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SALIENT RESEARCH ACHIEVEMENTS
AND THEIR APPLICATION TO
FISHERMEN AND THE INDUSTRY



CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY

(Indian Council of Agricultural Research)

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SALIENT RESEARCH ACHIEVEMENTS AND THEIR APPLICATION TO FISHERMEN AND THE INDUSTRY

The Central Institute of Fisheries Technology was set up in 1957 with the prime objective of developing the needed technologies for modernisation of fishing and fish processing in the country. Some of the salient research findings of applied importance are as follows:

1) Designs, materials and maintenance of fishing craft

i) **Designs:** Twelve standard designs of mechanised fishing craft in the size range 7.67 m.—15.24 m. suitable for operation on the Indian coast were prepared, apart from designs prepared against special requests by different State Fisheries Departments. It is estimated that of the 15,000 mechanised wooden boats now constituting the Indian fishing fleet, more than 10,000 are built according to the popular 'CIFT Boat Designs'. Of the rest,

the majority are adaptations of the basic CIFT designs.

ii) **Materials:** With the rapid progress in mechanisation of craft, the need arose to find out cheaper construction materials to bring down the overall cost of the wooden boats. Investigations carried out resulted in recommending venteak, a cheaper wood, in place of the conventionally used costly teak and aini. Secondary species of timbers like Mango and Haldu, after suitable preservative treatment were also found to be suitable as boat construction materials. Aluminium-magnesium alloy and fibreglass reinforced plastic were recommended as suitable substitutes for the costly and imported copper for sheathing the hulls of wooden fishing vessels against deterioration under marine conditions. The saving in foreign exchange achieved by

using the indigenous aluminium alloy is estimated at about Rs. 40 million

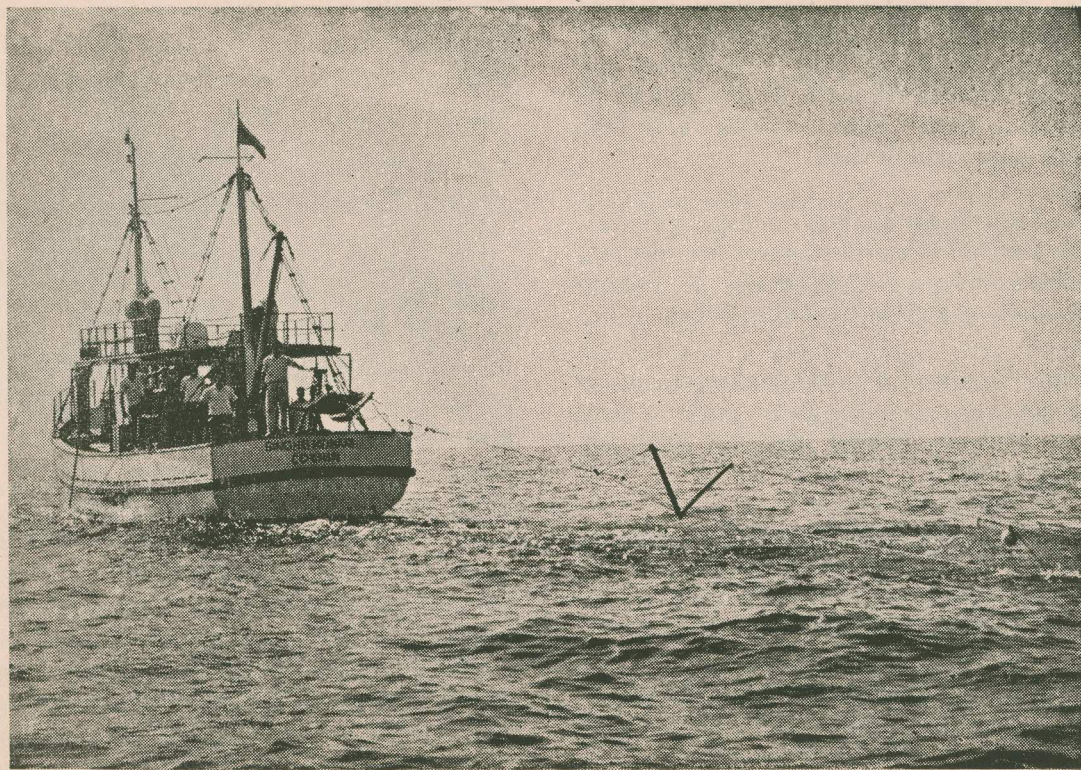
iii) **Maintenance:** A suitable antifouling paint composition incorporating copper aceto-arsenite in an indigenous resin base was formulated and recommended for application on fishing boats. The process is now being patented. Five varieties of indigenous resins have also been recommended in place of the imported resin 'Damar battu' for use on wooden boats. Studies on corrosion resistance have resulted in recommending ternary aluminium alloy blocks anodes in place of conventional zinc blocks for application on the hulls of fishing boats. A self-sacrificial paint primer has been developed for the protection of steel trawlers. These protective measures and materials recommended enhance the service life of a boat considerably thus reducing inputs for periodic repairs and replacements.

