

Spearheading Quality Fish Processing



भारत सरकार
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(पशुपालन, डेयरी एवं मत्स्यपालन विभाग)
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गुणता
मत्स्य प्रसंस्करण की अगुवाई

**Spearheading
Quality Fish Processing**

स्मारिका, 2007

Souvenir 2007

आई.एफ.पी के नवीकृत मत्स्य प्रसंस्करण
कॉम्प्लेक्स को काम में लगाने के अवसर पर प्रकाशित

*Published on the occasion of commissioning of
renovated fish processing complex at IFP*

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अपर मात्स्यिकी निदेशक, केरल

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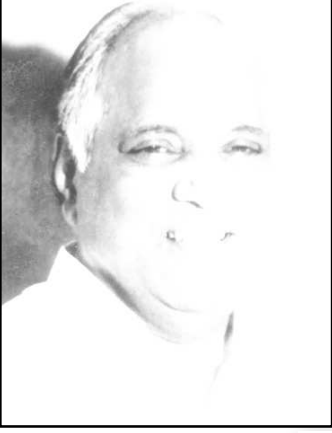
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शरद पवार
SHARAD PAWAR

कृषि, उपभोक्ता मामले, खाद्य और
सार्वजनिक वितरण मंत्री
भारत सरकार
**MINISTER OF AGRICULTURE
& CONSUMER AFFAIRS,
FOOD AND PUBLIC DISTRIBUTION
GOVERNMENT OF INDIA**
10, December, 2007

Message

I have great pleasure to know that Integrated Fisheries Project, Cochin of this Ministry is releasing a Souvenir to commemorate the commissioning of refurbished fish processing complex. Ever since its inception as Indo-Norwegian Project, the contributions of IFP to our country's fishery economy, in the fields of mechanization of fishing industry, value addition of fish products and rural community development, are laudable.

I wish this institute all success on this occasion and hope that IFP will continue to bring about improvements in the field as per their revised mandate.

(Sharad Pawar)





V. S. ACHUTHANANDAN

Chief Minister of Kerala

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23-11-2007

Message

I am glad to know that the Integrated Fisheries Project is bringing out a Souvenir to commemorate the commissioning of the refurbished fish-processing complex at Kochi.

I hope that it would be a worthy publication in the contemporary fisheries sector.

Wish you all the success.

(V. S. Achuthanandan)

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S. SHARMA

Minister for Fisheries and Registration

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THIRUVANANTHAPURAM

DATE: 27.09.2007.....

Message

I am pleased to know that the Integrated Fisheries Project (IFP) is bringing out a souvenir to commemorate the commissioning of the refurbished fish processing complex at Kochi. The erstwhile Indo-Norwegian Project (INP) has taken the initiative in the 1960's for the modernization and mechanization of fishing industry in the country which has been instrumental in increasing fish production and enhancing marine products exports. I came to know that the Ministry of Agriculture has remodeled the present IFP's mandate and mission for taking up the new challenges of development. Accordingly the processing and freezing facilities have been renovated which is to be commissioned by the Union Minister for Agriculture, Government of India, shortly,

I hope that the IFP will continue to serve for the development of fisheries and welfare of fisher folk in the years to come.

I wish the souvenir all success.

(S.SHARMA)

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S.Girija*

Foreword

The Integrated Fisheries Project, with its glorious past as the erstwhile Indo Norwegian Project, has rendered yeomen service to the country's fishery economy by spearheading modernization of fishing, processing and marketing industries and the socio economic development of various stakeholders in their rural midst. These achievements in the national service notwithstanding, the need for revalidating the Project's mission and mandate tailoring to suit the needs of the changing times can hardly be over emphasized. Accordingly in its pursuance, the Ministry of Agriculture through appropriate and administrative measures, has remodelled the Project's mandate and mission as follows:

Post harvest technology upgradation and appropriate dissemination.

HRD for the export and domestic processing & marketing industries as well as the enhancement of livelihood of rural communities, especially through women empowerment.

Standardization of quality management of fish, fish products and fish handling practices, local area and community development/livelihood security interventions in the various States and Union Territories.

**Director i/c, Integrated Fisheries Project, Kochi.*



Pursuing the revised mandate and mission in letter and spirit, the Project is making a turnaround and is surging ahead with renewed synergy of the active cooperation and hard work of the entire employees and the patronage of our Administrative Ministry.

As a part of the upgradation processes of the Project, our processing and freezing facilities have been refurbished with state-of-the-art equipments and processes which is being ceremoniously commissioned by the Hon'ble Union Agriculture Minister.

To commemorate the momentous event we are bringing out this Souvenir. Responding positively to our entreaty, the best minds of the country's Fisheries intelligentsia have contributed very valuable articles, which have rendered this volume a very worthy publication in the field of contemporary Indian fisheries. Our sincere gratitude for their committed endeavours in bringing out this valuable document is gratefully placed on record.

We have always been fortunate to enjoy the benevolent patronage of our Administrative

Ministry in all our endeavors. We do offer our humble gratitude to Ms. Charuseela Sohoni IAS, Secretary to Government of India, Ministry of Agriculture, Department of Animal Husbandry, Dairying & Fisheries and to Shri Ajay Bhattacharya IAS, Joint Secretary (Fy), Ministry of Agriculture for all their support and guidance.

The Commissioning of the modernized plant and the present Souvenir would not have been materialized but for the relentless hard work put in and the sincere cooperation extended by the entire employees of IFP, which is sincerely appreciated.

The editorial and secretarial work has been assiduously and meticulously discharged by a team of staff members whose efforts are also thankfully acknowledged.

It is sincerely hoped that this publication would be of benefit to not only academic fisheries but also to the industrial fisheries.



(S. Girija)



Challenges for Indian Marine Fisheries*

Mohan Joseph Modayil**

... resource sustainability achieved through informed fisheries governance and community based coastal resource management and dovetail with the overall developmental agenda of the Government encompassing many sectors.

Asia contributes to 63.17% of total fish production in the world. However, South Asia's contribution is only 6%. India occupies a prime position admits South Asian countries in fish production. While Bangladesh (17%), Pakistan (9%), Srilanka (3%), Nepal (q.n.s) have only small shares, India contributes to 71% in this region. If the contribution of the whole Asia is considered, China is the topper and although we are next, the gap between the first and the second is enormous. We cannot be just complacent stating we are the second; concerted action is needed for increasing the fish production in the country so that the gap is reduced to a respectable one and the overall benefits from increased production is able to link to the national productivity and economy.

Over the past few years, the marine fish production from India has been stagnating and fluctuating between 2.5 and 2.8 mmt. The most recent figure is around 2.7 mmt. As per our estimates, the growth rate between 2002 and 2003 was - 0.1% and between 2003 and 2004 was -1.9% as against the growth in inland aquaculture which was about 8%. So while aquaculture has been steadily growing, the capture fisheries have shown stagnation. This is not 'alarming' as many would say, but just natural. Every system has a potential maximum and the fact is that we have just reached this maximum from the presently exploited fishing grounds. In the light of this, the target for fish production during the coming year is 3.26 mmt for marine and 4.83 mmt for inland sectors. The outlook therefore should be to meet these targets through increased fish culture activities,

**The views expressed here are personal to the author and may not reflect those of the organization represented.*

***Director, Central Marine Fisheries Research Institute, Cochin*



and not from the capture sector. There is scope for increasing the fish culture growth rate from the present 8 % to even 20 % thereby making a visible impact on the productivity.

Percapita availability of fish in South Asia is 2.3 kg in Pakistan, 8.5 kg in Bangladesh, 15.8 kg in Srilanka as against 4.1 kg in India. The per-capita demand for fish as an item of food in India would vary between 6.9 kg and 9.2 kg by year 2030. At the present population growth rate, India would require 15 to 20 million tons of fish by year 2030. In other words the growth in domestic demand for fish would range between 121% and 195% over the present production. How will we meet the demand? Certainly an up-hill task, but not impossible if logical steps leading to better management are implemented.

