

## A CRITICAL EXAMINATION OF MORPHOMETRIC CHARACTERIZATION OF BOTIA ALMORHAE FISH

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### ABSTRACT

Both Aquaculture and Fisheries have developed into potential industries in recent years by providing food for enhancing livelihoods through foreign exchange. Aquaculture and Fisheries are both industries that not only provide essential nutrition, but also contribute to the improvement of the standard of living of the broader human population by generating foreign exchange. *Botia almorhae*, also known as the "Almorha loach," is an endangered and extremely uncommon species of loach native to the Terai region. It is one of the most attractive loaches found in India. *Botia almorhae* has a high ornamental value and a moderate nutritional value. The body of *Botia almorhae* is yellow with black reticulated bands. *B. almorhae* consume crustaceans, snails, mosquito larvae, *Tubifex*, *Daphnia*, etc. The most crucial factor for these loaches is that they always have access to pure, oxygenated water. The Almorha loach requires daily water adjustments of approximately 25 percent. There is no literature on the embryonic development and artificial reproduction of *B. Almorhae*, but discrete data are available on loaches of different genera.

**KEY WORDS:** *Botia Almorhae, Morphology, Fish, Aquaculture, Flora and Fauna.*

### INTRODUCTION

Tropical nations, such as India, have an abundance of flora and fauna. Which have attracted naturalists since time immemorial, and the interest in investigating and learning about bio diversity has increased significantly in recent years. As the population continues to rise, we continue to exploit our natural resources and biodiversity without considering the repercussions. The IUCN has raised the alarm due to fears that at least 10 percent of all species will become extinct within the next few decades due to rapid erosion. This resulted in the establishment of the Convention on Biological Diversity (CBD) in order to devise methods for enhancing bio diversity. This had in turn generated a sense of awakening of the values of taxonomy as precise identification of the fauna and flora, forms the basis for all the remedial action and measures. As all biotic communities, including the human

population, depend directly or indirectly on water bodies, especially freshwater bodies. The fauna and flora of the particular ecosystem, i.e. fresh water bodies, are under direct duress. This necessitates immediate and prompt action for the proper administration of fauna and flora to prevent their depletion and extinction.

The freshwater teleost *Botia almorhae* was chosen for this study due to its rarity and progressive depletion in its natural habitat, namely the rivers Suyal and Ramganga W. Pathani in "Threatened fishes of India" reported the status of *Botia almorhae* in Kumaun lotic waters and predicted the dwindling trend of the well-known fish. The inland capture fisheries of the lotic waters are rather limited in their production potential as well as a few front line data are available for high altitude species of Kumaun Himalaya. *Botia almorhae*, also known as chital, is an attractive aquarium and food fish native to the Kumaun River. It was abundant in the Kumaun region's Ramganga W and Suyal rivers.

*Botia almorhae*, commonly known as Chittal or in some areas Patterchatti, is an unexplored Kumaun fish with respect to its morphometry, bionomics, and ecology. It is a beautiful aquarium and food fish. Although some few lines are available about *Botia almorhae*, its figure and identification (facts are based on a single specimen in Day's fauna book), and there is little description on its natural, these revelations do not provide a comprehensive understanding of this endangered fish. The fish biology is essential for the correct management of aquaculture development, particularly in the muddy region of the Kumaun Himalaya, where fisheries could support many economically and meet or subsidize the demand for protein-rich foods and other essential nutrients.

## RESEARCH METHODOLOGY

The valley of Kumaun is situated between 280-44'N and 300-49'N latitude and 780-45'E and 810 -5'E longitude with total area of 21,035 sq. Km. The freshwater fish known as Chital (Quarab) or Patterchatti (Chaukhutiya) is scientifically known as *Botia almorhae*; Day collected specimens ranging in length from 8.0cm to 16.5cm and weight from 16.96 to 58.21gm monthly for two years from the Suyal and Ramganga river systems using a cast net. *Botia almorhae* fishes were primarily collected at Quarab (Suyal) and Chaukhutiya (Ramganga) of district Almora, Kumaun Himalaya (29036'N and 79040'N). The collection sites for these freshwater fishes were transported each month to the laboratories of the Zoology Department on the Soban Singh Jeena Campus of Kumaun University in Almora. The total length of *Botia almorhae* was measured to the nearest millimeter from the tip of the snout to the tip of the greatest caudal ray, and the fish was weighed to the nearest milligram before

morphometric measurements were taken. In addition to sexual dimorphism, autopsy was used to corroborate the identification of a fish's gender.

