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Condition factor, diet and gonadosomatic index of *Carasobarbus luteus* (Heckel, 1843) in Karkheh River, Iran

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Abstract

This study describes the condition factor (K), gonadosomatic index (GSI) and relative length of the gut (RLG) of *Carasobarbus luteus* in Karkheh River. A total of 210 specimens were caught by using various mesh size of gill nets from July 2010 to July 2011. The maximum condition factor for males was in February 2011 and for females was in October 2010. Minimum condition factor for males was in January 2011 and for females was in July 2010. The highest gonadosomatic index (GSI) values were determined in April 2011 for both sexes while the lowest values were recorded in May 2011 for males and in August 2010 for females and spawning period were during in April to May. RLG index increased with increase in age and the mean of RLG index was 1.99±0.43.

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Introduction

The cyprinid fish *Carasobarbus luteus* (Heckel, 1843), which is called himri or hemri in Iran, is widely distributed in the rivers Tigris and Euphrates and adjacent drainage basins. In Iran, it is found in the Tigris River Basin including the Hawr Al Azim Marsh, the Persian Gulf Basin including the Helleh, Dalaki, Shapur, Mond and Dasht-e Palang rivers and Lake Famur (Parishan), the Lake Maharlu Basin and the Hormozgan Basin. This fish is highly valued as it is in high demand as food (Borkenhagen *et al.*, 2011; Coad, 2011).

Condition factor refers to the well-being of a certain species and its degree of fatness, which depends on the weight of the fish sampled (Pauly, 1983; Fafioye and Oluajo, 2005). Different values of the condition factor of a fish indicate the state of sexual maturity, the degree of food sources availability, age and sex of some species and the system of environment (Mat Isa *et al.*, 2010).

In work with fishes, the gonadosomatic index (GSI) is widely used as an index of gonadal activity and as an index for spawning preparedness. Moreover, it is common for researchers studying reproduction to use the GSI for comparing treatment groups or samples taken at different times of the year (Devlaming *et al.*, 1982).

Relative length of the gut (RLG) is a useful index which provides an idea of the nature of food consumed (Sarpanah Sarkohi *et al.*, 2010). Biswas (1993) stated that the length of the gut of an animal depends on the nature of food they consume and increases with increasing proportion of vegetable materials.

Few studies have been done on the biology of this species in the Iraq (Al-Jaferye *et al.*, 1976; Bhatti and Al-Daham, 1978; Al-Daham and Bhatti, 1979; Barak and Mohammad, 1982; Jerzy and Ali, 1982; Ahmed, 1982; Ahmed *et al.*, 1984; Naama and Muhsen, 1986; Epler *et al.*, 1996; Szypula *et al.*, 2001; Epler *et al.*, 2001), in the Syria (Al Hazzaa, 2005) and in the Turkey (Gokcek and Akyurt, 2008). Differences are known to occur in biological features between the populations of same species living in different regions. There was no data available on biological characteristics of *C. luteus* in Karkheh River until now and consider economic importance of this species and distribution in Iran, investigations on biological characteristics of it for fisheries management and protection of wildlife species seems importance. Therefore, this study was carried out to determine the, condition factors (K), gonadosomatic index (GSI) and Relative length of the gut (RLG) of *C. luteus* population habiting in Karkheh River.

Materials and methods

A total 210 of *C. luteus* were captured from July 2010 to July 2011 in Karkheh River. The sampling was carried out using gill-nets with various mesh size (10×10, 20×20 and 30×30 mm). The stations were located at a latitude of 31°33'7"N and longitude 48°26'30"E and 31°29'39"N and 48°26'2"E for station 1 and 2, respectively.

The *C. luteus* samples were transported to the laboratory in ice-box and their total length (TL), weight (TW) and gonad weight were measured at a sensitivity of 1.0 mm, 0.1 gr and 0.01 gr, respectively. An average of 14 scales from each fish was mounted between two glass microscope slides for age estimation. Scale ages were determined by viewing all scales on a slide and assigning age based on the scale with the greatest number of annuli.

Condition coefficients were calculated for both sexes using the following equation (Biswas,1993).

$K= W/L^{-3}\times100$.

Where: K= condition factor, W= Total weight (gr) and L= Total length (cm).

The gonadosomatic index was calculated according to the following equation (Wootton, 1990):

$GSI= (W_g/W) \times100$

Where: W_g= Gonad weight(gr) and W= Total body weight(gr)

The feeding habits of the fish was determined by the using the relationship of relative length of the gut (RLG), where RLG > 3 represents herbivore, RLG < 1, carnivore and 1-3 RLG value represents omnivore (Odum, 1970). The RLG was calculated by the equation given below:

RLG = length of the gut (cm)/ total body length (cm)
Statistically significant differences between sexual and age groups were tasted with Student's t-test and analysis of variance (ANOVA) using SPSS (19 version) computer programs.

