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Note

Trawl fishery of penaeid shrimps along Mandapam coast of Palk Bay, Tamil Nadu, southern India

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ABSTRACT

The shrimp fishery of Palk Bay is unique, being mostly supported by a single species *Penaeus semisulcatus* throughout the year. The estimated total landing of penaeid shrimps by trawls at Mandapam coast of Palk Bay Tamil Nadu during 2016 was 1652 t. The shrimp landings at Mandapam comprised twelve species *viz, Penaeus semisulcatus, P. latisulcatus, P. indicus, P. merguiensis, P. japonicus, P. canaliculatus, P. monodon, Kishinouyepenaeopsis maxillipedo, Metapenaeus moyebi, Meta penaeopsis, M. toloensis* and *Megokris granulosus.* Along this coast, shrimps are landed round the year with a peak landing in June. *P. semisulcatus* dominated the catch (1077.2 t) followed by *P. latisulcatus* (161.06 t), *M. moyebi* (109.61 t), *M. stridulans* (91.19 t) and *K. maxillipedo* (89.83 t). The peak season for the shrimp fishery usually starts from June and continues up to August, contributing 75-80% of the total annual shrimp landings. The annual average catch per hour (CPH) for shrimps was estimated at 10.7 kg and maximum CPH (21.9 kg) was observed in February. Mean length, size range and sex ratio as well as gut contents of penaeid shrimps landed during the study period were also analysed. The findings of the present study provide information for framing management measures for sustaining the shrimp fishery.

Keywords: Catch per hour, Fishery, Management, Palk Bay, Penaeid shrimps

Shrimp fishery by mechanised trawls in a depth range of 30 to 40 m is one of the major fisheries in the Palk Bay. This fishery is supported by 59 species under the family Penaeidae, of which *Penaeus semisulcatus*, *P. monodon* and *P. indicus* are the top three landed species (Rajakumaran and Vaseeharan, 2014). Penaeid shrimps constitute the backbone of Indian seafood export as the major foreign exchange earner as well as a source of livelihood for innumerable stakeholders in the country. The shrimp fishery in Palk Bay is dominated by a single species *P. semisulcatus* throughout the year. During the seventies, an increasing shrimp export market led to the intensification of exploitation of shrimp resources by mechanised trawlers in the Palk Bay region. Even among shrimps, there has been greater demand for large-sized species since they fetch high price in the export market. The catch per hour (CPH) of penaeid shrimps showed a steady increase during the five years from 1980 to 1984 except in 1982, but the catch per unit effort (CPUE) over the years has shown a declining trend (CMFRI, 1987). Accurate and continuous updation of data on species diversity, fishing pattern and effort is required for better maintenance and management of fishery resources. The present study analysed the trawl fishery pattern of penaeid shrimps and their species composition during January to December 2016 along the Mandapam coast of Palk Bay, south-east coast of India.

The trawl fishery catch data was collected through Multi-stage stratified random sampling technique (Srinath *et al*., 2005) on weekly basis from January to December 2016 at Mandapam landing centre, Palk Bay, Tamil Nadu. The monthly catch was estimated based on the total catch on the observation day and total number of actual fishing days in a month. The weight of the individual species in random samples of the catch was taken to arrive at the month-wise species composition. Mean length, size range and sex ratio of penaeid shrimps landed were also analysed. Gut contents analysis was carried out for five penaeid shrimp species *viz, P. semisulcatus, P. latisulcatus, P. indicus*, *P. merguiensis* and *P. monodon.*

In the nineties, fishing was carried out by mechanised trawlers of 9.15-9.76 m (OAL) fitted with 41-88 HP engines to exploit the shrimp resources in northern Mandapam coast (Krishnan, 2012) following the local management practice of alternate fishing days (3 days in a week). Maheshwarudu *et al.* (1996) reported that the small mechanised trawlers of 9.15-9.76 m OAL fitted with 41-88 HP engines were used during 1993. However, the present study recorded the prevalence of higher engine capacities (180 HP) in the shrimp fishery of Palk Bay. Fishing is performed in the depth range of 7-13 m along the Palk Bay coast. Mechanised trawlers of 18 m fitted with 180 HP engines are normally employed throughout

the year following alternate fishing days in a week on a single day fishing pattern. These trawl nets usually have cod end mesh size of 25 mm as against the recommended mesh size of 35 mm. The fishing ground is located in the north-western side of Mandapam and up to the Indian EEZ. A single day fishing operation consists of six hauls and each haul is operated for 3 h.

