Marine Prawn Production in Low Energy Fishing sector of Indian Coast - present trend and future prospects

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During the 1985-89 period, prawn landings in low energy fishing sector amounted to an annual average of 82800 tonnes. This forms over 40%of the total prawn landings in the country. Fixed bag nets, seine nets and bottom-set gill nets operated from mechanised as well as non-mechanised country crafts are the major gear employed in this sector contributing to about 77% ,17% and 4% of the landing respectively. Statewise % contribution by various gear are detailed while bag net catches are predominantly constituted by less valuable species of non-penaeid prawns, the catches of seine nets and gill nets comprise mainly of penaeid prawns that fetch better economic returns to the fishermen. Gill net catches are the most profitable ones as they are predominantly supported by prawns of the *Penaeus* group which carry high unit value.

Percentage contribution of low energy fishing sector to the total prawn landings in India has gone down from 47.8 in 1980 to 40.7 in 1985-89 periods. The degree of decline inthis sector is found to be on the highest order along the middle and upper east coast. Measures for conservation of prawns in the coastal zone and improving the prawn landings of the low energy fishing sector are discussed.

Prawns form an important source of income generation for the traditional fishing sector, its earnings could be enhanced considerably by improving the prawn catch, in quality as well as quantity, through appropriate low-energy fishing techniques. This paper discusses the present status of marine prawn production in India by low energy fishing methods and identifies the problems and future prospects of this sector.

The catch data used for the study was obtained from the National Marine Living Resources Data Centre(NMLRDC) and the biological data from the Crustacean Fisheries Division of this Institute as well as from published accounts. Gear-wise landings of prawns for the last five years, 1985 to 1989, have been analysed in detail, and the annual production compared with the previous five years' (1980-84) landings. A general account of the fishery existing prior to this period (1978) was given by George and Suseelan (1980). The observations on artisanal prawn fisheries reported by Kunju (1956), George(1961), Ramamurthy (1965), George & Mohamed (1966), Rao (1979), Rajan *et al.*(1982), Dan(1983), Mary Manissery (1983), Sukumaran & Nandakumar (1983), Joel & Ebenezer (1985), Lalithadevi (1985), Sukumaran(1987), Arvindakshan & Karbhari (1988), Nandakumar (1988), Sukumaran *et al.*(1988), Manickam *et al.*(1989), Sankaralingam (1989), Sivadasan & Balasubramanian (1989), Suseelan *et al.* (1989), Rajamani & Manickaraja (1990), Balasubramanian *et al.* (1991) and others provide information on the composition and magnitude of catches, biology, migration and population characteristics of important species at different centres of Indian coast.

Low Energy Fishing Methods for prawns

Almost all types of fishing by the indigenous craft and gear carried out at present for catching prawns in the traditional fishing sector can be considered as

low energy fishing methods. Ramamurthy and Muthu (1969) have described in detail the various fishing methods employed in the shrimp fishery of Indian coast. The distribution of different types of gear operated in more recent years has been given by George & Suseelan (1980). There are three major types of gear in operation, namely, fixed bag nets, seine nets and gill nets, depending on the mode of their operation. These nets are operated with the help of mechanised as well as non-mechanised country craft such as catamarans,canoes and plank-built boats of varying sizes and designs. Through the programme of motorisation majority of the indigenous crafts engaged in this fishery are powered by inboard or outboard engines now. The mechanisation involved is meant only for propulsion of the craft and not for the actual fishing operation.

Fixed bag nets are the most common gear used in Maharashtra and Gujarat coasts and in the Upper East coast where the nets are operated against the flow of tide. In the former region, the large size bag nets locally known as 'Dol' nets are operated between 15 and 40 m depth, with maximum fishing off Bombay and Nawabundar. Smaller stake nets, mostly operated from non- mechanised boats, are extensively used in the shallow coastal waters and tidal creeks throughout this region. The bag nets operated in West Bengal and north Orissa coasts are also of smaller size and constitute the most important gear for prawn fishing in the deltaic regions, tidal creeks and estuaries. The cod-end mesh size of the 'Dol' nets is around 10 mm, while that of the smaller nets range from 5 mm to 10 mm in both west and east coasts. The peak fishing seasons are November-February in Gujarat, October-December and March-May in Maharashtra and November-January in the upper east coast.

