LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF *BOTIA LOHACHATA* (CHAUDHURI, 1912) FOUND IN KIRTHAR MOUNTAIN REGION, SINDH-PAKISTAN

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ABSTRACT

In the present study the length-weight relationship (LWR) and condition factors (*k* and *kn*) of *Botia lohachata* species had been investigated and explicated with exacting reference to the growth position and condition factor in hill stream. The specimens were collected from the Ranikot stream of Kirthar mountain region. Four (04) morphometric traits of 28 individuals were analyzed in present study. The mean total length and weight was observed 13.913±3.961 cm and 8.138±2.137g, respectively. The correlation of LWR was found significantly (p<0.05) correlated (r^2=0.988). The overall the '*b*' value (2.684) suggests allometirc growth in *Botia lohachata*. However mostly traits correlation among other traits shows strong correlation with TL (r^2=0.9). In further, the condition (*k*=0.176) and relative condition factors (*kn*=0.379) shows the highest environmental impact on fish growth. *Botia lohachata* is one of the declared endangered fish species. Hence, present findings will have crucial contribution for sustainable conservation of this precious species in the stream waters. Present findings also will provide an important baseline to fisheries researchers and scientists.

Keywords: *Botia lohachata*, Environmental impact, Condition factor, Length weight, Growth, Stream water.

INTRODUCTION

Botia lohachata (Chaudhuri, 1912) commonly known as 'Reticulate loach' belong to family Cobitidae is one of the freshwater fish species. This is native to Pakistan, India, Bangladesh and Nepal (Talwar and Jhingran, 1991; Froese and Pauly, 2016). It inhabits in rivers and streams of rocky and gravel bottoms. It prefers to live in the slow-running and still water state (Hossain *et al*., 2011). The Pakistani *Botia* has a downward point face loaches and four pairs of barbells bulging from its mouth. It attains length size of about6.6 to 13.7cm (Shrestha, 2023 and Rahman, 1989). This loach has giraffe-like pattern with so small scales which are fixed in its skin. It is a bottom dwelling active scavenger fish. Generally it is identified that all body parts of fishes are reliant on the length of the body. However the total length of the body is not dependent on the entire other body components consequently morphometric measurements of fishes and the study of statistical correlation amongst them are crucial for taxonomic study of species (Tandon, *et al*., 1993).

Length-weight relationships (LWR) are essential and considered as a standard principles in fisheries research and provide useful information for fishery managers (Mir *et al*., 2014). LWR of fishes is a significant feature in fisheries and fish biology it applies in assessment of the usual weight of the fish of a known length group by applying a mathematical association relation among them (Qadri and Mir, 1980). LWR is extensively used in fishes to know the health condition and growth either isometric or allometric. Hence, the analysis of LWR, helps to understand as comparison of fishes of regions, ontogenic change as well as other aspects of fish population dynamics (Ecoutin *et al*., 2005; Koutrakis and Tsikliras, 2003 and Binohlan and Pauly, 1998).

Apart from LWR, in fisheries science the condition factor (*k*) is similarly significant, that predicts the environmental effect on the fishes through the statistical calculation (Kohler, 1995). In the present study, the health condition and population status of *B.lohachata* has been investigated that inhabiting at Kirthar Mountain region**,** Ranikot Stream, Sindh-Pakistan.

MATERIALS AND METHODS

The samples were collected from various sites (25˚45'N - 26˚00'N, long 67˚45'E - 68˚00'E) of the hilly stream (Fig. 1).Total 28 specimens of *B. lohachata* were caught using cast net during July 2020 to June 2022 at about 12:00Noon to 3:00pm, furthers samples were immediately preserved in 10% formalin for further data analysis.

Fig. 1. Map showing collection site of *B. lohachata* from Kirthar Mountain region**,** Ranikot Stream, Sindh-Pakistan.

