Evolution of Fisheries and Aquaculture in India

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Contribution of marine sector in fish production

The last five decades of fisheries research together with the technological advancements in the harvest and post-harvest areas have accelerated the process of transformation of a traditional, subsistence marine fisheries into a market driven multicrore industrial sector. With the result, the marine fish production has made great leaps through successive stages, first with a change from natural to synthetic fibres in gear fabrication and a concurrent introduction of mechanised trawlers in the fifties, second with the introduction of mass harvesting gear, the purse seine along the southwest coast in 70s and immediately followed by the introduction of motorisation (OBM) of country crafts and the subsequent proliferation of innovative gears in late eighties, and introduction of multiday fishing in 90s the yield reached around 2.7 million t during the year 1997. The production remains almost static since 1997. India is one among the top ten fish producing countries of the world contributing over 3% of the world marine fish production. The marine fisheries sector in the country contributes about 50% to the total fish production.

The availability and distribution pattern of marine fishery resources in India are typical of tropical waters. The fishery resource is constituted by a large variety of species coexisting in the same ground. There are nearly 1570 species of finfishes and about 1000 species of shellfishes known from our seas. The multispecies fishery comprise of over 200 commercially important finfish and shellfish species (Table 54). The important varieties belonging to the pelagic groups like sardines, anchovies, mackerel, carangids, Bombay duck, ribbonfishes, seerfishes, tunas; demersal finfish stocks like sharks, rays, croakers (sciaenids), perches, silverbellies, lizard fishes, catfish; crustaceans like penaeid and non-penaeid shrimps, crabs and lobsters; and cephalopods like squids and cuttlefishes are common. The abundance of these stocks varies from region to region and from season to season with large pelagics like tunas being more abundant around Island Territories

and small pelagics like sardines and mackerel supporting a fishery of considerable magnitude along the southwest and southeast coasts. The Bombay duck and non-penaeid shrimps form a good fishery along the northwest coast, while perches are dominant in the southwest and southeast coasts, especially in the Gulf of Mannar, Palk Bay and Wadge Bank areas (Fig. 33). Among this, species/groups contributing to more than one lakh tonnes a year are oil sardine, mackerel, Bombay duck, ribbonfishes, carangids, perches, croakers, shrimps and cephalopods.

Table 54. Catch trends and potential yield estimates of major groups

Group	Average catch (t)		Group contribution (%)	Potential * yield (t)
	1985-89	1999-2003		
Elasmobranchs	54027	62799	2.46	71408
Oil sardine	141831	319419	12.53	294869
Other sardines	76541	101130	3.97	101490
Anchovies	68630	115598	4.53	141817
Other clupeoids	132626	43987	1.73	78932
Bombay duck	93185	105601	4.14	116227
Ribbonfishes	78384	172102	6.75	193670
Carangids	111040	120608	4.73	238148
Indian mackerel	123832	128430	5.04	295040
Seerfishes	35171	48905	1.92	61719
Coastal tunas	34185	50337	1.97	65472
Barracudas	-	17125	0.67	20849
Catfishes	50630	53711	2.11	51255
Eels	6317	9637	0.38	9081
Croakers	102934	141933	5.57	273027
Perches	90083	189093	7.42	226793
Flatfishes	29612	45482	1.78	47304
Silverbellies	60766	53849	2.11	67247
Pomfrets	37356	38378	1.51	46088
Penaeid shrimps	143073	196464	7.70	194192
Non-penaeid shrimps	48057	142929	5.61	138711
Stomatopods	-	43663	1.71	120351
Lobster	-	1938	0.08	3874
Cephalopods	39799	107415	4.21	101259
Others	40034	239327	9.39	975594
Total	1598113	2549860		3934417

Source: modified CMFRI, 1997a * Anon., 2000

The annual catchable potential yield in the Indian EEZ is validated by a Committee as 3.93 mt consisting of 2.02 mt of demersal, 1.67 mt of pelagic and 0.24 mt of oceanic resources (Anon, 2000). This working group for the first time estimated the potential yield of as many as 68 species/ groups of fishes occurring in the EEZ. The present annual average production of about 2.55 mt forms 64.8% of the revalidated fishery potential.

