Fishery for *Penaeus indicus* in Indian Waters

G.SUDHAKARA RAO*

Central Marine Fisheries Research Institute, Cochin 682 014

The Indian White prawn *Penaeus indicus*, is distributed widely in the Indo-Pacific starting from New South Wales in Australia in the east to the east coast of Africa in the west. However, the commercial fishery for *P. indicus* was reported only from India and Africa. In India, the species forms a commercial fishery only between Puri in the east coast and Mangalore in the west coast with maximum concentration along the Tamilnadu Coast. In view of its demand in the export market the species has been subjected to heavy exploitation all along its area of distribution in Indian waters. Although information on the fishery for *P. indicus* is available from a number of localised areas along the coast of India, (Panikkar and Menon, 1956; Menon and Raman, 1961; George, 1961, 1962; George and Mohamed, 1967; George *et al.*, 1963; Jhingran and Natarajan, 1969; Kurup and Rao, 1974; Subrahmanyam, 1965, 1966, 1967; Suseelan, 1975; Rao, 1975; 1987, 1988 a, 1988 b, MS1, MS2; Rao *et al.*, MS; Lalitha Devi, 1986, 1988; Manisseri, 1988; Manisseri and Manimaran, 1981; Rajamani and Manickraja, 1990), a clear picture of the fishery in its entirety in the range of its distribution is lacking except for that of Rao *et al.*, (MS) along the east coast. In this paper an attempt is made to describe the fishery for *P. indicus* in Indian waters in its totality in respect of catch, effort and population dynamics to formulate management measures for the optimum utilisation of the this valuable resource.

FISHING CRAFT AND GEAR

Ramamurthy and Muthu (1969) described the various methods employed in the prawn fishing along the east and west coasts of India. Shore seines and boat seines with a variety of boats are widely used in catching *P. indicus* in the inshore waters since ancient times. In the estuaries and backwaters, the species is caught by drag nets, stake nets and cast nets. In the Chilka Lake it is caught by bamboo traps. In the sea, it is caught by trawlers of different sizes. These trawlers are classified as small trawlers (9.75 m), medium trawlers (13.1 m), mini-trawlers (16 m) and large trawlers. Rao (MS 2) described the various types of trawlers in respect of size of the boat, size of net and the cod end mesh size. While the small trawlers and the medium trawlers are distributed all along the coast, the mini-trawlers and the large trawlers are almost restricted in their operation to north-east coast and land the catch at Visakhapatnam. Occasionally *P. indicus* is also caught by purse seines along the Kerala-Karnataka Coast (Nair and Narayanakutty, 1985).

A striking change that has taken place in recent years in the traditional sector is the widespread use of bottom-set gill nets in catching *P. indicus* all along the coast in varying intensities. More recent innovation is the emergence of 'Disco net' as an important gear for exploiting *P. indicus*. This net introduced in the Kanyakumari District of Tamil Nadu in 1984 (Joel and Ebenezer, 1985) is so efficient in entangling prawns in the midwater column, that it spread to the other areas in no time replacing the gill net along both the coasts.

DATA BASE

Data of the annual landing of penaeid prawns from inshore waters for the period 1980-'89 are taken from the records of the Fishery Resources Assessment Division (FRAD) of the Central Marine Fisheries Research Institute (CMFRI). The proportion of *P. indicus* landings of the east coast for the period 1985-89 is taken from the primary data sheets of field staff of FRAD for sampled centres and projected for the entire east coast. The proportion of *P. indicus* in the landings along the east cost for the period 1980-84 was estimated based on the information available at CMFRI Research Centres at Madras, Kakinada and Visakhapatnam and various publications emerged from the work at these research centres. The proportion of *P. indicus* in the penaeid prawn landings of Kerala and Karnataka is taken from published reports of scientists, Annual Reports of CMFRI and the other departmental reports. Estimation of *P. indicus* landings were based on these data. *P. indicus* landings by large trawlers are taken from Rao (MS 2).

Data on the estuarine fishery are not available for specific time period series from different estuaries. Hence attempt was made to give annual average landings for each estuarine system. Published information by various sceintists of CMFRI and CIFRI, periodic reports available at Visakhapatnam Research Centre and the publications of Rao (MS 1) and Suseelan (MS) formed the basis for the estimation of *P. indicus* landings in different estuarine systems. Since a huge number of publications and unpublished reports are scanned to get information, even if it is very little in each publication, it has not been possible to cite all these reports due to lack of space.

