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Investigation of Fecundity and its Relationship with Some Growth Indices of *Capoeta capoeta Gracilis* (Keyserling, 1861) in the Two Streams (Dough and Zarrin-Gol) of Gorganroud River Basin, Golestan Province, Northern Iran

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Abstract: This study was done to quantify the fecundity of *Capoeta capoeta gracilis* and its relationships with length, weight, ovary weight and fish age in The Streams of Dough and Zarrin-Gol during the spawning season. The average of length and weight captured females were 15.39±3.04 cm and 54.37±34.85 g for Dough Stream; 12.95±1.56 cm and 28.39±11.27 g for Zarrin-Gol Stream. Fish aged 3-6 years were present in the samples. The average of absolute fecundity was 6030.312±4009.654 (S.D.) and 5512.33±2522.093 (S.D.) ova per female for Dough and Zarrin-Gol Streams respectively. The linear relationships were found significant between fecundity and total length, total weight, ovary weight and fish age in both Rivers. The results of data indicated that the coefficient of correlation '*r*' fecundity fish size (total length and total weight) in Dough stream was higher than that Zarrin-Gol Stream. The observed variations in fecundity among the considered population in the Streams can be interpreted as species response to different habitats.

Key words: Fecundity % Body length and weight % Ovary weight % *Capoeta capoeta gracilis*

INTRODUCTION

The genus *Capoeta* of the Cyprinidae family [1] has a wide distribution in Southwest Asia and contains about 20 species, of which 10 occur in Iran. The current study focused on species of *Capoeta capoeta gracilis* [2] that is present in all Rivers, Lagoons, Bays and water reservoirs in the south Caspian Sea basin. In the basin besides its ecological significance, *C. c. gracilis* is an important taxon for sport fishing [3], inland water fishing in some rivers it comprises 33% of captured fishes and zoogeography [4].

A few reports exist on fecundity of *C. c. gracilis* but reports existed on growth models by Abdoli *et al*. [5] and Patimar *et al*. [6]. Virtually little is known about the fecundity of *C. c. gracilis* in river systems of the South Caspian Sea basin, Northern Iran. So, the aim of this study was to quantify the fecundity relationships with body parameters (weight and length) of *C. c. gracilis* in the two streams (Dough and Zarrin-Gol) of Gorganroud River basin at the spawning stage in Spring season.

MATERIALS AND METHODS

86 specimens of *C. c. gracilis* were mature femals that collected from the two streams of Dough (sampling station: N37°21' E 55°32, altitude 180 m, average depth 0.5 m) and Zarrin-Gol (sampling station: N36°51', E54°57', altitude 350 m, average depth 0.70m) in spawning time of April-May, 2009 and 2010 years. The captured fishes were preserved in 10% formalin solution and transferred to lab. Total length (TL) is measured to the nearest 1 mm and total weight to the nearest 0.1 g. Scales and opercular bones were used for age determination.

The fecundity of the fish was calculated using the gravimetric method. And its relation with various body parameters including body length and body weight, ovary weight and age were determined. Samples of 30-40 eggs of each female were collected for measuring the egg diameter.

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Table 1: Estimation of different parameters of *C. c. gracilis* in Dough and Zarrin-Gol Streams

Streams	Age group (year)	Total length	Total weight	Ovary weight	Egg diameter	Relative fecundity	Absolute fecundity
	3	12.23±1.05	25.47±6.13	0.61±0.25	0.49±0.15	102.20±58.03	4269.90±542.77
Dough	4	14.39±2.31	43.16±20.11	3.35±2.47	0.97±0.31	111.73±94.02	4496.96±867.26
	5	15.67±1.06	55.53±12.03	4.94±0.66	1.02±0.23	233.12±171.71	8257.57±2602.84
	6	18.36±2.77	85.19±45.16	5.72±2.95	1.03±0.17	165.55±100.77	9875.32±4967.58
	3	11.29±0.715	18.53±3.921	0.57±0.728	0.53±0.27	336.26±189.97	3969.12±1564.9
Zarrin-Gol	4	13.07±0.67	28.16±4.86	1.68±1.09	0.81±0.28	252.58±477.33	5371.94±1152.84
	5	13.91±0.59	32.17±4.36	1.72±0.37	0.84±0.15	182.01±107.51	5473.90±507.34
	6	16.57±1.11	60.91±7.27	5.90±2.27	1.180±0.311	146.80±18.58	12107±398897

RESULTS

Age specific parameters of the studied population are given in Table 1. The results show that there are considerable variations in all parameters between populations.

