

# *Fisheries Technological Research*

## *In India*

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Scientific research in India was mostly confined to the Universities in the pre-independence period. The Council of Scientific and Industrial Research which celebrated its Silver Jubilee on 10th August 1968 was created during the second World War with a view to helping the war efforts and this happened to mark the beginning of real technological research in our country. A strong impetus was imparted to this enterprise by the installation of a chain of about thirty National Laboratories as a result of what was called the "Nehru-Bhatnagar Effect". The fate of fisheries technological research was none the better. Our fishery industry at the time of attaining independence was in such a pitiable state that it demanded a complete overhauling in the sense that our fishing methods and handling practices were out-moded and unscientific, being carried down through generations without any improvement. Realising the importance of this industry in our economy, some of the Provincial Governments had already initiated some research work although on a moderate scale for

improving the prevailing conditions. Among them may be mentioned the Fisheries Experimental Station, Tanur, Fisheries Technological Station, Calicut, Craft and Tackle Unit, Madras, all started by the then Government of Madras under the guidance of Sir F. A. Nicholson. Later on, the Government of India also started their Exploratory Deep Sea Fishing Station. It was in the year 1947 that the Central Marine Fisheries Research Institute at Mandapam Camp and the Central Inland Fisheries Research Institute at Barrackpore were started with a view to further improving the fishery industry in our country. However, these latter institutions confined themselves mostly to the Biology of the fishes, their migrations and reproduction cycles.

The need for research in fisheries technology was really felt when we started exporting processed fishery products like frozen and canned prawns and earning valuable foreign exchange. Consequently, the Central Institute of Fisheries Technology (C. I. F. T.) was started in Cochin with the

purpose of assisting the development of this valuable industry. The Craft and Gear Wing was the first to be started in 1957 with a view to designing and building mechanised fishing boats and different kinds of nets, evolving practical fishing methods utilising these accessories, studying the properties of the materials like wood, twines etc. used for these purposes and for exploring the possibilities of substituting cheap and indigenous products in place of costly and imported items. This was based on the report of a Committee appointed by the Government of India under the chairmanship of Mr. Rich. The Processing Wing was added on to it in 1958 based on the report of Dr. Ernest Hess. The important assignments of this Wing were to evolve methods of proper handling and transportation of fresh fish to interior markets, to help the industry in properly processing the products and exporting them to foreign markets, to elucidate ways and means for proper preservation and equitable distribution inside the country of the varieties of fish which do not find ready markets outside and to make proper economic use of the by-products of the industry like fish oils, prawn shells etc. This, in short, is the history of the origin of Fisheries Technological Research in our country. The following is an attempt to review briefly the problems being tackled and the progress achieved so far by this Institute which was originally started under the Union Ministry of Food and Agriculture but later on taken over by the Indian Council of Agricultural Research with effect from 1st October 1967.

### **Boat design and construction**

Our fishing operations were hitherto confined to a distance of ten to fifteen kilometers from the coastline and the first and foremost requirement for increasing the fish catches was mechanised boats. The Institute has consequently made design drawings of

different sizes of boats with different powered engines, constructed their prototypes and has contributed a lot to the mechanised fishing in our country by making available the drawings and other details of the technical know-how to State Government and private boat building yards. The fact that more than 1500 such boats are already operating now is ample proof of the services of the Institute in this field. By substituting cheaper woods like venteak in the place of more costly teak and 'ayini' and indigenously available aluminium-magnesium alloy sheets for sheathing the underwater portions of boats instead of costly and imported copper sheets, it has been possible to reduce the cost of construction of boats by one-third. The worms and other organisms that bore the wooden parts of boats under water and the extent of havoc played by them have been studied and remedial measures worked out. Development of antifouling paints and other means for protecting underwater portions of boats and designing and fabrication of fishing accessories like winches, power take-off clutches etc. also have been successfully handled by the Institute. The efficiency of operation of these boats is subjected to careful study and based on such observations the designs are subjected to necessary modification for better efficiency and a continuous process of development is underway.

