

Study of Gonadosomatic Index of Freshwater fish *Mystus vittatus* (Bloch)

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ABSTRACT

Gonadosomatic index is an index of gonad size relative to fish size is a good indicator of gonadal development in fish. The percentage of body weight of fish that is used for production of eggs is determined by the gonadosomatic index. In the present study the gonadosomatic index (GSI) in *Mystus vittatus* was determined. For this, the monthly record of weight of ovary and weight of fish was determined in due course of resting to pre-spawning, spawning and post-spawning periods. Variability in the body weight was found to be correlated with the variation in the developmental stages of ovary from microscopic to macroscopic stages. Gonadosomatic index gradually included during pre-spawning period and its peak was reached during spawning period. This fish was collected from rural area Mirnagar Birra pond of Hajipur Sadar Block of Mirnagar Birra Boarder area village of district Vaishali, Bihar.

Keywords: *Mystus vittatus*, Gonadosomatic index, Fish length, Fish weight, Spawning period.

INTRODUCTION

Aquatic ecosystem of India is under considerable stress resulting in depletion of fish population. Due to ever increasing population and industrialization availability of agriculture land is reducing day by day. Moreover, in a developing country like India where 30% of population is still suffering severely by malnutrition and health hazards fish food may be useful tool to provide proteineous and easily digestible food item. The reproductive biology of *Mystus vittatus* (Local name: Tengara) has not been widely reported in literature and this species is now on the way of extinction too. The aim of this study was to investigate the gonadosomatic index and stages of gonadal development, which are some aspects of the reproductive biology of *Mystus vittatus* of Birra pond of district Vaishali, Bihar. It is hoped that the information obtained from this study will contribute to our knowledge of the reproductive biology of *Mystus vittatus* and will be useful for fisheries and aquaculture production.

MATERIALS AND METHODS

Material for the study was obtained from Mirnagar Birra pond of district Vaishali, Bihar. Matured and immature fishes were weighed along with the weight of gonads monthly. Later % of gonad weight in relation to the total body weight was calculated by using the following formula¹⁻³.

$$\text{Gonadosomatic Index} = \frac{\text{Weight of Gonad}}{\text{Weight of Fish Body}} \times 100$$

Gonadosomatic index of *Mystus vittatus* was calculated. A minimum 25 fishes in March 2019 and maximum 30 fishes in February 2020 were sacrificed and the average value of gonadosomatic index were calculated.

RESULTS AND DISCUSSION

Gonadal stages were examined macroscopically and classified ^{4,5} as follows: Stage I- immature, stage II- Developing, stage III- Developing, Stage IV- Maturing, Stage V- mature, Stage VI- Ripe (Running) and Stage VII- spent. The number of males and females in the different stages of Gonadal development were counted and recorded.

It was found that a positive and linear correlation existed during the study period. The average body weight (W_T) of *Mystus vittatus* was 25.541 gr, and the average body length (L_T) was 97.616 mm. The minimum and maximum weights of gonad (W_G) was observed as 0.10 and 0.35 in December and June respectively whereas average value of ovary weight in all the twelve months was calculated to be 24.433 mm. Gonadosomatic index value was found to increase from January to June-July and the peak value was recorded as 1.29 in July. The highest value of gonadosomatic index observed in July may be due to accumulation of large quantity of yolk in ripe ova (Table 1).

Table 1
Gonadosomatic index value calculation in freshwater fish *Mystus vittatus*, during the year 2019-2020. The mean value of length of left and right ovaries were taken into consideration.

