

# ON THE FISHERY OF THE INDIAN WHITE PRAWN *PENAEUS INDICUS* H. MILNE EDWARDS ALONG THE TINNEVELLY COAST, TAMIL NADU

MARY K. MANISSERI AND C. MANIMARAN

*Central Marine Fisheries Research Institute, Cochin.*

## ABSTRACT

The fishery is seasonal, June-July to October-November. The total landings of prawns by mechanised vessels in 1978 was estimated at 539 mt, of which nearly 63.4% was large-sized *P. indicus*. The species occurs in the adjacent waters of Punnai-kkayal also, as a 10-year fishery of lesser magnitude. The modal sizes of *P. indicus* from the Manappad fishing grounds ranged from 151-155 mm to 171-175 mm for males and 151-155 mm to 191-200 mm for females. Stages of maturity indicated intense spawning activities in this fishing ground. The fishing season coincides with the south-west monsoon, when there is a seasonal fishery, exclusively constituted by large sizes of the same species, in the adjacent waters of the Kanyakumari District on the southwest coast. A comparative study of the various features of the fishery of *P. indicus* in these two areas indicates the possibility of recruitment of the species to the Manappad fishery from the stock off Kanyakumari, which, in turn, is probably recruited from the Kerala coast at the time of intense physico-chemical changes in the marine environment, brought about by the south-west monsoon.

## INTRODUCTION

The two major prawn fishing grounds off Tinnevely coast are, at Manappad, with a rich seasonal fishery dominated by *Penaeus indicus*, and at Punnai-kkayal, Tuticorin, which presents a 10-year fishery dominated by *P. semi-sulcatus*. Active exploitation of the prawn fishery off Manappad (Lat. 8°22', Long. 78°3') by mechanised trawlers commenced in 1970-71. Some areas along this coast were sporadically exploited earlier for penaeid prawns by mechanised as well as indigenous crafts, landing their catches at various centres all along the coast. Although the fishery off Manappad contributed to good quantities of large-sized penaeid prawns, not much information is available on the characteristics of this fishery. Hence a detailed study on the fishery resources and biological aspects such as seasonal abundance, size-frequency, sex-composition, maturity stages, spawning seasons, recruitment, etc., of the dominant species *P. indicus*, in comparison with the fishery of the species at Punnai-kkayal area is attempted.

## THE FISHING GROUNDS AND SEASONS

The nearshore region, of the continental shelf of south-east coast of India is well known for its rich corals, and the bottom is generally rocky and sandy. But there are narrow gullies of muddy bottom with rich concentrations of prawns, about 6 km away from the shore at Manappad and slightly closer at Uvari fishing village. Fishing is carried out usually at depths of 15 to 25 m, occasionally extending up to 30 to 32 m. The muddy nature of the bottom in this region makes trawling possible.

Prawn fishery off Manappad is invariably seasonal, unlike that of Punnai-kkayal where exploitation is done throughout the year. The fishing season of Manappad by mechanised boats commences by June-July and terminates by October-November of each year. It is generally seen that the close of the prawn-fishing season at Manappad coincides with the commencement of the peak season further north in the Gulf of Mannar, at Mandapam and Rameswaram, in the months of January to March (OMFRI, 1975). Depending on the availability of prawns in these fishing grounds, mechanised vessels move from one base to the other. Mechanised vessels fishing in the grounds off Manappad operate from the bases at Virapandiyanpattanam and Tiruchendur, and those fishing in the Punnai-kkayal grounds and adjacent waters operate from the base at Tuticorin.

## SPECIES COMPOSITION AND TRENDS IN PRODUCTION

The total quantity of prawns landed by mechanised fishing vessels at Virapandiyanpattanam and Tiruchendur, in the year 1978, is given in table 1. *P. indicus* (Naaran) was the predominant species, contributing to about 63.4%. The other species represented in the catch were *P. semisulcatus* and *Parapenaeopsis stylifera*. The total landings in the season was about 539 t of which 69.7% was constituted by large-sized *P. indicus* and *P. semisulcatus*, fetching an average

TABLE 1. Total prawn landings (in kg) at Virapandiyanpattanam and Tiruchendur during 1978.

