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SEMINAR ON POTENTIAL MARINE FISHERY RESOURCES

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Central Marine Fisheries Research Institute
(Indian Council of Agricultural Research)
P. B. No. 2704, E. R. G. Road, Cochin-682 031, India
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Published by

P. S. B. R. JAMES
Director
Central Marine Fisheries
Research Institute
P. B. 2704, Cochin 682031
India

Compiled by

M. S. RAJAGOPALAN
Scientist S-3
Central Marine Fisheries
Research Institute
Cochin 682031

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UTILIZATION OF THE POTENTIAL MARINE FISHERY RESOURCES OF INDIA

M. R. NAIR AND T. K. GOVINDAN
Central Institute of Fisheries Technology, Cochin-682 029

ABSTRACT

India's potential marine fishery resources, which have been projected at 4.5 million tonnes per annum, is thrice the current average production. The most important methods of utilization of fish in the country at present are in fresh condition and by salt-curing and drying, which together use up 87% of the catches. Of the remaining, 5% each is utilized frozen for export and for reduction into fishmeal. The rest is utilized for canning and for miscellaneous purposes like extraction of oil, manure etc. With the introduction of more efficient craft and gear and modern methods of harvesting worked out by our research institutions, a major portion of our potential resources, if not all, is likely to be netted in the near future. It then becomes binding on our part to make the best use of this natural bounty without any wastage whatsoever. This latter aspect has been fully tackled and solved by recent researches carried out on post-harvest technology, the more salient points of which are discussed in this paper.

INTRODUCTION

The average annual marine fish production in India at present is 1.5 million tonnes as against a projected potential of 4.5 million tonnes, which means that there is scope for a trebling of the catches from the marine sector alone. The country has made considerable progress in the matter of utilization of her fish catches from the not-so-satisfactory conditions that existed two/three decades back when fresh oil sardine, mackerel and even prawn had to be buried in coconut gardens as manure during glut seasons, though very infrequently, memories of which still linger in our minds. But developments in subsequent years both in the matters of scientific research towards better utilization of the fish catches and in promotional activities in fish trade

have given us the confidence and capacity to make full utilization of our potential marine fishery resources.

Drastic changes have occurred in the pattern of utilization of fish catches in India in the 1970s compared to that in the 1950s. The figures presented below bring out the glaring differences of this aspect.

Mode of utilization	1950s	1970s
Annual average catch (million tonnes)	0.93	1.95
Marketing fresh (%)	43.36	66.50
Salt curing and drying(%)	49.82	20.33
Reduction (%)	6.83	4.89
Freezing (%)	N.A	5.18
Canning (%)	N.A	0.47
Miscellaneous(%)	N.A	2.63

N. A.: data not available.

While there has been a doubling of the annual catch, the percentage utilized in fresh condition increased from 43.36% in the earlier period to 66.5% in the latter, and that by salt curing and drying showed a drastic fall from 49.82% to 20.33%. Another noteworthy feature is that 5.18% of the catch has been utilized by freezing and 0.47% by canning during the latter period. These figures include both marine and inland fishes of the country, as the breakup figures are not available.

A gist of the modern trends in utilization of marine fishes in the country is presented in the following paragraphs.

UTILIZATION OF FRESH FISH

Two-thirds of the country's fish catches are at present utilized in fresh condition. Approach roads to the fishing villages, quick means of transporation and the cheapest and most widely employed preservative for fresh fish, viz. ice, were conspicuously lacking in the earlier years. All the maritime State

Governments have taken commendable measures to provide the above facilities especially during the past two decades. Motorable approach roads wers laid to almost all important fishlanding centres, large number of ice plants were commissioned in both public and private sectors, and quick means of transport like trucks, vans etc were employed in large numbers for the expeditious movement of fresh fish to the potential interior markets. It is a fact that the *per capita* consumption of fresh fish declines drastically as the distance from the coast increases, obviously because of the difficulties involved in transporting the fish to the interior markets and the escalation in its cost contributed by the expenditure incurred in transporation