The first question we should ask is how much of fish do we waste? Discards at sea add up to 30%, other post harvest losses account for up to 15%, non food uses account to up to 9.73% in the marine sector. In other words, about 55% of fish do not reach the food basket. Edible animal protein harvested from the seas with the objective of primary consumption by human beings in reality does not reach the common man as a food item. Certainly this is a wastage of the valuable resource. This currently 'wasted' marine fish could be saved and better utilized by appropriate interventions. There is some misconception in this area. By utilization, what is really meant is not preparation of byproducts from bycatch. In fact bycatch should be avoided and only targeted catch should be utilized. Some argue that the bycatch is downgraded and therefore, new products should be developed for human consumption. This has no logic; on the contrary, is a dangerous proposition in so far as the resources are concerned. Any attempt to develop byproducts from the bycatch should be discouraged as this will eventually lead to systematic exploitation of the bycatch and more and more fishing vessels will venture in to the seas in search of the bycatch, thus further destroying the fish wealth. The bycatch becomes a targeted catch. We are already witnessing this phenomenon in the sector. Therefore, the earlier we put a stop to

developing and commercializing technologies for bycatch utilization, the better for the fishery resource. Instead, we must focus on designing and developing mechanisms for reducing and ultimately eliminating the bycatch from fishing. The faster this is achieved, the better it is for the fish wealth. The post harvest loss is another area of concern. While such losses are common in all sectors, fish being a highly perishable commodity, there is great scope for interventions here to reduce the post harvest losses through better handling and preservation strategies. The use of low value marine fish as the main source for fish meal used in the preparation of animal feed is another area of concern. The world's source of cheap fish is being depleted at an alarming rate and richer countries are looking at poor and developing countries for setting up their fish meal plants or for procuring cheap fish protein for the fish meal industry. It is time that an alternate for fish meal is found for the animal feed industry. Thus, the growth of aquaculture is also a threat to the marine fishery resources as juvenile and low value fish are systematically being used up for fish meal, thus endangering the resource sustainability.

The next question is where and how much are the negative trends in production? In general, it can be stated that the north east seas contribute to 10%, south east 23%, south west 33% and north west 34%. Among the major maritime states, the change in catch rates (kg fish caught / hr) declined between 1991 and 2000 from 38.5% to 17.5% in Andhra Pradesh, 38.2 % to 24% in Tamil Nadu, 73.6 % to 57.4% in Kerala, 54.0% to 32.5% in Maharashtra and 113.0 % to 87.4% in Gujarat. Per-capita area available per boat for fishing also declined drastically during the last two decades in all the states. The fishing effort exerted for capture of fish is much more than what is actually required. In other words, the same quantities of fish can be caught by a much lesser number of fishing vessels. This is called 'over capacity'. This over capacity is well reflected in all the fishing sectors. It is estimated that the non-mechanized sector has 81% overcapacity, the motorized sector has 60% overcapacity and the mechanized sector has 55% overcapacity. There is urgent need to reduce the



overcapacity which is well recognized need, but there is neither any political will for this nor any policy outlook.

The status of various fish stocks also is a matter of concern. Species such as (*Sardinella*, *Hilsa*, *Rastrelliger*, *Scomberomorus*, *Euthynnus*, *Caranx*, *Harpadon*, *Nemipterus*, *Leiognathus*, *Formio*, *Trichiurus*, *Secutor*, *Tachysurus*, *Otolithus*, *Johnius*, *Fenneropenaeus*, *Metapenaeus*, *Panulirus*, *Sepia*) are all either fully exploited or over exploited in most regions. The high exploitation rate ($E=0.59$) indicates substantial degradation and biological over fishing of our fish stock. Harvesting immature/undersize fish, destructive fishing, degradation of critical habitats, international resource use, issues of equitability, inter-sectoral and intra-sectoral conflicts, post harvest losses, discards, bycatches, gender equity and poverty issues, lack of opportunities and pressures of credit system contribute to the added pressures on marine fishers and resources leading to depletion. At the same time, we still have an open access system in India coupled with inadequate fisheries management and poor governance with weak implementation of MFRA.

There is need for a paradigm shift in our outlook for marine capture fisheries. The focus has to shift from 'increasing yield' to 'increasing profitability'. This approach should revolve around setting new goals to: (1) Ensure sustainability (2) Ensure equitability (3) Ensure stock resilience (4) Reduce environmental impacts (5) Implement code of conduct for responsible fisheries (6) Enable a knowledge driven fisheries governance. Certain options for increasing yield could be in terms of reducing the fishing capacity, diversification of fishing to deep seas and multi day fleets, construction of FADs to attract fish shoals, targeted fishing for straddling species like tuna, marlins, oceanic sharks and deep sea fishes. Sustainability can be ensured only if we could understand what sustainability is. For most people, catching the same or larger quantities of fish year after year is sustainability. Sustainability has many dimensions and should be understood in its totality, which should consider the state of the environmental

system, the stress on the environment in terms of exploitation, the human vulnerability to environmental changes and loss of fishery resources, the social and institutional capacity to cope with such losses and the ability to respond to the demands of global pressures with collective efforts based on a knowledge driven resource utilization agenda. Ensuring equitability is also of paramount importance. Equitability can be ensured by reducing marginalization, creating alternate livelihood, income and employment, enabling fishers to cope with emerging scenarios (for eg. WTO impacts, labeling, certifications) and by reducing vulnerability of fishers to fish famine, natural disasters, trade and non trade barriers and globalization. Stock resilience can be achieved by reducing fishing effort, discards, bycatch, juvenile fishing, enforcing mesh size regulations and MFRA, reducing harvest and post harvest losses, diversification of fishing methods and introducing resource friendly and resource specific gears. Environmental impacts could be reduced by reducing damage to benthos, creation of artificial fish habits, FADs, artificial reefs, declaring closed areas and marine protected areas, closed seasons, biodiversity loss reduction, conservational mariculture, sea ranching, coping with climate change and natural calamities and introducing eco-friendly gears such as TEDs and BEDs.

There is urgent need to change over from open access to regulated regime to user rights mode. Reducing over capitalization and intra sectoral conflicts are key elements. Fisheries management should anchor upon resource sustainability achieved through informed fisheries governance and community based coastal resource management and dovetail with the overall developmental agenda of the Government encompassing many sectors. A holistic approach is needed and actions cutting across many sectors is essential. Individuals and institutions can only flag issues and bring these to the attention of the government. The ultimate action lies with the Government and it is time that some thoughts and action are spared by the Government to save the marine fisheries sector from the impending doom.

1



Marine Fishery Resources Potential and Management in the Indian EEZ

V.S.Somvanshi*

The exploitation of fish stocks and their conservation and management should be interlinked with the twin objectives of sustainable fishing and sustainable livelihood.

India has taken impressive strides in Marine Fisheries in the past decades. The marine fishery sector in India plays a vital role in providing food and nutritional security and also employment avenues, as per the recently conducted census, to about 9 lakh fishermen. This sector also plays crucial role in the economic development of the country. The aquatic living resources although renewable are not infinite and need to be properly managed. With their contribution to the nutritional, economic and social well being of the population the resource utilization is to be sustained. The Code of Conduct for Responsible Fisheries (CCRF) prescribed by the FAO (1995) sets out principles and International Standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity. The Code recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and the interest of all those concerned with the fishery sector.

The Code provides principles and standards applicable to the conservation, management and development of all fisheries. It also covers all the aspects related to fishing, processing and trade of fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management.

The objectives of the fisheries development in the country were many, and the fishery sector had made significant progress by achieving these objectives since the

**Director General, Fishery Survey of India, Mumbai*



commencement of Five Year Plans. The country, endowed with rich marine fishery potential and occupying a prominent place among the fish producing countries in the world, has to address various issues including augmenting production, balancing conflict of interests of different stake holders, developing domestic as well as export markets, formulating management measures for ensuring sustainability. This could only be achieved by upgrading the small scale sector, diversification of trawling for catching other than shrimp resources, reduction of fishing effort in the present fishing grounds, upgradation and modernization of fishing vessels and introduction of fuel efficient vessels and gears with emphasis on deep-sea and oceanic fisheries development. There must be a shift from open access system to the rights based fishery, introduction of resource specific deep-sea fishing vessels.

The marine fish landings showed rapid increase in the sixties through seventies and eighties and during 1990s, they have reached a plateau. During 2004-06, the catches were stagnating around 2.6-2.8 million tonnes (t). Some of the commercially exploited major fish stocks are showing signs of over-exploitation. As the demand for seafood is growing rapidly, the exploitable deep-sea resources need to be tapped. It is also imperative that conservation measures have to be taken on a priority basis for enhancing and sustaining productivity and production.

Present status of Marine Fisheries

India is endowed with a potentially rich and varied aquatic resources. India has a vast coastline of 8,118 km, a continental shelf of 0.50 million sq.km. and an EEZ of 2.02 million sq.km. The vast fishery resources of India have immense potential for development. The potential of marine fishery resources revalidated in the year 2000 from the EEZ estimated as 3.93 million t. This comprises of 1.94 million t of demersals, 1.74 million t of pelagics and 0.25 million of oceanic resources. The present fish production from the seas around the country is in the range of 2.7 to 2.9 million (t)

which accounts for 1.5% of the total GDP of the nation. This production mainly comes from the coastal areas within 100m depth. The balance of the potential yield estimate and present production has to be mainly harvested from the deep-sea and oceanic waters. Marine Fisheries in India are typically multi-gear and multi-species in nature. The major resources identified for exploitation are Shrimps, Oil sardine, Mackerels, Ribbon Fishes, Bombay duck, Carangids, Croakers, Pomfrets, Seer fishes, Perches, Catfishes, Flatfishes, Lizard fishes, Silver bellies, Goat fishes, Threadfins, Coastal Tunas and Pelagic Sharks in the EEZ. These fishery resources are harvested by trawls, long lines, drift nets and bottom set gillnets, hook and line, purse seines and several regional fishing gears like 'Dol' nets and ring seines. Tuna and cephalopods are the two least exploited resources because of the limited operational range of majority of the present fishing fleet and lack of suitable technology.

