

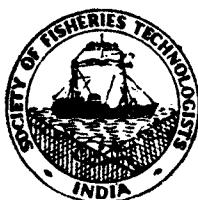
Man Power and Fishing Equipment Available and the Exploited Fishery Resources in the Coastal Waters of India

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Man Power and Fishing Equipment Available and the Exploited Fishery Resources in the Coastal Waters of India

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Information on the marine fishery resources is a pre-requisite for planning and development of harvest and post-harvest technology. In the country, there are about 2400 marine fishing villages and 1400 landing centres. The total marine fishermen population is about 2.12 million. Among them 23% are active fishermen. There are about 19,000 mechanised fishing craft of which 60% are trawlers, 21% gill-netters, 15% dol-netters and 2% purse-seiners. The non-mechanised fishing craft in the country are about 0.14 million. Of them, the major constituents are catamarans* (52%), plank built boats (28%) and dugout canoes (19%). There are about 26,000 trawlnets and 460 purse seines. In the non-mechanised category, there are about 30,000 boat seines and 66,000 fixed bag nets.

The total marine fish production in India varied from 1.25 to 1.39 million tonnes during the three year period 1979-81, the average catch being 1.33 million tonnes. A critical study on the state-wise and species-wise landings during the last three years was made and an account of the same is presented, indicating the scope for development of harvest and post harvest technologies.

A strong information base regarding inputs such as manpower, craft and gear and infrastructure facilities in the marine fisheries sector is essential for proper planning of developmental programmes. Data on number of marine fishing villages, landing centres and transport and other basic amenities available in these villages are also required to understand the status of small scale marine fishery sector. For proper appraisal of the resources position of the various exploited fishes, assessment of catch and effort expended together with data on biological and environmental aspects is needed. With these objects in view, the Central Marine Fisheries Research Institute has been conducting quinquennial surveys on fishermen population and related items. Estimation of marine fish landings and the effort expended is being carried out since 1948 by this Institute on a continuous basis following a well developed sampling design. These surveys enable us to understand the status of small scale fishery sector and the exploited and potential fishery resources in the coastal waters. This forms a pre-requisite for planning and development of harvest and post harvest technology.

Manpower resources

As per the census carried out in 1980 (CMFRI, 1981) the number of marine fishing villages and the landing centres along the coast of main land are 2,408 and 1,416 respectively. The number of fishermen households have been found to be about 0.37 million the total marine fishermen population being 2.12 million. Active fishermen form 23% of the total fishermen population. State-

wise break-up of the above information is given in Table-1. It could be seen that the no. of fishermen per km coast line is the highest in Kerala (1,143) followed by Karnataka (418), Tamil Nadu (396), Maharashtra (373), Andhra Pradesh (336), Goa (261), Orissa (244), and Gujarat (125). The number of persons per family for the whole of India works out to 5.7. Among the states, Karnataka records the maximum (7.2). Other states where the family size exceeds the all India average are Gujarat (6.6), Kerala (6.4), West Bengal, Maharashtra, and Goa (5.9 each). However, in the states of Andhra Pradesh (4.5), Tamil Nadu (5.2) and Pondichery (5.5) the family size is less than the all India figure.

Craft and gear

There are about 0.14 million non-mechanised craft in India of which catamarans constitute about 52%, plank built boats 28% and dugout canoes 19%. So far as mechanised boats are concerned there are about 19,000 boats of which trawlers form 60% and gill-netters 21%. State-wise distribution of non-mechanised and mechanised craft and gear are given in Table-2.

The maximum number of mechanised boats is found in Maharashtra (25%) followed by Gujarat (18%), Kerala (16%), Tamil Nadu (15%), and Karnataka (11%). Most of the purse-seiners are found in Karnataka. Maximum number of trawlers are found in Kerala and Tamil Nadu and maximum number of gill-netters are found in Gujarat. Dol-netters are found in Maharashtra and Gujarat.

