



**Length- weight relationship of six coldwater food fish species of River Poonch,
Pir Panjal Himalaya, India.**

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ABSTRACT

Length-weight relationships are of great importance in fishery assessment studies since it provides vital information about the growth of fishes, reproductive biology and general well-being of fish in their respective habitats. In the present investigation a total of 158 specimens of *Schizothorax richardsonii* (N=30), *Garra gotyla* (N=28), *Botia biridi* (N=25), *Crossocheilus diplocheilus* (N=25), *Mastacembelus armatus* (N=24) and *Tor puitora* (N=26) were collected during June, 2017 to October, 2018 from different sites of the River Poonch of Pir Panjal Himalayan region, with the help of local trained fishermen by using cast and gill nets. The results revealed that positive allometric growth ($b>3$) for *S. richardsonii*, *C. diplocheilus* and *M. armatus*, while negative allometric growth ($b<3$) were noted in *G. gotyla*, *B. biridi* and *T. puitora*. The 'a' values of all the fish species was reported in the ranged from 0.001 to 0.410 and the coefficient of variation (r^2) was noted in the ranged from 0.87-0.98. The data generated in the present study would be useful in determining the health status of these fish species as well as for their better management and conservation.

INTRODUCTION

Length- relationship (LWR) estimation of fishes can provide important information in understanding the growth rates of fish population and their dynamics (Anderson *et al.*, 1996; Al Nahdi *et al.*, 2016). Length-weight relationship of fishes plays a vital role in fisheries and fish biology as it allows the assessment of the mean body weight of the fish in a particular length set by evaluating a mathematical relation between them (Beyer,

1991). The LWR study also provide information about biological and fisheries data in relation to the past events of life of definite species and other characteristics of fish population including various development events, weight-length relationship have broadly been used for the alteration of growth in weight and growth in length (Teixeira de Mello *et al.*, 2008; Mortuzaand and Almisned, 2013; Nile *et al.*, 2013; Zhulan *et al.*, 2013; Sheikh and Ahmed, 2018). Besides, the LWR specifies the degrees of maintenance of taxonomic features in fish species and very beneficial in the managing and utilization of fish species (Pervin and Mortuza, 2008). Fish growth usually identified through rise in both weight and length which is considered the most appropriate parameter to identify the population analysis at particular period (Jobling, 2002). Now-a-days, study on LWR of fish species are considered as an important biological parameters to generate information about the growth and condition of fish species living in both natural and culture condition. The study of LWR also plays a significant role in management and conservation of fishes. (Sarker *et al.*, 2006; Muchlisin *et al.*, 2010; Khan *et al.*, 2012). Lot of work on LWR of different fish species has been reported from various parts of the world (Moutopoulos and Stergiou, 2002; Muchlisin *et al.* 2010; Mortuza and Almisned, 2013; Kembenya *et al.*, 2014; Gumano *et al.*, 2016), as well from india (Dhanze and Dhanze, 1997; Sunil, 2000; Serajuddin, 2005; Haniffa *et al.*, 2006; Bhat *et al.*, 2010; Khan *et al.*, 2012; Mir *et al.*, 2012; Khan and Sabah, 2013; Gogoi and Goswami, 2014; Kashyap *et al.*, 2015). However, a very limited information about LWR of fish species habituating in River Poonch, which is an important tributary of Indus River system (Bashir *et al.*, 2015; Sharma *et al.*, 2015). Therefore, the present study was conducted to estimate the LWR of six coldwater indigenous food fish species inhabiting the River Poonch of Pir Panjal Himalayan region.

MATERIALS AND METHODS

A total of 158 fish specimens were collected from various sites of river Poonch which include *Schizothorax richardsonii*, *Garra gotyla*, *Botia biridi*, *Crossocheilus diplocheilus*, *Mastacembelus armatus* and *Tor putitora* were captured using cast net and gill net with help of fishermen. Specimens were identified with the help of standard keys given by Talwar and Jhingran (1990) and Kullander *et al.*(1999). The total length of specimens was measured to the nearest 0.1cm and weight was determined on digital electronic balance (Shimadzu UX320G) with 0.1g accuracy. The length weight relationship was estimated by using the standard formulae $W=aL^b$, (Ricker 1973) where, W= body weight (gm); L= Total length (cm). The parameters 'a' (intercept) and 'b' (regression coefficient slope) was derived by using formula: $\text{Log}W=\text{Log}a+ b \text{Log}L$ (LeCren, 1951) with 95% confidence interval. Moreover, log-log plots were used to detect and exclude outliers. All parameters were analyzed by using statistical software SPSS 20 and Microsoft Excel 2010.

