

**Investigation of Fecundity and Its Relationship with
Some Growth Indices of *Alburnus chalcoides* (Guldenstaedt, 1772)
Immigrant to Sefidrood, Chamkhaleh and Shirood Rivers, Northern Iran**

¹Mina Rahbar, ²Hossein Khara and ¹Ali Khodadoust

¹Young Researchers Club, Islamic Azad University-Lahijan Branch, Iran

²Department of Fishery and Aquaculture, Faculty of Natural Resource,
Islamic Azad University-Lahijan Branch, Lahijan, Iran

Abstract: This study was done to quantify the fecundity of *Alburnus chalcoides* and its relationships with length and weight in the Sefidrood, Chamkhaleh and Shirood Rivers, Iran during the spawning season. According to the obtained results the highest average fork length was (15.23 ± 1.07 cm) and body weight (36.71 ± 7.98 g) belonged to *A. chalcoides* specimens caught from the Chamkhaleh River and maximum ovary weight (4.37 ± 1.67 g) and absolute fecundity (3728.7 ± 1478.66 eggs) belonged to *A. chalcoides* specimens caught from the Shirood River, while the lowest average fork length (13.41 ± 0.81 cm), body weight (24.51 ± 4.55 g), ovary weight (3.54 ± 0.88) and absolute fecundity (2613.97 ± 548.79 eggs) were recorded in Sefidrood's *A. chalcoides*. Highest average egg diameter (1.18 ± 0.04 mm) and average mean gonadosomatic index (14.72%) belonged to Sefidrood's *A. chalcoides*, while the lowest average diameter ovules (1.11 ± 0.12 mm) and average mean gonadosomatic index (12.15%) were recorded in Chamkhaleh's *A. chalcoides*. On the basis of Kruskal-Wallis and Mann Whitney tests, significant differences were detected in the biometry parameters and fecundity of *A. chalcoides* specimens from different regions.

Key words: *Alburnus chalcoides* • Body Weight • Fecundity • Female Broods • Fork Length

INTRODUCTION

Fecundity is one of the important indicators of fish breeding biology. Fecundity among egg-laying animals is the number of eggs being readied for the next spawning by a female [1, 2]. Knowledge about fecundity of a fish is essential for evaluating the commercial potentialities of its stock, life history, practical culture and actual management of the fishery [3, 4]. *Alburnus chalcoides* is one of the economically valuable fishes in the Caspian Sea which belongs to the Cyprinidae family. This fish enters rivers and wetlands entering the Caspian Sea for spawning [5]. Several studies about the ecological and biological of *A. chalcoides* were done [5-7]. One of the important biological characteristics of this fish is fecundity. It studied in the Anzali Wetland [8], Sefidrood River [9] and southern water-bodies of Uzbekistan [10] while this fish migrate to the Shirood River and

Chamkhaleh too. So, the aim of this study was to quantify the fecundity relationships with body parameters (weight and length) of *A. chalcoides* in the Sefidrood, Chamkhaleh and Shirood Rivers at the spawning stage in spring season.

MATERIALS AND METHODS

In this study, 99 specimens of *A. chalcoides* were captured during the spawning season to the Sefidrood, Chamkhaleh and Shirood Rivers, Iran (33 fish from each zone) in 2008 (from May until June).

Fork length (FL) is measured to the nearest 1 mm and total weight to the nearest 0.1 g. The age of the *A. chalcoides* was determined from scale samples taken between the adipose fin and lateral line [11].

Fecundity was determined by gravimetric method [12] and egg size was determined by using a caliper (at 0.02

mm sensitivity). The relative fecundity was calculated by dividing the total egg number by the total body weight [11]. The gonadosomatic index was calculated using the formula of Dadzie and Wangila and Gaikwad *et al.* [13, 14]. Data collected were analyzed by using the software SPSS 10.0.13. For this purpose, given the lack of normal data (test Shapiro-Wilk) we used of Kruskal-Wallis test and Mann-Whitney for data with a confidence of 95% ($P>0.05$) and the regression relationships were used to determine the correlation of different factors.

RESULTS

In this study all the fish caught were belonged to the 2 years age group.