The largest number of catamarans is found in Tamil Nadu (43%) followed by Andhra Pradesh (30%) and

* Kettumaram — Editor

Table 1. State-wise figures of marine fishing villages and fishermen population in India-1980

	West Bengal	Orissa	Andhra Pradesh	Tamil Nadu	Pondicherry, Karaikal Mahe and Yenam	Kerala	Karnataka	Goa, Daman Diu	Maharashtra	Gujarat	Total*
No. of fishing villages	206	236	453	422	27	304	147	61	373	179	2,408
No. of landing centres	25	46	282	344	23	226	97	39	161	173	1,416
No. of fishermen households	14,169	20,329	72,862	75,721	4,625	99,894	15,638	6,725	38,178	23,075	3,71,216
Fishermen population	83,561	117,144	326,304	395,903	25,312	639,872	112,893	39,912	224,040	152,015	21,16,956
No. of fishermen engaged in actual fishing	19,756	30,724	83,903	96,500	5,512	131,101	25,005	8,871	42,237	36,527	4,80,136

*Excluding Andamans and Lakshadweep

Kerala (16%). As regards plank-built boats, 29% are found in Andhra Pradesh, 23% in Tamil Nadu, 11% in Kerala and 7% in West Bengal. Kerala ranks first with 39% of dugout canoes, Maharashtra coming second (18%) followed by Karnataka (17%), Tamil Nadu (8%) and Andhra Pradesh (7%).

As regards gear, there are about 26,000 trawl nets in the country with maximum number of them in Tamil Nadu (27%) followed by Kerala (20%), Maharashtra (19%), Karnataka (13%) and Gujarat (9%). Out of 30,000 boat seines 32% each is accounted for by Kerala and Andhra Pradesh, Tamil Nadu contributing 24%. Among 66,000 bag-nets major contribution comes from Gujarat (33%) followed by Maharashtra (28%) and Andhra Pradesh (22%).

Marine fish landings

The marine fish landings in India increased from about 0.58 million tonnes in 1950 to 1.42 million tonnes in 1975 thus registering a two and half fold increase. During 1976 to '81 the same varied from 1.25 to 1.40 million tonnes (CMFRI, 1982). Details of state-wise and species-wise average annual marine fish catch for the latest 3 years 1979-81 are given in Table 3. The first four ranking states are Kerala (25%), Maharashtra (21%), Tamil Nadu (17%) and Gujarat (14%).

A brief account of the important fisheries in the different maritime states is given below.

In Kerala, oil sardine formed the most dominant fishery contributing as much as 38% to the States' total landings, followed by penaeid prawns (12%), mackerel (6%), perches and ribbon fish (5% each), cat fishes, lesser sardines and tunnies (4% each). The major contribution to the landings of penaeid prawns came from Sakthikulangara near Quilon where a large number of mechanised boats operate during monsoon months and land heavy catches of 'Karikadi', *Parapenaeopsis stylifera*. The dominant species among perches is *Nemipterus japonicus* which is caught in large quantities by trawlers. Mechanised boats during 1981 landed about 35% of the total catch. Out of the total mechanised catch of about 96,300 t, trawlers, purse-seiners and others landed about 51%, 18% and 31% respectively.

In Maharashtra, *Harpodon nehereus* formed major component of the total marine fish landings constituting about 25%. Non-penaeid prawns is the next important group accounting for 20%. The other groups that contributed significantly to the total landings were penaeid prawns (11%), sciaenids (7%), pomfrets (5%), ribbonfish, catfish and elasmobranchs (4% each). Among non-penaeid prawns landed in this state, *Aceetes indicus* dominated the catches. Some of the important species that contributed to the penaeid prawn landings are *Solenocera crassicornis*, *Metapenaeus affinis* and *Parapenaeopsis stylifera*. The silver pomfret, *Pampus argenteus* is the common species of pomfrets caught in this coast. The mechanised catch during

