RECENT ADVANCES IN FISH PROCESSING AND PRODUCT DEVELOPMENT

M.R. NAIR
Central Institute of Fisheries Technology, Cochin - 682 029.

ABSTRACT

There are good possibilities for expanding the consumer sector in both the traditional and nontraditional marine products. Frozen shrimp continues to be the item of highest demand in foreign markets. Individual quick frozen (IQF) prawns which are indeed value added products and have already penetrated international markets elicit export incentive from development agencies like the Marine Products Export Development Authority. With the projected potential of 1.8 lakh tonnes of cephalopods against the current yield of 13,000 tonnes, there are good prospects of increasing exports of frozen squid and cuttlefish. The technology of packing fish in retortable pouches as an alternative to canning has now been perfected. Salted fish mince has good market potential within the country and abroad. Diversification of fish products which are acceptable to larger fish consuming communities would alone ensure profitable utilization of our marine resources.

INTRODUCTION

India's total marine fish landings amount to 1.63 million metric tonnes against the harvestable resource of 4.5 million tonnes projected potential. Of the landings, just over 65% are consumed in fresh condition, about 20% converted into salted and dried products, 4% reducted into fish meal and 7% made into frozen products which almost exclusively go for export purpose. The research and developmental activities in the postharvest technology of fish in the past three decades have contributed to significant improvements in the quality of marine products in the export and domestic markets. This is particularly true in the case of frozen prawn, an item of the highest demand
in foreign markets which amounts to 85% of total value of 531 crores (1987-88) in the total marine exports of the country.

FROZEN SHRIMP

The major importers of frozen sea foods from our country are Japan, USA, Europe, Australia, UAE, Saudi Arabia etc. The sea food processing industries employ the contact plate freezers and belt freezers (tunnel) for quick freezing of prawns. Brine freezing (immersion freezing) is used for freezing prawns onboard fishing vessels and in this method there is intimate contact between the surface of prawns and freezing medium thereby ensuring efficient and quick heat transfer. The prawns are usually deheaded to reduce the bulk, washed with sea water and frozen in small batches by immersion in agitated chilled sodium chloride brine at -15°C and after freezing the material is transferred to the vessel's cold storage. The excessive salt penetration occurring during brine freezing could be reduced by using a mixture of glucose syrup or corn syrup and salt as the freezing medium. The glucose-salt freezing solution will give a protective glaze to the frozen product and the frozen material will not stick together.

In commercial practice, prawns are frozen in different forms - Whole, Headless shell on, Peeled and deveined, Cooked and peeled, peeled and cooked, peeled deveined and cooked. The material is frozen in trays at -35°C to 40°C in contact plate freezers/tunnel freezers, after which it is dipped in ice water to give a thin coating of ice, wrapped in polythene paper and packed in waxed duplex cartons. The shelf life of block frozen glazed prawns at -20°C will vary from 24 weeks to 40 weeks depending upon the species and type of pack.

IQF PRODUCTS

There is good demand for individually quick frozen (IQF) prawns in international markets. For preparation of IQF products, belt freezers, fluidized bed freezers or liquid nitrogen freezers are to be employed. IQF products require special care during processing, packaging, storage and transport. It is very difficult to glaze IQF prawns and when packed without glazing, the chances of dessiccation are more. During storage and transportation too utmost care has to be taken to maintain the proper temperature otherwise the material will get partially thawed and will stick together forming a lump. It is gratifying to note that
some parties in India have already installed imported or indigenously fabricated units for preparation of IQF products which are indeed value added products eliciting export incentive from development agencies.

The frozen head on shrimp fetches better unit value realisation in foreign markets. Bigger varieties of prawns suitable for the purpose are to be ensured of their prime quality for processing as head-on and sufficient care be taken in handling and storing the catches on board the vessel. Blackening or melanosis becomes a serious problem if there is delay in freezing and further extra care has to be taken during packing and freezing to avoid the crushing of heads.

MICROBIOLOGICAL ASPECTS

Handling of shrimp is often not as per the prescribed procedures, resulting in bacterial contamination of the material at different stages in processing line. The possible sources of microbial contamination of the material are boat deck surfaces, fish boxes and baskets on board fishing vessels, harbour water used for washing which is often polluted with land sewage and harmful enteric organisms, utensils, palm of workers, air, flies, rodents in primary processing centres.

The level of incidence of organisms - E. Coli, Faecal Streptococci, Coagulase Positive Streptococci, Salmonella, Shigella, Vibrio-parahemolytics, Vibrio cholerae are to be regularly monitored. Limits are already prescribed for E. Coli, Faecal Streptococci and Coagulase Positive Streptococci. Other organisms should be totally absent. There is relationship between product quality and bacterial load of processed shrimp and this is influenced by seasons too. High incidence during early period of monsoon is traced to high degree of faecal pollution in aquatic environments. Introduction of pre shipment inspection scheme has considerably improved the hygiene and sanitation and lowering of upper limits of bacterial load.

