected as a model organism in present project. O. mossambicus is native to freshwater habitats in Southeastern Africa, including rivers, lakes, and coastal lagoons. It has been introduced to various regions around the world for aquaculture and has established invasive populations in many countries with suitable habitats, including parts of Asia, Australia, and the Americas. It thrives in diverse environments, from brackish coastal waters to freshwater rivers and lakes.

Mozambique tilapia is an important species in aquaculture due to its fast growth rate, tolerance to a wide range of environmental conditions, and palatability. It is farmed extensively in many countries for food production, both in freshwater and brackish water systems. In addition to its economic importance in aquaculture, Mozambique tilapia supports small-scale artisanal fisheries in its native range and in areas where it has been introduced (Arumugam *et al*., 2023) [2].

Selection of study area
The Nira River is selected as a study area for present work. The Nira River flows in a southeasterly direction through the Baramati region, meandering through agricultural lands, villages, and towns along its course. It eventually joins the Bhima River which is another major river in Maharashtra, near the town of Nira region. The confluence of the Nira

and Bhima river is an important geographical landmark in the region. It has been a lifeline for generations of people living along its banks, providing water for drinking, irrigation, and other domestic purposes. Additionally, the river offers recreational opportunities such as boating and fishing for residents and visitors alike.

Sample collection

A total of 61 fish samples were collected from selected study area. All collected samples were further brought to laboratory for morphometric and meristic analysis.

Morphometric and meristic analysis

The morphometric characteristics taken into consideration were total length (TL), fork length (FL), standard length (SL), pre-anal length (PAL), pre-pectoral length (PPL), pre-pelvic length (PVL), pre-dorsal length (PDL), head length (HL), body depth (BD), eye diameter (ED) and pre-orbital length (POL) (Mulyani and Budijono, 2020) [7]. The morphometric measurements were taken by using MGW Precision Digital Caliper 150mm/6" DIGE150.

The meristic characteristics taken into consideration were dorsal fin rays (DFR), anal fin rays (AFR), pectoral fin rays (PCFR), caudal fin rays (CFR) and pelvic fin rays (PVFR).

Statistical analysis

Statistical analysis for calculation of mean ad standard error was performed by using software PAST version 4.03.

Result and Discussion

Overall morphometric and meristic analysis showed that TL was about 20.8934 ± 0.3014 cm; FL was about 19.4328 ± 0.2789 cm; SL was about 16.8459 ± 0.2807 cm; PAL was about 12.4721 ± 0.1872 cm; PPL was about 5.6737 ± 0.1109 cm; PVL was about 6.7065 ± 0.1032 cm; PDL was about 6.4295 ± 0.1136 cm; HL was about 5.618 ± 0.0909 cm; BD was about 7.2344 ± 0.1008 cm; ED was about 1.3344 ± 0.0477 cm and POL was about 1.8049 ± 0.0463 cm (Table no. 1). Also Meristic characters showed that DFR, AFR, PCFR, CFR and PVFR were about 12.2951 ± 0.1244, 11.2459 ± 0.1229, 14.4754 ± 0.1061, 19.6393 ± 0.1998 and 12.21 ± 0.0938, respectively (Table no. 2).

Table 1: Morphometric analysis of *O. mossambicus* (n=61). Mean values are indicating mean ± standard error.

Morphometric character	Mean	Minimum value	Maximum value
Total length	20.8934 ± 0.3014	16.50	28.00
Fork length	19.4328 ± 0.2789	15.00	26.00
Standard length	16.8459 ± 0.2807	11.00	23.00
Pre-anal length	12.4721 ± 0.1872	10.00	16.50
Pre-pectoral length	5.6737 ± 0.1109	3.50	8.00
Pre-pelvic length	6.7065 ± 0.1032	5.00	9.00
Pre-dorsal length	6.4295 ± 0.1136	5.00	9.00
Head length	5.618 ± 0.0909	4.50	7.50
Body depth	7.2344 ± 0.1008	6.00	9.50
Eye diameter	1.3344 ± 0.0477	1.00	3.00
Pre-orbital	1.8049 ± 0.0463	1.00	2.50

Table 2: Meristic analysis of *O. mossambicus* (n=61). Mean values are indicating mean ± standard error.