The body weight of all individual was measured immediately by using an electronic balance with 0.01g accuracy the lengths of individuals were measured nearest 0.01cm using wooden fish measuring board. The standard procedures (Appa Rao, 1966; Dwivedi and Menezes, 1974) were found up to measure the traits. A total of four traits Body weight (BW), Total length (TL), Fork length (FL) and Standard length (SL) were measured (Fig. 2).
The LWR and condition factor (*k*) was calculated using the formula given by Le Cren (1951) i.e:

$$W = a L^b$$

Furthermore the Fulton's Condition Factor Index (Ricker, 1958), was also calculated by the equation which is estimated applying the following equation:

$$K= \{w/l^3\} \times 100$$

Relationships between the traits (TL, FL, and SL) were calculated Mean, Range, standard deviations and correlation of coefficient (r^2) were also analyzed by using SPSS (v.12)

RESULT AND DISCUSSION

In the present investigation, maximum total length of *Botia lohachata* was found 18.020cm. While the average weight, SL and FL were found 8.138 ± 2.137, 10.781 ± 4.079 and 12.198 ± 4.012, respectively (Table. 1). While, the TL values shows highest record then the early reported length of *B. lohachata*, i.e. 23.7cm (Shrestha, 2023).The LWR was resulted *b*=2.684. Further, the slope 'b' of TL, FL and SL were also calculated and resulted *b*= 0.899, *b*=0.753 and *b*=0.627 respectively (Table 2). While, the coefficient (r^2) values for LWR, TL, FL and SL were found r^2=0.989,r^2=0.989, r^2=0.982 and r^2=0.974. Those show significant linear relationships among the length parameters (Table 2). The LWRs values of *Botia lohachata* reported from Ganges River, Northwestern Bangladesh, the '*b*' ranged from 2.65–2.69 showing allometric growth; while the LLRs were highly correlated (P <0.001) but negative allometric growth (b <3.00, P <0.001) (Hossen *et al.*, 2016). Furthermore, Dupare (2025) reported "*a*" values of TL, SL and HL (0.217, 0.552 and 0.848) and "*b*" (2.638, 1.877 and 3.327) and r^2 (0.961, 0.951 and 0.891), respectively. The co-efficient of correlation (r^2) i.e 0.989, showing equal correlations between the two parameters.

The growth condition of *Botia lohachata* in the present findings (*b*=2.684) is about similar (*b*=2.638) as findings of Dupare (2025). While, this finding is significantly different (*b*=3.345) which was reported by the Hossen *et al*. (2016). This difference illustrates how regional environmental conditions, including food accessibility and habitat quality, can shape growth dynamics (Froese, 2006). The variation in '*b*' value indicates an isometric growth. It may vary due to multiple factors including habitat, season, age nutrition and gonadal maturity. Generally, it ('*b*' value) is an indicator of food intake and growth patterns. However, that might be differ due factors of ecosystem the both biotic and abiotic (Le Cren, 1951).

Table 1. Length (cm) and weight (g) measurements of *B. lohachata* collected from Kirthar Mountain region**,** Ranikot Stream, Sindh-Pakistan.

STATICALLY ESTIMATION	**MAX**	**MIN**	**MEAN**	**STD (±)**
Weight	10.625	5.024	8.138	2.137
Total Length	18.02	8.001	13.913	3.961
Fork Length	16.8	6.422	12.198	4.012
Standard Length	15.64	4.883	10.781	4.079

STD= Standard deviation, Min= Minimum, Max: Maximum.

Table 2. Statistical results of Length weight relationship of *Botia lohachata* collected from Kirthar Mountain region**,** Ranikot Stream, Sindh-Pakistan.

Traits	***A***	***B***	r^2	k=100 w/L^3	kn=w/aL^b
WL	1.150	2.684	0.989	0.176	0.379
TL	0.891	0.899	0.989	0.176	0.877
FL	1.101	0.753	0.982	0.224	1.149
SL	1.311	0.627	0.974	0.277	1.441

a= Intercept, *b*= Slope, r^2= Coefficient, *k*= Fulton condition factor and *kn*= relative condition factor. .

Fig. 2. The morphometric measurements of *B. lohachata* collected from Kirthar Mountain region**,** Ranikot Stream, Sindh-Pakistan. (SL=Standard length, FL= Fork length and TL= Total length).

The condition factor (*k*) and relative condition factor (*kn*) were also analyzed. Condition factors (*k* and *kn*) results highest environmental impact on the growth traits except relative condition factor (*kn*) on FL and SL. The related findings of Joadder (2019) support the present findings. When the average weight of the fish does not increase proportionally to the length then condition factor may possibly vary with length (Carlander *et al*., 1952).

The present study provides valuable insights into the growth pattern and condition of *Botia lohachata* based on LW and LL relationships. Conclusively, the growth dynamics and condition indices observed in this study reflect the combined influence of biotic and abiotic factors, reinforcing the importance of localized assessments for

effective fishery management and conservation planning. These findings contribute baseline biological information for *B. lohachata* and may support future ecological, stock assessment, and management studies.

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CONFLICT OF INTEREST

Authors declare that they have no competing interests.

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