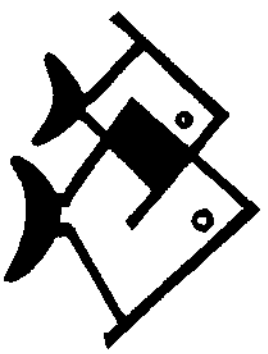
INDIAN FISHERIES

1947 – 1977



ISSUED ON THE OCCASION OF THE FIFTH SESSION OF
THE INDIAN OCEAN FISHERY COMMISSION HELD AT COCHIN FROM
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fisheries technology

Fisheries technological research in India received very little attention prior to the establishment of the Central Institute of Fisheries Technology. Steady increase of fish production and the prospects of further exploitation of fishery resources made it imperative to organise proper research on design of fishing crafts, gears, fishing techniques, methods of handling, means of preservation and utilisation of fish. The progress of research and development on different aspects of fishery technology during the last three decades are discussed below.

Fishing crafts

The implementation of the programme of craft mechanisation in India was broadly divided into a 'Base' and four development phases, *viz*:

Base	...	Country craft
1st development phase	...	Country Craft motorization
2nd development phase	...	Introduction of small mechanised boats
3rd development phase	...	Introduction of more specialised boats
4th development phase	...	Broadening into fishing fleets

A survey on the traditional fishing crafts of the country has shown the existence of 17 principal types of fishing crafts, which fall under the following broad classes according to the locality:

1. Plank-built boats of the west coast — North;
2. Dugout canoes of the west coast — South;
3. Plank-built boats of south-east coast,
4. Catamarans of the Coromandel Coast;
5. Plank-built boats of the Andhra Coast;
6. Plank-built boats of the north-east coast.

These crafts have been indigenously evolved on the basis of their suitability for operation in the respective local condition. All of them are using oars or sails as the main aid for propulsion.

The motorisation of the indigenous crafts is perhaps the first step in the introduction of fully mechanised fishing. In many of the Indian maritime States, there is a general paucity of indigenous fishing boat types which could take in a motor. The following list indicates the indigenous designs which were found to be suitable for motorisation.

1. Lodhias and Machwas	West Coast -North
2. Satpati and Versova boats	

3.	Tuticorin boats	South-east coast
4.	Andhra Nava	Andhra Coast
5.	Chot and Batchari boats	North-east coast

These boat designs were motorised, a few on an experimental basis and the others on a fairly extensive scale.

To replace the dug-out canoes and catamaran which operate from the open surf beaten beaches with motorisd boats, several experiments were conducted to evolve a beach landing boat. A number of prototypes were constructed and trials taken. Although, as a result of these extensive trials, a fairly good idea of a standard design could be formed, the main difficulty encountered was the lack of trained personnel for handling such a boat on the beach and while negotiating through the surf.

A purse seiner

Many designs of small and medium sized mechanised boats to be operated from harbours and sheltered bays were introduced into the fishing industry since the year 1953. The base of this mechanisation programme was the design popularly known as "Pablo". More and more larger boats were introduced in subsequent years. With the introduction of larger boats gear handling and fish detection facilities were also improved. Commencing from the designing of a mechanized beach-landing craft, 12 designs of fishing boats in the size range of 7.6 to 15.2 m suitable for operation from harbours, creeks and sheltered bays were developed. Detailed drawings and specifications of these were supplied to interested agencies. Besides these, six designs of fishing boats 6.24 to 9.12 m long for reservoir fishing, one boat 11.6 m long for pole and line fishing, and one boat of 18.42 m of trawling-cum-fish-carrying vessel and another of 17.5 m steel trawler-cum-purse-seiner were prepared and supplied against specific request. Attention is now directed towards larger class of steel vessels. Fishing boat development has thus registered steady progress.

With the increase in the cost of construction material of conventional fishing craft, a detailed study of the properties of various indigenous timbers was under-taken and 30 different species of timber were identified as suitable substitutes. The use of such secondary timber for the construction of fishing craft would bring about considerable savings. Similarly, investigations showed that the use of aluminum-alloy sheet in place of costly copper sheet used as sheathing material for wooden boats would bring about substantial savings in cost and foreign exchange.