### **Net design and practical fishing**

The Institute has succeeded in designing nets of different types, sizes and meshes suitable for different localities and types of fishes, studying the properties of twines like cotton, hemp and nylon generally employed for making nets and evolving chemical treatments for their preservation. Technical details required for formulating quality standards for cotton and nylon twines to be used for nets were gathered and supplied to the Indian Standards Insti-

tution who have made use of them. The efficiency of the nets designed by the Institute is being studied by practical fishing experiments and necessary improvements in design are effected from time to time. These and similar exploratory fishing activities have shown that landings of fish in the comparatively poorer east-coast could be considerably increased and the prawn landings in Gujarat area multiplied several times. Notable progress has been achieved in locating rich fishing grounds, evolving gear required for successful operations in reservoirs like Gobindsagar in Punjab and Hirakud in Orissa and in the use of artificial jigs in troll line fishing. Electronic instruments have been designed for measuring depths and angles at which the nets operate and opening of the nets while trawling which factors influence the efficiency of operation. Electrical fishing is the latest development in this field which is generally employed for catching fish from freshwater sources like reservoirs and lakes. The principle here is to pass a strong electric impulse between two electrodes dipped in water when the fish which happen to be in between the electrodes get shocked and float to the surface and can be scooped out. Considerable exploratory work has been done by the Institute for applying this method to catch fish from reservoir and sea.

### **Fish preservation**

When more fish is landed by such improved fishing methods it becomes of absolute importance to preserve and make the best economic use of them to our advantage. Today about 65% of our total fish landings is consumed as fresh. In olden days, great losses have occurred due to want of quick transport arrangements and the technical know-how required for handling and preserving them. Quick means of transport like lorries, insulated trucks and refrigerated rail wagons and use of plenty

of ice now help in rushing the fresh fish to our interior markets. Cheap and efficient containers for such transport of fish have been evolved by the Institute. If frozen fish is packed in 2.5 cm. thermocole lined second hand tea-chests, it can stand a journey of 4 days at ambient temperatures by which time it can reach even the farthest points in our country and be sold as fresh fish or further stored in ice for another two to three days in good condition. Such containers can be used five to six times over. Insulation boards that can be used for cold storages and trucks have been prepared by the Institute from coconut pith so abundantly available in Kerala. Methods have been evolved for removing fishy odour from insulated vans and refrigerated wagons used for transporting fish.

### **Dehydration**

At least 50% of our total marine fish landings is either sun-dried or salt cured and dried. This product is partly exported to neighbouring countries and partly consumed internally. This is probably the earliest method ever to be used by man for preserving food materials. Eventhough other countries have effected substantial improvement in the technique, it is still being carried on in the hereditary way in our country.

The latest technique to be employed for dehydration of food stuffs is accelerated freeze-drying (AFD). Eventhough it has grown to commercial magnitudes in U.S.A. and some European countries, it is still in the experimental stages in many developed and developing countries including ours. This Institute has already launched a programme of research in freeze-drying of fishery products.

Eventhough dried prawn pulp is an important export commodity of our coun-

try, the method employed for its production is primitive and unscientific. The Institute has designed and fabricated a steam jacketed mild steel drum rotated by an electric motor which can dry fresh beheaded prawns in two and a half hours to give an excellent and hygienic product, cooking, drying and deshelling occurring in one step.

Drying of salted fish is generally carried out by sun's heat which takes two to three days and the material absorbs a lot of bacterial and insect contamination during the process. In rainy season it becomes impossible to employ this method. Artificial drying tunnels have been fabricated for overcoming these difficulties and drying salted fish in 8 to 10 hours. Besides, the Institute has evolved chemical preservative mixtures for keeping salted and dried fish free from fungus and bacterial attack and most suitable containers for packing and transporting such products. Necessary improvements in curing techniques and standardisation of the procedure for making 'massmin', an important fishery product of Laccadive and Minicoy Islands have been effected.