An estimated 1652 t of penaeid shrimps were landed in Mandapam Palk Bay from January to December 2016 (Table 1) as against the total landings of 18695 t, constituting 8% of the total catch. The shrimp fishery was dominated by *P. semisulcatus* (1077.2 t) followed by *P. latisulcatus* (161.06 t), *M. moyebi* (109.61 t), *M. stridulans* (91.19 t) and *Kishinouyepenaeopsis maxillipedo* (89.83 t). The shrimp landings were highest in February (336.94 t) followed by June (238.35 t). The peak season of shrimp fishing reported earlier were January to May (Nandakumar, 1980), May to August (Maheshwarudu *et al.*, 1996) and August to September (Krishnan *et al.*, 2012). In the present study, peak landings were observed in February and October. The fishing effort was also higher during these months (Fig. 1). The highest total landing was observed in the month of October followed by February. The maximum CPUE was observed in the month of October (1105 kg) followed by June (588 kg). The average catch per hour for shrimps was 10.7 kg and the maximum was observed in February with 219 kg (Table 2). The catch per hour recorded in the present study is much higher than earlier records during 1988-89 (2.01 kg) and 1992-93 (1.43 kg), indicating fishing intensification. The intensified fishing for *P. semisulcatus* in this region after 2000 has substantially increased the CPUE in accordance with growing market demand (Maheshwarudu *et al.,* 1996).

Results of the present study, showed that the penaeid shrimp fishery of Mandapam, Palk Bay is constituted by twelve species *viz*, *P. semisulcatus, P. latisulcatus, P. indicus, P. merguiensis, P. japonicus, P. canaliculatus, P. monodon, K. maxillipedo, M. moyebi, M. stridulans, M. toloensis* and *Megokris granulosus* (Fig. 2) and was dominated by *P. semisulcatus* followed by *P. latisulcatus, M. moyebi*, *M. stridulans* and *K. maxillipedo*. James and Adolf (1969) reported that *M. affinis* formed a seasonal fishery in Palk Bay and was the dominant species followed by *P. semisulcatus.* Nandakumar (1978; 1980) reported that Palk Bay shrimp fishery was supported by 15 species while Maheswarudu *et al.* (1996) found that Palk Bay fishery comprised 10 species and *P. semisulcatus* formed the bulk of the catch. From the above sequence of Palk Bay shrimp fishery, it is evident that after 1960's the dominant species *M. affinis* has slowly declined in the landings and *P. semisulcatus* has replaced it, clearly indicating a shift

Table 1. Penaeid shrimp landings by trawlers at Mandapam, Palk Bay during 2016

Months	*P. semisulcatus*	*P. canaliculatus*	*P. monodon*	*K. maxillipedo*	*P. latisulcatus*	*M. moyebi*	*M. stridulans*	*M. toloensis*	*M. granulosus*	*P. merguiensis*	*P. japonicus*	*P. indicus*	Total (t)
January	110.37	0.22	0.43	10.76	17.21	12.91	4.30	0.00	2.15	2.15	0.04	0.43	160.98
February	175.45	0.21	2.05	8.21	82.08	20.52	20.52	0.00	5.13	20.52	0.21	2.05	336.94
March	74.98	0.00	0.00	6.70	5.02	10.05	2.34	0.00	3.35	8.37	0.00	1.67	112.49
April	25.34	0.00	0.00	3.86	1.39	3.09	3.09	0.00	3.09	0.77	0.00	0.31	40.94
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June	179.68	1.38	0.28	9.63	4.13	13.76	9.63	0.00	11.01	8.26	0.06	0.55	238.35
July	88.14	0.00	0.00	4.52	2.26	0.57	2.26	0.00	5.65	4.52	0.02	0.90	108.84
August	108.71	0.07	0.67	5.02	5.02	6.70	5.02	3.35	1.67	5.02	0.00	0.67	141.92
September	55.38	0.00	0.00	4.28	2.85	7.13	2.57	0.00	1.43	1.43	0.09	0.29	75.43
October	85.89	1.35	0.00	8.97	13.46	8.97	13.46	0.00	0.90	5.38	0.00	0.04	138.41
November	76.61	0.00	0.42	12.48	16.64	8.32	10.40	0.00	0.42	4.16	0.21	0.83	130.49
December	96.65	0.18	0.00	15.40	11.00	17.60	17.60	0.00	4.40	3.52	0.00	0.88	167.23

