Technical contribution

Length-weight relationships of three cyprinid fishes from Sirwan River, Kurdistan and Kermanshah provinces in western Iran

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Summary

The length–weight relationships (LWR) for three fish species collected in Sirwan River, located in Kurdistan and Kermanshah provinces, western Iran, were estimated. The values of the slope parameter (*b*) in the length–weight relationship equations were determined as 3.086 for *Alburnus mossulensis*, 3.382 for *Alburnus filippii* and 3.425 for *Capoeta damascina*, all significantly different from the expected *b* = 3 value, indicating a positive allometric growth pattern for all the three species.

Introduction

In order to estimate the biomass, it is necessary to know the length-weight relationships of the species. Generally, length-weight relationship of fish is used to estimate the condition of fish, its biomass from length observation, the conversion of growth in length equations to growth-in-weight and it is also useful for between-region comparisons of life histories of species (Pauly, 1993; Goncalves et al., 1997; Binohlan and Pauly, 1998).

The available information on fish length-weight relationship in Iran is mostly limited to some reports on commercially important fishes (Hosseini, 2002; Naddafi et al., 2002; Shokri et al., 2005; Esmaeili, 2006; Esmaeili and Ebrahimi, 2006; Heydarnejad, 2009; Alavi-Yeganeh et al., 2011; Raeisi et al., 2011).

Alburnus mossulensis, *Alburnus filippii* and *Capoeta damascina* are three native species in the Sirwan River in Kurdistan and Kermanshah provinces. However, no length-weight data were available for these species in FishBase (Froese and Pauly, 2012). This study provides the first published reference of length-weight for these species from Sirwan River.

Materials and methods

Specimens were collected from Sirwan River (34°15-35°47N; 45°53-48°00E) in Kurdistan and Kermanshah provinces, western Iran.

The specimens were collected in April and August 2011. The specimens were caught by several different types of fishing gears: (i) a hand net with a 5 mm mesh size (STR) (ii) a gill net with a 30 mm mesh size (STR) and (iii) cast net with a 15 mm mesh size (STR).

After hauling, fishes were removed and preserved in 10% neutralized formalin for subsequent analyses in the laboratory.

For each specimen, the total length (TL) was measured with a digital caliper to the nearest 0.1 mm, and body weight was measured on a digital scale with 0.01 g accuracy. The *LW* relationship was estimated using the equations:

$$W = aL^b$$

and

$$\log(W) = \log(a) + b\log(L)$$

Where W is the whole body weight (g) and L the total length (cm).

The 95% confidence limits of parameters a and b and the correlation coefficient r were also calculated. To demonstrate the significant differences of the obtained b-values from the expected isometric value $b = 3$, a t-test expressed by the following equation (Sokal and Rohlf, 1987) was used:

$$t_s = \frac{b - 3}{s_b}$$

Where t_s is the t-test value; b is the slope and s_b is the standard error of the slope. Comparison of the obtained values in t-test and the respective tabled critical values determine the b values statistical significance, and their inclusion in the isometric range ($b = 3$) or allometric range ($b < 3$ for negative allometric or $b > 3$ for positive allometric growth patterns).

Statistical analyses were performed in the R package version 2.11.0 (Lucent Technologies, Murray Hill, NJ).

Results and discussion

The sample size, the minimum, maximum and mean length (±SE), length-weight relationships parameters and the descriptive statistics are presented in Table 1.

In our study, the results showed a suitable estimation of weigh-length relationship, whereas parameter b lied between the expected ranges of 2.5–3.5 (Froese, 2006).

Length-weight relationships are not constant over the year and may vary significantly due to biological, food availability, temporal and sampling factors, health and sex (Bagenal and Tesch, 1978; Froese, 2006) none of which were considered for in this study.

In conclusion, this study provides basic information on LWRs for these species that would be useful for fishery biologists and managers in western Iran.

Table 1
Descriptive statistics and *LW* relationship parameters for three cyprinid fishes in Sirwan River, western Iran

Species	Length (cm)			*LW* relationship parameters and statistics						
	n	Min	Max	*a*	SE(a)	CL95% (a)	*b*	SE(*b*)	95%CL*b*	r^2
Alburnus mossulensis	75	5.26	16.63	0.006	0.053	0.0053–0.0086	3.111	0.057	2.988–3.216	0.976
Alburnus filippii	81	5.20	15.03	0.003	0.050	0.0028–0.0045	3.384	0.051	3.281–3.488	0.982
Capoeta damascina	47	4.94	14.25	0.006	0.081	0.0044–0.0094	3.223	0.010	3.011–3.436	0.954

n, sample size; SE, standard error; Min, minimum; Max, maximum; *a* and *b*: parameters of equation $W = aL^b$; CL 95%, confidence limits; r^2, coefficient of determination.

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