

Studies on the Gonadosomatic Index and Fecundity of a Carp *Cirrhinus reba* (Hamilton) from Fishponds of District Jacobabad, Sindh, Pakistan

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Abstract.- The study was conducted from fishpond to determine the fecundity and gonadosomatic index of a carp, *Cirrhinus reba*, during the period March 2004 to February 2005. It was observed that both males and females mature simultaneously. The gonads attain the maximum weight 5.05 ± 0.88 and 12.5 ± 1.55 for males and females respectively in July and minimum in November. The fish has only one spawning season of short duration, running from June to August as indicated by the peaks of gonadosomatic index and ova diameter. The fecundity of *C. reba* varied from 20,722 eggs in fish of 150 mm (TL) to 211,200 in fish of 290 mm total length. The fecundity increased with increasing total length, gonad length, gonad weight and body weight. The relationship of fecundity was curvilinear with total length and gonad length and linear with body weight and gonad weight.

Key words: Fishponds, gonadosomatic index, fecundity of carp, *Cirrhinus reba*.

INTRODUCTION

Fecundity is one of the most important biological aspects of a fish species. This must be known to assess the productive potential and to evaluate the commercial potentialities of a fish stock (Das *et al.*, 1989). For efficient fish culture and effective management practices it is prime important to know the fecundity of fish (Mian and Dewan 1984). Moreover, study is also essential to determine the index of density dependent factor affecting population size (Simpson, 1951). Notable works have been done on some aspects of biology of this species from India and Bangladesh. Rao (1972) reported observations on the spawning of *C. reba* in Cauvery and Bhavani rivers, Gupta (1975) studied biology of *C. reba* and Khan (1986) estimated fecundity of *C. reba* from India and Dewan *et al.* (1985) published information on the amount of food taken by *C. reba* and its diel patterns of feeding, recently Qazi (2001) conducted research on the induced breeding of *C. reba* by pituitary gland extract from Bangladesh.

At present one report on length-weight relationship and condition factor of *C. reba* from

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Manchar Lake published by Narejo (2006) is available. No work has been done on the fecundity and gonadosomatic index of *C. reba* in Pakistan. In view of that the present study was undertaken to determine the fecundity and gonadosomatic index of *C. reba* and to establish a relationship between the fecundity and standard length, body weight, gonadal length and gonadal weight of the fish.

MATERIALS AND METHODS

The study was carried out for a period of twelve months from March 2004 to February 2005. Experimental fish were obtained randomly from fishponds of District Jacobabad, Sindh, to determine the standard length and body weight. The male and female fishes were differentiated and data were recorded after dissecting out the gonad of individual fish. Then the ovary and testis of each fish was taken out very carefully and preserved in a well labeled vial containing 5% formalin for subsequent studies. For fecundity, total fifteen matured fishes were used randomly from June to September. Gravimetric method was used to determine the fecundity of fish. In using this method, the external connective tissues were removed from the surface of

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the ovaries. Moisture of ovaries was removed with the help of blotting paper. Weight of the ovaries of each fish was recorded in gram with the help of electronic balance. Then 0.01 g of each ovary was taken separately from anterior, middle and posterior portions of each lobe. The number of matured eggs for each portion were sorted out separately and counted. The mean number of eggs in 0.01 g was determined and then multiplied by the total weight of the ovary, which gave the total number of eggs *i.e.*, the fecundity of respective fish.

Gonadosomatic index (GSI) of the male and female fishes of the collected samples were determined separately by following method.

$$\text{GSI} = \frac{\text{Weight of the gonad (g)}}{\text{Weight of the fish (g)}} \times 100$$

Diameter of the eggs at different stages of maturity was measured with the help of an objective micrometer. In this study, 100 ova were taken randomly per month from the mixed sample of eggs of three portions of each ovary. Measurements of ova diameter were taken along the longest axis of the ova. The relationship between fecundity and standard length, body weight, gonad length and gonad weight were determined with the help of a computer following SPSS program.