2) Development of fishing gear and methods

i) **Materials:** For effective utilisation of the country's fishery resources, development of suitable gear for operation from suitable crafts was found most important. As a first step the characteristics of different gear materials were studied and suitable

preservation methods worked out for cotton nets. Cotton twines have now been successfully replaced by synthetic twines like nylon, polyethylene of low and high density etc for fabrication of trawls and other types of nets. The Institute has also, of late, worked out standards of HDPE tape twisted twine which is considered to be the cheapest of all twines suitable for trawls, and also for nylon twines suitable for gill nets. Studies were also made of floats and other fishing gear accessories towards evolution of basic quality requirements. The standards of quality as worked out by the Institute were adopted by the Indian Standards Institution for issue of the national quality standards.

ii) **Designs:** Over 30 designs of trawl nets have been prepared for operation from different size groups of vessels and as also designs of suitable otter boards for operation with these trawl nets. It was a result of the developments made at this Institute that trawling became a very popular fishing method, contributing substantially to the seafood export industry. Owing to the present trend in diversification of fishing methods, more and more emphasis is being laid in exploitation of resources other than prawns.



'Sindhu Kumari' second of the 15m. trawler designed and built by the Institute for offshore fishing.

Improved designs of traps for lobster fishing have been developed and successfully tried in Kanyakumari District. These are now ready for exploitation on commercial scale. Design of a purse seine for operation from country crafts was also developed and successfully tried.

Designs of other gear evolved include gill nets for fishes like seer, pomfret, lobster etc. The Institute also introduced trolling, a new technique of fishing for seer, barracuda and other predatory fishes.

iii) Inland Fishing: For the development of inland fisheries and for increasing the present level of production, efficient fishing gear and methods have been introduced.

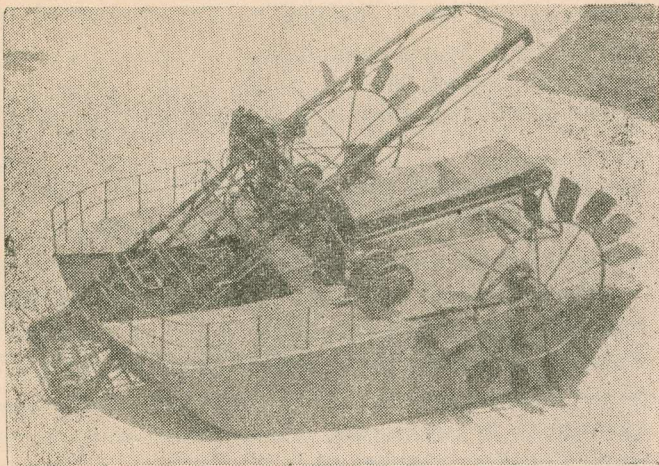
Suitable gear for the eradication of forage fishes and predators as well as standard gear for the capture of major carps like catla, rohu, mrigal and the like have now been put to operations.

With the implementation of these integrated efforts, it has been possible to enhance the fish production from the Hirakud reservoir of Orissa. A technique for estimating the landing from Hirakud reservoir in Orissa has also been developed.

The above innovations on craft and gear contributed significantly to increase the fish landings of the country from 0.8 million tonnes in 1959 to 2.25 million tonnes in 1979.

3) Deck machineries and allied equipments

Increased tempo in the programme of mechanisation of fishing operations necessitated development of different mechanical gear handling and fishing equipments. Designs were thus developed of trawl winches for different sizes of vessels as also designs of gallows, gurdies, linehaulers and a power-take-off clutch. Several electric and electronic equipments were also developed for use in commercial and experimental operations, among which may be mentioned trawl depth meter, temperature salinity meter, warp load meter, speed and distance log. Most of the mechanised boat engaged in trawling have further advantage of these innovations to improve their catches. Five of the instruments have already been commercialised through NRDC and being marketed by M/s. Saraf Electro oceanic Appliances, Cochin-3.



The machine designed and built by the Institute for removal of weeds from inland water bodies

An inboard-outboard drive for propulsion of country crafts using inboard diesel engine was fabricated. This system holds promise of increasing the efficiency of coastal fishing. A few crafts mechanised with the engine are now in successful

operation in the southern States of India and if popularised and widely adopted this type of low H. P. engines can revolutionize the traditional fishing sector by reducing fishing effort and increasing the catch.

4) Weed Harvester:

A machine was also developed for removing submerged and floating aquatic weeds from inland water areas which are now lying derelict owing to suffocation by these weeds. The machine which won an Invention Award from the NRDC of India is now under production by a private firm under an agreement with the NRDC.