### Freezing

Eventhough we are exporting crores of rupees worth of frozen fishery products every year and our people have gained considerable skill in this process, the services of a Research Institute like this are absolutely essential for solving complicated technical problems sometimes encountered by them. At present this process is employed only for prawns, frog-legs and lobster tails which find a ready export market. But it has now been found that our other fishes like sardines, mackerel, tuna, pomfret etc. can be preserved for months and even years without any spoilage employing this method. The Biochemistry Section of the Institute carries out extensive researches on the several

chemical changes that take place in the fish tissue during such processing and preservation and the nature and distribution of the biochemical constituents in the fish muscle. Methods have been worked out for painless cutting of legs from live frogs, improving the colour and quality of frog legs, preventing loss of weight on freezing and thawing of fishery products and measuring temperature fluctuations in frozen fishery products being transported by road/rail for shipment etc.

### Canning

Canning has established itself in our country as an important export oriented industry and the technical know-how is rather well known to those engaged in it. But they have to depend on the technological laboratory for getting their minute and complicated problems solved. To mention an example, recently some large consignments of canned prawns exported from India were rejected in foreign markets due to blackening occurring inside can and on the material, resulting in loss of lakhs of rupees. Researches carried out with a view to pinpointing the cause of this trouble showed that minute traces of iron and copper getting accidentally into the material during the processing stage are the real culprits and that they could be kept completely arrested by the addition of 0.1% citric acid in the brine used for filling the cans. At present canning is limited to prawns intended for foreign markets. Mackerel, tuna, sardine and pomfrets are canned to some extent for our defence forces and for a limited internal market. But it has been shown by the Institute that other abundantly available fishes like seer, lactarius, catla, carp, molluscs, mullets, etroplus and tilapia can be well preserved by this method. Research is also being carried out for studying the changes occurring in canned fish under storage and evolving methods to control them.

## **Bacteriology**

Bacteria are one of the main causes of spoilage in fish as in any other food material. The Bacteriology Section of the Institute is carrying out extensive studies on the bacteria originally present on the fish, those that get access to it during the course of processing, the havoc played by them on the material and ways and means of keeping them under control. The importance of these studies could be well imagined when we know that these micro-organisms sometimes contain even dangerous and pathogenic types. The scientific staff of the Institute give technical assistance to the processors regarding maintenance of strict hygienic conditions in the factories. Efforts are also under way for evolving quick methods for enumerating the micro-organisms occurring in fishery products.

## **Speciality Products**

Cheaper varieties of fish which do not find ready market can be converted into a variety of protein-rich food products having no fishy odour or flavour. The Institute has succeeded in evolving formulae for fish flakes or crisps which can be fried in oil and eaten, fish, crab and prawn pastes for bread-spreads, breaded frozen fish and prawns and fish soup powder.

## **By-products**

It is absolutely important to utilise the by-products like shells and other waste portions for a fish processing factory to run on a sound economic basis. As it is, these valuable materials are more or less wasted in our country. To mention a typical example, the sardine oil which we produce in large quantities at present is mostly used for painting country boats, whereas, research

work in this Institute has shown that it can be used for a number of industrial purposes like preparation of artificial rubber, a quick-drying and cheap substitute for costly vegetable base for printing inks and paints and high class lubricating oil. Valuable chemical compounds like glucosamine hydrochloride, edible protein and chitin can be isolated from prawn shells usually wasted from processing factories. Methods have also been evolved for isolating good quality fish protein concentrate for human consumption from cheap miscellaneous fishes and press cake from sardine oil industry. Bacteriological peptone required for all the laboratories in our country which is at present being imported at exorbitant rates can now be prepared from cheap fishes like *synagri* sp. The intestines, heads, tails etc. of fish which are discarded from processing plants and the smallest varieties of miscellaneous fish can be converted into fish meal and liquid fish ensilage for poultry and cattle feed.

## **Quality Control**

The Institute has gathered technical details for formulating quality standards for a large number of fishery products and supplied the same to Indian Standards Institution who have made use of them for I.S.I. specifications. It is this Institute which is carrying out preshipment inspection of frozen and canned fishery products exported from our country and issuing export fitness certificates.

This article has touched only the comparatively important aspects of the problems being handled at the Central Institute of Fisheries Technology which is doing immense technical help for the all round development of our fishery industry.