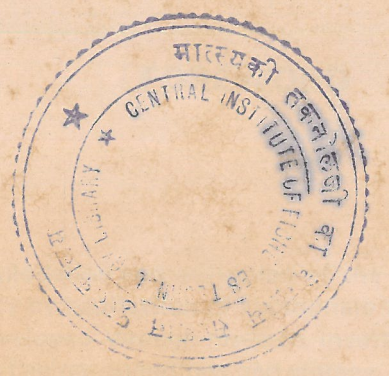
TECHNOLOGIES DEVELOPED AT CIFT

CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
MATSYAPURI P. O., COCHIN 682 029

Special Bulletin - 11



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Matsyapuri P. O., Cochin 682 029

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FOREWORD

Scientific exploitation and utilisation of the vast fish resources of India can be achieved only by application of appropriate techniques and equipments. These are to be developed through research investigation in fishing craft and gear suited to local fishing conditions and storage, preservation, transportation and processing of the landed fish. In recognition of the pressing need for co-ordinated research in various aspects of fishery technology for the over all development of fishery industry in India, the Ministry of Food and Agriculture, Govt. of India, set up the Central Institute of Fisheries Technology at Cochin in 1957.

Since its inception, the Institute has taken up and successfully completed studies on many important aspects of fishing and fish processing. Several new and improved technologies have been developed at the Institute for construction and maintenance of fishing craft, fabrication, operation and maintenance of fishing gear, processing and utilisation of fish and shell fish and fabrication of equipments, instruments and accessories to be used in fishing and fish processing. A brief account of these technologies is presented in this bulletin. Details of the technologies are available at the Institute. The bulletin was prepared with the assistance of all scientists involved in the development of the technologies. It is hoped that this publication will be of great use to the research workers, teachers, extension personnel, fishermen, fish processors and new entrepreneurs engaged in or associated with fisheries technology.

M. R. NAIR
Director
C. I. F. T.

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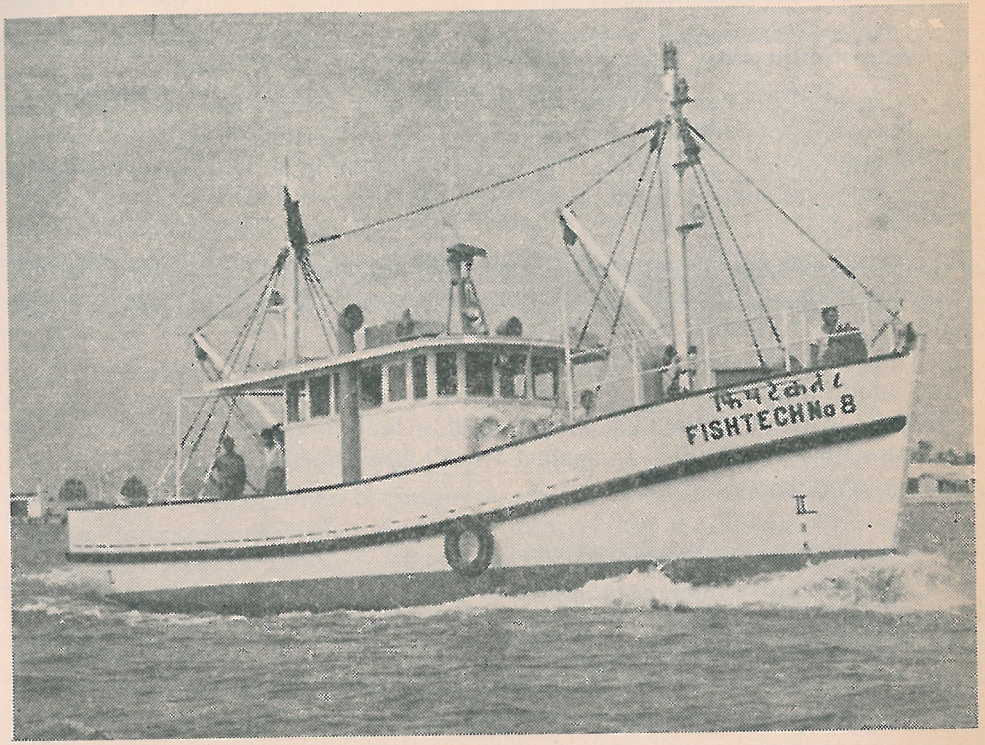
I. FISHING CRAFT

1. Mechanised fishing boats

The first step in mechanised fishing in India involved the designing of craft of various sizes suitable for our waters utilising indigenous building materials. This need was fulfilled by the development of twelve standard



15 m. mechanised wooden fishing boat-designed and built at CIFT

designs of mechanised fishing boats in the size range of 7.67 m. to 15.24 m. Apart from these, designs were also prepared on specific requests from different

State Fisheries Departments. It is estimated that there are now over 10,000 mechanised wooden fishing boats built to these designs in operation along the Indian cost.

Venteak *(Lagerstroemia lanceolata)* has been recommended as a cheaper substitute for costly teak *(Tectona grandis)* and 'aini' *(Artocarpous hirsuta)*. It seasons well and is durable and easy to work with. It is not easily attacked by white ants and fungi and has better resistance to marine borers. By using venteak in place of teak, about 40% saving in timber cost can be achieved.

Secondary species of timbers like mango *(Mangifera indica)* and haldu *(Adina cardifolia)* after suitable preservative treatment have also been found suitable for boat construction.

2. Aluminium-alloy sheathing for wooden fishing vessels

Most of the fishing vessels constructed and operated in our country are wooden. Unprotected wooden hulls of fishing vessels get damaged by marine borers and fouling organisms. The traditional method of protecting the hull is by giving copper sheathing which is very costly.

CIFT has recommended cheap aluminium-magnesium-alloy for sheathing wooden hulls in place of costly copper along with G. I. fastenings, cast iron fittings and aluminium alloy tacks and screws. The alloy is light, resistant to seawater corrosion and cheap in price. Fouling on the metallic surface can be eliminated through the use of a specific painting schedule recommended by the Institute. Cost of aluminium sheathing of a 9.75 m. boat is worked out to be approximately Rs. 4200/- as against Rs. 12,200/- for sheathing the same size of boat with copper.

3. Chemical wood preservatives

Traditional fishing contributes to the major part of fish landing in India. 'Kattamaram' and built-in or dug-out canoes are used for traditional fishing. These wooden crafts deteriorate rapidly due to weathering and also in contact with sea water containing various organisms which destroy wood. Fishermen are using indigenous preservatives like cashew nut shell liquid, fish oils etc. to protect their fishing craft. But studies have shown that these preservatives have very little toxic properties. They merely act as water repellents.

Considering the financial loss incurred by the traditional sector, CIFT has developed some chemical wood preservatives viz. arsenic creosote, copper

creosote and creoscor. Creosote is a coal tar distillation product. Fortification of creosote with copper or arsenic makes it more toxic and consequently prolongs the efficiency of the preservative. Fortified creosote imparts not only toxicity of wood against bacteria, fungi and termites but also retards the formation of cracks on the wood due to weathering.

Creoscor is a high efficiency oil-borne wood preservative which is prepared by heating together heavy creosote oil, copper compound and plant resins. The treatment consists of giving two or three liberal coats of copper creosote or arsenic creosote on all parts of the boat. The hull portion is then coated with creoscor which not only protects the craft but also provides a smooth surface which helps to reduce the frictional resistance to motion of the craft in water.

The new treatment costs only 28% of that for traditional treatment.

4. Mercury free anodes for cathodic protection

Marine metallic structures are constantly subjected to very severe corrosion resulting in huge economic loss. Properly designed cathodic protection system is not only technically feasible but also economically viable. Presently, zinc and ternary aluminium anodes are used for cathodic protection.

A galvanic anode free from mercury has been developed for use in cathodic protection of fishing boats and metallic marine structures. The life of these anodes is 3 times that of zinc anodes. As these anodes are mercury free unlike its commercial counterparts, pollution of the aquatic environment by mercury does not occur.

5. Marine antifouling paint

Fouling, the growth of certain plants and animals on the hulls of fishing boats, is an economically important problem since it increases the frictional resistance of boats resulting in increased consumption of fuel, loss of speed etc.

CIFT has developed an antifouling paint with cuprous oxide and modified indigenous resins. This paint prevents fouling on boat hulls for a period of one year compared to 6-8 months in the case of commercial antifouling paints available in the market now. The new paint is 30% cheaper than the commercial paints.

6. Marine anticorrosive paint

Corrosion is a serious problem in fishing boats. An anticorrosive paint has been formulated by CIFT with cashew nut shell liquid resin. This is 50%

cheaper than the commercial paints and lasts for one year as against 6-8 months in the case of commercial samples.

7. Protective coating for cast iron propellers

A protective coating based on epoxy resin has been developed for application on cast iron propellers in fishing boats. This technology enhances the service life of cast iron propellers by arresting graphitization which shortens the life span of these propellers. The protected cast iron propeller is a good substitute for conventional bronze propellers. These propellers are 50% cheaper than bronze propellers.

8. Toxic wood plastic composite

Wood impregnated with styrene-polyester monomers and fortified with creosote/TBTO (Tributyl tin oxide) and polymerised by gamma radiation yields toxic wood plastic composite which is far superior in mechanical properties and resistance to bio-deterioration when compared to parent wood. By this technology, cheaper secondary species of wood can be converted into products of superior quality and can be a good substitute for those boat scantling which are prone to fungal attack and require greater strength.

