Length-Weight and Length-Length Relationships of *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae*)* In Dalaki River Bushehr, South of Iran

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Abstract: Length-weight and length-length relationships were derived for *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae), in Dalaki River Bushehr, in South of Iran. Sampling was done throughout one Season from October to December 2011 using electrofishing (D.C. at 200-300 V., 50 Hertz frequencies and one anode). Total length and weight ranged from 75.67 to 215 mm and 3.31 g to 90g, respectively. The Length-weight (LWR) and length-length relationships (LLR) were determined according to the power regression model. The b value in the length-weight relationship was significant difference between males and females (t-test, P?0.05). Length-weight relationship showed positive allometric for males as: $W=0.07 \times L^{3.79}$ ($r2=0.93$) and negative allometric for females as: $W=0.05 L^{2.87}$ ($r2=0.96$).

Key words: *Capoeta capoeta intermedia* · Length-Weight Relationships · Electric Fishing · Dalaki River

INTRODUCTION

Cyprinidae are the richest and most important family of fish. Cyprinid fishes of the genus Capoeta inhabit mainly fast flowing streams and rivers of the Levant, Middle East, Caucasus and Southwestern Asia, but some species may also be found in lakes and springs [1]. *Capoeta capoeta intermedia*, one of the subspecies of the genus Capoeta inhabits South of Iran.

The length-weight (LWR) and length-length (LLR) relationships have been applied for basic uses for assessment of fish stocks and populations [2]. The length-weight relationships also helps to figure out the condition, reproduction history, life history and the general health of fishing species[3-7] and is also useful in local and interregional morphological and life historical comparisons in species and populations. The relationship between the length (L) and weight (W) of a fish is usually expressed by the equation $W= aL^b$. Values of the exponent 'b' provide information on fish growth. When b = 3, increase in weight is isometric. When the value of b is other than 3, weight increase is allometric (positive if b > 3, negative if b < 3). This parameters (a, b) are important in stock assessment studies [8-10].

The present study describes the Length-weight, length-length relationship of *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae*)* in Dalaki River Bushehr, in South of Iran

MATERIALS AND METHODS

In this study, 70 individuals (30 females and 40 males) of *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae*)* in Dalaki River Bushehr, in South of Iran using Electrofishing (D.C. at 200-300 V., 50 Hertz frequencies and one anode) from October to December 2011. Dalaki River located in 50-52°E geographical area. The length of Dalaki River in the province Bushehr has 115 kilometers, which this river is permanent river in south of Iran. From connection of Shapur River and Dalaki, Helleh River was formed and finally falls into the Persian Gulf [11] (Figure 1).

Sampled fishes were fixed with 10% formalin and transferred to the laboratory. For each specimen, total length (TL) and standard length (SL), whole body wet weight (g) and sex was recorded. Total length of captured fish was measured to the nearest 0.01 cm and weighted to the nearest 0.01 g [12]. The length-weight relationship was estimated by using following equation: [2]

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Fig. 1: Location of Dalaki River in Bushehr province, South of Iran

$$W = a\,L^b$$

Where W is the whole body weight (g), L is the total length (mm), a is the intercept of the regression and b is the regression coefficient (slope) that it is usually between 2 and 4 [2].

A t-test was used for comparison b value obtained in the power regression with isometric value [2]. Also a t-test was used for comparison b value in the power regression of male and female fishes [13]. The relationship between total and standard lengths (TL and SL) was determined according to the power regression model.

The growth pattern (t) was using the following equation: [14]

$$t = \frac{sd\ln L}{sd\ln W} * \frac{|b-3|}{\sqrt{1-r^2}} * \sqrt{n-2}$$

Where SdlnL is Standard deviation of the Length natural logarithm (cm), Sdlnw is Standard deviation of the natural logarithm weight (g), b is Curve slope of the relationship between length and weight, r^2 is Regression coefficient between length and weight and n is number of samples.

Data were statistically analyzed by analysis of variance (ANOVA) using the General Liner Models procedure coupled with Duncan's multiple range test in spss software (ver16.0).

RESULTS AND DISCUSSION

Overall 70 fish were measured. The length-weight relationship was significant difference between males and females (t-test; P?0.05). The sample size, the minimum, maximum and mean length (± STD) and weight are presented in Table 1.

