J. Mar. Biol. Ass. India, **51** (1) : 126 - 129, January - June 2009

Short Communication

On the fishery and some aspects of biology of *Penaeus (Melicertus) canaliculatus* (Olivier, 1811) landed at Puthiappa, Kozhikode, southwest coast of India

P. T. Sarada

Calicut Research Centre of Central Marine Fisheries Research Institute, Calicut-673 005, India. E-mail: ptsarada@yahoo.com

Abstract

The annual catch of *Penaeus* **(***Melicertus) canaliculatus* varied from 353 to 7090 kg with an average of 2009 kg during 2003-2007. The fishing season was from January to June. The total length of males was 91-195 mm and females 86 to 230 mm in the fishery. Females dominated the catch. Crustacean remains were dominant in stomach contents (63.9%) followed by molluscan shells (22.5%). About 78% of females were in spent stage of ovarian development and 5.7% were with ripe ovary. The peak spawning months were February and June. The fecundity varied from 1,55,400 to 2,36,600 eggs with an average of 1,85,733. L_{∞} and K were 200 mm and 1.9 for males, and 237 mm and 2.0 for females, respectively. Length-weight relationship was Log W = -5.1287+2.99997 Log L for male and Log W = -5.1900+3.0271 Log L for female.

Keywords: *Penaeus canaliculatus*, fishery, biology

Introduction

Penaeus (Melicertus) *canaliculatus* (Olivier) has assumed an important place in the marine shrimp landings of Kerala, by its reasonably good landing and its large size in the catches of multi-day trawlers. Occurrence of this species from Indian waters was reported by Ramamurthy (1967), Thomas (1974, 1977), Kurian and Sebastian (1976), Silas and Muthu (1976), Suseelan and Muthu (1979), George and Suseelan (1982), Suseelan and Kathirvel (1982), Suseelan *et al.* (1982), Nandakumar (1984 a, b) and Kathirvel and Selvaraj (1988).

There is little information on the fishery and biology of *P.canaliculatus* from Indian waters and hence, the same was studied based on the data collected during January 2003 - December 2007.

Material and methods

Data on catch and effort of *P. canaliculatus* landed by trawlers at Puthiappa, Kozhikode (Kerala) were collected twice a week during January 2003 – December 2007 and the days' catches were pooled and raised to the corresponding months. Random samples of weight varying from 1.5 to 2 kg were collected twice in a month for studies on total length (mm), weight (g), sex ratio, maturity and food. For diet composition studies, Points Method (Pillay, 1952) and Index of Preponderance Method (Natarajan and Jhingran, 1962) were used. The sex ratio was tested using Chi-square (Snedecor and Cochran, 1967). Length-weight relationship was estimated using the equation Log W=Log a + b Log L (W = weight in grams; L = length in mm). The relationship between male and female was tested using ANOVA. A total of 515 shrimps, ranging in total length from 66 to 230 mm and weight from 2.41 to 105 g were analysed. L_{∞} and K were calculated using ELEFAN-1. L_{∞} was calculated using Powell-Wetherall method (Wetherall *et al*., 1987) also.

Results

Fishery: Though there were stray numbers of *Penaeus canaliculatus* in trawl landings during 1987-1991 (personal observation), a minor fishery started

from 2004 only. The annual catch varied from 0.35 t in 2005 to 7.1 t in 2006 with an average of 2.0 t. The average effort expended was 17,426 units. The percentage contribution of the species in shrimp catch during the period was 0.18 (Fig.1). Generally the fishing season was from January to June. The maximum catch was recorded in May followed by April and February (Fig. 2).

