

Length weight relationship of *Triplophysa marmorata*, an endangered balitorid fish species from Kashmir Himalayas, India
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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.

INTRODUCTION

The valley of Kashmir is blessed with a number of water bodies which harbour many freshwater indigenous and exotic fishes like schizothoracids, trouts, carps and others. The earliest reports on the fish fauna of Kashmir valley is that of Heckel (1838), who reported sixteen species of fishes from the valley, followed by works of Kullander *et al.*, 1999 and Bhat *et al.*, 2010. Heckel, 1838, while documenting the fish fauna of the Kashmir Valley, described two species of scaly fish called *Cobitis marmorata* and *Cobitis vittata*. Kullander *et al.*, 1999 renamed them *Triplophysa marmorata* and *Triplophysa kashmirensis*. *Triplophysa marmorata* is a freshwater benthopelagic fish that lives in the snowy waters of the Kashmir Himalayas. It is locally known as ‘Ara Gurun’. The genus *Triplophysa* belongs to the family Balitoridae, a subfamily of Nemacheilinae (Chen and Yang, 2005; Froese, 2011). It is a diverse group comprising of approximately 124 nominal species worldwide (Walker and Yang, 1999). In India, species belonging to this genus have been reported in the upper Indus River basin in Jammu and Kashmir and also in the Lahul and Spiti regions of Himachal Pradesh, where the rivers and streams of mountainous areas with rocky beds inhabit (Scheimer, 1993). The *Triplophysa* species of Kashmir occurs in river Jhelum and its tributaries and are also found in spring waters e.g. Verinag and Kokernag etc. The literature on *Triplophysa* living in the cold Himalayan waters of Kashmir is scarce. Studies on the length-weight relationship and condition factor of various fish species from the Kashmir valley have been documented by many researchers (Bashir *et al.*, 2016; Sunder *et al.*, 1977; Yousuf *et al.*, 1992). 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 (Bashir *et al.*, 2015). 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. This can further help fish biologists to develop conservation programmes for this important endemic fish species of the region.

MATERIALS AND METHODS

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.

Length weight relationship

The determination of length weight relationship was made by applying the log transformation equation $w = aL^b$ to the data (Day, 1878).

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



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

Condition factor

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

Ponderal index (*K*) = $W \times 10^5 / (L)^3$

Where,

W = Total weight of fish in grams

L = total length of fish in millimeters

10⁵ = It has been introduced to bring the value of ponderal index near unity.

