

GONADOSOMATIC INDEX AND FECUNDITY OF AN INDIAN MAJOR CARP *LABEO CALBASU* IN GOHAD RESERVOIR

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KEY WORDS

Gonadosomatic index
Fecundity
Labeo calbasu
Gohad reservoir

Received on :
24.12.2011

Accepted on :
11.02.2012

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ABSTRACT

In the present study gonadosomatic index and fecundity of an Indian major carp *Labeo calbasu* in spawning season i.e. from May to August 2007 have been reported. Ovarian weight of the carp ranges from 140 ± 320 g with a mean value of 201 ± 16.56 g. The ovarian weight is almost 20% of the body weight in fully mature fishes. In this study, it has been shown that the fecundity of fish increase with the increase in size, weight of fish and gonad weight. The average weight and length of fish are 1006 ± 75.22 g and 38.85 ± 1.29 cm respectively. The average fecundity was measured as 402217 ± 30661 ova per fish with an average fecundity of 400.5 ± 8.40 ova per gram of body weight and 10241 ± 401.8 ova per cm of fish length.

INTRODUCTION

A clear knowledge of gonadosomatic index 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. Saksena (1987) has suggested the use of gonadosomatic index and volume of the gonad as indicators of gonadal state. The fecundity and gonado sometic index have also been studied in *Mystus gulio* (Sarker et al., 2002), in *Anabas testudineus* (Marimuthu, 2009) and in *Labeo rohita* (Alam and Pathak, 2010).

Accurate fecundity estimates are also important for understanding the dynamics of fish populations, predicting trends in population abundance and estimating spawning stock biomass (Eldridge and Jarvis, 1995). Now a day, the knowledge of fecundity has been applied for detecting the different population of the same species of fish in different locations. *L. calbasu* is an important commercial major carp. It is found in freshwater habitat, viz., lakes and reservoirs in almost throughout the year. The population of this carp is scanty not only in the reservoir understudy but throughout the state. A considerable work has been done on the fecundity of fishes in India. A linear relationship between fecundity length and weight of the fish and weight of ovary has been established by several authors (Khan, 1939; Pillay, 1954; Alikunhi, 1956; Das, 1964; Desai, 1973; Chaturvedi, 1976; Natrajan and Reddy, 1980; Pathani, 1981). Sarkar and Pramanik (1984) and Nautiyal and Lal (1985) have studied

fecundity of the Garhwal Himalayan Mahseer, *Tor putitora* and concluded that mahseer is a poor breeder. Kumar and Balasubramanian (1986) have observed a definite exponential relation between fecundity and various parameters, such as standard length, weight of fish, weight of ovary and length of ovary in spiny eel in Vellayani Lake, Trivandrum. Knowledge regarding maturity, breeding and fisheries of *L. calbasu* is still fragmentary. This carp has been suggested as an alternative to Indian major carps, and can be used in culture system replacing traditional *catla*, *rohu* and *mrigal* combination. Therefore, it is very important to know about gonadosomatic index and fecundity of this carp, *L. calbasu* to get more and more information about its reproduction potential and usefulness as a candidate carp for fish culture.

MATERIALS AND METHODS

To determine the gonadosomatic index and fecundity fully matured specimens, weighing from 750 to 1600g and with length ranging from 33.50 to 47.0cm were collected from the Gohad reservoir, in Gohad Town, Bhind (M.P.) during the period from May to August, 2007 (Fig.1). Using visual observations and common experience, very much bulging abdomen of the female fish can be easily distinguished for gravid stage. The collected fish were brought to the laboratory for the further study. After washing the fishes thoroughly with the tap water and drying with towel, total length of each fish was measured in centimeters with help of measuring scale to the nearest 0.1cm. The body weight of each fish was measured by means of a single pan balance in g. After weighing the ovaries, one gram each from six cross sectional samples were taken from anterior, middle and posterior regions of the paired

ovary and the pieces were kept in Gilson's fluid separately. Then the numbers of the ova were counted from these parts of the ovary. The total number of ova in the entire ovary was computed and the mean was calculated. The gonadosomatic index and fecundity was computed by following formulae.