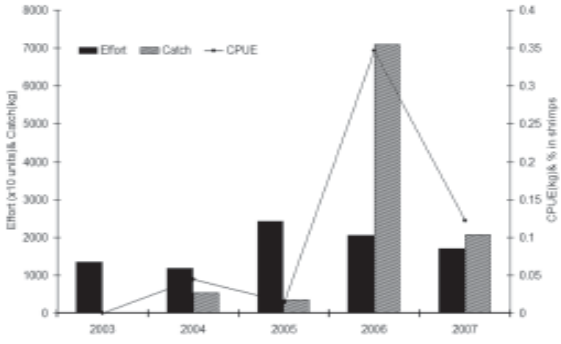

Fig. 1. Annual effort, catch and CPUE of *Penaeus canaliculatus* from trawlers at Kozhikode

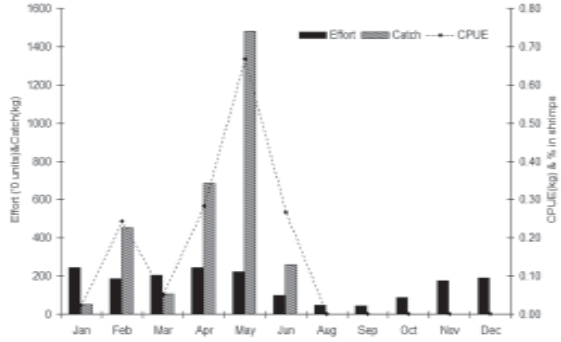

Fig. 2. Monthly effort, catch and CPUE of *P. canaliculatus* during 2003-2007

Biology

***Length range*:** The length of males in the catch ranged from 91 to 195 mm (Fig. 3). However, the major portion (77%) of the catch was in the length group 116-160 mm (modal length: 136-140 mm). The length of females ranged from 86 to 230 mm and about 77% of the catch was in the size group 116 to 180 mm (modal length: 151-155 mm; 166-120 mm).

***Sex ratio*:** Females were dominant in all the years except in 2004 (Fig. 4). In the total catch

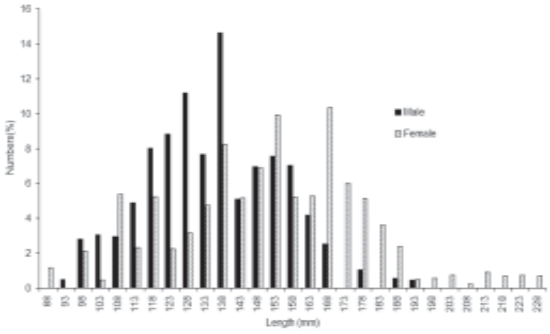

Fig. 3. Length distribution of male and female *P. canaliculatus* in trawl landings at Kozhikode during 2003-2007

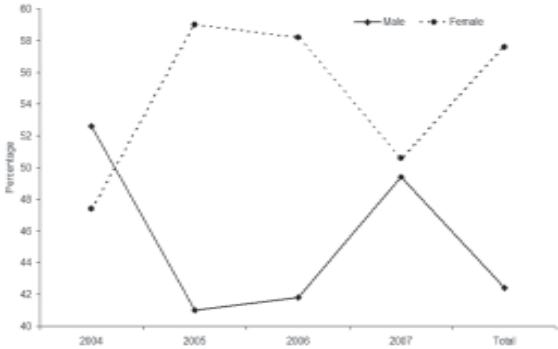

Fig. 4. Sex ratio of *P. canaliculatus* in trawl landings at Kozhikode during 2003-2007

females formed 57%. The deviation of male to female ratio from 1:1 was found significant at 0.05 levels.

***Food and feeding*:** As the variation of food and feeding condition by sex and month was not significant at 0.05 level, the data were pooled. Poorly-fed shrimps dominated the catch (68.3%), followed by moderately fed (19.2%) and actively fed shrimps (12.4%).

The dominant food item was crustacean remains (63.9%) followed by molluscan shells (22.5%). As the crustacean remains in the stomach were mainly setae and small pieces of shells and flesh, identification could not be carried out. Molluscan shell consisted of intact and broken shell pieces of spat of bivalves and gastropods. The digested (unidentifiable condition) and detritus in the stomach together formed 13.2%. Fishes and foraminiferans contributed 0.3% each to the total food items.

Maturity condition: Spent females dominated the catch (79%) followed by early maturing (11%), ripe (6%) and late maturing (4%) stages. Mature females dominated in June (55%) and February (45%). Spent females dominated in April (39%) followed by May (38%) (Fig. 5).