JUVENILE FISHERY

The Indian White Prawn is exploited in its juvenile phase in almost all the estuaries and backwaters between the Chilka lake in the east coast and the Mangalore Estuary in the west. The reported occurrence of *P. indicus* north of the Chilka Lake in the east coast and north of Mangalore in the west in the estuaries as well as in the sea should be referred to as either *P. merguiensis* or *P. penicillatus*. It was not possible to give estimates of landings from numerous small estuaries since information available is fragmentary in nature and any attempt to use these data may lead to erroneous interpretations. Hence an attempt is made here to describe the fishery for *P. indicus* in the major estuaries of both the coasts.

CHILKA LAKE

With a waterspread area of 906 sq. km in the summer and 1165 sq. km in the flood season, Chilka lake is a very good fishing ground for *P. indicus* and other penaeid prawns. Drag nets and bamboo traps are the main fishing gears employed in prawn fishing. Jhingran and Natarajan (1969) studied the fishery during 1957-'65 period. The annual landings varied from 335 t in 1963 to 878 t in 1965 with the average estimated as 661 t. On an average *P. indicus* formed about 64.3% of the annual prawn landings during this period. Two peaks were observed in the abundance of *P. indicus*, a primary peak in April - July and a secondary in August - December. Juveniles of 20-150 mm in total length were observed in the landings with 85-125 mm size groups forming the mainstay of the fishery. Seaward migration starts at 105-125 mm. Rao (MS 1), studying the fishery for the period 1983-'90, gives somewhat different picture of the fishery. Annual landings of *P. indicus* and total prawn landings for the period 1983-'90 are given in Table 1. *P. indicus* landings varied from 274.4 t in 1984-'85 to 451.6 t in 1989-'90 with the average estimated as 347.7 t which is far lower than what was observed in the earlier period 1957-'65. Similarly the proportion of *P. indicus* in the total prawn landings was much lower (29.4%) as compared to the earlier period (64.2%). The fishery reached a peak in May - September in most of the years with a secondary peak during December - January in some years. *P. indicus* of 48-158 mm were observed in the landings with juveniles of 93-128 mm dominating the fishery. Monthly length frequency distribution

*Present address: VRC of CMFRI, Visakhapatnam - 530 003.

indicates that the seaward migration starts at a length range of 113-123 mm.

Subrahmanyam (1976) tried to establish relationships between postlarval index, juvenile abundance, lunar periodicity and landings from the lake. However, his data did not indicate any relationship among either of these factors and the landings from the lake

GODAVARI ESTUARY

The Godavari estuarine system encompassing an area of 400 sq. km forms an important nursery ground for a number of penaeid species. Stake nets, drag nets and dip nets are the main gears employed for harvesting the prawn resources of the estuary (Ganapati and Subrahmanyam, 1966). Rao (MS 1) based on the data collected during 1968 - '77 estimated the landings from the entire estuarine system. The annual average landings of *P. indicus* and total prawns in tonnes by different gears are given below

Net	Total Prawns	*P.indicus*	%
Stake net	1499	132.5	8.8
Drag net	1222	122.9	10.1
Dip net	176	8.5	4.8
Total	2897	263.9	9.1

Annual average landing is 263.9 t and it forms about 9.1% of the total prawn landings of the estuary. Stake nets account for 132.5 t (50.2%) followed by drag nets (122.9t) and dip nets (8.5 t). Annual fluctuations in the landings of *P.indicus* as well as total prawns at B.V.Palem landing centre are indicated in Fig.1. During the period 1968-78 annual landings of *P. indicus* varied from 20.7 t in 1976 47.9 t in 1973 with the average estimated as 34.5 t. The fishery indicated a declining trend from 1973 till 1976 with a slight increase in 1977.

Rao (1975) pooled the data collected at B.V.Palem for the period 1968-73 to study the seasonal variations in the landings (Fig.1). It was observed that the fishery reached the peak in May and November, the months of maximum waterspread area in the estuarine system. *P. indicus* of 20-140 mm length were observed in the landings with 40-80 mm juveniles forming the mainstay of the fishery. It appears from the length freqency distribution that the seaward migration starts at about 85 mm.

Subrahmanyam (1965, 1966) failed to establish any correlation between the phase of the moon and *P. indicus* landings. Lalitadevi (1988) studied the fishery at three landing centres for the period 1979-83 and made an unsuccessful attempt to correlate the rainfall and the *P. indicus* landings. However, her studies confirmed the observations of Rao (1975) in respect of the proportion of *P. indicus* in the prawn landings, seasonal variations in the landings and the length composition.