Months (1978)	VIRAPANDIYANPATTANAM				TIRUCHENDUR				Grand total
	<i>P. indicus</i>	<i>P. semi- sulcatus</i>	Other species	Total	<i>P. indicus</i>	<i>P. semi- sulcatus</i>	Other species	Total	
Jun	6,171	686		6,857					6,857
Jul	72,188	5,537		77,725	65,117	5,476		70,593	1,48,318
Aug	84,244	2,893		87,137	36,359	1,301		37,660	1,24,797
Sep	47,873	5,523	7,792	61,1*8	8,615	1,009	1,205	10,829	72,017
Oct	17,072	9,573	1,24,050	1,50,695	3,317	1,527	19,149	23,993	1,74,688
Nov	858	452	11,100	12,410					12,410
Total	2,28,406	24,664	1,42,942	3,96,012	143,408	9,313	20,354	1,43,075	5,39,087

of Rs. 55.50 per kg (head on). The total price of prawns landed during the season is given in Fig. 1. The peak landings of *P. indicus* were recorded in July (137.3 t) and August (120.6 t). Larger quantities of *P. stylifera* were landed towards the latter half of the season. The maximum landings of this species at Vinapandiyanpattanam was in the month of October (124 t). Such quantities are not recorded from any of the nearby fishing grounds, such as Cape Comorin. Punnaikkayai and Mandapam. However, this species is not sought-after like Naaran, as it fetches very low prices. In comparison, the estimated total landings of penaeid prawns by mechanised fishing vessels from off Punnaikkayai in 1978 was 244.7 t. On an average, about 72 boats operated per day from the base at Tutuorin, *P. indicus* formed only about 24.4% of the total catch with poor catches in December and January.

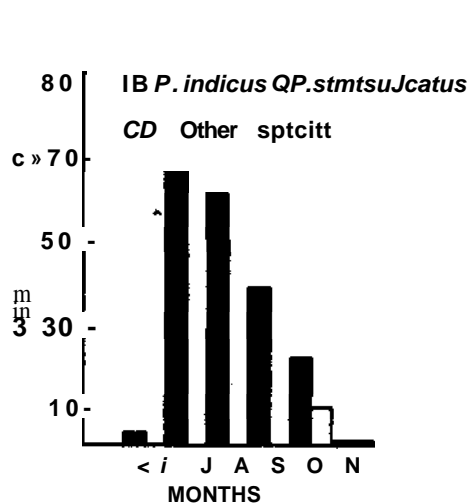


FIG. 1. Price of prawns (head on) landed at Virapandiyanpattanam and Tiruchendur during 1978.

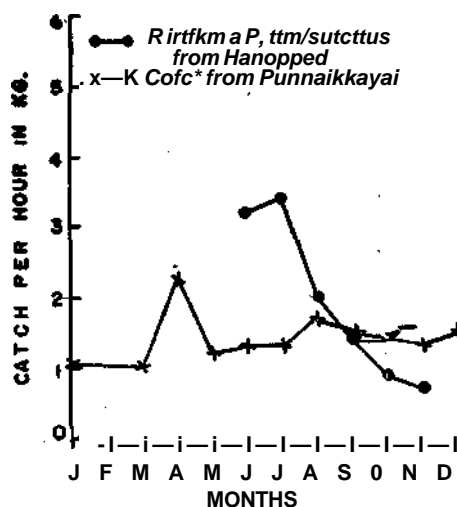


FIG. 2. Catch rate of prawns from Mnappad and Punnaikkayai fishing grounds during 1978.

A comparison of the catch per unit hour (CPUH) of prawns from Manappad and Punnaikkayai fishing grounds in 1978, is given in Fig. 2. It may be noticed that the catch rate of Naaran from Manappad grounds was high in June and July (3.2 kg and 3.4 kg per hour respectively), but showed a steep decline in the following months. On the contrary, the catch of prawns from Punnaikkayai did not show any sudden fluctuation, and the fishery was more or less steady throughout the year with, an estimated average catch rate of about 1.42 kg per hour.