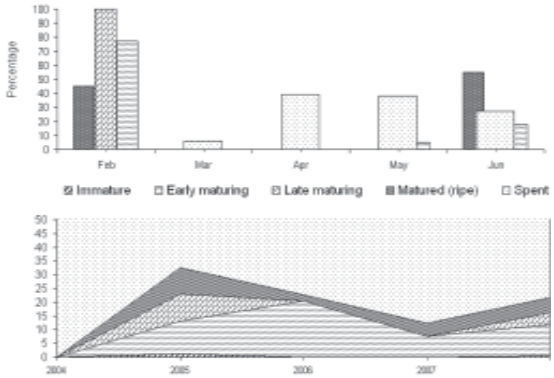

Fig. 5. Maturity condition of female *P. canaliculatus* in trawl landings at Kozhikode during 2003-2007

***Fecundity*:** The length of fully mature females ranged from 185 to 225 mm and ovary weight from 2,220 to 3,380 mg. The number of eggs varied from 1,55,400 to 2,36,600 with an average of 1,85,733.

Length-weight relationship:

Male**:** Log W = Log -5.1287+2.99997 Log L (r = 0.9837; n = 217)

Female**:** Log W = Log -5.1900+3.0271 Log L (r = 0.9671; n = 268)

The length-weight relationship was found significant between males and females at 0.05 level.

Growth parameters: Modal progression of length (Fig. 6) showed that males attain 121 mm and females 146 mm at the age of 6 months. The length after one year was estimated as 169 mm and 200 mm respectively for males and females. In the fishery the age at L_{max} (195 mm for males and 230 mm for females) was 24 months for both males and females. L_{∞} and K were calculated as 200 mm and 1.9 for males and 237 mm and 2.0 for females respectively.

Discussion

The present study indicates the emergence of *P. canaliculatus* from stray numbers in the past to a

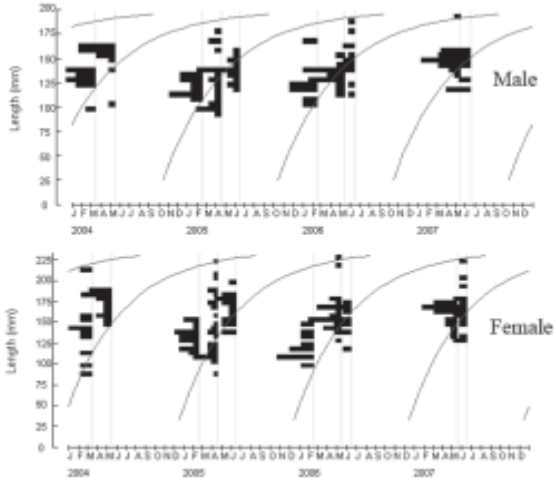

Fig. 6. Monthly modal progression of male and female *P. canaliculatus* in trawl landings at Kozhikode during 2003-2007

minor fishery off Kozhikode from 2004. Earlier Suseelan *et al*. (1982) recorded an estimated catch of 882 kg from Neendakara during November-December. In the present study the season observed was January-June. Kathirvel and Selvaraj (1988) observed the occurrence of this species in May-June in the Kovalam backwaters near Madras. Nandakumar (1984 a) observed the postlarvae of *P. canaliculatus* ranging in length from 9 mm to 11 mm during September, April and June. Occurrence of ripe females in February and June and juveniles in February and March from this area indicates the spawning period. According to Suseelan *et al*. (1982), 89% of the females caught during November-December were either late maturing or mature. In the present study, the maximum length of male and female was 195 mm and 230 mm, respectively as against the corresponding maximum size of 145 mm and 185 mm reported by FAO (1984). The age and growth studies showed that males and females attained 121 mm and 146 mm respectively after 6 months. After one year, males reached 169 mm and female 200 mm. Kathirvel and Selvaraj (1988) reported similar growth rate from culture experiments. When juveniles of 45 mm (total length) were reared, they reached 119 mm within 90 days with a growth rate of 24.6 mm/month. The present study indicates longevity as 2 years. The analysis of food in the stomach showed that *P. canaliculatus*

is carnivorous and the colour and pigmentation of the prey inside the stomach indicate shrimps as the major diet. As *P.canaliculatus* is fast growing (Kathirvel and Selvaraj, 1988), large sized, attractive and valued at Rs.300 to Rs.350 per kg (>120mm total length), it is suitable for farming for edible and ornamental purposes.

