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THE MARINE FISHERIES INFORMATION SERVICE: Technical and Extension Series envisages the rapid dissemination of information on marine and brackish water fishery resources and allied data available with the Fishery Data Centre and the Research Divisions of the Institute, results of proven researches for transfer of technology to the fish farmers and industry and of other relevant information needed for Research and Development efforts in the marine fisheries sector.

Abbreviation - *Mar. Fish. Infor. Serv. T & E Ser., No.* 26: 1980

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Cover photo: Oyster racks with the stock of oysters in the farm, exposed during low tide.

OYSTER FARMING*

Introduction

Large quantities of the edible oyster, *Crassostrea madrasensis* (Fig. 1) growing wildly in most of the tidal creeks and estuarine regions along the east coast of India are allowed to perish unexploited. The shell lime industry, however, quarry agglutinated dead shells from rugged beds and those found as subfossil deposits in river beds. Realising the edibility of the oyster meat, Hornell initiated oyster culture experiments as early as in 1910 at Pulicat lake. For some unaccountable reasons this was not followed up by later workers. As a part of global strategy for developing oyster farming following the great strides made in this venture by developed nations, the Central Marine Fisheries Research Institute focussed its attention in developing systems for the culture of edible bivalves, identifying edible oyster farming and mussel farming as priority areas for Research and Development. Evaluation of the resources potential, identification of suitable water spread and areas for culture, evolving proper techniques to collect required seed for farming, introducing an appropriate method of farming and establishing a model farm formed the broad objectives of the project initiated in 1975 on edible oyster culture.

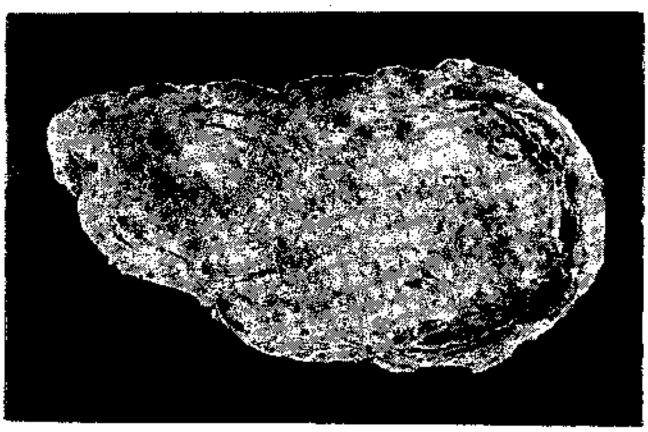


Fig. 1 View of the oyster *Crassostrea madrasensis*

The existence of considerable expanse of natural beds in several of the tidal inlets (Fig. 2) and the presence of shallow bay area in the vicinity of Tuticorin facilitated oyster farming experiments to be started at Tuticorin. Regular sampling of the oysters in the beds showed a biannual spawning habit with a peak spawning period in April-May and the water quality in the area exhibited favourable factors for healthy oyster growth. By employing suitable method for spat collection and providing better growing conditions for the seed so collected it appeared distinctly possible to raise large number of oysters achieving faster growth rate and better meat yield. Weighing the pros and cons of the different systems of oyster culture followed in other countries and bearing in mind the local conditions, it was decided to experiment with the 'rack' system of culture. By this system oysters kept on a wooden

Fig. 2 Natural bed of oyster

platform above the bottom but below the water surface will receive maximum quantity of water filtration and feeding promoting physiological efficiency towards fast growth and flesh weight increment.

Spat collection

Of the several types of spat collectors like bamboo reapers, concrete blocks, nylon meshed net pieces, bamboo

Fig. 3 Lime quoted tiles used for spat collection

*Prepared by S. Mahadevan, K. Nagappan Nayar and P. Muthiah, Tuticorin Research Centre of CMFRI.

Table 1: *Details of spat collection in* 1978 *and* 1979.

