



GONADOSOMATIC INDEX, OVA DIAMETER AND FECUNDITY OF FRESH WATER HILL STREAM TELEOST *NEMACHEILUS MOREH* (Sykes)

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Abstract: The reproductive cycle in fishes involves changes in body weight and weight of gonads. Measurements of total weight and weight of gonad is usually correlated and reported in terms of the gonadosomatic index (GSI). The term was firstly introduced by Menin. Gonadosomatic Index per month in *Neimacheilus moreh* was ranged from 0.06 ± 0.02 to 0.31 ± 0.11 in males and 0.16 ± 0.07 to 10.38 ± 4.06 in females. Higher value of GSI for females reported in September 10.38 ± 4.06 , and in February 12.47 ± 5.08 . The peak in males in comparison with female was seen during the September 0.31 ± 0.11 . The data on ova diameter ranged from 09.40μ to 32.81μ . GSI of females and ova diameter shows higher value 10.38% and 32.81μ subsequently in month of September. Similar pattern is also seen in month of February, It can be inferred that, *Nemacheilus moreh* breeds twice a year so that gonads attain maximum weight twice in a year i.e. September and February. Fecundity of females, length and weight ranged from 48 mm to 62 mm and 1.170 to 3.710 gm respectively were estimated. The number of eggs ranged from 142 to 1197 with a mean fecundity of 546.

Keywords: *Nemacheilus moreh*, Fecundity, Gonadosomatic Index, Ova diameter, Spawning, Gonads.

INTRODUCTION

Nemacheilus moreh, is a small fish plays vital role in torrential ecosystem and contribute immense importance in fish biodiversity. Though it is not productive and economically important, it is pretty common in river Mutha and tribal people, the "Katkari" catch them on commercial point of view.

The reproductive cycle in fishes involves changes in weight and weight of gonads. Measurements of total weight and weight of gonad is usually correlated and reported in terms of the Gonadosomatic index (GSI). The term was firstly introduced by Menin¹ and since then GSI has been used in study of reproductive behavior of species as an indicator of gonad development. Gonadosomatic index has been studied by various researchers^{2,3,4}. Increase in GSI during the period of gonad maturation is mainly due to the deposition of large amounts of proteins and lipids directly from ingested food during the active feeding season^{5,6}. Different views have been expressed about formation of oocytes. Formation of oocytes originates from the germinal epithelium^{7,8,9,10}, and studied oogonial stages in different spawning seasons¹¹.

Fecundity can be defined as the number of ova laid by a fish during the spawning season, it is species specific. Number of eggs depends on the size and age of fish. The fecundity has been studied by several investigators^{12,13,14,15} and have reported that, the knowledge of fecundity is useful in fishery development and management.

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Literature survey reveals that no studies have been made on spawning season of *N. moreh*, therefore present study was carried out to understand the breeding cycle and fecundity.

MATERIAL AND METHODS

The fish *Nemacheilus moreh* were collected from Mutha River, at a stretch of 2.5 Km. near village Shivane to Warje, Tq. Haveli, Dist. Pune, Maharashtra, situated between $17^{\circ}54''$ and $19^{\circ}21''$ N latitude and $73^{\circ}24''$ to $75^{\circ}14''$ E longitude in western India in each month during January 1998 to January 2001. Fishes were collected with the help of local tribes 'Katkari', by the kick-net method. *N. moreh* always inhabits in a group and dwells at bottom. The home made net (Dhoti or Saree) set against the water current in river, and the fishes entangled inside, the net get lifted. Fishes were brought to laboratory and length; weight, sex and gonad weight were recorded for each specimen. Length was measured to the nearest 1 mm and weight to nearest 0.1 gm. Weight of gonads were measured after dissecting the fish to the nearest 0.01 gm. Gonadosomatic index (GSI) was calculated for each month using the formula.

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

Average GSI of each month of male and female were plotted separately.



For fecundity, ovaries of various length group females were collected and placed in petridish containing Gilsons fluid to separate eggs from ovary. Gilson fluid prepared as follows;