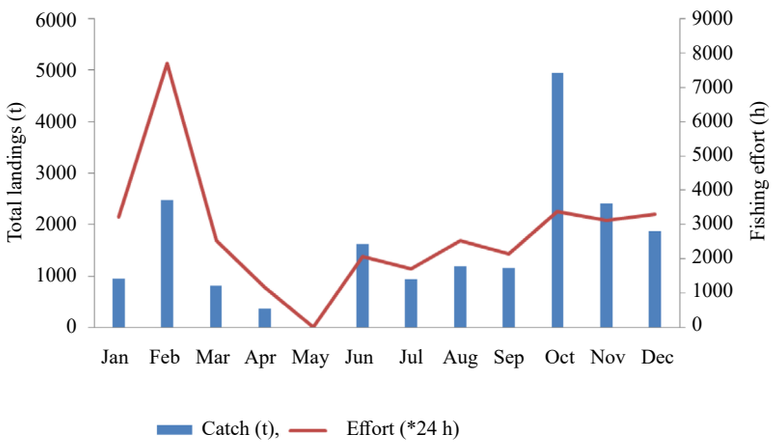

Fig. 1. Catch and effort of shrimp trawlers in Mandapam, Palk Bay during 2016

Table 2. Catch per unit effort (CPUE) and catch per hour (CPH) of shrimp trawlers in Mandapam, Palk Bay during 2016

Months	CPUE of total catch (kg)	CPH of total catch (kg)	Fishing effort (h)	CPH of shrimps (kg)
January	220.7	12.3	17874	9.0
February	241.8	13.4	15390	21.9
March	239.9	13.3	13914	8.1
April	229.1	12.7	11124	3.7
May	0.0	0.0	0.0	0.0
June	588.9	32.7	11430	20.9
July	408.7	22.7	10170	10.7
August	353.0	19.6	9270	15.3
September	403.6	22.4	12834	5.9
October	1105.6	61.4	18630	7.4
November	578.4	32.1	18720	7.0
December	424.1	23.6	19800	8.4

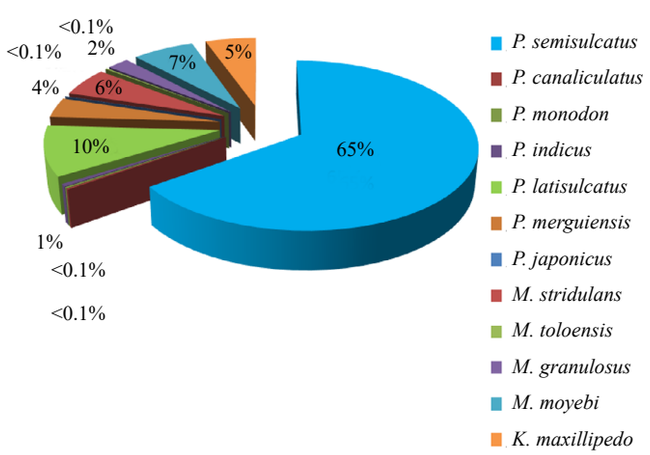

Fig. 2. Species composition of penaeid shrimps landed in Mandapam, Palk Bay during 2016

Table 3. Mean length, size range and sex ratio of penaeid shrimps landed at Mandapam, Palk Bay during 2016

Species	Mean length TL (mm)		Size range (mm)		Sex ratio (Male =1)
	Male	Female	Male	Female	
P. semisulcatus	118.77	119.03	79-173	36-271	1.1
P. latisulcatus	143.71	157.30	110-185	40-230	1.7
P. indicus	144.32	154.66	90-183	128-233	1.4
P. merguiensis	123.65	165.44	51-250	65-291	1.7
P. japonicus	183.67	173.00	179-190	124-222	0.7
P. canaliculatus	164.67	181.67	149-175	147-227	1.2
P. monodon	187.38	233.48	94-222	114-285	0.9
K. maxillipedo	77.74	85.68	59-100	60-110	2.5
M. moyebi	62.32	87.65	51-102	58-111	2.6
M. stridulans	65.91	71.95	52-85	19-100	1.2
M. toloensis	80.73	79.56	59-110	20-111	1.3
M. granulosus	78.25	86.25	57-102	59-112	2.2

in species dominance in the Palk Bay shrimp fishery. Since 1980s, *P. semisulcatus* continued to be the dominant species in the Mandapam Palk Bay region. After 1987, *M. affinis* has totally vanished from the fishery.