Results

Condition factor

The mean condition factor in males was more than of females; this factor was 1.26 in males and 1.23 in females. Monthly variations in the condition factor were determined for each sex. However, differences between sexes were not statistically significant (t-test; P > 0.05). The maximum values of condition factor for males in February 2011 and for females October 2010 and minimum values of condition factor for males in January 2011 and for females July 2010 (Fig. 1).

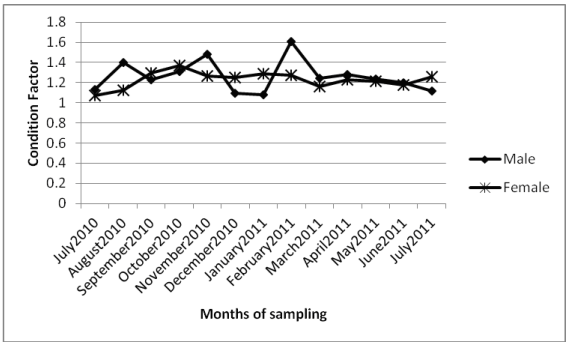

Fig. 1. Monthly variation in Condition Factor of *C. luteus* in Karkheh River during July 2010 to July 2011.

Gonadosomatic index (GSI)

GSI values for both sexes are shown in Fig. 2.The highest GSI values were attained in April 2011 for both sex while the lowest values were recorded in May 2011 for males and in August 2010 for females.

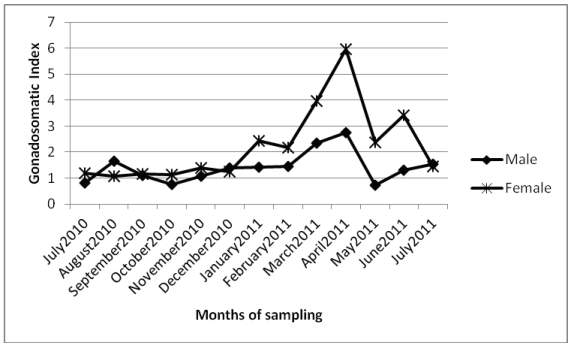

Fig. 2. Monthly variation in Gonadosomatic Index of *C. luteus* in Karkheh River during July 2010 to July 2011

Relative length of the gut (RLG)

The average of Relative length of the gut (RLG) was 1.99±0.43 and amount of RLG was between1.04 to 3.33. The average of RLG was increased with age (Fig. 3). Except 0+ age group, all age groups were not have statistically significant differences between together (ANOVA, P > 0.05).

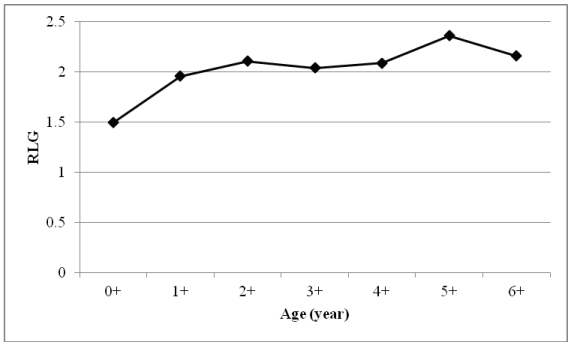

Fig. 3. Trend in mean Relative length of the gut according to age of *C. luteus* in Karkheh River during July 2010 to July 2011.

Discussion

The highest amount of (K) was observed in February 2011 for males and in October 2010 for females. Condition factor is a well-being value and its increasing coincides with fish weight increasing. Seasonal growth amount can be measured by status factor and growth changes may be related to fish food or reproduction stage (King, 2007).

C. luteus spawning was during April to May according to GSI. Bhatti and Al-Daham (1978) and

Al-Daham and Bhatti (1979) report a spawning season of May-July (peak June-July) for a lower Euphrates River, Iraq population. Epler *et al.* (1996) report spawning in June/July in freshwater Iraqi lakes, earlier in a saline lake. This could be related to the geographical and ecological differences between the stocks.

In this study we found the average of RLG was increased with age (Fig. 3). According to RLG index *C. luteus* has an omnivore diet. Eskandary *et al.* (2007) in Dez Dam Lake found this fish has omnivores diet. Pazira and Vatandost (2008) have a study on the diet of *Barbus (=Carasobarbus) luteus* in the Dalaki and Helle Rivers, they found this fish has omnivores diet but the average of RLG was decreased with age. The R.L.G. value was found to have a close relationship with the amount of vegetable matter and animal matter in the gut content. The R.L.G. value increased with the increase of vegetable and decreased with the increase of animal matter in the gut content (Dasgupta, 2004).

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