

## Indian Fisheries to 2000 A.D.

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In 1950's and 1960's marine Fishery production of India has increased at a rate which exceeds considerably the rate of growth of human population. For the past six years this growth trend has been very slow and erratic. Looking towards the end of century, the trend projections for marine fishery production indicates that the annual production can be increased to 3.25 million tons. In view of the low productivity and high cost of technology involved, the deep sea fishing would be highly questionable. Based on the techno-economic studies, possibilities of large scale aquaculture have been indicated for increasing the fish production substantially.

India with an extensive coastline of about 6100 km and Exclusive Economic zone of above 2 million sq. km contributes about 46% of the total exploited living resources from the Indian Ocean. In 1950's and 1960's marine fishery production of India has increased at a rate of over 4% per annum, which exceeds considerably the rate of growth of human population. However, for the last six years this growth trend has been very slow and erratic. The production has been almost around 1.3 million tonnes.

It has been calculated that about 36 grams of protein per day per person is adequate for essential maintenance. Thus the average catch of 1.3 million tons in recent years could entirely directed to that end, supply little more than 15 per cent of the protein needed by the India's 69 million people. In view of the anticipated growth to 95 million by the year 2000 A.D, India's fish requirement will be about 7.5 million tons per year, which is more than 5 times the present fish production.

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### Present Status and Prospects

The marine fisheries of India, are dominated by pelagic fishes (60 %) like mackerel and sardine, which contributes about 70% of the total. An analysis of yearly catch data, for last 30 years, indicates that there are wide fluctuations in pelagic catches, and abundance of mackerel and sardine exhibit an inverse relationship. The demersal catch which contributes to about 40% is represented by shrimp and other varieties, like butter fish, pomfrets, sciaenids etc. The demersal catches in contrast to pelagic stock show less seasonal variations.

The production of the fish of any maritime country over a number of years as a result of increasing fishing effort has generally upward trend so long as the composite fisheries are rationally exploited. However, during the last six years, although the fishery effort has increased considerably, the growth rate is slow and erratic. This is mainly because most of the mechanised boats are less than 20 metres in length and have their range of operation is restricted within the 40 metres depth zone. As a result, a large part of the potential fishery grounds upto systems like estuaries, backwaters and mangrove vegetation, which have high productivity potentials, are at present very meagerly utilised.

Estimates of potential annual catch of India, have been made earlier based on biological production, which varies from 3 to 8 million tons. In view of the stagnation in Indian fish catch, conservative estimate of 3 million tons would seem to be a very realistic figure, indicating that the present yield of 1.37 million tons could be increased by a factor of about 3.

As elsewhere, the extrapolation technique has greatly helped the development of fisheries in the past. The fishery production has their inherent limitations, arising out of factors like changes in government policies, technological innovations, prevailing prices in inland and export market, availability of fishery resources etc. In view of these constraints, it was thought proper to restrict only to trend projections rather than attempting for statistical model.

The study of growth pattern in investment in fisheries development by Government, mechanisation of boats, fishermen population and consequent increase in fish during last 30 years, revealed that, there is a correlation between these factors. The investment pattern and mechanisation of boats found to follow a growth rate, which more appropriately can be expressed by a modified Pearl Reed curve. Statistically curve was found to be significant at 10 per cent level of significance. After duly considering all these factors, the catch data for last 30 years was fitted in the modified Pearl Reed curve.

$$\text{i.e. } Y = C + \frac{x^1}{e^{bx}} \quad \begin{array}{l} Y \text{ is production ; } e \text{ is Napierian base} \\ C \text{ and } b \text{ are constants ; } x \text{ is variable (year)} \end{array}$$

Accordingly the projected production for 1985, 1990, 1995 and 2000 is 1.6, 2.10, 2.7 and 3.25 million tons, respectively.

While we have reasonably good information about the resources potential of the continental shelf, the extensive offshore areas accounting for more than 90% of the total sea floor are scientifically little known. Available information on biological productivity indicates that in general the areas beyond the continental shelf are 80% less productive than inshore waters.

Research studies indicated that the type of fish catch in offshore area depends more on region and the type of device used for fishing. From Table 1, it could be seen that opportunities for offshore fishing are limited in South eastern and North eastern divisions, compared to others. According to Indian Institute of Management, Ahmedabad, which recently completed a survey, the cost-output ratio of larger trawlers is 2 to 3 times higher than that of small fishing boats and traditional fishing. Not only are the chances of finding fish in deeper water is less but such fish as may be caught will be three times costlier than those caught by traditional fisherman.

### **Aquaculture**

The nagging question is, if the marine fisheries cannot fully meet the nutritional needs, what are the avenues and development? The most potential area for the generation of newer seafood resources is the development of capture fisheries through fish farming or coastal aquaculture.

Fish farming is already contributing very significantly to the food production and to the economy of a number of Asian countries. India has a vast potential for the production of fish and aquatic animals by marine farming. The most recent estimates put the world harvest of farmed fish at about 5 million tons, of which 80 per cent is produced in Asia and the Far East. This means that only about 6 per cent of the total fish yield is contributed by aquaculture.

Despite the immense potential which the aquaculture offers for generating extra food resources, it is surprising to note that it has been extremely slow in its growth and development. Lack of scientific methods to illustrate the usefulness of aquaculture, and the absence of relevant data to show the monetary returns it can give, have been the main factor for its restricted application. Perhaps the main factor which has contributed to the slow growth of aquaculture has been due to the unrealistic appraisal of the potentialities of biosphere to produce food for growing population, as it was earlier thought that the food resources of the sea are simply inexhaustible and the desired increase is always possible by intensifying the exploitation of wild stocks.