$$\text{Gonadosomatic index} = \frac{\text{Weight of ovary}}{\text{Weight of fish}} \times 100$$

Fecundity = Number of ova in 1.0g of ovary × Total weight of ovary in g

RESULTS

The ovaries of *L. calbasu* are paired elongated and sac like structures, lying ventral to the kidneys in the abdominal cavity. They remain adhered to the body wall by means of mesenteries called mesovarium. Posteriorly, the two halves get fused at their hinder end and open to the exterior through a common oviduct. The halves of paired ovaries are of approximately equal in size. Both the ovaries are full of mature and immature oocytes and are slightly tapering interiorly but broader posteriorly. This makes a bulky appearance of ovaries. The ovaries appear yellowish brown to light brown in colour with conspicuous superficial blood vessel.

Gonadal development was studied by using the gonadosomatic index of fishes. Mean gonadosomatic index increased gradually from May and reach to peak in July and then decreases in August, 2007. The gonadosomatic index of *L. calbasu* was ranging from 18.22 to 22.10 with a mean of 19.87 ± 0.383 (Table 1 and Fig. 2). The high value of gonadosomatic index is indicative of mature stage of gonads in the fish. The mature ova are round and heavily laden with yolk.

The total fecundity of this carp ranged from 3, 12, 100 to 6,57,600 ova with an average of $4,02,217.0 \pm 30661$ ova per fish. It is quite clear that female fish with greater weight had higher fecundity. The number of ova per gram body weight of fish was found as 400 ± 8.40 ova/g and the number of ova per

Table 1: Monthly gonadosomatic index of an Indian major carp, *L. calbasu* in Gohad reservoir

Months	Gonadosomatic index (mean \pm SE)	Average fecundity
May, 2007	19.89 ± 0.08	337726
June, 2007	20.57 ± 0.27	382812
July, 2007	20.69 ± 0.048	502820
August, 2007	18.77 ± 0.024	385700

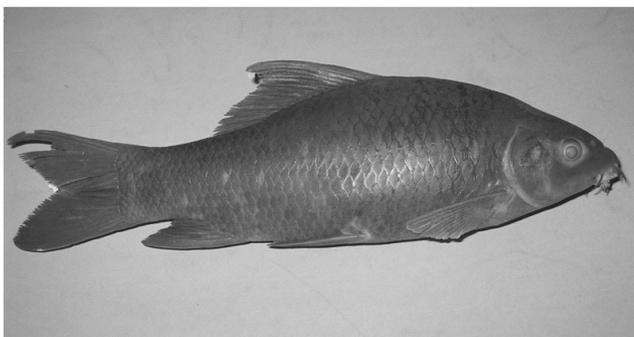


Figure 1: Adult specimen of *L. calbasu*

Table 2: Fecundity data of an Indian major carp, *L. calbasu* in Gohad reservoir

Fecundity parameters	Mean \pm SE
Total fecundity	402217.0 ± 30661
Fecundity/g body weight	400.0 ± 8.4
Fecundity/cm body weight	10241.87 ± 401.87
Total gonadosomatic index	19.87 ± 0.383

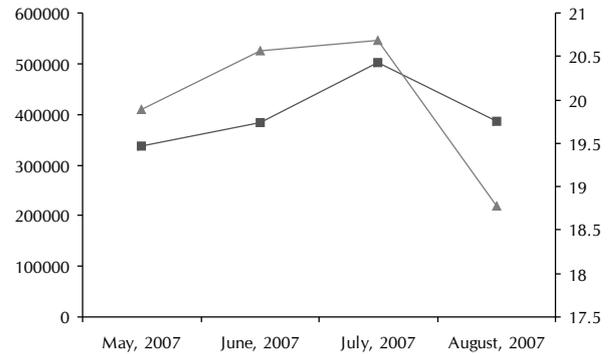


Figure 2: Graph showing monthly variation in gonadosomatic index and fecundity of an Indian major carp, *Labeo calbasu* in Gohad reservoir

cm of length of body was found to be 10241.87 ± 401.87 ova/cm.

