

## Short Communication

# Length-weight relationships of seven indigenous fish species of Kashmir Himalaya, India

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**Abstract:** In the present study length-weight relationships (LWR) were studied for seven important fish species of Kashmir Himalaya. Khont, *Schizothorax plagiostomus* (Heckel, 1838), Chush, *S. labiatus* (McCalland, 1842), Chirruh, *S. esocinus* (Heckel, 1838), Ale gad, *S. niger* (Heckel, 1838), Satter gad, *S. curvifrons* (Heckel, 1838), Ara gurun, *Triplophysa kashmirensis* (Hora, 1922) and Ara gurun, *T. marmorata* (Heckel, 1838). During the study period 2017-2018, a total 280 samples of seven fish species were collected from various water bodies (Sindh, Jhelum and Vishu rivers). Prior to this study, LWR of two species *T. kashmirensis* and *T. marmorata* were unknown to fish database. The findings of the present study will be useful for the conservation and management of above indigenous fish species of Kashmir Himalaya which are declining day by day.

**Keywords:** *Schizothorax* spp., *Triplophysa kashmirensis*, *Triplophysa marmorata*.

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## Introduction

Length-weight relationship (LWR) estimation of fishes is a useful tool to check the health status of fishes (Bolger & Connolly 1989). LWR of fishes also plays a vital role in fisheries and fish biology as it provide help for the assessment of the mean body weight of the fish in a particular length set by evaluating a mathematical relation between them (Beyer 1991). LWR has also been used to evaluate the biological and fisheries data in relationship to past events of definite species and other characteristics of fish population to find out the alteration in growth and weight (Moutopoulos & Stergiou 2002; Nile et al. 2013). This relationship like other morphometric parameters can be also used as diagnostic tool for description of taxonomic characters as well as for the differentiation of various development events (Strauss & Bond 1990). In addition, the LWR specifies the degrees of maintenance of taxonomic features in fish species and is very beneficial in the managing and utilization

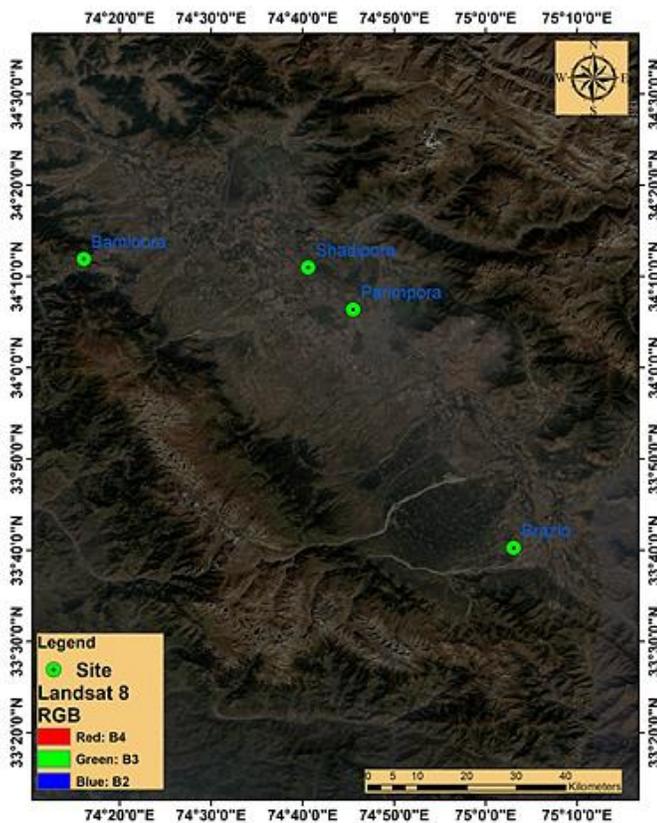
of fish species (Pervin & Mortuza 2008). Although several work has been carried out on LWR of different fish species from various parts of the world (Moutopoulos & Stergiou 2002; Muchlisin et al. 2010; Mortuza & Almisned 2013), however only scattered information on LWR has been available from Kashmir Himalaya and no work on LWR of two important indigenous fish species i.e. *T. kashmirensis* and *T. marmorata* has been reported before this study. Therefore, the present study was undertaken to estimate the LWR of seven indigenous fish species inhabiting this region.

## Materials and Methods

A total of 280 fish specimens collected from three different water bodies of Sindh, Jhelum and Vishu rivers in which *Schizothorax labiatus*, *S. esocinus* and *S. curvifrons* were collected from Sindh River at Bamloora site (34°12'03.92"N, 74°46'01.07"E), *S. plagiostomus* and *S. niger* were collected from Jhelum at Shadipora site (34°10'59.28"N,

**Table 1.** Descriptive statistics and estimated parameters of total length, weight data, regression parameters, 95% CI of seven fish species. N= total number species; a, intercept slope; b, slope; CI, confidence interval; r<sup>2</sup>, coefficient of determination; \*Anti-log of a.