The coastal fisheries exploit a large number of species using different craft and gears mostly in the depth range of 0 to 50 m although in recent years, this has been extended upto about 120 m in some regions. Being a multigear fishery (gillnets, drift nets, hooks & line, pole & line, trawl line, bag nets, ringseines, purseseines, trawls etc.), fishing practices vary between different regions, depending on the nature of the fishing grounds and the distribution of the fisheries resources. The marine fish production in the country progressively increased from 0.58 mt in 1950 to 2.73 mt in 1997 showing an average annual growth rate of 6.4% over a period of 4 decades (Fig. 34). The annual growth rate during the different decades commencing from 1950, declined from 6.5% during 1950-60 to 2.3% during 1960-70; it increased to 4.3% during 1970-80 and to 4.8% during 1980-90 but declined to 4.0% during 1990-96. This fall in the growth rate is reflected in the annual catch attaining the optimum level in the inshore fishing grounds extending upto a depth of 50 m. As could be seen from the Fig. 34 the marine fish production has reached a plateau since 1991, which is because of the fishing effort being mainly concentrated in the 0-100 m depth zone of the coastal belt. Over these years the trawling effort has increased considerably leading to excess pressure in the coastal waters.

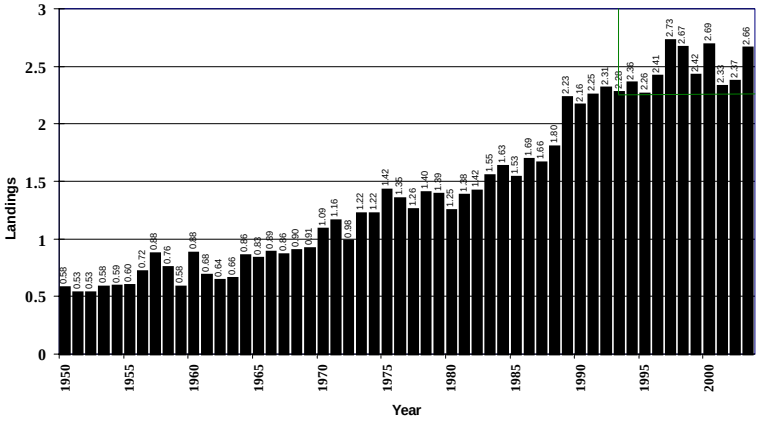

Fig. 34. All India marine fish landings (in mt.) during 1950-2003

The annual average landing during 1999-2003 period was 2.55 mt against an annual catchable potential yield of 3.93 mt principally constituted by oil sardine (12.5%), penaeid prawns (7.7%), perches (7.4%), ribbonfishes (6.7%), non-penaeid prawns (5.6%), croakers (5.6 %), mackerel (5.1%), carangids (4.7%), anchovies (4.5%), cephalopods (4.2%) and Bombay duck (4.1%) (Table 54).

The mechanised sector accounted for 67.9%, motorised sector 25.0% and artisanal sector 7.1% of the total production. The sector-wise landings in different regions during 2003 is given in Fig. 35. Comparative output of the marine fishing sector of different coastal states in 1985 and 2000 are given in Table 55. Catch trend during 2003 (Fig. 36) indicate that the northwest coast contributed 34% to the total marine fish production followed by the southwest coast (33%), southeast coast (23%) and the remaining (10%) by northeast coast (CMFRI, 2003).

The increase or decrease in the annual marine fish production of the country by and large depends on the success or failure of oil sardine, mackerel, Bombay duck and shrimp fisheries (Pillai, 2003). The wide fluctuations in the annual yield of oil sardine and mackerel are well known and is generally observed to be due to fishery independent factors such as spawning success, recruitment strength and environmental factors affecting the resources. However, in the case of the shrimp fishery, particularly the penaeid prawns which are much sought after by the export trade, the landings have been fluctuating from year to year with no definite trend. In most of the years, the margin of fluctuation has been varying from 10 to 15%. Further, the data on production, CPUE and other parameters of the coastal