OTHER CRUSTACEAN PRODUCTS

Lobsters which fetch the maximum unit value among the marine products are frozen in different forms - lobster tails, raw whole lobster, and cooked whole lobsters. The problems encountered in the freezing preservation of material are shell and meat blackening, presence of foreign material, dessiccation
and decomposition. While the shelf life of frozen lobster tails is 8 to 10 months at 23°C, that of raw and cooked whole lobsters is 6 to 7 months only.

Meat picked from edible species of crabs is amenable to freezing into raw and cooked glazed blocks which have storage life of 51 and 42 weeks respectively at -23°C.

QUALITY CHANGES

Dessication, denaturation of protein, toughening, discoloration, drip loss, etc. are the major changes occurring during freezing and storage of crustacean foods. The greater the temperature differential between the fish and evaporator and greater the velocity of circulating air, the more will be the moisture losses. Moisture losses will be more at high storage temperatures. The fluctuations in storage temperature will also influence the loss in weight and the quality of frozen crustacean foods.

The changes in texture of frozen shellfish, attributed to protein denaturation, was found to depend on various factors such as storage temperature, state of rigor at the time of freezing, freezing rate, thawing time, etc. It was brought out that for short term storage (less than 2 months) of prawns, freezing without glaze is preferable while for prolonged storage, glazing is essential and that a glaze with a sugar-salt solution is superior to ordinary water glaze in overall quality.

The present mode of packaging 2 Kg blocks of frozen product is termed bulk/institutional pack, which the importing countries reprocess into smaller consumer packs. Ideal packaging is essential for controlling the detrimental effects due to oxygen and dessication. ISI specifications are available only for corrugated fibre board boxes. Two of the common defects reported in the case of master cartons used for packing frozen prawns are low mechanical strength and tendency to get wet. The variation in the dimension of master carton is due to variation in the dimension of duplex cartons used inside the master cartons.

Frozen seafoods are transported either in refrigerated trucks or insulated vehicles. Wide fluctuations in temperature taking place in the frozen cargo during transportation from cold storage to truck and from truck to ship's refrigerated hold, adversely affect their quality and all efforts are to be made to avoid the time lapses at these stages. Solid carbon dioxide or liquid nitrogen are used in developed countries for supplementary cooling.
of already chilled or frozen material during transport in insulated vehicles.

PRODUCT DIVERSIFICATION

Diversification of frozen crustacean foods will fetch better returns to the processors. Production of IQF shrimp, frozen head-on shrimp, frozen breaded shrimp, frozen cooked prawn in sauce or gravies are some of the products worth mentioning. With additional extra care exercised in areas such as improvement in the pre-process handling on board fishing trawlers, chilled seawater storage and super chilling, elimination of faecal and pathogenic organisms in frozen products and improvement in packaging of finished frozen material, there is no doubt the seafood industry in India could make successful inroads in the international markets and earn competitive prices for their exported products.

The high degree of idle capacity of freezing plants could be profitably utilised for processing other fishes and shell fishes both for export and internal distribution. Large scale studies have shown that quick frozen tuna and seer in the form of chunks wrapped in polythene film remained in better condition during frozen storage than in the form of fillets. Absolutely fresh oil sardine with fat content of 20% DWB when block frozen with heavy glaze remains in good condition for 6 to 8 months for -18°C. Pomfret, seer, sole ribbon fish, eel, perch when quick frozen in different forms - whole, round, fillet have good demand in West Asian countries like Bahrain, Kuwait, Saudi Arabia, UAE, Oman etc. and South East Asian countries like Taiwan, Singapore, Hong Kong, Malaysia, Thailand etc. Frozen squid and cuttle fish have already established themselves as commodities for export. With the projected potential of 1.8 lakh tonnes of Cephlopods against current yield of 13,000 tonnes, the prospects of increasing exports on these commodities are indeed bright.

In the canning sector, barring small quantities of oil sardine and mackerel being canned for internal market and defence supplies, our entire installed capacity lies idle which could be advantageously made use of for canning a wide variety of other fish and shell fish. Oil sardine subjected to 'Mediterranean Salting' could be canned in a special style and considered as delicacy in several consuming countries. Technology has been evolved for canning sardine in natural style, in curry, tomato sauce, canning of shell fish like clams, mussels, crabs, oysters, cephalopods and for preparation of "canned prawn with peas", tuna in flavoured
oil as well as onion with peas, which are novel items, would find good demand both in the internal markets and abroad. The technology of packing fish in retortable pouches alternative to canning has now been perfected and it is hoped to put up a pilot plant in the near future for production and test marketing of these products.

Edible meat picked from mixed varieties of fish freed of skin and bones with the help of meat picking machine and frozen into block as 'fish kheema' finds good acceptability as base for several products. 'Salted fish mince' is yet another product which has good market potential within the country and outside.

As has been illustrated above, there are immense possibilities for expanding the consumer sector in both traditional and non-traditional marine products. The right step in the present context is to resort to diversification of fish products which can meet the preference of a larger fish consuming community both within the country and abroad, thereby ensuring profitable utilization of our marine resources.