

Short Communication

Breeding biology of shrimp *Parapenaeopsis styliifera* (Milne Edwards) (Crustacea: Decapoda) along the Neendakara zone, SW coast of India

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Investigations on gonado-somatic index, stages of maturity and fecundity of *Parapenaeopsis styliifera* were carried out from the Neendakara zone, Kerala coast for a period of one year. Females with mature ovaries occurred throughout the year showing that they spawn continuously the peak season being May and July. The gonado-somatic index exhibited a variation from 3.39 to 10.54(%). The mean fecundity of 87,641 was observed. There was a linear relationship between the fecundity and the length of shrimp, weight of shrimp, length of ovary and weight of ovary.

[**Key words** : Fecundity, gonado-somatic index, shrimp, stages of maturity]

Among the maritime states of India, Kerala is still the major producer of Indian shrimps. In recent years Shaktikulangara-Neendakara zone in the Kollam district of Kerala (SW coast of India) has gained considerable importance as a major centre of fishing industry in the state where thousands of trawlers operate and substantial quantities of shrimps are landed. Though a number of species of penaeid shrimps contribute to the shrimp fishery in general, one characteristic feature of the monsoon fishing at Neendakara zone is that it is predominantly supported by a single species, viz; *Parapenaeopsis styliifera*, (locally known as "Karikkadi Chemmeen") and contributes to nearly 95% of the total shrimp catch of the state in the mechanised sector. Salient features of population characteristics, magnitude of resources, biological characteristics and rate of exploitation of the species along the coast have been studied^{1,2}. The reproduction, gonado-somatic index, fecundity and the biology of this species have also been studied^{3,4}. However, the stages of maturity and its relationship with gonado-somatic index and fecundity of *P.styliifera* (Milne Edwards) (Crustacea: Decapoda) has not been elucidated. Therefore the present study was conducted with a view to assess the stages of maturity, gonado-somatic index and fecundity of *P.styliifera* in the Neendakara zone of Kerala coast. The study is sig-

nificant in the light of the controversy on the ban on trawling during, the SW monsoon period (June-August).

The materials for the present study were collected from Neendakara zone (lat. 8°55"N; long. 76°10"E), Kerala, SW coast of India. A random sampling (fortnight) of the required *P. styliifera* was made during each month for a period of one year. Stages of maturity of gonad, ripeness of ova, gonado-somatic index (GSI) and fecundity were studied^{1,3,5-7}. In order to find out the breeding season, the gonado-somatic index was calculated⁶ as

$$\text{GSI} = (\text{Weight of ovary} / \text{Weight of shrimp}) \times 100$$

Regression analysis was done to test the linear relationship between the fecundity and total length, length of ovary, weight of ovary and weight of shrimp⁸.

Based on the external changes in colour, size and microscopical examination of ovary, five maturity stages were recognized viz; immature (mode-50-100 μ), early maturing (mode 150-200 μ), late maturing (mode 250-300 μ), mature (mode 350-500 μ) and spent (mode 50-100 μ) based on ova diameter. Data regarding the GSI of *P.styliifera* is presented in Fig.1. High GSI value was observed during February, May, July, August, September and October. Data pertaining to the maturity of *P.styliifera* is presented in Table 1. From the data, it is seen that shrimp with mature ovaries occur throughout the year except in January with a peak in September, March, May and June. Spent females occur in February, April, May, June,

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Table 1—The percentage occurrence of the different stages of maturity of *P. styliifera* (females)

Months	No. of females examined	Immature	Early maturing	Late maturing	Mature	Spent
Jan	102	85.30	11.76	2.94	0.00	0.00
Feb	72	50.00	4.17	16.67	20.83	8.33
Mar	57	47.37	15.79	5.26	31.58	0.00
Apr	72	29.13	20.83	29.17	16.67	4.17
May	60	20.00	20.00	20.00	35.00	5.00
Jun	57	26.32	21.05	10.53	31.58	10.53
Jul	60	0.00	15.00	55.00	25.00	5.00
Aug	63	14.29	14.29	47.62	23.81	0.00
Sep	75	8.00	8.00	40.00	44.00	0.00
Oct	78	34.61	34.61	7.70	23.08	0.00
Nov	72	50.00	12.50	20.84	8.33	8.33
Dec	78	76.92	7.70	3.85	7.70	3.85

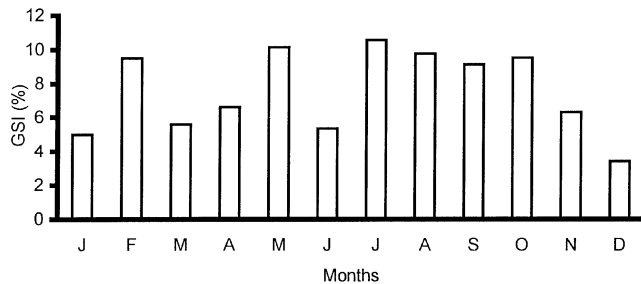


Fig. 1—Monthly variations in the gonado-somatic index

July, November and December. A total of 70 mature females ranging from 70-120 mm were used for fecundity studies. Fecundity was calculated as the total number of eggs in the ovary. It shows that the relationship between fecundity (F) and total length (TL), length of ovary (LO), weight of ovary (WO) and weight of shrimp (WS) were linear. The value regarding the regression analysis of fecundity of *P. styliifera* is given in Table 2.

The maturation of ovary from immature to mature stage is accompanied by distinct changes in colour and size of the ovary in relation to carapace cavity and appearance^{5,7}. Different stages of maturity have been observed in different species of shrimps^{9,10}. In the present study, it was observed that in *P. styliifera*, five maturity stages could be identified based on the ova measurements. The results show that *P. styliifera* is a continuous breeder with a peak period during SW monsoon. Therefore, the high incidence of ripe individuals in certain months (May and September) and spent ones with residual egg of previous spawning in subsequent months over a number of months indicate that these species may spawn during any of these months.

Table 2—The relationship between fecundity (F) and total length (TL), weight of shrimp (WS), length of ovary (LO) and weight of ovary (WO) of *P. styliifera* (females)

Parameter	Relationship	Correlation coefficient*
Fecundity & total length	Linear	0.4073
Fecundity & weight of shrimp	Linear	0.3870
Fecundity & length of ovary	Linear	0.3712
Fecundity & weight of ovary	Linear	0.3044

*All are significant at 1% level

Gonado-somatic index method has been successfully employed to determine the breeding season of shrimps¹¹. The breeding season is indicated by high values for gonad indices and a subsequent "spawn out" condition and period of low gonad indices prior to the peak period denote the growth of the gonad⁶. In *P. styliifera* it was observed that the peak GSI was noticed during the months of May, July and August and during the subsequent months December and January the GSI was low. Hence it can be inferred that maturity of shrimps and breeding have a direct relationship with GSI.

The present study clearly indicates that *P. styliifera* breeds throughout the year and the peak breeding activity is in monsoon season. The results would suggest that ban on monsoon trawling will serve a useful purpose in ensuring resource conservation.

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