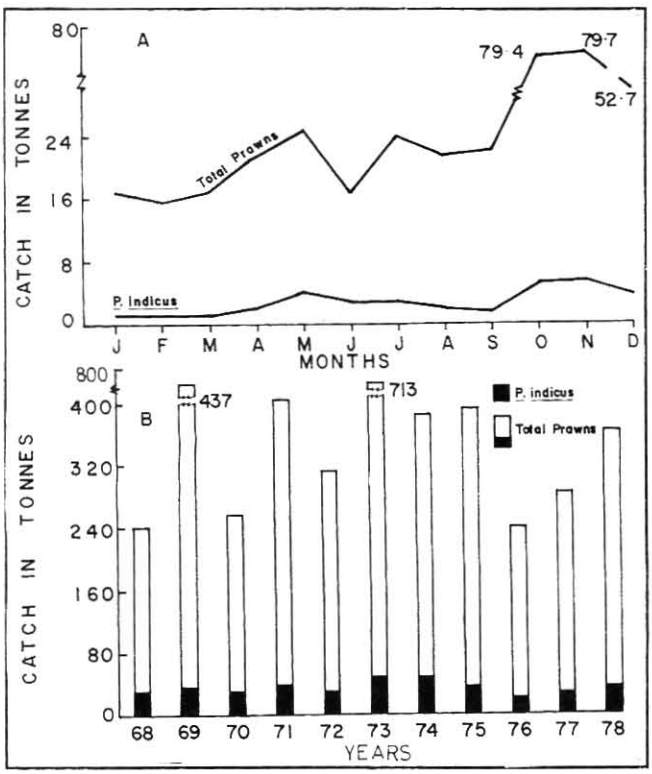

Fig.1 (A) Average monthly landings of *P.indicus* and total prawns at B.V.Palem (Godavari Estuary during 1968-73 and (B) Annual landings of *P.indicus* and total prawns at B.V.palem during 1968-77.

KRISHNA ESTUARY

The Krishna estuarine system extending over an area of 111 sq. km affords a lucrative prawn fishery. CMFRI (1975) conducted a study of the prawn resources and estimated the annual prawn landings as 970 t and *P. indicus* formed about 5% of the landings. This gave an estimated production of 48 t as annual landings of *P.indicus*. The species was landed throughout the year with peak landings during October - December.

PULICAT LAKE

The Pulicat Lake, the second largest brackishwater lake covers an area of 777 sq.km. Jhingran (1983) summarised the information available on the prawn fishery of the lake for the period 1962-72. Stake nets, drag nets and shore seines are the gears employed for exploiting the prawns. Annual landings of prawns varied from 379 t in 1968 to 635 t in 1967 with the average estimated as 511 t. With annual landings estimated as 319t *P.indicus* forms about 52.5% of the prawn landings. Sampson Manickam (1973) studied the prawn fishery at Pulicat village. *P. indicus* was observed throughout the year with peak landings in December. Juveniles of 45-155 mm were observed in the landings with 91-115 mm size groups dominating the fishery. Subrahmanyam and Rao (1968) found two peaks in the recruitment of postlarvae, one during January - April and the other during June - September. These peaks were correlated to the juvenile abundance during May - August and October - December. Rao and Gopalakrishnaiah (1974) established a direct correlation between the recruitment of postalarvae and the juvenile landings from the lake.

KILLAI BACKWATER

This backwater extending over an area of 26.7 sq. km. support a good prawn fishery. Average annual landings of prawns was estimated as 98.6 t (Evangeline *et al.*, 1975). *P.indicus* dominated the prawn landings forming as much as 45% (Subramanian 1987). Average annual landings of *P. indicus* estimated as 44 t with better landings during August - December. Juveniles of 30-110 mm were observed in the landings with 60-90 mm size groups dominating the fishery.

COCHIN BACKWATER

The vast net work of backwater system around Cochin, the Cochin backwater is a very big estuarine system on the southwest coast extending over an area of 256 sq. km. Menon and Raman (1961) and George (1961) described the prawn fishery and the contribution of *P. indicus* to this fishery. They observed *P. indicus* only during 6 months in a year with abundance varying in different years (2-10%). The study conducted during 1972-73 (CMFRI, 1975) gave a different picture. This survey observed *P. indicus* throughout the year, the peak season being different in different years. However, in most of the years, better landings were observed in March-June. Suseelan (NS) summarised the information available and estimated the average annual prawn landings as 1960 t. *P. indicus* forms about 6% of the landings with an average of 118 t. Juveniles of 50-120 mm were observed in the landings with 60-80 mm size groups dominating the fishery.

