

EXPLOITATION OF MARINE FISHERY RESOURCES AND THEIR UTILISATION

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Abstract

Demand for marine fish is continuously increasing in the external and internal markets. Diversified fishing by adopting various technological options has enhanced the marine fish production from 1.5mt during 1983-84 to 2.3 mt during 1992-93. The expanding aquaculture industry supplemented the shrimp production from capture fisheries and helped to enhance our export performance. Aquaculture production of shrimps recorded a three fold increase during the last decade from 14,000 tonnes during 1983-84 to 45,000 tonnes during 1992-93. The present analysis indicates that about 10% of the marine production is channeled to export markets. The utilisation of fish and fish products have undergone changes over the years. The consumption of dry fish has declined and other forms of preservation like freezing and canning have gained momentum. The trash fish, hitherto largely under-utilised has been diverted to fish meal plants which proved a boon to the poultry industry. Product diversification in marine exports boosted our foreign exchange earnings from \$600 million during 1992-93 to \$800 million during 1993-94. The quantity of shrimp and cuttle fish export, registered a growth of 16% and 8% respectively over the previous year. At present, value added products account for 12% of our exports indicating scope for further development. The live fish trade of crabs and lobsters have a flourishing market in south east Asian countries. Some varieties like sea horses, sea fans and sharks have pharmaceutical utility. Deep sea fishing has been identified as one of the thrust areas in VIII Five Year Plan. Studies reveal that about sixty percent of the catch-mainly cheaper varieties-from these vessels were discarded. Suggestions for better utilisation of such discards are discussed in the paper. In India, annually about 50,000-60,000 tonnes of prawn head and shell fish wastes are available offering good scope for development of chitosan which finds use in horticulture, floriculture and pharmaceutical industries. Certain marine varieties like bull's eye, snake mackerels and deep sea prawns are under exploited due to inadequate consumer demand. Hence extension efforts should be strengthened to create consumer awareness and demand for better utilisation of these varieties. Diversified fishing, product diversification and development of viable aquaculture technologies will help to meet the needs of domestic and external markets.

Introduction

The exploitation of marine fishery resources is heavily dependent on its utilisation pattern. The mode of utilisation of different varieties determines the demand and price which influence the production. Interdependence of utilisation pattern and production trends of any commodity is well known and the important economic factors influencing fish utilisation trends are consumer preference and expansion or widening of the market. The export demand for shrimps during sixties and seventies led to the growth of Sea Food Industry in India. The ever expanding international market for shrimps encouraged mechanised fishing and intensive exploitation of prawn resources in our coastal waters. Since the production of shrimps from inshore capture fisheries almost reached saturation, aquaculture is emerging as a potential supplier to supplement the marine production of prawns to cater the overseas demand. Similarly the change in utilisation pattern and export demand for cephalopods after the seventies boosted its production. Product diversification and thrust on value-added products provide ample scope of employment generation in the post-harvest sector. The present paper deals with the utilisation pattern and its impact on exploitation of marine fishery resources with the following specific objectives.

1. To analyse the exploitation pattern of marine fish over the years in relation to its potential ;
2. To assess the improvement in fish utilisation pattern and its impact in price and demand; and
3. To assess the role of product diversification, value-added products and utilisation of byproducts in marine fisheries sector.

Both primary and secondary data have been collected and utilised for the study. The data on production of different varieties of fish have been collected from National Marine Living Resources Data Centre (NMLRDC) of CMFRI and export related information from published reports or Marine Products Export Development Authority (MPEDA). Primary data on dry fish marketing, live fish trade and marketing pattern of pharmaceutically important products and price of fish at various points of marketing channel have

been collected from the selected centres of Tamil Nadu during 1992-94.

Marine Fish Production Over The Years

Marine fish production has increased from 5.34 lakh tonnes in 1950-51 to 25.92 lakh tonnes in 1992-93. This increase may be attributed to technological developments in capture fisheries, especially in craft gear combinations. It is observed that, the percentage of marine fish landings to total fish production is around 50-60% during past ten years. It seems that there is over exploitation of some of the resources in the 0-50 m zone. In this zone nearly 70% of the potential has been exploited so far.