Table 2. State-wise figures of marine fishing craft and gear in India—1980

	West Bengal	Orissa	Andhra Pradesh	Tamil Nadu	Pondichery, Karaikal, Mahe and Yanam	Kerala	Karnataka	Goa, Daman Diu	Maha-rashtra	Gujarat	Total*
<i>No. of fishing craft</i>											
(a) Mechanised											
Trawlers	—	350	580	2,614	160	2,630	1,553	494	1,726	1,209	11,316
Gill-netters	740	119	—	143	3	362	28	274	715	1,547	3,931
Dol-netters	—	—	—	—	—	—	—	—	2,248	650	2,895
Purse-seiners	—	—	—	—	—	37	325	66	—	—	428
Others	—	—	—	—	—	9	98	74	29	7	217
Total	740	469	580	2,757	163	3,038	2,004	908	4,718	3,413	18,790
(b) Non-mechanised											
Plank built boats	2,770	3,262	11,359	8,957	83	4,376	1,747	1,108	2,445	3,040	39,147
Dugout canoes	88	186	1,781	2,210	72	10,415	4,454	1,397	4,759	1,080	26,442
Catamarans	—	6,276	22,198	31,851	1,595	11,480	23	8	—	—	73,431
Others	—	4	675	325	—	—	718	—	436	—	21,58
Total	2,858	9,728	36,013	43,343	1,750	26,271	6,942	2,513	7,640	4,120	1,41,178
<i>No. of fishing gear</i>											
Trawl nets	—	760	1,068	7,083	397	5,133	3,437	937	4,955	2,291	26,061
Purse-seines	—	—	—	—	—	40	353	70	—	—	463
Drift/gill-nets	1,347	10,427	42,385	1,18,300	18,51	23,307	6,571	3,346	1,63,902	7,383	3,78,819
Boat seines	—	2,676	9,738	7,220	375	9,779	23	165	—	—	29,976
Fixed bag-nets	5,048	2,778	14,617	1,842	152	—	941	430	18,754	21,857	66,419
Hooks and lines	625	15,265	10,752	22,111	720	2,949	1,507	127	10,864	2,376	67,296
Rampans	—	—	—	—	—	—	86	101	207	—	394
Shore seines	411	2,893	3,042	4,549	84	2,926	3,924	987	—	—	18,816
Traps	60	515	130	8,919	9	2,239	—	—	—	86,952	98,824
Scoop nets	345	37	2,925	1,040	362	1,371	—	—	—	—	6,080
Others	2,147	5,201	37,199	6,339	120	2,761	10,925	2,813	49,247	28,013	1,44,765

* Excluding Andamans and Lakshadweep.