The mean of absolute fecundity was 6030.312±4009.654 (S.D) eggs /per female in Dough Stream and 5512.33±2522.093 (S.D.) eggs / per female in Zarrin-Gol Stream. Egg diameter increased with fish size. The average of egg diameter ranged from 0.49±0.15 (S.D) to 1.03±0.17 (S.D) mm in Dough Stream and 0.53±0.27 (S.D) to 1.180±0.311 (S.D) mm in Zarrin-Gol Stream (Table1).

A linear significant relationship was found between absolute fecundity and total length, total weight and age in both streams (Figures 1and 2). The correlation coefficient '*r*' was higher than 0.50 which corresponds to a positive significant correlation between absolute fecundity and body parameters. Older fish showed a higher absolute fecundity. Even though there were leaner relationships between fecundity and ovary weight in Dough Stream and between absolute fecundity and age in Zarrin-Gol stream the relationships (Fecundity-Ovary weight and Fecundity-Age) were statistically significant in both streams (Figures 3 and 4).

Minimum and maximum average value of fecundity at age were 4269±542.77 (S.D) and 9875.32±4967.58 (S.D) in Dough Stream and 3969.12±1564.9 and 12107±398897 in Zarrin-Gol Stream in 3^+ and 6^+ age groups respectively.

The relative fecundity ranged from 43.9 to 404.83 ova per gram in Dough Stream and from 128.22 to 526.23 ova per gram in Zarrin-Gol Stream.

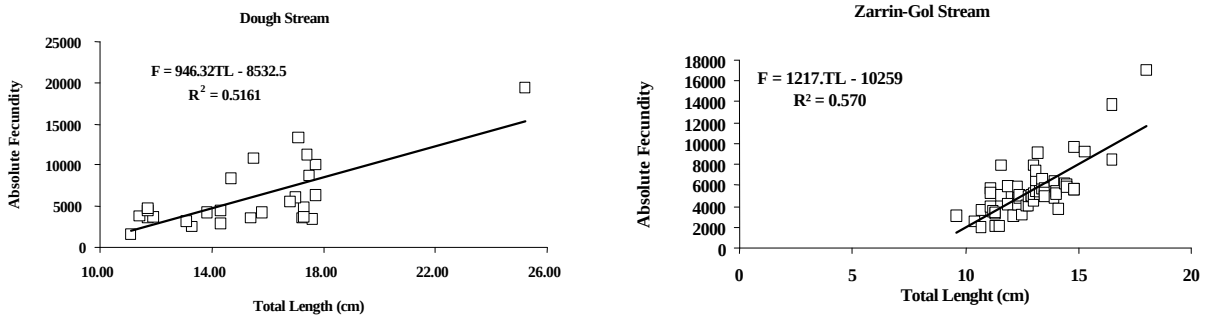

Fig. 1: Relationship between total length and fecundity in Dough and Zarrin-Gol Sreams

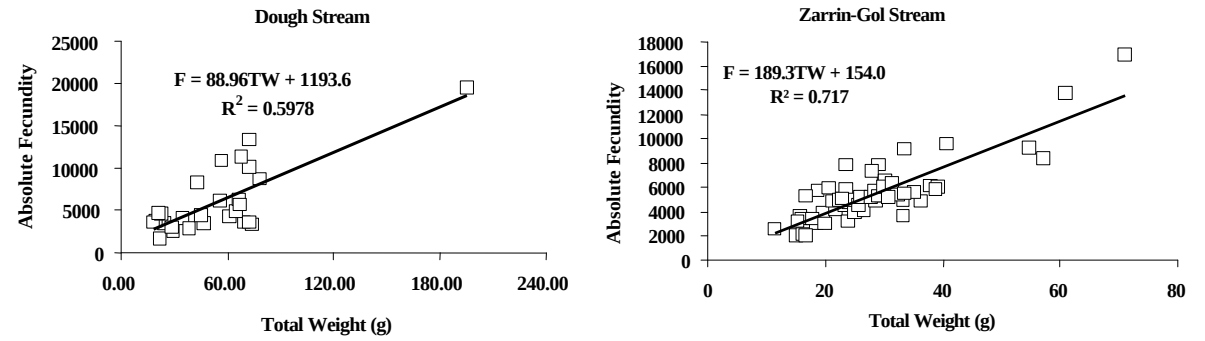

Fig. 2: Relationship between total weight and fecundity in Dough and Zarrin-Gol Streams