We have to gear up the above facilities to cope up with the increased landings of our potential resources still remaining untapped. More ice plants have to be set up, preferably in the public sector and ice supplied in plenty at subsidised rates so that the landed fish is maintained in the freshest condition possible until it is delivered to the consumer. Refrigerated/ insulated trucks must be made available for the efficient transporation of the landed fish to the interior markets. A limited number of refrigerated rail wagons had been in operation for some time in selected routes of the Indian Railways for lifting iced fish to distant places. They have to be revived and that too on a much wider scale in order to facilitate better distribution of our marine fishery resources in the fresh/iced condition. Freezing plants and frozen storages have to be set up at or around important fish landing centres so as to preserve the fish over longer periods in glut seasons. Chilled and frozen storage facilities will have to be provided in important interior cities where iced/frozen fish could be stored safely until marketed. In short, a 'cold chain' has to be built up embracing the entire country for efficient utilization of our fresh fish. This becomes all the more important in view of the increased landings expected out of the potential resources of both marine and inland waters and taking into consideration the fact that consumption of fish in the fresh condition deserves all encouragement as all their nutrients are retained unlike in the case of processed fish where heavy losses invariably occur of many of the vitamins, minerals, proteins and overall eating qualities.

Technical know-how has already been worked out for such long distance transportation of iced/frozen fish. Liquid nitrogen or solid carbondioxide can be successfully employed for supplementary cooling while transporting iced/frozen fish in insulated trucks over long distances. Since the private entrepreneurs dealing in this commodity may not be in a position to invest the huge capital required, these facilities will have to be provided by the public sector and leased out at concessional rates to the private sector on the lines on which the Marine Products Export Development Authority undertakes such services for the seafood export industry.

UTILIZATION OF FISH BY CURING

The second largest method of utilization of fish in India is by salt curing and drying which takes up one-fifth of her total landings. Though this was the only method employed for long term preservation of fish in the pre-independence era, utilizing one-half of the landings, it has receded to the background afterwards, with the advent of the modern methods of processing like freezing and canning and utilization of more fish in the fresh condition Still being the easiest and cheapest method of long-term preservation, it is bound to remain for a long time to come not only in India but in all developing countries as an important avenue of fish utilization.

Even though cured fish was the mainstay of India's export trade in processed seafoods in the period prior to the Second World War, it declined drastically afterwards, touching the lowest ever level of 1022 tonnes in 1981-82. However, it is slowly picking up afterwards recording a figure of 6492 tonnes worth Rs. 5.35 crores in 1983-84, the important markets being Srilanka, Singapore, Japan, Saudi Arabia and U. K.

One cause for the sharp decline of industry after the Second World War was the ban imposed on inport of cured fish products by our neighbouring countries which were our important markets due to reasons economic or otherwise of their own. We could not exploit the sophisticated markets in the developed

countries due to the primitive and unsatisfactory processing methods employed by us, rendering the products substandard according to the norms laid down by them. Research work carried out in the country in recent years has evolved methods which can turn out high quality, extra hygienic cured fishery products which can satisfy the quality requirements of even the most sophisticated of the countries.

The curing operations have to be carried out exclusively in processing halls specially constructed for the purpose. Preliminary steps of removing the guts and gills and filleting should be done over table tops of metallic or cement concrete make, and the dressed fish thoroughly cleaned in potable water until free from blood, bits of intestines and extraneous matter of any description. Salting has to be done in the correct proportion depending upon the size of the fish, and the salted fish stacked in cement tanks preferably lined inside with stainless steel or porcelain tiles. After the fish is properly 'struck through', which takes about 48 hours at our ambient temperature, they are lightly washed to remove adhering salt crystals and dried hygienically on raised platforms or in artificial dryers. Contamination from insects/ flies, birds, extraneous materials like sand etc. should be strictly avoided during the drying stage. Drying should be continued until the moisture content is reduced to sufficiently low levels as to prevent fungal and bacterial attack. The dried fish should be sealed in attractively printed synthetic film pouches for retail distribution and polythene lined gunny bags or dealwood/plywood/ cardboard boxes for bulk sales.

If the dried product is dusted superficially with calcium propionate powder before packing, it remains free from attack of red halophilic bacteria and fungi for quite long periods. In the case of fishes containing considerable proportions of fat, an antioxidant powder like butylated hydroxy anisole or butylated hydroxy toluene is also incorporated with the calcium propionate. This protects the fish from oxidative rancidity and discolouration for long durations. With the fuller exploitation of our potential marine fishery

resources, the quantity of fish available for curing is likely to increase several fold. If we modernise our curing techniques on the lines indicated above, we can advantageously exploit many a foreign market for cured fishery products, besides catering to the needs of our interior markets. Wet curing for fatty fishes where the salted fish is utilized as such without drying so as to exclude the possibility of development of rancidity during drying and Colombo curing where tho salted fish is held under saturated brine along with a natural preservative viz. *Garcinia cambogea* can also be applied for preservation of sardines, mackerel and some other varieties of fishes in seasons of glut. Being the cheapest of the processed fishery products, cured fish is sure to find ready acceptance not only in the urban areas in the hinterland but also among the tribals and labour classes inhabiting/working in high ranges in the plantation industry etc. Hence modernisation of our fish curing industry is an urgent need for the proper utilization of our potential marine fishery resources.