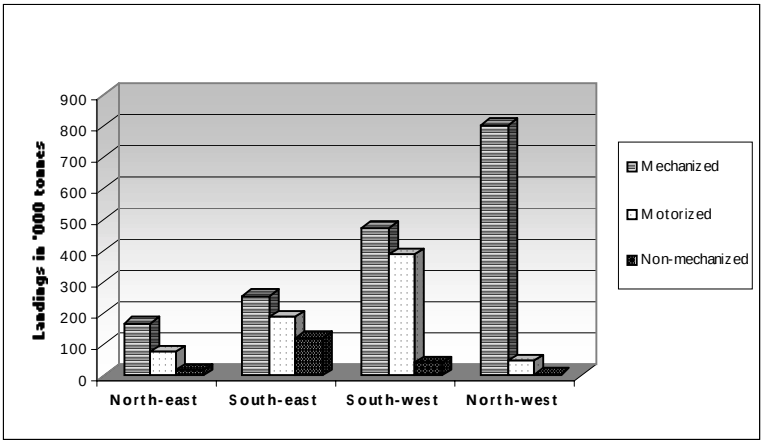

Fig.35. Sector-wise landings in different regions during 2003

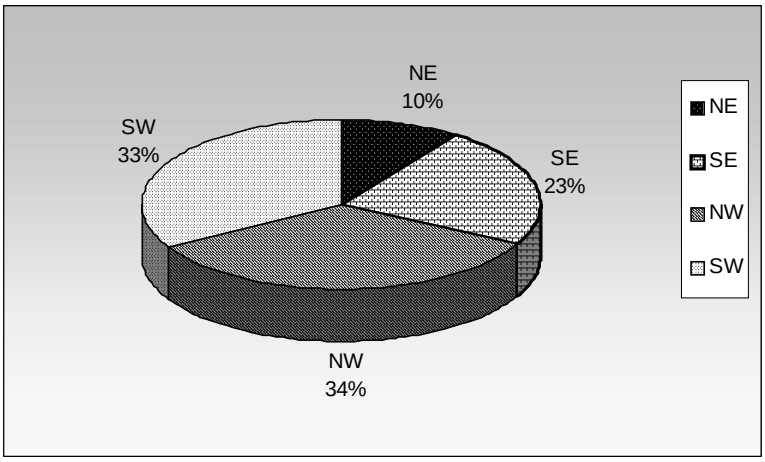

Fig. 36. Region-wise fish landings in India during 2003

shrimp fishery at centres such as Sassoon Dock, Karwar, Mangalore, Calicut, Cochin, Neendakara, Mandapam and Chennai have indicated that further increase of effort may not yield increased production as the exploitation has reached the optimum level.

Table 55. Comparative output (in tonnes) of the primary marine fishing industry of different coastal States/Union Territories of India in 1985 and 2000

States/Union Territories	1985		2000	
	Output	Rank	Output	Rank
Andhra Pradesh	126848	6	166482	6
Gujarat	288500	3	670951	1
Goa	39927	8	61460	9
Karnataka	200828	5	165653	7
Kerala	295339	2	575500	2
Maharashtra	388088	1	397901	3
Orissa	49205	7	125935	8
Tamilnadu	257000	4	393000	4
West Bengal	39350	9	171500	5
Andamans	6304	11	28147	11
Lakshadweep	4676	12	13600	13
Pondicherry	19913	10	38620	10
Daman and Diu	N,A		15946	12

Source: Korakandy, 1994 and Sudarsan, 2000

Although the achievements were tremendous, slowly but gradually, this common property was stressed and led to over harvest of atleast a few

easily vulnerable and target species and degradation of fish habitats perhaps even to the extent of denudation by the unbridled human greed.

Status of exploitation of dominant species – stocks along the Indian coast in the 0-50 m depth zone is given in Table 56. It is evident from the table that exploitation of many of the species at different regions have reached optimum level and in the case of certain prime species, the exploitation rate has even crossed MSY level. The substantial increase in the effort over these 4 decades resulted in the decrease in per capita are a per active fisherman and per boat in the inshore fishing grounds, and also in the catch per unit effort. It also gave rise to conflicts among different categories of fishermen, particularly between the artisanal and mechanised groups. Ultimately the sustainability of many resources harvest from the coastal areas has been jeopardized by the incessant fishing pressure coupled with the impacts of pollution, and other anthropogenic causes. Such a critical situation warrants effective management of the exploited stocks in the coastal waters for sustaining the current production and to augment it further by focussing attention on the deep sea and oceanic sector.