#### LENGTH-FREQUENCY DISTRIBUTION

*P. indicus* ranged in length (from tip of rostrum to tip of telson) from 121 mm to 200 mm in males and from 131 mm to 215 mm in females. However,

only 2.7% of the males landed during the season belonged to the size groups 121-135 mm, and 2.6% of the females in size groups 131-140 mm. The dominant mode for males shifted from 151-155 mm in June to 156-160 mm in July and August and 171-175 mm in September and October. In the case of females, the dominant mode shifted from 171-175 mm in June to 151-155 mm in July, 176-180 mm in August, 186-190 mm in September and 196-200 mm in October (Fig. 3). The absence of predominant modes at smaller sizes in later months might indicate the absence of further recruitments of younger prawns into the fishery. In other words, recruitment to this fishery may be only in June-July and this might explain the high catch rate in those two months. However, the fishery lasted up to the beginning of November, probably, due to the survival and growth of the same stock, or to the entrance of larger size groups in later months from the original source itself, or by both.

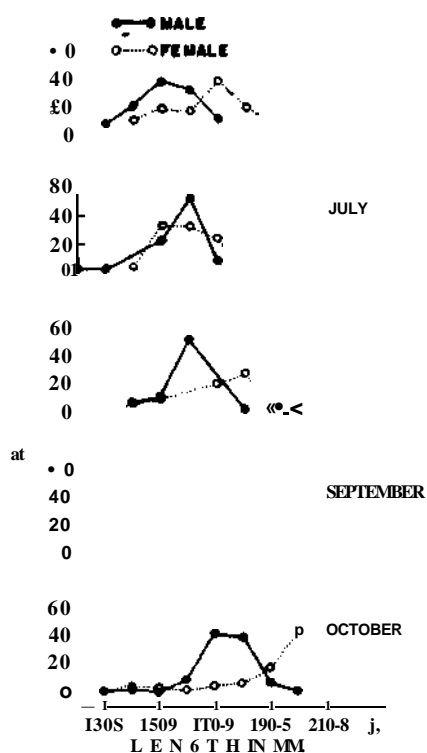


FIG. 3. Length-frequency distribution of *P. indicus* from Manappad fishing grounds during 1978

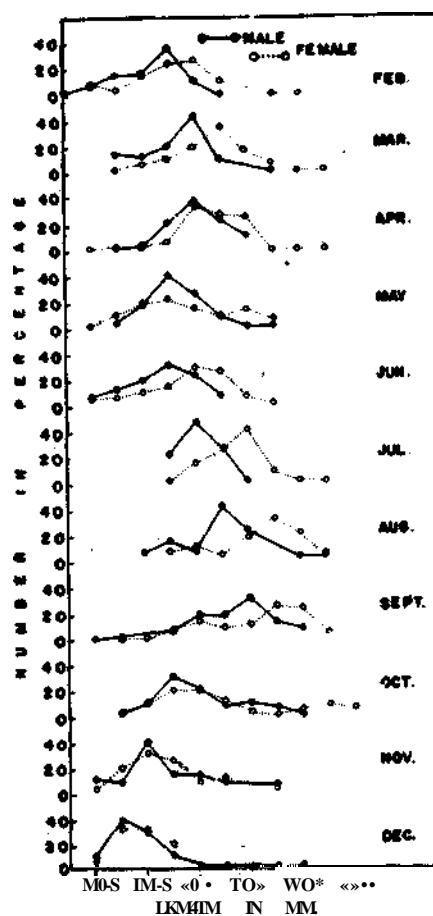


FIG. 4. Length-frequency distribution of *P. indicus* from Punnai-kkayal fishing grounds during 1978.

*P. indicus* landed by mechanised boats from the adjacent fishing grounds off Puninaikkayal in 1978, ranged in length from 96 mm to 200 mm in case of males and from 101 mm to 210 mm in case of females (Fig. 4). A comparison of the dominant modes of the males and females from January to December 1978 showed that they were at bigger size groups of 161-165 mm and 166-170 mm in males and 176-180 mm and 186-190 mm in females in August and September, when similar sizes appeared at Manappad also. In most of the other months the species was represented mainly by smaller size-groups only. The lowest modal sizes of males were 126-130 mm, 121-125 mm, 136-140 mm and 141-145 mm, and that of females 126-130 mm, 121-125 mm, 146-150 mm and 136-140 mm in November, December, February and May, respectively. (Catch was comparatively very poor in January). Thus the recruitment of the species into the fishery at Puninaikkayal fishing ground and nearby areas seems to be in the months of November-February and May, as against June-July at Manappad.