Family	Species	N	Weight		Length range		Regression Coefficient				
			Min	Ma	Min	Max.	a*	95% CI of a	b	95% CI of b	r <sup>2</sup>
Cyprinidae	<i>S. plagiostomus</i>	38	225	38	21.7	38.8	0.0206	0.0120-0.0540	3.074	2.089-3.173	0.98
	<i>S. labiatus</i>	40	200	38	19.2	36.4	0.0220	0.0180-0.9735	3.021	2.68-3.160	0.98
	<i>S. esocinus</i>	40	230	38	20.4	38.2	0.0108	0.098-0.0302	2.98	2.362 to 2.86	0.98
	<i>S. curvifrons</i>	36	180	36	17.1	37.4	0.1530	0.0290-0.0560	3.06	2.93-3.120	0.97
	<i>S. niger</i>	39	220	37	25.5	33	0.2101	0.0783-0.820	2.92	2.433-3.091	0.98
Balitoridae	<i>T. kashmirensis</i>	42	10	25	4.6	14.6	0.1062	0.0120-0.0423	2.96	2.71-3.0521	0.96
	<i>T. marmorata</i>	45	8.7	38	4.4	18.7	0.0231	0.0095-0.0165	2.98	2.81-3.1503	0.97



**Fig.1.** Shows sampling sites of fish collection.

74°40'35.28"E) and Parimpora (34°06'23.33"N, 74°45'30.58"E), whereas *Triplophysa kashmirensis* and *T. marmorata* were collected from Vishu River near the Brazlo brigde (33°38'35.81"N, 75°03'03.79"E) as shown in Figure 1. Fish samples were captured by a cast net of 18×2.5m dimensions and mesh size of 15-45mm between February 2017 and January 2018. Specimens were identified based on Kullander (1999). The total length of specimens was measured using a Vernier caliper (0.1cm accuracy) and weight was determined by a Shimadzu

UX320G digital electronic balance (0.1g accuracy).

The length-weight relationship was estimated using the formulae of  $W=aL^b$ , where W= total weight (g) and L = Total length (cm) (Ricker 1973). The parameters 'a' (intercept) and 'b' (regression coefficient slope) were derived using the following equation:  $\text{Log}W = \text{Log}a + b \text{Log}L$  (LeCren 1951) with 95% confidence interval. Moreover, log-log plots were used to detect and exclude outliers (Froese 2006). All parameters were analyzed by using statistical software SPSS 20 and Microsoft Excel 2010.

**Results**

The length-weight relationship of seven indigenous fish species inhabiting the water bodies of Kashmir (Himalaya) have been evaluated and the results are presented in Table 1. The b values of LWR of all the seven fish species was reported in the range from 2.92-3.07 and regression coefficient (r<sup>2</sup>) ranging from 0.97-0.98.

**Discussion**

Length-weight relationship (LWR) of fish reflects health indices to facilitate understanding growth profile and general fitness, regarding to compare the morphology between the species (Santos et al. 2002). LWRs of fishes are affected by many factors, including the length range of sampled specimens, number, habitat, seasonality, sex, diet, stomach fullness, etc (Forese 2006; Karachle & Stergiou 2008; Sharma et al. 2015).

In the present study, values of 'a' and 'b' for these

seven species are within the normal range, as suggested by the Bayesian length weight approach (Froese & Pauly 2019). Although some works on LWR of *Schizothorax* spp. has been reported in the past, however, the FishBase data of some species has not been available. In the present study, the 'b' values were reported within the range of 2.92 to 3.07 among all the seven species. The 'b' value of *S. plagiostomus* was 3.074 in this study, which is slightly higher than the 'b' value for *S. plagiostomus* reported from the peripheral water bodies of Dal Lake (Qadri & Mir 1980) as well as from Jammu water bodies (Bhagat & Sunder 1983). Contrary to this study, the 'b' value of 2.98 estimated for *S. esocinus* by Bhagat & Sunder (1984) from Dal Lake. This might be associated with habitats differences as well as the availability of the food. Tyagi et al. (2014) recorded the 'b' value of *S. richardsonii* from different rivers in the range of 2.44-3.11. The present results are also inconformity with above findings. Moreover, Bashir et al. (2016) reported values of 'b' for *S. niger* (2.89), *S. curvifrons* (2.91) and *S. plagiostomus* (2.92) from the tributaries of rivers Jhelum and Dal lake in Kashmir Valley, which are slightly lower than the values obtained in the present study. While in case of *T. kashmirensis* and *T. marmorata*, the 'b' values were '2.93' and '2.98' which is fall within expected reported range (Froese 2006; Froese & Pauly 2019).

In conclusion, the present study provides basic information on LWRs of seven food fish species from Kashmir valley that could be useful in estimating the average weight at a given length group and in determining the fitness status of the fish population. In fisheries management, it is broadly applied as it provides information on stock condition and also helps to compare specific growth of different fish species among different regions. The data generated in the present study would also be useful for conservation and management of these fish species, as some among which are presently under the status 'threaten' in the IUCN Red List of Threatened Species.

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