Boat seines and shore seines of various types are widely used in the southern coast and throughout the east coast since ancient times. The former type is operated upto a depth of about 20 m, and forms the most important device employed for prawn fishing in the artisanal sector of Kerala, Tamil Nadu and Andhra Pradesh. In the south-west coast, certain new types of seine nets have been introduced in recent years, which have proved to be more efficient than the conventional boat seines for exploiting fish and prawns from the coastal waters. These are the 'Mattu bale' of Karnataka and 'Ring seines' of Kerala coasts introduced in 1984 and 1985 respectively. The 'Mattu bale' is a miniature version of purse seine net measuring about 240 m in length, 10-12 m in width and having a mesh size of 11-18 mm, and is operated from two canoes fitted with outboard engines. It is operated in large numbers along the Mangalore coast during July-September. The ring seine is also like 'Mattu bale' and is operated in Kerala coast during the southwest monsoon season and has almost replaced the conventional boat seine 'Thanguvala' the principal gear used for Mud bank fishery (Chaakara) for ages. 'Thallu valai, of Palk Bay area is more like a small trawl net without otter boards (Manickam *et al.*, 1989). It varies in length from 10 to 18 m, with cod-end mesh size ranging 5-25 mm. The net is operated from non-mechanised plank-built boats using sails and wind energy for propulsion and dragging the net. Fishing is generally carried out during night in the shallow seagrass beds lying between 3 and 4 m depth and peak fishing takes place during October-December. Smaller nets of the same design are also operated in large numbers by tying the net to hip and dragging it along the bottom very close to the shore by two persons. Boat seines and shore seines having mesh size ranging 5-20 mm (mostly 10-12mm) at cod-end are the most common gear used for prawn fishing in Andhra and South Orissa Coasts. In general, peak fishing is February-May and August-October.

In recent years the wide-spread introduction of bottom-set gill nets for catching large size prawns has taken place. In order to improve the efficiency of such selective fishing for prawns, single layered nets are replaced by the tripple-walled trammel net popularly known as 'Disco vala'. In Tamil Nadu the disco net was first introduced in the Kanyakumari District coast in 1984, and soon it became very popular on account of its impressive performance for entangling prawns. The net is operated from catamaran by one or two persons at depths upto 35 m. At present the disco net is the most common gill net operated for prawns along the coasts of Trivandrum and Kanyakumari districts on the southwest coast and almost throughout the east coast. The peak season for gill net fishing falls generally between June and November.

Important species and their abundance

The important species of prawns contributed by low energy fishing and the maximum sizes attained by them in the marine environment are shown in Table 1. Non-penaeid prawns account for about three-fourth of the prawn catch in the bag net fishery of which *A.indicus* forms about 40-50% in Gujarat and 60-75% in Maharashtra and West Bengal. At Bombay, the *Acetes* catch landed by 'Dol' nets is reported to include *A.indicus* and *A.johni* (Aravindakshan & Karbhari, 1988). Among the other non-penaeid prawns *N.tenuipes* and *E. ensirostris* are almost equally represented in the fishery of Gujarat, while in Maharashtra the former species is more abundant (15-35%) than the latter (1-4%). The penaeid component of bag net fishery include predominantly *S. crassicornis*, *M. brevicornis*, *M.kutchensis* ,*P.stylifera* and *P.sculptilis* in the northwest coast and *M. brevicornis* , *P.sculptilis* and *Penaeus* spp. in the upper east coast.

Table 1. *Important species of prawns contributing to the catches of low energy fishing sector of Indian coast and their maximum sizes attached in sea*

Name of species	Maximum size (mm)
Penaeid	
Metapenaeus affinis	186
M.brevicornis	132
M.dobsoni	130
M.kutchensis	206
M.monoceros	202
M.moyebi	110
Parapenaeopsis hardwickii	135
P.sculptilis	170
P.stylifera	145
Penaeus indicus	230
P.merguiensis	240
P.monodon	365
P.semisulcatus	250
P.penicillatus	210
Solenocera crassicornis	140
Non-penaeid	
Acetes indicus	40
Exhippolysmata ensirostris	80
Exopalaemon styliferus	90
Nematopalaemon tenuipes	80

