

# STRATEGY FOR INCREASING MARINE FISH PRODUCTION IN GOA

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## State of Art

The 104 km long coastline of Goa (between Latitude 14° 49' - 15° 52' N and Longitude 73° 38' - 74° 24' E) along the central west coast of India, is characterized by opening of seven rivers viz., Tiracol, Chapora, Mandovi, Zuari, Sal, Talpona and Galgibag, into the Arabian Sea. The Exclusive Economic Zone (EEZ) upto 200 nautical miles or 380 km from the shoreline of Goa, is 90,850 km<sup>2</sup> including 9,984 km<sup>2</sup> of continental shelf area upto 200 m in depth and the balance 80,866 km<sup>2</sup> of slope and abyss in the form of deep, distant and oceanic waters. Additionally, 200 km<sup>2</sup> area on estuaries, creeks, backwater and marsh, including 19,000 ha of khazan lands and 2,000 ha under mangrove vegetation, is also available for harvesting as well as for generating seafoods.

Table 1. Marine fish catch (tonnes) in Goa: Total, pelagic and demersal (1965-1985).

Year	Total	Pelagic	Demersal
1965	18,000	7,560	10,400
1966	24,700	15,808	8,892
1967	13,650	7,644	6,006
1968	20,170	16,050	4,120
1969	27,590	26,500	1,090
1970	20,890	19,290	1,600
1971	40,000	38,400	1,600
1972	30,110	27,260	2,850
1973	15,740	13,630	2,116
1974	19,530	16,280	3,250
1975	29,100	20,700	8,400
1976	34,930	22,720	12,210
1977	24,810	15,810	9,000
1978	27,140	15,930	11,210
1979	25,450	15,840	9,610
1980	24,450	12,040	12,410
1981	34,530	18,320	16,216
1982	34,010	15,710	18,300
1983	37,740	12,520	25,220
1984	38,530	13,910	24,620
1985	41,520	28,100	13,420

Source: CMFRI Bulletin No. 9 (Technical & Extension Series) 1979.  
 CMFRI Bulletin No. 41 (Technical & Extension Series) 1982.  
 CMFRI Bulletin No. 67 (Technical & Extension series) 1986.  
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The annual marine fish catch (Table 1) which was about 18,000 metric tonnes in 1965 has gone upto 41,520 tonnes in 1985. The contribution of Goa to the national marine fish production is 2.36 per cent per annum. Almost 90% of Goa's population relish seafoods and the per head annual consumption of fish is 7.4 kg. As deduced from various published reports, the seawater quality and ecological status of marine and estuarine ecosystems of Goa is, at present, non-polluted, except possibly for localized effects of mining rejects on the estuarine environment and living resources (Parulekar et al., 1986). Besides the catch from open sea fishing, about 2,500 tonnes per year of seafoods like prawns, finfishes, clams, oysters, mussels and crabs are harvested from estuaries, creeks, backwaters and traditional fish farming practices of Goa.

Since 1981, the marine fish production in Goa is showing a consistent growth rate of 5.1 per cent with an average annual landing of 35,206 metric tonnes (Malgavkar and Pai Panandikar, 1988). Contrasting trends in the contribution of pelagic and demersal stocks to annual fish landing are discernible. While from 1965 to 1977 the pelagic resources contributed almost 72% of the total (Parulekar and Dalal, 1978), in post 1980's the demersal catches are accounting for 62% (Malgavkar and Pai Panandikar, 1988). This observation while reflecting on the wide variability in the availability of shoaling pelagic resources, brings to light the consistent increase in the output of trawling operations.

Important species and varieties contributing to marine fish catch of Goa are prawns, mackerels, oil sardines, other sardines, silver bellies, carangids, sciaenids, cat fish, butter fish, seer fish, pomfrets, thread breams and soles. Estuarine fish catch mainly comprises of prawns, mullets, cat fish, ambassids, anchoviella and pearl spot.