	No. of tiles	Minimum No. of Spat/tile	Maximum No. of Spat/tile	Average/ tile	Area of collection
April–May 1978	27,000	5	64	24	Karapad creek beds
September–October 1978	30,000	—	—	—	–do–
April–May 1979	18,000	11	97	33.5	Tuticorin bay near creek
	10,000	1	21	10.8	Creek proper
	20,000	1	16	8.7	Near natural beds
September–October 1979	20,000	—	5	5.0	Tuticorin Bay

mats, strings of coconut shells, rens of green mussel and oyster shell valves, country tiles (with and without lime coating) tried in different locations around the bed, the most satisfactory results were obtained from twice lime-coated semicylindrical country tiles (Fig. 3) laid completely submerged on wooden platforms. Determining accurately the spawning period of oysters and laying tiles just at the right time of release of oyster spawn increases the percentage of success. April–May spawning period proved to be the ideal time for large scale collection work. September–October period was not so effective. The results of spat thus collected are shown in Table 1.

Post spat collection period

a) *Spat removal:* Spat settled on collectors (Fig. 4) were allowed to grow on them up to a size of 30 mm–35 mm after which removal of individual spat is easily done without injuring the fleshy interior. Pressure slightly exerted dislodges the spat without damage. After the removal of spat the tiles can be stored and recycled for use in the next season. Depending on handling they are good for at least four seasons.

Fig. 4 Oyster spat settled on tiles

b) *Initial transplantation:* Initially the scraped oysterlings are put in nylon meshed (12 mm mesh size) cages of 6 mm iron rod frame for a period of two months (Fig. 5). Each cage (measuring 40 x 40 x 10 cm) can easily hold 200 oysterlings. Later they can be transferred to large rectangylar cages of 22 mm meshed nylon netting (size 90 x 60 x 15 cm).

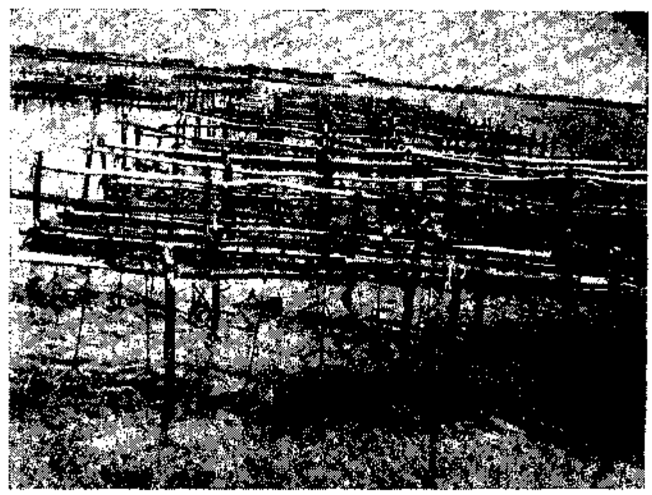


Fig. 5 Just transplated oyster spat grown in box type cages

Erecting racks for growing oysters

Each rack is so constructed as to occupy an area of 26.5 sq.m. with a length of 13.2 m and breadth of 2 m. A midwater wooden platform of interconnected teakwood stubs of 2 m length is put up supported by two parallel rows of 6 teakwood poles each planted vertically down at a distance of 2 m, pole to pole. All wooden materials are treated with tar prior to being used in the rack erection. The platform in each rack can carry a total of 20 rectangular cages of 150–200 oysters each and is so positioned that only during the lowest low tide periods the cages get partially exposed (cover photo).

During initial stages of experiments 30 such racks were set up side by side in Karapad creek. Siltation in the farm area and erosion of creek bunds posed problems. Notwithstanding these, growth of oysters was fast and harvestable size of 90 mm length was attained in 12 months. The various processes involved from spat collection to oyster growing were streamlined by the experience during this experimental period. In 1978 the oyster farm was shifted to the nearby open sea coast and as many as 90 racks were erected. Spat collected in 1979 spawning season were transferred to racks, each rack carrying 3,000 oysters in 20 cages. During the early stages of growing in farm, unexpected predation of oysters of size 35–45 mm was noticed by a gastropod, *Cymatium cingulatum* which caused a mortality of 15% of the stock. This problem was tackled by removing the predators by hand-picking. No other disease problem was encountered. Oysters reached 85–90 mm size in 12 months time with a meat weight of 8–10%, each oyster weighing 120 g (shell on) with a meat weight of 10 g. A total of 2,00,000 oysters attained harvestable size.

