

SEASONAL CHANGES OF GONADOSOMATIC INDEX OBSERVED IN THE FRESHWATER FISH *CHANNA PUNCTATUS*

SUNITA KAPIL*, K. M. KULKARNI, S. S. GIJARE AND V. T. TANTARPALE

Department of Zoology,
Vidya Bharti Mahavidyalaya, Amravati - 444 602
E-mail: shrutipande17@yahoo.com

KEY WORDS

Channa punctatus
Gonadosomatic index
Testis
Ovary

Received on :
12.07.2011

Accepted on :
21.10.2011

*Corresponding
author

ABSTRACT

In the present study the values of gonadosomatic index of freshwater fish *Channa punctatus* collected from Wadali lake near Amravati region of Maharashtra during 2006- 07. The minimum gonadosomatic index for females (0.285) observed in winter season. The maximum gonadosomatic index values of ovaries were observed in rainy season (0.775) and intermediate values of gonadosomatic index were in Summer (0.472). The gonadosomatic index for males were (0.62 in summer, (0.74) in rainy and (0.42) in winter.

INTRODUCTION

The knowledge of fish fecundity has much relevance in fish population studies and in successful management and exploitation of the fishery (Maurice and Burton, 1984; Manna and Raut, 1991; Alam and Das, 1996). The egg production varies not only among different species but also within the same species depending upon the length and weight of gonad, influenced by the environment (Kulshrestha *et al.*, 1990; Barmanh and Saikia, 1995). Even the geographical distribution is known to influence the fecundity (Somvanshi, 1985; Shinde *et al.*, 2002). Maturity determination by gonadosomatic ratio has proved significant role in the life of fishes. It is helpful in fish breeding too (Belsare, 1962; Lehri 1968; Shashi and Akela, 1996).

The method of studying the spawning season is to follow the seasonal changes in gonadal weight in relation to body weight, expressed as the gonadosomatic index (Ahirrao, 2002). Gonads undergo regular seasonal cyclic changes in Weight, particularly in females indicate the spawning season (Dadzie *et al.*, 2000). Gonadosomatic index is one of the important parameter 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, (Sathyanesan, 1959; Siddiqui, 1977; Saksena, 1987; Rao *et al.*, 1999; Mohan and Jhahhria, 2001; Gupta and Shrivastava, 2001; Shankar and Kulkarni, 2005).

The objective of the present work has to determine the state of maturity and spawning period influenced with different seasons in the fish *Channa punctatus*.

MATERIALS AND METHODS

For the study of gonadosomatic index, the healthy freshwater fishes *Channa punctatus* were collected from fish market and Wadali Lake of Amravati. They were brought to the laboratory and were thoroughly washed with water and blotted completely to remove excess of water and weighed on electrical balance. To the study of gonadosomatic index 693 fishes were examined, out of these 287 were male and 406 were female and were dissected to remove the gonads .The weight of gonads of individual fish was recorded and Gonadosomatic index was calculated by using the formula.

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

RESULTS AND DISCUSSION

In the present study gonadosomatic index of freshwater fish *Channa punctatus*, the gonadal development were observed at different seasons such as summer, rainy and winter. The highest values of gonadosomatic index of ovaries was(0.775) observed in the rainy season. The average length of fishes was 30-130mm, while minimum values of gonadosomatic index was(0.285) observed in winter season and intermediate gonadosomatic index values was (0.472) noted in summer season (Table 1). During the study it was noted that the ovaries of same size of fishes contained various number of eggs this may showed due to environmental conditions and intake capacity of food by fishes.