The recent approach in fisheries management is focused on sustainable utilization. To achieve sustainability, appropriate policies and practices are required in various stages of exploitation, conservation and management. The policy orientation in regard to exploitation has to address the issues like technological up-gradation, diversification, resource specific capture techniques, capacity building, value-addition and utilization of low value resources. Introduction of fish aggregating devices (FAD), application of satellite remote sensing technology for fish location etc. are to be encouraged.

Physically and economically we have accomplished the fishing operations in different areas of EEZ upto the depth of 100m. The distant water deep-sea and oceanic resources requires to be developed by introducing expensive technologies and the vessels of requisite capacity having longer endurance to stay at sea. In view of this the future is for harvesting balance of the resources with focus on fish processing and value addition. Three types of preservation systems on board the deepsea fishing vessels are required (1)



Blast freeze system (2) Chillwater preservation system (3) Preservation on Ice.

The fish processing industry in India commenced with the exports of shrimps and with the advent of deep sea shrimping along the North-east coast of India. Subsequently, cephalopods (squids and cuttle fish) and fin-fishes were also processed (frozen and exported). Recently, surimi is also added to export basket. Surimi is made from the low grade white meat fish considering the higher demand for fish and fishery products, as the raw material become scarce, greater attention needs to be given for appropriate post-harvest technology.

Sashimi grade tuna is emerging as an important product which has demand all over the world. The processing technology of tuna byproducts involving blast freezing (-55°C) and preservation in chilled water system or on ice is yet to be popularized in India. Introducing the state of art technology of these types will definitely help in making the country's sectoral activities economically viable.

Among the demersal resources, the candidate species for harvesting deep sea shrimps and lobsters, Threadfin breams, Bullseye, Mackerel, Horse mackerel, Black ruff, Indian drift fish, Baracuda, Sciaenids and Scads. Among the pelagic potential stocks are Coastal tunas, Carangids, Ribbon fish and Pelagic sharks. The oceanic stocks are least exploited and potential species are Yellowfin tuna, Skipjack tuna, bill fishes and Sharks.

Presently, the oceanic tuna resources which have high market value are not exploited as an organized fishery and tunas are not processed in India, excepting recent individual efforts made by the pioneer entrepreneurs. The processing of tuna requires high skills, right from catching, handling, preservation, processing and packing onboard the vessel as well as on shore. The demersal and pelagic resources available for exploitation are rather low value which require value addition. The value addition should also be promoted to meet the demand in domestic markets rather than to cater to the export market.

The exploitation of fish stocks and their conservation and management should be interlinked with the twin objectives of sustainable fishing and sustainable livelihood. These measures should be of a coherent nature to promote conducive environment and healthy stocks which will ensure optimum and sustainable levels of yield within the threshold limits of the ecosystem and not resulting in any ecological imbalance. The major areas to be focused are effort regulation, use of bycatch exclusion/reduction devices, use of selective and eco-friendly fishing gear. Approaches such as bio-economic approach in general and bio-socio-economic considerations in particular where the coastal communities are involved and prevention of environmental degradation, preservation of bio-diversity and integration of coastal fishing activity with Coastal Zone Management plans are essentially required to be applied for sustainable development.

1

"There," said he pointing to the sea, "is a green pasture where your children's grandchildren will go for bread"

OBED MACY]

[HISTORY OF NANTUCKET



Sea Food Export from India- Potential and Challenges

G.MohanKumar*

**All concerned
with the seafood
exports should
strive in this
direction to
achieve the
desired objective
of India's marine
products exports
to 6 billion US
dollars.**

India has a substantial potential of fishery production of nearly 8.4 million MT per year composed of 4.5 million MT inland and 3.9 million MT marine fishes.

Out of the estimated resource potential, only 3.01 million MT marine fish and 3.50 million MT inland fish (total 6.51 tonnes) are currently being exploited. More than 90% of the fisheries output (by volume) is consumed domestically, most of which is in the originating states themselves. Only about 25% of the marine fish caught is exported. There are many reasons for under utilization of the resource potential and exports being very low percentage of total volume.

India's current seafood exports (2006-07) stands at 6,12,641 MT valued at 1.85 billion US\$ (Rs.8363.53 cr). As per the FAO statistics, during the year 2004, India occupied 19th position among the top exporting countries of the world. Shrimp is the main item of export from India, its share being 55% by value and 28% by quantity. Among aquaculture nations, India occupies the second position in the world with an annual production of 2.47 million MT. Fresh water fish, which constitutes 93.1% of the production, is mostly used for the domestic market and does not figure significantly in international trade. India exports shrimp mainly in the form of headless shell-on, PUD, PD, Peeled tail-on etc. Block frozen/IQF raw materials meant for further processing dominates India's exports. The current level of value addition of shrimp is only 4.63%. In this context, a brief account on the prospects India has to boost the seafood exports and the challenges ahead are dealt in this paper.

**Chairman, MPEDA, Kochi*



Export Performance

Although frozen items were present in the export basket from 1953 onwards in negligible quantities, it was only since 1961 that the export of dried marine products was overtaken by export of frozen items leading to a steady progress in export earnings. With the devaluation of Indian currency in 1966 the export of frozen and canned items registered a significant rise. Thereafter frozen items continued to dominate the trade. Markets for Indian products also spread fast to developed countries from the traditional buyers in neighbouring countries. More sophisticated and affluent markets viz. Japan, USA, Europe, Australia, etc. became our important buyers. The share of marine products exports has steadily grown over the years from a mere Rs.3.92 crore in 1961-62 to Rs.8363.53 crore in 2006-07 (Fig-1 and Table 1).

During the year 2006-07 shrimp continued to be our major item of exports in value (55%) followed by frozen fish (17%), frozen cuttlefish (9%), frozen squid (7%) and other items. With the technical guidance and financial assistance rendered by MPEDA, India's tuna fish export had increased by 90% in 2006-07 compared to 2005-06. For the first time, Sashimi grade tuna to the tune of 758 MT valued at 3.54 million US\$ was also exported from India. European Union remained India's largest market with a percentage share of 34% followed by Japan (16.1%), USA (16.03%) and China (14%) and other countries. China's emergence as a leading buyer of Indian seafood needs special reference. While there was increase in exports to EU, Japan, China and Middle East there was a fall in our seafood exports to USA. This was mainly due to the anti dumping duty imposed by the US Government on Indian Seafood

Figure 1: Marine products Export performance (US\$ million.)

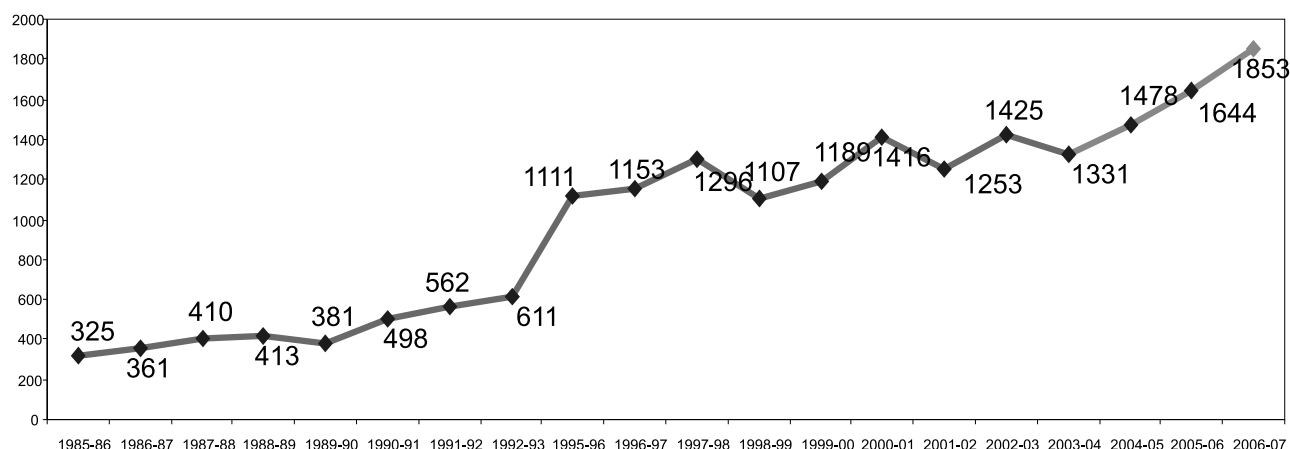


Table 1: Exports during 10th Five Year Plan

Year	Quantity (MT)	Value (Rs. Crore)	Average Unit value realisation (Rs./Kg.)	Average Exchange Rate US\$	Value in US \$ Million	Average Unit Value Realization US \$ / Kg.	Growth rate %		
							Quantity	Rupee Value	Dollar Value
2002-03	467297	6881.31	147.26	48.29	1424.90	3.05	10.09	15.52	13.69
2003-04	412017	6091.95	147.86	45.70	1330.76	3.23	-11.83	-11.47	-6.61
2004-05	461329	6646.69	144.08	44.66	1478.48	3.20	11.97	9.11	11.10
2005-06	512164	7245.30	141.46	43.50	1644.21	3.21	11.02	9.01	11.21
2006-07	612641	8363.53	136.51	44.60	1852.93	3.02	19.62	15.43	12.69