UTILIZATION BY FREEZING

As seen from the figures presented earlier, 5.18% of our total fish landings is utilized by freezing. This modern method of preservation of fish was introduced for the first time in the country only in the 1950s and even today it is applied mainly to export commodities like prawns, squid/cuttlefish and some of the costly varieties of fishes. A quantity of 54,444 tonnes of frozen shrimp valued at Rs. 314.81 crores was exported from India during the fiscal year 1983-84. This works out to 58.73% by quantity and 84.39% by value of the total exports, which proclaims the unique position that this single commodity occupies among our marine products. Making allowances for processing wastes like heads, shell etc, the quantity of prawns exported works out to about one lakh tonnes as landed against a total landings of 2.1 lakh tonnes of penaeid and nonpenaeid prawns together. Since this item is in the highest demand in the foreign markets, we can take it for granted that the remaining one-half of the landings belong to the nonexportable varieties. Our projected potential of these two varieties of prawns together exceeds the current yield by one-third and our freezing industry 70% of the

installed capacity of which is estimated to be lying Idle can very well take care of the increased landings.

Our exports of fresh and frozen fish in 1983-84 were 22,573 tonnes worth Rs. 29.1 crores - 24.35% by quility and 7.8% by value of the total exports. Of course, a major portion of it may have been exported in the fresh (iced) condition, though no separate figures are available for the two types. With our projected potential of marine fishes at three times the current yield, the increased catches of quality fishes can be frozen making use of our already installed idle freezing capacity and utilized for export as well as internal distribution making use of the 'cold chain' suggested earlier. We have already worked out the technical know-how for freezing preservation of all our important marine fishes Good demand exists for frezen fish in middle east countries like Bahrain, Kuwait, Saudi Arabia, U.A.E., Oman etc., fareastern countries like Taiwan, Singapore, Hongkong, Malaysia, Thailand and Japan, European countries like Federal Republic of Germany and U. K. and the United States of America.

Frozen cuttlefish and squid amounting to 3578 tonnes worth Rs. 6.47 crores (3.86% by quantity and 1.64% by value of the total exports) were exported from India in 1983-84. With the projected potential of 1.8 lakh tonnes of cephalopods against the current yield of 13,000 tonnes, the increased catches can be very well taken care of by our idle installed freezing capacity.

UTILIZATION BY CANNING

India had a flourishing shrimp canning industry in the 1960s and the earlier half of the next decade, the record export of 2199 tonnes of the product worth Rs. 5.2 crores taking place in 1973. Thereafter the exports dwindled down to a mere 41 tonnes valued at Rs. 2.4 million in 1983-84. We were also canning some of our food fishes like oil sardine, mackerel, tuna etc. mainly for supply to the Army Purchase Organisation and partly for catering to the internal and export markets The canning industry in India is at its lowest ebb today due to several causes like the high cost of the imported tin containers (the particular

quality of steel plate satisfying the requirements for fish containers is not manufactured indigenously at present) and filling media like edible oil and increasing labour costs. Substitution of tin cans with cheaper aluminum cans and synthetic film pouches and edible oil as filling medium with brine, tomato sauce etc. has been successfully tried out in the country; but the industry is yet to adopt them on a commercial scale. Technical know-how has been evolved by our research laboratories to can oil sardine in its own juice, brine, curry, tomato sauce etc., mackerel in curry, brine etc, tuna, seer, pomfret, lactarius, eel-smoked sardine, eel and dhoma, hilsa, tilapia, crab meat, clam, mussel and oyster meat etc. This can ensure full utilization of our increased catches with better exploitation of our projected potential resources of marine fishes.

DIVERSIFIED PRODUCTS FROM MARINE FISHES

Several of the less popular varieties of marine fishes which are at times referred to as 'trash fishes' are yet to find better utilization. Technology is now available for this by utilizing them as raw materials for many diversified products.

Meat picked from such miscellaneous fishes with the help of meat picking is frozen in small blocks. The product called 'kheema' finds good acceptability as a base for several products like fish cutlets, edible fish flour, fish hydrolysates, fish flakes, fish soup powder etc. Fish protein concentrate (FPC) is prepared as a colourless and odourless dry powder from such picked meat after cooking and extraction with solvents to remove fatty and odoriferous compounds. FPC can be incorporated with wheat flour to the extent of 10% for preparing popular dishes like 'chapathi' and 'puri' and baked products like bread and biscuit, increasing their nutritive value without imparting any fishy odour or flavour to the products.

