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Gonadosomatic Index and Fecundity of an Indian Major Carp *Catla catla* (Ham)

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ABSTRACT

A study was conducted to determine the gonadosomatic index (GSI) and fecundity of *Catla catla* during the period of March 2013 to February 2014. From this study it has been shown that fecundity of fish increases with increase in size, weight of fish and gonad weight. The fecundity of *Catla catla* varied from 53,988 eggs in fish of 450.6g weight to 1,60,000 in fish of 950.4g weight. The gonad attain the maximum weight 5.75g and 11.5 for males and females respectively in July and minimum(0.55g male and 1.05g female)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.

KEYWORDS: GSI, *Catla catla*, Ova, Fecundity.

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I. INTRODUCTION

Carp culture is the largest and most wide spread practice of animal aquaculture in the world¹. The number of eggs contained in ovary of a fish is termed as fecundity. The term fecundity denotes the egg laying capacity of a fish or it refers to the number of ripe eggs produced by a fish in one spawning season. Fecundity is one of the most important biological aspects of a fish. This must be known to assess the productive potential and to evaluate the commercial potentialities of a fish stock. For efficient fish culture and effective management practices it is prime important to know the fecundity of fish². The fecundity and gonadosomatic index have also been studied in *Mystusgulio*³, in *Anabas testudineus*⁴ and in *Labeo rohita*⁵. Gonadosomatic index (GSI) is one of the important parameters of the fish biology, which gives the detail idea regarding the fish reproduction and reproductive status of the species and help in ascertaining breeding period of fish. The gonadosomatic index measures the cyclic changes in gonad weight in relation to total fish weight, and can be used to determine spawning periods. A clear knowledge of GSI and fecundity plays a significant role to evaluate reproductive potential of fish and for estimated spawning season of a species. The gonad weight gives an easily measured quantitative record of changes in the condition of gonads.

The gonadosomatic index, as a percentage weight of ovary to the body weight has been used as a maturity index of fish. In view of that the present study was undertaken to determine the fecundity and gonadosomatic index of *Catla catla* and to establish a relationship between the fecundity and standard length, body weight, gonadal length and gonadal weight of the fish. Many works has been done on the fecundity of different fishes^{6,7}.

II. MATERIALS AND METHODS

The research work is conducted at Manal fish farm, Orathanadu, Thanjavur Dist. Tamil Nadu, India. The study was carried out for a period of March 2013 to February 2014 to determine the gonadosomatic index and fecundity. They were brought to the laboratory and were thoroughly washed with water and blotted completely to remove excess of water and each fish was weighed using electrical balance and dissected to remove the gonads. The weight of individual fish and its gonads were recorded and GSI was calculated using the formula.

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

For fecundity, total fifteen matured fishes were used randomly from June to September. Gravimetric method was used to determine the fecundity of fish. By using this method, the external connective tissues were removed from the surface of 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. 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 SPSS program.

III. RESULTS

Gonadosomatic index (GSI) For the GSI study 120 males and females (60 each) *Catla catla* were examined to determine the GSI and fecundity. GSI values ranged from 0.55 to 5.75 in male and 1.05 to 11.05 in female and showed one peak in July (Table 1). During the present study the higher values of GSI were observed from June to August, it ranged between 4.20 to 5.75 and 8.80 to 11.05 for males and females, respectively. After extrusion of ripe gonads, the gonads were reduced in size and weight. Table 1 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 0.55 ± 0.21 and 0.65 ± 0.09 respectively (Table 1). 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 (0.305 mm) and gonadosomatic index.

A. Maturation of ova

The diameter of ova of 80% ranged from 0.285 to 0.305 mm June to August, while 20% ova were found ranged from 0.120 to 0.182. 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 1). No evidence was found to show that the resting oocytes in mature females would reach maturity during the current spawning season.

Table 1. Month-wise changes in ova diameter and gonadosomatic index of a carp, *Catla catla* from fishponds

S.No.	Month	Ova diameter (mm)	GSI %	
			Male	Female
1.	March	0.080	1.20	2.25
2.	April	0.120	1.45	2.95
3.	May	0.182	2.25	5.35
4.	June	0.242	4.20	10.25
5.	July	0.305	5.75	11.05
6.	August	0.285	3.25	8.80
7.	September	0.170	1.45	3.22
8.	October	0.007	0.55	1.25
9.	November	0.013	0.65	1.05
10.	December	0.022	0.85	1.33
11.	January	0.035	1.25	1.88
12.	February	0.065	1.16	2.03