Fig-2 Major items of export in US\$ realization

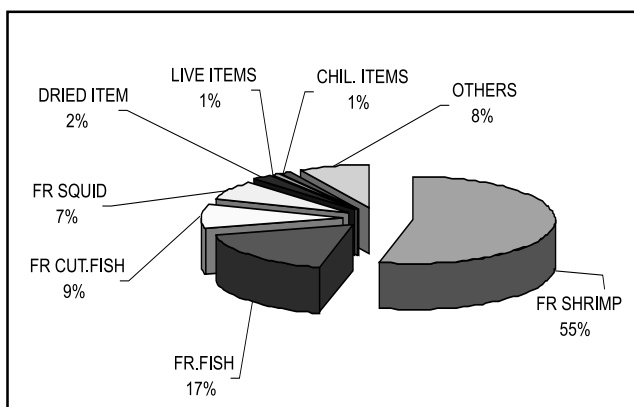
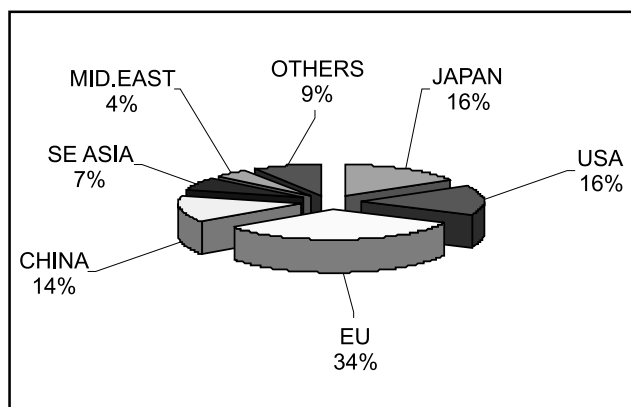


Fig-3 Major export markets in US\$ earnings



imports along with other five countries (Figures 2 and 3).

As per MPEDA's vision for the seafood industry, exports will have to increase from the current level of 0.61 million MT to at least 2 million MT in the year 2015. The value of exports will have to increase to the level of 4 million US\$ by the year 2010 and at least 6 billion by 2015 so that marine products industry retains its share to at least 2.5% in India's total exports thus retaining its visibility. If this happens, India's share in the world seafood trade could be 5-6%. If this is achieved, India will become one among the top five seafood exporting countries in the world. This overall increase will be achieved through expansion of production and increased production of value-added products including the products produced from imported raw materials. At least 75% of the total exports by the year 2010 will have to be accounted for by value-added products. This will also be accompanied by an increased foray into the retail segment of the international fish trade.

Development of tuna fishing in India

Tuna resources in Indian EEZ are estimated at 2.13 lakh MT. But the exports of tuna from India was only to the tune of 24000 MT that too mostly in frozen form. The average price realization of the tuna products is around 1-2 dollars at present. Though India has potential of good tuna resources, its exploitation to optimum level could not make much headway owing to the non availability of appropriate technology for tuna fishing and its post

harvest handling. Though the Ministry of Agriculture has given permission to operate mechanized vessels in Indian EEZ through LOPs, it has not made any significant impact on tuna exports.

With a view to develop tuna fishing industry in the country, MPEDA has been operating a scheme for subsidizing the cost of conversion of existing fishing vessels to tuna long liners. As per the scheme, MPEDA provides assistance for vessel modification up to 50% of the cost subject to a maximum of Rs.15 lakh for deep sea fishing vessels and Rs. 7.5 lakh for mechanized fishing vessels. Apart from this, MPEDA has been conducting a series of trainers training programme for the benefit of fishermen in scientific tuna long lining and on board handling of catch by availing the service of foreign experts.

In order to boost our efforts in developing the tuna industry, MPEDA has appointed an expert in tuna long lining from Australia as 'Advisor Tuna' for undertaking the task by which demonstration of conversion of few vessels utilizing imported Australian tuna long line equipments, designing fishing gear suitable for local vessels and giving technical advice for their conversion, training local fishermen in fishing using the converted vessel, training local gear/machinery manufacturing companies in designing and making gear/equipment for tuna long lining, training personnel in correct on board post harvest techniques, designing of shore based infrastructure for packing Sashimi grade tuna etc, will be accomplished.



Besides this, MPEDA proposes to provide interest subsidy for the construction/purchase of new tuna long liners as a measure to introduce more resource specific vessels in the EEZ.

Aquaculture scenario

India is endowed with 8129 km of coastline, 0.5 million sq. km of continental shelf and 2.2 million sq. kms exclusive economic zone worthy for taking up mariculture activities. Apart from this, a potential of 1.2 million ha of brackishwater areas and 5.4 million ha of freshwater bodies suitable to take up land based aquaculture are also available. The details on the potential for the Indian aquaculture are presented in tables 2 and 3.

Table 2: Indian Aquaculture: Potential

Length of Coastline	8129 kms.
Exclusive Economic Zone (East 0.56, West 0.86 and Andaman & Nicobar 0.60)	2.02 m.sq.kms
Continental shelf area	0.50 m. sq.km
Marine resource potential	3.90 million MT
Present level of exploitation	3.62 million MT
Inland resource potential	4.50 million MT
Present level of exploitation	2.04 million MT
Brackish water area	1.20 million ha
Freshwater area	5.40 million ha
Potential fresh water area	1.67 ha (exploitable)

Table 3: State-wise details of potential and area available for aquaculture

Sl. No.	State	Potential area BW	Available (ha) FW
1	Andhra Pradesh	150,000 (12.60%)	2,60,000
2	West Bengal	405,000 (34.01%)	2,75,000
3	Orissa	31,600 (2.65%)	1,14,800
4	Tamil Nadu	56,000 (4.70%)	2,77,000
5	Pondicherry	800 (0.07%)	—
6	Kerala	65,000 (5.46%)	85,000
7	Karnataka	8,000 (0.67%)	70,000
8	Goa	18,500 (1.55%)	—
9	Maharashtra	80,000 (6.72%)	3,00,000
10	Gujarat	376,000 (31.57%)	3,14,500
TOTAL		1,190,900 (100.00%)	16,96,300

Aquaculture is being practised in the country mainly in freshwater and brackish water environments. The black tiger shrimp *Penaeus monodon*, which is native to India cultured in the brackish water area in the coastal states and giant fresh water prawn *Macrobrachium rosenbergii* cultured in fresh water areas are the major candidate species in coastal aquaculture. Earlier the white shrimp, *P. indicus* was also being cultured but of late its share is negligible. During the year 2006-07 India produced 1,44,347 MT of shrimp and 30,115 MT of scampi through aquaculture from 1,49,632 ha of brackishwater and 30,042 ha of freshwater areas. Ninety five per cent of the production of shrimp and prawn cultured in the country is exported. Aquaculture in the marine waters is yet to be attempted in India on commercial scale. Details on the present status of aquaculture in India and the infrastructure facilities available for aquaculture are given in tables 4 and 5.