The prawn fishery of seine nets is mainly supported by penaeid prawns except in Andhra Pradesh where both penaeid and non-penaeid prawns contribute in sizable quantities. In the southwest coast, *M.dobsoni* forms the mainstay of the fishery, the rest of the catch being contributed by *P.indicus*,*P.stylifera* and others. During the southwest monsoon period, species like

M.dobsoni and *P.indicus* tend to concentrate in the nearshore waters and form lucrative fisheries. The heavy catches of prawns obtained by 'Mattu bale' in south Karnataka coast and ring seines in Kerala coast (particularly in the 'Chaakara'fishery) during this period are constituted by large size *M.dobsoni*. On the Tamil Nadu coast, juveniles of *P.semisulcatus* are caught in enormous quantities by 'Thalluvalai' in the Palk Bay and Gulf of Mannar, and they form about 80-100% of the prawn catch. North

Table 2. *Trend in five yearly average production of prawns in the low energy fishing sector (LEF) against total marine prawn landings in India, 1980-89*

Region		Landings in tonnes 1980-84	1985-89
North West Coast (Gujarat & Maharashtra)	Total	92013	112938
	LEF	58286	62587
	% of LEF in total	63.3	55.4
South West Coast (Goa, Karnataka & Kerala)	Total	43665	59472
	LEF	8714	11166
	% of LEF in total	20.0	18.8
Upper East Coast (Orissa & West Bengal)	Total	5383	4392
	LEF	3877	2213
	% of LEF in total	72.0	50.4
Middle East Coast (Andhra Pradesh)	Total	11852	9760
	LEF	5525	3050
	% of LEF in total	46.6	31.1
Lower East Coast (Tamil Nadu & Pondicherry)	Total	14307	16419
	LEF	3463	3580
	% of LEF in total	24.2	21.8
All India	Total	167220	202981*
	LEF	79865	82596*
	% of LEF in total	46.8	40.7

*Excluding 204 t from Andamans

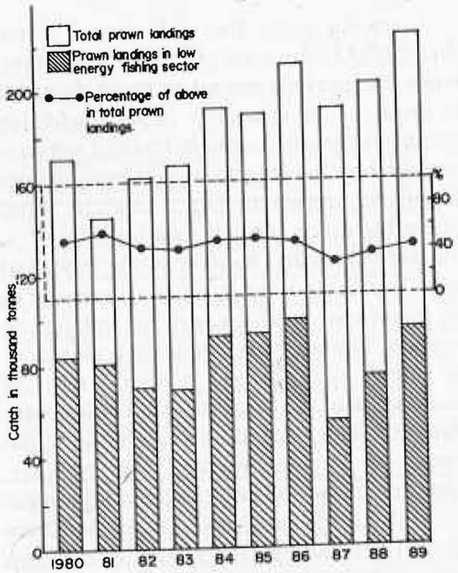

Fig. 1. Marine Prawn Production

of Palk Bay, however, *M.dobsoni* again dominates in the fishery. In Andhra coast, the seine net catches are dominated by *M.dobsoni*(50-70%), *M.brevicornis*, *M.monoceros*, *P.indicus* and *P.stylifera* among penaeids and *A.indicus* (50-70%), *N.tenuipes* and *E.ensirostris* among non-penaeids.

The gill net fishery (including trammel net) is characteristically dominated by the larger varieties of penaeid prawns.*Penaeus* sp. account for the bulk of the fishery, the most predominant ones being *P.indicus* and *P.merguiensis*. In the north west coast, *P.merguiensis*, *P.penicillatus*, *P. sculptilis*, *M. monoceros* and *M.affinis* are the common species encountered in the catch. While *P. merguiensis* forms the major catch (70-80%) between Goa and north Karnataka, *P.indicus* constitutes almost the entire fishery (80-100%) of south Karnataka, Kerala and Tamil Nadu coasts. In Andhra coast, gill nets of varying mesh sizes are used and

Table 3. *Statewise break-up of prawn landings in tonnes, by low energy fishing methods (LEF) against total prawn landings, 1985-89*

