# STUDY ON MORPHOMETRIC RELATIONSHIP AND INTERMUSCULAR BONES OF *CATLA CATLA* (HAMILTON, 1822)

**V.S. Mahajan**
*Shri Shivaji Arts, Commerce & Science College, Akot, Dist. Akola, MH, India*

**P.S. Joshi**
*Shri Shivaji Arts, Commerce & Science College, Akot, Dist. Akola, MH, India*

**S.G. Chhaba**
*Smt. Radhabai Sarda Arts, Commerce & Science College, Anjangaon Surji, Dist. Amravati, MH, India*

**Abstract**
*The present study is the assessment of morphometric relationship and intermuscular bones of Catla catla (Hamilton, 1822). Samples of farmed fish were collected from local fish market. They were cultivated intensively on isonitrogenous and isocaloric formulated pelleted feed. Fish specimens of one year culture with average length of specimens was 43.17±0.76 cm while average weight was 1209.33±64.51 g. The Calculated weight [$W = a\ L^b$] was significantly similar to observed weight with a= 0.015 & b= 3.0005. The average Relative Condition Factor (KR) was observed to be 1.00 while Fulton condition factor equation (KF) was observed to be 1.5. indicating the robustness or well-being of experimental fish. The number of S pin and Y pin intermuscular bones were 38 & 54 respectively in fish specimen with length 42.5 cm and weight 1150 g.*

***Keywords:*** *Catla catla, condition factor, fish, intermuscular bones morphometry.*

## Introduction

The *Catla catla* commonly cultivated fish also known as the major South Asian carp, is an economically important South Asian freshwater fish in the carp family Cyprinidae. It is native to rivers and lakes in northern India, Bangladesh, Myanmar, Nepal, and Pakistan, but has also been introduced elsewhere in South Asia and is commonly farmed (Day 1986, Jayaram 2010)

Catla is a fish with large and broad head, a large protruding lower jaw, and upturned mouth. It has large, greyish scales on its dorsal side and whitish on its belly. It reaches up to 182 cm (6.0 ft) in length and 38.6 kg (85 lb) in weight. Catla is a surface and midwater feeder. Adults feed on zooplankton using large gill rakers, but young ones on both zooplankton and phytoplankton. Catla attains sexual maturity at an average age of two years and an average weight of 2 kg (Menon 1987, 1992).

It is one of the most important aquacultured freshwater species in South Asia. It is grown in polyculture ponds with other carp-like fish, particularly with the Labeo rohita and mrigal carp. The reported production numbers have increased sharply during the 2000s, and were in 2012 about 2.8 million tonnes per year. Catla is sold and consumed fresh, locally and regionally. It is transported on ice. Fish of 1–2 kg weight are preferred by consumers (Talwar and Jhingran 1991).

It is rich in Omega 3 fatty acids, Vitamin A, Vitamin B and Vitamin C. It is also rich in Vitamin D, a Vitamin which is present only in a few foods and consumption of the fish will prevent Osteoporosis, a Vitamin D deficiency disease (Eschmeyer and Fricke 2011).

According to Elliot *et al.,* (2023) reviewed that along with length-weigh relationship and condition factor, Intermuscular bones (IBs) are a common characteristic of Asian carp. Ingested IBs and other fishbone fragments are associated with health complications and have remained a significant concern among consumers. Asian carp are bony, and their safety concerning IBs is a hot topic, prompting extensive research on possible ways of eliminating IBs from fish products.

In this concern, present investigation aims to study the length -weight relationship, condition factor and the intermuscular bones of *Catla catla.*

## Materials and Methods

**Sample Collection:** Samples of farmed fish were collected from fish market of Akot, Dist. Akola, Maharashtra (India). They were cultivated intensively on isonitrogenous and isocaloric formulated pelleted feed. Fish specimens of one year culture and each of 1100-1200 g weight range were collected for concern species. Specimens were brought to laboratory and identified using available literature (Day 1986, Jayaram 2010; Menon 1987, 1992; Talwar and Jhingran 1991, Eschmeyer and Fricke 2011).

**Morphometric Study:** Length-weight relationships (LWRs) and relative condition factor are of great importance in fishery assessment studies since it provide information about the growth of the fish, its general wellbeing, and fitness in culture system.

**Length-Weight Relationship:** The log transformation formula of was used to establish

LWRs (Le Cren, 1951). The length-weight equation $W = a\ L^b$ was used to estimate the relationship between the weight (g) of the fish and its total length (cm). Using the linear regression of the log-transformed equation: log (W) = log (*a*) + *b* log (L), the parameters *a* and *b* were calculated with '*a*' representing the intercept and '*b*' the slope of the relationship. In order to establish LWRs with respect to periodic variations that can affect *b* (Zargar *et al.*, 2012). When applying this formula on sampled fish, *b* may deviate from the "ideal value" of 3 that represents an isometric growth (Ricker and Carter, 1958) because of certain environmental circumstances or the condition of the fish themselves. When *b* is less than 3, fish become slimmer with increasing length, and growth will be negatively allometric. When *b* is greater than 3.0, fish become heavier showing a positive allometric growth and reflecting optimum conditions for growth. Simple linear regression was calculated with using PAST Ver. 4.03. The formula for simple linear regression is Y=mX+b, where Y is the response (dependent) variable, x is predictor (independent) variable, m is the estimated slope and bis the estimated intercept.

**Condition Factor:** The condition factor or ponderal index (K) was determined using length and weight data of fish samples. The condition factor was calculated as per the standard method of Le Cren (1951). The Relative Condition Factor (KR)= $W_0/W_c$ Where $W_0$ is observed weight while $W_c$ is Calculated weight. The Fulton condition factor equation (KF) =(WX100) / $L^3$. These formulae were used to estimate the relationship between the weight (g) of the fish and its total length (cm). When 'K' value for fish is greater than 1.0, indicate the robustness or well-being of experimental fish.