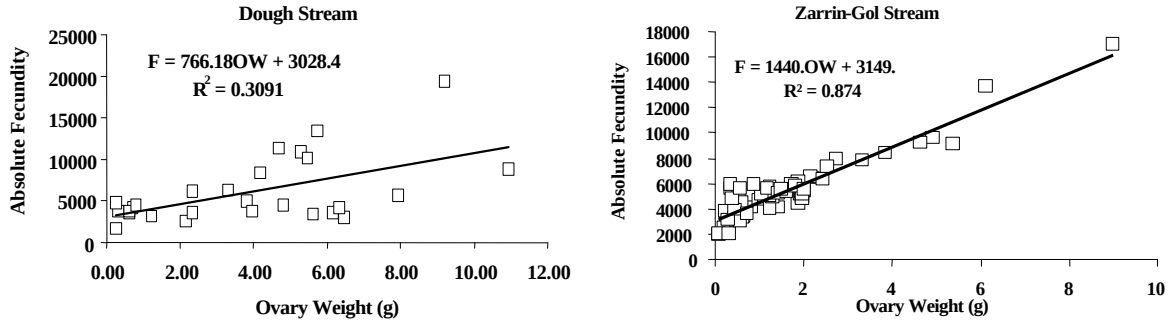

Fig. 3: Relationship between ovary weight and fecundity in Dough and Zarrin- Gol Streams

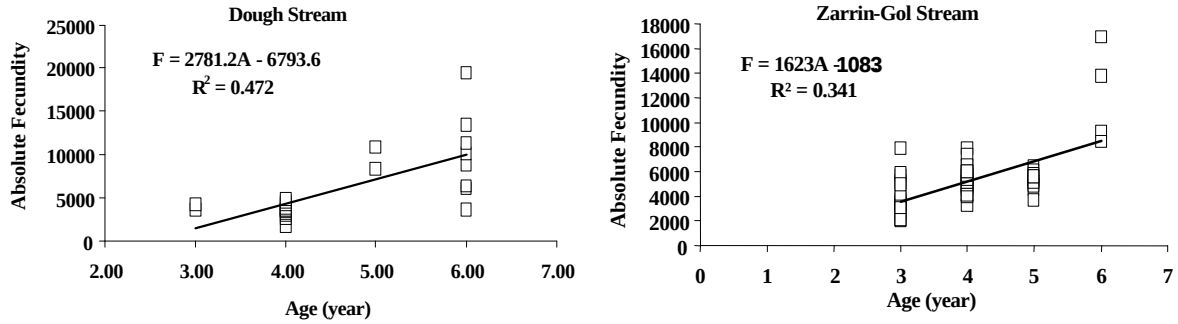

Fig. 4: Relationship between age and fecundity in Dough and Zarrin-Gol Streams

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 [7].

Little data on reproductive life-history of *C. c. gracilis* in Iran could be found in the course of the literature search, thus it is rather difficult to describe the current position of reproductive biology of the species in South Caspian basin. So, to be the best knowledge of the authors, this study documents the comparative reference on variation of fecundity of *Capoeta capoeta gracilis* in Southeast Caspian streams.

For the studied species, fecundity was correlated with the fish length, weight, age and gonad weight. This pattern was similar to that reported by Erdogan [8] and Turkmen *et al*. [9].

The observed absolute fecundity were different from those reported by Erdogan [8] (varying from 1711 in a 3 years old to 16254 eggs in a 9 years old females) and by Turkmen *et al.* [9] (reported a minimum value of from 3754 for a 4 years old female and a maximum value of 35859 eggs for a 12 years old female). These variations indicate that *C. c. gracilis* may show considerable variation in egg production in different areas. It can be hypothesized that differences in habitat characteristics have significant effect on total egg production that is considered as one of the important reproductive parameters of populations.

Turkmen *et al*. [9] reported fecundity-length and fecundity-weight relationships of *C. c. umbla* were described by a exponential function and fecundity-ovary weight and fecundity-age relationships were described by a power function, but in this study relationships fecundity with body length, body weight, ovary weight and age were linear functions. The positive linear regression found between absolute fecundity-length and absolute fecundity-weight in both streams indicates that larger and older fish produce higher egg number (i.e absolute fecundity), meaning larger specimens are more fecund than small individuals in the studied populations.

The correlation of fecundity with weight was higher than that with length for both stream, this was supported by Turkmen *et al*. [9] for the species.

The relative fecundity decreased as the fish grew in length and weight in Zarrin-Gol Stream and it increased in Dough Stream. Relative reproductive investment (as number of eggs per female size) decreased in Zarrin-Gol while it increased in Dough Stream. This difference in relative fecundity is also another inter-population variation that has not been reported before for the species.

Turkmen *et al*. [9] reported that it ranging from 0.93 to 2.45 Fm for *Capoeta capoeta umbla.* Considering this ranged, there is significant difference in egg diameter between *C. c. gracilis* and *C. c. umbla*. [9]. Egg size was more closely related to stage of maturity than length and weight of fish. The results indicated that there is a positive relationship among egg size and total length and weight, this result is supported result reported by Heyer, *et al*. [10].

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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