

# Gonadosomatic index, Spawning season and spawning periodicity in fish *Puntius sophore*

<sup>1</sup>Krishan Raj Kant, <sup>2\*</sup>Seema Langer, <sup>3</sup>Chanchal Angral, <sup>4</sup>Jyoti Sharma

<sup>1,3,4</sup>Research Scholar, <sup>2\*</sup>Professor, Department of Zoology, University of Jammu, Jammu 180006 (India)

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**Abstract:** The paper deals with the Gonadosomatic Index (GSI), spawning season and spawning periodicity of fish *Puntius sophore* from Jammu water bodies. The GSI showed single highest peak of  $14.06 \pm 1.59$  during the month of July thereby indicating that greater percentage of fish were maturing during this period. Its gradual fall during August and sudden drop during the month of September ( $0.9 \pm 0.59$ ) clearly suggested the onset of spawning activity in this fish. Its gradual fall during August and sudden drop during the month of September ( $0.9 \pm 0.59$ ) clearly suggested the onset of spawning activity in this fish. A fall in GSI value from its maximum, reduction in the size of gonads (flaccid appearance) and occurrence of spent fish characterized by the presence of corpus luteum and prevalence of atretic oocytes, few oogonia and stage I oocytes act as indicator of spawning. On the basis of these parameters, *Puntius sophore* appear to be monsoon spawner i.e spawn from July to August that may sometime even extend upto early September. Besides GSI, highest percentage of ripe eggs during July to August and decline in September, presence of corpora lutea during August and September very aptly suggest July to September to be the definite breeding period of fish *Puntius sophore*. While investigating the spawning periodicity in fish, *Puntius sophore* is an asynchronous spawner and spawn once in a year and have a slightly long period of spawning extending from July to mid-September.

**Keywords:** Gonadosomatic Index (GSI), Jammu water bodies.

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## I. INTRODUCTION

*Puntius sophore* is commonly called as pool barb. It has economic value too. Due increasing population and industrialization availability of agriculture land is reducing day by day. Moreover in a developing country like India where 30% population is still suffering severely by malnutrition and health hazards fish food may be useful to provide potentous and easily digestible food items. The scientific management for obtaining high yield of fish production eventually calls the adequate and in depth study of breeding mechanism. In order to complete the task present study was undertaken to trace accurately spawning period of *Puntius sophore*. This is reported in terms of gonadosomatic index which express the relative change in gonad weight to the percentage of body weight.

## II. MATERIAL AND METHODS

### Collection area:

Fishes were collected from their natural habitat from a stream at Gho-Manhasan located at a distance of 20km north west of Jammu city (32° 67' Lat N; 70° 79' Long E).

Fish *Puntius sophore* were collected from their natural habitat from a stream at Gho-Manhasan and these were acclimatised in plastic troughs at room temperature. They were fed on live feed and formulated feed, every alternate day dead fish were removed. The fish dried with blotting paper were weighed on the electronic weight balance. The gonads were also weighed on the electronic balance. Every month 2 to 3 fishes were sacrificed in order to assess the maturation stage of gonads and GSI was calculated by using the formula.

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

### III. RESULTS AND DISCUSSIONS

Persual of the table 1 & 2 clearly shows that weight of ovary followed regular cyclic changes which are found to be correlated with the development activity in the gonads. The GSI showed single highest peak of  $14.06 \pm 1.59$  during the month of July thereby indicating that greater percentage of fish were maturing during this period. (Fig.1). Its gradual fall during August and sudden drop during the month of September ( $0.9 \pm 0.59$ ) clearly suggested the onset of spawning activity in this fish. (Table 1&2 & Figure 1). It is very clearly evident from the table 4.2 that the percental occurrence of mature ova in different months reveals considerable variations and there was only one batch of eggs undergoing maturation at one time. The ripe eggs spawned within a short period extending from July to August and may be same upto September indicating that the fish had a definite breeding season in a year. Similar results were reported for *Rasbora rasbora* by Agarwal (1982), who reported the highest value of GSI for the month of July and sudden drop in the month of August. A fall in GSI value from its maximum, reduction in the size of gonads (flaccid appearance) and occurrence of spent fish characterized by the presence of corpus luteum and prevalence of atretic oocytes, few oogonia and stage I oocytes act as indicator of spawning. On the basis of these parameters, *Puntius sophore* appear to be monsoon spawner i.e spawn from July to August that may sometime even extend upto early September. Hossain and Haque (2005) while investigating *Rasbora rasbora* also reported it to be monsoon spawner.