Specific parameters of the studied population are given in Table 1. According to the Kruskal-Wallis test, there were significant differences in the fork length, body weight, ovary weight, egg diameter, absolute fecundity as well as gonadosomatic index between the three studied Regions ($P<0.05$), but relative fecundity did not show significant differences among three Regions ($P>0.05$).

Mann-Whitney test indicated that fork length and body weight of *A. chalcoides* were significant difference among the following regions:

(Sefidrood-Chamkhaleh), (Sefidrood-Shirood) and (Chamkhaleh-Shirood) Mann-Whitney test showed a significant difference between Sefidrood region and Chamkhaleh region in ovary weight.

Mann-Whitney test indicated that absolute fecundity, egg diameter and GSI of *A. chalcoides* showed a significant differences between the following regions: (Sefidrood-Chamkhaleh) and (Sefidrood-Shirood).

Figures 1-3 describes the relationship between absolute fecundity and fork length of *A. chalcoides* and figures 4-6 expressed the relationship between absolute fecundity and body weight of *A. chalcoides* which shows a significant positive relationship.

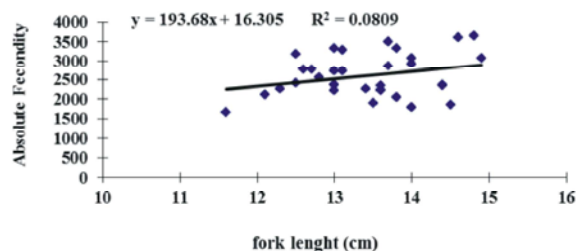


Fig. 1: Relationship between absolute fecundity and fork length of *A. chalcoides* from the Sefidrood River, Iran

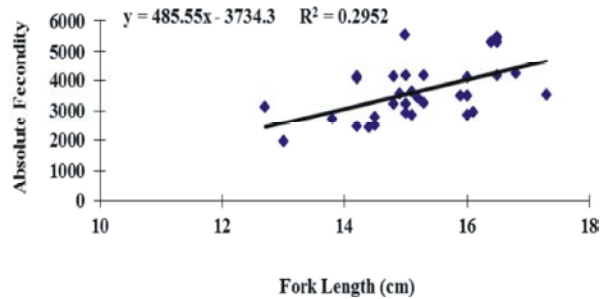


Fig. 2: Relationship between absolute fecundity and fork length of *A. chalcoides* from the Chamkhaleh River, Iran

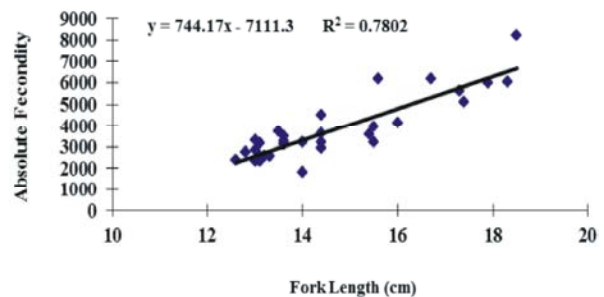


Fig. 3: Relationship between absolute fecundity and fork length of *A. chalcoides* from the Shirood River, Iran

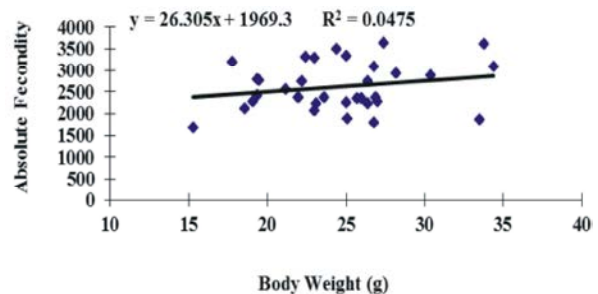


Fig. 4: Relationship between absolute fecundity and body weight of *A. chalcoides* from the Sefidrood River, Iran