#### SEX-RATIO

A study of the sex-ratios of *P. indicus* from the fishing grounds off Manappad and Punnaikkayal in 1978 showed that there was a slight predominance of females. The yearly average percentage of males and females from the former ground was 47.4 and 52.6 and from the latter ground was 46.7 and 53.3, respectively.

#### MATURITY STAGES

Stages of maturity of female *P. indicus* were categorised<sup>1</sup> as immature, early maturing, late maturing and mature, spent-recovering and impregnated (Rao 1968), and recorded every week from January to December 1978 (Fig. 5). One of the interesting features noticed in the fishery at Manappad was that the immature prawns were very scarce. On an average, only 5.5% of the females were immature and the rest were in various stages of maturity. More than half of the immature prawns were recorded in the first month itself, there being very few, and at times none, in the following months. Impregnated specimens were recorded, though in small numbers only, in July (8.7%), August (5.4%) and October (11.0%). Spent-recovering stage also was fairly well-represented throughout the season, with an average of 30%, per month. The females at early maturing stages displayed a trend of decrease towards the close of the season, similar to that of the immature stage. This decline in the number of immature and early maturing stages with the advance of the season, might suggest that entry of such individuals to the fishery took place towards the beginning of the season only, thereby supporting the earlier inference that recruitment to the fishery took place during the first few months of the season.

Late maturing and mature females were quite abundant in July, August, September and October (Fig. 5), especially in September, when they contributed to 87.13%. The presence of large numbers of maturing and mature individuals

together with negligible numbers of immature ones throughout the season would indicate that this is a spawning ground of *P. indicus*. A comparative study of the different maturity stages of this species present in the catches from the fishing grounds off Punnaikkayal (Fig. 5) also showed that maximum number of maturing and mature individuals occurred during the same period. This would also

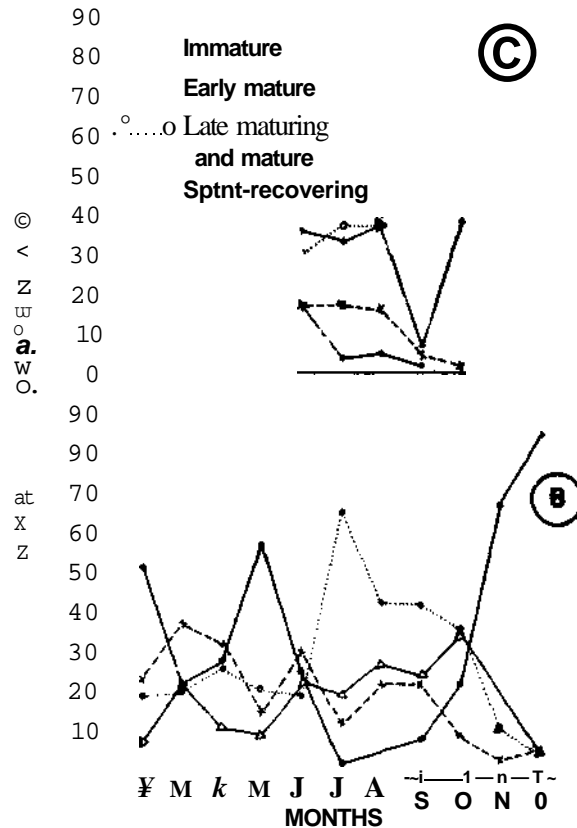


FIG. 5. Maturity stages of *P. indicus* (female) from A. Manappad and B. Punnaifcyil fishing grounds, during 1978.

lead to the inference that the peak spawning season of *P. indicus* of this region is during July to October. George et al (1963) observed *P. indicus* breeding throughout the year with two peaks, one in December-January and the other in May-June along the south-west coast of India. But according to Subrahmanyam (1963) the breeding activity of the species was pronounced in March and May to September at Madras. The present observation on the fishery along the south-east coast is more or less in agreement with the observations made by Subrahmanyam along the east coast. This would confirm the suggestion made by George et al (1963) that there may be difference in the breeding season of the species

occurring along the west and east coasts of India. At Punnaikkayal large numbers of immature prawns were landed in November (66.67%), December (83.91%), February (50.52%) and May (56.86%). Correspondingly female prawns of late maturing, mature and spent-recovering stages were less during these months. So the recruitment of the species into the fishery appears to be during the months, November-February and May, strengthening the inference made from length-frequency studies.