In present study total length and weight ranged from 75.67 to 215 mm and 3.31 g to 90 g, respectively. Johari *et al*. [15] reported total length for *Capoeta capoeta* in Talar River from 120.49±20.72 mm for males and134.96±31.72 g for females. Valipour [16] reported, Total length and weight for *Capoeta capoeta* in Maku Dam Lake from 27 to 290 mm and 0.4 to 327.7g, respectively and Shamekhi Ranjbar *et al*. [17] reported Total length and weight for *Capoeta capoeta gracilis* in Dough River from 12.23 to 18.36 mm and 25.47 to 85.19g, respectively. Probably these differences attributed to the selectivity of the sampling tools and different environmental conditions.

Table 1: Length characteristics (mm) and weight characteristics (g) for *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae*)* in Dalaki River Bushehr, South of Iran

Sex	Length characteristics (mm)				Weight characteristics (g)		
	n	min	max	Mean ± STD	min	max	Mean± STD
Males	40	75.67	128.5	111.17±13.90	3.31	22.53	13.72 ±5.39
Females	30	110	215	150.77±23.54	16	90	35.86±18.32
Total	70	75.67	215	134.16±28.02	3.31	90	26.57±18.05

Table 2: The length-weight relationship parameters for *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae*)* in Dalaki River Bushehr, South of Iran

sex	n	a	b	R^2
		Parameters of the relationship		
males	40	0.07	3.79	0.93
Females	30	0.05	2.87	0.96
Total	70	0.06	3.21	0.96

Table 3: The relationship between total length (TL in mm) and standard length (SL in mm) for *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae*)* in Dalaki River Bushehr, South of Iran

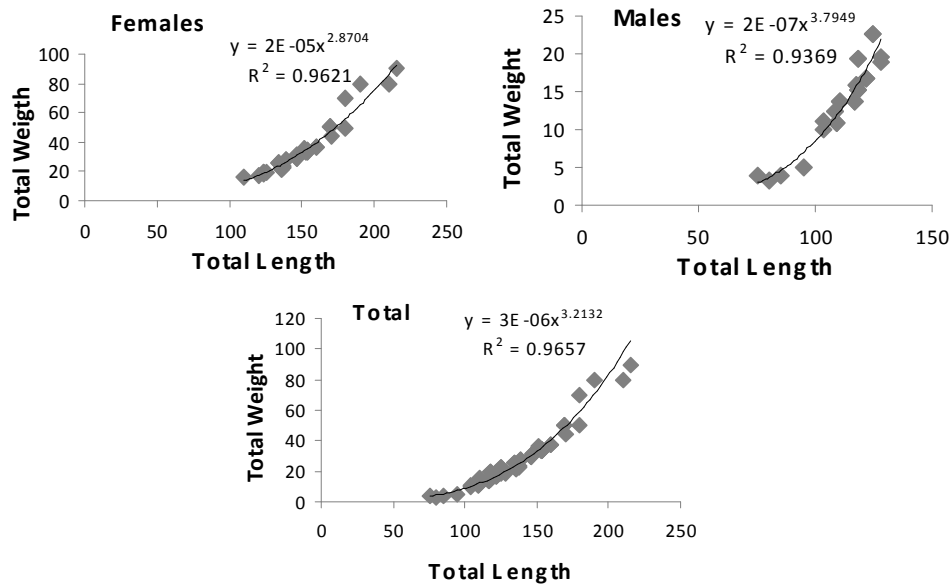| Sex	n	Equation	a	b	R^2
			Regression parameters		
males	40	SL = a + b× TL	1.23	0.911	0.96
Females	30	SL = a + b× TL	0.402	1.14	0.90
Total	70	SL = a + b× TL	0.52	1.09	0.95

Fig. 2: The length-weight relationship for *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae*)* in Dalaki River Bushehr, South of Iran

The relationship between total length and Total weight was determined according to the power regression model (Figure 2).

The length-weight relationship parameters are presented in Table 2. The b value in the length-weight relationship was significant difference between males and females (t-test, P?0.05).

In present study, length-weight relationships for males, females and the total sample population were determined as W=0.07 TL$^{3.79}$, W=0.05 L$^{2.87}$ and W=0.06 TL$^{3.21}$ respectively (Table2). Badri Friman *et al.* [18], reported Length-weight relationship as W = 0.0271L $^{2.82}$ for males, W = 0.0278L $^{2.82}$ for females.

The values of b found in present study on *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae) in Dalaki River Bushehr for males, females and total sample population were determined positive allometric, negative allometric and positive allometric respectively.