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ASHTAMUDI BACKWATER

The Ashtamudi in Kerala extending over an area of 32 sq. km forms an important nursery ground for a number of penaid prawns. Suseelan and Kathirvel (1982) and Suseelan (MS) gave a detailed description of the fishery. Average annual landing of prawns was estimated as 182 t with *P. indicus* forming about 11% of the landings. The average annual landing of the species was estimated as 20 t based on these data. Juveniles of 68-133 mm were observed in the landings with 86-120 mm size group dominating the fishery.

KORAPHUZA ESTUARY

Suseelan (MS) summarised the information on the Koraphuza Estuary. An estimated 84 t of penaeid prawns are annually landed and *P. indicus* forms about 10% of these landings. Annual landings of *P.indicus* were thus estimated as 8.4 t with wide variations from year to year.

MANGALORE ESTUARY

Ramamurthy (1972) observed wide fluctuations in the prawn landings during 1963-'68 period. The annual prawn landings varied from 3 t in 1967-'68 to 16 t in 1966-'67. *P.indicus* was observed throughout the year with peak landings during November - March. Suseelan (MS) estimated the annual prawn landings as 10t during the 1981-82 period and *P. indicus* formed about 10% of the landings with an estimated annual catch of one t.

There are a number of small estuaries all along the coast with prawn resources. Together these estuaries contribute about 36 t of penaeid prawns per year. Assuming *P. indicus* forms about 15% of the landings, the catch of it is estimated as 5.4 t.

The above analysis indicates that *P. indicus* is an important resource in the estuaries in its area of distribution along the the Indian Coast. The annual landings of *P.indicus* were estimated as 1176 t and it forms about 14.7% of the estuarine prawn fishery between Chilka Lake and Mangalore.

INSHORE FISHERY

P.indicus forms an important constituent of the inshore prawn landings of the States of Andhra Pradesh, Tamil Nadu and Kerala. Although it is landed in Orissa and Karnataka, it does not contribute much to the fisheries of these States. Statewise landings of *P. indicus* for the 10 year period of 1980-'89 are given in Table 2. *P. indicus* landings in India varied from 6149 t in 1985 to 11,970 t in 1989 with an average estimated as 9358 t. Average annual prawn landings were estimated as 126,830 t and *P. indicus* formed about 7.4% of these landings. Tamil Nadu is the major contributor to *P. indicus* fishery contributing as much as 53.1% followed by Kerala (21%). Andhra Pradesh (15.2%), Orissa (2.4%), Karnataka (1.6%) and Pondicherry (1%). In addition to these landings, large trawlers fishing in the northeast coast, land about 529.2 t of *P.indicus* forming 5.7% of the annual *P. indicus* landings of the country. A detailed description of these fisheries is given below.

LARGE TRAWLERS

Rao (1987, 1988 a MS2) described the prawn fishery exploited by the large trawlers along the northeast coast. The 'white' prawn landed by these trawlers comprise of *P.indicus* (50%). *P. merguiensis* (25%) and *P. penicillatus* (25%). Based on these observations, the annual landings of *P.indicus* are estimated from the large trawler prawn landings. The landings of *P.indicus* varied from 328 t in 1987 to 713 t in 1986 with the average estimated as 529 t (Fig.2 A). Although the species is landed throughout the year, the main fishing season is during October - December. Depthwise analyses indicate that the abundance of *P. indicus* decline with increasing depth from 11 m to 100 m with maximum concentration in 11-40 m.

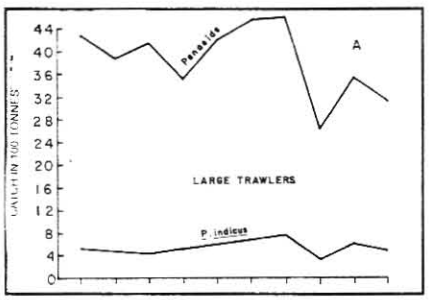

Fig.2A. Annual landings of *P. indicus* and penaeid prawns by large trawlers

Orissa: The landings of *P.indicus* fluctuated from 67 t in 1988 to 484 t in 1986 with the average estimated as 224 t. After reaching a peak in 1985 and 1986 the fishery gradually declined till 1989 (Fig.2B). Non-mechanised boats accounted for over 93% of the landings and the rest by the mechanised boats (only 7%). Gill nets are the main gear landing *P.indicus* along the Orissa Coast with better landings in July - December. The species is either not represented in the landings during January - June or poorly represented. Within the July - December period, the peak in the landings varied in different years. Males of 113-168 mm and females of 113-193 mm were observed in the landings with males of 128-158 mm and females of 133-168 mm dominating the fishery. Most of these are in their first year of life or just entered the second year.