5) Fish Processing Technology.

i) **Transportation of fresh fish:** The spoilage pattern of commercially important fish and shell fish during storage at ambient temperature and ice temperature were worked out. Cheap and effective packing containers were developed for short and long distance transportation of iced/Fresh/frozen fish in good condition.

ii) **Freezing and canning:** Methods have been worked out for freezing and canning a number of species of fish and shell fish like prawns, pomfret, tuna, seer clams, mussels, frog leg etc. These methods have been adopted by the processing industry for production of products for export to world markets. The Institute has also developed suitable methods for reducing cooking and thawing drip losses in respect of cooked and frozen prawns respectively.

By adopting the Institute's method for preventing drip loss in frozen and canned prawns the fish processing industry has saved a foreign exchange of Rs.7 crores since 1970. Blackening was a serious problem in canned prawns exported from India, Canned prawns valued Rs. 7 lakhs were rejected in 1972 due to blackening. Since then, industry used an improved technique developed in CIFT for processing canned prawns with the result that no canned prawn is rejected due to blackening at present.

iii) **Mechanical drying of fish:** For dehydration of fish and prawn, the Institute has designed tunnel dryers of $\frac{1}{2}$ and 1 tonne raw material capacity.

Dryers as per these designs have been set up at places. Other dryers being developed include a solar dryer for drying fish, a rotary drum dryer for production of fish meal and dehydration of prawns

iv) **Utilisation of uneconomic varieties of fish and fishery waste:**

For economic operation and survival of the fishing industry, it is necessary to utilise the raw-material wastes and cheap quality fishes for production of useful products. The Institute has paid due attention to this aspect and methods have since been worked out for a number of products like chitosan and shrimp extract from prawn shell waste, poultry feed from prawn shell powder, fish meal, rice bran wheat bran and molasses in worked out proportion, bacteriological peptone and fish protein concentrate from miscellaneous varieties of fish. Processes have also been developed for preparation of a number of speciality products from fish like fish/prawn pickle, soup powder, prawn flakes, fish fingers etc. and some of these processes have been adopted by interested parties for production on a semi-commercial scale.

v) Extraction and utilisation of sardine

oil: Improvement of the traditional method of extraction of sardine oil is another field in which the Institute was successful. The improved methods worked out has proved advantageous in processing quality oil which finds use in a variety of ways including preparation of factice or mineral rubber surface coating material, vehicle for printing ink and lubricating oil.

vi) Utilisation of non-penaeid prawns (*Acetusa*

spp.) Non-penaeid prawns are landed in bulk along coast of Maharashtra. A method for extracting the muscle proteins alone, free of shell portion has now been successfully developed. The extracted meat can be preserved either in the dry or frozen condition and then subsequently utilised for incorporation in different food products for enrichment with protein.

vii) **Utilisation of bivalve molluscs:** Technologies have been developed for preparation of different products such as clam pickle and canned clams, mussel pickle, dried and smoked mussel meat, canned oysters etc. using meat of clams, mussels and oysters which is not being used properly at present.

Training was imparted in these technologies at different places as a result of which some entrepreneurs have already taken up small-scale industries.

viii) **Other technologies:** Other innovations deserving mention are the humane method of cutting frog legs for freezing, method for prevention of yellow discoloration of silver pomfrets, prevention of blackening in canned prawns, development of an automatic brine dispenser for use in canning line and production of frozen fillets from low quality fishes like cat fish, jew fish, Indian halibut etc.

6) Quality Control

Quality standards and technologies for achieving the same were evolved for different types of fishery products which enabled different entrepreneurs to process products conforming to the quality requirements of the foreign buyers and ultimately helped in the increase of seafood exports from this country.

The pre-shipment inspection of seafoods intended for export was initiated by this Institute to help the export of seafoods and after its standardisation, was passed on to the Export Inspection Agency.

Indian Standards Institution has adopted the quality standards evolved by this Institute for seafoods for the formulation of ISI specifications.

Based on the investigations on improvement of the bacterial quality of frozen prawns and frozen frog legs, methods were worked out to bring down the bacterial load of the finished products. This helped the export industry to increase their exports and reduce rejections as it has happened in the case of frozen frog legs where the rejections came down from 70% to 10% as a result of our work on *Salmonella*.

Efficient cleaning schedules were worked out for fishing boat decks, fish containers, fish transport vehicles, utensils and equipments used in prawn peeling sheds and processing plants to bring down the total bacterial count and destruction of pathogenic organisms.

A deodorant was developed for use of in prawn peeling sheds and processing factories. (In Cochin there are parties manufacturing this). This has



Types of Fish products developed by the Institute

generated employment potential to a considerable extent among educated young people.