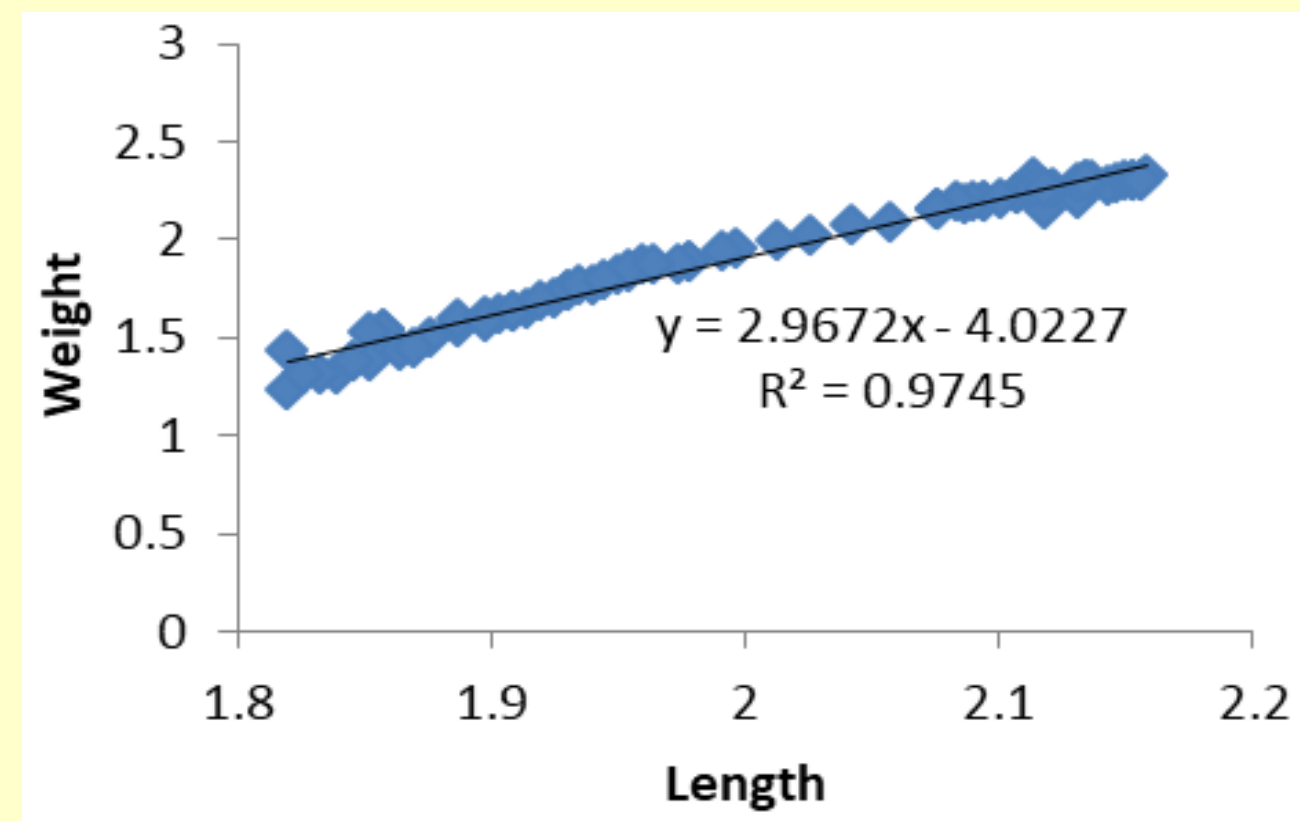


Fig 2: Scatter diagram showing length-weight relationship of *Triplophysa marmorata*

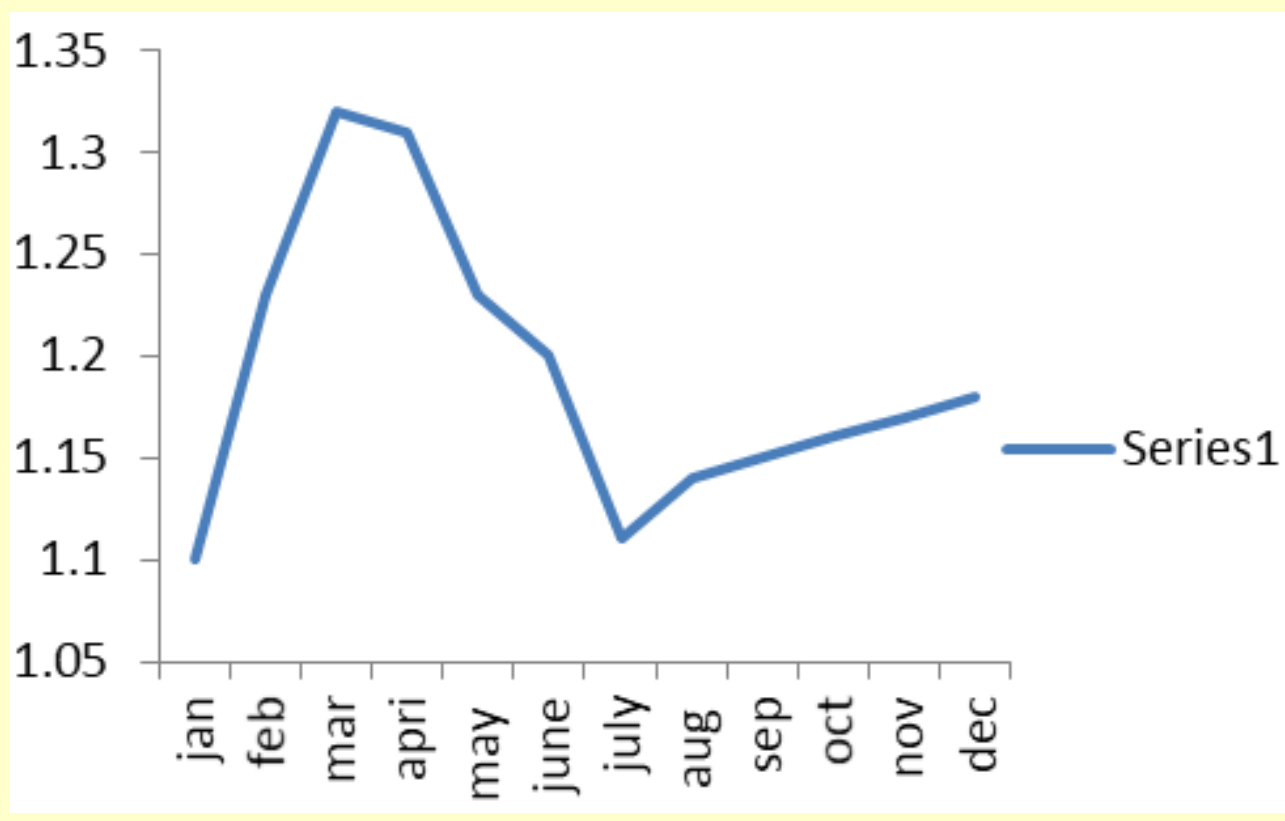


Fig 3: Monthly variation in condition factor of *Triplophysa marmorata*

RESULTS AND DISCUSSION

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. 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.

Discussion

When living in an ideal environment, the growth of fishes follows the cube law ($W=L^3$) (Fulton,1904). 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, (Lagler, 1952) 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 (Le Cren, 1951). 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 (Martin, 1949) 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. Raizada *et al.*, 2005; Bal *et al.*, 1984 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.

CONCLUSION

From the above observations, the following can be concluded:

- 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 $\text{Log } W = -4.022 + 2.967 \text{Log } L$.
- Condition factor (*K*_n) 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.

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