Challenges in aquaculture and responses

Aquaculture in India is expected to register a high rate of growth in the coming years. Through a systematic exploitation of the brackish water potential, the production of brackish water species will have to be increased from the current level of 1,50,000 MT to at least one million MT during the year 2015. At least 50% of this production should be contributed by the native species of shrimp *P. monodon* and *P. indicus*. India, being part of Asia, the trend and situation in aquaculture appears to be more or less similar to other countries in the region and have challenges such as:

- Continued diversification of production systems especially marine fin fish
- Enhanced regulation and better governance
- Drive for better management
- Develop feed technology, which can substantially reduce cost of production and find suitable substitute for fish meal. For finfish, live feed like SS Rotifer and Copepods have to be developed.
- Develop SPF broodstock of *P. monodon* in the next five years.
- Increasing influence of markets, trade and consumption patterns



Table 4 State-wise details of Shrimp & Scampi Production in India (2006-2007)

Sl. No.	State	Shrimp		Scampi		Total	
		Area (ha)	Production (MT)	Area (ha)	Production (MT)	Area (ha)	Production (MT)
1	West Bengal	50915	42006	4744	4471	55659	46477
2	Orissa	11453	9726	3591	856	15044	10582
3	Andhra Pradesh	65234	75414	17335	24056	82569	99470
4	Tamil Nadu	3712	5307	324	449	4036	5756
5	Kerala	11691	5151	1210	88	12901	5239
6	Karnataka	3329	1883	90	46	3419	1929
7	Goa	828	654	0	0	828	654
8	Maharashtra	848	979	2714	115	3562	1094
9	Gujarat	1622	3227	34	34	1656	3261
Total		149632	144347	30042	30115	179674	174462

Table 5 Infrastructure facilities available in India for Aquaculture

State	Hatcheries (Shrimp & Scampi)	Feed Mills	PCR Labs	LCMS MS labs
W. Bengal	12	1	2	1
Orissa	17	Nil	5	1
Andhra Pradesh	199	25	41	3
Tamil Nadu	81	1	21	1
Kerala	30	1	11	2
Karnataka	14	Nil	4	1
Maharashtra	8	Nil	2	1
Gujarat	3	Nil	1	1
Total	364	28	87	11

1. Strengthening of Shrimp and Scampi farming:

In order to meet the challenge on boosting aquaculture production for export MPEDA proposed to strengthen the existing schemes for consolidating and further promoting shrimp and scampi culture in 1.64 lakh ha with a production of 2.37 lakh MT (1.0 lakh ha/1.68 lakh MT of shrimp and 0.64 lakh ha/0.69 lakh MT of scampi) during 11th plan. Hatcheries, Feed mills, PCR labs along with other ancillary units also will be strengthened. MPEDA

initiated registration of hatcheries with a set of norms to regulate the sector and to ensure production of quality seed. Development of Specific Pathogen Free (SPF) brood stock and selective breeding of faster growing variety have also been initiated in association with USA based consultant through Rajiv Gandhi Centre for Aquaculture (RGCA) under the aegis of MPEDA. This project has succeeded in producing two generations of shrimp in captivity. The project when completed will be able to provide SPF shrimp seeds to farmers.



Encouraging scampi culture in Padasekharams of Kerala, assisting for revival of abandoned shrimp farms, taking up organic farming for tapping the growing market for organic products are also proposed for strengthening of shrimp and scampi culture.

Since large number of aqua farmers fall under small and marginal categories, whose capacity to cope up with present day requirement of safe and traceable product is comparatively low, it is proposed to encourage the farmers to form in to societies for empowering themselves by capacity building and better exchange of information. Required extension, capacity building etc, will be provided to these societies through the National Centre for Sustainable Aquaculture (NaCSA) , a new agency established under the umbrella of MPEDA. Environmental issues will be adequately addressed towards sustainable farming.

2. Expansion of Shrimp and Scampi farming:

Towards expansion of cultivable area, MPEDA has initiated mission mode programmes for augmenting shrimp and scampi production through aquaculture in under developed states like Gujarat, Maharashtra and Orissa. It is envisaged to bring additional 68,850 ha of brackish water area and 29,500 ha of freshwater area under culture to achieve an additional production of 1.09 lakh MT of shrimp and 34,800 MT of scampi in these states. Establishment of 100 shrimp and scampi hatcheries, 15 feed mills and 10 processing plants are also aimed at to achieve this goal. The total investment expected will be around Rs 2,000 crore with a direct employment potential of 1.2 lakh persons and indirect employment potential of 2 lakh personnel with an expected foreign exchange earnings of around Rs 6000 crore on completion of the five-year action plan.

3. Diversification of Aquaculture:

MPEDA also encourages diversification of aquaculture by cultivation of other non-shrimp and exportable species such as sea bass, mussel, tilapia, catfish, groupers etc through some projects under inland as well as off shore cage farming. Serious

attempts on the commercial farming of potential species such as mud crab and seabass are being undertaken through RGCA, as well as to develop technological package for commercial production of tuna species. Production of artemia for use in hatcheries and brood stock development for freshwater prawns are also being concentrated. These technologies will be disseminated to farming communities through extension, education and demonstration programmes.

Making India a world leader in cage farming with in next ten years is part of MPEDA's vision and hence an MOU has been signed recently with M/s. Innovation Norway, a premier Norwegian Agency, for promoting cage farming in India to produce marine finfish on large scale in off shore waters. The Norwegians will assist MPEDA in setting three pilot projects – two in the west coast viz Maharashtra and Kerala and one in the Andaman and Nicobar Islands. It has been found that A & N Islands have tremendous potential for cage farming and it is likely to become a major center for production of finfish in future.

Challenges in Export of Marine Products and Responses

1. Marketing Services:

Marketing Service plays a vital role in further streamlining the export procedures for a smooth flow of exports. Problems faced by the industry are taken up by MPEDA at the appropriate forum. Through the feedback given, the Ministry of Commerce, Govt. of India could come out with concrete proposals in the foreign trade policy related to the fish and fishery products. Besides, problems relating to various provisions of Exim Policy are taken up with the DGFT, Customs, etc. whenever larger interests of exporters are affected. Trade enquiries, trade dispute settlement etc. are also attended.

Indian shrimp imports into US have been subjected to anti dumping duty from August 2004 and the same is still in force. Further, as per the order issued by the US Customs and Border Protection, Port Directors of US Customs were instructed to take in addition to cash deposit,



continuous bonds from importers of designated agriculture, and agricultural products subject to anti dumping duty. This anti dumping duty and the bond requirement by the US has brought major set back to the Indian seafood industry. India has now filed a dispute before the WTO and the decision of the dispute settlement panel is awaited.

It is proposed to adopt an aggressive marketing strategy for penetrating new markets and for strengthening Indian position in the traditional markets. Attention will be focused on the retail segments of the markets. A Brand Equity campaign to promote Indian seafood will be launched. For this MPEDA has appointed M/s.Lintas personnel as the marketing consultant. MPEDA will also help small and medium scale producers to access major retail markets through a system of Co-branding. To popularize the high quality marine products, marketed by seafood units in India, the Govt. of India has introduced a Logo scheme. Logo will be granted only to top end exporters with sophisticated and highly hygienic processing facilities which are subject to strict regular monitoring. Implementation of the scheme will take place shortly.

Developing proper cold chain and distribution systems are very important in seafood trade. Promoting chilled room and cold storages in metros and other cities and hilly areas through financial assistance schemes with a view to promote consumption of processed fishery product within India. It is envisaged that by 2010, there will be a well developed cold chain and distribution system for domestic marketing of the fish produced within the country. This will involve construction of large size cold storages, operations of thousands of refrigerated containers and installation of cold storages at the consuming points. A substantial part of the seafood will be sold through supermarket outlets as well as specialized fish vending shops within the country. Metros like Delhi, Mumbai, Kolkata, Chennai, Hyderabad and Bangalore will have a booming processed /fresh seafood market sold through modern retail outlets. The aquaculture industry also will develop a reasonable cold chain to preserve the quality of the shrimp/prawn/ fish harvested.

2. Quality control

One of the major problems in exports is the rejection of consignment by the countries of the EU. The stringent food safety norms stipulated by importing countries call for the strict quality control. Shrimp farmers and seafood processors in the country are well aware of banned antibiotics and they are testing for the presence of these antibiotics in their consignments. Samples of shrimp, scampi, seeds, feeds, and chemicals are being analyzed under NRCP. In order to create necessary testing facilities for residual antibiotic and other environmental contaminants to the lowest sensitivity level enabling the seafood processors to test their products for compliance, MPEDA through Government of India have set up laboratories with imported sophisticated equipment like HPLC, MSMS, (High Performance Liquid Chromatograph with (Mass Spectrometer) which are quite expensive in the laboratories under the control of Government Agencies at various centers in the country and few of these labs got NABL accreditation. MPEDA, in association with SEAI, AP region will also set up a pilot project to undertake 100% screening of farmed shrimp for residues of banned antibiotics by setting up six labs having automatic ELISA testing machines.

In order to ensure traceability of the farms, which is essential for quality control in seafood export market, detailed census of shrimp and scampi farms with 14 – digit code has been taken up with GIS mapping with the technical assistance from the National Remote Sensing Agency (NRSA).

Aquacultured shrimp is expected to maintain the highest quality and should be free from contaminants. To avoid set backs, standards stipulated by the importing countries have to be strictly adhered. Therefore MPEDA is actively conducting village level campaigns to create awareness among farmers on the repercussions of the quality issues in overseas markets. A “National Residue Control Plan” is also designed and implemented for regular monitoring of the residues of undesired chemicals/contaminants at the tissue level by collecting samples regularly from hatcheries, farms, processing plants, feed mills etc.



