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17 Pelagic fisheries resources of India – an overview

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ABSTRACT

The annual pelagic fish production increased from 0.30 million t during 1950 to 1.2 million t during 1996 along the Indian coast. The four fold increase in production was due to mechanisation, motorisation of the country crafts, introduction of larger mechanised boats etc. Kerala ranked first among the maritime states of India, contributing 31% of the total pelagic fish followed by Gujarat (13.7%) and Tamil Nadu (13.0%). Out of the 250 species that contribute to the pelagic fisheries, only about 60 species belonging to 7 groups form fisheries of substantial magnitude. The groups which exceed one lakh t in production per year were mackerel, oil sardine, anchovies, carangids and Bombay duck. The fluctuations in the landings of oil sardine and Indian mackerel and the gear-wise production of pelagics are discussed in the paper. Suitable management measures and suggestions for future research priorities for sustaining the pelagic fisheries have suggested in this overview.

Introduction

The marine fish production in India has progressively risen to the tune of 2.4 million t in 1996 due to the introduction of larger mechanised boats, motorisation of the country crafts, modernisation in harvesting sector coupled with extension of fishing to deeper grounds since the late 1950s. The average annual marine fish production of India for the period 1985 to 1996 was 2.06 million t of which the pelagics contributed 1.06 million t accounting for 51.4% against a potential yield of 2.21 million t of this group from the Indian EEZ. Almost 90% of the production was obtained from within the 50 m depth zone. As per the latest revalidation, annual potential yield from the EEZ of India is 3.9 million t, out of which 2.21 million t are from within the 50 m depth zone

and 1.69 million t from beyond it (Anon, 1991). The current yield from 0-50 m depth zone is at the optimum level, and hence does not offer any scope for increasing the yield and in fact this zone requires regulatory management for sustaining the yield. Therefore, the region beyond 50 m depth has to be the focus of expansion.

Exploitation of pelagic resources

The pelagics have been exploited by the conventional crafts and gears and as a consequence of modernisation in the harvesting sector, new inboard/ outboard engine fitted crafts and innovative gears such as ring seine *matta vala* disco net etc. gradually replaced many of the traditional fishing crafts and gears. Mechanised fishing by trawls, purse-seine, gillnets etc also supported the growth of the pelagic fisheries.

Trend in production: The pelagic fisheries resources of India are largely of multispecies multisector fisheries. There are about 250 species contributing to the fishery. A few species enjoy wide geographical distribution, while the others, such as the shads and the Bombayduck, have rather restricted distribution.

Srinath (1989) and James and Alagarswami (1991) analysed the pattern of development of the pelagic fishery based on historical data relating to 1961-85 and 1979-85 respectively. Pillai (1992) has given a comprehensive account on the results of the stock assessment of the major pelagics. Until the mid-seventies, the share of the pelagic stocks in the overall production remained very high with a consistently increasing trend from 54% in 1950 to 71% in 1960, and thereafter, at around 65% till the early seventies. The pelagic catches increased from 309,000 t in 1950 to the current 12,43,424 t (1996) registering nearly a fourfold increase. The growth in the production of the pelagics vis-a-vis the overall production could be gauged from Table 1 and Fig. 1.

Table 1. Growth in the average annual overall and pelagic fish production through the five decades from 1950 to 1996

Period	Production (Tonnes)		Relative growth (%)	
	Pelagics	Overall	Pelagics	Overall
1950-59	362,548	618,501	-	-
1960-69	527,211	814,721	+45	+31
1970-79	643,142	1,243,707	+22	+27
1980-89	819,093	1,579,836	+27	+27
1990-95 (6years)	1,116,792	2,258,874	+36	+43
1996	1,243,424	2,422,043	+11	+7