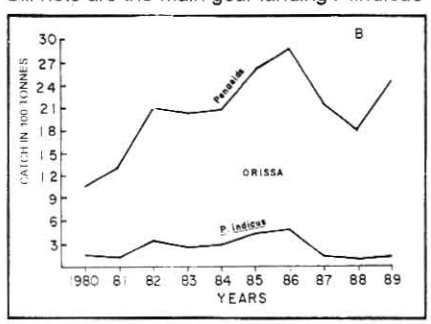

Fig.2B. Annual landings of *P. indicus* and penaeid prawns in Orissa

Andhra Pradesh: *P. indicus* forms about 17.2% of the penaeid prawn landings of Andhra Pradesh. Annual landings of *P. indicus* varied from 983 t in 1980 to 1912 t in 1986 indicating wide annual fluctuations (Fig.3 A). Average annual landings during 1980-'89 were estimated as 1427 t and of these 70% or 1000 t were landed by non-mechanised gear of which gill nets and disco nets accounted for a major share. Rao (1988 b) studied the trawl fishery of Kakinada for the period and described the various aspects of the fishery. In the trawl fishery at Kakinada *P. indicus* formed about 6% of the annual penaeid prawn landings. Although the species was landed throughout the year, the landings were better during April-June. Males of 93-193 mm and females of 98-218 mm were represented in the landings with males of 123-183 mm and females of 133-193mm dominating the fishery. Rao (MS3) studied the trawler prawn fishery of Visakhapatnam for the period of July 1983 to June 1987. The proportion of *P. indicus* in the penaeid prawn landings varied from 11.1% in 1985-86 to 30% in 1986-87 with the average estimated as 16%. The species was represented in the landings throughout the year with better landings during July - December with minor deviations from year to year. Although males of 105-195mm and females of 105-205 mm were represented in the landings males of 125-175 mm and females of 125-185mm dominated the fishery (Fig3b.) Age composition of the landings showed that most of the prawns were in their first year of life or just entered the second year.

Tamil Nadu: Forming about 34.4% of the penaeid prawn landings during 1980-89 pe-

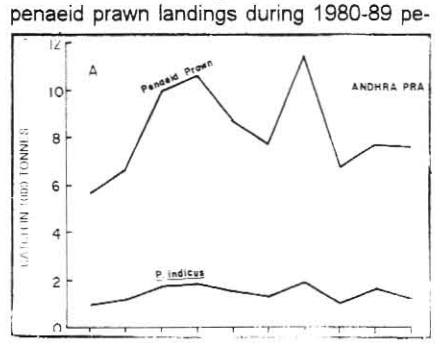

Fig. 3A. Annual landings of *P.indicus* and penaeid prawns in Andhra Pradesh

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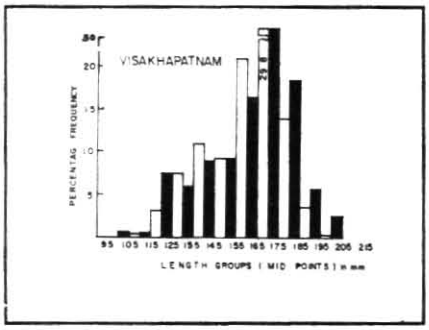

Fig.3B. Annual length frequency distributions of *P. indicus* in trawler landings at Visakhapatnam

riod, *P. indicus* forms an important component of the prawn fishery of Tamil Nadu. Annual landings varied from 2186 t in 1985 to 7379 t in 1989 with the average estimated as 4969 t (Fig.3 C&D). Non-mechanised gear accounted for over 72% of the annual *P.indicus* landings and the rest by trawlers. Gill nets and disco nets account for over 90% of the non-mechanised boat landings.