The fishing operations, which extends from September to May with peak period during October-February, are carried out by a fishing fleet comprising of 750 on board engine boats, 200 outboard engine boats and about 2,500 country crafts (Malgavkar and Pai Panandikar, 1988). All the existing fishing boats are less than 45 ft in overall length and consequently their operational range is restricted to neritic waters of less than 50 meter depth and not far than 30 km from the shore. Further, the endurance of staying power of the fishing boats is limited to a maximum of 12 hours per fishing trip. Further, most of these boats are not equipped with fish finding, depth finding, navigational, communication and preservation aids on board.

Commonly operated fishing gears are stern trawl, purse seine, shore seine, gill net, stake net, trolling line, cast net and hook & line. New gears like 'disco net' are in demand. As per the provisions of the Marine Fishing Regulation Act, a clear cut demarcation of fishing zone for traditional and mechanized type of fishing, is under implementation in Goa.

The utilization of fish is 81% fresh, 9% sundried, 5% salted and 5% for manuring. A part of fresh catch, mainly frozen shrimps and canned fish, is processed for export trade. The quantum of export which was about 60 tonnes in 1967 had rapidly gone upto 663 tonnes in 1973 followed by a sharp decline. However, since then the export trade is showing slow but steady progress. The average annual foreign exchange earnings are reportedly around Rs. 85 lakhs. These earnings are subjected to a high degree of

fluctuations not only due to fall in annual catch but also due to vagaries of demand and price prevailing in the international market.

Infrastructure in the form of fishing harbour, landing jetties, fuel outlets, slipway & repair shop, cold storage, ice plants, fish drying and curing yards, net materials and refrigerated transportation vehicles, do exist but not upto the desired level.

There are 52 fishing villages and the total fishermen population is estimated to be about 17,000 (Annon., 1981). At present, the marine fishing activities in Goa are concentrated in an area of about 3,000 km<sup>2</sup> up to 40 m depth. It means that only about 3.3 per cent of Goa's EEZ is being fished and more than 95% of the exploitable area remains unutilized.

In the context of culture fisheries, it needs to be emphasized that coastal aquaculture by traditional methods, involving composite culture of wild stocks of prawns, mullets, milk fish and pearl spot is in vogue for centuries together, in the estuaries and backwaters of Goa. Presently, about 16 km<sup>2</sup> area of tidal water spread, involving a manpower of 350 and annual production of about 60 tonnes of prawns and finfishes, is under *manas* and *agar* type of fish farming in Goa (Parulekar and Verlekar, 1984).

#### Prospects and potentials

Though, since liberation in 1961 the annual marine fish catch has shown steady increase, it is felt that the optimum sustainable yield from the EEZ of Goa is still to be attained. Some published reports on the potential and sustainable marine living resources of Goa are available. Available resource potential estimates are based on extrapolations from organic production data, calculated potential yield of different categories of fish or exploratory fishing survey records of exploited, underexploited and unexploited fishing areas.

On the basis of published data on column productivity, Parulekar and Dalal (1978) have estimated (Table 2) the potential pelagic fishery resources for the EEZ of Goa, to be 69,600 tonnes for the shelf and 8,000 tonnes for the oceanic area. The sustainable yield is projected to be 46,560 tonnes per annum.

Table 2. Estimated potential and sustainable yield of pelagic fishery resources from the EEZ of Goa.

Depth zone (m)	Area (km <sup>2</sup> )	Annual organic production (tonne C/year)	Estimated potential resources (tonne/yr)	Estimated sustainable yield (tonne/yr)
0-50	2,849	7 x 10 <sup>6</sup>	77,600	46,560
50-200	7,135	9 x 10 <sup>5</sup>		
Above 200	80,866	6 x 10 <sup>4</sup>		

Updated after Parulekar and Dalal (1978).

The demersal fishery resources mainly for the part of shelf of Goa, as assessed from the published reports, show variations from 19.3 kg/ha (Jones and Banerji, 1973) to 30.1 kg/ha (Rao and Dorairaj, 1968) to 47.8 kg/ha (Prabhu and Dhawan, 1972) and accordingly the potential demersal resource upto 70 meter depth are estimated to be 47,558 tonnes with a sustainable yield of 28,536 tonnes per year.