Table 56. Status of exploitation of different species-stocks along the Indian coast in the 0-50 m depth zone

Species	State of exploitation		
	Full	Over	Under
Sardinella longiceps	All along	-	-
S. gibbosa	SW coast	-	West coast
Hilsa ilisha	NE coast	-	-
Encrassicolina devisi	-	-	All along
Stolephorus waitei	-	-	-
Rastrelliger kanagurta	All along	-	-
Scomberomorus commerson	-	SE&SW coast	-
Euthynnus affinis	All along	-	-
Thunnus tonggol	All along	-	-
Auxis rochei	-	-	All along
Katsuwonus pelamis	-	-	All along
Megalaspis cordyla	-	-	SW coast
Decapterus russelli	-	-	All along
Selaroides leptolepis	SE coast	-	-
Atropus atropus	NW coast	-	-
Alepes kalla	SW coast	-	-
Atule mate	-	-	SW coast
Caranx carangus	SE coast	-	-
Parastromateus argenteus	-	West coast	-

Formio niger	-	SW coast	-
Trichiurus lepturus	-	East coast	West coast
Harpodon nehereus	NW coat	-	-
Nemipterus japonicus	All along	-	-
Nemipterus mesoprion	All along	-	-
Leiognathus bindus	East coast	-	-
L. dussumieri	Tamil Nadu	-	-
L. jonesi	Tamil Nadu	-	-
Secutor insidiator	East coast	-	-
Tachysurus tenuispinis	-	West coast	-
T. thalassinus	-	W&NE coast	-
Otolithus cuvieri	NW coast	-	-
Johnius macrorhynus	NW coast	-	-
J. vogleri	NW coast	-	-
J. sina	SW coast	-	-
J. carutta	SE coast	-	-
Penaeus monodon	East coast	-	-
P. indicus	-	East coast	-
P. semisulcatus	-	SE coast	-
Metapenaeus monoceros	All along	-	-
M. dobsoni	All along	-	-
Acetes indicus	NW coast	-	-
Panilurus polyphagus	-	NW coast	-
Loligo duvauceli	All along	-	-
Sepia aculeata	East coast	-	West coast
S. pharaonis	East coast	-	West coast

Source: Murty & Rao, 1996

There is increasing awareness in recent years among researchers, policy planners and management experts that any additional increase in fish production has to be obtained from offshore, deep sea and oceanic waters beyond the harvesting range of coastal fishing fleet. The estimated potential yield from deeper areas in the EEZ beyond 50 m depth is 1.69 mt. This includes several conventional and non-conventional resources. Oceanic resources consist of tunas (*Thunnus albacares, T.obesus, Katsuwonus pelamis*), billfishes, myctophids (*Benthosema* spp., *Myctophum* spp. and *Diaphus* spp.) and oceanic squids (*Symplectoteuthis oualaniensis*, *Onychoteuthis banskii*, *Thysanoteuthis rhombus*). But there is no directed fishery for these species, except marginal exploitation by chartered vessels, which operated under the deep sea fishing schemes in the nineties and which have since been suspended. Longline surveys conducted by Fishery Survey of India (FSI)

have revealed abundant resources of skipjack (*K. pelamis*) and yellowfin (*T. albacares*) tunas and pelagic sharks in our waters (Somvanshi, 2001a). Tuna resources of the coastal area and the high seas should be treated separately for evolving strategies for tuna fishing operations and management of the fishery (Pillai *et al.*, 2002).

Among the multigears, gillnets, drift nets and bag nets of varied mesh sizes are widely employed by traditional fishermen along both the coasts while ring seines, purse seines and mechanized gillnets are confined to the south west coast. The details of state-wise fishing practices by non-mechanized and mechanized boats are given in Tables 57 and 58. Bottom trawlers upto 13 m OAL are operated along the entire coast, while the second generation large trawlers 13-17m are operated from selected harbours along both the east and west coasts.