The growth of the Sea Food Industry in India is mainly depending on the landings of shrimps and cuttle fishes. Shrimp catches increased from 1.17 lakh tonnes during 1983-84 to 2.0 lakh tonnes during 1993-94. Now the mechanised fleets of our coastal waters were concentrating more on shrimp trawling and the catch rate of prawns from our near shore waters is declining. The phase of intensive exploitation and export of cuttle fish started only by the middle of last decade. The production of cephalopods was only 15,016 tonnes during 1983-84 which was increased to 95,761 tonnes during 1993-94. The motorization process of majority of country craft in recent years in the south-west coast of India became economically viable and sustainable as these units catch more cuttle fish due to its export utilization and consequent high unit value realisation. Further, about 35% of the shrimp production from the marine sector is constituted by the non-peneaid prawns. Utilisation of non-peneaid prawns is mostly confined to dried form. Of late, some varieties of deep sea prawns are also landed and the consumer preference for the same is gradually developing in interior markets. Attention is to be bestowed on the improvement of product development of non-peneaid prawns and deep sea prawns to boost up their consumer demand both in domestic and international markets.

The commercially important major varieties which have shown notable increase in our marine fish landings during the last decade (1983-84 to 1993-94) are given in Figure 1. The percentage increase in production was 48% for elasmobranchs, 33% for Bombay duck, 102% for perches, 49% for croakers, 181% for ribbon fishes, 298% for mackerels, 70% for crustaceans and 388% for molluscs. One of the main factors responsible for the increase in production of these varieties is the widening of Indian domestic market coupled with increase in fish eating population due to phenomenal improvement in handling and transportation of marine fish to far off places.

The current level of exploitation from the marine fishery sector is about 2.4 million tonnes as against the estimated potential of 3.9 million tonnes. There is enormous scope to increase the landings of perches, ribbon fishes, carangids, mackerels and coastal tunas (Fig. 2). The existing exploitation is far less than the potential of these resources. Considering our potential, hardly 50% of perches, 30% of ribbon fishes, 45% of carangids, 55% of mackerel and 18% of coastal tunas are being caught from our marine waters. The under exploitation of these resources are due to various production and marketing problems. In recent years, the domestic as well as export demand for these varieties are picking up and more intensive exploitation is possible even with increased cost of production. Besides these varieties, there are some non-conventional marine resources offering scope for exploitation in future. Some of them are Bull's eye (*Pricanthus spp.*), Indian drift fish (*psenes indicus*) and Black ruff (*Centrolophus niger*). These are distributed widely at a depth range of 50-200m. These varieties have appreciable nutritive qualities which equal familiar table fishes.

The marine fish production is being supplemented by shrimp production from the expanding aquaculture industry. This is mainly because of the high export value of the shrimp. The aquaculture production of shrimps is estimated at 50,000 tonnes during 1993-94. In India, brackish water area situated for prawn farming has been estimated at 1.2 million hectares, out of which 70,700 ha (5.94%) was under culture in 1992-93. The details of the estimated area, production and productivity of shrimps in India, is given in Table 1.

It is observed from the table that, West Bengal, Gujarat and Andra Pradesh have comparatively more estimated area under brackish water aquaculture than the other states. But the actual area under shrimp farming during 1992-93 was high in West Bengal, followed by Kerala and Andhra Pradesh. The over all productivity was at 0.66 t/ha because major area is under traditional prawn farming. The technological development in prawn culture hopes to attain a productivity of 5-10 t/ha. The high rate of production and profitability of semi-intensive prawn culture attracts more and more entrepreneurs to enter into this field. By the year 200 A.D., the area under intensive and semi-intensive systems of aquaculture is expected to be more than one lakh hectares and the production of shrimps is expected to be on par with

marine sector.

Fish Utilisation Pattern

The utilisation pattern of any commodity depends on economic factors and technological innovations. Regarding fish, the biological consideration also influences its utilisation trends. The utilisation of fish in frozen, iced or canned form or fish meal form depends on the preference of the consumers in the domestic as well as export markets. The iced fish faced consumer resistance in the initial years and now it gained almost total consumer acceptance.

1. Export marketing

Export of marine foods from India has made rapid progress over the years. Currently about 10% of our marine landings is channeled towards exports. The earnings from sea food export has increased from Rs. 384.29 crores in 1984-85 to 2433.33 crores in 1993-94. Shrimp is the major item of our sea food export which forms about 70% in the gross earnings from marine products during 1993-94. The unit value realised per kg of shrimps increased from Rs. 57.8 during 1983-84 to Rs. 238.06 during 1993-94. The various forms of shrimp export are block, raw, cooked, head-ontail, shell on peeled, poly bags, tray packs and carton packs. The export of various marine items during 1992-93 is given in Table 2.