Prospects

The oyster culture experiments successfully carried out at Tuticorin marks only the first stage in ushering in an era of oyster industry in India. Based on the experiences during the course of these experiments several areas of research and development efforts appear to be warranted on priority basis before total success can be achieved.

Spat collection is one aspect where the present experiments have indicated the enormous potentiality of the coastal regions which can be usefully tapped to get adequate seed supply from natural sources. Although only a few lakhs of spat were collected for the experiments at Tuticorin, it appears distinctly possible to collect several millions by employing large number of spat collectors using the lime coated tile technique. The rack culture system yielded fruitful results in harvestable oysters being made available within a short span of 12 months unlike in other countries where growing period is protracted. Production of an average of 0.48 tonnes of oysters from a single rack has been demonstrated at Tuticorin. In one hectare it is possible to put up at least 280 racks and stock nearly one million oysters resulting in an yield of a minimum of 135 t. oysters (with shell) with a total meat yield of 13.5 t. Experiments are in progress to evolve modifications towards bringing down the capital investment on materials. Future research in this direction would aim at employing less costly materials for rack erection as well as for the trays used for growing oysters.

Marketing oysters is one area that warrants our immediate attention in as much as there is very little market either locally or in the interior places for the oyster meat. Extension work like market development, marketing the products at competitively low rates, ascertaining the consumer preferences of the quality of the flesh before marketing are all areas which will have to be taken up for intense developmental study during the course of next few years. Proper technology of oyster meat preservation to satisfy consumer taste and foreign market is another aspect needing immediate attention. In the extensive culture of oyster in the coastal areas, care has to be shown to avoid locating farm sites in places which are likely to interfere with the use of such water areas by the local fishermen for traditional fishing. Concerted efforts to tackle the above problems will hasten the establishment of a new production oriented seafood industry in India.

LABORATORY BRED PRAWNS FROM NARAKKAL CULTURED IN SALT PAN RESERVOIRS AT TUTICORIN—A SUCCESS STORY*

Rapid developments and fast changes are taking place in the field of prawn culture in India and abroad. Domestication of the culturable species of marine prawns, their induced maturation and spawning in captivity and mass production of stockable size of prawn seeds have become a reality in India chiefly due to the researches conducted at the Narakkal Prawn Culture Laboratory (NPCL) of the Central Marine Fisheries Research Institute. Establishment of a land-based maturation facility and development of mass cultures of locally available live feed organisms—diatoms, rotifers and cladocerans—were the major contributory factors in achieving this break-through. As a result of these developments over one million prawn seeds, chiefly belonging to the Indian prawn *Penaeus indicus* were produced at the NPCL in the early half of 1980.

The prawn seeds produced at the NPCL were byproducts of the experiments conducted there and not products of a concerted production programme. Although most of these seeds were used in the Lab to

*Prepared by K. H. Mohamed, M. S. Muthu and R.Marichamy, C. M. F. R. I.

Land programme of the Institute at the Vypeen Island and Quilon, some were supplied to the prawn Culturists at Goa and Tuticorin and also to the Calicut Research Centre of the CMFRI for experiments in the polythene lined ponds on the sandy beach of Calicut. The main objective of these supplies was to study the problems associated with long distance transport and to evaluate their growth and survival in different ecological conditions. A report on their growth and production in the polythene-lined ponds at Calicut is given elsewhere in this issue. The consignment sent to Tuticorin is dealt with below.