Spawning is an act which closely follows maturity in fishes and is usually determined through such characteristic features: i) Fall in GSI from its maximum value. ii) Reduction in size of gonads (flaccid appearance of ovaries). iii) Appearance of corpus luteum in the ovaries. iv) Availability of spawn in surrounding medium or fingerlings.

Presently, it has been observed that GSI exhibited cyclic changes and depicted a single peak during the month of July which consequently observed a decline during the month of August suggesting thereby the onset of spawning in this fish (Figure 30). Besides GSI, highest percentage of ripe eggs during July to August and decline in September, presence of corpora lutea during August and September very aptly suggest July to September to be the definite breeding period of fish *Puntius sophore*.

It was observed during present studies that *Puntius sophore* spawn in early monsoon season when not only plenty of food is available in water body but water temperature creates very congenial atmosphere for the offsprings. That monsoon is well suited for breeding of freshwater fish has already been well documented by different scientists (Wallace, 1903; Hickling, 1935; Malhotra, 1965a; Jyoti, 1972; Gupta, 1980; Jhingran, 1982; Singh, 2009, Vohra, 2011, Ashwin *et.al*, 2012 and Tiwari *et.al*, 2014). All these authors held that reproduction is the most demanding phase of life and therefore needs to be restricted to the best environmental phase, suitable both for spent parents as well as the offsprings.

While investigating the spawning periodicity in teleosts, Agarwal (1996) reported that teleosts exhibit definite spawning periodicity and are seasonal breeders. Several workers like Marza (1938); Ishida *et al.* (1959); Yamamoto and Yamazaki (1961); Billard (1986) and Subhan and Hafeez (1998) recognised two pattern of gonadal development in fishes. According to pattern of gonadal development, spawning pattern is characterized by those species which have short well defined spawning season. In this case both of the sexes, exhibit synchronized development of a single cohort gamete which all pass as a wave through successive stages of gametogenesis to mature through a limited period, and after this the gonads return to the immature state until the next spawning season. This pattern of gonad development has been termed as synchronous.

The other pattern is characterized by species which have a prolonged spawning season during which each individual may breed several times. There is a more or less continuous recruitment and subsequent development of gametes in individual fish over a prolonged period before and during the reproductive period. This pattern has been identified as asynchronous. *Puntius sophore* of present studies exhibit the second pattern of gonadal development because its ovaries at any stage of reproductive cycles contain 3-5 different stages of developing oocytes and hence is an asynchronous spawner.