The growth of the fleets shows that the artisanal fleet (including the motorized) increased by about 110% from the 1960s to the 1990s and the mechanized fleet by about 570% during the same period (CMFRI, 1997) and has resulted in an over capacity of fleet operating in the inshore waters (Table 59).

Currently 2251 traditional landing centres, 33 minor and six major fishing harbours serve as bases for 208000 traditional nonmotorised crafts, 55,000 small scale beach landing motorised crafts, 51,500 mechanised crafts (mainly bottom trawlers, drift gillnetters and purse seiners) and 180 deep sea fishing vessels of 25 m OAL (Anon, 2001). The development of harbours and landing jetties, motorization of artisanal crafts and the rapid expansion of mechanized fishing have contributed towards a significant increase in fish production, employment generation and revenue earnings. It has also resulted in declining per capita area for the boats and given rise to serious conflicts between artisanal and mechanised sectors in the inshore waters where CPUE for most of the fisheries and especially shrimp are showing a declining trend (Table 60). The pattern of marine fish landings in India during the past fifty years (Figs. 34 and 36) clearly reveals that the contribution by the artisanal sector to the total production was significant only up to 1960s while presently, the contribution by the mechanized and motorized sector accounts for 93% of the marine fish catch (CMFRI, 2003). Under these circumstances adoption of sustainable fishing practices, diversified multi-gear and resource specific fishing and complementary mariculture practices by traditional fishermen to supplement their income are being advocated .

Ornamental fish and fisheries

Besides the marine fishery resources for human consumption, there are certain resources of commercial value. Marine aquarium fish trade is gaining increasing popularity the world over with an estimated value of 4.5 billion US$ (Srivastava, 1994). The Gulf of Mannar, Palk Bay, Gulf of Kutch, southwest coast and the Lakshadweep and Andaman group of islands are known to be rich in ornamental fishes (Murty, 1969; Murty *et al*., 1989; Murty, 2002). The wrasses, damselfish, surgeons, butterflyfish, moorish idol, squirrelfish, triggerfish, rabbitfish, parrotfish, angels, goatfish and pufferfish are the major aquarium fishes represented by nearly 180 species. Most of these fishes are abundant and offer scope for live fish export and development of home aquariculture in the country. The results of the survey and assessment of marine ornamental fishes of Lakshadweep (nine islands) implemented by the Central Marine Fisheries Research Institute indicate an annual potential yield of 25 million fish consisting mainly of wrasses (38.0%), damsel fishes (32.7%), goat fish (8.4%), parrot fish (7.4%), squirrel fish (4.9%), surgeon fish (4.8%), butterfly fish (2.1%), trigger fish (0.8%) and others (Murthy, 2002). Their exploitation, utilization and trade should be exercised with caution without trampling the habitat or other co-habitants of ecological value. The seahorses are valuable aquarium fishes and are also in great demand in Singapore and China for making soup and for medicinal purposes. In recent years, particularly divers from the southeast coast of India are also intensively exploiting them. As majority of these fishes are associated with coral reefs and those in great demand are not very abundant, their exploitation may disturb the habitats and result in depletion of stocks warranting restricted exploitation and monitoring of the stocks alongwith development of culture and hatchery technologies for the major species.

Issues in marine fisheries management in India are:

- declining trend in catch and catch rates of commercially exploited stocks;
- excess fleet size in terms of numbers;
- over capitalization and unwarranted 'capacity over load';
- ecosystem/diversity degradation affecting the productivity and the carrying capacity (Srinath and Balan, 2003).

The annual growth rate of marine fisheries production increased from 4.3 % during 1970s to 4.8 % during 1980s and declined to 4.0 % during 1990s (CMFRI, 1997a) and lowering down in growth rate is reflected in the annual catch attaining the optimum levels in the inshore fishing grounds up to a depth of 50 m. The substantial increase in fishing effort since the 1970s has resulted in the decrease in per capita area per active fishermen and per boat in the inshore fishing grounds and also in the CPUE, which,