Marine foods are exported from India in frozen, canned and dried forms and their contribution in our exports is presented in Table 3. It is observed from the table that, maximum amount of sea food is exported in the frozen form (96%). The share of dried and live items are very much marginal in the total share of Indian sea food export. Further about 50-55% of our frozen exports are contributed by low graded product like P.D. (Peeled and deveined) and P. U. D. (Peeled and Un Deveined) whereas high unit value products like headless contributes 40% and head on contributes only 2%. As the major share of the frozen quantity is constituted by low priced products, India could not take full advantage of its potential foreign exchange earnings from marine products. It is explicitly known that we are supplying mostly rawmaterials to the importing countries, which in turn reprocess it and realise more income. Hence, efforts should be made to increase the share of value added products in our sea food export.

2. Internal marketing and price behaviour

Major portion of the marine fish catch (90%) is channelised in the domestic market for human consumption in fresh, frozen and cured forms. The fish utilisation pattern depends on level of income of the people, food habits of the people and form of fish disposal and availability.

Earlier marine fish consumption was mostly confined to the coastal and adjoining regions. Now it is observed that about 50% of the fish is consumed fresh in and around producing centres, 43% in demand centres located upto a distance of 200 km from the coast and only 5% goes to the centres located beyond 200 kms. The extent of spoilage of fish at landing centres as well as various points of the distribution channels has been considerably reduced due to wide spread use of ice, technological improvements in processing and transportation facilities.

Demand and price of marine fish are continuously increasing in our domestic markets. The increase in fish prices over the years is even higher than the increase in food grain prices. The wholesale and retail price behaviour of some of the commercially important varieties of marine fish over the years is given in Table 4.

It is observed from the table that, the prices (wholesale as well as retail) of all the varieties have recorded a considerable increase during this decade. The rise in wholesale price has increased three times for seer fish (from Rs. 19 to Rs. 58), more than two times for barracudas (from Rs. 11.25 to Rs. 30.00) three times for tunas (from Rs. 10.00 to Rs. 30.00) during this period. In case of retail prices, it is found that pomfrets, barracudas, tunas and cat fishes have recorded a two-fold increase during this period. The difference between the price paid by the consumer and the price received by the producer is referred to as gross marketing margin. This comprises all marketing costs of assembling, grading, packing, transportation, processing and storage and margins of wholesalers and retailers. Studies conducted on the market margins revealed that fishermen's share in consumer's rupee ranged from 31 to 32 paise for

different varieties. The wholesalers margin ranged from 15 to 37 paise and the retailers margin from 11 to 25 paise and the marketing expenses from 4 to 14 paise of consumer's rupee.

3. Forms of utilisation

(i) Fresh form

About 44% of the fish catches are consumed in fresh form now. The development of infra structural facilities like approach roads, insulated vans for transport, wide use of ice for preservation, has helped to increase the consumption of fresh fish to the interior markets away from the landing centres. The utilisation pattern of fish in 1961 and 1993 is given in Figure 3. The diversion of fish to dry fish trade has declined from 44% during 1961 to 31% in 1993. The exports/frozen form has increased from 2 to 10% and the conversion to fish meal has increased from 7 to 15% during this period.

In fresh fish trade, areas of fish surpluses and deficits are quite commonly observed in the marketing system. The supply of fresh quality marine fishes is highly confined to major cities like Delhi, Patna, Lucknow and Bhopal which are situated far off from our coastal belt. Air lifting of marine fish from major centres can be introduced on experimental basis to assess the marketability.

To cope up with the increased landings, it is advisable to establish ice plants for a cluster of closely located fishing villages. Introducing more refrigerated trucks or vans for internal distribution especially long distant interior markets will be helpful to reduce the spoilage. In other words, establishing a cold chain covering the entire country will boost up the effective utilisation of fresh fish.