9. Development of zinc rich paint

In fishing boats, corrosion is very severe at the stern area owing to the presence of several dissimilar metals and turbulance caused by the churning action of the propeller. A zinc rich paint utilising totally indigenous materials has been developed to combat corrosion in the stern part of fishing boats. This formulation is cheaper compared to commercial zinc rich paints with better performance characteristics.

10. Indigenous resins as preservatives for wooden craft

Application of a surface coating material from an imported resin 'Damar battu' (obtained from members of the family *Dipterocarpaccae*) on the wooden structures of indigenous fishing craft was extensively followed by the fishermen of the states of Maharashtra and Gujarat. CIFT has shown that 'Damar battu' can be successfully replaced by the indigenous natural resins like Andaman damar *(Canarium euphyllum)*, Black damar of Malabar *(Canarium strictum)*, Rock damar *(Hopea odorata)*, Sal damar *(Shorea robusta)*, White damar *(Vateria indica)* as well as a resin prepared from cashew nut shell liquid. The powdered resin mixed with an equal quantity of ground nut oil is heated and immediately smeared on the wooden structures. Several such coatings are given over which a cementiferous uniform coating made of lime and castor oil is applied.

II. FISHING GEAR

11. Long wing trawl

The long wing trawl is a specialised trawl for shrimping with long wings on either side, and short belly to cover a wider area and to sweep evenly along the sea bed. Since it is exclusively for shrimps, it has lesser vertical height and reduced resistance. By this design the shrimping efficiency can be increased to about 45% than a conventional shrimp trawl.

Cost of the net ranges from Rs. 2750/- to Rs 4000/- depending on size.

12. Bulged belly trawl

Due to the influx of large number of fishing vessels engaged in shrimping, the per capita return reduced considerably and it was felt that the catch of shrimps alone cannot sustain the industry. To overcome this, the concept of bulged belly trawl was introduced providing the net a better vertial opening without affecting the shrimping efficiency.

This is attained by increasing the height of the side panels, providing more slackness at the wing side by introducing double slanting jibs and streamlining the tapering of the belly to get better and efficient lifting of the head rope. With this, it is possible to increase the fish catch by about 30% than with a long wing trawl with out any reduction in the efficiency in shrimp catch.

Cost of the net ranges from Rs. 3500/- to Rs. 5000/- depending on size.

13. Six seam trawl

This is yet another improved version of shrimp trawl, designed particularly for the north west coast where there is better quality of bottom fishes. This net has six panels to get a greater vertical opening than a bulged belly trawl in order to facilitate capture of off bottom fishes, without affecting the shrimp catch. This net, by its design, offers comparatively lesser resistance.

Cost of the net ranges from Rs. 2750/- to Rs. 4000/- depending on size.

14. Double rig shrimp trawl

The inherent quality of a shrimp trawl is lost as the size of the net increases by loss of its adaptability and even sweep along the sea bottom. As such, it is not possible to go on increasing the size of the net proportionate to the increase in the size of the vessel and its HP. To overcome this, double rig shrimp trawling, using two smaller nets, operated from out rigger booms, is introduced for medium class vessels. This provides wider coverage of area with better and efficient sweeping along the bottom at a reduced resistance of about 15% than a single net of double the size. By resorting to double rigging, the shrimp catch can be increased to almost double than that with a conventional shrimp trawl.

Cost of the net ranges from Rs. 3500/- to Rs. 5000/- depending on size.

15. Large mesh fish trawl

This design is a modified two seam demersal trawl suitable for area where there is an abundance of quality fishes. The salient features are the large meshes in the fore part, greater slackness along the head and foot rope and higher vertical opening. The increased mesh size facilitates better flow of water, there by considerably reducing the resistance of the gear. This lower resistance enables the use of a bigger net about 25% more in size than a conventional demersal trawl.

Cost of the gear ranges from Rs. 3000/- to Rs. 4500/- depending on size.

16. High opening trawl

This is basically a four seam demersal trawl with increased mesh size for operation from small class vessels along the inshore area. The most salient feature of the gear is the extra slanting wings attained by simultaneous baiting and creasing respectively along fhe inner and outer sides. This facilitates easy lifting and spreading of the head rope. This design can be used as both shrimp trawl and fish trawl by suitably adjusting the mesh size.

Cost ot the net ranges from Rs. 3000/- to Rs. 4500/- depending on size.

17. Purse - seine

A purse-seine is a specialised gear for capture of pelagic and shoaling fishes. Hitherto, this gear was operated from medium class vessels of length ranging from 13.11 to 15.24 m. CIFT has developed a purse-seine fo operation from small class of vessels hitherto engaged in trawling, as an alternate gear when

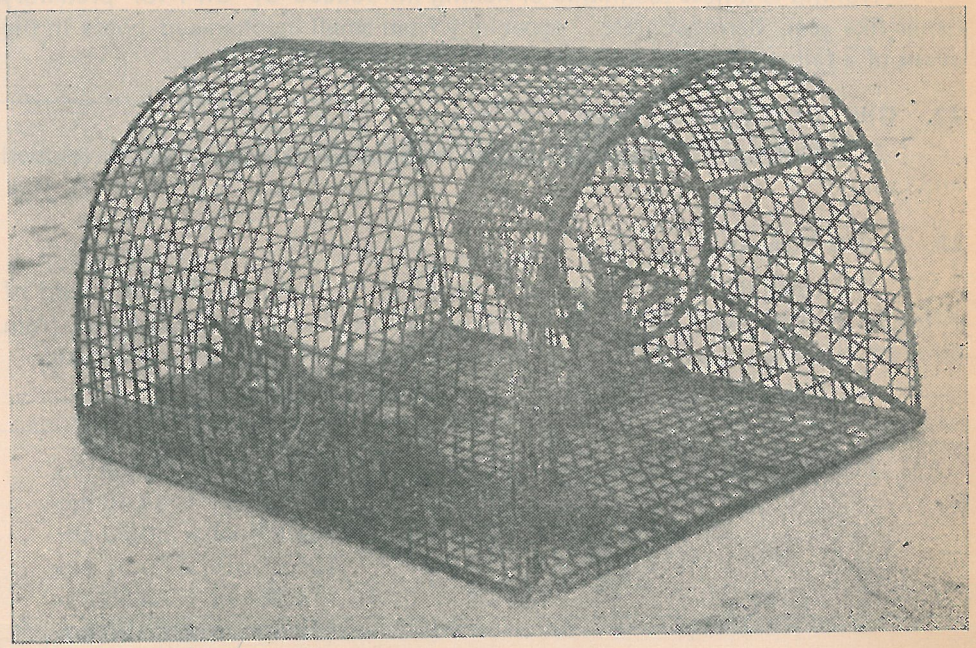
shrimping fails, and during the sardine and mackerel fishing seasons. The cost of the gear of length 260.5 m. comes to about Rs. 1.5 lakhs as compared to a net of 325 to 400 m costing Rs. 2.5 to 3 lakhs.

18. Mini purse-seine

Introduction of a two boat mini purse-seine from country craft offers a welcome change from traditional shore-seines and bag-seines, the main gear for pelagic shoaling fishes. The operation is simple which, annexed with the motorization of the country craft, has yielded good results by way of increased catch, more number of fishing days, more fishing trips and operation at farther grounds. The net can be operated by a group of 20 traditional fishermen from two mechanised/non-mechanised thangu vallams. The gear has a length of 225 m costing about Rs. 1 lakh and has a capacity of 5 tonnes of catch per haul.

19. Improved lobster trap

Spiny lobsters constitute an important item of marine products exported from India fetching sizeable foreign exchange for the country. The traditional



Modern lobster trap

traps at present used for lobster fishing are crude, inefficient and easily damaged, made of coconut or palmyrah leaf stalk fibres. The new trap is fabricated out of MS rod frame mounted with 2.5 cm square welded mesh. Corrosion being the greatest disadvantage for iron material in sea water, a complete coating of plastic was provided to this trap as a measure of preservation which makes the trap completely impervious to sea water. The trap costs about Rs. 400/- and its life is estimated at 3 years with a double fold catching efficiency which makes it economically advantageous in the long run. These traps have found great favour with traditional lobster fishermen.

20. Gill nets

Gill nets are selective gear, the efficiency of which depends upon the choice of proper twine size and mesh size. The mesh size and twine size have been standardised for common gill net fishes like seer, pomfret, hilsa, lobster etc.

21. Troll lines

Trolling is a new technique of fishing introduced by CIFT for predatory fishes like seer, barracuda etc. especially from small mechanised boats in the event of a failure in prawn fishery.

22. Gill nets for reservoirs

Standard gear like trammel net and frame net have also been developed and introduced for capture of major carps like rohu, mrigal, catla and cat fish.