Table 57. State-wise fishing practices by non-mechanized boats

State/UT	Country boat Fishing Practices	Type of Fishing boats	OAL (m)	Fishing Gear	Motorised Fishing Practices	Type of fishing boats	OAL (m)	Motor/Engine power (h.p.)	Fishing Gear
Gujarat	Cast netting	Dhingi	5	Cast net 2.5" to	Cast netting	Plank-built boats	6	-	2.5" to 6" mesh-
Maharashtra	-	-	-	6" mesh size	Bagnetting,	Dug-out canoes			Bagnet
Goa	Cast netting	Dug-out		Cast net 4m	Shore seining	Dug-out canoes	3 to 11		Beach seine
	Sluice gate	Plank-built		Sluice gate net	(Beach seining)	Plank-built			(100-500 m)
	Netting	Boats/			Purse seining	boats/Catamaran			
		Catamarans	3-6		Pole & lining				Stake net
					(stake netting)				Gill nets of
Daman & Diu	Cast netting	Catamarans	-	Cast net	Gill netting	Fibre glass canoes	12m	8-12	90-120 mm mesh
	Gill netting	Plankbuilt	-	Gill net	Squid jugging	Dug-out canoes	4-6	7-10	
		Dugout boats							
Kerala	Cast netting	Catamarans		Cast net	Trap fishing	Plank-built boats	6-9	7-40	Rampan/
	Gill netting	Dugout	-	Gill net	Fishing with	Plank-built boat	6-9	-	Bagnet
	Line fishing	plankbuilt boats							
West Bengal	Gill netting	Plank built		Hooks & line	Shore Seining	Wooden boat	6-9	-	Shore seine
		Dugout boats		Cast net	Line fishing	Plank-built boat	5-7	-	Hook & Line
					Crab catching	Plank-built boat	4.5-6.5	-	Bait & Line
Orissa	Gillnetting	Dhingi/	6.85	Drift	Gillnetting	Plank-built boat	8-11	6.5-20	Drift gillent
	Gillnetting	Dugout	6-8.5	200 to 1000 m	Gillnetting	FRP (PLC)	9-11	6.5-20	Drift Gillnet
Andhra Pradesh	Gillnetting	Catamarans/			Trawling			6.5.10,16.5,	Gillnet, longline
	Shore	Wooden	upto 9	Gill net					Shore seine (15-
	Seining	*Masula*		Shore seine					
		Stitched boat							
A&N	Gill netting	Dugout		Gill net	Cast netting	Plank-built boat	7-10	8.5-10	
Island	Cast netting	Plank built			Hook & Lining	Fibre glass	6-8	25 OBM	Hook & Line

Source : Somvanshi, 2001, 2001a

Table 58. State-wise fishing practices by mechanized boats

State/UT	Fishing Practices	Type of fishing boats	OAL (m)	Motor/Engine Power (h.p.)	Fishing Gear
Gujarat	Trawling	Trawlers	14 to 15	88-106	Bottom Trawl
	Gill netting	Gill netter (Wooden)	10 to 14	65-88	2.5" to 10" mesh-size
	Dol netting	*Dol* netters	9 to 12	65-88	*Dol* net
	Gill netting	FRP Boats	100 – 12	75 – 15 (OBM)	Gill net 2.5"-8" mesh size
	Trawling	Trawlers	10-17	6 Cylinder 76 to 100	Trawl
	Purse seining	Purse seiners	17	6 Cylinder 76 to 100	Purse seine
	Long lining	Liners	10	4 Cylinder 26 to 75	Hook & Line
Maharashtra	Gill netting	Gill netters	10	1 to 2 Cylinder (50%)	Gill net
			10-15	3 to 4 Cylinder (47%) 26 to 75	
			17	6 Cylinder (30%) 76 to 100	
Goa	Trawling	Trawler/Trawler-cum-purse seiner	9-15	37 h.p., 3 Cylinders	Trawl 20 m
	Purse seining	Trawler-cum-purse seiner/ Purse seiner with dingi		45,57,87 and 98-125	Purse seine 200-600 m
	Long lining	-			Hook & Line
	Drag net				Drag net 200-300 m
Daman & Diu	Trawling	Trawler (Wooden)	15	98-118	150m, 30 mm mesh size
	Gill netting	Wooden boats	12-15	8-40	120 to 900 m, 140-160 mm mesh size
		FRP boats	14	25-108	90-120 mm
	Trawling-cum-Gill netting	Boat (Wooden)	16	105-118	120 to 900 m, 140-160 mm mesh size

