

Length-Weight and Length-Length Relationships of *Gambusia* (*Gambusia holbrooki*) in the Dinor River Kermanshah, Iran

Safoura Sedaghat and Seyed Abbas Hoseini

Department Fisheries, Gorgan University of Agricultural Sciences and Natural Resources, Iran

Abstract: Length-weight and length-length relationships were derived for *Gambusia holbrooki* in the Dinor River Kermanshah of Iran. Sampling was done between April to November of 2011 using beach seine with a mesh size of 5 mm. The relationship between total and standard lengths (TL and SL) was determined according to the power regression model. Regression coefficient (b) value in the length-weight relationship differed significantly between males and females (t-test, $P < 0.05$). We determined a positive allometry power length-weight relationship for females as: $W = 0.06 \times L^{3.49}$ ($r^2 = 0.99$, $n = 59$) and for male determined an isometry as: $W = 0.05 \times L^{2.87}$ ($r^2 = 0.84$, $n = 51$).

Key words: *Gambusia Holbrooki* % Length-Weight Relationship % Dinor River

INTRODUCTION

Dinor River is located in District of Kermanshah city in west Iran. This River has 65 km long, 2200 m altitude from originates and average slope 1/4 percent, the mean annual discharge is 451 million cubic meters [1].

Gambusia (*Gambusia holbrooki*) has been colloquially described as the 'animal weed' of our aquatic environment, because of its ability to rapidly reproduce, disperse widely and occupy diverse habitats, to the detriment of native species. This small, introduced fish is also highly aggressive and predatory. *Gambusia* is now common and widespread, occurring in most freshwater habitats in Iran.

The relationship between body weight and length is simple but essential in fishery management [2]. Length-weight relationships drastically help scientists to convert growth-in-length equations to growth in weight in stock assessment models [3], to estimating growth rates, age structure, to obtain the condition of fish and comparative growth studies [4-6], to estimate biomass from length frequency data and for the estimation of fish condition [5]. In addition, these relationships contribute to the comparison of life history and morphological aspects of populations between different regions of the same country.

In Iranian waters (freshwater and sea water), fish have been poorly studied and little biological information is available [7-11].

The present study describes the length-weight relationship of *Gambusia holbrooki* in the Dinor River Kermanshah, Iran.

MATERIALS AND METHODS

A total of 110 specimens of *Gambusia holbrooki* were caught in Dinor River Kermanshah of Iran using beach seine with a mesh size of 5 mm at monthly intervals between April to November of 2011. 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. The length-weight relationship was estimated by using following equation:

$$W = a L^b$$

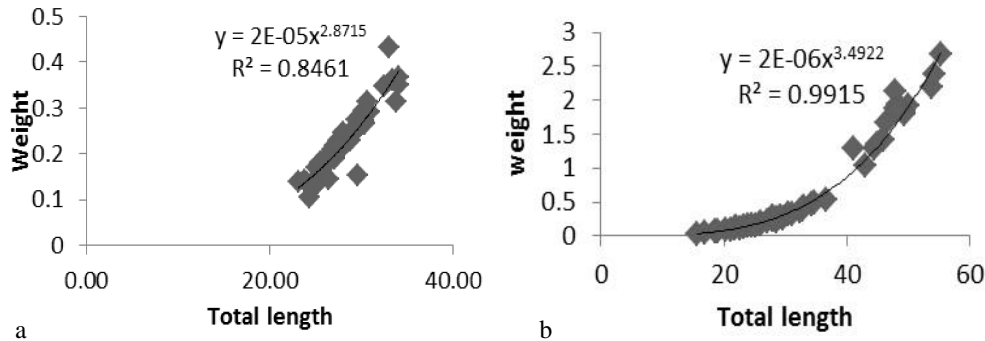
Where W is the whole body weight (g), L is the total length (mm), a is the intercept of the regression and b is the regression coefficient (slope) [12]. The parameters a and b of the length-weight relationship was estimated by the least-squares method based on logarithms [13].

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

A t-test was used for comparison b value obtained in the power regression with isometric value [14]. Also a t-test was used for comparison b value in the power

Table 1: Length characteristics (mm) and weight characteristics (g) of *Gambusia holbrooki* in the Dinor River Kermanshah, Iran

Sex	Length characteristics (mm)				Weight characteristics (g)		
	n	Min	Max	Mean±STD	Min	Max	Mean±STD
Male	51	23.04	34	27.76 ±2.72	0.10	0.43	0.22± 0.07
Female	59	15.6	55.3	33.15 ±10.94	0.10	2.67	0.70± 0.76

Fig. 1: Length-weight relationship of *Gambusia holbrooki* in the Dinor River Kermanshah, Iran, (a): males, (b): females

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.

RESULTS AND DISCUSSION

Overall 110 fish were measured. The length-weight relationship differed significantly between males and females ($P < 0.05$). The sample size, the minimum, maximum and mean length and weight (\pm STD), are presented in Table1.

The results of this study was consist with several other researchers such as Ghorbani *et al.* [15], Cabral *et al.* [16]. For both sexes of all individuals, the relationship between total length and weight was described as: for females: $W = 0.06 \times L^{3.49}$ ($r^2 = 0.99$, $n = 59$); and for males: $W = 0.05 \times L^{2.87}$ ($r^2 = 0.84$, $n = 51$) (Figure 1). There was significant difference between sexes in the slopes (b) of length-weight relationship ($P < 0.05$) (Table2).

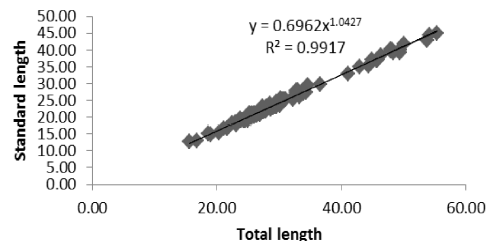
The parameter b was 3.49 for females and 2.87 for males. Therefore, the b coefficient can be used in the pointed out length range, although sampling was carried out in various seasons. The length-weight relationship parameters would be treated as mean annual value.

We determined a positive allometry power length-weight relationship for females and for male determined was isometry.

The relationship between total and standard lengths (TL and SL) was determined according to the power regression model, which is presented in Figure 2.

Table 2: Length-weight relationship of *Gambusia holbrooki* in the Dinor River Kermanshah, Iran

Sex	n	Parameters of the relationship		
		a	b	R ²
Male	51	0.05	2.87	0.84
Female	59	0.05	3.49	0.99

Fig. 2: The relationship between total and standard lengths of *Gambusia holbrooki* in the Dinor River Kermanshah, Iran

According to Weatherley and Gill [17] the annual length-weight relationships could differ between seasons and years and many factors could contribute to these differences namely, maturity, temperature, salinity, food availability and size. Length-weight relationship may vary seasonally according to the degree of sexual maturity, sex, diet, stomach fullness, sample preservation techniques [18], number of examined specimens, area/season effects and sampling duration.

This study gives basic information to fishery biologists about length-weight and length-length relationships for *Gambusia holbrooki* in the Dinor River Kermanshah, Iran.

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