Maritime states & Union Territories	1985 Total	1985 LEF	1986 Total	1986 LEF	1987 Total	1987 LEF	1988 Total	1988 LEF	1989 Total	1989 LEF	Average Total	Average LEF
Gujarat	19848	10446	24343	12954	22907	5565	23738	11374	47183	22471	27604	12562
Maharashtra	106973	69214	103728	63116	69772	33535	67756	39553	78440	44708	85334	50025
Goa	3496	45	4695	64	5795	19	3963	24	4618	78	4513	46
Karnataka	4584	72	5285	373	9374	553	8690	1000	8568	1820	7300	764
Kerala	26887	3449	37292	12168	53125	5698	67658	13251	53335	17212	47659	10356
Tamil Nadu	11471	1827	15842	3966O	18219	4775	16893	3296	16938	3428	15873	3458
Pondicherry	762	288	602	116	508	42	399	129	461	32	546	122
Andhra pradesh	8842	3080	14048	4297	7721	1698	9129	3272	9060	2905	9760	3050
Orissa	2872	493	3055	635	2298	517	2022	138	2462	113	2542	379
West Bengal	3106	3106	1515	1511	980	967	19328	1925	1712	1600	1850	1834
Andamans	201	201	211	211	87	87	310	310	213	213	204	204
All India total	189042	92221	210616	99411	190786	53456	202496	74272	222990	94640	203186	82800

the major species caught include *P.indicus* (60-90%), *M.brevicornis*, *P.monodon*, *P.merguiensis*, *P.semisulcatus* and *M.affinis*. In the Orissa coast also *P.indicus* accounts for about half of the gill net catch, the rest being contributed mainly by *P.merguiensis*, *P.monodon* and *M.affinis*.

Review of production trend

Analysing the data for the year 1978, George & Suseelan(1980) made the first attempt to assess the gear-wise production of prawns in Indian coast. According to them, the gear operating in the traditional fishing sector accounted for about 49% (87,300 t) of the total prawn landing during that year. In order to understand the subsequent trend in prawn production of this sector (treated here as the production of low energy fishing sector), the relevant catch data for the period 1980-89 have been complied and the annual production trend shown in Fig.1. In terms of percentage contribution of this sector to the all India prawn landings, the trend showed a gradual diminishing tendency over the years.

Table 2 gives a comparative statement of the average production of prawns in the low energy fishing sector against the total prawn landings of India for two five-yearly blocks, 1980-84 and 1985-89, region-wise as well as on all-India level. A scrutiny of the region-wise production trend would reveal that prawn landings in the low energy fishing sector increased from 1980-84 period to 1985-89 in the northwest region by about 4300 t, southwest region by about 2500 t and in the lower east coast by about 100 t. In the middle and upper east coasts, however, the production declined by about 2500 t and 1700 t respectively. A noteworthy change that has become evident from the present analysis is that the percentage contribution of low energy fishing sector to the total prawn landings has gone perceptably in all the maritime regions of India during the last five-year period. The degree of decline in prawn production in this sector appears to be on the highest order along the middle and upper east coast.

Pattern of prawn fishery during 1985-89

Statewise production

The statewise break-up of prawn landings in the low energy fishing sector and the corresponding total prawn landings for the period 1985-89 are given in Table 3. Con-

tributing over 60% of the landings, Maharashtra ranked top in this fishery, followed by Gujarat (15.2%), Kerala (12.5%) Tamil Nadu (4.2%), Andhra Pradesh (3.7%) and West Bengal (2.2%) among important states. In Gujarat as much as 53% of the catch was contributed by non-penaeid prawns. In Maharashtra, over 78% of prawn catch was constituted by non-penaeid prawns. The prawn catch in Goa by indigenous gears was extremely poor (46 t) as the fishery for this resource was mainly trawl based. The fishery was almost entirely supported by penaeid prawns in Kerala, Karnataka, Tamil Nadu, Pondicherry and Orissa. In Andhra Pradesh major portion was contributed by penaeid prawns (67%) and the rest by non-penaeids. In West Bengal, almost the entire prawn landing came from low energy fishing sector and the catch consisted predominantly of non- penaeid prawns. In Andamans also only indigenous fishery existed for prawns and the entire catch was supported by penaeid prawns.

Gear-wise production

The contribution of different types of gears employed in the low energy fishing sector varied considerably in quality as well as quantity. The gear-wise break-up of the average prawn landings and the annual trends in production of prawns by each of the gears for the period 1985-89 are given in Tables 4 to 7 and the group-wise break-up by different gear in Table 8.