Table 3. State-wise average annual catch (in tonnes) during 1979-1981

	West Ben- gal (Cont- tai coast)	Orissa	Andhra Pradesh	Tamil Nadu	Pondi- cherry	Kerala	Karna- taka	Goa	Maha- rashtra	Guja- rat	Anda- mans	Laksha- dweep	Total
1. Elasmobranchs	194	3,771	5,691	13,692	348	6,209	3,168	1,074	9,981	10,972	60	286	55,446
2. Eels	—	9	313	99	36	6	44	20	3,159	4,401	—	—	8,087
3. Catfishes	1,379	3,197	3,462	4,485	77	11,609	7,592	1,403	10,044	6,975	36	—	50,259
4. <i>Chirocentrus</i>	299	1,462	1,070	2,118	117	1,033	182	142	2,226	2,916	32	—	11,597
5(a) Oil sardine	—	—	—	509	—	1,11,162	47,140	4,335	434	—	—	—	1,63,580
(b) Lesser sardines	—	3,038	11,943	29,226	2,025	11,520	4,739	2,188	903	—	213	—	65,795
(c) <i>Hilsa ilisha</i>	652	5,715	71	43	8	9	6	4	873	101	—	—	7,482
(d) Other <i>Hilsa</i>	34	253	1,234	3,120	65	24	136	18	1,079	6,028	31	—	12,022
(e) <i>Anchoviella</i>	410	287	8,633	10,848	380	6,206	4,434	119	172	—	134	—	31,623
(f) <i>Thrissocles</i>	—	317	4,427	5,685	445	1,555	529	761	1,682	958	—	—	16,359
(g) Other clupeids	947	2,033	4,333	3,546	339	731	1,439	340	17,628	7,052	21	—	38,409
6 (a) <i>Harpodon nehereus</i>	706	300	724	3	—	—	7	7	66,399	51,590	—	—	1,19,736
(b) <i>Saurida and Saurus</i>	—	116	1,111	1,359	223	6,032	332	337	1,580	67	—	—	11,157
7. <i>Hemiramphus and Belone</i>	—	25	75	731	30	394	126	7	71	64	49	104	1,676
8. Flying fish	—	7	38	1,722	490	5	18	1	—	—	1	20	2,302
9. Perches	88	205	4,476	6,419	867	15,534	550	552	3,184	2,753	244	298	35,170
10. Red mullets	—	134	486	1,214	169	54	23	25	767	101	—	27	3,000
11. Polynemids	178	1,061	1,212	406	7	28	1	8	1,429	996	—	—	5,326
12. Sciaenids	500	3,449	8,456	17,212	319	4,849	2,714	1,544	17,599	31,699	—	—	88,341
13. Ribbon fish	193	846	10,063	12,169	175	15,240	976	774	10,194	7,892	9	—	58,531
14(a) <i>Carnx</i>	—	366	4,321	4,569	393	6,160	2,207	780	1,255	576	94	46	20,767
(b) <i>Chorinemus</i>	87	493	536	854	20	197	91	85	378	1,417	—	—	4,158
(c) <i>Trachynotus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—
(d) Other carangids	23	51	532	4,676	504	1,124	904	315	613	30	65	35	8,872
(e) <i>Coryphaena</i>	—	—	—	—	—	—	—	—	—	—	—	—	—
(f) <i>Elacate</i>	—	—	—	—	—	—	—	—	—	—	—	—	—
15(a) <i>Leiognathus</i>	43	849	5,757	44,087	801	3,524	2,639	1,561	419	—	152	—	59,832
(b) <i>Gazza</i>	—	—	—	—	—	—	—	—	—	—	—	—	—
16. <i>Lactarius</i>	—	40	901	1,026	28	664	649	575	460	2,357	—	—	6,700
17. Pomfrets	1,359	7,622	2,233	951	115	1,339	455	173	14,055	13,692	16	—	42,100
18. Mackerel	—	465	4,026	4,889	395	17,753	26,495	3,592	677	49	144	—	58,485
19. Seer fish	315	2,175	4,027	5,946	97	4,456	1,951	826	3,353	4,133	135	32	27,446
20. Tunnies	—	105	398	3,755	19	10,504	1,729	429	1,565	773	51	2,263	21,591
21. <i>Sphyraena</i>	—	7	91	1,114	42	540	67	72	44	—	67	12	2,056
22. <i>Mugil</i>	—	8	123	405	27	103	13	77	32	968	105	—	1,861
23. <i>Bregmaceros</i>	—	—	—	—	—	—	—	—	149	523	—	—	672
24. Soles	2	80	1,132	1,954	169	4,638	734	977	1,962	2,252	—	—	13,900
25(a) Penaeid prawns	268	1,795	7,028	10,951	451	34,808	3,958	1,895	30,263	11,357	48	—	1,02,822
(b) Non-penaeid prawns	463	40	3,023	849	56	659	46	—	52,124	4,066	—	—	61,326
(c) Lobsters	—	1	15	223	5	31	42	11	371	400	—	—	1,0,99
(d) Crabs and other crustaceans	7	219	1,441	7,181	217	5,976	4,958	2,003	437	7,433	5	—	29,877
26. Cephalopods	1	56	502	1,687	45	3,199	152	159	2,303	3,855	—	14	11,972
27. Miscellaneous	1,461	1,684	3,864	14,843	567	6,939	10,440	936	6,029	21,326	83	214	68,386
Total	9,609	42,279	1,07,860	2,24,566	10,071	2,94,815	1,31,685	28,125	2,65,892	2,09,772	1,795	3,351	1,329,820

1981 formed about 89% of the total catch. The share of trawler catch in the total mechanised catch was about 21%.

