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Dr. Renukadevi Golikatte
MPE Society's SDM. Arts, Science, Commerce and BBA College, Honnavar, Uttra Kannada, Karnataka, India

Niranjan Hegde
MPE. Society's Dr. MP Karki Institute of Excellence and Research, Honnavar, Uttara Kannada, Karnataka, India

Correspondence
Dr. Renukadevi Golikatte
MPE Society's SDM. Arts, Science, Commerce and BBA College, Honnavar, Uttra Kannada, Karnataka, India

Seasonal variation in the gonads and management issues of *Gerres filamentosus,* Sharavati estuary, central west coast of India

Dr. Renukadevi Golikatte and Niranjan Hegde

Abstract
Sharavati estuary is one amongst the four main estuarine systems in Uttara Kannada district. Here *Gerres* forms a minor but important fishery of considerable significance. Hence, an attempt has been made to study seasonal variation in the annual cycle and management issues of *Gerres filamentosus* from Sharavati estuary. The seasonal fluctuation in the weight of the gonad in relation to weight of the fish was studied to indicate the spawning season of the fish (Gonado - Somatic Index GSI). The GSI of *Gerres filamentosus* ranged from 0.2 to 1.6 (1998) and 0.8 to 1.8 (1999) in males and 1.1 to 4.3 (1998) and 1.02 to 4.6 (1999) in females. July is considered as the peak spawning month due to sharp fall of GSI values in females from 4.3 in June to 1 in July during 1998 and 4.6 in June to 1.1 in July during 1999. The fecundity of fish is usually determined from the number of ova of the mature groups in the ovary. The fecundity of the *Gerres filamentosus* (size range 154mm to 240mm) was found to vary from 48,300 to 1, 16, 760 eggs, the average being 67,791 eggs per female. Demand for the fish is high during monsoon period due to suspension of sea fishing that seriously affects the continuation of the species. Hence, an attempt has been made to convince the fishermen not to exploit the mature fishes.

Keywords: gerres filamentosus, gonado somatic index (GSI), fecundity, sharavati estuary

Introduction
Reproduction is a link in the life cycle of the fish which ensures the continuation of the species. Gonado- Somatic Index (GSI) and fecundity are the two best known indicators of the reproductive potential of a species. Gonado – Somatic Index indicates the range and peak of maturation and spawning with respect to time whereas fecundity determines the number of ova of the mature group of fishes in the ovary. The present study was undertaken to light on various aspects of reproduction, seasonal variation in the gonads threat and conservation of *Gerres filamentosus* (Fig. 3).

Materials and Methods: The material for the present study was procured fortnightly from Sharavti estuary from January 2008 to December 2009. The Specimens were brought to the laboratory, after washing and removing the surface moisture with blotting paper. Each fish was measured for its total length to the nearest 1 mm and weighed to nearest 0.01 gm. As there is no sexual dimorphism, it was cut open and maturity stages were recorded together with colour, length and weight of the Gonads. The gonads were removed and preserved in 4% Formaldehyde for further study. The Fluctuations in the weight of the gonad in relation to the weight of the fish was studied to indicate the spawning of the fish.

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

The weight of the mature ovary was recorded with the help of chemical balance. The relationship between fecundity and different variables like length, weight of the fish and weight of the ovary were statistically derived by the using the formula, Y = a+bX.
Y = Fecundity
X = Variable (Length L, Body weight W, Gonad weight G)
Where 'a' and 'b' are constant.

Result and Discussion: The maturation and spawning of *Gerres filamentosus* is correlated to the monsoon season. The GSI values of both males and females increased gradually from March to reach a peak during June in both the years of observation (Fig.1). July is considered as the peak spawning month due to sharp fall of GSI values from 1.6 to 0.2 for males and 4.3 to 1.0 for females during 2008 and from 1.8 t 0.3 for males and 4.6 to 1.1 for females during 2009 (Table 1). On the basis of GSI the annual cycle of reproduction of *Gerres filamentosus* can be dived into pre-spawning period (March to June) Characterized by high GSI values, spawning period (July to September) Characterized by sharp decrease in the weight of the gonad and post- spawning period (October to February) Characterized by progressive increase in the weight of the gonads.

In the Present study fecundity of *Gerres filamentosus* (154 mm to 240 mm) was found to vary from 48300 to 116760 eggs, the average being 67,791 eggs per female. It was also observed from the Table 2 that the number of ova per gram body weight varied from 485 to 955, while the number of ova per gram ovary weight ranged between 11,761 to 24,250. From the above observation it is evident that the southwest monsoon season (July to September) is the main spawning season for the fish and the average number of ova produced per female is 67,791 (Fig. 4 & 5). But in our costal area the fishing is the main occupation of our fishermen. This species is locally called 'shethka' considered as highly esteemed food fish by the middle and rich classes. The fish landed is generally sold in fresh condition due to demand for it as favorite table fish. Demand for the fish is high during monsoon period due to suspension of sea fishing. When mature fishes are exploited, that seriously affects the continuation of the species. Hence, an attempt has been made to convince the fishermen by meeting them personally and advised them not to exploit the fishes especially during the monsoon season which is the main spawning period of the fishes. Along with this other measures taken are advised them not use and throw the plastics in the estuary, an idea regarding bad effects of light fishing, not use the small mesh sized nets which can exploit the fries and fingerlings.