Fixed bag nets: These nets accounted for the major share of prawn catch in Maharashtra, Gujarat and West Bengal. The general trend in total prawn production of low energy fishing sector in these states outlined in the preceding pages was set by this gear (Table 5).

Seine nets: Formed the major source of prawns to the low energy sector in Kerala, Tamil Nadu and Andhra Pradesh. Among the different types of seines operated in the country, maximum prawn landing came from boat seines (10.1%) and the rest from ring seines and 'Mattu bale' (5.1%) and shore seines (2.4%). In Karnataka although the magnitude of the fishery was relatively very low (600 t) in this sector, about 80% of the catch was contributed by seine nets. In Kerala landings were mainly by boat seines and ring seines. In Tamil Nadu, the

Table 4. *Average annual prawn landings in tonnes by different types of gear operated in the low energy fishing sector 1985-89*

Maritime states & Union Territories	Fixed bag nets	Boat seines	Shore seines	Ring seines/ Mattu bala	Gill nets	Other types	Total
Gujarat	12512.2	-	-	-	48.2	1.6	12562
Maharashtra	49634.2	-	-	-	333.4	57.6	50025
Goa	-	-	5.6	-	15.2	25.2	46
Karnataka	-	2.6	92.4	515.8	53.8	99.0	764
Kerala	-	5026.6	128.8	3677.7	1160.6	362.0	10356
Tamil Nadu	-	2424.4	646.0	-	226.0	162.2	3458
Pondicherry	-	2.2	-	-	4.2	115.3	122
Andhra Pradesh	-	879.4	1083.8	-	1041.0	46.2	3050
Orissa	151.4	30.4	1.2	-	191.8	4.8	379
West Bengal	1812.4	-	8.4	-	13.2	-	1834
Andamans	-	-	-	-	-	-	204
Total	64110	8465	1966	4194	3087	874	82800
%	77.40	10.10	2.40	5.10	3.70	1.10	

Table 5. *Annual prawn landings (C) in tonnes and statewise percentage contribution of fixed bag nets, 1985-89*

Maritime states & Union Territories	1985 C	%	1986 C	%	1987 C	%	1988 C	%	1989 C	%	Average C	%
Gujarat	10323	12.6	12867	16.5	5564	14.0	11374	21.6	22433	32.8	12512.2	19.5
Maharahstra	68486	83.6	62874	80.8	33277	82.6	39126	74.5	44408	64.9	49634.2	77.5
Goa	-	-	-	-	-	-	-	-	-	-	-	-
Karnataka	-	-	-	-	-	-	-	-	-	-	-	-
Kerala	-	-	-	-	-	-	-	-	-	-	-	-
Tamil Nadu	-	-	-	-	-	-	-	-	-	-	-	-
Pondicherry	-	-	-	-	-	-	-	-	-	-	-	-
Andhra Pradesh	-	-	-	-	-	-	-	-	-	-	-	-
Orissa	11	-	627	0.8	5	-	114	0.2	-	-	151.4	0.2
West Bengal	3104	3.8	1467	1.9	955	2.4	1925	3.7	1611	2.3	1812.4	2.8
Total	81924		77835		39801		52539		68452		64110	

seine net landings were contributed mainly by boat seines and 'Thallu valai'and the rest by shore seines. According to Manickam et al. (1989) 95% of the prawn landing from "Thallu Valai" was constituted by juveniles of *P.semisulcatus* in the size range 31-100 mm. In Andhra Pradesh, shore seines accounted for the major share of prawn catch. In general, penaeid prawns formed the mainstay of the prawn fishery of seine nets (92%). The landings of 'Mattu bale' and ring seines were exclusively constituted by penaeid prawns. In boat seines, their proportion ranged from 96 to 100% in different maritime states, except in Andhra Pradesh where penaeid and non penaeid prawns was represented in the ratio of about 60:40 respectively. In shore seines also penaeid prawns formed the major component of the catch in most regions of Indian coast except in Andhra coast where non-penaeid (59%) dominated over penaeid (41%) in the landings.

Gill nets : On an average, about 3100 t of prawns of the highest quality were exploited by gill nets, of which as much as 96% was constituted by penaeid prawns. In all the important states gill net prawn landings showed a sharp decline from the year 1988 to 1989.