Fishing gear and methods

The indigenous gears, in the country are mainly gill nets, bag nets, boat and beach seines. The advent of mechanisation of the crafts, however, did not greatly benefit in the early years the gear in use and the method of their operation. In fact, initially, the mechanised crafts still used the indigenous gears. It soon became apparent that returns by way of catch was not commensurate with the extra investment on mechanistion. Stern trawling, particularly for prawns, was attempted even with the small boats and met with unprecedented success. Consequent to the expansion of the prawn processing industry, the interst in this new fishing method grew steadily and has come to stay. The Indian Standards Institution have also brought out requisite standards for the stern trawling gear for the different class of vessels. The other gear and methods to be introduced are outrigger trawling, midwater trawling, purse-seining and long lining. Specifications on different net materials have also been worked out.

Several new designs of fishing gear were introduced during the last few years. Particular mention may be made of a design of a 15.25 m four-seam trawl for operation from a 9.45 m trawler and a 15 m bulged belly trawl suitable for a 10.97 m trawler. The main advantage of these nets is the enhancement of the catch by about 30%. A special gill-net was evolved for lobster fishing so that the lobsters caught suffer the least injury.

Several mechanical fishing accessories, ancillary fishing equipment and electronic testing devices of practical value in fishing operation were evolved during the past few years. These include a combination of winch for a 7.67 m boat, a power-isolation clutch for power transmission from engine to winches, designs of gallows, jockey pulleys, and mechanical spraying arrangement for chumming of fish. Among the electronic devices, mention may be made of designing of impulse generator for carrying out electrical fishing. A telemetry-type electromechanical net-depth meter for continuous measurement of the depth of operation of the trawl net was developed and its prototype was successfully fabricated and tested. The two mechanical deweeding machines developed for operation in small and medium inland water-bodies proved to be highly beneficial in eradicating floating as well as submerged weeds from waters used for fish culture.

The advent of synthetic man-made fibres is yet another landmark in fishing gear development. The non rotting character of synthetics is of great importance, particularly in tropics. The laborious and expensive rot-proofing treatments can be dispensed with and gear could also be stored without drying. Gill nets, in particular, have greatly benefited by man-made fibres. The main requirements of materials for gill nets are fineness, pliability, elasticity, durability and invisibility when used in water. Polyamide (Nylon) continuous filament yarns are, therefore, in great demand for gill nets.

For most parts of a trawl net the theoretical requirements are to have fine twines to minimise hydraulic resistance against current. The twines should be strong and be of low specific gravity so that the net fully opens up under water. Suitable synthetic materials are polyamide, polyethylene and polypropylene, which are all manufactured within the country. Polythylene and polypropylene are usually in the form of twisted monofilaments. High density polyethylene are also available in the form of tape-twisted twines and fibrillated tapes for twisting, both of which processes eliminate knot slippage.

Six net making factories are in operation in the country. More factories are likely to be established, when the demand for machine made webbings increases. Indian Standards Institution have already issued standards for the different textile materials used in fishing gear.

Fish processing and product development

The traditional form of processing in the country was salting and sun-drying . Since this form of processing is likely to continue for years to come, primarily to cater to the needs of the rural areas, many forms of artificial dehydration units like tunnel dryer, single and multideck; rotary drum dryer and solar dryer have been developed using indigenously available materials. These equipments ensure production of good quality products.