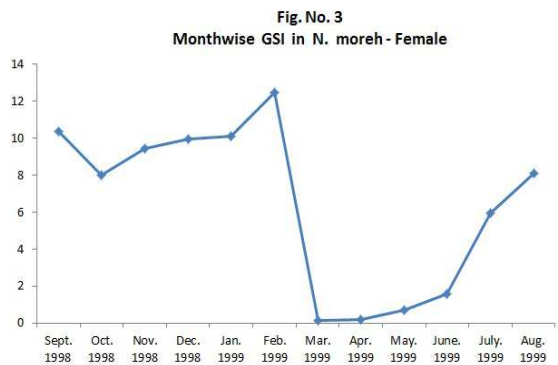
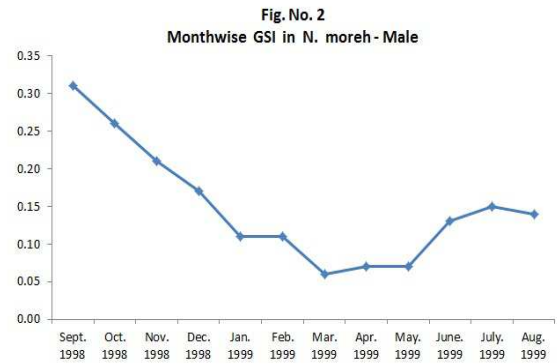
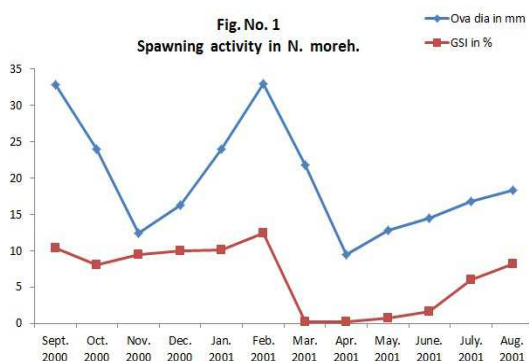
1. Nitric acid 80% - 15 ml
2. Glacial acetic acid - 09ml
3. Alcohol 60% - 100ml
4. Distilled water - 880ml
5. Mercuric chloride - 20gm

Cleaning and counting of eggs were done and noted. Routine method for calculating fecundity were not used since the fish is very small and as ovaries were so small weights between few mg to 600 mg, therefore the ova were counted directly.

Monthly samples of the gonads were processed in Bouins fluid, for histological preparation in laboratory. The ovaries of each month were processed for further study after cutting at 6µ. For the measurement of the ova diameter, an Occullo meter was used to segregate the non-symmetrical oocytes. It was observed that, at least 4 -6 small and 3 -6 larger oocytes were measured in every month of every specimen. Thus from the data collected, average diameter for each month was calculated. By plotting the graphs of ova diameter against the month, spawning season was judged.

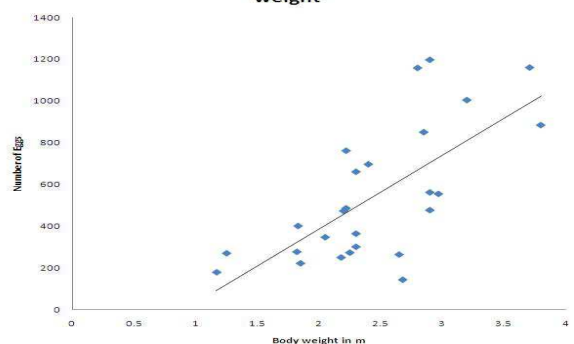
RESULT AND DISCUSSION

Gonadosomatic Index of *Nemacheilus moreh* was ranged from 0.06 ± 0.02 to 0.31 ± 0.11 in males and 0.16 ± 0.07 to 10.38 ± 4.06 in females. Monthly changes in GSI of male and female are shown in (Fig. 2 and 3), higher value for females reported in September 10.38 ± 4.06 , and in February 12.47 ± 5.08 . The peak in males in comparison with female is seen during the September 0.31 ± 0.11 and there is slight decline in GSI values in January. There is little enhancing in GSI values in February 0.11 ± 0.07 . Same type of GSI is also seen in female fishes. There are two peaks of gonad activities co insides for males and females, one in September and another in February.