Evaluation of present status

The foregoing account of the prawn fishery clearly indicates that, inspite of the many innovations taken place in the traditional fishing sector, no significant contribution has been set by this sector in augmenting the overall prawn production of the country. The present analysis of the fishery shows that the average annual landing from this sector stood at about 80,000 t for the 1980- 84 period and 83,000 t for the 1985-89 period. This increase of 3000 t is too nominal when compared to the handsome increase of about 33,000 t recorded by the mechanised fishing sector. The situation becomes more clear when the percentage contribution of the traditional sector to the total prawn landing is considered. The annual production of the traditional sector, which was 48.9% in 1978 (George& Suseelan, 1980) fell to an average of 47.8% in 1980-84period and then to 40.7% in 1985-89 period. Looking at the catch trends of the different regions of the coastline (Table 2) it becomes apparent that change in prawn production occurred at varying levels in dif-

ferent regions. Though the total prawn landing in this sector increased marginally in some of the regions, its percentage contribution to the total prawn landing has uniformly declined throughout the Indian coast.

Problems and prospects

The marine capture fishery is becoming more and more industrilaised even in the small-scale sector, promotion of low energy fishing to augment fish production at lesser cost would be a meaningful proposition. The coastal shrimp fishery of India is facing an array of multifarious problems. Some of the relevant ones are discussed below.

1. Decline in coastal shrimp stocks

The shrimp fishery of India has already attained the maximum production level as a result of the fast developing tempo of mechanised fishing. The present study clearly reveals that the production of prawns in the traditional sector has deteriorated considerably over the past few years, while the mechanised fishing sector has maintained increased landings in some of the regions. Among the many reasons for the decline in the catches of the traditional sector, the most probable is the limitation of the shrimp resources in the inshore waters and the concentrated fishing for the same by trawlers. Reports of the occurrence of strictly coastal pelagic shrimps like *Acetes indicus* in significant quantities in the trawl fishery at centres like Kakinada in Andhra Pradesh (Rao *et al.*, 1980) are evidences showing operation of the mechanised vessels in areas traditionally occupied by the artisanal fishery. In the northeast coast, the big trawlers licensed for deep-sea fishing operate on the inshore waters less than 20 m depth (Rao, 1987). The trawlers have prospered at the expense of the traditional sector leading to the decline of catch of the latter. This situation is gravely felt in the middle and upper east coasts where the prawn production of both the sectors have suffered severe decline during the 1985-89 period.

2. Destructive fishing of young prawns

Many species of penaeid prawns contributing to the marine fishery spend their juvenile phase in estuaries and backwaters where they are exploitated in large quantities. As this brackishwater population constitutes an important source of recruitment for the inshore stock, their heavy destruction in such nursery grounds is an important threat to the coastal fishery. In the sea also, large scale destruction of young prawn is caused by the operations of small meshed trawl nets and seines. The most damaging fishing method the marine capture fishery has witnessed in recent years is the operation of 'Thallu valai' in the Palk Bay area. Enormous quantities of early juveniles of *Penaeus semisulcatus* are fished out by this net along with destruction of large areas of seagrass beds which form the ideal habitat of the young prawns. All these uncontrolled fishing activities are causing deleterious effects on the coastal shrimp resources.

Table 6. *Annual prawn landings (C) in tonnes and statewise percentage contribution of seine nets*, 1985-89*

Maritime states & Union Territories	1985		1986		1987		1988		1989		Average	
	C	%	C	%	C	%	C	%	C	%	C	%
Gujarat	-	-	-	-	-	-	-	-	-	-	-	-
Maharashtra	-	-	-	-	-	-	-	-	-	-	-	-
Goa	-	-	-	-	-	-	-	-	28	0.1	5.6	0.1
Karnataka	16	0.2	28	0.2	387	4.1	856	5.4	1767	7.7	610.8	4.2
Kerala	3136	43.0	10420	61.1	4063	43.2	10546	66.3	16000	69.6	8833.0	60.8
Tamil Nadu	1735	23.8	3654	21.4	4014	42.7	2728	17.2	3233	14.0	3070.0	21.1
Pondicherry	-	-	-	-	-	-	-	-	11	0.1	2.2	-
Andhra Pradesh	2308	31.6	2941	17.3	888	9.4	1773	11.1	1906	8.3	1963.2	13.5
Orissa	100	1.4	1	-	53	0.6	-	-	2	-	31.2	0.2
West Bengal	-	-	-	-	-	-	-	-	42	0.2	8.4	0.1
Total	7295		17044		9405		15903		22979		14525	

