

## Length-Weight Relationship and Condition Factor of Rosy Barb, *Puntius conchoni* (Hamilton, 1822) from River Jhelum in Kashmir Valley, India

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**Abstract:** This study is the first attempt to describe the monthly variation in length-weight relationship (LWR) as well as annual condition of a highly commercial aquarium fish *Puntius conchoni* (Hamilton, 1822) from River Jhelum in Kashmir Valley, India. A total of 527 specimens used in this study were caught with traditional fishing gear from January to December 2011. Overall, the allometric coefficient  $b$  of the LWR was found to be negatively allometric ( $b < 3$ ) throughout the year. The condition factor (K) showed an overt variation with highest value during the breeding season. The condition factor showed variation with total length of fish and the peak value was observed at a length of 6.25 cm. The result obtained through this study will be useful for fishery managers to impose adequate regulations for sustainable fishery management.

**Key words:** Wild Population • Month-Wise Variation • *Puntius conchoni* Jhelum • Kashmir

### INTRODUCTION

Length-weight relationship (LWR) of fishes are important in fisheries and fish biology because they allow the estimation of the average weight of the fish of a given length group by establishing a mathematical relation between them [1]. Like any other morphometric characters, the LWR can be used as a character for the differentiation of taxonomic units and the relationship changes with the various developmental events in life such as metamorphosis, growth and onset of maturity [2]. Besides this, LWR can also be used in setting yield equations for estimating the number of fish landed and comparing the population in space and time [3]. LWR parameters (a and b) are useful in fisheries science in many ways: to estimate weight of individual fish from its length, to calculate condition indices, to compare life history and morphology of populations belonging to different regions [4] and to study ontogenetic allometric changes [5]. Furthermore the empirical relationship between the length and weight of the fish enhances the knowledge of the natural history of commercially important fish species, thus making the conservation

possible. Fulton's condition factor (K) is widely used in fisheries and fish biology studies. This factor is calculated from the relationship between the weight of a fish and its length, with the intention of describing the "condition" of that individual fish [6]. Different values in K of a fish indicate the state of sexual maturity, the degree of food sources availability, age and sex of some species and the system of environment [7].

The *Puntius conchoni* which is locally known as 'bloz' is a deep bodied cyprinid fish species. It is one of the hardiest of the barbs, undemanding and beautiful; most impressively colored during the mating period. It is characterized by the presence of dark black rounded spot at the base of the caudal peduncle. It is widely distributed in lakes and small streams in the Kashmir valley. The maximum known length of this fish is 14.0 cm in male [8].

LWR have been extensively studied across the world [9-11]. The literature available on the LWR and condition factor of this fish is not available in fish base, but recently Shafi and Yousuf [12] have generated some information on length weight and condition factor of this fish from Dal Lake in Kashmir. Therefore, the present study was

under taken to establish the pattern of growth and general condition of this fish species from the natural habitat for conservation and assessment.

**MATERIALS AND METHODS**

**Sample Collection:** 527 samples of *P. conchonius* were collected monthly from January 2011 to December 2011 from River Jhelum in District Baramulla (74.36° east and 34.20° north) of Kashmir by using different types of fishing gears. The required measurement of length and weight were taken at the site by using digital caliper (Mitutiya) and digital weighing machine (ACCULAB Sartorius Group) respectively. The length of the fish was taken from the tip of snout (mouth closed) to the extended tip of the caudal fin nearest 0.01mm and weighed to the nearest 0.01 g (total weight).

**Length-Weight Relationship:** The relationship between length and weight of fish was analyzed by measuring length and weight of fish specimens collected from study area. The statistical relationship between these parameters of fishes were established by using the parabolic equation by LeCren [13]

$$W = aL^b$$

where, W = weight of fish in grams, L =length of fish in mm, a = constant and b = an exponential expressing relationship between length-weight.

The relationship (W = aL<sup>b</sup>) when converted into the logarithmic form gives a straight line relationship graphically

$$\text{Log } W = \text{Log } a + b \text{ Log } L$$

where b represents the slope of the line, Log a is a constant.

**Condition Factor (K):** The coefficient of condition, K was calculated using Fulton [14]

$$K = W*100/L^3$$

where, W = weight in grams, L = Length in cm and 100 is a factor to bring the value of K near unity. The significance of the LWR and K were assessed by analysis of variance (ANOVA) and the values for each river were tested by t-test to verify its significance level in different months of a year. All the statistical analysis was done in Excel 2007.

**RESULTS**

**Length-Weight Relationship:** The length range of fish, coefficient of determination (r<sup>2</sup>), growth coefficient (b), 95% confidence interval of b and condition factor (K±SD) are given in Table 1. In our study we calculated LWR and condition factor of *P. conchonius* throughout the year and noticed the variation in these parameters. The value of b showed deviation from cube law throughout the year as negative allometric growth (b < 3) was observed. The growth coefficient was minimum in October (b=2.56) and maximum in July (b=2.86). The coefficient of determination (r<sup>2</sup>) ranged from 0.90 in July to 0.99 in September.