B. Fecundity

Table 2. Total Body weight, Gonad weight and Fecundity of *Catla catla*

S.No	Fish weight (g)	Gonad weight (g)	Fecundity
1	450.6	32.4	53988
2	600.2	48.4	73380
3	650.4	50.1	76354
4	560.2	35.4	62500
5	750	56.4	98000
6	800	65.4	102500
7	660.7	51.4	81000
8	780.2	59.8	100500
9	680.5	54.6	97000
10	920.4	71.5	120000
11	850	67.2	108000
12	600	45.7	72500
13	720.4	53.4	96500
14	750.6	56.9	100500
15	950.4	76.8	160000

These individuals ranged from 450.6 to 950.4 g in total weight. The estimation of gonad weight and fecundity, in the present study ranged from 32.4 to 76.8 (g) and fecundity 53988 to

160000 eggs. The maximum fecundity was observed from a fish with a total weight of 950.4 and 76.8 g in gonad weight and the minimum was observed from a fish with a total weight 450.6 g and 32.4 gonad weight (Table 2). It was noted that the fecundity increased with the increase in gonad weight and body weight of the fish. The fecundity shows relationship between the gonad weight and body weight.

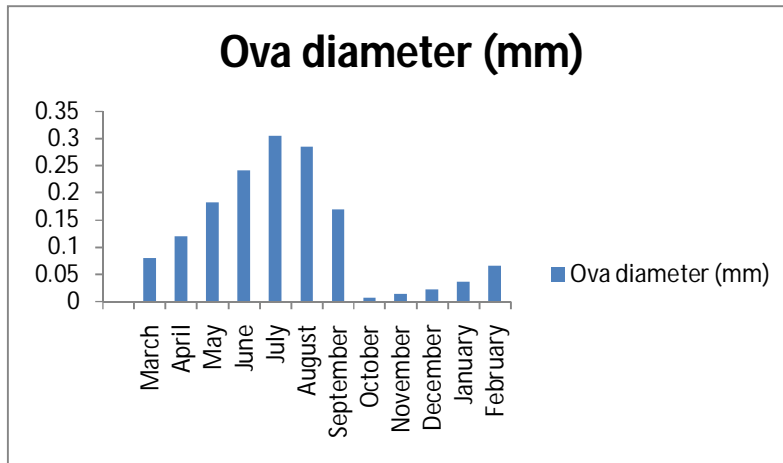


Fig 1. Monthly variation of mean value Ova diameter of *Catla catla*

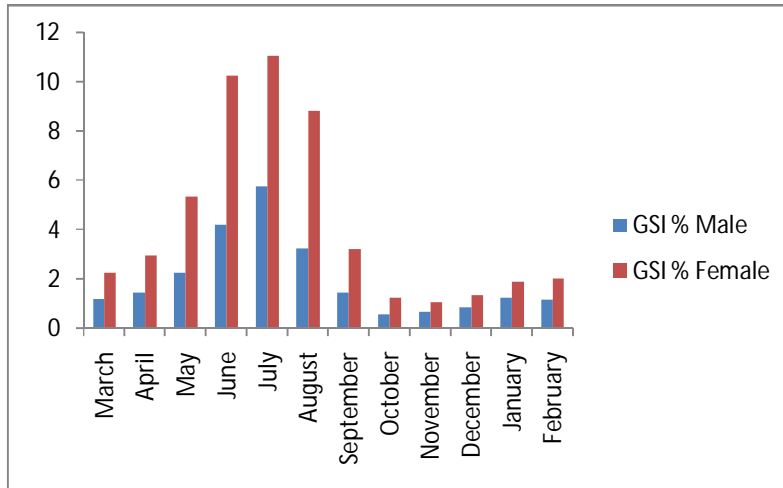


Fig 2. Monthly variation in GSI of male and female *Catla catla*

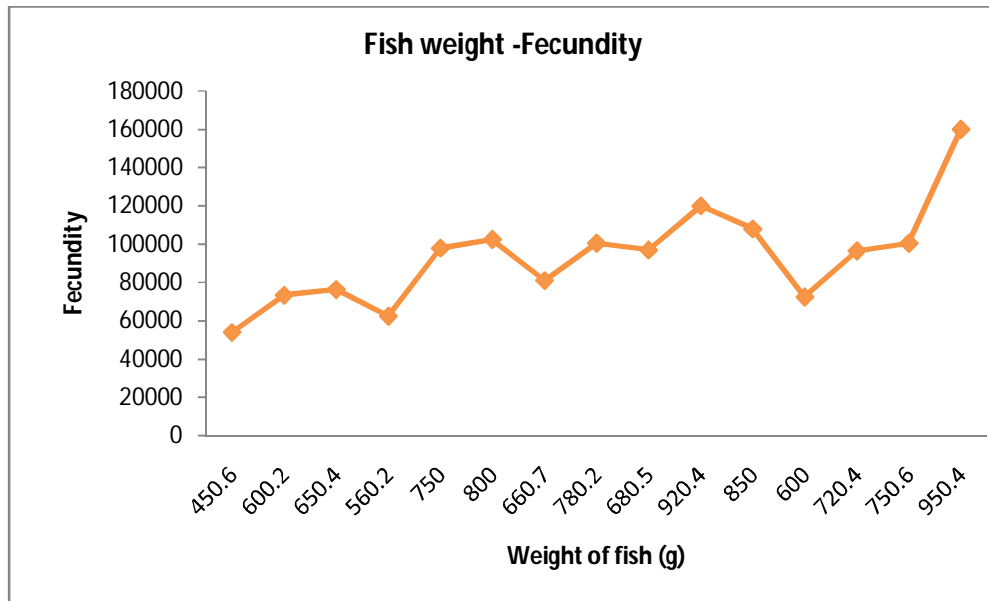


Fig 3. Relationship between Fecundity and Fish weight of *Catla catla*

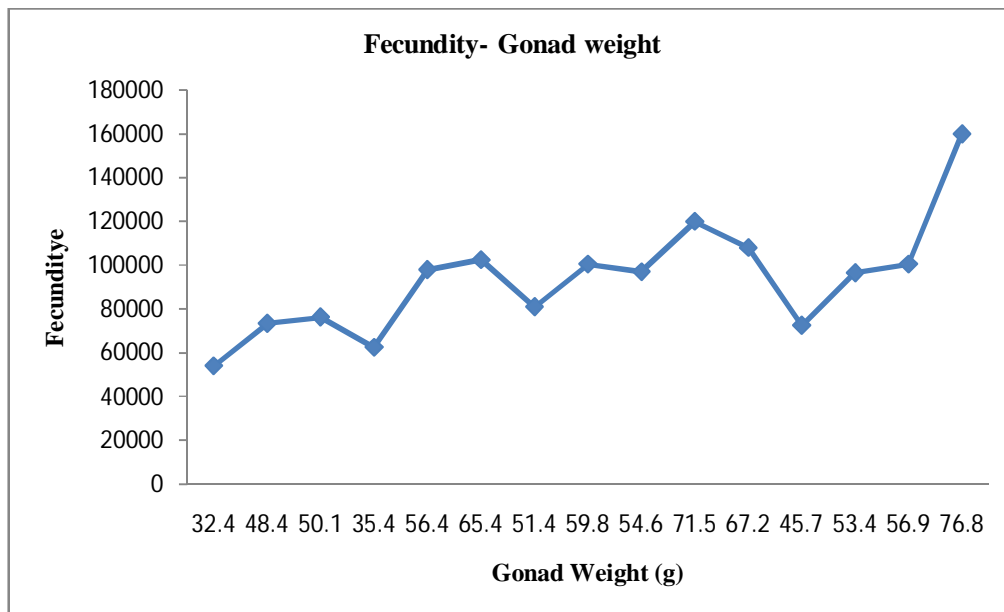


Fig 4. Relationship between Fecundity and Gonad weight of *Catla catla*

IV. DISCUSSION

It was observed that the fish *Catla catla* have only one breeding season of short duration running from June to August, with a peak in July. Similar observations have been made by in *C. reba* from Cauvery, Bhavani Rivers and Muzaffar nagar (U.P) India, respectively^{8,9}. The maximum size of

the mature egg found during the present study was 0.305 mm, which is in accordance with the findings of in *C. reba* during the month of July¹⁰. The GSI during the present investigations shows one peak during summer in the month of July (5.75 and 11.05) for males and females, respectively. The range of fecundity observed during the present findings was from 53988 to 160000 eggs and gonad ranges from 32.4 g to 76.8 g total weight respectively. This is little lower than that of reported b 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) India¹¹. The fecundity of an individual female varies according to many factors including age, size, species, and environmental conditions (such as food availability, water temperature and salinity), that supports the present findings. The present investigation clearly indicates that fecundity increased based upon the increase in body weight and gonad weight in *Catla catla*.

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