23. Otter boards

The Institute has developed a number of designs of otter board of different shapes and sizes for operation with different sizes of trawl from different size groups of vessels. The particulars of otter boards designed are:

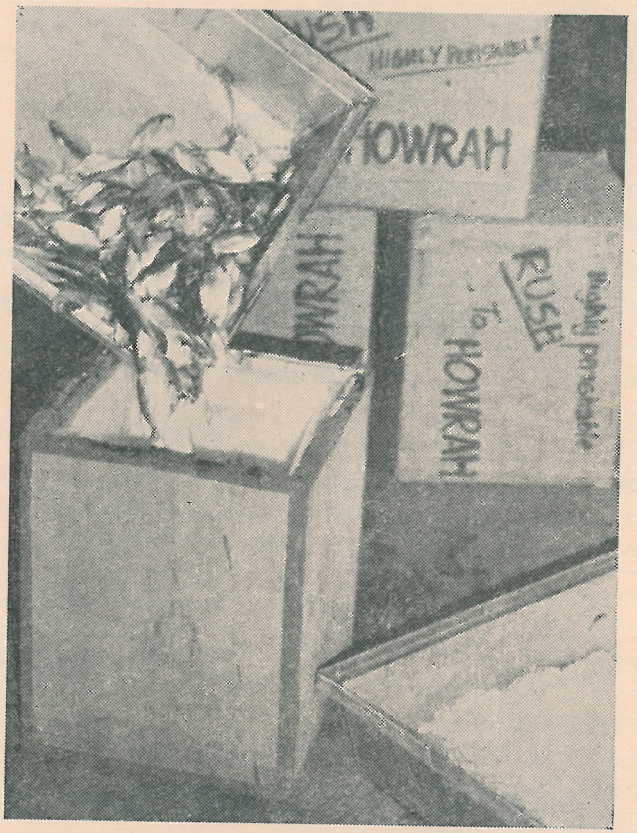
Shape	Size
Flat rectangular otter board	76.20 cm x 38.10 cm
"	88.90 cm x 44.45 cm
"	101.60 cm x 50.80 cm
"	106.68 cm x 60.96 cm
"	114.30 cm x 63.50 cm
"	139.70 cm x 63.50 cm
"	152.40 cm x 76.20 cm
"	117.80 cm x 88.90 cm

Shape	Size
Flat rectangular otter board	170.0 cm x 100.0 cm
"	190.0 cm x 101.0 cm
"	190.0 cm x 90.0 cm
"	200.0 cm x 100.0 cm
"	210.0 cm x 101.0 cm
Oval otter board	100.0 cm x 60.0 cm
"	180.0 cm x 112.5 cm
Vertical curved otter board	100.0 cm x 50.0 cm
Concave otter board	101.0 cm x 50.5 cm
'V' form otter board	190.0 cm x 120.0 cm

III. FISH PROCESSING

24. Insulated box for packing fish

Fresh iced fish, transported by the traditional containers, spoils quickly due to high rate of ice melting and considerable quantity of fish is lost by this way.



Insulated box

CIFT has developed a container which can keep fresh fish with ice in good condition for 4 days of transport. Second hand tea-chest is given a 25 mm thick thermocole insulation inside and this can be used as an efficient container for packing and transport of iced and frozen fish. The containers stand a maximum of 5 trips and an average of 3 trips in transportation involving journey of about 40 hours.

The cost of different sizes of insulated box is given below.

quickly lost by

Capacity of box	Size	Cost of fabrication
80 kg	45.5 cm × 45.5 cm × 51.0 cm	Rs. 88/-
110 kg	48.2 cm × 48.2 cm × 58.5 cm	Rs. 106/-

25. Freezing of fish and shell fish

Freezing is one of the important methods for preserving food. In our country, fish is mainly frozen for export and only a small portion of the frozen product is consumed within the country.

The Institute has developed a number of processes for freezing almost all important varieties of fish and shell fish available in the country. Some of them are freezing of sardines, crabs, lobsters, prawns, mackerel, squid, cuttle fish, clams, mussels, cat fish, seer, pomfret etc.

26. Prevention of drip loss

About 5 to 15% of the weight of prawns may be lost as the result of freezing and further thawing at the time of use. Industry is putting additional quantity of prawns at the time of freezing to compensate for the above loss. India is losing a large quantity of prawns in this way.

CIFT has developed a chemical treatment of prawns before processing which retains the original weight of prawns without any drip loss. The process involves dipping of prawns in a 16% solution of sodium tripolyphosphate and potassium dihydrogen phosphate in the ratio 3:1 which is used as the glaze water. The cost of treatment comes to Rs. 250/- per tonne.

Even though industry has been using this method profitably, it is stopped now due to the enforcement of a ban on any chemical treatment in prawns for export.

27. Humane method of cutting frog legs

The traditional method adopted by the freezing industry for obtaining the frog legs is by cutting the hind legs from live frogs with a knife without

rendering the animal insensitive to the operation. The operation has been objected to by the societies engaged in prevention of cruelty to animals as also generally by the people for ethical reasons.

CIFT has developed a simple and effective method for cutting the legs from frogs after making them insensitive to the operation. The method consists of simply putting the live frogs in 10% solution of common salt for 10 mts. to paralyse them followed by cutting the legs and washing in chlorinated water to reduce bacterial load. The additional cost involved in this process is Rs. 20/- per tonne of frog legs.

28. Freezing of frog legs

Processing of good quality frozen frog legs free of salmonella has been a serious problem to the industry in India. Salmonella are pathogenic bacteria usually found in frogs and their presence in processed frog legs is highly objectionable in the international markets.

CIFT has developed a technique for processing frog legs free of salmonella. The process involves paralysing the live frogs in salt solution, cutting the hind legs with minimum disturbance to the intestine, washing properly with chlorinated water, handling and packing hygienically etc.

29. Canning of fish & shell fish

Canning is another form of preservation of food materials. Canned fish products also form one of the items exported to other countries but because of the comparatively high cost of production, Indian canned fish products cannot, at present, compete in the international markets with similar products entering from other countries. The high cost of production is mainly due to the cost of vegetable oil used as filling medium in cans and the cost of cans.

CIFT has developed processes for production of quality canned products like canned sardine, frog legs, clam meat, mussel meat etc. using cheap brine medium instead of the costly oil. It has evolved processes for canning different varieties of fish in tomato sauce and sardine in its own juice (as natural pack). Methods have been developed for canning almost all varieties of fish and shell fish in different media and forms. Canned mackerel, seer fish, tuna, prawns, crab meat, pomfrets, hilsa and anchoviella are some of them to be mentioned.

30. Prevention of black/blue discoloration in canned prawns and crab meat

Prawn/crab meat canning industry in India is entirely export-oriented. Black or blue discoloration is a common defect noticed in canned prawns/crab

meat. The canned products affected by blackening are rejected on inspection leading to heavy loss to the canning industry.

Diversified canned fish products

CIFT has developed process for processing canned prawn/crab meat avoiding black discoloration. The process involves treatment of the meat with ethylene di-amine tetra acetic acid (EDTA) which is added in the fill brine in appropriate quantity depending on the quantity and type of the material. The cost of treatment with EDTA comes to Rs. 25/- per 1000 cans of 128 gm. pack.

31. Chlorine level indicator paper

In fish processing plant, chlorination of water is normally practised to reduce the bacterial contamination, for which sodium hypochlorite is used. The concentration of chlorine in sodium hypochlorite varies with different types

of sample. As a result, the concentration of sodium hypochlorite required for chlorinating known volumes of water also varies with the sample.

The CIFT has developed a chlorine level indicator paper which gives instant reading and at the same time is very cheap, costing just 2 ps. per test. In this new simple method, one drop of the water to be tested is placed on a small piece of the test paper. The colour developed is immediately compared with the colour chart on the front cover of each indicator book and the chlorine concentration read as ppm.

32. New deodorant for fish processing industry

In order to mask the foul odour emanating from processing plants, a deodorant consisting of pine oil and a detergent has been developed. The new deodorant can be used in washing the floor of the processing hall and can be sprayed in factory premises, fish landing and handling places etc. to remove the undesirable fish odours.

The new formulation is easy to prepare and is very economical. The cost of production comes to Rs. 1/- per litre.

33. Anti septic ointment for use by prawn handlers

Constant contact with prawns, water and ice produces certain lesions/ eruptions on the palms of workers engaged in prawn peeling. On contact with soap and chlorine, such eruptions develop burning sensation and workers suffering from such skin lesions hesitate to keep their hands clean by washing and disinfection. Contact with unclean hands will result in substandard processed products. The CIFT has developed an effective antiseptic ointment to heal such skin lesions and thereby avoid contamination of processed products. The main constituents of the ointment are benzoic acid, salicylic acid, potash alum, coconut oil and white soft paraffin. Cost of ointment comes to Rs. 40/- per kg.

34. Improved method of fish curing

The present method of fish curing is most unscientific. The fish after salting is sun dried on the open beach or ground by which process it gets contaminated with a lot of sand and mud. Fish cured in this way often shows contamination with red halophyllic bacteria and fungus and these products cannot be stored for more than two months.

The CIFT has standardised a method for preparing good quality cured fish. In this improved method, the fish, after proper evisceration and cleaning, is

salted in specified way and kept in clean cement containers for about 24 hrs. The salted fish is then dried on clean drying platform to the required moisture level. The dried fish is then sprinkled with 0.1% calcium propionate and packed in suitable lots in polythene bags for retail marketing and in polythene lined plywood boxes or gunny bags for bulk storage. Use of calcium propionate extends the shelf life of the product to 8-10 months compared to 1-2 months by the traditional method. The cost of calcium propionate treatment comes to Rs. 30/- per tonne.

35. Laminated Bombay duck

Commercially dried Bombay duck is very poor in quality and is usually consumed by economically poor people. CIFT has developed a process to prepare laminated Bombay duck. The fresh fish, after surface drying and removal of head, tail, fins etc. is split open and dried. The dried material is pressed through a roller press, sides trimmed and further dried to about 10% moisture level followed by packing in polythene bags. Laminated Bombay duck can be stored for at least one season. This product is likely to have good demand in foreign markets. Cost of laminated Bombay duck comes to Rs. 30/-per kg. The product can be fried in oil and consumed.

36. Dehydrated Jelly fish

Jelly fish is a marine species highly abundant in the east and west coasts of India. It has hitherto been unutilized although some of the species are said to be edible. The CIFT has now worked out a suitable method for processing jelly fish. As it is highly susceptible to spoilage under tropical conditions, it has to be processed immediately after catch or kept for a short period in iced condition.