#### DISCUSSION

The prawn fishery off Manappad was supported to a great extent by the spawning population of large-sized *P. indicus* with the dominant modes for both males and females above 151-155 mm. According to Panikkar and Menon (1955), Menon (1957), Menon and Raman (1961) and George (1961, 1962a and b). *P. indicus* spends its juvenile stages in estuaries and move out into the sea after reaching a size of about 120 to 130 mm. The only estuary in this region, which could form a nursery ground for the juveniles of the species, is the Punnaikkayal estuary. But juveniles are obtained only in small quantities from this estuary, and adjacent to the estuary there is a marine fishery for the species. It contributed to 24.4% of the total catch in 1978 with an average! of 4.4 t per month. So the Punnaikkayal estuary may be supporting the fishery of the adjacent area only and the possibility of it farming an exclusive nursery ground to support the rich fishery of Manappad is remote. Besides, the fishery off Punnaikkayal was not seasonal and the landings were comparatively steady throughout the year ruling out any possibility of a major recruitment to the fishery off Manappad in May-July. This would lead to the conclusion that the fishery off Manappad is supported either by a stock produced there itself or recruited in the larger sizes from some area other than Punnaikkayal region. The former is ruled out since at no time younger specimens are present in the fishery of this area. The prawn fishery of areas further north, like Erwadi and Mandapam, is mostly contributed by *P. semisulcatus* (C.M.F.I., 1975). Thus recruitment from the northern side is not likely. On the contrary, *P. indicus* forms the dominant species of the fishery towards the southern side of Manappad. George and Mohamed (1967) observed that the prawn fishery of Kanyakumari District is exclusively constituted by large-sized *P. indicus*. Though juveniles (37 to 135 mm) of the species are obtained from the Manakkudy estuary of the Kanyakumari District, it contributes to a monthly average of 0.24 t only (Suseelan 1975). According to George and Mohammed (1967) the fishing season at Kanyakumari starts with the onset of the south-west monsoon in May-June and extends up to September-October. Within the region itself, the fishing season begins and also ends earlier in the northern villages. The significance of this fishery is that it occurs during the monsoon, when fishing activities all along the west coast are ekhet stopped or very slack. The point of interest is that the fishery off Manappad is exactly during the same period, and contributed by similar sizes of prawns of the same species.

Ramamirtharn and Jayaraman (1960) observed the phenomenon of upwelling along the south-west coast of India during the southwest monsoon period. Banse (1959) also observed the same and suggested that fishes were forced to move to deep waters or press very close to the shore during such physico-chemical disturbances. Following this observation, George (1963) reported that all the important species other than *Metapenaeus dobsorti* in the fishery off Cochin move to deeper waters during this upwelling period in the monsoon season. According to Rao (1972), the occurrence of larvae of *M. dobsorti* all-the-year-round in the inshore waters and the scarcity of larval forms of larger species (*P. indicus*, *M. affinis* and *M. monoceros*) in the same area from February to August indicate that it might be due to some migration of larger forms from the area. Of course, the exact depth or area to which these large-sized prawns migrate during the south-west monsoon is not definitely known. But it is to be noted that the rich fishery of large-sized *P. indicus* along the south-west coast of Kanyakumari and adjacent south-east coast including Manappad takes place at about the same period. George and Mohamed (1967) were of opinion that the only possible source from where recruitment to the Kanyakumari fishery can take place is from the northern region, viz. the Kerala coast, with several estuarine nursery grounds where the species exists as a fishery. Hence it is probable that during the upwelling period of south-west monsoon the species moves to the south and appears in the fishery off Kanyakumari District and also the adjacent areas on the east coast. Close similarity of the fishery of the species at Kanyakumari and Manappad in size composition, season and all aspects of the nature of the population getting recruited into the fishery strengthens this view.