**Inter-Muscular Bones:** The fishes were taken to post-harvest laboratory, sacrificed and bled. The whole fish was cooked for few minutes for both the sides. The whole fish after cooking were chilled and placed on a dissecting tray, the skeleton and pin bones were dissected out using needle and artery forceps (Sahu *et al.,* 2012).

**Statistical Analysis:** The statistical analyses were performed following Zar (1999) using the SPSS version 10 (SPSS Inc., Chicago, IL, USA; Kinnear and Gray 2000).

## Results and Discussion

**Length-Weight Relationship:** The average length of specimens was 43.17±0.76 cm while average weight was 1209.33±64.51 g (Table 4.1). The calculated weight was significantly like observed weight. The obtained *b* value for the experimental fishes was observed to be greater than 3 showing a positive allometric growth and reflecting optimum conditions for growth. Length weight relationship is significant at $p<0.05$.

**Table 1: Length weight relationship in *Catla catla* (Hamilton, 1822)**

| Sr. No. | Total Length$^X$ | Observed Weight$^Y$ | Length-Weight Relationship | | |
|---|---|---|---|---|---|
| | | | a | b | Calculated W |
| 1 | 42.5 | 1150 | 0.015 | 3.0005 | 1153.428 |
| 2 | 43.0 | 1200 | | | 1194.624 |
| 3 | 44.0 | 1278 | | | 1279.936 |
| Length-Weight Relationship equation | | | | | $Y=0.015X^{3.0005}$ |
| Linear regression equation | | | | | Y=84.28X-2429 |
| r= 0.9979 | | $r^2$= 0.9958 | | | *p=0.0410* |

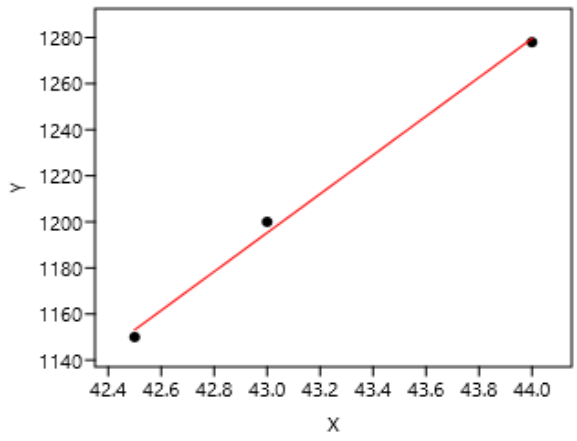


**Figure 1: Length weight relationship in *Catla catla* (Hamilton, 1822)**

The present findings are in well agreement with the findings of previous studies of Sarder *et al.,* (2011), Kumaresan (2011), Saima *et al.,* (2013), Ujjania *et al.,* (2013), Roshni *et al.,* (2014), Javaid *et al.,* (2015), Bhatt *et al.,* (2016), Soni and Ujjania (2017), Balai *et al.,* (2017), Rathore and Sharma (2017), Taymaa *et al.,* (2018), Chandrvanshi *et al.* (2019), Soni and Ujjania (2019), Nimat *et al.*(2020), Andrabi *et al.* (2021), Beata *et al.* (2022) and Elliot *et al.,* (2023).

**Condition Factor:** The average length of specimens was 43.17±0.76 cm while average weight was 1209.33±64.51 g. The average Relative Condition Factor (KR) was observed to be 1.00 while Fulton condition factor equation (KF) was observed to be 1.5. indicating the robustness or

well-being of experimental fish (Table 4.2). The present findings are in well agreement with the findings of previous studies of Ujjania *et al.,* (2013), Roshni *et al.,* (2014), Bhatt *et al.,* (2016), Soni and Ujjania (2017), Balai *et al.,* (2017), Rathore and Sharma (2017), Chandrvanshi *et al.* (2019), Nimat *et al.*(2020), Andrabi *et al.* (2021).

**Table 2: Condition factor of *Catla catla* (Hamilton, 1822)**

| Sr. No. | Total Length | Observed Weight | KR | KF |
|---|---|---|---|---|
| **1** | 42.5 | 1150 | 0.9970 | 1.4981 |
| **2** | 43.0 | 1200 | 1.0045 | 1.5093 |
| **3** | 44.0 | 1278 | 0.9985 | 1.5003 |

**Inter-Muscular Bones:** The fish with length 42.5 cm and weight 1150 g was taken to laboratory, sacrificed and bled. The whole fish was cooked for few minutes for both the sides. The whole fish after cooking were chilled and placed on a dissecting tray, the skeleton and pin bones were dissected out using needle and artery forceps. In studied fish 38 Spins and 54 Y Pins intermuscular bones were observed (Table 4.3). The number of intermuscular bones (IBs) are related with length and weight of specimens and have a significant concern among consumers. These views are in well agreement with the findings of previous studies of Sahu *et al.,* (2012), Roshni *et al.,* (2014), Sahu *et al.,* (2014), Beata *et al.* (2022) and Elliot *et al.,* (2023).

**Table 3: Intermuscular bones of *Catla catla* (Hamilton, 1822)**

| Sr. No. | Total Length | Observed Weight | S Pins | Y Pins |
|---|---|---|---|---|
| **1** | 42.5 | 1150 | 38 | 54 |

**Figure 2: *Catla catla* (Hamilton, 1822)**

**Figure 3: Inter-Muscular Bones of *Catla catla* (Hamilton, 1822)**

## Conclusion

From the above observations and discussed results, it is concluded that the obtained values of length-weigh relationship, condition factor and Intermuscular bones (IBs) represented its healthy status and have a significant concern among consumers.

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