The minced meat after cooking, pressing and hydrolysis with enzymes yields a hydrolysate which is dried to a powder to give bacteriological peptone useful for preparing culture media for microbial organisms. The cooked and pressed meat when homogenised with starch and flavouring ingredients and dried in

thin flakes, yields a product which swells to several times its original size when deep fried in oil. The fried product is quite crunchy and tasty. The hydrolysate can also be incorporated with malt, sugar, cocoa powder etc. and dried to yield a fine beverage similar to those available in the market and produced using vegetable proteins. The cooked kheema can be incorporated with the required amounts of starch, spices, emulsifying agent etc. dried and powdered to give an instant fish soup powder, which when dispersed in water at 5% level and boiled for a few minutes yields a fine soup.

Long term preservation by pickling, using venegar, oil and spices, can be applied to several types of our marine fishes and meat of bivalves like clam, mussel and oyster.

UTILIZATION OF BYPRODUCTS

Scientific utilization of the byproducts of the marine fish processing industry can go a long way in bringing better returns to the fishermen. Cheap miscellaneous fishes offal from the processing industry can be converted into fish meal either by wet rendering (cooking, pressing, drying and powering) or by dry rendering (drying as such and pulverising) processes. This product can be incorporated in poultry and cattle feeds. Any spoiled raw material of this sort can be similarly converted into a dry powder for purposes of manure. The above raw material can also be preserved by ensilaging, i. e., by mincing and keeping its pH low by addition of mineral acid or by producing the acid *in situ* microbial fermentation of added carbohydrates in the form of molasses. The ensilage can be fed either directly to cattle after neutralisation of the acid by chalk power or converted into a dry feed mix by neutralisation of the acid, addition of rice bran, tapioca powder, seaweed powder etc. drying and pulverising.

The oil sardine which are landed in huge amounts during certain seasons sometimes exceed the limits of utilization by ordinary methods. They are then used for extraction of oil. The fish is boiled up with water and the oil that floats to the surface

ladled off. cooked mass is pressed in canvas bags and the press liquor allowed to stand when all the oil floats to the surface, This is separated and added to the first lot. Several industrial products like faetice (artificial rubber), printing ink, lubricating oil, insecticidal soaps etc. have been developed out of the oil, besides its conventional use for tempering of steel, fat liquoring in leather industry and application on wooden boats as a protective. The press cake is dried and incorporated into fish meals from other sources.

As estimated, 50,000 tonnes of prawn shells and head wastes are thrown out of our processing factories every year. A high quality protein can be isolated from it in paste form by extraction with dilute alkali. Solvent extraction of the remaining portion yields pharmaceutically important compounds like cholesterol and glucosamine hydrochloride. The chitinous product left behind is deacetylated which finds several industrial applications like purification of water, clarification of wine, glazing of textiles and paper and as a general industrial flocculant.

Shark fin is another valuable product which is lightly salted, dried and exported fetching the highest average unit value among our seafoods of about Rs. 150/- per kg, 147 tonnes of the product being exported in the year 1983-84. A technique has now been developed for separating the rays (fibres) from the fins which are actually used in the preparation of shark fin soup, which is a highly esteemed dish in the countries which import the fins. The rays are valued above Rs. 1000/- per kg. in those countries. The skin of large varieties of sharks can be tanned scientifically to yield a high quality leather excelling even cow hide leather in strength properties. Similarly, fish maws, which are the air bladders found in some of our marine fishes, are cleaned, dried and exported, fetching more than Rs. 100/- per kg. On an average, the quantity exported during 1983-84 was 102 tonnes. The product is mainly used for clarification of wines beer etc.

CONCLUSION

With a projected potential of marine fishery resources of three times the current average yield and in view of the declaration of an EEZ of 200 nautical miles and the scientific methods

of harvesting already worked out, we have to gear ourselves up for the proper utilization of the landed catches so that wastage is avoided and the fishermen get remunerative returns for their efforts. With the improvements already achieved in the harvesting technology using the most modern fishing craft and gear, a major portion at least of our potential resources is sure to be exploited in the immediate future. The fish processing research laboratories in our country have risen up to the occasion and scientific methods are now available for the maximum utilization of any amount of landed fish. The foregoing account presents a brief description of the major developments that have taken place in this direction in India in a short span of the past two and a half decades.