State/UT	Fishing Practices	Type of fishing boats	OAL (m)	Motor/Engine Power (h.p.)	Fishing Gear
	Dol netting	Boat (Wooden) FRP boat	10-12	40	*Dol* net 20 m 30-120 mm mesh size
Kerala	Trawling Purse seining Long lining Gill netting	Trawlers Purse seiners Gill netters	10-13 9-10	40-100 40-80	Trawl, Fixed bag Purse seine, Boat Seine Hooks & Lines Drift/gillnets
West Bengal	Gill netting Trawling Fishing with Bagnet Gill netting Trawling Fishing with Bagnet Shore seining	Gill netter (Wooden) Trawler (Wooden) Boats (Wooden) Gill netter (Wooden) Trawler (Wooden) Boats (Wooden) Boats (Wooden)	13-14 16 9 9.5 – 16.67 13.7 – 14.4 7.5 – 9 7.5 – 9	60 h.p. – 80 80 h.p. – 106 15 h.p. – 24 20 h.p. – 118 106 h.p.-120 12 h.p. – 20 12 h.p. – 20	Gill net Trawl Bagnet Gill net Trawl net - Shore seine
Orissa	Trawling Gill netting	Wooden Trawler Wooden Gill netter	10-13 8.5 – 11	68-108 30-68	Trawl net 26 to 40 m 20-45 mm mesh size Drift gillnet 310 to 1500m 80-120 mm mesh size
Andhra Pradesh	TrawlingGill netting Long lining Shore seining	Wooden, steel, wooden with aluminium shieling and FRP lining	9,10,11,13,20	68,98,108,175	Trawl net
A & N Islands	Trawling Long lining Gill netting	Trawler (steel) Trawlers (steel) Trawler (Wooden)	21.59-24.95 21.59-24.95 10-12.8	402-624 402-624 88-106	Trawl Hook & Line Drift / Gill net
Lakshadweep	Pole and line	Wooden	9-14	-	Pole and line

Source: Somvanshi, 2001, 2001a.

in turn, has given rise to intra/inter sector conflicts among different categories of fishermen, especially artisanal and mechanized sectors (Sathiadhas, 1996). Technological improvements in capital intensive fishing implements have also rendered existing older units less economical or non-operational, leading to substantial idling of fleets and underemployment (Sathiadhas *et al.*, 1999). There is urgent need to formulate national and state level regulations/policies in marine fisheries in conformity with the objectives of the FAO Code of Conduct for Responsible Fisheries and other relevant global conventions and regulations, within the ambit of the prevailing socio-political and economic objectives (FAO,1995).

Table 59. Optimum and existing fleet size (in number)

Fleet	Existing	Optimum	Percent Excess	Percentage of contribution to total catch (1996-97)
Mechanized	46918	20928	55.0	67.0
Motorized	31726	12832	60.0	20.0
Non-mechanized	159481	31059	81.0	13.0
Total catch: 2.41 million tonnes (1996-97)				

Source: CMFRI Vision 2020

Table 60. Change in per capita area in ha/boat (non-mechanised + mechanised) in the shore areas (0-50 m) and offshore shelf areas (50-200 m) during successive periods

State	1961-62		1973-77		1980		1990	
	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore
Gujarat	1453	2214	1095	1669	862	1314	499	760
Maharashtra	257	852	251	833	205	680	108	359
Goa	3030	7070	229	534	87	204	94	220
Karnataka	114	244	109	233	89	190	51	109
Kerala	59	123	57	118	44	92	40	84
Tamilnadu	78	55	74	53	52	36	53	38
Pondicherry	-	-	82	55	77	51	25	17
Andhra Pradesh	84	69	64	53	46	38	31	25
Orissa	528	599	317	359	147	166	96	109
West Bengal	1503	626	599	249	234	97	192	80
Lakshadweep	-	-	-	-	-	-	-	347
Andamans	-	-	-	-	-	-	-	3043

Source: CMFRI Vision 2020