Consequent to the promulgation of the US Seafood Regulation and the EU Regulations on HACCP/own-checks system, the implementation and compliance with the HACCP system has been made mandatory for every seafood processor in India. MPEDA assists the Indian Seafood Industry for effective implementation of various aspects of HACCP system by technical personnel trained in India and abroad.

3. Post harvest Management:

By the year 2010, the issues relating to post harvest management of wild caught fishery products will have to be addressed i.e. quality management will begin from catch. The fishermen will be fully trained in on-board handling and a large number of vessels will have chilling and freezing facilities like refrigerated sea water system, refrigerated fish hold, etc on-board. At least 25 major landing centres of the country would be upgraded to international standard by the year 2010 and effort will continue to ensure that all the landing centres meant for exportable catch are upgraded by the year 2015. These landing centres will be managed by autonomous stakeholders' societies. The pre-processing centres will have undergone drastic up-gradation throughout the country. Some world-class pre-processing centres run autonomously by women peeling workers will be established in the major pre processing centres like Kollam in Kerala. As regards the processing sector, all the existing seafood plants will have to be upgraded to be able to process seafood for the European market.

MPEDA is concerned with the proper hygiene in fishing vessels and landing centers and also about the conservation aspects of Indian Fisheries. In order to address these issues in a professional way MPEDA has established a society, Network for Fish quality management and Sustainable Fishing (NETFISH) with its head quarter at Kochi. This society will network with fishing related NGOs, institutions and scientists to carry the message of fish quality and environmental conservation to the grassroot level.

4. Value addition

The demand for more ready-to-eat convenient seafood in developing nation on account of the quality and time demand is proposed to be tapped to increase the export of value added marine products from India. For this purpose the road map set aims a share of value added marine products of 50% to 75% in our total marine products export valued at 6 billion US\$ by 2015. For this purpose there will be setting up of new units, expansion / conversion of the existing units with large capacity to process and pack value added seafood items for export.

5. Availability of raw material for Processing:

India has over 388 world-class processing plants out of which 192 are approved for exporting to the European Union. The total processing capacity is estimated to be approximately 10,000 MT per day. However, owing to scarcity of raw material, the current capacity utilization is only around 20%. The under utilization of capacity has very much affected the financial viability of the seafood industry. In order to offset this, MPEDA has proposed to make India a processing hub by which exporters could import raw material for job work and this could be re-exported as value added products. Further, Procedural formalities have been simplified to enhance the installed capacity utilization of the processing units.

In order to boost value added products, 29 items have been brought under focus products scheme enabling the processors of these items to avail themselves of duty credit to the extent of 1.25% on the FOB value of exports made. Also, on MPEDA's recommendation Government of India now permits import of duty free ingredients which will go in the production of value added products to the extent of 1% of the FOB value of seafood products exported during the preceding financial year.

6. Welfare of workers of fish processing units:

In order to provide reasonable and comfortable living and working conditions for the workers



particularly women workers employed in the fish processing units and to provide a social and financial security for the insured and the dependants, MPEDA is operating a scheme for workers employed in the fish processing/pre-processing units with benefits such as insurance coverage to Accidental Death (Rs.50,000/-), Loss/Damage to dwellings/contents due to fire, riot, strike, malicious damage, landslide, flood, storm and earth quake (Rs.20,000) and few other benefits to beneficiary's spouse and dependants. The premium of Rs.200/- will be shared by the employer, the employee and MPEDA at the rate of 50%, 25% and 25% respectively. So far 12,952 workers are insured under the scheme and others are on the process of enrolling.

7. Investments:

Establishment of seafood industry requires huge funding in national/international level. At national level it is required that

- Banks and other financial organization should provide assistance / credit at reasonable interest rate to increase our competitiveness in capacity

building and value addition for export.

- Encouraging investment in Research and Development especially research projects to apply advanced technologies to serve production and business.
- Investment in training for Human Resource Development in developing traditional and rural production.

At international level the Governmental policies to facilitate foreign investment encouraging various economic sectors to invest in capacity building, credits etc in India are required to be concentrated.

As the growth in marine capture fisheries stagnated over the last few years, proper planning in consolidation of existing achievements and expansion programmes are essential to boost the production and marine products exports. Proper utilization of the enormous aquatic resources will pave the way for accelerated growth. All concerned with the seafood exports should strive in this direction to achieve the desired objective of India's marine products exports to 6 billion US dollars.

1

I have been very impressed by the good management and working condition of this unit. Indeed, after having worked in about 74 countries, it is the first time I have seen 30 years old equipment so well run by a state enterprise.

HARCEL GIUDICELLI

24th November 1993

Harcel Giudicelli
FAO consultant
France



M.K.R.Nair**

Fisheries Management in India- Present Status, Challenges and Road ahead*

... management of living resources of our water bodies with an emphasis on sustainable exploitation, we cannot afford to underplay our national responsibilities of managing our fisheries and aquaculture.

Of late everyone seems to have got convinced that fisheries need to be managed. Managing an unmanaged or improperly managed sector calls for challenges, the proverbial resistance from the stake holders included. Right Choice of Management options have to be based on scientific facts and should fulfill the national goals and also should conform to the sub-regional, regional and global requirements. A strong decision support system, a clear and firm political will, an enabling legal mechanism, an efficient institutional set up and overall an unstinted stakeholder participation are the key elements required to mould a vibrant fisheries management pattern in any country. The present state of fisheries management, challenges before the policy planners and the suggested road map are briefly discussed in this paper.

State of Fishery Management

Constitutional and jurisdictional status

As per the allocation of business, fisheries within territorial waters is a state subject and fishing and fisheries beyond this is in Central list. Aquaculture also falls under the purview of States. At the centre, the Department of Animal Husbandry, Dairying and Fisheries (AHD&F) under the Ministry of Agriculture has the mandate for Development of fisheries and aquaculture. Other Ministries involved in fishery-related activities are: the Ministry of Commerce engaged in promoting export-oriented production, both by

* *The views in this paper are that of the author and need not necessarily reflect the Government Policies.*

***Joint Commissioner (Anti Poaching Law), Dept. of Animal Husbandry & Fisheries, Ministry of Agriculture, Govt. of India.*



capture and culture, the Ministry of Food Processing Industries handling post harvest operations and domestic marketing, the Ministry of Earth Sciences engaged in ocean studies including its biological productivity and our interests beyond Exclusive Economic Zone (EEZ).

Decision support system

The fisheries Departments under the States engage in collecting statistics, which is coordinated by the Nodal Department of AHD&F. Apart from this the Indian Council of Agricultural Research (ICAR) which as a registered society is carrying out collection of data on fish landings and also conducts scientific studies in fish biology, fishery technology. Their findings through various reports reach the policy planners. Apart from this the field level institutions of the nodal Department of AHD&F is engaged in exploratory surveys of the EEZ, development of post-harvest technology, infrastructure development and HRD. Like wise the Ministry of Earth Sciences devotes to Southern and Northern ocean studies and sponsors Projects for studying the living resources and enhancement of productivity of oceans.

Legal mechanisms in place

In the marine fisheries sector the Marine Fishing Regulation Act (MFRA) has been promulgated by all coastal states and Union territories as per the model bill circulated by the Nodal Ministry at Centre. The Indian Fishing Act, 1897, The Territorial waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act, 1976, The Maritime Zones of India (Regulation of Fishing by foreign vessels) Act, 1981, The Marine Products Export Development Authority Act, 1972, The Indian Coast Guard Act, 1978 and The Indian Merchant Shipping Act, 1958 are the main Central Acts dealing with marine sector

In the Inland sector isolated Acts in certain states dealing with Inland fishing and aquaculture and Reservoir fisheries exist. The Coastal Aquaculture is regulated by the Coastal Aquaculture Authority Act 2005 promulgated by the nodal Ministry. A modal Central Act for Inland fisheries has been circulated to all states for framing uniform legislation in Inland sector on the lines of MFRAs.

International Instruments

A host of international instruments and conventions have laid down the frame work for fisheries management, basically in the marine sector. Of this The United Nation's Convention on the Law of the Sea, 1982 and the Agreement for Conservation and Management of Straddling Fish stocks and highly Migratory Fish stocks (UN Fisheries Stoke Agreement for short) there under has been acceded by India. We are also party to the FAO Code of Conduct for Responsible Fisheries (CCRF), Indian Ocean Tuna Commission (IOTC), Asia-Pacific Fishery Commission (APFC) and the Convention for Conservation of Antarctic Marine Living Resources (CCMLR). Codex Alimentarius Commission and The International Union for the Conservation of Nature and Natural Resources (IUCN) are other international Institutions in which the country is actively associating.