In the process developed, the umbrella portion alone is taken, trimmed, washed well, cleaned and then treated in four solutions of salt and alum of different concentrations and drained till the moisture content is reduced to less than 60%. It is then graded, packed and stored in chilled condition at around 0°C. Cost of production of dehydrated jelly fish comes to Rs. 20/- per kg.

37. Processing of mussel meat

Mussels *[Perna viridis]* are bivalves abundantly available along the west coast as well as the east coast of India. Mussel meat has been consumed in fresh condition and there has been no method available for its proper processing and storing for future use. CIFT has developed methods for hygienic preparation and utilisation of mussel meat.

a) PREPARATION OF MUSSEL MEAT :

Fresh mussels collected are kept in sand free sea water for about 24 hrs to remove sand from their intestines followed by keeping in sea water containing 5 ppm available chlorine for 2 hrs. After proper cleaning, the meat is shucked either in the live condition itself or by heating in open vessels for about 15 mts. The shucked meat is further washed in chlorinated water and packed.

b) DRIED MUSSEL MEAT :

One of the cheap methods of storing processed mussel meat for future use is drying. The meat shucked from the shell as described above is blanched in boiling brine and then dried followed by packing in suitable containers. Cost of dried mussel meat comes to Rs. 18/- per kg.

c) SMOKED MUSSEL MEAT :

Smoking is another cheap and effective method of preserving mussel meat. The shucked meat is partially dried and smoked followed by further drying. The product obtained is very delicious.

Cost of smoked mussel meat comes to Rs. 19/- per Kg. approximately.

38. Smoked fish products

Smoke curing of fish has got great scope in our country with respect to internal as well as external markets. Smoked fish and shell fish products are delicacies and much relished in foreign countries. Moreover, the process smoking would lead to better utilisation of economically underutilised fishes like sole, cat fish, shark etc.

CIFT has developed methods for preparing smoked products from different varieties of fish which are at present fetching low prices. The dressed fish, whole or as fillets, are dipped in brine, dried partially, smoked in a smoke kiln and dried further to the required moisture level. Approximate cost of production of some important varieties are given below.

1.	Smoked sardine	:	Rs. 2,500/- per tonne
2.	Smoked mackerel	:	Rs. 6,500/- per tonne
3.	Smoked shark	:	Rs. 5,000/- per tonne
4.	Smoked eel fillets	:	Rs. 6,000/- per tonne
5.	Smoked cat fish	:	Rs. 4,000/- per tonne
6.	Smoked sole	:	Rs. 4,000/- per tonne

39. Improved method of preparation of 'masmin'

'Masmin' is a traditional fish product of Lakshadweep prepared from tuna fish which is an abundant catch of this island. Masmin is crude and poor in quality fetching a very low price. Improvement in quality of this product is sure to get a better price leading to the improvement of the island's economy.

CIFT has developed an improved method for preparing masmin. The fillets from tuna are cut into steaks, brined, steamed, partially dried, smoked and finally dried followed by packing. The cost of masmin prepared by the improved method comes to Rs. 18/- per kg.

40. Prevention of insect infestation in masmin

The major problem confronting the storage of masmin, the traditional fishery product of Lakshadweep, is insect infestation.

A simple process of treatment for the prevention of insect infestation has been developed by CIFT. The method consists of keeping the freshly prepared product at 125°C for 15 minutes followed by hermetically sealing to prevent further attack by insects. The heat treatment destroys the eggs and larvae of the insects which are found to grow and multiply otherwise. The cost of of treatment comes to Rs. 150/- per tonne of the material. This amount is quite negligible compared to the huge loss of masmin affected by insects.

41. Fish hydrolysate

Fish hydrolysate is a solubilized fish protein produced by proteolytic enzymatic methods.

The comminuted whole fish is mixed with water, steam sterilised and cooled. This material is hydrolysed with papain after adjusting the pH. The hydrolysed material is filtered through a filter press and the clear filtrate collected, concentrated and dried under vacuum. The yellowish brown powder obtained, being highly hygroscopic, is kept in air tight containers.

For consumption, it is mixed with malt, sugar and other ingredients and used as a drink. The cost of production comes to Rs. 40/- per kg.

42. Fish wafers

This is a protein rich food product prepared from miscellaneous fish. It is prepared out of fish meat, starch powder, salt etc. The cooked and processed meat is first homogenized with water. To this, corn flour, tapioca starch and

salt are added and the whole mass blended for about an hour. The homogeni slurry is then spread uniformly in trays in layers of 3-4 mm. thickness a

Fish wafers- before and after frying

cooked in steam. The cooked material is then cooled and the layers cut int desired shapes and dried. The dried wafers are then packed in polythene bags glass bottles.

The product contains 15-20% protein. For consumption, it is fried i oil and used as a side dish. Cost of production is approximately Rs. 18/-per kg

43. Fish soup powder

This is yet another type of protein rich food formulated by CIFT. Cooked fish meat, cut into small pieces, is mixed with fried onion and other ingredients

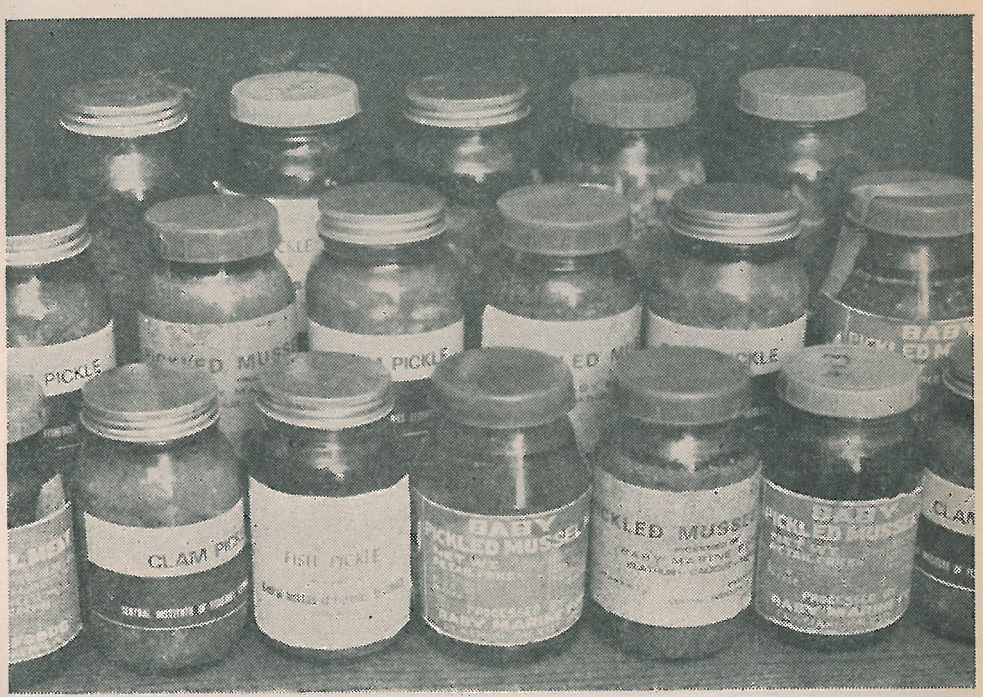
and ground thoroughly till it becomes a fine paste. The pasty mass is spread in trays, dried and powdered. The fine powder is mixed thoroughly with the required quantity of milk powder and stored in bottles or laminated paper bags. The product is a rich source of animal protein and other nutrients and stores well for 16-18 months at room temperature.

For consumption, one part of the powder is boiled in 20 parts of water for five minutes. Cost of production of the soup powder comes to Rs. 23/- per kg.

44. Pickles from fish and shell fish

Fish pickles have got wide acceptance in the internal markets. They are likely to get regular foreign markets particularly in Gulf countries.

The meat from fish/shell fish is prepared as per specific methods, mixed with salt, kept aside for some time, fried and mixed with lightly fried chilly powder, turmeric, mustard seed, garlic and ginger. Boiled and cooled water



Pickles from fish and bivalves

is added. Sugar and salt are then added to taste and the product cooled and stored in bottles. The product prepared by this method keeps well for 8-10 months compared to 2-3 months of the conventional product. Pickles can be prepared from fish, prawns, mussel meat, clam meat etc.

The cost of pickle per bottle of 360 gm. capacity comes to Rs. 6/- to Rs. 10/- depending on the species of fish.

45. Extraction of shark fin rays

Shark fin rays are valuable products of export from India. Formerly, only shark fins were being exported. But now even fin rays are exported. CIFT has developed a technique for extracting rays from shark fins.

The dried fins are soaked in acidic water for sufficient time to get the muscle and skin softened. The fins are then treated with acetic acid, the skin

Rays being extracted from shark fins

scraped off and the fins further treated with the acid when separation of the rays in clusters becomes easy. The rays are then dried and packed in polythene bags.

The rays are utilised in the preparation of soup. There is good internal demand also for shark fin rays especially in major hotels. Cost of production of shark fin rays is approximately Rs. 800/-per kg.

46. Shrimp extract from prawn waste

In India, tonnes of prawn wastes are now being thrown away or used for converting into manure. The high percentage of protein present in the waste can be isolated for human consumption or for feeding animals.

The CIFT has developed a process by which the waste can be converted into a protein rich product. The fresh prawn head and shell waste is minced after thorough washing, boiled with sodium hydroxide, the boiled mass filtered and the filtrate neutralised with hydrochloric acid and acetic acid. The neutralised filtrate is then concentrated to obtain a semi solid mass. The product is then either canned or packed in polythene bags and frozen. Approximate cost of production is Rs. 15/- per kg.

