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Length-weight relationship and condition factor of *Triplophysa marmorata* from Wular Lake, Kashmir

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Abstract

Length-weight relationship and condition factor were evaluated for seventy-four specimen of *Triplophysa marmorata* collected from Wular Lake, Kashmir during the study period of one year using cast net of mesh size 0.5 cm. The sampling was carried out on a monthly basis from December, 2014 to November, 2015. The analysis of the results obtained showed that the growth pattern of the fish was negatively allometric with b value <3 (2.96). A strong correlation (0.974) was observed between the length and weight of the fish species in the lake. The average condition factor (K) was recorded as 1.2 indicating that fishes were thriving well in the aquatic body under study.

Keywords: Cast net, *Triplophysa marmorata*, allometric, growth pattern, wular lake

1. Introduction

The water bodies of the Himalayan region inhabit diverse kind of fish fauna. Out of the total fish fauna available in India, 17% fishes have been documented from the mountain ecosystem establishing the status of the area as a center of origin and evolution of biotic forms [1]. The first account of fishes inhabiting cold regions of India was given by Hamilton, 1822. Heckel, 1838 while documenting fish fauna from Kashmir valley, described two scaleless fish species called *Cobitis marmorata* and *Cobitis vittata*. Later [4] renamed them as *Triplophysa marmorata* and *Triplophysa kashmirensis*.

Triplophysa marmorata is a freshwater benthopelagic fish occurring in the snow fed Himalayan waters of Kashmir. It is locally known as "Ara Gurun" (Heckel, 1838). It is distinguished from *Triplophysa kashmirensis* in having shorter length of lateral line and caudal peduncle. Genus *Triplophysa* belongs to the family Balitoridae, sub-family Nemacheilinae (Chen and Yang, 2005; Froese, 2011). The genus is a diverse group comprising about 124 nominal species all over the world [5]. In India, the species belonging to this genus have been reported in the upper drainage of River Indus in Jammu and Kashmir and also in Lahul and Spiti area of Himachal Pradesh where they inhabit rivers and streams of hilly areas with rock beds [7].



Fig 1: Specimen of *Triplophysa marmorata* captured from Wular Lake

Studies on the length-weight relationship and condition factor of various fish species from the Kashmir valley have been documented by many researchers [8-14]. However, till date there hasn't been any evaluation on these fish parameters (length, weight) from Wular Lake, one of India's largest freshwater lakes and a Ramsar site [15].

Moreover, the literature concerning *Triplophysa* living in cold waters of Kashmir Himalaya is scanty. Hence this study was aimed to evaluate the length-weight relationship and condition factor of *Triplophysa marmorata* from Wular Lake, thus providing a comprehensive baseline data of this fish species.

2. Materials and Methods

2.1 Study area

The study was carried out in Wular Lake located in District Bandipora at an altitude of 1530 m asl between 34°20' N latitude and 70°42' E longitude. The lake is elliptical in shape with a maximum length and breadth of 16 and 7.6 km respectively. A total of seventy-four specimen of *Triplophysa marmorata* were collected from the lake every month between December, 2014 to November, 2015. Total length to the nearest 0.1 cm and weight to the nearest 0.1 g were recorded for each individual. Identification of fishes was done using the standard taxonomic works of Day, 1878 and Kullander, 1999.

2.2 Length weight relationship

The determination of length weight relationship was made by applying the log transformation equation $w = aL^b$ to the data [17].

Where,

W = Total weight of the fish in grams

L = total length of the fish in millimeters

a = Initial growth constant

b = Regression co-efficient

2.3 Condition factor

The ponderal index or condition factor for each fish was evaluated by Fulton's formula (Fulton, 1904) i.e.

$$\text{Ponderal index (K)} = \frac{W \times 10^5}{(L)^3}$$

Where,

W = Total weight of fish in grams

L = total length of fish in millimeters

10^5 = It has been introduced to bring the value of ponderal index near unity.

3. Results

3.1 Length weight relationship

- The equation for length-weight relationship was obtained as $\text{Log } W = -4.022 + 2.967 \text{Log } L$ (Fig 2). The coefficient of determination (R^2) was calculated as 0.974.