Institutional Mechanism

The States/UTs and the Nodal Ministries at Centre through their various arms spell out policy frame work for fisheries Management based on the inputs required from the decision support systems, and implement the policies and programmes through the line departments in the states and centre, drawing strength from the legal framework. Various managerial functions carried out by different institutions are:

1. Indian Coast Guard – Surveillance and monitoring of EEZ, implementation of fishing operations, combating illegal, unregulated and unreported (IUU) fishing)
2. Inter-ministerial Empowered Committee for development of deep sea fishing - Regulates access to EEZ, decides over all capacity for various types of fishing operations.
3. Coastal Aquaculture Authority- Sets norms for coastal aquaculture in the country banking on precautionary principle and polluter pays principle.
4. Sanitary Import Permit Committee- Regulates import of fish and fishery products into the country.



5. Committee on Exotics- Considers issues related introductions of live aquatic organisms into the country
6. National Committee to oversee implementations of CCRF

Besides these, the Regional Fishery Management Organisation viz., BOBP-IGO hosted by India and the IOTC stationed at Seychelles address regional fishery management issues.

Challenges

The vast coastline and diverse geographic zones in the Indian main land poses varied challenges depending upon the resource base of each state, the priority each state attaches to managing their fishery and their receptiveness to larger national and regional requirements. Absence of a well informed cadre of fishery managers and lack of a systematic approach to training and retraining the existing cadres on the basis of a relevant, structured and nationally acceptable curriculum mars implementation of any management programme. Lack of a policy for management of the varied fishery resources of the state is another draw back.

Over-capacity in the coastal fisheries and the lack of political will in containing the same in certain regions have emerged as the biggest challenges which, if contained would certainly impact the commercial stock. Lack of regulation in the manufacture of netting and non-implementation of mesh regulation in the near-shore fisheries have resulted in fishing non-targeted species, catching of juveniles size over fishing and habitat destruction. A partial fishing ban introduced a few years back is still under challenge by various sectors and a uniform national plan for closed season is yet to emerge.

At the centre there is no legal mechanism to regulate fishing in the EEZ by Indian flag vessels and joint venture vessels. Similarly legislations (i) to regulate species introductions, (ii) to regulate aquaculture other than those covered by the Coastal Aquaculture authority Act, and (iii) to manage the assets created in the harvest and post harvest infrastructure are yet to be put in place.

At the state level, the Marine Fishing Regulation Acts require considerable implementations by way of amendments in order to accommodate the changed provisions that has taken place in the past two decades in the Marine Fisheries Sector, such as the provisions of Monitoring, Control and Surveillance (MCS), concept of Eco-system based fisheries management the elements of CCRF, the provisions, on gear selectivity by-catch reduction and over-capacity. In the inland sector absence of a uniform law on use of water bodies, tariff system, Reservoir policy and Riverine policy calls for urgent action in these areas.

At international level the only important instrument accessed by us is the UN Fish stock agreement. The FAO compliance Agreement has to be accessed and the follow up action in respect of both needs to be initiated. On the basis of International Plan of Action adopted by the FAO, the following National Plan of Action (NPOA) needs to be evolved:

1. NPOA for IUU fishing
2. NPOA for management of shark
3. NPOA for management of Fishing capacity
4. NPOA for prevention of accidental capture of sea birds

There has been no remarkable progress in implementation of CCRF. Similarly norms for cross border transportation of aquatic animals, quarantine and surveillance are yet to be drawn up.

Different agencies departing from the national policy and towing own lines such as maximizing export, subsidizing fishery unmindful of resultant capacity enhancement and promoting fishing without care for sustainability are some of the major challenges before the fisheries manager.

The Road Ahead

An action plan for achieving effective fisheries management should essentially focus on the stakeholder in the first place. The respective states/ UTs should draw up a list of stake holder's organizations, be it cooperatives, NGOS or bodies like Fish Farmers' Development Agencies (FFDA).



A dedicated fisheries management Cell should function at each state directorate of fisheries which would be in constant touch with the stake holder groups and the decision support system. This cell needs to liaise with the nodal department at Centre on all matters of fisheries management. The management Cell should address the following (indicative) list of issues which are common to most states:

- (1) Promulgating a State Fisheries Policy.
- (2) Amendment to MFRA.
- (3) Enactment of Inland Fisheries Act.
- (4) Assessment and capping of fishing capacity.
- (5) To evolve leasing policy for water bodies including large and small lakes and reservoirs.
- (6) Evolving mechanism for mesh size regulation.
- (7) Evolving mechanism for regulating boat construction.
- (8) To achieve a unified fishing ban.
- (9) To evolve plans to check illegal, unregulated and unreported (IUU) fishing.
- (10) To evolve plan to check introduction of exotics.
- (11) To strengthen the decision support system including data base management.
- (12) To engage in awareness creation, training and Extension of management personnel.

The Organisation of work at nodal Ministry at centre is with a focus on development followed by welfare of fisheries. Development emphasizes maximizing production, which often compromises management goals of conservation of resources and achieving sustainability. Ideally there should be a fisheries management Cell at the Centre with separate budget allocation and dedicated team of personnel which should horizontally interact with other line departments having activities which are likely to impact fisheries. The Cell should interact vertically downward with the management Cell at the States/UTs and upward with RFMOS and international agencies. Specific tasks to be

accomplished by the Cell should include:

- (i) To accede to FAO compliance agreement
- (ii) To draw up NPOA in line with the four IPOAs mentioned in the foregoing
- (iii) To put in place legal frame work for managing:
 - (a) Fishing in the EEZ and beyond by Indian Flag vessels
 - (b) Inland Fisheries and fresh water aquaculture
 - (c) Species introduction
 - (d) Management of Fishing harbour & Fish Landing Centre
- (iv) To evolve an action plan for translating CCRF into action
- (v) To set up an MCS for marine fisheries
- (vi) To comply with stipulation of IOTC
- (vii) To urge upon the State for assessment and regulation of fishing capacity, and,
- (viii) To implement Safety Training, Certification and Watch-keeping in Fisheries sector (STCW-F)

Conclusion

In the wake of global debate in fisheries and aquaculture shifting its focus from maximizing production to management of living resources of our water bodies with an emphasis on sustainable exploitation, we cannot afford to underplay our national responsibilities of managing our fisheries and aquaculture. It is further more relevant in the context of the WTO regimes of fisheries subsidies, which is on the anvil, stipulating an acceptable fisheries management system to be in place with reference points notified to the concerned agencies. Examination of the linkages and impact of other related activities such as domestic fish trade, fish quality assurance and food safety, though relevant, has not been attempted in the present review.

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Post Harvest Technology of Marine and Freshwater Fishes – Scope for Value Addition

K.Devadasan*

With the increasing number of working housewives, who can afford to pay a better price, ready to eat products are already becoming popular in our urban supermarkets. Our industry should tap this vast potential market.

Against an estimated mean sustainable yield of 3.9 million tonnes of marine fish, the actual fish landing in the country is remaining stagnant at approximately 2.5 million tonnes per annum, in spite of intensive fishing effort. The freshwater bodies of our country have an estimated potential to produce approximately 4.5 million tonnes whereas the actual production again is only 2.5 million tonnes. China is the leading country in freshwater fish production with an annual production of about 24 million tonnes. It is interesting to note that Asian countries contribute to about 90% of world's freshwater fish production. Proper exploitation of the deep sea resources and environment friendly aquaculture practices will go a long way in augmenting fish production to cope with increasing demand for fish and fish products. The Indian fishery industry gives employment to over 7 million people directly or indirectly. Currently India ranks 4th in fish production in the world. The fish processing industry is also the largest single foreign exchange earner for the country annually bringing in foreign exchange to the tune of Rs.6,500 crores. In terms of value realization the lion's share is brought in by shrimp, though in terms of quantity, fish, is number one. The seafood industry made a humble beginning in the fifties and early sixties. With the support and guidance from various organizations of the Government of India, especially, the Central Institute of Fisheries Technology, Cochin, the industry could make rapid progress and soon gained international approval and acceptance. The international scenario is changing fast and the importers are insisting on new varieties of value added and ready-to-eat products and stringent quality standards. Diversification and value addition have become the key words now. The export earnings from

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marine products are proposed to be doubled in the coming few years. For this, export of fish is the only viable proposition as shrimp export has almost come to a saturation point. For increasing the export of fish, conversion of fish to attractive value added products is essential. Value added ready-to-eat fishery products can get good market within the country also especially in urban areas where they are a boon to the working housewives. But Indian fishery industry is still largely shrimp oriented and the bycatches and low value fishes are mostly wasted. Roughly 30% of the total landings are bycatches and low value fishes. At least 25% of this (i.e. 4-5 lakhs tonnes annually) can be easily converted into attractive value added products with good market potential. On a conservative estimate, it is computed that annually 1.5 lakhs tonnes of fish are discarded as unusable. Deep-sea and freshwater fishes do not find ready acceptance as such in the market. Conversion of these valuable resources to attractive value added and ready-to-eat products is the only way to avoid regrettable wastage of valuable protein. The industry is to be guided properly at this crucial juncture in its history, to prevent India falling behind in the international arena in this field. Considerable R & D and extension activities are called for, to achieve this aim.