Table 1: Monthly descriptive statistics and estimated parameters of length-weight relationships of *Puntius conchonius* from River Jhelum in Kashmir valley (India) from January to December 2011

Months	N	Total length (cm)		Regression parameters			
		Minimum	Maximum	a	b±SE	95% CI of b	r <sup>2</sup>
January	47	1.55	10.50	0.0135	2.59±0.11	2.45-2.74	0.93
February	32	2.42	11.65	0.0131	2.76±0.07	2.56-2.86	0.97
March	57	3.03	9.50	0.0134	2.57±0.08	2.46-2.76	0.95
April	63	2.53	10.03	0.0132	2.75±0.09	2.50-2.92	0.97
May	58	2.05	11.54	0.0120	2.75±0.05	2.55-2.82	0.96
June	55	3.82	12.83	0.0123	2.75±0.04	2.69-2.98	0.98
July	38	2.54	7.44	0.0162	2.86±0.03	2.56-2.92	0.90
August	39	1.63	8.43	0.0137	2.75±0.04	2.68-2.97	0.95
September	42	3.43	10.26	0.0147	2.66±0.01	2.42-2.83	0.99
October	29	2.11	8.65	0.0144	2.56±0.07	2.43-2.70	0.95
November	37	2.54	10.34	0.0137	2.77±0.03	2.57-2.91	0.96
December	30	2.55	9.35	0.0154	2.78±0.05	2.61-2.98	0.97

N: total number of samples; a: intercept; b: slope; CL: Confidence limits; r<sup>2</sup>: Coefficient of determination. \*Anti-log a.

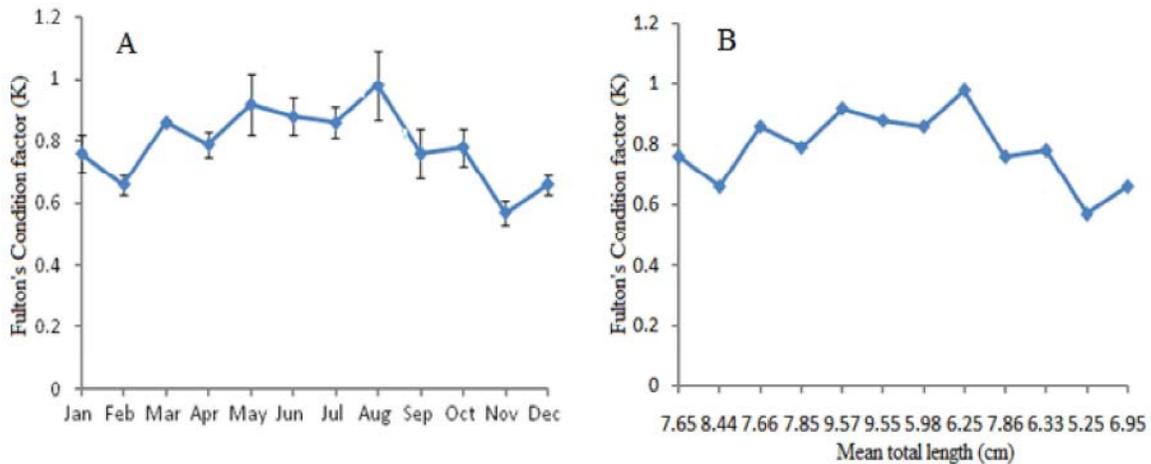


Fig. 1: The month-wise and size-wise variation in condition factor of *P. conchoniuis* from River Jhelum in Kashmir, India

**Condition Factor:** The condition factor of *P. conchoniuis* was calculated month-wise, it ranged from 0.57-0.98. K was highest in August followed by May, June, July, March, April, October, September, January, December, February and it was lowest in November (Fig 1A). Additionally mean K was also plotted against the mean total length of the fish and it was observed that the condition factor peaked at a length of 6.25 cm and was lowest at 6.95 cm and 8.44 cm (Fig 1B).

### DISCUSSION

The LWR of fish have significant importance in studying the growth, gonadal development and general well-being of fish population [15-17] and for comparing life history of fish from different wild populations [4].

This is the first study for *P. conchoniuis* on the parameters of LWR in Jhelum River of Kashmir, which could serve as a tool for providing insight into growth strategies of this species. The *b*-values of the present study conform to the suggestion of Froese [6] that *b* normally falls between 2.5 and 3.5. In terms of growth type, a value close to three indicates that the fish grows isometrically and other values indicate allometric growth [18]. In this study negatively allometric growth ( $b < 3$ ) was observed throughout the year. Such changes in *b* value may be attributed to certain environmental factors such as overfishing, food competition and trophic potential of the rivers [19]. Considering the *b* values, large specimens have a body shape that becomes more elongated or the small specimens were in better nutritional condition at the time of sampling [6] An approximate 95% confidence limit

for *b*-values showed a significant tendency for the populations to increase in body thickness as they grew by an over-proportional increase in length relative to growth in weight presumably favoring the swimming speed. Similar kinds of observations were noticed by Shafi and Yousuf [12] in *Puntius conchoniuis* and Manojkumar and Kurup [20] *Puntius carnaticus* and they attributed these inferences to size, sex, feeding intensity and gonadal development of fish.

According to Le Cren [13], ecological conditions of the habitats or variation in the physiology of the animals, or both, are responsible for growth rate variations in the same species in different months of a year (Fig. 1). On the contrary, it can be seen that the growth condition is towards a declining trend in different months. Similar kind of growth pattern was observed by Haniffa *et al.* [21] in *Channa punctatus* and attributed it to habitat degradation.

The condition factor of *P. conchoniuis* showed variation in different months and at different lengths, it was noticed that the K was higher when fish entered into the maturation phase during the months of June, July and August for rest of the months K showed slightly lower values. Le Cren [13] reported that environmental factors, food supply and parasitism have great influence on the health of the fish. The differences in condition factors seasonally could be attributed to low feeding intensity and degeneration of ovaries during winter and high feeding intensity and full development of gonads during summer months. Comparatively higher values of K during winters could be attributed to high deposition of fats as preparation for the coming breeding season.

The present study is the first attempt to provide information about the growth condition of *P. conchoniis* from wild habitat. This study will enlighten biologists about the status and growth condition of this fish in natural waters and will be useful for the fishery biologists and conservation agencies, for successful development, management, production and ultimate conservation.

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