In the testes of male fishes *Channa punctatus*, maximum gonadosomatic index was (0.74) observed in the month of

Table1: Seasonal changes of gonadosomatic index observed in the freshwater fish *Channa punctatus*

Season	Average weight of fishes (mg)		Average weight		Gonadosomatic index	
	Male	Female	Ovary	Testis	Ovary	Testis
Summer(Jan-May) (30-130mm)	541.59 ± 11.65 SE = 3.88	600.89 ± 3.86 SE = 1.28	2.841 ± 1.22 SE = 0.40	3.544 ± 0.722 SE = 0.24	0.472 ± 6.14	0.62 ± 4.58
Rainy(June-Sept) (30-130mm)	590.66 ± 4.08 SE = 1.36	700.96 ± 3.96 SE = 0.663	5.417 ± 2.35 SE = 0.78	4.383 ± 1.46 SE = 0.487	0.775 ± 3.69	0.74 ± 8.06
Winter(Oct.-Dec.) (30-130mm)	527.72 ± 7.12 SE = 2.37	599.16 ± 0.56 SE = 0.62	1.708 ± 1.86 SE = 0.62	2.228 ± 0.076 SE = 0.256	0.285 ± 18.13	0.42 ± 10.11

rainy season, while minimum gonadosomatic index was (0.42) observed in winter season. The intermediate values of gonadosomatic index of testes was (0.62) in summer season (Table 1)

The highest values of gonadosomatic index in rainy season indicated accumulation of large quantity of yolk in ripe ova and reached at peak in this season. The full development of ovary showing prolonged spawning. Some investigators reported similar observation on the other fishes, (Hoque and Hossain, 1993; Roy and Hossain, 2006; Alam and Pathak, 2010). The increase in GSI with advanced developmental stages of ovaries were also reported in *Puntius filamentosus* (Manna *et al.*, 2010), *Puntius dukai* (Joshi and Joshi, 1989), *Barbus longiceps* (Stoumbondi *et al.*, 1993).

In the present work the gonadosomatic index values showed increase in rainy season. Similar findings by (Encina and Lorenzo, 1997) revealed that most of the Indian freshwater teleosts attained maturity and breed during monsoon season. The lowest values of gonadosomatic index in winter season indicate depletion of gonadal products as a result of intense spawning activity, shedding of eggs and due to resorption of remnants of ova in the spent ovaries, similar findings were observed by Adamassu (1996) in GSI of *O. niloticus*. Decline in gonadosomatic index gives clear indication of affected metabolism which in turn affect reproductive potential due to increase in concentration of nickel chrome electroplating effluent or other stressors (Chandra *et al.*, 2004; Srivastava *et al.*, 2008). With the information of gonadosomatic index the prespawning, spawning and post spawning periods in any of the fish can be determined, which may help in management of fishes in *Tetrodon cutcutia* determine of maturity and spawning periods by gonadosomatic index and measurement of mean ovary diameter (Kumar *et al.*, 2003). Also the study of (Shengde and Mane, 2006) found gonadosomatic index of Cyprinid fish *Cirrhinus reba* to be directly proportional to spawning while inversely proportional to post spawning season. Where as in summer the values of gonadosomatic index showed the prespawning stage. The fishes are in maturing stage and starts maturing upto peak from the month of summer upto rainy season which indicates progress of maturing phase up to full development of ovary.

The gonadosomatic index values of testis showed mature stage. In summer season increase in temperature, the spermatogenetic activity also increase. The primary and secondary spermatocytes and spermatids were filled in the lumen of lobules. Thus this season comprises preparatory and prespawning phase. Hence gonadosomatic index level of testes was higher than winter season. Gonadosomatic index used to determine the spawning season, (Ha and Kinzie, 1996;

Jacob and Nair, 1983; Varghese, 1975).

The seasonal factors might greatly influence the maturation of ovary resulting the successive changes in the gonads and body weights (Lincoln *et al.*, 1980). Gonadal development and maturation observed in major carp *Labio rohita* was influenced positively by increasing day length and temperature (Kumar *et al.*, 2003; Singh *et al.*, 2005).

The present investigation, concluded that the gonadosomatic index of gonads of freshwater fish *Channa punctatus* increased at rainy season whereas lowest rates in winter and intermediate status in summer season.

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