Silverbellies formed the most dominant fishery in Tamil Nadu accounting for as much as 20% of marine fish landings in the State. Lesser sardines ranked next with a contribution of 13%, followed by sciaenids (8%), elasmobranchs (6%), ribbon-fish and penaeid prawns (5% each). The more common species among silver bellies are *Leiognathus jonesi* and *L. bindus*. The share of mechanised catch in the total during 1981 was 48%. Trawlers landed about 98% of the total mechanised catch.

In Gujarat, Bombay duck formed the largest component in the marine fish catches during the period under consideration, its share in the total catch being 25%. Sciaenids formed the next important group (15%) followed by pomfrets (7%), penaeid prawns and elasmobranchs (5%) each. *Protonibea diacanthus* (ghol) and *Oolithoides brunneus* (Koth) are the commercially important species under sciaenids. Here also the silver pomfret, *Pomus argenteus*, is dominant among pomfrets. The landings from mechanised fishing craft formed about 74% of the total catch in 1981. The trawler catch was about 57% of the total mechanised landings.

In West Bengal, the average annual marine fish landings during 1979-81 period for Midnapur district were estimated at 9600 t. Cat fish and pomfrets contributed 14% each to the total, the other important groups being clupeoids (10%), Bombay duck and *Hilsa ilisha* (7% each) and sciaenids and non-penaeid prawns (5% each).

The average annual landings from Orissa were to the tune of about 42,000 t. Pomfrets contributed 18% followed by *Hilsa ilisha* (13%), elasmobranchs (9%), sciaenids and cat fishes (8% each) and lesser sardines (7%). Fifty four per cent of the total catch during 1981 came from mechanised craft.

In Andhra Pradesh, the average annual marine fish catch worked out to 0.108 million t during 1979-81. Lesser sardines occupied the first rank among the different groups of fishes landed along this coast forming about 11% of the total. The next position went to ribbon fish (9%) followed by *Anchoviella* and sciaenids (8% each), penaeid prawns (7%) and silverbellies and elasmobranchs (5% each). During 1981, 23% of the total catch came from mechanised fishing craft.

The average annual marine fish landings from Pondicherry (excluding Mahe and Yenam) amounted to about 10,000 t during the period under consideration. Lesser sardines contributed significantly forming about 20% to the total catch. Next in importance were perches (9% followed by silver bellies 8%), carangids and flying fish (5% each) and prawns (4%). The mechanised

catch during 1981 formed about 35% of the total catch of which 93% came from trawlers.

In Karnataka, out of an average total catch of 0.132 million t, oil sardine constituted 36%. The next major fishery in this state is that of mackerel (20%), catfishes come third in the order of importance (6%) followed by other crustaceans and lesser sardines (4% each). During 1981, 84% of the total catch came from mechanised fishing craft. Out of the mechanised catch, the share of purse seiners, trawlers and others was 74%, 25% and 1% respectively.

In Goa (excluding Daman and Diu) average total catch amounted to 28,000 t. Oil sardine ranked first in respect of marine fish landings in this state (15%), followed by mackerel (13%), lesser sardines (8%) other crustaceans (7%), penaeid prawns and silver bellies (6% each) and sciaenids (5%). The landings from mechanised fishing craft during 1981 represented about 86%. Trawlers landed about 48% of the total mechanised catch.

In Andamans, the average total catch was 1,800t. The major contribution came from perches (14%), the other important groups being sardines (12%) and silver bellies, mackerel and seer fish (8% each).

On an average 3,400 t of fish were landed in Lakshadweep annually during 1979-81 period. Tunas formed the dominant catch (68%) followed by perches (9%) elasmobranchs (8%) and halfbeaks and fullbeaks (3%).

Following is a brief account of the fish landings in some of the major landing centres.

1. *Visakhapatnam Fisheries Harbour*: The average annual fish landings at this harbour for 1979-81 period came to 6863 t. Perches formed the largest component in the catches (17%)—the dominant species among the perches being *Nemipterus japonicus*—followed by croakers (10%), lizard fish and ribbon fish (9% each) and silver bellies (8%).

2. *Kakinada Fisheries Harbour*: During 1979-81 period 8,684 t of fish were landed on an average per annum, penaeid prawns (21%) contributing the major portion of the catch. Ribbon fish and carangids (*Decapterus* spp.) came next in the order of abundance (10% each) followed by croakers (8%) and perches and silver bellies (6% each).