(ii) Curing or Drying

Nearly 31% of our fish landings are consumed in this form. This is the cheapest and easiest method for long time preservation. The consumption of dry edible fish also varies in rural and urban areas. It 69.5% in rural areas 28.2% in urban areas and 2.3% in metro cities. The export of dries marine products have recorded an earning of Rs. 18.02 crores through the sales of 4233 tonnes of the product during 1992-93. The consumer demand for dried fish products in the domestic market especially in hilly tracts and far off places from the coastal belt is considerable. There are certain varieties like white Baites, Sharks and non-peneaid prawns having higher consumer preference in dried form to other forms in certain region of our country. The curing techniques can be improved to reduce the incidence of bacterial and fungal attack which affect the quality of dried products. The major problem in dry fish marketing is to maintain quality since substantial quantity of partly spoiled fish also gets converted to dried fish and enters into the trade at various levels.

(iii) Freezing

Freezing is the popular method of processing introduced during 1950's. This method is now most widely used for preserving and exporting to foreign countries. Frozen fish has considerable demand in the global market as well as the domestic market. At present there are 322 freezing plants located in our country with a production capacity of 1486 tonnes per day.

(iv) Canning

Canning is another form of fish preservation for utilisation. In India, canning is done for varieties like oil sardine, mackerel and tuna was done to meet the needs of Army Purchase Organisations, internal and export markets. Because of high cost of the imported tin containers and filling media like edible oil and increasing labour costs, this is at stagnated condition now. There are about 66 canning plants in our country with a production capacity of 250 tonnes per day.

(v) Fish meal

Fish meal is another form of utilisation of fish. It is to be noted that, in the leading fish producing countries, more quantity is diverted for industrial use than for human consumption. There are about 34 fish meal plants with a production capacity of 600 tonnes per day located in our country. Utilisation of non-edible items and also spoiled fish for the manufacture of feeds for cattle and poultry and as an important ingredient for artificial feed for aquaculture is on increasing trend.

Studies conducted by the National Transportation Planning and Research Centre, New Delhi during

1984 indicate that about 9% of exportable and 30% of non-exportable fish catch were spoiled at the time of landing itself. With regard to the landings of country craft 12% of the exportable varieties and 25% of the non-exportable varieties were getting spoiled. With the development of fish meal industry, none of the marine fishery resources are now going as waste.

The fish meat picked from cheaper varieties of fish is frozen in small blocks. This is referred to as "Kheema" which can be used for the preparation of products like, fish cutlets, edible fish flour, fish flour, fish flakes and fish soup powder.

Fish Protein Concentrate (FPC) is prepared as a colourless odourless powder from such picked meat. FPC finds use in preparation of items like chapathi and bread biscuit when mixed with wheat flour. Care should be taken to avoid imparting any fishy odour or flavour to the products.

The minced meat after cooking, pressing and hydrolysis with enzyme yields a hydrolysate which is dried to a powder to give bacteriological peptone useful for preparing culture media for microbial organisms.

Some varieties of marine fishes and meat of bivalves like clam, mussel and oyster can be preserved for a long time using vinegar; oil and spices.

(vi) Live fish trade

Recently, the export of live items have gained momentum in the sea food industry. Such live items are of great demand in south east Asian countries. The major market for live items is Singapore. Live fish, live mud crab and live lobster are the items included under this head. The particulars of the quantity of live items exported and the value realised are given in Table 5. The unit value per kg was Rs. 381.03 for live lobster and Rs. 51.56 for live mud crab during 1992-93.

(vii) Value added products

The sea food industry in developed countries concentrates on preparation of more amount of processed or 'ready to eat' or 'ready to cook items'. India, so far has been supplying frozen sea foods which are reprocessed by the importing countries. As a result the importing countries realise higher profits than India. Now, our sea food export comprises only 12% as value added IQF (Individually Quick Frozen) packs.

During 1992-93, 8587 tonnes of shrimp in value added IQF forms have been exported, which fetched a value of Rs. 12777.46 lakh. The unit value realised was Rs. 148.80/kg. The share of IQF shrimp in the total export of shrimp from India during 1992-93 was 11.53% in quantitative terms and 10.83% in terms of value. Italy was the major importer of our IQF shrimp followed by Spain and USA. The value realised through export of value added products is comparatively higher than the export of frozen sea foods. But, it is to be noted that, production of value added products is highly capital intensive and requires sophisticated machineries and improved processing & packing technologies which are insufficient in India now. Hence, initiative may be taken to establish such units by government in collaboration with foreign concerns which have expertise in this field.