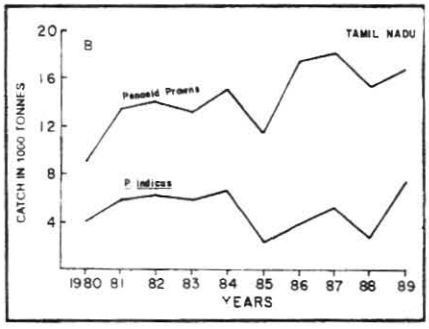

Fig.3C. Annual landings of *P. indicus* and penaeid prawns in Tamil Nadu

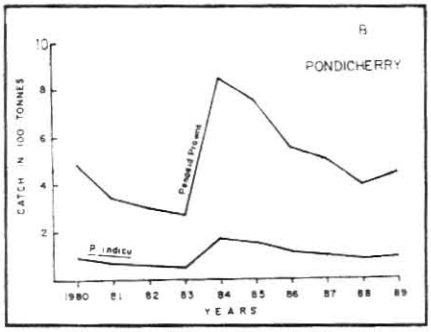

Fig. 3D. Annual landings of *P. indicus* and penaeid prawns in Pondicherry

At Cuddalore during 1986-'87 and 1987-'88 *P.indicus* formed about 8.4% and 7.7% of the trawler prawn landings respectively. In 1986-87 the landings were better during August - February while in 1987 - 88 the fishery reached peaks in July and December - January. The December - January peak was unprecedented in that the landings amounted to 31t almost forming 60% of the annual landings. Males of 93-168 mm and females of 93-188 mm were represented in the landings with males of 105-153 mm and females of 113-168 mm forming the mainstay of the fishery (Fig. 3E).

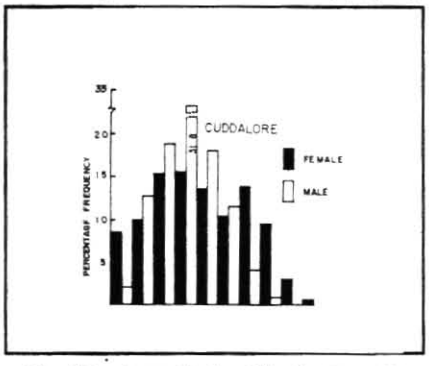

Fig.3E. Annual length frequency distribution of *P.indicus* in trawler landings at Cuddalore

At Madras during 1988-89 and 1989-90 *P. indicus* formed about 14.4% and 11.9% of the trawler prawn landings respectively. Although the species formed an important component of the trawler fishery throughout the year the major season was observed during June - December of both the years. Males of 113-183 mm and females of 113-203 mm were observed in the landings with males of 118-168 mm and females of 123-193 forming the mainstay of the fishery.

The fishery for *P. indicus* along the Kanyakumari - Manappad Coast represents an unique phenomenon (George and Mohamed, 1967; Manisseri and Manimaran, 1981; Manisseri, 1988; Rajamani and Manickraja, 1990). The fishery is highly seasonal commencing from May - June and closing by October - November. The fishery commences by the onset of monsoon and is constituted by large sized males of 150-180 mm and females of 150-190 mm. During this short period, a hectic activity is observed at this region to exploit the seasonal fishery as a result of the species migrating from Kerala Coast to the Gulf of Mannar. All these workers believe that the population supporting the fishery south of Manappad is different from that of north of Manappad and the former is a spillover of the west coast population. This is supported by the recovery of tagged prawns in the Gulf of Mannar which were released off Cochin.

KERALA

Forming about 4.8% of the prawn landings, *P. indicus* did not contribute much to the prawn fishery of Kerala. The annual landings varied from 688 t in 1981 to 2585 t in 1989 with the average estimated as 1962 t (Fig.4). Almost 90% of these landings are by trawlers, with non-mechanised gear contributing very little (George, 1961; Kurup, 1985) except along the Trivandrum Coast, where gill nets land appreciable quantities in the monsoon months (Manisseri, 1988). George *et al.* (1963) found the maximum abundance of the species during January - April in the trawler landings at Cochin, although the species was observed throughout the year. Kurup and Rao (1974) studying the species from the trawler landings of Ambalpuzha also observed similar seasonal changes in the abundance of *P. indicus*. Males of 113-163 mm and females of 123-168 mm formed the mainstay of the fishery with very little seasonal variations.