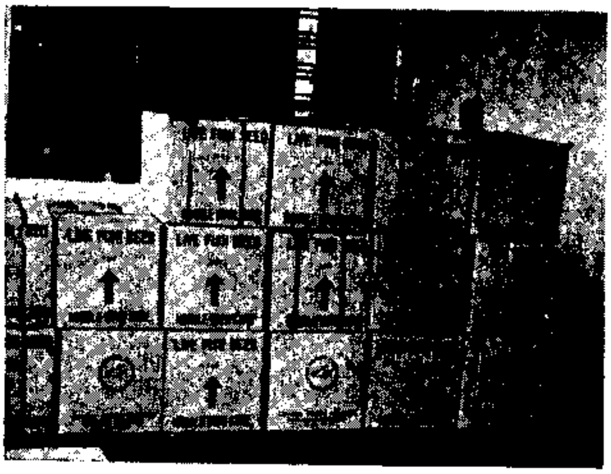
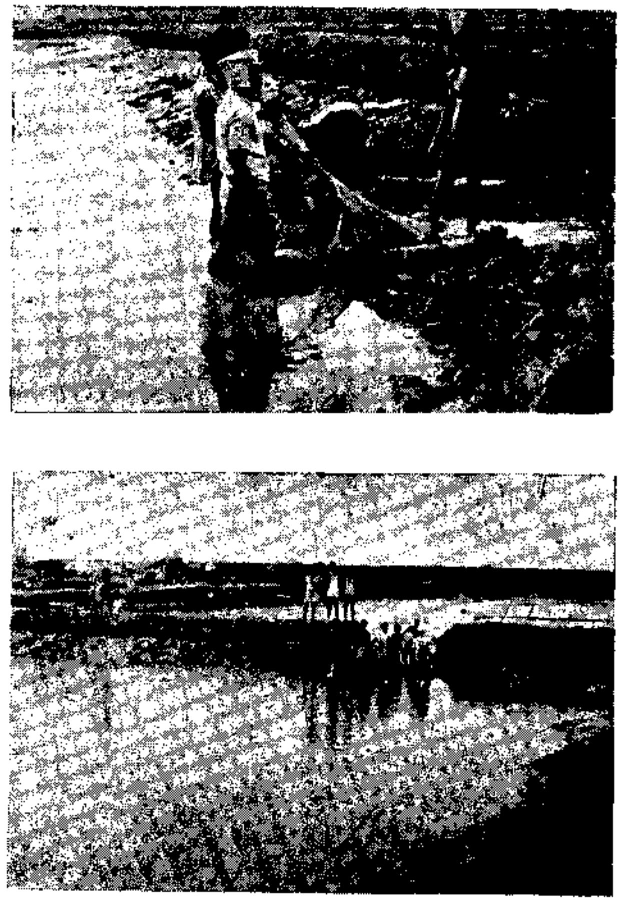


Fig. 1 Prawn seeds packed in polythene bags inside cardboard cartons ready for transport.

On 11-6-1980 a consignment of 70,000 postlarvae (50 cartons) and 5040 (12 cartons) of juveniles of *Penaeus indicus* reared at the NPCL were sent to M/S Ponrathnam and Balakrishnan of Tuticorin. 1400 postlarvae or 420 juveniles were packed in each polythene bag containing six litres of filtered brackishwater (salinity 15 ppt) and four litres of medically pure oxygen. The polythene bags were sealed airtight and packed in cardboard cartons (Fig. 1). The entire consignment was lifted from Narakkal at 1800 hours on 11-6-1980 and transported by commercial lorry service to Tuticorin. The cartons were opened at the pond site at 0800 hours on 12-6-1980 and the surviving seeds were released into the ponds without any acclimatisation procedures.

The culture ponds formed part of a salt pan reservoir situated on the southern bank of the Kallar river on the east coast 20 km north of Tuticorin (Figs. 2 and 3). The water supply to the ponds was through regular pumping from the estuary with the result the salinity of the water frequently became very high. At the time of stocking the salinity of the ponds was 45 ppt. The bags containing the seeds were secure and the mortality during transport which lasted only for 14 hours was 42% in the case of the post larvae and 17% in the juveniles. 40,000 post larvae (average size 12 mm) were stocked in pond 'A' which was 1.5 ha in extent and 4200 juveniles (average size 35 mm) were stocked in pond 'B' which was 0.3 ha in area. Before stocking, the ponds were fertilized with chicken dung, superphosphate and nitrate and were free of predatory fish. Regular monitoring of the hydrography of the ponds and sample measurements of the growing prawns were carried out.