RESULTS

Gonadosomatic index

For the GSI study 280 males and females (140 each) *Cirrhinus reba* were examined to determine the GSI and fecundity. GSI values ranged from 0.45 to 5.05 in male and 1.05 to 12.5 in female and showed one peak in July (Table I). During the present study the higher values of GSI were observed from June to August, it ranged between 4.60 to 5.05 and 9.80 to 12.5 for males and females, respectively. After extrusion of ripe gonads, the gonads were reduced in size and weight. Table I shows sudden decrease in gonad weight from October to January as indicated by the decline of GSI after spawning to minimum indices during October and November 0.45 ± 0.20 and 0.76 ± 0.10

respectively (Table I). Therefore, it was observed that fish spawned once a year with one spawning peak highest in the month of July as indicated by the values of ova diameter (0.300 mm) and gonadosomatic index.

Table I.- Month-wise changes in ova diameter and gonadosomatic index of a carp, *Cirrhinus reba* (Hamilton) from fishponds (District Jacobabad), Sindh, Pakistan.

S. No.	Month	Ova diameter (mm)	% GSI	
			Male	Female
1	March	0.090	1.30	2.35
2	April	0.128	1.65	3.90
3	May	0.192	2.78	5.95
4	June	0.292	4.60	12.50
5	July	0.300	5.05	10.05
6	August	0.280	3.80	9.80
7	September	0.180	1.55	3.20
8	October	0.008	0.45	1.05
9	November	0.015	0.76	1.10
10	December	0.025	0.90	1.22
11	January	0.040	1.05	1.90
12	February	0.070	1.15	2.05

Maturation of ova

The data on ova diameter of *C. reba* from the fishpond of district Jacobabad is presented in Table 1. During the period of twelve months (March 2004 to February 2005) diameter of ova as found in the ovaries of *C. reba* was recorded. The diameter of ova of 80% ranged from 0.260 to 0.300 mm June to September, while 20% ova were found ranged from 0.128 to 192. All the ova (80%) were measured and found to be spherical and uniform in diameter, this indicated that the majority of the eggs were shed in a single batch during the peak period of spawning June to August (Table I). No evidence was found to show that the resting oocytes in mature females would reach maturity during the current spawning season.

Fecundity

The estimate of fecundity in the present study was based on 15 specimens of mature females of *C. reba* sampled during June to September 2004. These individuals ranged in size from 150 to 300 mm in total length. The estimation of ova, in the present study ranged from 20,722 to 211,200 eggs. The

maximum fecundity was from a fish with a total length of 290 mm and 120.5 g in weight and the minimum from a fish with a total length of 150 mm and 44.7 g in weight (Table II). The number of ova was 981.47 per gram of body weight and the number of ova present in per gram of ovary weight was 20180.16. It was also noted during the present investigations that the fecundity increased with the increase in total length, gonad weight and body weight of the fish (Figs. 1-3). The fecundity-total length shows curvilinear relationship, while gonad weight and body weight shows linear relationship with fecundity.

Table II.- Total length, body weight, gonad weight and fecundity of *Cirrhinus reba*.

S. No.	Length of fish (mm)	Weight of fish (g)	Gonad weight (g)	Fecundity
1	150	44.7	1.5	20,722
2	180	65.8	3.3	55,910
3	290	120.5	5.5	211,200
4	190	70.0	3.5	56,500
5	205	80.8	4.1	75,370
6	222	83.5	4.3	80,930
7	185	68.5	3.4	56,000
8	165	45.5	1.8	23,355
9	230	85.8	4.5	96,330
10	200	75.3	3.6	57,180
II	175	60.2	3.1	42,220
12	195	68.5	3.3	45,570
13	216	82.2	4.2	78,400
14	240	90.4	4.6	102,230
15	275	101.5	4.9	120,100

Log F = - 18.75+4.61 x Log L
 Fecundity-total length
 r = 0.94

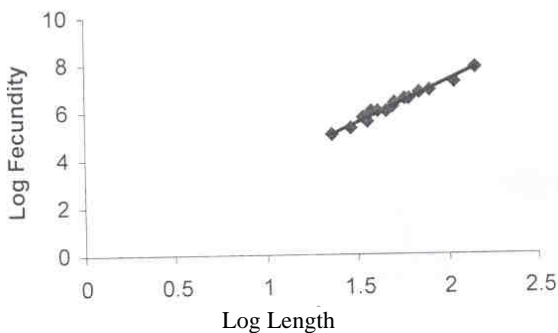


Fig. 1. Logarithmic relationship between fecundity and total length of *Cirrhinus reba* (Hamilton) from fishponds of district Jacobabad, Sindh, Pakistan.