47. Chitin in poultry diet

Use of chitin for the production of glucosamine hydrochloride which finds application in antibiotics and baby food formulations is already known. CIFT has developed process for preparation of chitin from prawn shell waste and formulated a diet incorporating chitin for broiler chicks. The diet with chitin was found to improve the feed efficiency resulting in about 10-12% weight gain in the birds compared to a chitin free diet. Cost of production of chitin comes to Rs. 40/- kg.

48. Chitosan from prawn shell wastes

More than 50,000 tonnes of prawn shell wastes are available from the prawn processing factories in India. This is not properly utilised at present.

CIFT has developed a process for production of chitosan from prawn shell waste. Chitosan is a valuable chemical substance. The process involves specific treatment of the prawn shell waste for removal of protein and mineral contents and isolation of chitosan.

Chitosan can be used as sizing material for textiles. It can be used as a water clarifying agent and also in the preparation of cosmetics, pharmaceuticals etc. Cost of production of chitosan is worked out to be Rs. 60/- per kg.

49. Fish ensilage

A practical, easy and economic way of making up the nutritional deficiency in cattle feed is to incorporate suitable amount of fish protein in a proper acceptable form into the feed. The CIFT has developed two methods of preparation of fish ensilage which is a form of fish protein.

a) In the first method, any non-oily trash fish is minced, formic acid added to it and mixed well and kept covered for some time till the whole mass becomes a homogeneous slurry. The acid stops the spoilage of fish and causes break down of the bones and flesh into a slurry. The product, the ensilage, is kept in stoppered containers.

b) In the second method, 10% by weight of molasses is added to the minced fish, the material made into a slurry by adding water and the whole mass cooked and then cooled to room temperature. A pure culture of *Lactobacillus plantarium* - NCIE 6105-is next added to the mass, stirred well and fermentation allowed to proceed. The product obtained after fermentation is fish ensilage. Preservation here is effected by the lactic acid formed during the process.

Cost of the ensilage comes to approximately Rs. 5/- per kg.

50. Fish feed

Formulations have been developed for preparation of fish feed incorporating miscellaneous fish and fishery wastes like prawn shell and squilla, ground nut cake, ground nut oil, starch and salt mixture in specified proportions.

The cost of the feed comes to Rs. 4/- per kg.

51. Poultry feed

Poultry feed is important for nourishment of poultry. The feed is prepared by incorporating prawn shell powder, fish meal, tapioca powder, rice bran and molasses in a specified proportion.

Compositions have been worked out at CIFT for the preparation of starter, breeder and concentrate feeds. Cost of poultry feed comes to Rs. 3/- per kg.

52. Lime from mussel shell waste

CIFT has already developed methods for utilisation of mussel meat. No method has been developed to utilise the mussel shells which are available in plenty but thrown away as waste.

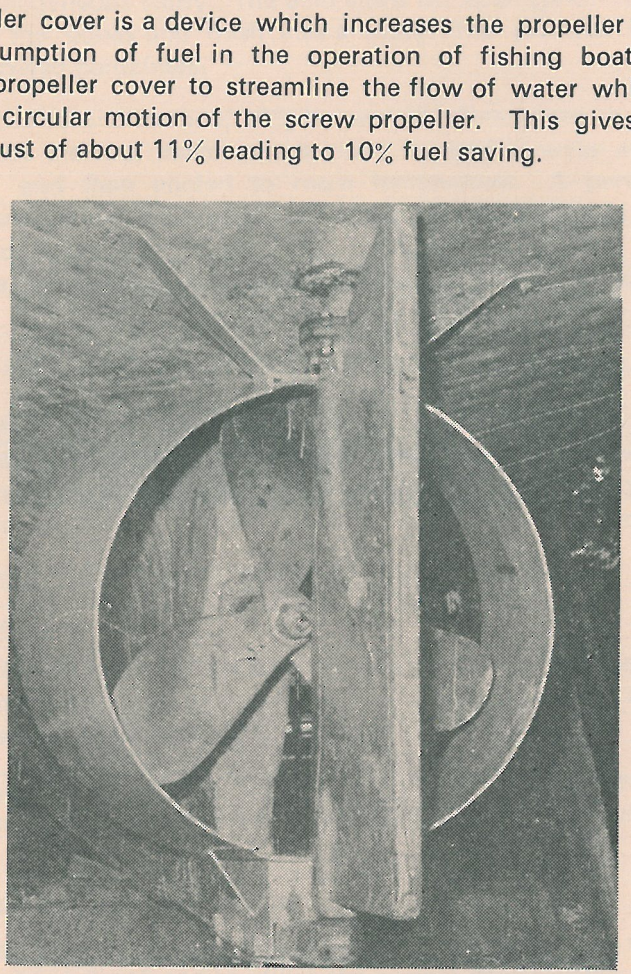
A simple process has been developed by CIFT for converting mussel shells into lime. Well cleaned shell and charcoal are mixed and ignited in a furnace followed by cooling to get lime. The yield is about 80% and the material contains 100% CaO.

At present only clam shell is used for production of lime. Mussel shell also gives equally good lime. Cost of production of quick lime from mussel shell is Rs. 500/- per tonne.

IV. FISHERY ENGINEERING

53. Propeller cover for fuel saving

Propeller cover is a device which increases the propeller thrust leading to less consumption of fuel in the operation of fishing boats. CIFT has developed a propeller cover to streamline the flow of water which is pushed away by the circular motion of the screw propeller. This gives an effective additional thrust of about 11% leading to 10% fuel saving.

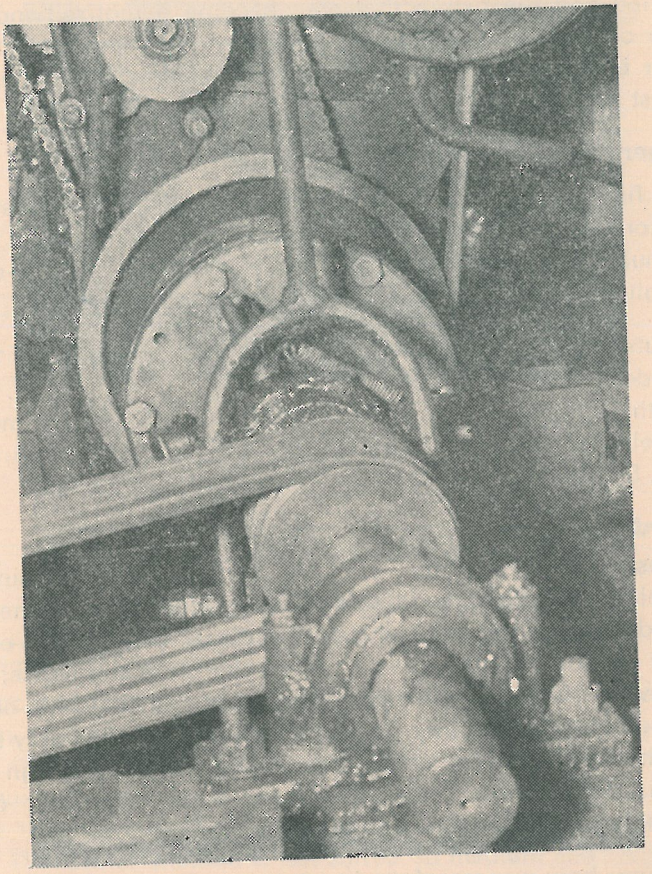


Propeller cover

The cost of a propeller cover suitable for 9.75 m fishing boat comes to Rs. 5,000/-.

54. Power-take-off clutch

Power-take-off clutch in fishing boats serves to transmit power from main engine to drive fishing equipments like trawl winch, gurdy etc. on the deck. In view of the introduction of deep sea trawlers, there is ample scope for manufacture of clutches for operation in vessels in the range of 16.75m to 30.5m. Cost of fabrication of a clutch suitable for 9.75 m fishing boat comes to Rs. 20,000/-



Power-take-off clutch

The commercial exploitation of this equipment has been taken up by the National Research Development Corporation, New Delhi.

55. Electric impulse generator for fishing

Electrical fishing is a new method for commercial catching of fish. It is found that electrical trawling can increase the fish catch up to 30% compared to ordinary trawling. Since sea water is about 500 times more conductive than fresh water it is not economically possible to use Alternating or Direct Current for electrical fishing. Impulse current has to be used for this purpose.

CIFT has developed an impulse generator which can produce varying impulses suitable for electrical fishing. With its use, a certain area of sea water gets electrified and the fish in that area become narcotized and float so that they can be caught easily. The generator can also be used for producing impulses for electrical fishing in fresh water to eradicate unwanted species of fish. Cost of an impulse generator comes to Rs. 25,000/-

56. Refrigerated sea water plant

Fresh fish is usually preserved in ice or refrigerated sea water (RSW) for temporary storage. Storage in RSW has the added advantage that fish can be cooled much more rapidly and efficiently and more quantity can be stored in a given volume of the container compared to ice storage.

