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Short Communication

Length-weight relationships of *Garra rufa*, in the Tigris and Persian Gulf basins of Iran

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Abstract: *Garra rufa*, a bottom dwelling freshwater fish and native to the Middle East, is distributed in the southwestern Iran and the Tigris basin. Considering the importance of length-weight relationships data of a species in different habitats, the length-weight relationship of *G. rufa* from 13 rivers in the Persian Gulf and the Tigris basins was explored. The value of exponent *b* ranged from 2.74 to 3.19 with average of 2.99 in the Tigris basin and 2.96 in the Persian Gulf basin which was in normal range (2.5-3.5). As the length-weight parameters were concluded for each location separately, this information would be useful for further population dynamics researches.

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Introduction

Garra rufa, a bottom dwelling freshwater fish, belongs to the family Cyprinidae and native to the Middle East (Jarvis, 2011). This species is distributed in the Southwestern regions of Iran in the Tigris, Persian Gulf, Lake Maharlu, Kor River and the Hormuz basins (Coad, 2013). A scale-less head, two pairs of barbels, an adhesive mental disc and cycloid scales are some characteristics of this species (Jarvis, 2011). *Garra rufa* feeds mostly on algae and diatoms (Coad, 2013) and its maximum total length has been recorded at 13 cm in Iran (Esmaeili and Ebrahimi, 2006).

To estimate weight corresponding to a given length, growth rates, length and age structures, and other components of fish population dynamics, length and weight data are needed (Cherif et al., 2008; Froese, 2006). Also, the length-weight data of a species in different habitats will be useful to compare life history and morphological aspects of populations

inhabiting different habitats (Cherif et al., 2008). Esmaeili and Ebrahimi (2006) studied length-weight relationship of 291 specimens of *G. rufa* in Iran but they did not mentioned anything about the localities and it remained unclear whether the specimens were from a single locality or different localities. Therefore, due to the lack of length-weight relationship of different populations of *G. rufa* complex in Iran, this study was conducted to explore the length-weight relationships in 13 populations of *G. rufa* collected from Tigris and Persian Gulf basins.

Materials and Methods

The specimens were collected from 13 rivers in the Persian Gulf and Tigris basins by electrofishing. The collected specimens were fixed in 4% formalin, after over-anaesthetization. The locality and sampling data are provided in Table 1. In the laboratory each specimen measured to the nearest 1 mm (Total

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Table 1. Sampling sites, number of examined specimens, total length and weight data (Min, Max, Mean \pm Standard Deviation (SD)) of the studied populations of *G. rufa*.

River	Coordinate	N	TL min	TL max	TL m	W min	W max	W m
Tange haft	32° 55' N 48° 45' E	27	50.70	95.96	68.26 \pm 13.58	2.45	13.32	5.95 \pm 3.34
Beshar	30° 40' N 51° 32' E	21	54.82	101.62	75.21	1.97	13.98	5.78 \pm 2.99
Mazoo	32° 48' N 48° 24' E	19	58.92	123.36	88.96 \pm 18.51	2.66	28.31	10.51 \pm 6.70
Palangan	35° 5' N 46° 37' E	51	63	178	137.1 \pm 2.65	11.5	239	129.92 \pm 60.15
Sirvan	35° 14' N 46° 18' E	27	60	148	96.2 \pm 1.9	3.6	57.8	10.85
Kheirabad	30° 31' N 50° 27' E	70	50.74	124.84	82.32 \pm 16.81	1.96	28.1	8.26 \pm 5.07
Gamasiab	34° 22' N 47° 55' E	10	52.51	105.74	72.11 \pm 16.85	2.10	18.06	6.34 \pm 5.55
Ghalate	34° 30' N 47° 36' E	31	69.4	153.86	109.68 \pm 25.97	4.46	55.85	21.93 \pm 14.62
Cheshme gerdab	33° 29' N 47° 57' E	12	75.96	169.58	122.37 \pm 29.80	5.87	73.71	28.52 \pm 20.90
Maroon	30° 40' N 50° 18' E	12	53.04	100.16	73.50 \pm 12.08	1.84	13.45	5.40 \pm 3.01
Dashte chenir	28° 43' N 51° 47' E	17	48.18	120.62	82.44 \pm 18.20	1.53	23.74	8.22 \pm 5.40
Kheirak-shekarak	29° 14' N 51° 37' E	20	54.82	111.12	79.39 \pm 18.18	1.91	15.78	6.10 \pm 4.06
Tange faryab	29° 13' N 51° 27' E	47	49.38	105.06	78.95 \pm 11.32	1.64	14.15	6.11 \pm 2.54

N: Sample size; TL min: minimum total length; TL max: maximum total length; TL m: average total length; W min: minimum weight; W max: maximum weight; W m: average body weight.

Table 1. The Length-Weight relationship parameters (a, b, and R²) for *G. rufa* in different rivers.

Basin	River	b	α	R ²
Tigris	Tange haft	2.74	0.00005	0.95
	Beshar	2.86	0.00002	0.93
	Mazoo	2.99	0.00001	0.99
	Palangan	2.95	0.05	0.98
	Sirvan	3.00	0.01	0.97
	Kheirabad	2.96	0.00002	0.98
	Gamasiab	3.19	0.00001	0.98
	Ghalate	3.16	0.00001	0.99
	Cheshme gerdab	3.08	0.00001	0.99
	Maroon	3.14	0.00001	0.97
Persian Gulf	Dashte chenir	3.02	0.00001	0.99
	Kheirak-shekarak	2.82	0.00002	0.98
	Tange faryab	2.86	0.00002	0.98

length, TL) and weighted to the nearest 0.1 g (weight, W). The length-weight relationship of *G. rufa* was determined by the method of least squares using the equation $W = \alpha L^b$ (Keys, 1928) and logarithmically transformed into $\log W = \log \alpha + b \log L$ (Keys, 1928), where W is the weight of the fish in grams and L is the length of the fish in centimeters.

Results and discussion

The number of specimens analyzed in each locality and the mean body length and weight are presented in Table 1. The length-weight relationship parameters α , b, and R² are denoted in Table 2. The results revealed that there was a significant relationship ($P < 0.001$) between length and weight for fishes in each river. The normal distribution of

exponent b usually is 2.5-3.5 (Froese, 2006), and for *G. rufa* in all rivers it was similar to the noted range. The average of parameter b was 2.99 in Tigris basin and 2.96 in the Persian Gulf basin, and for all specimens, the overall value was 2.98 (2.74-3.19), this value is concordant with the b calculated by Gerami et al., (2013) and Esmaeili and Ebrahimi (2006) for *G. rufa* in Cholvar Branch of the Karun River, since there are similar values in some populations. This results can be useful for further research on *G. rufa*.

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