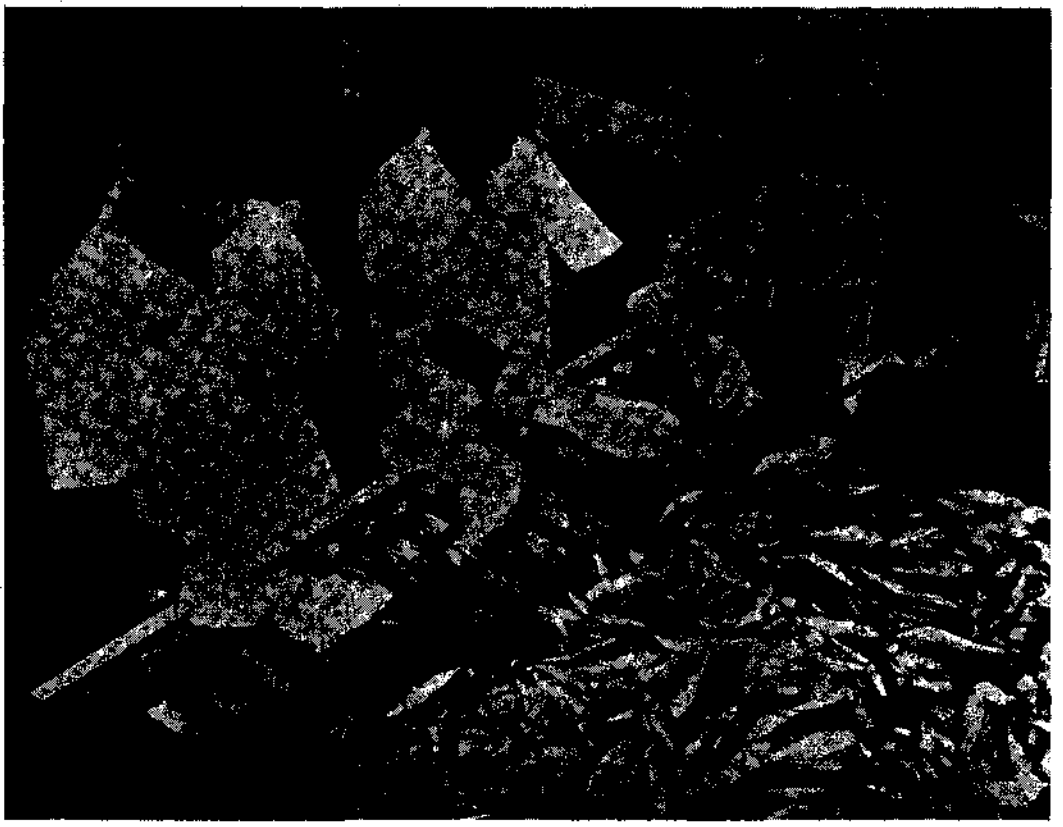
Cleaning shrimps in a freezing plant

The traditional cured products have limited shelf life and unattractive appearance. To obviate both these defects extensive research has been undertaken. Rubbing the normally cured fish with salt containing 3% sodium propionate has been found to be very effective in preventing mould growth and attack from red halophylic bacteria, thus presenting an attractive apperance to the product with extended shelf life of over 4 months. Improvement over the traditional method of 'Colombo curing' of mackerel incorporating sodium benzoate and other fishes using tartaric acid and garlic as preservatives, development of processes for smoke curing different fish are other significant achievements.

In the urban centres as well as in the export of fishery products, a thorough shift has been noticed from traditional dry/cured products to more sophisticated ones like frozen and canned. Microbiological investigations on fresh fish and shell fish brought out

the pattern of changes in the qualitative and quantitative composition of microflora in fresh and icestored fish as well as frozen fish products. This has helped in eliminating potential food-poisoning agents. A method for processing froglegs free from *Salmonella* infection was developed. This has helped in improving the quality of the export products. An effective method of pre-treatment of fish in 15% brine for 3 minutes was evolved for controlling belly-bursting during freezing and storage of oil-sardines, which was causing considerable loss to the industry.

With ready markets existing for frozen and canned prawns, the industry had in the past been reluctant to set foot on any other commodity, partly due to the uncertainty of the reception of the new commodity in the international market and partly because the technology of production of many products, which could have a demand, was not fully known. It is now clear that the future of the industry will entirely depend on diversification in the produce as well as markets both within the country and abroad. Of late, a greater awareness to this problem has been generated and significant contributions have been made by research laboratories to develop new fishery products. The Indian Standards Institution has also evolved quality standards for the different products developed.