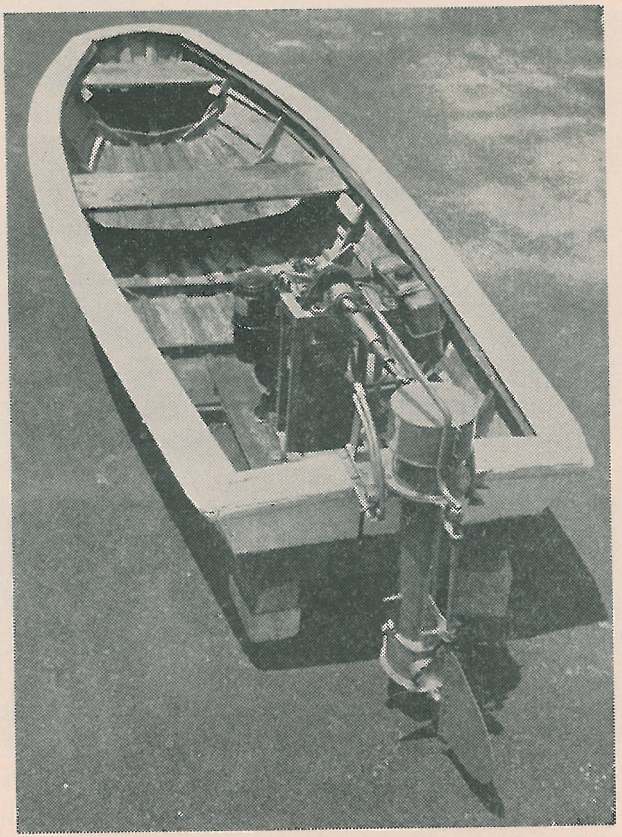
Institute has developed a RSW plant with capacity of 150 Kg. The plant is made of 18 guage stainless steel and 16 guage M. S. sheet and insulated with 100 mm thick thermocole. This can be used in medium size of fishing vessels for storage of fresh fish. Cost of fabrication of the plant comes to Rs. 50,000/-.

57. Inboard/out board drive

At present, small country craft are mechanised using out board drive with light weight petrol engine fitted above the drive. Due to the high cost of petrol, such drives are not economical. As diesel engines are comparatively heavier, they cannot be fitted directly above the drive and hence, an inboard/ out board drive with engine on board the vessel and the drive out board has been developed and successfully operated. As the device is very simple it can be fitted to the small country craft without modifying the design of the craft. The device is suitable for small row boats also. The cost of the drive (excluding engine) comes to Rs. 3,000/-.

This know-how was transferred to entrepreneurs through NRDC and now

diesel out board motors have come to the field which are very economical. The cost of such a unit comes to about Rs. 15,000/-.

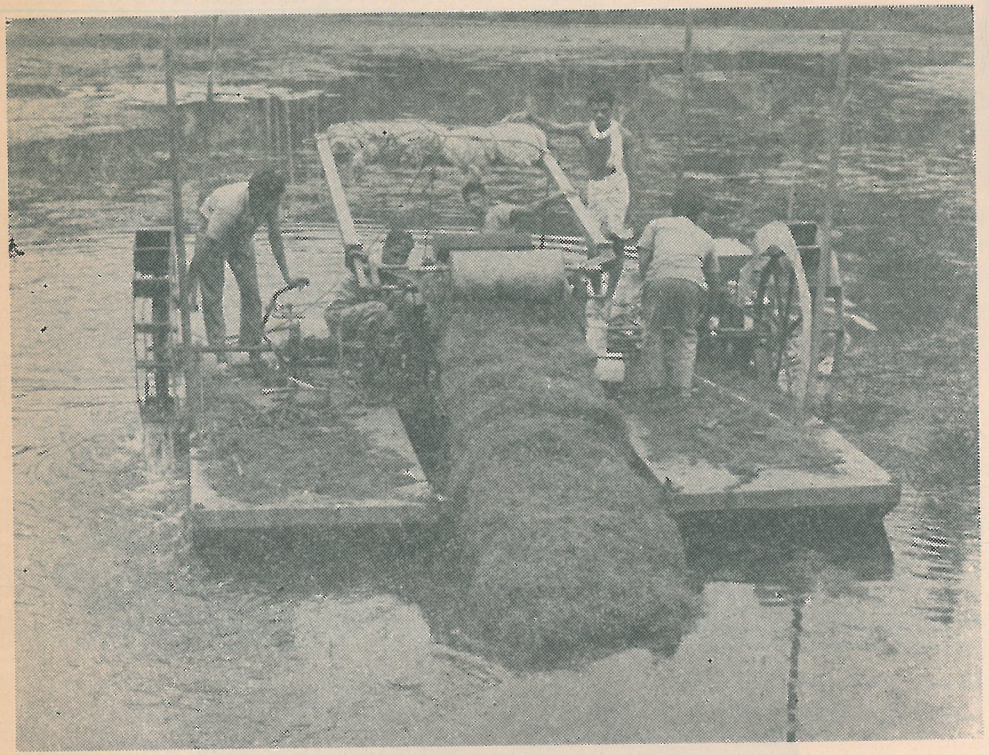


Out board drive fitted to a row boat

58. Aquatic weed harvester

Aquatic weeds pose a serious problem to fisheries, navigation, agriculture and irrigation by their uncontrolled growth. Thousands of hectares of inland water areas like bheels, tanks, lakes, ponds etc. are depleted of essential nutrients required for the growth of fish because of this problem. The existing methods are to clear weeds either by manual labour or by the application of chemicals. The former method is not suited to medium and large water areas while the latter method causes pollution of the aquatic resources.

CIFT has developed a machine which can mechanically remove weeds, both floating as well as submerged, without any of the above disadvantages.



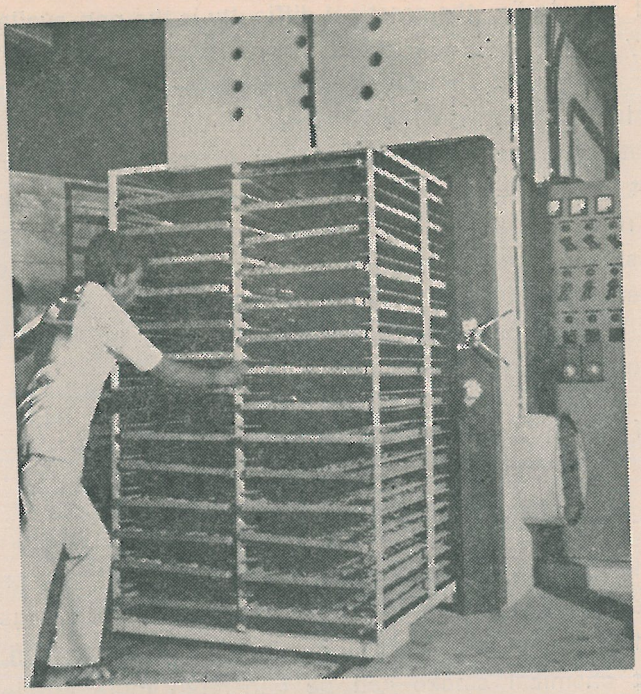
Aquatic weed harvester

This equipment has been taken up by the National Research Development Corporation, New Delhi for commercial exploitation. The cost is about Rs. 3.5 lakhs.

59. Tunnel dryer

Traditional method of drying fish in India is sun drying. Sun drying requires more time and sun dried products are unhygienic and of low quality. During rainy seasons drying is very difficult.

To avoid all these problems, CIFT has developed an artificial dryer of one tonne raw material capacity. The dryer consists of a long concrete tunnel divided into upper and lower chambers. The electric heaters, blower and



Tunnel dryer

other controlling instruments are installed in the upper chamber and trolleys with trays are kept in the lower chamber. The drying time is normally 8 to 14 hrs in the tunnel dryer while sun drying takes 2 to 3 days for satisfactory drying. The cost of construction comes to Rs. 1.5 lakhs.

A modified tunnel dryer with fibre glass has been designed and developed. In this case, the body of the dryer is fabricated with M. S. frame with fibre glass inner walls and outside walls with GI sheet with fibre glass resin bonded slabs for insulation in between. As the body is made of four pieces, it is easy for transportation, installation and dismantling. This dryer is comparatively light and gives uniform air distribution. The approximate cost for a dryer is Rs. 1.5 lakhs.

60. Rotary drum dryer

Production of fish meal from miscellaneous fish and fish wastes is an important part of fishery industry in India. Even though big fish meal plants

are imported into India, the practical difficulty is the non-availability of sufficient quantity of raw materials to run such plants. Collection and transportation of raw material from one centre to another also adds to the cost of production. In this context CIFT has developed a small fish meal plant of 1/2 tonne raw material capacity all with indigenous components. The advantage of this plant is that even in a small fishing village, raw material may be available to run such a plant economically. This dryer can also be used for drying prawns. The dryer consists of a double jacketed vessel with the outer and inner shell made of mild steel plate and provided with a steam jacket and motor. The motor is coupled with a suitable gear box to obtain the required r.p.m.