Months	W_T (in gram)	L_T (in mm)	L_G (in mm)	W_G (in gram)	Gonadosomatic Index (GSI)
Jan (25)*	25.0	97.0	20.1	0.11	0.40
Feb (25)	25.0	97.5	20.2	0.12	0.48
March (26)	25.4	97.8	25.2	0.15	0.59
April (27)	25.6	98.0	26.3	0.20	0.78
May (30)	26.7	98.6	28.5	0.30	1.12
June (30)	27.1	98.5	30.0	0.35	1.259
July (30)	27.0	98.6	30.0	0.34	1.29
August (28)	26.6	98.6	29.5	0.34	1.278
September (26)	24.6	97.8	22.0	0.20	0.813
October (25)	24.5	96.5	21.2	0.15	0.612
November (25)	24.2	96.5	20.1	0.12	0.495
December (28)	24.8	96.0	20.1	0.10	0.403
Mean	25.541	97.616	24.433	0.206	0.763

W_T = Weight of total fish body, L_T = Length of total fish body, L_G = Length of gonad, W_G = Weight of gonad. (*) represents number of fishes.

The decrease in gonadosomatic index from August onwards might be due to shedding of eggs. The months June and July were found to be peak season of spawning when the ovaries were likely to be fully ripe and matured. A gradual increase in gonadosomatic index from March months onwards advocated in yolk nucleus during histological and histochemical studies⁶⁻¹⁰. On the contrary some scientists reported the gonadosomatic ratio/index of roach females and selected species of finfish from New York Bright increased soon after the spawning period¹¹⁻¹³. This study will contribute valuable knowledge needed for fisheries management and aquaculture by increasing the knowledge of reproductive biology of *Mystus vittatus*.

REFERENCES

1. Cochran, W. G. 2007. *Sampling techniques*. John Wiley and Sons, New York.
2. Nikolsky G. V. 1963. The ecology of fishes. *Academy Press, London and New York*. 1963.
3. Strum, L.M.G. 1978. Aspects of the biology of *Scomberomorus maculatus* (Mitchill) in Trinidad. *J. Fish Bio.*, 13: 155-172.

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4. Quyam A. and Quasim S. Z. 1964. Studies on the Biology of some freshwater fishes. Part-I-*Ophiocephalus puntatus* (Bloch). *J. Bom. Nat. Hist. Soc.* 61: 74-98.
5. Kumar, S. 2015. Determination of maturity and spawning by Gonadosomatic Ratio (GSR) in *Heteropneustes fossilis*. *Int. Res. Vision.*, 1(2): 1-3.
6. Shashi, S. B. and B. P. Akela. 1996. Determination of maturity and spawning period by gonadosomatic index and measurement of mean ova diameter in certain teleosts. *Environ. Ecol*, 14: 399 – 403.
7. Kumar, S. and S. B. Shashi. 2001. Determination of maturity and spawning periods by G S I & MOD measurements in *Tetraodon cutcutia*. *Environ. Ecol*, 19 (2): 454-457.
8. Shashi, S. B. and R. Sengupta. 2002 Spawning and maturity determination by GSI & MOD in two local teleosts. *Ind. J. Environ. Ecoplan*, 6 (2): 323-326.
9. Sushil, K., S. B. Shashi and C. B. Singh. 2004. Determination of maturity and spawning periods during GSI & MOD measurements in *Colisa fasciatus*. *Aquacult*, 5 (2): 159-162.
10. Wilk, S. J., W. More and L. L. Stehlik. 1990. Annual cycle of gonadosomatic indices as indicators of spawning maturity for selected species of fin fish collected from the New York, Bright. *Fish. Bull. U. S.*, 88: 775-786.
11. Cowx, I. G. 1990. The reproduction tactics of Roach *Rutilus rutilus* (L). *Hydrobiologia*, 37: 193-208.
12. Shashi, S. B. 1999. Maturity determination by GSR in teleost *Channa straitus* during annual reproductive cycle. *Environ. Ecol*, 17 (a): 240-241.
13. Barbieri, L. R., M. E. Chittenden Jr., and S. K. Lowerre-Barbieri. 1994. Maturity, spawning and ovarian cycle of Atlantic croaker, *Micropogonias undulatus*, in the Chesapeake Bay and adjacent coastal waters. *U.S. National Marine Fisheries Service Fishery Bulletin*, 92:671–685.