The average annual landings of the major pelagics in the initial stages of mechanization (1961-65) to 1995-96 is given in Fig. 2. In the early years (in the development of marine fisheries) the growth rate in the production of pelagic fishes had been conspicuously higher than that of the overall production. This trend got reversed in 1970-'79 because of the rapid expansion of commercial trawling for shrimps for exports by the industrial sector. Commercial trawling resulted in significantly high production of demersal finfishes also, besides shrimps, crabs, lobsters and cephalopods. Although the pelagic fish catches increased by 22%, the trend in the overall production was set by the demersal finfish and crustacean catches. The next decade (1980-89) witnessed a growth of 27% in the pelagic catches as well as in the overall production. During this decade there was rapid motorization of traditional fishing craft, particularly in the latter half of the eighties. As a result, the stagnation in marine fish production witnessed in the first half of the eighties gave way for accelerated production in the latter half. Intensive motorization of the traditional fishing crafts resulted in a remarkable increase in the annual production, especially of the total pelagics, which increased from 769,000 t in 1985, to 1,313,000 t in 1989, registring a 71% increase (Fig.1).

Statewise contribution: The State-wise average contributions to the pelagic fish production showed that Kerala ranked first among the maritime States of India contributing about 31% of the total pelagic fish catch, followed

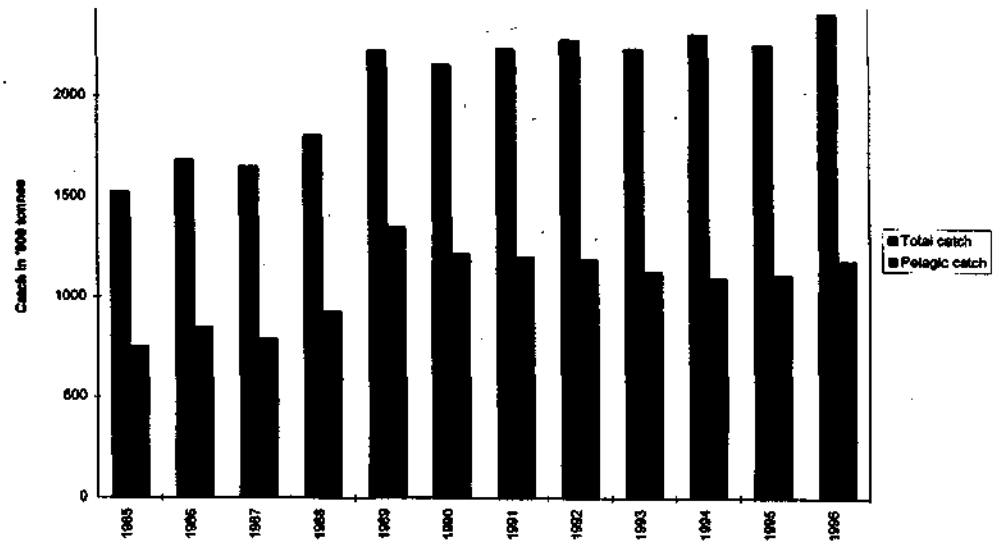

Fig. 1. Year-wise all India pelagic fish production and the total marine fish production