(viii) Marine fish byproducts

The byproducts of marine fish processing industry can be scientifically utilized to provide better returns to the fishermen. The details are as follows:-

a) Fish oil

Oil extracted from oil sardine finds use in manufacture of products like factice (artificial rubber), printing ink, lubricating oil and insecticidal soap. The pressed cake is dried and incorporated into fish meal from other sources.

b) Chitin

The crustacean shell waste contains chitin, a bio polymer having use in many industries. Around 50,000-60,000 tonnes of prawn shells and head wastes are thrown out from processing industries in our country in a year. These crustacean wastes contain about 10% chitin on dry weight basis. Chitosan is a

product obtained from chitin. It is of great importance in agriculture, foods, paper, textiles, bio-medical, cosmetics, bio-technology and water treatment.

c) Shark and its products

Shark is one of the resources having multiple utility. The fish is used as delicious item in fresh and dried forms. Shark catch during 1992-93 was 41462 tonnes and there is good scope to increase it. Shark liver oil has good demand due to its pharmaceutical importance. Similarly, Sharkfin is valuable product, which is slightly salted and exported. The fibres are separated from fins and a soup, known as 'shark fin soup' is prepared. The shark skin is canned and used in leather industry. During 1992-93, 165 tonnes of dried shark fins were exported, which fetched a value of Rs. 5.1 crore at an unit value of Rs. 310 per kg.

d) Sea horse

Sea horse is having pharmaceutical value. It is caught by divers, sun dried and sold. It is reported that dried sea horse is found to cure 'whooping cough' in children. Dried sea horse on powdering and mixing with coconut oil is applied as a medicine on cut wounds. Regular intake of dried sea horse powder with honey reduces the incidence of 'Asthma'. Due to its pharmaceutical importance, it has also a lucrative export market. It is having a flourishing business in Keelakari region of Tamil Nadu and it fetches Rs. 2000-4000 per kg depending on their size. Some of these byproducts are exported and thereby realise more foreign exchange. The export of various marine byproducts and the value realised are given in Table 6.

(ix) Discards of trawlers and deep sea vessels

Realising the importance of deep sea fishing venture in increasing the fish catch, the government has cleared, in the last two years, investment proposals worth Rs. 1800 crores in deep sea fishing including fish processing. Out of 89 projects approved during the last two years, in deep sea fishing, 36 involve foreign equity and investment worth Rs. 1508 crores.

In case of deep sea fishing, it is found that nearly 60% of the catch is thrown back into the sea. The annual discards of fish by Indian fleets has been estimated at 1.2 lakh tonnes. The pollution caused by this is likely to be dangerous. To avoid such discards, factory ships may be constructed, wherein all the processing and packing facilities are present on board. Secondly, some ships may be sent as transport ship to get the discards from such big vessels. The possibility of procuring the fish from deep sea vessels by a naval ship in the high seas and supplying it to the armed forces of our country can be probed. The discards from the small mechanised boats are also increasing with the introduction of extended fishing trips for more than two days. Assessment of losses due to this discards requires attention and sufficient number of carrier boats can be put to operation for transportation in the inshore regions.

Conclusion :

Exploitation of some of the marine resources has reached/reaching a stage of saturation in inshore waters. The scope for further increase in fish production lies in exploring deep sea fishing and intensifying brackish water aquaculture on scientific lines. There is a need to effectively utilise the fish catch and popularise the non-conventional deep sea resources to increase the consumer acceptance. Since, at present, the area under brackish water aquaculture is only about 6% of the total estimated area, suitable steps may be taken to tap the potential and to increase the productivity. There should be adequate post-harvest and marketing infrastructural facilities to improve the fish utilisation. Though our sea food export has touched Rs. 2400 crores by 1993-94 there is scope to increase the foreign exchange earnings by enhancing the proportion of value added products. To safeguard the interest of both the producer and consumer there is a need to regulate the fish marketing. This will minimise the interventions of the middlemen also. Through the efficient and improved method of transportation the fresh fish should be made available in interior markets. The quality of the dry fish is also to be improved. Besides, the processing of marine fish resources leaves many byproducts like fish oil, chitin and fish maws. Means of effectively utilising these byproducts can be found. Live fish trade which has recently been gaining momentum in export market, should be made use of to get maximum benefit. Using the carrier boats the present discards from the deep sea fishing vessels can be efficiently utilised.