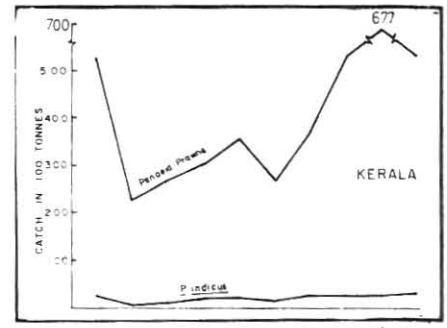

Fig.4 Annual landings of *P.indicus* and penaeid prawns in Kerala

STOCK ASSESSMENT

Rao *et al* (Ms) studied the population dynamics of the species in the east coast assuming that the population is different from that of the west coast. Applying 'relative response' model (Alagaraja, 1984) to the landings data for the period 1980-89, Maximum Sustainable Yield (MSY) has been estimated as 7371 t for the east coast population and 2088 t for the west coast population. The estimates appear reasonable in that the fishery declined sharply following the years of over-explotation. The failure of the fishery during 1985 and 1988 in the east coast was due to excessive exploitation during the preceding years. Similar decline was also observed along the west coast in 1981 and 1985. The heavy exploitation during 1986-89 in the west coast may result in the failure of the fishery in 1990 and 1991.

Rao *et al.* (MS) studied the population dynamics of the species along the east coast. Applying analytical model based on age, growth, natural mortality and fishing mortality, MSY was estimated as 2546 t for males and 3315 t for females. Assuming that the population along the west coast is also having similar biological characteristics, the MSY has been estimated as 3712 t and 4650 t for males and females respectively for both the coasts. Variations in the yield and biomass as a result of changes in fishing mortality are shown in Fig.5. It is seen from the figure that males are exploited at just the optimum level and any increase in the effort will lead to declined yeild. In the case of females

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the effort is more than 40% of what is needed to land the MSY level of landings indicating a wastage of effort. The combined estimate for males and females is 8362 t for both the coasts. The present estimate is lower by 1097 t than the MSY estimate obtained by the relative response model. Since the analytical method takes into consideration both the biological charactersitics and the fishery characteristics for the population estimates, it is more precise than the other method and hence desirable to take these estimates for the policy decisions in the management of the fishery.

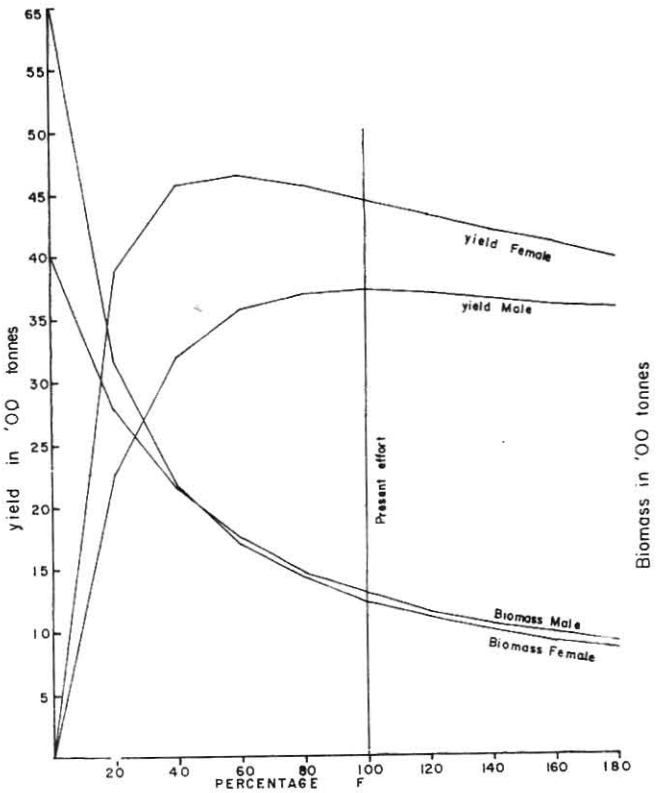

Fig. 5 Relationship between fishing mortality and yield and biomass for *P.indicus*

GENERAL REMARKS

It is evident from the above analysis that *P. indicus* is an important resource along the east coast and the south west coast not only in the inshore waters, but also in estuaries and backwaters. Although time series data are lacking in respect of most of the estuaries to show that the estuarine fishery declined in recent years. The data available for the Godavari Estuary and the Chilka Lake clearly indicate this fact. The fishery declined in most of the estuaries, because of human interference in the form of agriculture, reclamation for housing and industries. Some of the worst affected are the Adayar Estuary, the Cochin Backwater, the Godavari Estuary and the Chilka Lake. Pollution in the form of industrial effluents, agricultural pesticides and domestic sewage is highly deteriorating the estuarine ecosystem which is the habitat for the juvenile *P. indicus*. The more recent threat to *P. indicus* is the prawn farming. This is affecting the natural population in two directions, one in the form of conversion of estuarine areas into prawn farms depriving the juveniles of their feeding grounds and the other in the form of seed collection. In view of great demand for *P.monodon* seed, seed collectors are destreying enormous quantities of juvenile *P. indicus* which is caught incidentally along with *P.monodon* seed in huge quantities all along the east coast.