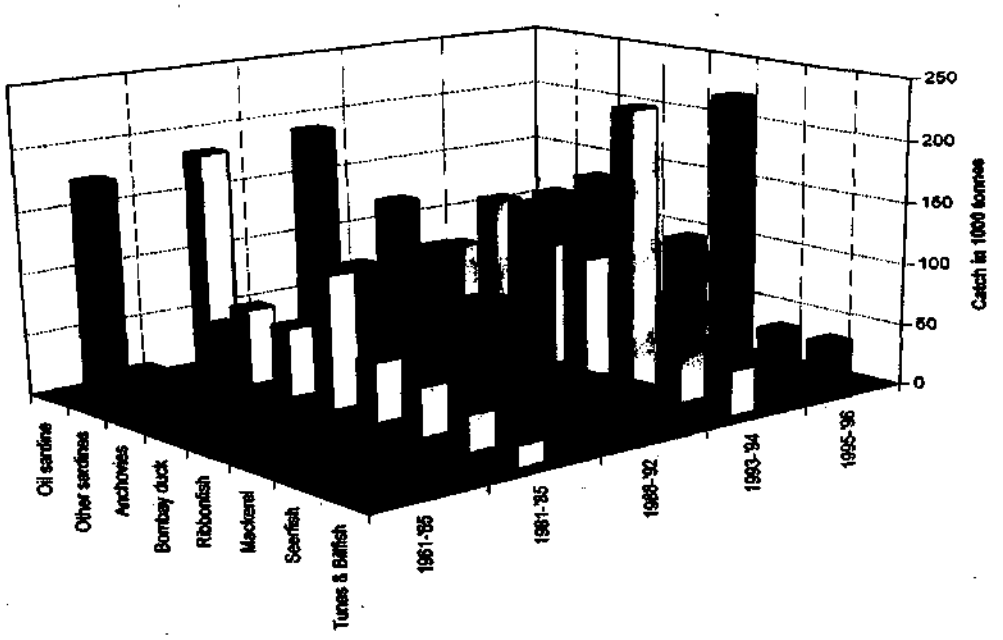

Fig.2. Average annual landings of major pelagic groups in the initial stages of mechanization (1961-'65 to 1995-'96)

by Gujarat and Tamil Nadu contributing 13.7% and 13.0% respectively. The contributions by other States were: Maharashtra 10.8%, Karnataka 10%, Goa 7.1%, Andhra Pradesh 6.9%, West Bengal 3.8%, Orissa 1.4%, Andaman & Nicobar Islands 1%, Pondichery 0.8% and Lakshadweep 0.5%. This shows that the southwest region comprising Goa, Karnataka and Kerala continued to be the highly productive area followed by northwest, southeast and northeast regions and the Island Systems.

Major pelagic stocks: Out of the 250 species that contribute to the pelagic fisheries along the Indian coast, only about 60 species belonging to 7 groups viz., the oil sardine, lesser sardines, anchovies, Bombayduck, ribbonfishes, carangids and Indian mackerel form the major fisheries. The annual production of these groups during 1996 is 1 million t forming 76.2% of the pelagics and 41.0% of the total marine fish landings. The other pelagic groups which include the wolfherrings, shads, barracudas, unicorn cod, mullets, seerfishes and coastal tunas formed only 23.8% of the pelagic fish landings. The percentage contribution by the pelagic groups ranged from 1.0% in the case of barracudas to 14.0% by mackerel. The groups which exceeded one lakh t in production per year were mackerel, oil sardine, anchovies, carangids and Bombay duck. The Indian mackerel and carangids were the most predominant, contributing 7.74% and 7.22% respectively to the overall marine fish landings during 1991-95. Anchovies formed 6.41%, followed by the Bombayduck (4.9%), ribbonfishes (4.31%), oilsardine (4.25%), lesser sardines (4.15%), other clupeids (2.25%), *Hilsa* shad (1.11%) and barracudas (0.52%) in the overall marine fish landings during this period.

The major single-species fisheries of the pelagic resources, the oil sardine (*Sardinella longiceps*), the Indian mackerel (*Rastrelliger kanagurta*) and the Bombayduck (*Harpodon nehereus*) showed wide fluctuations in their availability for exploitation. The oil sardine fishery has been most strikingly characterised by wide fluctuations in the annual landings from the very early years of exploitation. There have been several periods of high abundance as well as major population crashes during this century. The variability in abundance of the oil sardine is cyclic. The decadal averages of all India oil sardine production indicated a decreasing trend from 205,000 t in the sixties to 137,000 t during the first half of the nineties. Though the traditional gears were in operation in the sixties, the annual landings were relatively better compared to the late seventies which represented a period of low abundance of this species. The introduction of purse seines and later the ring seines coincided with the low

abundance period and hence the total landings of oil sardine showed no increase despite the efficiency of these gears.

During the last fifty years, the all-India production of the oil sardine ranged from 14,000 t in 1952 to an all-time high of 3 lakh t in 1968 contributing 0.1% to 31.9% to the total marine fish landings in India. The oil sardine catch increased from 78,000 t in 1986 to 2,79,000 t in 1989, to decline again to 47,000 t in 1994. The catch further improved to 1,10,000 t by 1996. The average (1985 to 1996) annual landings of the oil sardine on the west coast was 128,282 t (86%) and the east coast 21,262 t (14%). Of late it has become an established fishery on the east coast also (Luther, 1988). The lesser sardine landings registered an increase during 1986-95 from 68,000 t in 1986 to 1,25,000 t in 1995.