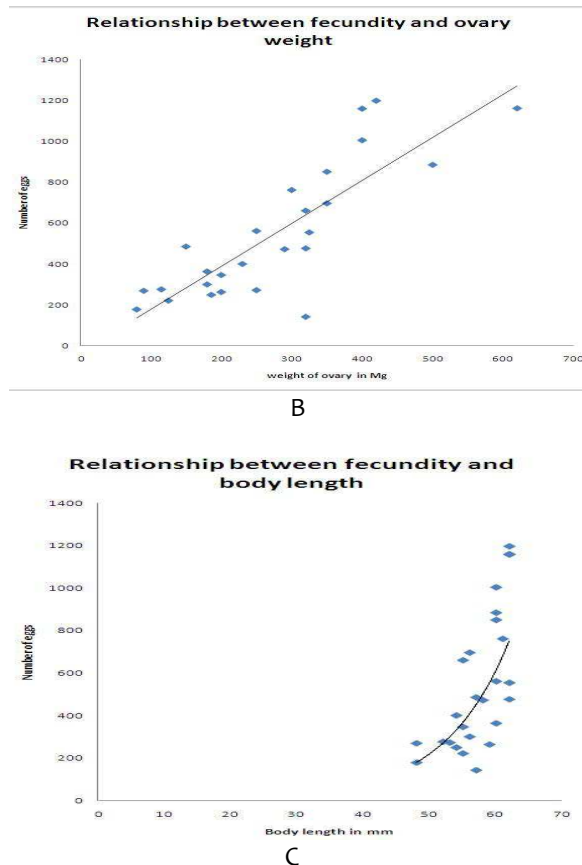


The gonads start developing in May to June (0.07 to 0.13%) in male and (0.68 to 1.6%) in female with a peak maturation in September (10.38%) and there was little fall (0.31 %) towards October to January indicating that the spawning has been commenced. In February, there was again an increase in weight of ovary (12.47%), and sudden fall in March (0.10%). After this month gonads passes through post spawning phase. In male fishes there was no marked changes occurred in weight of fishes. The variation was very little in the weight of immature ovaries in different adults. As the spawning season approaches, the differences in weights between the ovaries of different maturing adults became more, indicating that all adults do not mature at the same time. Monthly changes in GSI of males and females indicate a spawning pattern. This may be supported by two factors. Two successive peaks were found in males and female, first in September and second in February, and annual mean GSI values (0.16% to 12.47% in females and 0.06% to 0.31 % in males).

Fig. 4: Relationship between fecundity and Body weight



A



The data on ova diameter ranged from 09.40 μ to 32.81 μ . GSI of females and ova diameter shows higher value 10.38% and 32.81 μ subsequently in month of September. Similar pattern is also seen in month of February, for GSI and ova diameter 12.47% and 32.96 μ subsequently (Fig.1). It can be inferred that, *Nemacheilus moreh* breeds twice a year so that gonads attain maximum weight twice in a year i.e. September and February.

Fecundity:

Fecundity of 26 ripe females was estimated, their size and weight ranged from 48 mm to 62 mm and 1.170 to 3.710gm respectively. The number of eggs ranged from 142 to 1197 with a mean fecundity of 546. There was no significant variation in the two lobes of the ovary. A wide variation in fecundity was observed among fish of the same size. However, there was a general tendency of fecundity (F) to increase with growth, with length (L) and weight (W) and also with ovary weight (OW). (Fig. 4 a and c). Fecundity showed nearly linear relationship with body weight (Fig. 4 a), and a direct relationship with gonad weight (Fig. 4 b), and a curvilinear relationship with total length of fish (Fig. 4 c). Regression equations for these relationships are:

$$F = 3.089 + 538.352 W \quad (W = \text{body weight}) \quad r = 0.06.$$

$$F = 0.321 + 99.529 OW \quad (OW = \text{Ovary weight}) \quad r = 0.790$$

$$\text{Log } F = 10.312 + 7.387 \log L \quad (L = \text{total length}) \quad r = 0.803.$$

DISCUSSION

A study on monthly changes in the gonad and body weight (GSI) has been used to determine the spawning period of the species. In *N. moreh* the peak value of GSI observed in September followed by gradual decline until January. Second peak observed in February which is suggestive indication for the spawning in September-October and continued up to February- March. In *Mystus cavasion*, all the adults do not mature at a time; therefore, the spawning season extends for longer period¹⁶. During spawning of *N. moreh*, the aggregation of more males than females are significant may be due to similar pattern described¹⁶. In the shad, *Ethmalosa fimbriata* (Bloch.), the ripe male and female were available for spawning in October and March¹⁷. In *Mystus aor*, two GSI peaks, one during April and other during August¹⁸, the small peak in April is mainly due to maturation of a small fraction of population and the relatively higher peak during August, indicate greater number of fish maturing during this period. Similar two peaks of GSI have been also reported in Pearl spot *Etroplus suratensis* (Bloch) in April and October¹⁹.

In *N. moreh*, GSI peaks are similar to *Mystus aor*,¹⁸ and *Etroplus suratensis*¹⁹, with smaller peak in September and higher peak in February. Thus active spawning possibly may take place from September - October and February - March, hence observations recorded in the present study agree with the observations of previous studies^{21,22}.

A considerable variation in the fecundity between fish of equal length is a common and it may be due to environmental factor, such as temperature, food availability and generic differences^{23,24,25,26}. The absolute and relative fecundities generally increase with the increase in fish length or fish weight, (Fig 4). However, smaller fish, if examined, was responsible for the deviation in the GSI values. It was also found that, the wide variation in fecundity exists in fishes even of same length and weight. In the present study, fecundity increases with weight and length of fish and correlates positively²⁶.

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