* Include boat seines, ring seines/mattubala and shore seines

Table 7. *Annual prawn landings (C) in tonnes and statwise percentage contribution of gill nets, 1985-89*

Maritime states & Union Territories	1985		1986		1987		1988		1989		Average	
	C	%	C	%	C	%	C	%	C	%	C	%
Gujarat	115	5.3	85	2.8	1	-	-	-	38	1.5	48.2	1.6
Maharastra	728	33.7	242	7.8	258	8.0	427	9.6	12	0.5	333.4	10.8
Goa	7	0.3	1	-	11	0.3	7	0.2	50	2.0	15.2	0.5
Karnataka	56	2.6	-	-	158	4.9	2	-	53	2.1	53.8	1.8
Kerala	99	4.6	1370	44.2	965	29.9	2157	48.6	1212	48.2	1160.6	37.6
Tamil Nadu	1	-	120	3.9	550	17.1	424	9.5	35	1.5	226.0	7.3
Pondicherry	-	-	-	-	-	-	-	-	21	0.8	4.2	0.1
Andhra Pradesh	771	35.7	1227	39.7	810	25.1	1414	32.1	973	38.7	1041.0	33.7
Orissa	382	17.7	7	0.2	459	14.3	-	-	111	4.4	191.8	6.2
West Bengal	2	0.1	44	1.4	12	0.4	-	-	8	0.3	13.2	0.4
Total	2161		3098		3224		4441		2513		3087	

3. Dominance of uneconomic species in the fishery

The fishery of fixed bag nets operating in the northwest and northeast coasts of India is largely supported by non-penaeid prawns, more particularly by the tiny shrimp *Acetes*, which are of low economic value. The first and foremost measure that seems appropriate to overcome these problems is to step up the productivity of the inshore fishing grounds by restricting the operation of destructive fishing nets like 'Thallu valai' in Tamilnadu coast, increasing the mesh sizes of non-selective gears operating in the mechanised as well as traditional fishery, regulating fishing operations in estuaries and backwaters for juvenile prawns etc. would improve the inshore prawn resources.

In the gill net fishery, the catch can be increased by taking advantage of shoaling behaviour and migration of prawn. Taging experiments and fishery surveys conducted by the CMFRI have shown that *P.indicus* performs large scale migration from kerala coast to Gulf of Mannar skirting round Cape Comorin as a result of environmental changes during the monsoon period. Similar kind of migration, though for shorter distances, is also reported for *P. merguiensis* in the Karnataka Coast (Nandakumar, 1988). These migrating stocks can be best exploited using the gill nets/ trammal nets. Operation of trammel nets will be worth encouraging throughout the Indian coast.

Table 8. *Average composition of penaeid and non-penaeid groups in the prawn landings of important gear operated in the low energy fishing sector, 1985-89*

Gear	Penaeid Catch (tonnes)	%	Non-penaeid Catch (tonnes)	%	Total Catch (tonnes)
Fixed bag nets	17135	26.7	46975	73.3	64110
Boat seines	7845	93.8	520	6.2	8365
Shore seines	1268	64.5	698	35.5	1966
Ring seines	4194	100.0	-	-	4194
Gill nets	2968	96.1	119	3.9	3087
Total	33410		48312	59.1	81722
%	40.7				

Proper shrimp fishing technology is lacking in the traditional sector to exploit the strictly bottom dwalling species like 'Karikkadi' (*Parapenaeopsis stylifera*) in comparatively deeper waters, say 15-20 m depth, where trawlers are not permitted to operate due to management restrictions. Suitable gear technology has to be developed in order to extend the operational range of the motorised sector involved in prawn fishing for the fuller utilisation of our resources.

The 'Dol' net operation can be made more profitable if the penacid component of the fishery is increased. This can be achieved by extending the 'Dol' net operation to deeper waters.

It may be seen from the above that there is ample scope for developing the inshore prawn fishery of Indian coast by low energy fishing and improving the economy of the traditional fishing sector. The success of this largely depends on an efficient machinery for judicious management and conservation of the coastal resource.

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