3. *Pudumanikuppam*: The average annual catch obtained by mechanised boats at this centre during 1980-1981 came to 4,018 t. Silver bellies contributed maximum (22%) to the catches during the two year period. Perches and penaeid prawns formed the next important group contributing 17% and 15% of the total landings respectively.

4. *Rameswaram*: The total annual average catch by mechanised boats for 1980-1981 worked out to 17,483 t. Silver bellies (51%) dominated the catches followed by elasmobranchs (17%), penaeid prawns (10%) and croakers (8%).

5. *Sakthikulangara*: The fish landings by mechanised boats at this centre which is one of the most important mechanised fish landings centres in the country showed wide fluctuations during 1979-81 period with the maximum in 1980 (84,556 t) and minimum in 1981 (32,427 t). Penaeid prawns formed the major portion of the landings (36%), 'Karikadi' (*Parapenaeopsis stylifera*) forming the bulk of the catch. Perches (20%) mostly comprising *Nemipterus japonicus* came next in the order of abundance followed by lizard fish (10%) and cat fish (8%).

6. *Cochin Fisheries Harbour*: The average catch for the two year period 1980-81 worked out to 26,194 t. Oil sardine (43%) formed the major catch. Mackerel accounted for 16%, whereas the shares of penaeid prawns and perches were 11% and 7% respectively. The major portion of the catch of oil sardine and mackerel came from purse seiners. *Nemipterus japonicus* dominated the perch landings.

7. *Sassoon Docks*: This is also one of the most important fisheries harbours in the country. The average annual landings during the three year period 1979-81 was 26,028 t. Penaeid prawns contributed to as much as 30% of the total landings, croakers (15%) coming next in abundance. The other groups that formed a sizable part of the catch were cat fishes (8%) and elasmobranchs and ribbon fishes (7% each).

Prospects for development of harvest and post-harvest technologies

Harvest: With the declaration of Exclusive Economic Zone, the area of fishing coming within our jurisdiction has increased from 0.1 to 2.0 million km². The estimated potential yield of EEZ is about 4.5 million t of which our present exploitation comes to less than one third (George, *et al.* 1977).

There exists in abundance along our coast a diversity of species like oil sardine, mackerel, Bombay duck, white bait, ribbon fish, catfish, silver-bellies, other sardines, horse mackerel, scads and perches. (Silas *et al.* 1976). The magnitudes of the oil sardine and mackerel resources along the coast are estimated at 0.35 to 0.4 million t and 0.45 million t respectively. Good resources of tunas and bill fishes in our coastal and offshore waters are available for exploitation, as also squids, cuttle fish, lobsters and deep sea prawns.

In order to exploit resources fully, we have to further develop harvest technology by diversification of fishing over space and species with the introduction of larger vessels for purse-seining, long-lining, pelagic and mid-water trawling and squid jigging.

Post-harvest: In the recent past a number of fishing harbours have come up in places like Paradeep, Visakhapatnam, Cochin, Malpe, New Ferry Wharf, Sassoon Docks and Veraval, wherein large number of mechanised boats land fish catches in huge quantities at short intervals. This has necessitated development of post-harvest technology by way of providing facilities for preserving, processing and marketing. Huge quantities of oil sardine and mackerel are landed by purse seines operating in Karnataka, Kerala and Goa. As oil sardines are quickly perishable, they need preservation at the time of capture itself. Hence suitable preservation technology has to be developed both at the time of capture and landing so as to maintain the marketable quality of fish. With the increased exploitation of our deeper waters there is bound to be an increase in the landings of conventional and non-conventional resources some of which may not find ready markets. In this context, it is necessary to develop technologies for their conversion into suitable products for marketing in India and abroad.

With increased thrust on aquaculture as an important source for augmenting fish production, more and more areas of culturable waters are expected to come under this sector. There is a wide scope for development of post-harvest technology to preserve and process items like mussels, oysters and seaweeds for use within the country as well as for export.

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