From an exhaustive study on the benthic production and assessment of demersal fishery resources of the Indian seas, Parulekar, Harkantra and Ansari (1982) have estimated the potential demersal yield of EEZ of Goa to be 332 kg/ha from shelf region and 1.5 kg/ha from slope and deep regions. This is against the present level of exploitation of 77.12 kg/ha for shelf only. Accordingly, the potential demersal resources of EEZ of Goa are estimated to be 1,12,600 tonnes with a sustainable yield of 67,560 tonnes per year.

The result of Indo-Polish Fishery Survey have indicated (Dwivedi, 1978) that in Goa region, the depth zone of 100 to 140 m is more productive than the depth zone of 60 to 100 m. It has been shown that there is an unexploited resource of smaller tunas, (*Euthynnus affinis* and *Thunnus tonggol*), frigate mackerel (*Auxis thazard*) and horse mackerel (*Megalops cordylla*). Investigations by aerial and acoustic surveys conducted along the West coast of India by UNDP/FAO have confirmed that both mackerel and sardine shoals occur in neritic waters particularly in the depth zone of 38 to 80 meter off Goa (Annon, 1973). These fishing grounds can be exploited throughout the year but the maximum abundance will be prior to the outbreak of southwest-monsoon.

Besides the exploited fishery resources there are other marine living resources which at present are either underexploited or unexploited. Some of the important underexploited resources are the shell fishes like clams, mussels and oysters which have an estimated exploitable potential of over 5,000 tonnes per year (Parulekar et al., 1984). Other unexploited resources are the seaweeds, having an annual production potential of 2,000 tonnes by wet weight.

Researches and experimental mass culture through pilot and demonstration scale plants have clearly indicated the high techno-economic feasibility of commercial farming of clams, mussels, oysters, seaweeds, brine shrimp, prawns and finfishes in the open sea and in the coastal ecosystem of Goa (Annon, 1981). Scope for the expansion of coastal aquaculture in Goa appears to be good as there are vast stretches of fallow 'Khazan' lands admeasuring about 4,300 hectares available for ready use and with a proven profitability of 100% rate of return on the investment (Parulekar and Verlencar, 1984). Besides the fish farming in Khazan lands, more than 2,700 hectares of water spread is available in sheltered coastal bays, coves and estuarine embouchers. These areas are most suitable for suspended culture of mussels and oysters, rope culture of seaweeds and pen culture of clams and finfishes. An annual yield of 10,000 tonnes of a variety of seafoods is anticipated (Annon 1981).

### **Development strategy**

It is evident that the high biological productivity potential of the coastal ecosystems like estuaries, creeks and backwaters of Goa, are only marginally being utilised.

Similarly, the continental shelf is extensively exploited only upto the depth of 40 metres whereas almost 90% of the area of EEZ of Goa still remains untapped (Malgavkar and Pai Panandiker, 1988). For harvesting the untapped marine living resources of the shelf region, especially in the depth zone of 40 to 200 meter, a programme of phased conversion and replacement of existing small sized (below 45 ft in OAL) mechanized boats by combination (trawler/purse seiner) vessels of 20 meter in length, needs to be implemented. Such boats, with an endurance of 2-3 days, can be most suitable for operating upto 200 meter depth.

The next stage is to plan for large vessels for distant water fishing. Such vessels with on-board facilities for quick freezing, preliminary processing and sorting, can stay out at sea for about two weeks at a stretch. As most of the distant-water catch off Goa is projected to be of mid-pelagic and demersal species, the crafts to be deployed should have facilities for midwater and bottom trawling. Conservatively, the number of large sized fishing vessels should not be more than ten, as the area to be covered is relatively small. Vessels, infrastructural facilities like large and medium to minor fishing harbours/ports, landing jetties, slipway and repair shops, fish curing yards, fish processing plants, cold storages, ice plants, fuel outlets, transport systems and manpower development on appropriate scale need to be planned and executed in a time-targeted manner.

The most important constraint in the development of coastal aquaculture and culture fisheries in Goa will be the paucity of quality seeds of cultivable species. On priority, it is essential to establish hatcheries and seed banks for making available quality spats, post larvae and fish fry for stocking and rearing on a round the year basis.

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