Meristic character	Mean	Minimum value	Maximum value
Dorsal fin rays	12.2951 ± 0.1244	10.00	13.00
Anal fin rays	11.2459 ± 0.1229	8.00	12.00
Pectoral fin rays	14.4754 ± 0.1061	12.00	16.00
Caudal fin rays	19.6393 ± 0.1998	18.00	23.00
Pelvic fin rays	12.21 ± 0.0938	11.00	13.00

Table 3: Correlation matrix of morphometric analysis of *O. mossambicus*.

	TL	FL	SL	PAL	PCL	PVL	PDL	HL	BD	ED	POL
TL	1										
FL	0.96047	1									
SL	0.87726	0.89471	1								
PAL	0.88941	0.85244	0.83358	1							
PCL	0.74863	0.76913	0.7575	0.73642	1						
PVL	0.8539	0.84834	0.77983	0.82662	0.73121	1					
PDL	0.82483	0.83853	0.77313	0.75997	0.76747	0.72705	1				
HL	0.81052	0.78846	0.76648	0.75099	0.79683	0.77742	0.84481	1			
BD	0.83076	0.83987	0.806	0.8082	0.72367	0.73801	0.77761	0.73555	1		
ED	0.34324	0.3717	0.35556	0.26259	0.57591	0.42959	0.52036	0.60167	0.3541	1	
POL	0.34023	0.24644	0.20088	0.25426	0.09886	0.30569	0.10963	0.19182	0.13514	-0.1657	1

The correlation matrix analysis revealed that TL is more positively correlated with the FL, SL, PAL, PCL, PVL, HL and BD. Similar results were reported by Ahirwal *et al*., 2022 [1]. ED and POL has been found to be less positively correlated with each other (Table no. 3).

Conclusion

The present study has been carried out for detailed report on tilapia fish species from the Nira river of Maharashtra. The differences in morphometric and meristic characters of individual within same species were observed indicates that

developmental stage may have impact on morphometric and meristic characters. These findings will be helpful to the fisheries biologists of the region to study their population parameters and implement suitable management strategies to ensure the sustainable utilization of these resources.

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References

1. Ahirwal SK, Singh J, Sarma K, Kumar T, Bharti V, Kumar A. Morphometric Characteristics, Length-Weight Relationships, and Condition Factors of Five Indigenous Fish Species from the River Ganga in Bihar, India. J Appl Ichthyol, 2023, 1329222.
2. Arumugam M, Jayaraman S, Sridhar A, Venkatasamy V, Brown PB, Abdul Kari Z, et al. Recent advances in Tilapia production for sustainable developments in Indian aquaculture and its economic benefits. Fishes,2023:8(4):176.
3. Azad KN, Sarower-E-Mahfuj M, Iqbal T, Azad KN, Shafaq MAI. Differentiation of intraspecific phenotypic plasticity of elongate glassy perchlet, Chanda nama: Insights into landmark-based truss morphometric and meristic variations. J Adv Vet Anim Res,2020:7(4):585-96.
4. Kosai P, Sathavorasmith P, Jiraungkoorskul K, Jiraungkoorskul W. Morphometric characters of Nile tilapia (Oreochromis niloticus) in Thailand. Walailak J Sci Technol,2014:11(10):857-63.
5. Kumaladewi P, Mufasirin, Lastuti ND, Alamsjah MA, Darmanto W, Andriyono S. Morphometric and Meristic Analysis of Rasbora in East Java Province. J Aquac Fish Health,2022:11(3):298-305.
6. Mukherjee M. Morphometric and meristic analysis of Sillaginopsis panijus along with seasonal variation from Rupnarayan River, West Bengal, India. Biosci Biotechnol Res Commun,2021:14(4):1737-45.
7. Mulyani I, Budijono B. Morphometric and meristic analysis of Asian Knifefish (Notopterus notopterus) in Sail River, Pekanbaru Riau Province. J Ilm Biol Eksperimen Keanekaragam Hayati,2020:7(2):59-64.
8. Sidiq M, Ahmed I, Bakhtiyar Y. Length-weight relationship, morphometric characters, and meristic counts of the coldwater fish Crossocheilus diplochilus (Heckel) from Dal Lake. Fish Aquat Life,2021:29:29-34.
9. Simon KD, Bakar Y, Temple SE, Mazlan AG. Morphometric and meristic variation in two congeneric archer fishes Toxotes chatareus (Hamilton 1822) and Toxotes jaculatrix (Pallas 1767) inhabiting Malaysian coastal waters. J Zhejiang Univ Sci B,2010:11(11):871-9.