Log F = - 18.57+6.03 x Log BW
 Fecundity- body weight
 r = 0.98

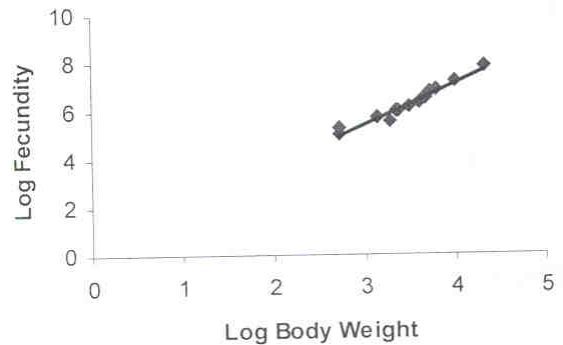


Fig. 2. Logarithmic relationship between fecundity and body weight of *Cirrhinus reba* (Hamilton) from fishponds of district Jacobabad, Sindh, Pakistan.

Log F = 13.36+4.45 x Log GW
 Fecundity- gonad weight
 r = 0.96

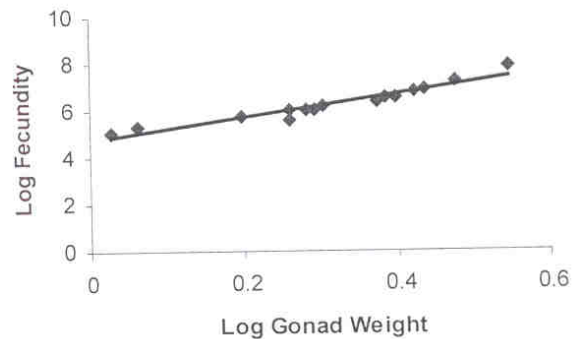


Fig. 3. Logarithmic relationship between fecundity and gonad weight of *Cirrhinus reba* (Hamilton) from fishponds of district Jacobabad, Sindh, Pakistan.

DISCUSSION

The gonadosomatic and fecundity study of a carp, *C. reba* from fishpond of District Jacobabad were described for twelve months from March 2004 to February 2005. It was observed that the fish *C. reba* have only one breeding season of short

duration running from June to August, with a peak in July. Similar observations have been made by Rao *et al.* (1972) and Gupta (1975) in *C. reba* from Cauvery, Bhavani Rivers and Muzaffarnagar (U.P) India, respectively. The maximum size of the mature egg found during the present study was 0.300 mm, which is in accordance with the findings of Gupta (1975) in *C. reba* during the month of July. The GSI during the present investigations shows one peak during summer in the month of July (5.05 ± 0.88 and 12.5 ± 1.55 for males and females, respectively Rao *et al.* (1972) and Qazi (2001) reported breeding season of a short duration in *C. reba* from June to August, with a peak in July from India and Bangladesh waters respectively, which supports the present findings. The range of fecundity observed during the present findings was from 20,722 to 211,200 eggs and size ranges from 150 mm to 290 mm in total length respectively. This is little lower than that of reported by Khan (1986) as 22,356 to 437,400 eggs from a fish measuring from 152 to 320 mm (TL) in *C. reba* from Baigul reservoir (U.P) India. According to Simpson (1951) the fecundity of an individual female varies according to many factors including age, size, species, environmental conditions (such as food availability, water temperature and salinity), that supports the present findings. During the present investigation, it was noted that fecundity increased with the increase in total length, body weight and gonad weight in *C. reba*. Similar observations have been reported by various workers in different fish species like Simpson (1951) in Plaice, Begenal (1967), Pillay (1958), Pillay and Rao (1962) in *Hilsa ilisha*, Botros (1962) in *Gadus morhus*, Siddiqui *et al.* (1976) in *Labeo bata*, Faruq *et al.* (1996) in *Clarias batrachus*, and Narejo *et al.* (2002) in *Mastacembelus armatus*.

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