Further, a study of the nature of the continental shelf of the south-east and south-west coasts of India reveals that, the 30 m contour line off Manappad and nearby areas is as broad as that off the Kerala coast which harbours a rich fishery of *P. indicus*. On the contrary, the 30 m contour line off Kanyakumari District is extremely narrow. Hence, in all probability the broad and shallow shelf region with its muddy substratum, off Manappad and adjacent areas on the east coast, may be providing a highly favourable habitat for the adults of *P. indicus* which, at the time of physico-chemical disturbances during south-west monsoon are forced to move from the inshore waters of Kerala towards the south and on reaching the narrow stretch of the inshore region of Kanyakumari, moves further to the shallow spread of the shelf region on the south-east coast and gets recruited in the fishery there.

#### ACKNOWLEDGEMENTS

The authors are greatly indebted to Dr. E. G. Silas, Director, Central Marine Fisheries Research Institute, Cochin, for his encouragement and guidance during the course of the present study, and to Dr. M. J. George and Shri S. Mahadevan for going through the manuscript critically and suggesting corrections. They are thankful to Shri K. Nagappan Nair, Shri K. H. Mohamed and Dr. P. Vedavyasa Rao for their help and guidance during the period of work.



## REFERENCES

- BANSE, K. 1959. On upwelling and bottom trawling off the South West coast of India. *J. mar. biol. Ass. India* 1(1): 33-49.
- GEORGE, M. J. 1961. Studies on the prawn fishery of Cochin and Alappet coast. *Indian J. Fish.*, 8(1): 75-95.
- GEORGE, M. J. 1962a. On the breeding of penaeids and the recruitment of their post-larvae into the backwaters of Cochin. *Indian J. Fish.*, 9(1): 110-116.
- GEORGE, M. J. 1962b. Observations on the size groups of *Penaeus indicus* (Milne Edwards) in the commercial catches of different nets from the backwaters of Cochin. *Indian J. Fish.*, 9(2): 468-475.
- GEORGE, M. J. AND K. H. MOHAMED. 1967. An assessment of marine prawn fishery resources of Kanyakumari District - South west coast of India. *Proc. Indo-Pacific Fish. Coun.*, 12(H): 210-219.
- GEORGE, M. J., K. RAMAN AND P. KARUNAKARAN NAIR. 1963. Observations on the off-shore prawn fishery of Cochin. *Indian J. Fish.*, 10(2A): 460-499.
- MENON, M. K. 1957. Contributions to the biology of penaeid prawns of the south west coast of India. 1. Sex ratio and movements. *Indian J. Fish.*, 4(1): 62-74.
- MENON, M. K. AND K. RAMAN. 1961. Observations on the prawn fishery of the Cochin backwaters with special reference to the stake net catches. *Indian J. Fish.*, 8(H): 1-23.
- MOHAMED, K. H. 1969. Genus *Penaeus* Fabricius. *Bull. cent. mar. Fish. Res. Inst.*, 14: 49-75.
- PANIKKAR, N. K. AND M. K. MENON. 1955. Prawn fisheries of India. *Proc. Indo-Pacific Fish. Coun.*, 6(11 & H1): 328-346.
- RAO, P. VEDAVYASA. 1972. Seasonal abundance of larvae and post-larvae of the commercially important penaeid prawns in the inshore waters of Cochin. *Indian J. Fish.* 19(1 & 2): 86-96.
- RAO, P. VEDAVYASA. 1968. Maturation and spawning of the penaeid prawns of the south west coast of India. *FAO. Fish. Rep.*, 67(2): 285-302.
- SUSEELAN, C. 1975. Resource and exploitation of juvenile penaeid prawns from Manakkudy estuary. *Indian J. Fish.*, 22(1 & 2): 96-106.
- RAMAMIRTHAM, C. P. AND R. JAYARAMAN. 1960. Hydrographical features of the continental shelf waters off Cochin during the years 1958 and 1959. *J. mar. biol. Ass. India* 2(2): 199-207.
- SUBRAHMANYAM, C. B. 1963. A note on the annual reproductive cycle of the prawn *Penaeus indicus* (M.Edw.) of Malabar. *Curr. Sci.*, 32(4): 165-166.