Cost of the dryer comes to approximately Rs. 75,000/-

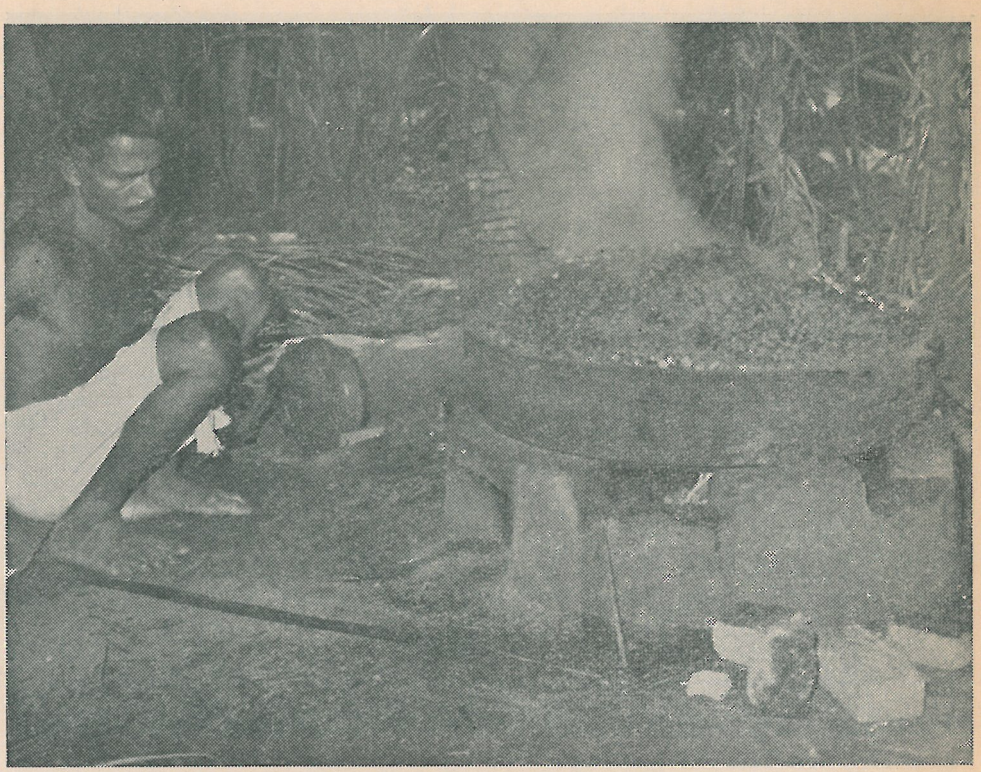
61. Electro-thermal smoke kiln

Smoking of fish has been an accepted method of fish preservation all over the world. In India too, this method of processing fish is gaining importance. The Institute has developed an electro-thermal smoke kiln based on the principle that chemical smoke can be generated more efficiently without burning wood in presence of oxygen. The smoke generated in an electrically heated furnace is controlled by regulating the furnace temperature.

The advantages of this equipment over the conventional type are (1) no loss of valuable wood chemicals during burning, (2) no deposit of soot or flying ash on the fish, (3) same kiln can be used for both hot and cold smoking of fish and (4) less consumption of time and fuel.

62. Modern hearth for boiling clams/mussels

CIFT has designed and developed a cheap and effective hearth for boiling clams. The fishermen engaged in clam fishery used to boil clams by the use of open hearth burning large quantity of fire wood as fuel thus increasing the cost of processing. The new hearth is an enclosed type of oven fitted with blower using paddy husk and saw dust as fuel. This requires less fuel and less time for boiling clams saving about Rs. 5/- to 6/- per day in the fuel cost



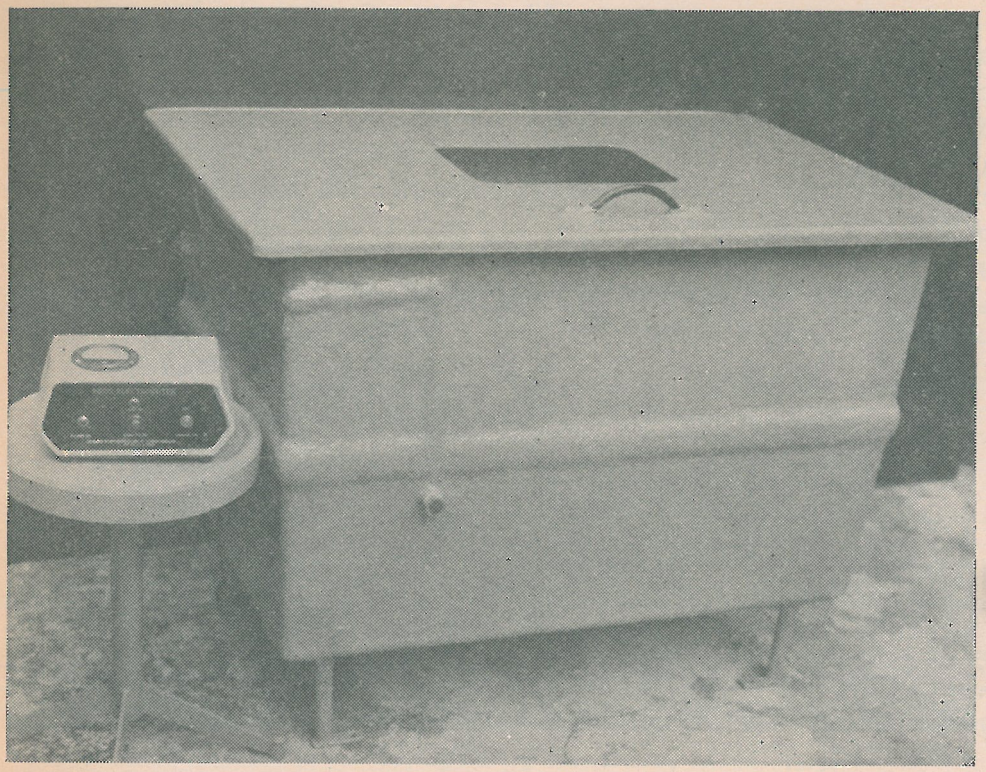
Modern hearth

alone. The cost of fabrication of the new hearth is about Rs. 300/-. This can be used for cooking/boiling mussels and other items also.

63. Electric apparatus for painless killing of frogs

The existing methods of cutting the legs from live frogs prior to frog leg processing are rather inhuman causing pain and suffering to the frogs. A humane method for cutting the legs has already been developed at the Institute which involves dipping the frogs in 10% brine for 10 minutes before butchering.

A commercial type of electric device for killing the frogs using electric shock has now been developed based on the design evolved by the College of



Electric apparatus for stunning frogs

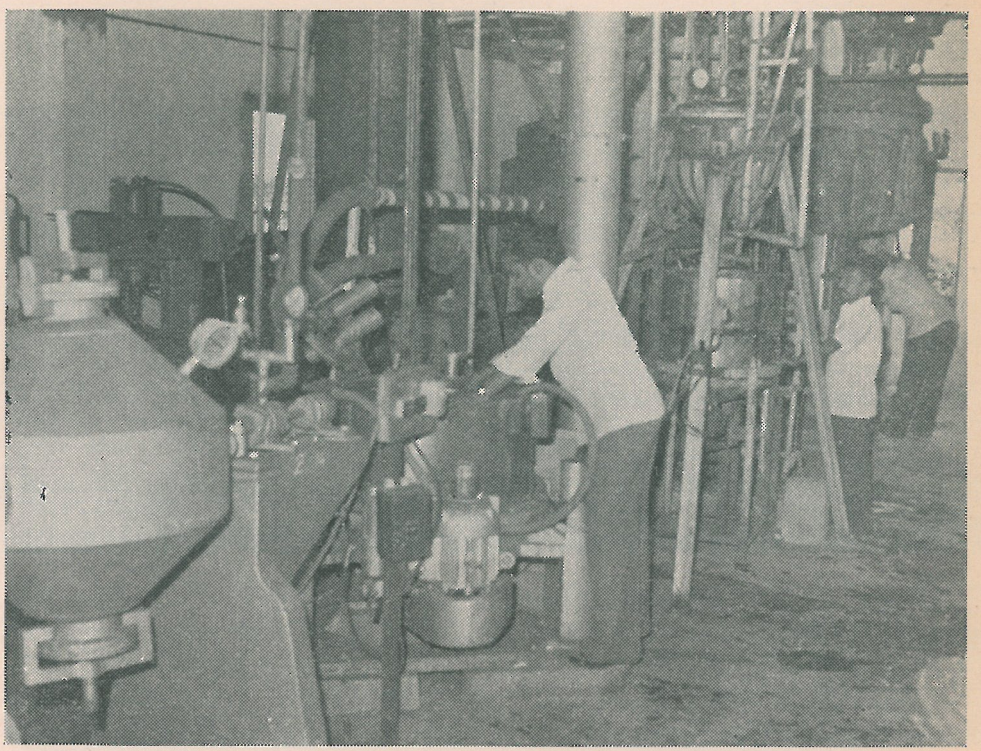
Fisheries, Mangalore. The apparatus developed has a capacity to stun 500 frogs at a time. The stunning time has been standardised at 3 minutes. The apparatus costs approximately Rs. 4,000/-

64. Chitosan plant

CIFT has developed a process for preparing chitosan from prawn shell waste. At present, no machinery is available in the market for producing this item. The Institute has designed and developed a small plant for production of 30 Kg. chitosan per day. It consists of a reaction vessel, bucket elevator, basket centrifuge, demineraliser, deacetylator, washing tank, evaporator, dryer

and pulveriser." It has to be got fabricated as per the Institute's design by any competent engineering firm.

The process of production of chitosan selected for the pilot plant is a semi-continuous one in that the flow of the materials is arranged mechanically



Chitosan plant

and all the equipments are operated simultaneously. This effects considerable saving in the processing time and ensures production of maximum quantity of finished product in a given time.

Cost of construction of the plant comes to Rs. 1 lakh.

V. ELECTRONIC INSTRUMENTS

65. Portable instruments for field operation

These are instruments for use in field studies and to be carried from place to place conveniently. They are designed with self contained power supply and for easy operation. They are available for measurement of water salinity, water turbidity, sedimentation, water current, current direction, watef depth, water density, warp load, boat speed, under water tension, angle of attack of otter board, tilt of otter board, sideways tilt of otter board, mesh shape or net, catch in net, flow inside net, bollard pull of marine engines etc.

Following are a few instruments developed under this category.

a. BATHY THERMOMETER : This instrument is used for the measurement of temperature and depth of ocean.

b. SALINITY TEMPERATURE DEPTH METER : This is used for measurement of salinity and temperature of ocean and estuarine waters.