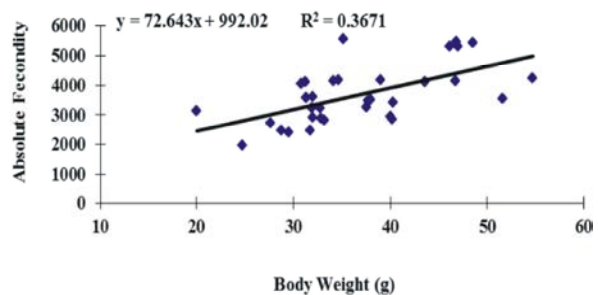
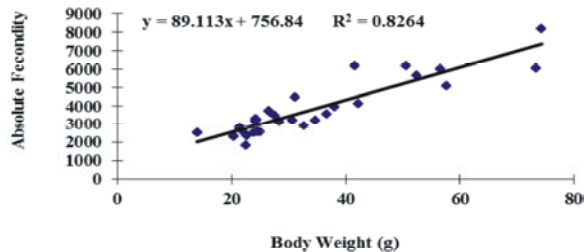


Fig. 5: Relationship between absolute fecundity and body weight of *A. chalcoides* from the Chamkhaleh River, Iran

Table 1: Estimation of different parameters of *A. chalcoides* from the Sefidrood, Chamkhaleh and Shiroad Rivers

Parameter Region	Fork length (cm) (Range)	Body weight (g) (Range)	Ovary weight (g) (Range)	Egg diameter (g) (Range)	Absolute fecundity (Range)	Relative fecundity (Range)	Gonadosomatic Index (%) (Range)
Sefidrood River	13.41±0.81 11.6-14.9	24.51±4.55 15.3-34.40	3.54±0.88 2.15-5.73	1.18±0.04 1.07-1.25	2613.97±548.79 1665-3642	108.7±25.68 67-165	14.72±3.81 4.73-25.06
Chamkhaleh River	15.23±1.07 12.7-17.3	36.71±7.98 20-54.70	4.03±0.99 1.56-6.03	1.11±1.12 0.64-1.24	3659.0±956.5 1971-5550	101.06±22.51 69-158	12.15±3.5 5.67-22.4
Shiroad River	14.57±1.76 12.6-18.5	33.35±15.08 14-74.30	4.37±1.67 2.3-8.83	1.12±0.06 1.03-1.23	3728.7±1478.66 1829-8206	113.15±17.89 81-149	13.49±2.51 6.93-19

Fig. 6: Relationship between absolute fecundity and body weight of *A. chalcoides* from the Shiroad River, Iran

DISCUSSION

One of the basic aims of rational fisheries management is to determine the reproduction properties of fish species. Thus, the determination of properties such as spawning age and season and fecundity is important for fisheries management [15].

Most bony fish, especially cyprinids spawn in spring and after the first maturation each year. In this fishes, gametogenesis occurs in autumn and spawns in spring and summer [16] and temperature is important factor of spawning in this species [17].

In present study the mean of absolute fecundity were 2613.97 ±548.79 eggs in Sefidrood River, 3659.0±956.5 eggs in Chamkhaleh River and 3728.7±1478.66 eggs in Shiroad River. In other studied absolute fecundity in *A. chalcoides* was between 41954-59400 eggs in southern water-bodies of Uzbekistan [10], 6630±754 eggs in Anzali Wetland of Iran [8] and 6591±833 eggs in Sefidrood River [9].

The positive relationship between fecundity and length and relationship between fecundity and weight represented in figures 1-6 reveals that weight is more related to fecundity than length, [1, 18] although both have a positive relationship with fecundity. This agrees with the reports of [11, 17, 19-23].

The egg quality especially egg diameter have good impact on fertilization rate and improvement of egg incubation. Most researchers have stated that when brood fish size rise, egg size will increase [9, 24-26].

In present study the mean of relative fecundity were 108.7±25.68 in Sefidrood River, 101.06±22.51 in Chamkhaleh River and 113.15±17.89 in Shiroad River. Also, similar previous results in *A. chalcoides* were recorded 90-129 in southern water-bodies of Uzbekistan [10], 140±6 in Anzali Wetland of Iran [8] and 116±28 in Sefidrood River [9].

When the egg size increases, the relative fecundity has been reported to decrease, either with female size [11] or with female weight [27, 28]. In our experiment similar trends were observed in relative fecundity with weight and size.

The results showed that maximum of gonadosomatic index belonged to *A. chalcoides* specimens caught from the Sefidrood River and minimum of Gonadosomatic index belonged to *A. chalcoides* in Chamkhaleh River.

In conclusion, these findings are important with respect to reproduction life history of the species and may be interpreted as the species response to improve fitness relating to habitat variations.

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