1.0 Significance of value addition

Value addition means 'any additional activity that in one way or other changes the nature of a product thus adding to its value at the time of sale'. Value addition is one of the most practical ways to increase the profitability in fish processing and sale in domestic as well as international markets. It is also becoming a market requirement as the wholesale traders, retail outlets and finally the consumers are on the lookout for fish products that require minimum preparation. There is a rapidly growing demand the world over for ready-to-serve or ready-to-cook 'convenience' foods. The affluent consumers abroad as well as the urban elite at home demand new types of value added, hygienically prepared, nutritious and attractively packed products. Technological breakthroughs in the development of value added fish products are reducing post harvest losses and are bringing about effective and profitable utilization of the entire catch without waste all over the world. Traditional

presented products are not preferred in today's market places whether they are in the developed countries such as Japan, the USA and the European Union or in the developing countries of Southeast Asia and the Far East. While the processing of value-added seafoods for developed markets requires much preparation / changes in raw materials, for the emerging Asian markets, improved harvesting technology, handling, packaging and transportation could be the main way of value addition. The export of live and fresh/chilled fish is a typical example. Value can be added to products according to the requirements of the intended market. These products range from live fish and shellfish to canned seafoods.

2.0 Important types of Value Added fish Products

The following are the important classes of Value added products exported from countries of Asia/Pacific region.

- Live Fish/Shellfish : High value species: Cultured grouper, red snapper, sea bream, Sea bass, Red Tilapia, reef fish, rock/spiny lobster and crab.
- Chilled Fish : Sashimi grade Tuna, Fillets, breaded fillets and minced fish in convenience packs suitable for the catering sector and retail sales.
- Frozen fish/
Fish Products: Tuna Steaks, Loins, Fillets, Breaded Fillets and minced fish in convenience packs suitable for the catering sector and retail sales.
- Shrimps: Shrimp based products range from head on IQF consumers packs to peeled tail-on, Breaded or Tempura Shrimp and cooked shrimp.
- Cephalopods: Various IQF packs of Squid fillets, tubes, rings, stuffed squid, Cuttle fish, sushi and sashimi(thin fillets) IQF fillets, blanched and cooked products, seafood mix



Dried Fish: Skinless, roasted squid/Cuttle fish, whole and shredded in consumer packs, various tit-bits made of Anchovies, small scads and squid, processed shark fin rays in consumer packs, shark fin soup in cans and consumer packs suitable for micro waving, smoked / cleaned Sea cucumber.

Canned Fish/ Shellfishes: Canned fish and shellfish including canned tuna in spicy sauce adapted for regional tastes.

Other Products : Surimi based products, fish cakes, fish balls, in consumer packs and various snack foods.

3.0 Marketing Prospects of value added products from India.

Compared to many other Asian countries, the process of Value addition is relatively new in India. The fish processing industry is mainly concentrating on one type of products viz, Shrimp. Due to this reason, almost all attempts to value addition have taken place in the case of shrimp based products only. The factors that have retarded the progress of industry towards value addition are outdated infrastructure, limited knowledge of market requirements and lack of trade enquiries from major markets due to lack of confidence. But fortunately the situation is changing dramatically. In order to satisfy the market and quality requirements in markets, particularly in the USA and Europe, the industry as a whole has upgraded production facilities recently. This has helped to boost the buyers confidence to large extent. Besides, the increasing cost of raw materials is forcing the processors into more value addition and product substitutes in order to maximize their export turnover.

4.0 Some tips for increasing the export value added products from India.

ā The most important step is to improve the image of Indian fish products in the World market. This can be done through advertisements in leading international magazines and more frequent participation

in International Trade Fairs.

ā A long term marketing strategy has to be prepared.

ā Consistency in quality and supply must be ensured to establish brand names with reputation.

ā As far as possible, the use of chemicals to improve product quality is to be avoided.

ā Product substitutes may be seriously considered to reduce dependence on shrimp alone. Aquaculture species such as tilapia and catfish offer good potential in international markets and they can be processed into fillets for the catering and retail sectors. Adequate attention may also be drawn to under-utilized species for diversification of the product range.

5.0 Prospective Value added 'convenience' fish products suitable for India

A few important 'ready-to-eat' or 'ready-to-cook' convenience fish products of modern origin with good prospects for export as well as domestic consumption suitable for India are described below:

5.1 Battered and Breaded Products

This is an important class of value added products in 'convenience form'. The battering and breading process increases the bulk of the product thus reducing the cost element. The coating pick-up can be increased further by adjusting the viscosity of the batter or by repeating the process of battering and breading. Conventionally, the fish content should not be less than 50% in such product. Fish fingers, cakes, portions, etc. are popular coated products. Steps involved in battering and breading may vary slightly depending on the product and pick-up of the coating wanted. Mostly the steps involved are : portioning/forming, pre-dusting, battering, breading, pre-frying, freezing, packaging and cold storage.

5.2 Fish mince and mince based products

The most important break through in the utilization of low value by-catch has been the production of fish mince and mince based products, considerable value addition is achieved. Fish mince or minced fish is the flesh separated in



comminuted form free from scales, bones and fins of fish. In principle, meat can be separated from any species of fish in this style; but it becomes significant when applied to low value fish which otherwise finds difficulty in marketing and utilization. Significant value addition will accrue to such fish by application of technology because of the use of mince in the processing of a variety of value added products like fish sausage, cakes, cutlets, patties, balls, pastes, surimi and surimi based products, etc. The processes for the production of most of these products are available and some of them are very much suitable for starting small scale industries.

3.3 Surimi and surimi based products

Surimi is a Japanese term for mechanically deboned fish mince from white fleshed fish that has been washed, redefined and mixed with cryoprotectants for good frozen shelf life. Washing removes fat, blood, pigments, soluble proteins and odoriferous materials and increases the concentration of myofibrillar proteins which improves the gel strength and elasticity of the product. Because of its gel strength surimi is used as an intermediate in the processing of several products with simulated texture, flavour and appearance like shrimp, lobster tail, scallop meat and crab legs. The properties of surimi depend upon the fish from which it is made. The fish of choice is Alaska Pollack which is low in fat and has white flesh. A decline in the catch of this fish has forced to look for other varieties of fish. Among the bycatch available in India threadfin breems, baracuda, ribbon fish, lizard fish and croakers are suitable for surimi processing. A few modern surimi-processing plants have been set up in India.

3.4 Ready-to-serve fish curry in flexible pouches

The Central Institute of Fisheries Technology (CIFT), Cochin has successfully developed a suitable three-layer configuration of flexible pouches which can perform the packaging function equally well as metal cans, and is free from the disadvantages met within them. This is a Retortable flexible pouch

based on Polyester/Aluminium foil/Cast polypropylene. Now flexible pouches are manufactured in India employing the configuration developed by CIFT and this has opened the way for commercialization of heat processed fish curry in flexible pouches. CIFT has standardized the process for the production of various fish preparations in these pouches using over pressure autoclave and the curry processed in them has remained without any change for over a year at room temperature. All such products are ready-to-eat and user-friendly. Recipes can be changed as per the taste preferences of the target market. Storage and disposal of these pouches are also easier compared to metallic cans.

Future of Value Addition in Fishery Products

Demand for convenience food is expected to increase. Overseas buyers prefer to import fishery products in processed and ready to eat form. They are also on the look out for cheaper alternatives. Countries like Vietnam, India and Bangladesh where a wider range of raw materials are available at a comparatively cheaper rate can be tough competitors to traditional exporters of value added products like Thailand, Taiwan and Korea. With the implementation of the HACCP system in producing countries, the US market is also shifting towards value added products. EU nations also offer opportunities because of its huge reprocessing industry. However, EU markets demand improved processing and packaging practices. Newly industrialized countries within the Asia/Pacific region also offer great potential. Countries like Singapore, Malaysia, Taiwan and Korea import value added convenience foods in large quantities. China also offers enormous opportunities for a variety of products ranging from live fish/shell fish to high value dried products. Value added ready to eat processed fish products will sell well in the domestic urban markets also. This is an area our fish processing industry has neglected so far. With the increasing number of working housewives, who can afford to pay a better price, ready to eat products are already becoming popular in our urban supermarkets. Our industry should tap this vast potential market. 1

