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*Short Communication*

# Length-weight and length-length relationships of *Aphanius dispar dispar* (Rüppell, 1829) in Dalaki river, Bushehr, in south of Iran

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**Length-weight and length-length relationships were derived for *Aphanius dispar dispar* in Dalaki river (in south of Iran). Sampling was done between January to August of 2011 using scoop net. The *b* value in the length-weight relationship did not differ significantly between males and females (t-test, P>0.05) and this value was significantly higher than 3 (P<0.05). The relationship between total and standard lengths was significantly linear (p<0.01). Relative condition factor (*Krel*) did not differ significantly between sex and various seasons (P>0.05). This study reports the length-weight relationship of *A. dispar dispar* for the first time in the worldwide and it provides basic information for fishery biologists in Iran.**

**Key words:** *Aphanius dispar dispar*, Length-weight relationships, length-length relationship, Dalaki River.

## INTRODUCTION

The relationship between body weight and length is a simple but essential in fishery management (Chien-Chung, 1998). Length-weight relationships drastically help scientists to convert growth-in-length equations to growth in weight in stock assessment models (Bobori et al., 2010), to estimating growth rates, age structure, to obtain the condition of fish and comparative growth studies (Kolher et al., 1995; Petrakis and Stergiou, 1995; Goncalves et al., 1996), to estimate biomass from length frequency data and for the estimation of fish condition (Petrakis and Stergiou, 1995). 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 (Hosseini et al., 2002; Shokri et al., 2005; Heydarnejad, 2009; Shadi et al., 2011; Zare et al., 2011).

*Aphanius dispar dispar* (Cyprionodontidae) is an exotic species that live in freshwaters and it distributed in the Persian Gulf catchment (Rüppell, 1829; Abdoli et al., 2009).

The present study describes the length-weight relationship of *A. dispar dispar* (Rüppell, 1829) in Dalaki river (Bushehr, in south of Iran) for the first time in the worldwide (Froese and Pauly, 2011).

## MATERIALS AND METHODS

The samples were collected monthly by means of scoop net with mesh size 3 mm (bar) during January to August 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) (Ricker, 1975).The parameters $a$ and $b$ of the length-weight relationship was estimated by the least-squares method based on logarithms (Zar, 1999):

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**Table1.** Length-weight relationship of *Aphanius dispar dispar* (Rüppell, 1829) from Dalaki river, Bushehr (in south of Iran).

| Sex | N | Length characteristics (mm) | | | Parameters of the relationship | | | |
|---|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Mean ± STD | *a* | *b* | 95%CL (*b*) | $r^2$ |
| Male | 94 | 25 | 56 | 34.92 ± 6.66 | 0.0001 | 3.0745 | 0.0005 | 0.95 |
| Female | 88 | 20 | 46 | 33.24 ± 7.78 | 0.0007 | 3.292 | 0.0004 | 0.98 |
| Mixed | 182 | 20 | 56 | 34.05 ± 7.29 | 0.0009 | 3.2053 | 0.024 | 0.97 |

The growth was positive allometric for *Aphanius dispar dispar* (b>3, P<0.05).

**Table 2.** The relationship between total length (TL in mm) and standard length (FL in mm) for *Aphanius dispar dispar* (Rüppell, 1829) from Dalaki river, Bushehr (in south of Iran).

| Sex | *n* | Equation | Regression parameters | | 95%CL (*b*) | $r^2$ |
|---|---|---|---|---|---|---|
| | | | *a* | *b* | | |
| Male | 94 | SL = *a* + *b*× TL | 0.6283 | 0.7916 | 0.021 | 0.82 |
| Female | 88 | SL = *a* + *b*× TL | 0.5755 | 0.8023 | 0.019 | 0.96 |
| Mixed | 182 | SL = *a* + *b*× TL | 0.6416 | 0.7964 | 0.096 | 0.91 |

**Table 3.** The *a* and *b* parameters of length-length relationships of *Aphanius dispar dispar* obtained from other parts of the world.

| Sex of fish | Length range (cm) | Known length | *a* | *b* | Unknown length |
|---|---|---|---|---|---|
| unsexed | 4.2 - 4.8 | TL | 0.000 | 0.800 | SL |
| unsexed | - | FL | 0.000 | 1.000 | TL |
| unsexed | - | SL | 0.000 | 1.233 | TL |
| unsexed | - | SL | 0.000 | 1.242 | TL |

*Log (W) = log (a) + b log (L)*

A t-test was used for comparison *b* value obtained in the linear regression with isometric value (Sokal and Rohlf, 1987). Also a t-test was used for comparison *b* value in the linear regression of male and female fishes (Zar, 1999).

The relationship between total and standard lengths (TL and SL) was determined according to the linear regression model. Also for each specimen, relative condition factor ($K_{rel}$) was calculated by following equations:

$$K_{rel} = \frac{W}{aL^b}$$

Where *W* is the whole body wet weight (g), *L* is the total length (mm) and *a* and *b* are the parameters of length-weight relationship.

A t-test and ANOVA test were used for comparison relative condition factor ($K_{rel}$) between sex and seasons.

## RESULTS AND DISCUSSION

Overall 182 fish were measured. The length-weight relationship did not differ significantly between males and females (t = 1.60; P>0.05). The sample size, the minimum, maximum and mean length (± STD), the length-weight relationship parameters and statistics are presented in Table 1.

Length-length relationships presented were highly significant (P<0.01) (Table 2), with the determination coefficient value increased ($r^2$ = 0.91). It did not differ significantly between males and females (t = 2.34; P>0.05).

Table 3 shows the parameters of the length-length relationships of this species obtained from other parts of the world (Froese and Pauly, 2011).

Relative condition factor ($K_{rel}$) did not differ significantly between males (0.91±0.1) and females (0.96±0.41) (P>0.05). Also, $K_{rel}$ did not differ significantly between various seasons (P>0.05) (Figure 1).

The parameter *b* was 3.2053 ± .024 and ranged between 2.5 and 3.5 (Froese, 2006). 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.

According to Weatherley and Gill (1987) the annual

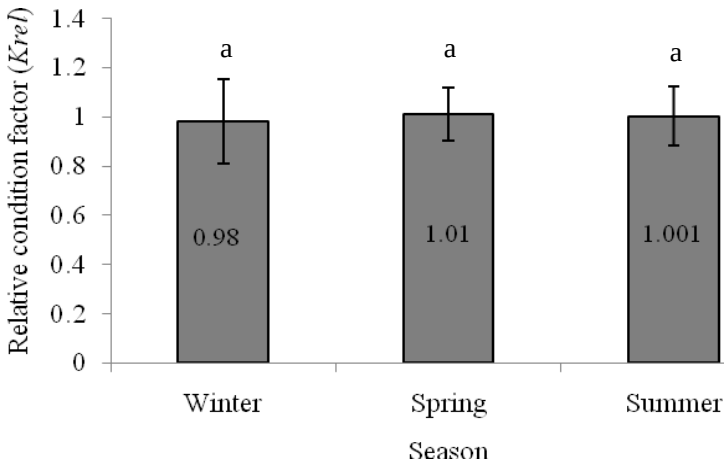


**Figure 1.** Mean relative condition factor ($K_{rel}$) (± STD) for *Aphanius dispar dispar* (Rüppell, 1829) between three seasons in Dalaki river, Bushehr (in south of Iran) (a: indicate the not significant difference).

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 (Wootton, 1992), number of specimens examined, area/season effects and sampling, duration (Moutopoulos and Stergiou, 2002). This study gives basic information to fishery biologists about length-weight and length-length relationships for *Aphanius dispar dispar* in southern Iran.

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