A rapid colourimetric test using a reagent-impregnated filter paper was developed to measure available chlorine levels from 20-25 ppm. This is to help the processing factories in adjusting the

chlorine levels in the water used for various operations towards production of bacteriologically sound products.

Work carried out on the quality control aspects of processed seafoods contributed significantly to the increase of marine seafoods exports to a level of 92, 184 tonnes valued at Rs.2,620 million in 1979. from a level of 16,337 tonnes valued at Rs. 40.2 million in 1960.

As the result of training programmes conducted by CIFT on Quality Control analysis of fish and fish products a number of fish processing factories have established their own Quality Control Laboratories absorbing technologists and supervisors.

7) Lab-to-land Programme

Under the lab-to-land programme of the Institute, 200 families have been adopted by this Institute from various fishing villages. At Chellanam, a coastal fishing village near Cochin, various technologies like motorisation of country crafts, improved preservation of crafts, fabrication and operation of purse-seines from country crafts and fabrication of fishing gear using knotless nylon webbing were

demonstrated and the fishermen of the adopted families were trained in the gear fabrication techniques. The fisherman are now trying to motorize their crafts based on the know-how developed by the CIFT with large scale follow-up action by the State Fisheries Department of Kerala.

At a village near Badakara, in Calicut District, fisherwomen were trained in fabrication of trawl nets, including reading and interpretation of the designs. A society of the fisherwomen is now fabricating such nets on a commercial basis, thus providing employment to society members and enhancing their family income. More such societies are expected to come up.

At Kumarakam, Kumbalam and Vaikom in Kerala technology of processing clam meat was transferred. As a result of the training-cum- demonstration programmes conducted, one commercial venture employing about forty persons has been started in Kumbalam (Kundara) for the manufacture of clam meat pickles. This party is now exporting clam pickles to Gulf countries. The lab-to-land programme of the Institute on utilization of clam meat and mussel meat has completely stopped the large scale

wastage of clam meat, considerably increased the utilisation of protein and mineral rich clam and mussel meat, generated employment to a large number of people and improved the socio-economic condition of the clam and mussel fishermen.

Demonstrations on the processing of mussel meat were held at Elathur (near Calicut). Four commercial units have already come up for production of mussel meat pickles.

At Vellayil (also near Calicut), modern practices of curing fish were demonstrated. Improved fish curing techniques were also demonstrated at Nemam, a village in Kakinada, as also preservation of cotton nets, scientific method of hanging gill nets and improved designs of fishing gear. The village Fishermen's Cooperative Society has started curing the fish on more scientific lines.

Fishermen of the Hirakud reservoir in Orissa were provided training in the use of improved designs of entangling nets and long lines. The fishermen are operating these gears and the results are being monitored.

At the village Chorwad adopted by the Institute's Research Centre at Veraval, the technologies transferred were fishing for sharks with gill nets, scientific methods of handling and preservation of fish and processing of sharks, skates and rays for better returns.

In connection with the above programme, extension pamphlets and literature on the various technologies transferred have been prepared in English and local languages which are very profitably made use of by the recipients.

8) Extension. Training & Education

The extension activities of the Institute are carried out through various media like answering technical enquiries, personal discussion, demonstrations, supply of designs, publications and conduct of film shows, exhibitions and open houses.

Summer Institute: The Institute conducts Summer Institutes for the benefit of candidates sponsored by State Departments of Fisheries, Agricultural Universities and related institutions. Three such institutes have so far been conducted, viz. on Coastal Fishing Methods, Fish Processing Tech-

nology and Production of Non-Traditional Diversified Fish Products and By-products.

Post-graduate education: This institute has been recognised by Kerala University, Cochin University, Bombay University and Jadavpur University for purposes of post-graduate research. Four of the Institute Scientists are recognized as guides for doctoral programmes. This Institute provides educational facilities for Masters's programmes in Industrial Fisheries and Mariculture. Institute library contains a rich collection of references on various aspects of fishery technology, and scholars from different institutions and Universities avail of this facility.

Training: Due emphasis is also given in extension training through conduct of ad-hoc training courses in different subjects of varying duration for sponsored technical personnel in India and abroad. Conduct of refresher training courses was also started in 1973 for imparting advanced training to technical supervisors from fish processing establishments and others connected with the fishing industry. A synopsis of the subjects covered and persons trained is given in the table.

S.No.	subject	No. of persons trained
1	Fish microbiology, quality control and analysis of fish products and bacteriological aspects of fish.	219
2	Fish processing	485
3	Speciality and by-products from fish and shell fish	117
4	Fish transportation	145
5	Fish curing	15
6	Fishing Craft and Gear Technology in general including gear design and fabrication and fishing methods	129
7	Boat building technology and construction including maintenance of boat hulls	50
8	Marine Engineering	2

Prepared by: Dr. P. N. KAUL

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