Beheading and nobbing of sardine and mackerel

Fillets made from fish which are generally not considered as table fish e.g. kilimeen (*Nemipterus* sp.), cat fish (*Tachysurus* spp.) and sciaenids, when frozen into consumer type packs, have been found to have great demand in the domestic markets. Likewise flesh of other cheap varieties of fish, which do not find a ready market as such, can be extruded and made into frozen consumer packs. Jew fish, cat fish, sharks, skates, rays, anchovies, pomfret, seer, tunnies, threadfin, ribbon fish, eel and perches, when frozen in different forms like whole, filleted or in chunks can have, apart from domestic demand, export possibility. A method

has been developed for canning sardine in its own 'juice' called the 'natural pack' which besides dispensing with the use of the costly filling medium, also saves

Bactereological test for quality control

labour to some extent. To provide an impetus, there also exists a scheme for payment of 20% subsidy on the f.o.b. value of the exported canned sardines. Methods have also been developed for smoking and canning sardine in different media. Technology for canning mackerel in oil, has already been developed. Similarly, canning mackerel in 'natural pack' has also been perfected. However, the most significant method is one recently developed for canning mackerel as skinless and boneless fillets. Yet another species having a high potential in production from Indian waters is the anchovy. Methods have been developed for canning them in different media such as oil, sauces and the response from consumers have been good. Canning processes have been standardised for smoked eel, tuna, seer and cat fish. These products can also have possible export markets.

Crabs are good raw materials for canning. The main problem connected with its canning is the discolouration of meat during storage. This has been successfully overcome by proper bleeding of crab meat before cooking so that the copper and iron contents, the causative factors for blackening, come down to a level so that their effect become insignificant.

Mussels, clams and oysters are the untapped resources. They render themselves very well for canning and probably hold a good potential for export trade. Suitable methods have been developed for canning clams and mussels taking care of the problem of grittiness commonly met with, when such items are canned.

Whereas the problems faced by the organised fish processing industry can find solutions by the diversification programmes, the problem of utilisation of the so-called 'trash fish' still remained, until the launching of the All-India Co-ordinated Research Project on 'Utilisation of trash fish.' The project has made much headway and a number of products have been developed, some of which have been taken up by the industry for commercial production. Suitable methods have been worked out for preparation of fish wafers, fish soup in powder and tablet form. A process has been developed for the production of functional fish

Canning plant

protein concentrate as also the preparation of fish hydrolysate by using enzymes papain and pepsin. Bacteriological peptone prepared from 'trash fish' has been found to be equal in all characteristics to the

imported brands. A number of products prepared with fish meat in different forms like meat flakes,minced meat or hydrolysed, partially hydrolysed meat like canned fish paste, fish cake etc. have also been developed. Another item of importance is the solid food mix prepared with fish ensilage using defatted rice bran and other vegetable products.

A very simple method has been developed for preparation of edible fish flour from non-fatty fish with a view to incorporating it as a cheap dietary supplement for combating protein malnutrition of the rural population. The methods consists of cooking fish followed by drying, pulverization and partial removal of bones. Feeding trials have shown promising results.

Processing fish invariably produces wastes. Proper utilisation of waste can support an auxilliary industry. It is estimated that more than 40 thousand tonnes of waste, comprising prawn shell and head, is turned out each year by prawn processing industry alone. Prawn shell contains chitin which has application as such in the preparation of antibiotics or converted into chitosan used in textiles. Besides, this waste, particularly the head, contains a good amount of protein, which can be recovered and put to proper use.

Dried fins of shark form an item of export from India. The importing countries process them into fin rays. Processing of fins within this country for rays would not only save freight charges but also generate employment. A simple method for extraction of fin rays has been developed which can be used on a cottage industry basis.

The body oil from oil sardine contains highly unsaturated fatty acids. Because of this property, after proper modification, the oil can be used for many industrial applications. Methods have been developed for preparation of a mineral rubber used in rubber compounding industry, base for paints and printing ink and as a lubricant. It has also been shown that sardine oil has a potential in bringing down the blood cholesterol content.