### **MORPHOMETRIC EXAMINATION:**

To determine the morphometric characteristics of the fish, eleven morphometric measurements were collected in relation to the fish's total length and standard length. On the premise of the description provided, the following parameters were determined:

**Total length (TL):** The greatest distance between the anteriormost protruding portion of the cranium and the posteriormost tip of the caudal fin, including any filamentous prolongations. The measurement is measured along a straight line and not along the body's curves. Where one lobe of the caudal fin is longer than the other, the maximal length is measured. In cases where the jaws are unequal, the mouth is closed and measured from the longer jaw's point.

**Standard length (SL):** The straight distance from the anteriormost portion of the head to the end of the vertebral column; in actuality, the flexure line of the body over the caudal peduncle is considered the posteriormost point.

**Body depth (BD):** The vertical measurement from a point on the fish's back where its height is greatest to the ventral surface or profile. The fleshy or scale-like structures of fine bases are excluded. It does not have to be in the center of the animal.

**Head length (HL):** A direct measurement of the distance between the tip of the snout and the most distant point on the opercular membrane on the upper angle of the gill orifice. Any fleshy membrane of the gill cover is also included.

**Head height or depth (HD):** The distance measured perpendicularly from the midline at the occiput vertically downward to the ventral contour of the head or breast. In actual practice, one arm of the divider is positioned at the occipital crest and the other arm is positioned below the head, vertically perpendicular to the upper arm, to form a vertical line. This measurement, unlike body depth, does not extend to the ventral profile line.

**Length of the caudal peduncle:** An oblique measurement from the posteriormost contact point of the anal fin to the end of the vertebral column or the flexure line of the body over the caudal peduncle.

**Length of the head including snout /Post orbital distance (PsOD)** : The longest distance between the posterior margin of the orbit and the posterior point of the fleshy operculum.

**Head width (HW)**: is the straight distance across the head in a ventral position; if the opercula are dilated, they are forced into a relatively normal position.

**Interorbital width (IOW)**: The minimum distance between the interior margins of the eyes and the bony rims of the orbits.

**Diameter of the eye (ED)**: The distance between the cartilaginous eye ball's outer and inner margins across the cornea.

**Predorsal length (PrDL)**: A straight measurement from the midpoint or apex of the snout, upper lip, or anterior head region to the structural base of the anteriormost dorsal fin ray. In vertebrates with a dorsal spine, the dorsal fin's basal bone serves as the structural foundation.

The external characteristics include fins, scales, barbells, profiles, and lateral line scales.

**1. Length of the anal fin (LAF)**: The greatest distance in a straight line between the most anterior and most posterior regions of the body's junction.

**2. Length of the pectoral fin (LPF)**: The largest ray of the fish.

**3. Length of the Caudal fin (LCF)**: The length of its greatest fin ray.

**4. Length of the rostral barbel (LRB)**: The rostral barbel's length is measured from its base to its apex.

**5. Length of the maxillary barbell (LMB)**: The length of the maxillary barbell is measured from its base to its apex.

Jayaram (2002) examined the data. Various biostatistics were utilized (correlation coefficient, regression coefficient, and analysis of variance (ANOVA) to determine differences between means (for homogeneity of variance), and correlation and regression analysis was performed on the measurements. The significance of the correlation coefficient (r) and regression coefficient (b) was examined. Then, the data were used to compute the regression equation for each development variable (y1-y31) in order to suit the straight-line equation.

## RESULTS AND DISCUSSION

To determine ethnic composition, the following 31 morphometric measurements were obtained. 18 morphometric measurements were correlated with total length and standard length, while the remaining 12 body parameters were correlated with head length.

(a) Body parameters from 1 to 19 were first correlated with total length and then with standard length (when correlated with standard length, total length was considered a body parameter).

(b) Body parameters between the ages of 20 and 31 correlate with cranium size.

- Analysis of variation between and within female and male groups. Separate descriptives were obtained for each variable.