The resource in the sea is heavily exploited all along the coast and there is need to reduce the effort for healthy state of the fishery. There is also a need to exploit the resource at optimum size to get better economic and biological advantage out of the resource. For instance much of the resource exploited in Cuddalore area is composed of smaller adults which might not be getting a chance to spawn atleast once in their lifetime. Such a situation may lead to growth overfishing in the near future and recruitment over fishing in the long run. The capture of smaller size groups is due to either the nature of very small mesh size of the cod end or due to fishing in very shallow waters where smaller size groups predominate the population.

The effort expended in catching females is more by 40% than what is needed to catch them at MSY level. Hence it is better to reduce the number of boats and increase the mesh size of the nets wherever it is necessary. Since the gear in question is exploiting a multispecies fishery a strategy has to be worked out so that some smaller species viz. *M.dobsoni* are not lost to the fishery if the mesh size is increased to reduce fishing mortality of *P.indicus*. Disco net is another gear that spells doom to *P. indicus* in Tamilnadu and Andhra Pradesh. In the traditional gill nets only bigger sized *P. indicus* are caught, while in the Disco net very small prawns are also caught in considerable numbers and do not give a chance to grow to bigger size. Very heavy landings of *P. indicus* in 1986 and 1988 in Andhra Pradesh and in 1989 in Tamil Nadu were mostly due to this gear. Another aspect of Disco net operation is its near-shore exploitation where juvenile *P. indicus* is more abundant

It is high time that we take cognizance of all these facts and implement proper management measures to harvest the resource at optimum level so that the population gives a continuous yield year after year. This can be acheived only by either reducing the effort or by increasing the mesh size or both, based on the situtation at different areas along the coast.

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Vasanthi Marine Harvests: Claims Disease Free Shrimp Production.

There is a refreshing news that Vasanthi Marine Harvests Ltd, located in Guntur district of A.P. could harvest from a two ha area its first crop of shrimp (disease free) each shrimp weighing around 35 g. The company has a 20 ha farm, and it plans to harvest the remaining 18 ha soon. This claim of harvesting disease-free shrimp is made when almost all the other farms reported virus attack on shrimp.

According to Mr. P.Krishnamraju, Managing Director of the company, the secret of their success is attributable to low rate of stocking and meticulous water management. Further the farm is located 4.5 metres above the water supplying creek level. They also have the advantage of not having any other shrimp farm near.

Mr. Raju is understood to have said that they were having plans of taking up crab culture on an experimental basis. The company would also set up a shrimp hatchery close to the farm site.

Rank Aqua to Supply Shrimp to Japanese Supermarket

It is learnt that Rank Aqua Estates has recently signed an agreement with a Supermarket Chain Stores of Japan for supplying shrimp. While a trial shipment has already been made, regular export is expected from June 1995, it is learnt.

The Company managed to escape the onslaught of shrimp viral disease in their cultured shrimp, it is stated. This they could manage by harvesting shrimp each weighing around 20-25 g each. It is stated that the company has registered a sales turnover of Rs. 63 crores and a net profit about Rs. 8.7 crores in 1994-95. The exact position is, however, not known.

COASTAL ANDHRA SHRIMP HATCHERIES CONSORTIUM

The above consortium has set up sales centres at various centres in A.P, it is stated. The consortium has invited hatchery owners to join the consortium and be a partner in cash central shrimp seed sales network.

According to the consortium, booking can be made at Visakhapatnam - 20 (30-9-20, Sarada street, Dabagarden); Bhogapuram, Vijayanagaram Dist. (Payakarao Raju Bhavan); Rajahmundry - 1 (First Floor, Surya Complex, Main Road); Nowdur, Nowdur Junction, West Godavari Dt. (Mr. Dandu Subbaraju); Kakinada - 4 (4-327, 4th Road, Gangaraju nagar); and at Nellore - 3 (First Floor, 24/885, J.V.Reddy building, Near Police Ground, Dargamettа).