The annual production of the Indian mackerel is also characterised by wide fluctuations as evident from the catch records of the past fifty years. During the last 10 years, the production ranged from 113,000 t in 1991 to 290,000 t in 1989.

As in the case of the oil sardine and the Indian mackerel, the Bombayduck also exhibited wide annual fluctuations in production. The average annual catch of Bombayduck was about 111,000 t during 1986-95 when it ranged from 74,000 t in 1987 to 136,000 t in 1991. The average catch during 1991-95 increased by 14% from the 1986-90 level, and formed 4.9% of the total marine fish landings in India. In 1996, the catch of 86,000 t indicated a decline of 23% from the 1991-95 average.

Though a progressive trend is noticeable in production of most of the pelagics, many of them, especially the oil sardine, mackerel, Bombayduck, seerfishes and tunas have reached the optimum level of exploitation in the conventional fishing ground. The stock assessment studies conducted for 19 species of exploited pelagic finfishes have shown that the present effort expended is close to or in some cases even crossed the level of MSY and further increase in effort in the coastal sector would be detrimental to sustainable yield (James, 1992). The groups which are expected to contribute significantly to the additional yield from beyond the conventional belt, where the rate of exploitation is limited at present, are whitebaits, carangids, ribbonfishes, tunas and pelagic sharks. Besides the above groups, the deeper areas of the oceans contain huge mesopelagic resources, such as file fishes, lantern fishes,

etc. which can be converted into fish meal. According to a recent observation, the mesopelagic fish fauna in the Arabian sea is dominated by myctophid fishes. Among them, one species *Benthosema pterotum* is arguably the largest single species population of fish in the world, with stock estimates ranging upto 100 million t per year. Similar populations, but of lesser magnitude, may be available in the Bay of Bengal also. Effective methods of their exploitation, handling, processing and utilization will have to be evolved. However the fishing activities in the offshore and the high sea areas are at present restricted since such activities are capital-intensive and require offshore fishing vessels (longliners, purseseiners, midwater trawlers), infrastructural shore facilities, expertise and skilled manpower. Development of the above for offshore fishing operations, coupled with value-added product development, marketing and export would provide the necessary impetus for further development of pelagic fisheries in the country.

Gearwise production of pelagics: The purseseiners are operated along the southwest coast, where the pelagics contribute more than 91% to their landings. Purseseine effort almost doubled from 56,000 boat-days in 1985 to 101,000 boat-days in 1996, but the pelagic landings declined from the maximum of 0.17 million t per year during 1986-90 to 0.15 million t in 1996 and the CPUE from 2038 kg/boat day during 1986-90 to 1454 kg/boat day in 1996.

The ringseines, which are operated along the Kerala coast increased the effort from 0.17 million boat days in 1985 to 0.24 million boat days in 1996. The pelagics which contribute about 90% to the landings of the ring seines, increased from 0.13 million t during 1986-90 to 0.18 million t during 1991-95 but decreased to 0.16 million t in 1996. In the ring seine, CPUE for the pelagics also declined particularly in 1996 mainly due to the reduction in the oil sardine catch.

The operation of gillnets decreased from the annual average of 1.1 million boat days during 1986-90 to 0.9 million boat days in 1996 while the production of pelagics increased from 0.73 million t in 1985 to the annual average of 0.9 million t during 1991-95, and declined to 0.84 million t in 1996. The average CPUE ranged from 80 kg/boat day during 1986-90 to 89 kg/boat day in 1996.

The trawlers land substantial quantities of pelagics which increased from 90,455 t in 1985 to 356,698 t in 1996 and the CPUE considerably from 63 kg/boat day in 1985 to 192 kg/boat day in 1996. The increase during 1991-96 was due to the phenomenal increase in the landings of ribbonfishes and *Coilia* along the northwest coast.