- The proportion and percentage of the body parts in relation to total length, standard length, and head length were calculated for the general or combined form, as well as for females and males (on the basis of sex). Separate descriptives were obtained for each variable.

**Table 1: Characteristics chosen for morphometric analysis of *Botia almorhae* fish in the present study.**

Sl. No.	Characters	Abbreviations
1	Total length.	TL
2	Standard length.	SL
3	Body depth.	BD
4	Minimum body depth.	MBD
5	Pre-Dorsal length.	PrDL
6	Post-Dorsal length.	PsDL
7	Length of pectoral fin.	LPF
8	Height of pectoral fin.	HPF
9	Length of dorsal fin.	LDF
10	Height of dorsal fin.	HDF
11	Length of pelvic fin.	LPvF
12	Height of pelvic fin.	HPvF

13	Length of anal fin.	LAF
14	Height of anal fin.	HAF
15	Length of caudal fin.	LCF
16	Height of caudal fin.	HCF
17	Distance between pectoral fin and pelvic fin.	DisPP
18	Length of caudle peduncle.	LCP
19	Head length.	HL
20	Head height/depth.	HH
21	Head width.	HW
22	Pre-Orbital distance/Snout length.	PrOD
23	Post-Orbital distance/Length of head excluding the snout.	PsOD
24	Eye diameter.	ED
25	Inter orbital distance.	IOD
26	Length of lower rostral barbel.	LIRB
27	Length of upper rostral barbel.	LuRB
28	Length of small sub-orbital spine.	LSbOs1
29	Length of large sub-orbital spine.	LSbOs2
30	Length of lower maxillary barbel.	LIMB
31	Length of upper maxillary barbel.	LuMB

### The significance and extent of a correlation

All correlation coefficient values lie on a scale ranging from -1 to 1. The closer the value of a coefficient is to -1 or +1, the stronger the correlation, whereas the closer it is to '0', the weaker the correlation. As a general guide to the correlation's significance, please provide the following descriptive interpretation.

#### The Strength of Correlation

Value of coefficient 'r' ( positive or negative)	Meaning
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0.00 to 0.19	A very weak correlation
0.20 to 0.39	A weak correlation
0.40 to 0.69	A modest correlation
0.70 to 0.89	A strong correlation
0.90 to 1.00	A very strong correlation

In the present investigation, correlation coefficients for all 31 morphometrical characters were recorded. 18 morphometrical characteristics out of a total of 31 were correlated with the total length (independent variable 'x' axis) of the fish. Again, the same 17 characters were correlated with standard length (independent variable 'x') total length of the fish was included as a dependent variable, and the total number of dependent variables, namely 18, remained unchanged. The remaining 12 variables, primarily from the head region, were significantly correlated with the fish's head length.

In this investigation, the correlation coefficients were recorded separately for males, females, and the general population (combined) in order to examine their strength. The following results were acquired and classified according to their significance.

## CONCLUSION

Due to the fact that taxonomic conclusions are based on samples from vast populations, data of various body parameters were subjected to a variety of statistical treatments in order to obtain and understand the current status of a fish population in water bodies in the present study. For statistical analysis to yield an accurate assessment of the fish population, the utmost number of characters (variables) is required. Various body parameters were correlated and regressed with total length, standard length, and head length. A total of 31 characteristics were considered, and their independent and combined correlation coefficients were determined. In general (combined) taking TL as independent variable, the 'r' value ranged from -0.0052 to 0.95509, when correlated with other characters for the fish *Botia almorhae* showed a significant correlation with PrDL (0.95509), SL (0.94112), LDF (0.88423), HDF (0.83482), HL (0.81854), HPvF (0.70163), LAF (0.59168), MBD, LCF (0.56238), HAF (0.54882), HPF (0.53471) and PsDL (0.50577).

Correlation is an essential instrument that is measured using ordinal or internal scales. When a change in one variable is accompanied by a change in another variable (positive) or when a change in one variable is

accompanied by a change in another variable (negative). Therefore, various Ichthyologists utilize the strength of correlation to record the strength of the correlation coefficient of various variables. The 'b' values from  $y = a+bx$  enable for the estimation of 'y' values given specified 'x' values. Consequently, several individuals have utilized the statistical methods of correlation and regression analysis.

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