### **Future Development**

It would be hazardous to venture into a forecast of which type of fish farming system would likely to contribute most to future development. The objectives associated with aquaculture development schemes are different for different places

TABLE 1  
Offshore Fishing Results

<i>Region</i>	<i>Findings</i>
<i>North Western</i>	
Latitudes 15° N—24° N Longitudes 67° E—74° E (Bombay, Cambay, Veraval Porbandar, Dwarka)	Trawling grounds extensive, catch rates for all powered vessels high, preponderance of large size quality fishes—yield of fishes high all around year except monsoon. Quality fishes large in northern zones. Prawns in greater abundance in Cambay.
<i>South Western</i>	
Latitudes 7°30' N—15° N Longitudes 73° 40' E— 77°33' E (Karwar, Mangalore, Cannanore, Cochin)	Continental shelf narrow, trawling grounds less extensive, best trawling grounds for shrimp. Proportion of quality fishes negligible. Scope for stepping up pelagic fisheries by introducing purse seining operations during mackerel and sardine fishing season.
<i>Southern, Eastern &amp; North Eastern</i>	
Tuticorin, Mandapam, West Bengal, Andhra Pradesh and Orissa	Catches lower than first two divisions. Shrimp occasionally high but never steady. Catch rates for low quality fishes like bellies very high.

and depend on natural policies, environmental and technological factors, as well as economic and social aspects. Fish farming may be primarily developed to provide low cost food or to create employment in rural communities, thus contributing to rural development and reducing their draft to large cities. It may be set up to produce a product which would generate foreign exchange and will also provide recreational and tourist attraction. It may also be developed as a business proposition to generate profit.

However, the future role of fish farming must be judged on its capability to provide additional supplies of low cost food. In saying this, we do not wish to neglect the possibilities existing in raising high value products for the luxury class market, but the large volume of food supplies which may people hope to obtain from aquaculture can only be achieved if production cost can be kept low. Prices for farmed fish must be on a level which low and medium income group can afford.

Several projections of possible increases in farmed fish production of the world have been made and it is generally believed that a ten-fold expansion by the end of this century leading to a production figure of 50 million tons should be feasible. It

is estimated that the area under pond culture (swamps and low lying areas with the adjoining sea) can be increased from the present three to four million hectares to perhaps 30 million hectares. This, however, will have to be confirmed by ecological studies and site investigations. Furthermore, it is known that the harvest of oysters and mussels at present is just below ten thousand tonnes, but sheltered and relatively shallow areas of lakes, reservoirs, lagoons and foreshores areas of suitable site for open water systems of oyster and mussel farming may be at least 3 million hectares.

The optimism regarding future production stems from the considerable rise in yields which have been obtained through improved techniques. In some areas of India, (Table 2) the average production of Indian crop was raised within a few years from 600 kg to 4000-5000 kg/ha through the adoption of moderately intensive polyculture techniques. Under favourable conditions, raft culture of mussel in India can produce 500 kg/ha/year. The success achieved, clearly indicates the greater possibilities of fish farming on commercial scale.

TABLE 2

## Annual yield from different aquaculture systems developed in India

<i>Space/Water</i>	<i>Location/System</i>	<i>Annual/Yield kg/ha</i>
Indian carp/Fresh	Cuttack (Orissa) Average for 132 ponds	4000
Mixed/Fresh	CIFRI. Barrackpore/Fish farm (West Bengal)	8750
Mixed/Brackish (Fish and prawn)	Kakinada (Andhra Pradesh) Fish farm	2250
Mixed/Brackish (Fish and prawn)	Goa/Traditional fish farms, paddy fields and Salt pans	1060
Green mussel/Brackish	Dona Paula (Goa)/Rope culture on floating rafts.	4,80,000

However, these estimates only give an indication of potential for further production. If these figures were to come anywhere nearer to reality, two considerations should be given :

- (i) The application of low-cost technology for sea farming production, and
- (ii) Utilization and marketing of the product rationally.

There are economic data available on commercial fish farming, but from the information available it appears that the cost of stocking and of artificial feed to be used during culture must be reduced drastically.

Thus, it is through improved technology and more efficient organization and management practices in fish culture, cheaper production can be expected to be achieved.

Further development will critically depend on the effective demand for fish and the extent to which farmed fish is able to generate consumer preference. The interesting example is of mussel culture. Mussels can easily be produced at a low cost and its production can also be expanded very rapidly. However, it would be difficult to sell large additional production in our present market of mussels. This would mean that more efforts are needed on product advertisement and market promotion.

While the need to do something about the utilization and marketing of farmed fish was perhaps less pressing up to now, any future large-scale expansion of the industry will have to give this sector its utmost attention. It must be clearly recognised that it is market where the success or failure of new aquaculture ventures will ultimately be decided.

In future, fish farming operations will therefore, have to be much more closely integrated into the processing of seafood and its marketing. It is not only necessary to ensure a feed back from the market on matters such as consumer responses, product concepts, price policies etc., but information from the market will ultimately determine the production scale and harvesting schedules. While in fisheries, in general people are accustomed to market what the sea and the fishermen make available—a production-oriented market offers one of the main challenges in aquaculture.

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