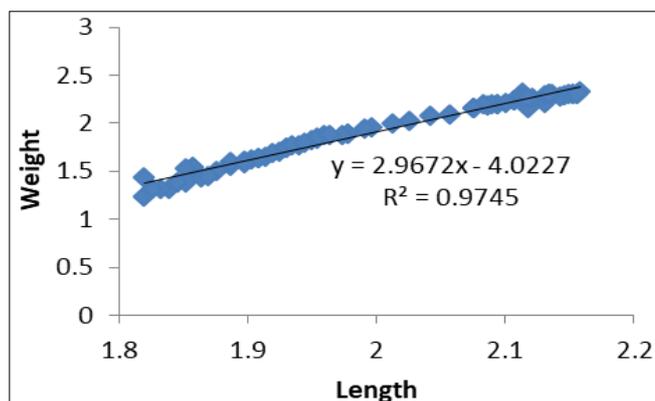


Fig 2: Scatter diagram showing length-weight relationship of *Triplophysa marmorata*

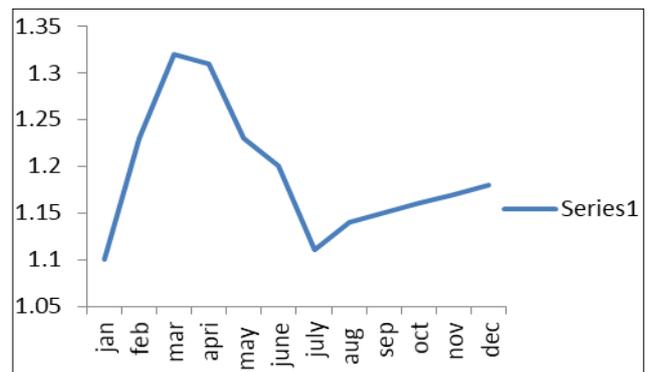


Fig 3: Monthly variation in condition factor of *Triplophysa marmorata*

3.2 Condition factor

The condition factor (K_n) of *Triplophysa marmorata* varied between 1.1 to 1.32 (Fig. 3) minimum of 1.1 in January and July, whereas the maximum value of 1.32 was noticed in March.

4. Discussion

When living in an ideal environment, the growth of fishes follows the cube law ($W=L^3$) [19]. However, in nature the length-weight relationship may deviate from the cube law, owing to changes in the water quality due to encroachment, siltation, pollution and other environmental conditions. Taking these factors into consideration, [20] proposed a formula slightly modifying cube law as $W=aL^b$. Since then this formula was used to calculate the length-weight relationship throughout the life history of different fish species.

The value of regression coefficient, "b" in length - weight relationship remains constant at 3 for an ideal fish living in an ideal condition [21]. However, as a fish passes through several stages, the simple cube law does not hold well throughout its life span and equilibrium constant shows certain variations [22] in the growth pattern of fish. The present study revealed that the fish species did not follow the cube law completely with the value of exponent "b" recorded as 2.96, thus revealing negative allometric growth ($b < 3$). Similar departures from cube law have been observed by Sunder (1984) while studying length weight relationship of *Cyprinus carpio* var. *specularis* who calculated value of b as 2.98 while as Raizada (2005) calculated value of b as 2.62 for *Chanos chanos*, thus observing negative allometric growth. The deviation observed in b value is ascertained to factors like food availability, environmental changes, season, sex and many other physiological factors as pointed out by Le Cren, 1951 [24, 25], indicated that value of b deviated not only between species but also within same species depending upon sex, maturity, food habits etc.

Fulton's condition factor, K is a measurement which involves the length and weight for a particular fish, therefore it could be influenced by the same factors as length-weight relationship. Le Cren, 1951 proposed that if the K value is 1.00, the condition of the fish is poor. A 1.20 value of K indicates that the fish is living in moderate condition. A good and well-proportioned fish would have a K value of approximately 1.40. Based on this criterion, the sampled fish in Wular Lake were living in a moderately well condition as the K value was obtained as 1.2. the main reasons behind observed values could be degree of food availability, age and environmental factors.

5. Conclusion

From the above observations, the following can be concluded:

- b. The growth of *Triplophysa marmorata* in Wular Lake was negatively allometric, value of 'b' being equal to 2.967 and length weight relationship equation obtained was $\text{Log } W = -4.022 + 2.967 \text{Log } L$
- c. Condition factor (Kn) which is used as an index for monitoring of feeding intensity, age and growth rate of fish was recorded with a mean value of 1.2 which indicates a moderately well condition of the fish in both the sexes.

6. Acknowledgement

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