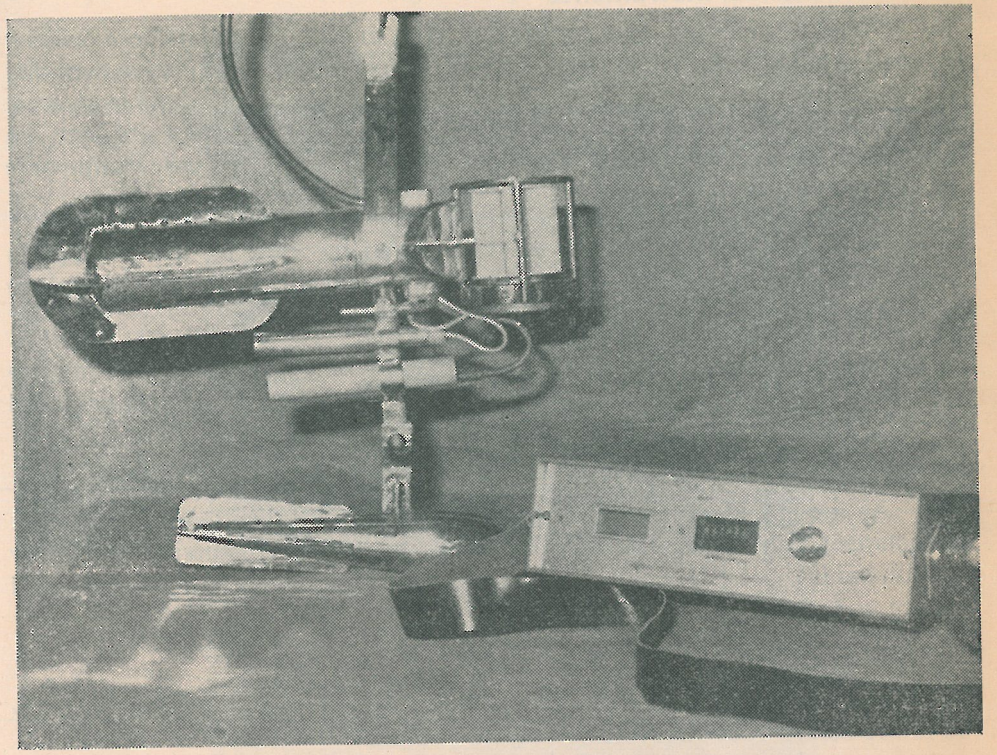
c. WARP LOAD METER : The instrument is used for the measurement of warp load of fishing trawlers.

d. TRAWL DEPTH METER : This instrument is used to measure the depth of operation of under water trawl net.

e. BOLLARD PULL METER : This is used for testing the bollard pull of marine engines.

f. OCEAN CURRENT METER : This instrument is used for measuring water current and direction in the ocean and estuarine waters.

g. OCEAN TELE-LAB : This is an instrument used for the measurement of current, current direction, salinity, temperature, and depth of ocean waters simultaneously using a single sensing probe. The cost of the Instrument comes to Rs 38,000/-.



Ocean Tele-Lab

66. Instruments for continuous monitoring

Some of the environmental and operational parameters need continuous monitoring and CIFT has designed instruments for continuous operation with facilities for data recording, data storage and automatic operation as option. The data monitored by them include water waves, temperature of cold storage, water temperature, relative humidity, solar radiation, wind direction, atmospheric pressure, soil moisture, soil temperature etc. The following are the important instruments developed under this category.

a. TIDE AND WAVE TELEMETERING SYSTEM : This can be used for continuous monitoring of tidal changes and wave profiles of coastal waters.

b. TEMPERATURE MONITOR : This instrument is used for measuring temperature of cold storages, culture ponds etc.

67. Multichannel instruments

These instruments display various data in a single meter from several remote operated points. Temperature of different cold storages, relative humidity from different points of a test site, solar radiation from several points in an area, water current from several points of a water distribution system etc. can be monitored by these instruments. Following are some of the instruments developed under this category.

a. THE FREEZER TEMPERATURE MONITOR AND ALARM: This instrument can be used for monitoring the temperature of several points inside and around the cold storage along with alarm.

b. THERMOHYGROMETER : This is used to monitor temperature and relative humidity of several points in open and enclosed places.

68. Data acquisition systems

An integrated system design has been made for acquisition of 18 different environmental data from remote sites needed for marine, estuarine and other environmental based applications. There are three different designs perfected for use under different occasions.

MODEL A:

This can be used at test site with all remote operated transducers connected to the central receiver system.

MODEL B:

This type is meant for acquisition of data from a remote test site with a 3-core data link up to 500 m length.

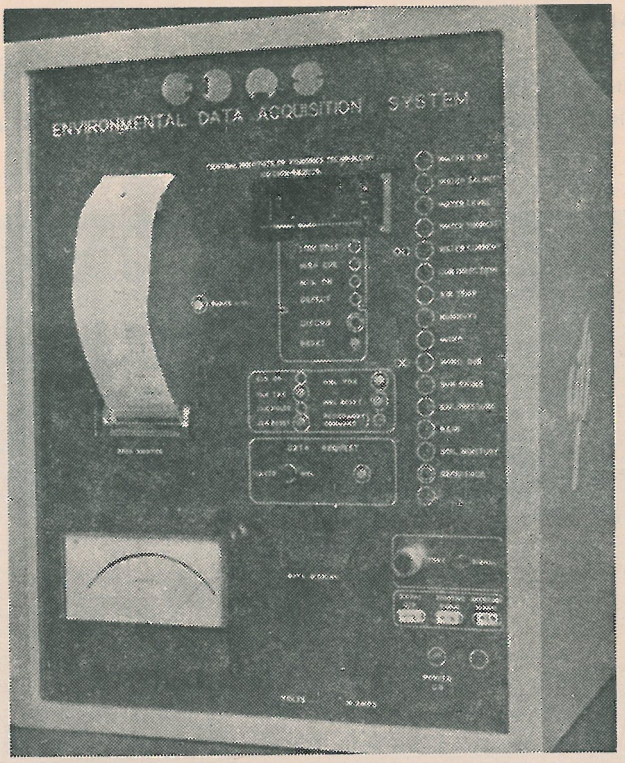
MODEL C:

There are manual types as well as automatic types incorporating data storage and programme facilities. These systems are available for acquisition of environmental data for different fields namely aqua-culture studies, fishery ecological studies, oceanography, agricultural meteriology, port and harbour survey etc.

A few specific instruments under this category developed at CIFT are given below.

a. ENVIRONMENTAL DATA ACQUISITION SYSTEM

This instrument can be used for the general use in coastal and inshore waters for monitoring 16 aquatic and meteriological parameters



Environmental data acquisition system

as already described above with facilities for automatic operation, printing and recording data at programmed intervals. The cost of fabrication is about Rs.70,000/-.

b. AQUATIC DATA LOGGER

This is designed specifically for the application connected with aqua-culture studies by monitoring the relevant parameters namely water

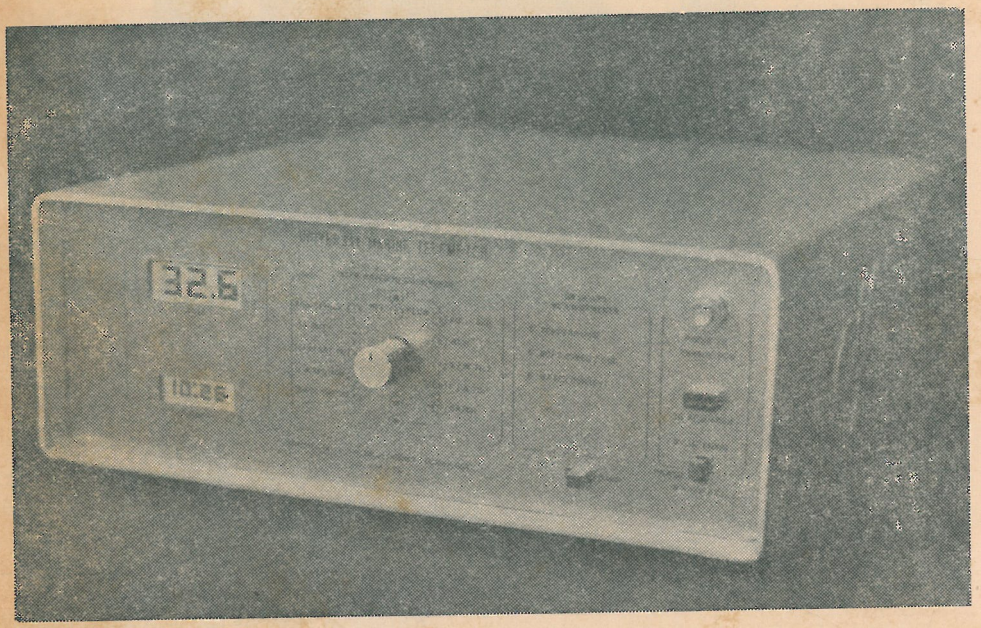
salinity, water temperature, water flow, turbidity, sedimentation, solar radiation, under water and other meteriological parameters.

c. MICROMET DATA LOGGER

The instrument is used for monitoring environmental parameters relevant to micrometeriological studies namely relative humidity, air temperature, solar radiation, wind, rain, soil moisture, soil temperature etc.

d. UNIVERSAL MARINE TELEMETER

This is designed for the performance evaluation of trawl system by simultaneous monitoring of 15 under water and environmental parameters namely, trawl depth, under water tension, mesh shape, catch in net, mouth opening, sideways tilt of otter board, fore and aft tilt of



Universal marine telemeter

otter board, angle of attack of otter board, flow inside net, temperature at trawl depth, salinity at trawl depth, solar radiation at trawl depth, boat speed, warp load and water current. The cost of fabrication of the instrument comes to Rs.35,000/-.

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