

## GONADOSOMATIC INDEX AND SPAWNING SEASON IN FRESHWATER CATFISH *NOTOPTERUS NOTOPTERUS* (HAMILTON)

A.N. SHENDGE AND U.H. MANE\*

DEPARTMENT OF ZOOLOGY, TULJARAM CHATURCHAND COLLEGE,  
BARAMATI-413 102, INDIA.

DEPARTMENT OF ZOOLOGY, DR. B.A. MARATHWADA UNIVERSITY,  
AURANGABAD-431 004, INDIA\*.

(e-mail : anil\_shendge4030@rediffmail.com)

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In the present investigation the gonadosomatic index (GSI) and spawning season of freshwater catfish *Notopterus notopterus* (Hamilton) from Bhima river, Dist. Pune, Maharashtra were studied. Observations on the variations in seasonal fluctuations in the GSI confirmed that the spawning period begins in July. The species has a prolonged spawning season in the females extending from July to January, whereas males mature in August ripe specimens were encountered in monthly samples until November. The recruitment pattern confirmed that there is one breeding season with two spawning peaks; the first in July and the second in December. Breeding season lasted from July to January with August to October being the peak periods. In the present study GSI is found to be directly proportional to spawning season and inversely proportional to post-spawning season.

**Key words :** *Notopterus notopterus* , Gonadosomatic index, spawning.

### INTRODUCTION

The reproductive cycle in fishes involves large changes in the weight of gonads which are usually reported in terms of the gonadosomatic index (GSI) expressed in terms of the gonadal weight as a percentage of the whole body weight. There have been numerous studies in which GSI has been used as an indicator of gonad development (Htun-Han, 1978). The GSI is an indicator of the status of gonads i.e. ovary and testis in terms of maturity and denotes the phase of the reproductive cycle. GSI is generally used for the study of maturation and spawning biology. It is also used to assess the degree of ripeness of the ovary. GSI is an indicator of breeding period in fish (Gupta, 1974). Earlier notable contributions on the studies of GSI are of Dadzie *et al.* (2000) from middle east and Kumthekar (1988), Ahirrao (2002), Telvekar *et al.* (2005), Shankar & Kulkarni (2006), Shendge & Mane (2006, 2007) and Pawar *et al.* (2007) from peninsular Indian regions. *Notopterus notopterus* is quite abundant in Bhima river, Dist. Pune, Maharashtra and has very high market value and forms favorite items in the diet of local people. Information on the gonadosomatic index in *N. notopterus* in relation to different phases of reproductive cycle is scanty and hence, present investigation was undertaken to study the gonadosomatic index during different phases of reproductive cycle in *N. notopterus*.

### MATERIALS AND METHODS

Monthly samples of *Notopterus notopterus* were collected from Bhima river, near Bhigwan (Latitude 18° 17' N and Longitude 74° 45' E), Pune District, Maharashtra during April 2008 to March 2009. A total of 89 males and 79 females ranging in size from 214 to 283mm and 224 to 321mm, respectively were used in the present study. The fishes

were washed thoroughly; surface moisture was removed by blotting and weighed to nearest mg using digital one pan electronic balance. After recording the body weight, the fishes were dissected for the gonads. The gonads were weighed to nearest mg and the gonadosomatic index was calculated using the formula as  $GSI = \text{weight of the gonad} \times 100 / \text{weight of the fish}$ .

## RESULTS AND DISCUSSION

In the present investigation, cyclical changes in the gonadosomatic index of *Notopterus notopterus* from Bhima river showed that weight of the ovaries followed regular cyclical changes which are correlated with the oogenetic activity in the gonads which was indicated by the seasonal changes in GSI (Fig.1).

In the females the gonads were in the resting stage of maturity during January, the GSI values were minimum 3.38. The lowest GSI in January indicates that during this month the weight of the ovary was minimum, possibly the ovaries in this month remaining in dormant stage. Similar results were also obtained in *Otolithes cuvieri* (Telvekar *et al.*, 2005) from Mumbai waters and *Macrones bleekeri* (Pawar *et al.*, 2007) from Sadatpur Lake, Pravaranagar, Maharashtra.