Mean length, size range and sex ratio of penaeid shrimps landed in Palk Bay coast of Mandapam during 2016 is given in Table 3. Females dominated in the catch and the sex ratio was always more than one except in *P. japonicus* and *P. monodon.* Similar observation was made by Thomas (1980) in *P. semiculcatus* along Mandapam coast of Tamil Nadu. Results of gut contents analysis of five penaeid shrimp species showed that, in *P. semisulcatus* and *P. latisulcatus* 40-48% of females were with empty stomach as compared to males, where as in *P. merguiensis* and *P. monodon,* the males were more with empty stomach than females (Fig. 3). Fully fed shrimps were rarely recorded in the catches. The main diet components in these penaeid shrimps were molluscan remains, crustacean remains, sea urchin remains and detritus. Molluscan remains were the major diet component in *P. semisulcatus P. latisulcatus* and *P. indicus* followed by crustacean remains. Whereas in *P. merguiensis* and *P. monodon,* sea urchin remains were found more dominant in the diet followed by crustacean remains (Fig. 4). Detritus accounted for 18-27% in the diet of these penaeid shrimps. These penaeids are more opportunistic feeders and they feed non-selectively on their food path, though they prefer carnivore prey items.

The dominance of penaeid shrimp fishery by *P. semisulcatus* observed in the present study, is in conformity with the observation of Maheswarudu *et al.* (1996). This fishery is very unique and *P. semisulcatus* continues to be a dominant species throughout the year in the Palk Bay. The seagrass ecosystem of Palk Bay is pristine and boosts a wide variety of fauna by providing nursery grounds in shallow and flat basins up to a depth of 15 m. Results of the present study highlights the need for sustaining the Palk Bay ecosystem especially the seagrass

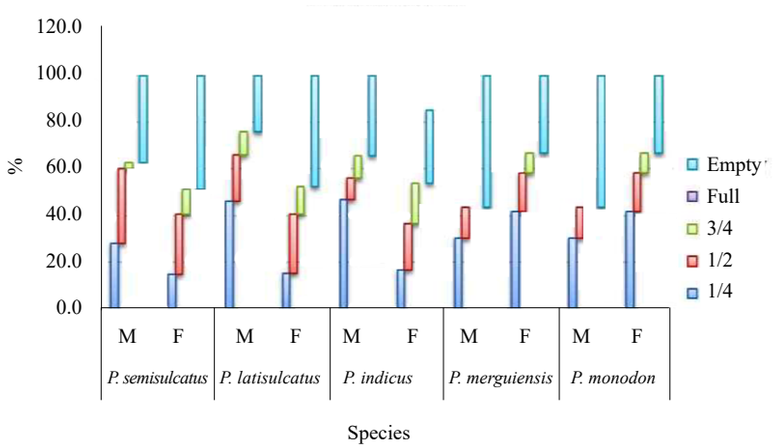

Fig. 3. Stomachfullness of penaeid shrimps landed in Mandapam, Palk Bay during 2016

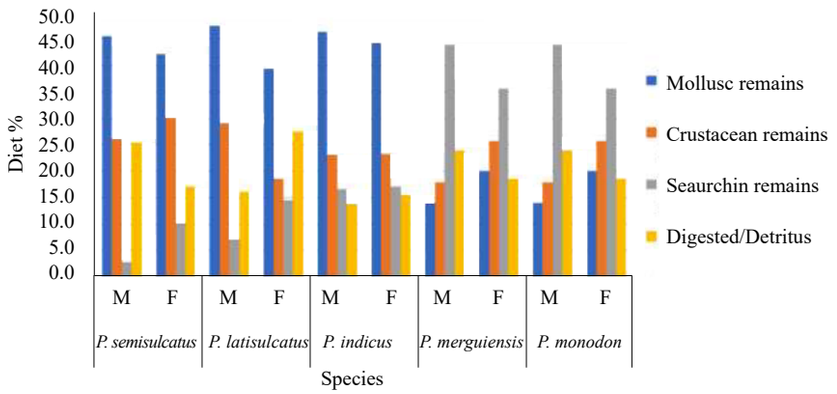

Fig. 4. Diet composition of penaeid shrimps landed in Mandapam, Palk Bay during 2016

ecosystem which is pivotal for breeding, feeding and nursery stages of *P. semisulcatus*.

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