The b value in the length-weight relationship for males, females and the total sample population were determined as 2.87, 3.05 and 2.91 respectively (Table2). according Bagenal and Tesch [12], allometric coefficients (b) may range from 2 to 4.The parameters of the fish, LWRs are affected by a series of factors including season, habitat, gonad maturity, sex, diet, stomach fullness, health and preservation techniques[12, 19]

The relationship between total length (TL in mm) and standard length (SL in mm) are presented in Table 3.

The equation describing the TL to SL relationship was: SL = 0.402+1.14×TL, r2 = 0.90 for females and SL = 1.23+0.911×TL, r2 = 0.96 for males (Table 3).

This study gives information to fishery biologists about length-weight and length-length relationships for *Capoeta capoeta intermedia* (Osteichthyes: Cyprinidae) in Dalaki River Bushehr, in South of Iran.

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REFERENCES

1. Coad, B.W., 1995. Freshwater fishes of Iran. Acta. Sc. Nat. Brno., 29(1): 1-64.

2. Ricker, W.E., 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Board Can., pp: 382.

3. Nikolsky, G.W., 1963. The ecology fishes. Academic Press, London and New York, pp: 352.

4. Wootton, J.T., 1992. Indirect effect, prey susceptibility and habitat selection: impacts of birds on limpets and algae. Ecology, 73(3): 981-991.

5. Pauly, D., 1993. Fishbyte section editorial. Naga, the ICLARM Quarterly, 16: 26.

6. Erkoyuncu, I., 1995. Fisheries biology and population dynamics. University of Ondokuz Mayis, Faculty of Fisheries, Sinop, Turkey, pp: 256 (in Turkish).

7. Avsar, D., 1998. Fisheries biology and population dynamics. University of Cukurova, Faculty of Fisheries, Adana, Turkey, pp: 303 (in Turkish).

8. Froese, R., 1998. Length-weight relationships for 18 less-studied fish species. J. Appl. Ichthyol., 14: 117-118.

9. Can, M.F., N. Basusta and M. Cekic, 2002. Weight-length relationships for selected fish species of the small-scale fisheries off the south coast of Iskenderun Bay. Turk. J. Vet. Anim. Sci., 26: 1181-1183.

10. Moutopoulos, D.K. and K.I. Stergiou, 2002. Length-weight and length-length relationships of fish species from Aegean Sea (Greece). J. Appl. Ichthyol., 18: 200-203.

11. pazira, A., S.M. Emami, E. Kouhgardi, S. Vatandoost and R. Akrami, 2008. The effect of the environmental parameters on biodiversity of macrobentose in Dalaki and Helle River of Boushehr, 2(4): 102-109.

12. Bagenal, T.B. and F.W. Tesch, 1978. Age and growth. In: Bagenal, T. (Ed), Methods for Assessment of fish in Freshwaters, 3rd Edition. IBP Handbook No. 3. Blackwell Scientific publication, Oxford, pp: 75-101.

13. Zar, J.H, 1999. Biostatistical Analysis. 4th edition. Prentice-Hall Englewood Cliffs, New Jersey., pp: 929.

14. Pauly, D. and J.I. Munro, 1984. Once more on the comparison of growth in fish and invertebrates, ICLARM. Fish Byte, 2(1): 106.

15. Johari, N., M. Shapuri and S. Vatandoost, 2011. Comparison of morphometric and meristical features *Capoeta capoeta* in Talar River of Mazandaran Province. Journal of Marine Biology-University of Ahvaz, 2(6): 53-64.

16. Valipour, A., 2004. Review feed of *Capoeta capoeta* in Maku Dam Lake, Iranian Journal of Fisheries, 13(2): 163-176.

17. Shamekhi Ranjbar, K.H., R. Patimar, R. Ghorbani and A. Azimi, 2012. Investigation of Fecundity and its Relationship with Some Growth Indices of *Capoeta capoeta Gracilis* (Keyserling, 1861) in the Two Streams(Dough and Zarrin-Gol) of Gorganroud River Basin, Golestan Province, Northern Iran. World Journal of Fish and Marine Sciences, 4(1): 111-114.

18. Badri farima, M., Sh. Aryan, M. Ramin, A. Abdul and SA. Ink Johari, 2011. Studies Indicators biological for *Capoeta fussca* In the subterranean ecosystems (A Case Study of South Khorasan), Journal of Marine Biology-University of Ahvaz, 1(4): 65-77.

19. Tesch, W., 1971. Age and growth. In: W.E. Ricker (ed), Methods for assessment of fish production in fresh waters, 2nd edn. International Biological Program, Oxford and Edinburgh, pp: 97-130.