Table 1: Mean GSI of males and females of *Gerres filamentosus*

Months	2008		2009	
	Males	Females	Males	Females
January	0.7	1.1	0.8	1.02
February	0.7	1.2	0.9	1.3
March	0.8	1.9	0.9	1.9
April	0.9	2.8	1.0	2.8
May	1.0	3.5	1.2	3.8
June	1.6	4.3	1.8	4.6
July	0.2	1.0	0.3	1.1
August	0.3	1.2	0.4	1.4
September	0.3	1.4	0.2	1.6
October	0.4	0.7	0.5	0.8
November	0.5	0.9	0.6	0.9
December	0.6	1.0	0.7	1.0

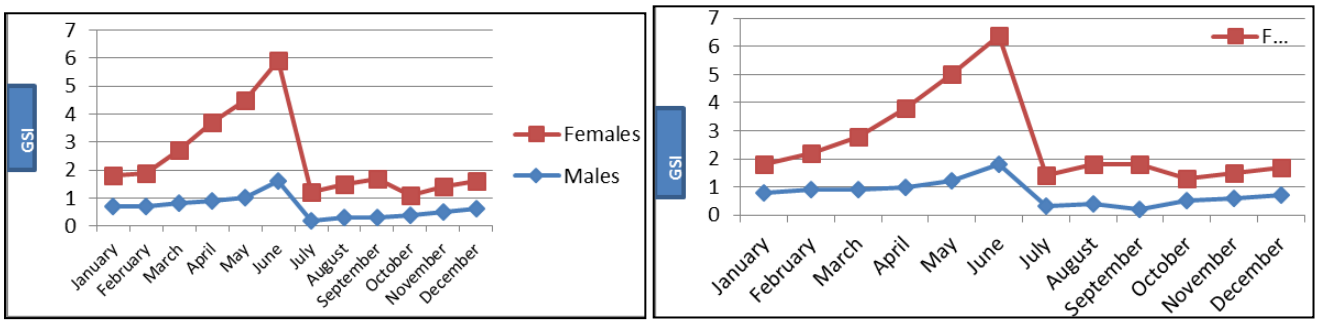

Fig 1: Showing mean GSI of 2008 and 2009

Table 2: Fecundity and other particulars of mature specimens of *Gerres filamentosus*

Total length of fish (mm)	Fish wt (gm)	Ovary wt.(gm)	Total number of mature Ova	Number of eggs per gm. of Wt. of the fish	Number of eggs per gm. of Wt. of Ovary
154	50.530	3.100	48300	955	15880
160	52.050	2.025	32920	632	16256
167	57.220	2.035	32227	563	15836
171	71.0	3.025	35607	501	11720
172	72.500	2066	78451	485	17049
180	84.026	4.540	35225	755	17279
183	91.085	4.040	68880	933	17049
185	92.200	5.600	77400	839	13821
186	92.265	6.190	75126	814	12136
190	98.500	6.650	78213	794	11761
195	113.500	3.200	59076	520	18461
200	116.000	4.000	97000	836	24250
210	150.000	4.700	110209	734	23448
220	179.600	6.540	121462	676	18572
230	196.700	6.500	114706	583	17647
240	206.000	7.000	116460	566	16680

Fig 3: View of Sharavati estuary and group of immature, mature and gravid *G. filamentosus*

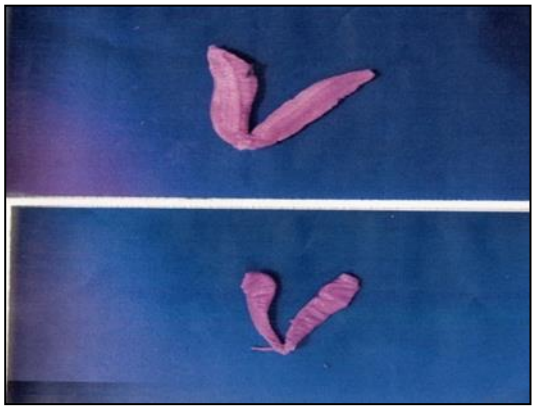

Fig 4: Gravid and Spent Ovary

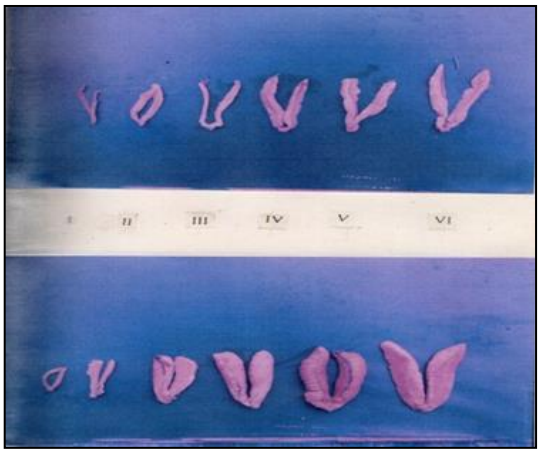

Fig 5: Different stages of development of testes and ovary

Conclusion

The GSI period is known to be reliable index of the breeding season in fish. The high values of GSI denote attainment of peak maturity of gonads, while the lowest GSI values indicate peak spawning (monsoon). In order to find the trends of increase or decrease in length and weight of the spawners various fecundity indices were calculated which are as follows:

Fecundity indices	Minimum	Maximum	Average
Number of ova per gram fish weight	485	955	699
Number of ova per gram ovary weight	11761	24250	16743
Co-efficient of maturity	2.81	6.76	4.35
Gono - somatic Index	2.90	7. 24	4.57

(Ovary weight in percentage of total fish weight called Coefficient of maturity and ovary weight in relation to the fish weight without ovary called Gono - Somatic Index).

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