Acknowledgements

The author is thankful to the Director, Central Marine Fisheries Research Institute, Kochi for encouragement; Dr. E. V. Radhakrishnan, Head, Crustacean Fisheries Division for encouragement and critically going through the manuscript. Thanks are also due to Dr. P. N. Radhakrishnan Nair, Scientist-in-charge, Calicut R.C. of CMFRI for the facilities provided.

References

FAO, 1984. *In*: W. Fischer and G. Bianchi (Eds.). Species identification sheets for fishery purposes. Western Indian Ocean (Fishery Area, 51). Prepared and printed with the support of Danish International Development Agency (DANIDA). Rome, Food and Agricultural Organisation of the United Nations, Vol-V.

George, M. J. and C. Suseelan. 1982. Distribution of species of prawns in the backwaters and estuaries of India with special reference to coastal aquaculture. *Proc. Symp. Coastal Aquaculture, Mar. Biol. Ass. India*, 1: p. 272-284.

Kathirvel, M. and V. Selvaraj. 1988. On the seasonal occurrence of early juveniles of *Penaeus canaliculatus* Olivier in Kovalam backwater near Madras, with notes on their cultivation and specific identity. *J. Mar. Biol. Ass. India*, 30 (1&2): 1-7.

Kurian, C. V. and V. O. Sebastian. 1976. Prawn and prawn fisheries of India, Hindustan Publishing Co., New Delhi, 280 pp.

Nandakumar, G. 1984 a. Occurrence of postlarvae of *Penaeus canaliculatus* Olivier and juveniles of *P. japonicus* Bate around Karwar. *Mar. Fish. Infor. Serv. T and E Ser.*, 60: 14-15.

Nandakumar, G. 1984 b. Observations on the prawn fishery of Mandapam area. *Indian J. Fish*., 27 (1&2): 257-260.

Natarajan, A. V. and V. G. Jhingran. 1962. Index of preponderance, a method of grading the food elements in the stomach analysis of fishes. *Indian J. Fish*., 8: 54-59.

Pillay, T. V. R. 1952. A critique of the method of study of food of fishes. *J. Zool. Soc. India*, 4: 185-200.

Ramamurthy, S. 1967. Studies on the prawn fishery of Kutch. *Proc. Symp. Crustacea*, 4: 1424-1436.

Silas, E. G. and M. S. Muthu. 1976. Notes on a collection of penaeid prawns from the Andamans. *J. Mar. Biol. Ass. India*, 18(1): 78-90.

Snedecor, G. W. and W. G. Cochran. 1967. *Statistical Methods*. Oxford and IBH Publishing Co., New Delhi, Sixth edition, 539 pp.

Suseelan, C. and M. S. Muthu. 1979. Description of postlarvae of *Penaeus canaliculatus* Olivier with notes on their seasonal abundance in Cochin backwaters. *Contributions to Marine Sciences dedicated to C. V. Kurian*, p. 224-228.

Suseelan, C. and M. Kathirvel. 1982. Prawn seed calendars of Cochin backwaters. *Proc. Symp. Coastal Aquaculture*, 1: 173-182.

Suseelan, C., M. M. Thomas, N. S. Kurup and K. N. Gopalakrishnan. 1982. A potential new resources of prawns from Neendakara area in Kerala Coast. *Mar. Fish. Infor. Serv. T and E Ser.*, 35: 15-17.

Thomas, M. M. 1974. Decapod crustaceans new to the Laccadive Archipelago. *Indian J. Fish.*, 21(2): 339-344.

Thomas, M. M. 1977. Decapod crustaceans new to the Andaman and Nicobar islands. *Indian J. Fish.*, 24(1&2): 56-61.

Wetherall, J. A., J. J. Polovina and B. Ralston. 1987. Estimating growth and mortality in steady state fish stocks from length-frequency data. *ICLARM Conf. Proc*., (13): 53-74.

Received : 18/09/08
Accepted : 23/06/09