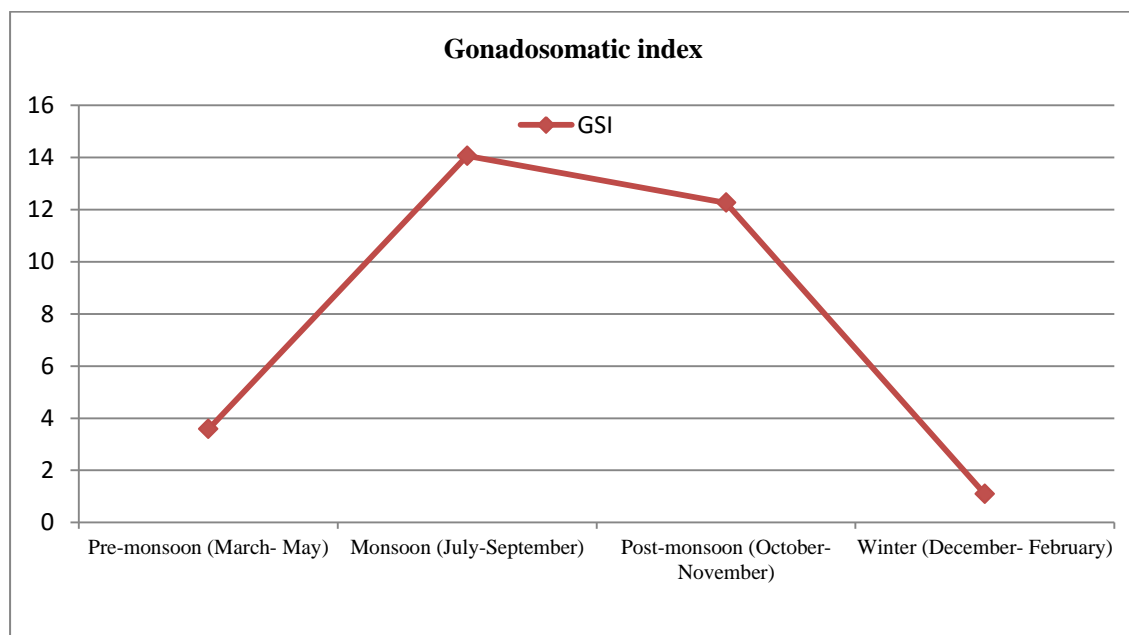
Prabhu (1956) recognized four types of spawners viz, spawning once in a year with in short duration, spawning once in a year with long duration, spawning more than once a year and spawning throughout the year that is intermittent spawning. *Puntius sophore* of present investigation fall under the second category of Prabhu (op.cit) as they spawn only once in a year and the spawning time spread to a period of approximately two and half months (July to Early September). Thus from the foregoing discussion it is clear that fish *Puntius sophore* is an asynchronous spawner and spawn once in a year and have a slightly long period of spawning extending from July to mid-September.

**Table 1. Monthwise variations in body weight, ovary weight and GSI of *Puntius sophore***

MONTH	Weight of fish (gms)	Weight of ovary (gms)	GSI
	Mean±standard deviation	Mean±standard deviation	Mean±standard deviation
SEPTEMBER	4.34±2.07	0.04±0.004	0.92±0.59
OCTOBER	5.31±1.03	0.05±0.002	0.94±0.23
NOVEMBER	6.12±2.05	0.06±0.002	0.98±0.19
DECEMBER	7.23±1.02	0.071±0.009	0.98±0.12
JANUARY	6.64±1.09	0.073±0.007	1.09±0.17
FEBRUARY	5.46±2.04	0.078±0.004	1.42±0.46
MARCH	5.47±1.04	0.081±0.001	1.48±1.20
APRIL	5.85±1.04	0.21±0.002	3.58±2.45
MAY	7.94±3.09	0.36±0.008	4.53±1.31
JUNE	8.75±0.02	0.75±0.001	8.57±1.44
JULY	13.86±4.04	1.95±0.002	14.06±1.59
AUGUST	8.64±3.02	1.06±0.034	12.26±3.14

**Table 2. Seasonal changes of mean of Gonadosomatic index (GSI) of *Puntius sophore***

SEASONS	TOTAL LENGTH (cm)	TOTAL WEIGHT (g)	GONAD WEIGHT (g)	GSI
Post Monsoon (Sep-Nov)	5.6-7.0	4.34±2.07-6.12±2.05	0.04-0.06	0.92±0.05-0.98±0.05
Winter (Dec-Feb)	4.1-7.5	5.46±2.04-7.23±1.02	0.071-0.078	0.98±0.15-1.42±0.15
Pre-Monsoon (Mar-May)	6.6-8.0	5.47±1.04-7.94±3.09	0.081-0.36	1.48±0.50-4.53±0.50
Monsoon (June-Aug)	6.1-8.5	8.64±3.02-13.86±4.04	0.75-1.95	8.57±0.50-14.06±0.50



**Figure 1. Seasonal variations of mean Gonadosomatic index of *Puntius sophore***

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