DISCUSSION

Gonadosomatic index has been considered as reliable estimate for gonadal maturity and spawning of any species. The gonadosomatic index increased with the maturation of fish and reaches to its maximum at the peak period of maturity. Its abrupt decrease indicates beginning of spawning. Our study confirms the observations on earlier worker including Saksena (1987), Selvaraj *et al.* (1989), Sarker *et al.* (2002), Juchno and Boron (2006) and Ozcan and Balik (2009). In the annual spawners such as brown trout, *Salmo trutta* and perch *Perca fluviatilis*, the mature ovary is approximately 20% of the total weight, and in the European plaice *Pleuronectes platessa* it is around 30%. However, in fish that spawns several times each year, the weight of mature gonad may be much less, as in the case of *Sartherodon variables* in lake Victoria in which the ovary is about 4% of the total weight (Fryer and Isles, 1972). *L. calbasu* has been observed to have ovarian weight around 20% of the body weight.

Fecundity finds its application in fish taxonomy on one hand, in fishery biology (population studies, production studies, mortality studies) on the other. It is used to estimate abundance of female population by dividing the total number of eggs laid by average fecundity of the species. Fecundity of fish is variously related to the egg sizes, gonad size, length, weight, and age of female fish (Nitschke and Mather, 2001; Kiran and Puttiah, 2003; Saifullah *et al.*, 2004; Naem *et al.*, 2005; Hussainy, 2008 and Bariche *et al.*, 2009). Greater the fecundity, smaller will be the size of egg. Large size fish will have more fecundity than small sized fish. It is also believed that larger fish lay larger egg (Bagenal, 1966). The largest specimen of *L. calbasu* had a body weight 1600g and it was

found to carry the highest number of eggs (657600) while minimum number of egg (312100) were observed in the specimen having a weight of 750 g. It is worth mentioning here that higher values of fecundity were noticed in the fishes of higher weight range (Khan *et al.*, 1992). Goswami *et al.* (2008) while studying *Nandus nandus* from new alluvial zone in West Bengal have suggested that fecundity is an important aspect of fish biology.

Major carp, *L. calbasu* is also used in culture system along with other Indian major carps, but has a slower growth rate than Rohu and Catla. By the end of one year *Calbasu* grows to a length of 30-35cm and a weight of 450g. It becomes sexually mature when the fish is about 25cm long and the fecundity has been found to be 435 eggs/g of body weight. The Indian major carps viz., *Catla catla* (280 eggs/g) *L. rohita* (271 eggs/g) and *Cirrhinus mrigala* (150 eggs/ g body weight) much less than *L. calbasu* which is about 400 ova/g of body weight. However, the fecundity of *C. catla* has been estimated from 2,30,831 to 30,77,900 Natarajan and Jhingran (1963) whereas, *L. rohita* has a fecundity of 2,26,500 to 27,94,000 Khan and Jhingran (1975). *C. mrigala* had lower fecundity that is from 1,81,685 to 18,09,536 (Jhingran and Khan, 1979). Inaba *et al.* (1957) has estimated 4,85,000 ova in a grass carp weighing 7.1kg but a higher fecundity has been noted by Alikunhi and Parmeswaran (1963) *i.e.*, from 3,08,800 to 6,18,100.

ACKNOWLEDGEMENT

We are thankful to the Head, School of Studies in Zoology, Jiwaji University, Gwalior for providing necessary facilities. We also extend our thanks to the coordinator, SAP-DRS-Phase 1 and to the laboratory mates for helping in various ways.

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