RESULTS

In the present study, the LWR of six indigenous fish species inhabiting the river Poonch of Pir Panjal Hamilyan region has been evaluated and the results are presented in Table 1. The 'b' values of LWR of all the six fish species was reported within the range from 2.17-3.18 with regression coefficient (r^2) ranging from 0.87-0.98.

Table 1 Descriptive statistics and estimated parameters of total length, total weight data and regression parameters, (95% CI) of six food fish species of river Poonch of PirPanjal Himalayan region India.

Species	N	Total length (cm)		Weight (gm)		b	95%CI of b	a [§]	95%CI of a	r ²
		Min	Max	Min	Max					
<i>Schizothorax richardsonii</i> ,	30	17	36.6	43.1	354.9	3.181	2.089-3.281	0.0305	0.0150-0.0760	0.989
<i>Tor putitora</i>	26	21.8	38.4	21.8	254.2	2.982	2.683-3.18	0.0328	0.0153-0.0635	0.978
<i>Garra gotyla</i> ,	28	9.8	21.5	42.4	151.8	2.171	2.051 - 2.96	0.0608	0.0098-0.0405	0.879
<i>Crossocheilus diplocheilus</i>	25	12.5	24.7	31.6	119.2	3.1048	2.143-3.220	0.0521	0.0370-0.0450	0.978
<i>Mastacembelus armatus</i>	24	21.2	49	48.9	98.2	3.151	2.433-3.271	0.4100	0.0462-0.450	0.987
<i>Botia biridi</i>	25	9.8	18.6	29.2	55.2	2.817	2.79-3.1521	0.00160	0.0100-0.0022	0.898

N= total number of species; 'b' slope; 'a' intercept slope; CL confidence interval; r^2 , coefficient of determination; [§]Antilog of 'a'.

DISCUSSION

Length-weight relationship (LWR) of fish has a significant role in fisheries management. The LWR can be used in estimating the average weight at a given length groups (Beyer, 1987) and is useful in estimating the health status of the fish population (Bolger and Connolly, 1989). LWR of fishes affected by intrinsic and extrinsic factors including the length range of sampled specimens, number, habitat, seasonality, sex, diet, stomach fullness, etc (Forese 2006; Sharma et al. 2015). In the present study the values of 'a' and 'b' for the six food fish species of the region were reported within the normal range. as suggested by the Bayesian length weight approach (Froese & Pauly 2015). The LWR of

M. armatus is reported first time from colder zone of Pir panjal of J and K. The 'b' value was reported of *M. armatus* more than '3' which indicate isometric growth. Although some work on LWR of important food fish species such as *S. richardsonii*, *G. gotyla*, *B. biridi*, *C. diplocheilus* and *T. putitora* inhabiting the river Poonch has been reported in the past, while LWR of *M. armatus* inhabiting in river Poonch was first time reported in this study. Bashir *et al.* (2015) reported values of 'b' for *S. richardsonii* (2.96) and *C. diplocheilus* (2.99) from Indus basin Jammu and Kashmir, which are slightly lower than the values obtained in the present study. The 'b' values of *G. gotyla* (2.17), *B. biridi* (2.80), in the present study was marginally lower than the 'b' values reported by Sharma *et al.*, 2015. Whereas 'b' value of *T. putitora* (2.98) was noted considerably higher than the 'b' value of *T. putitora* reported by Sharma *et al.*, 2015. While in case of *M. armatus* the 'b' value '3.15' observed in the present study is higher than the 'b' value reported by Narejo *et al.*, 2002; Khan *et al.*, 2012 from different water bodies.

CONCLUSION

This study provides the basic and update information on LWR of six fish species from river Poonch of Pir Panjal Himalayan region that could be useful for biologists and conservationists to impose suitable regulations for sustainable fishery management of the region.

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