Future prospects

The Working Group on the Revalidation of Potential Marine Fisheries of the Indian EEZ (Anon, 1991) indicated the potential yield from the pelagic resources of the EEZ to be 2,211,000 t, comprising 461,000 t from the northwest region, 834,000 t from the southwest region, 241,000 t from the southeast region, 178,000 t from the northeast region and 497,000 t from the other areas including the Andaman & Nicobar islands, Lakshadweep and oceanic regions. However, the current production of pelagics includes 310,000 t from the northwest region, 460,000 t from the southwest region, 278,000 t from the southeast region and 69,000 t from the northeast region. Thus, there is a gap of 597,000 t of yield from the EEZ of mainland of India alone. Since the potential pelagic yield from the 0-50 m depth zone is estimated to be 1,174,000 t and the current production is already 1,117,000 t, there is not much scope for further increase in production from this inshore zone, and hence, the need to bring the outer shelf and oceanic waters into increasing levels of exploitation. The major stocks holding good potential in the outershelf include the anchovies, carangids, ribbonfishes, tunas and pelagic sharks. The options available for the exploitation of their potential resources from the 50-200 m depth area are extension of the operational range of crafts, introduction of combination vessels (drift gillnetting and longlining) for multiday fishing, widespread employment of "light-luring purseseiners", conversion of trawlers for offshore drift gillnet and tuna longline fishery, providing chilling and cold storage facility on board the vessel, and implementation of suitable post-harvest technology for utilising the products for internal as well as export market.

Suggestions for future research/development of pelagic fisheries

- The most prominent feature of the pelagic fisheries in general and the small pelagics in particular is their extreme annual fluctuations. For more precise understanding of the causative factors study of real time series oceanographic data in relation to the catches and the application of math-

ematical models to such data to attempt prediction are needed.

- Spawning of the various species of the pelagics as a whole is intense throughout the year, some of them spawn intensely during the immediate premonsoon, some during the monsoon and others during the postmonsoon season. Therefore, spawning season cannot be used as the basis for banning fishing in any part of the year. However, fishing could be suspended in part or in full during the southwest monsoon season as is in vogue in States like Maharashtra, Karnataka and Kerala, as a means of reducing fishing effort to attain near optimum to optimum levels.

- Further proliferation of ringseiners needs to be checked urgently.

- As the pelagic fisheries constitute the mainstay of the economy of the small fishermen, the areas close to the shore upto a distance of 5 km should be exclusively earmarked for fishing by the artisanal fishermen.

- Survey of spawning population and stock-recruitment relationships need to be undertaken to bridge the gaps in our knowledge of the biology of the small pelagics.

- Tagging and recovery studies on the oil sardine and the mackerel need to be undertaken on a regular basis.

- Information on large stocks of mesopelagic and bathypelagic resources in the Indian EEZ is limited. Exclusive surveys of these oceanic resources need to be undertaken. Similarly the exploitation and utilization of mesopelagics and bathypelagics as direct source of fish protein, require technology development and upgradation in the harvest and post-harvest areas.

- Reassessment of the marine fishery potential needs to be carried out on a regular quinquennial basis to determine changes in stock sizes.

References

Anon, 1991. Report of the Working Group on Revalidation of the Potential Marine Fisheries Resources of the Exclusive Economic Zone of India, Govt. of India, pp. 66.

James, P.S.B.R. and K. Alagarswami 1991. Strategies for marine fisheries development in India. *CMFRI Bulletin* 44(3): 511-524.

James, P.S.B.R. 1992. The Indian marine fisheries resources – past, present and future. *Indian J. Fish.*, 39 (1,2): 1-4.

Luther, G. 1988. Oil sardine, an emerging new fishery resource along the east coast. *Mar.Fish. Infor. Serv. T&E Ser.*, 88: 13-19.

Pillai, P.P. 1992. An overview on the present status and future prospects of pelagic finfish resources of India. *Indian J. Fish.*, 39(3,4): 278-285.

Srinath, M. 1989. Trend of major exploited marine fishery resources of India during 1961-85. *CMFRI Bulletin* 44(1): 272-283.