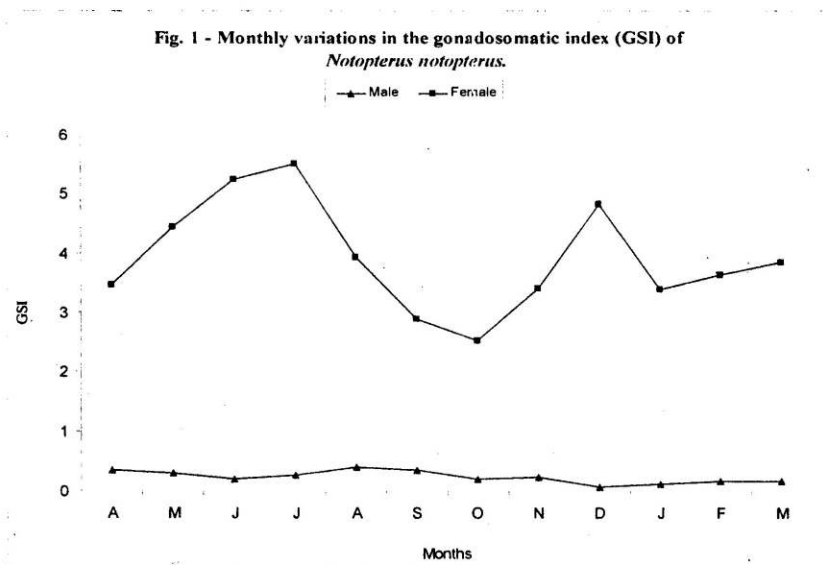
In the maturing stage which occurred during April, the values increased to 3.46. GSI increases during maturing stage possibly as a result of high level of cellular activity in the ovaries (Bhatti & Al-Daham, 1978). During May GSI increased significantly, when the ovaries were in the pre-spawning stage. The values were 4.45. GSI increased gradually during June (5.23) and then reached to a higher peak during July (5.51). During pre-spawning, GSI reaches to a higher peak due to increased number of matured oocytes with heavy yolk deposition (Babikar & Ibrahim, 1979; Pandarkar, 1998; Pawar *et al.*, 2007).

During August, September and October the values declined to 3.93, 2.88 and 2.52 respectively, correlating with onset of spawning. The GSI sharply increased during November (3.39) and December (4.82) and then gradually declined in January (3.38) correlating with the spawning and lysis period. The GSI slightly increased during February (3.63) and then gradually increased to 3.84 in March indicating the onset of maturing stages of the ovaries in the following breeding season.

In the present study, the GSI showed two peaks; one during July and the other during December. The higher peak in July indicated greater number of fishes maturing during this period. Decline in GSI in August and September indicated first attempt of spawning. The decline following peak further suggested the onset of spawning. The relatively smaller peak during December was mainly due to maturation of a small fraction of the population of this species during the period. Apart from monsoon rainfall resulting in increased water level and oxygen content, decreased temperature and pH, dilution of certain electrolytes, the factors like increased photoperiod and probably increase in food material for the fishes, even for feeding of fry and juveniles might have accounted for spawning in fishes. In earlier studies similar results were reported in *Mastacembelus armatus* (Gupta, 1974), *Etroplus suratensis* (Jayaprakas & Nair, 1981), *Mystus aor* (Ramakrishniah, 1992), *Cirrhina reba* (Shendge & Mane, 2006) and *Macrones bleekeri* (Pawar *et al.*, 2007). The higher GSI values during June to September indicated a major breeding period of this species.

The reports are also available on many other fishes from Indian waters and abroad showing that the GSI increased with the progressive development of the gonads in both males and females until the gonads became ripe and the index then declined sharply in the spawning and the spent fishes (Gupta, 1974; Babikar & Ibrahim, 1979; Khan *et al.*, 1990; Ikoni, 1996).

In the present investigation it was further observed that the GSI value increased significantly during April-June and December. This, apart from the fully grown vitellogenic oocytes, was probably due to up-take of fluid by some of the fully grown oocytes, which resulted in their swelling and becoming hyaline (Macer, 1974). However, in July almost all oocytes were fully vitellogenic and therefore it was likely that the GSI reached a peak value. The decline in GSI during August, September, October and January was due to spawning. The decrease in GSI during spawning probably was related to a decrease in the number of large vitellogenic follicles from the ovary, some times accompanied by atresia, especially of the larger vitellogenic follicles (Sumpter & Dodd, 1979).



**Fig. 1 :** Monthly variations in the Gonadosomatic Index (GSI) of *N. notopterus*.

The pattern of changes in GSI of males (Fig.1) was almost similar to that of females, except that the ovaries maintained a heavy weight for a longer period than the testes due to accumulation of yolk in the ova (Anantha *et al.*, 1995). Present study also revealed that females showed high values of indices than the males. In addition to these observations it was also noted that the GSI exhibited a maximum value during the beginning of the rainy season which corresponded to South-West monsoon. Similar observations were also reported in *Mystus nemurus* (Khan *et al.*, 1990), *Brienomyrus longianalis* (Ikoni, 1996) and *Macrones bleekeri* (Pawar *et al.*, 2007).

The monthly changes in the gonadosomatic indices suggest that the spawning season of *Notopterus notopterus* spreads over a long period of time; beginning in March and

extending up to January, with a main peak season in July, August and September.

The gonadosomatic index (GSI) of *Notopterus notopterus* increases during preparatory phase (PR), reaching maximum during pre-spawning (PSP) after which it declines in spawning phase (SP), reaching a minimum value in post-spawning phase (PS). The annual gonadal cycle of *Notopterus notopterus* can be divided into four phases viz. preparatory phase (March), prespawning phase (April-June), Spawning phase (July to October) and post-spawning phase (January-February).

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