Figs. 2 & 3 Ponds being prepared for the experiment

Although the stocking was done abrubtly without acclimatisation it would appear that fairly good number of post larvae survived as observations made on 20-6-1980 showed a large number of small prawns along the edges of the ponds. Periodically, supplementary feed consisting of chopped trash-fish, rice bran, prawn head meal and tapioca powder was given. Old water in the ponds was frequently allowed to flow out by gravity through concrete pipes protected by velon netting and new water pumped from the estuary by a 7.5 hp motor through inlet pipes covered by velon screens. The salinity in the ponds varied from 22.2 to 45.0 ppt and

Figs. 4 & 5 Prawn harvest

the temperature from 29.5 to 34.0°C. The depth of the water in the ponds was 50–70 cm. Harvesting was done on 12–11–1980 five months after stocking (Figs. 4 and 5).

Regular sampling showed fast growth in the first two months after stocking and thereafter the growth rate declined (Table 1). The growth rate of the post-larvae was relatively higher than that of the juveniles but at the time of harvest, those stocked as juveniles had attained a bigger size possibly due to the initial size advantage.

The details of final harvesting are given in Table 2. The yield obtained during the harvest has not been very encouraging. A higher stocking density and acclimation of the seed to the local conditions before stocking them in the ponds may have given better results. However, these experiments bring out interesting details regarding the survival of *P. indicus* in this highly saline environment. Of the 40,000 postlarvae stocked in pond 'A' only 9,180 survived after 5 months; this works out to a survival rate of only 23%. In pond 'B', however, where initial stocking was done with large sized juveniles the survival rate was better (47%). Although in the matter of survival and production these experiments are not very encouraging, they have established that the high saline reservoirs of salt pans could be utilized for prawn culture without interfering with normal salt production. It would also appear that in this particular type of environment stocking of prawn seed with higher initial size is beneficial resulting in better survival and product. It has also proved that the laboratory reared prawn seeds are robust enough to be transported to distant places and utilised for culture purposes. The NPCL is planning further experiments to get more information on transportation of prawn seed and culture of prawns in high saline media.

Table 1: *Growth of P. indicus stocked in salt pan reservoirs—Tuticorin.*

Date of Observation	No. of days after stocking	Pond 'A' (1.5 ha) Average size mm	Growth increment mm	Growth rate per day mm	Pond 'B' (0.3 ha) Average size mm	Growth increment mm	Growth rate per day mm
12– 6–'80	0	12	—	—	35	—	—
20– 6–'80	8	18	6	0.75	50	15	1.87
11– 7–'80	30	70	58	1.93	91	56	1.87
26– 7–'80	45	98	86	1.91	108	73	1.62
29– 8–'80	79	116	104	1.32	123	88	1.11
1–10–'80	112	125	113	1.01	137	102	0.91
12–11–'80	154	139	127	0.82	150	115	0.75

Table 2. *Details of final harvesting of P. indicus stocked in salt pan reservoirs.*

Pond	Quantity harvested (kg)	No. of prawns harvested	Av. size (mm)	Av. weight (g)	Production rate, kg./ha	Amount realised (Rs.)
A	179	9,180	139	19.5	120	3300.00
B	50	1,980	150	26.1	167	2000.00

POSSIBILITY OF USING POLYTHENE LINED PONDS FOR MARICULTURE IN SANDY BEACHES*

Introduction

Vast stretches of sandy seashores are at present lying unutilised. These sandy areas are not suited for agricultural operation. Neither are they considered suitable for aquaculture due to the porous nature of the soil and resultant seepage of water. However, if this seepage of water could be prevented by some means these areas could be utilised for aquaculture purposes. Experiments have been conducted at the Calicut Research Centre of Central Marine Fisheries Research Institute in this direction. These experiments have proved that the seepage of water through the soil could be prevented by suitably lining the ponds with black polythene film. Although the use of polythene film is quite prevalent in agriculture for various purposes, it has not so far been of much use in aquaculture. The conversion of these sandy shores into productive aquaculture ponds by providing polythene lining for them has shown bright possibilities of utilising extensive areas for aquaculture and a report on this method is presented here.

Construction of ponds

The sandy sea shore of about 0.5 ha area in front of the Research Centre at Calicut was utilised for making the fish farm. The thorny bushes were removed and ponds of various areas–0.01 ha, 0.025 ha and 0.1 ha were excavated with a slope of 60° and a depth of 1.5 m. Care was taken that no sharp edged hard materials like glass pieces or stones are left on the sides and

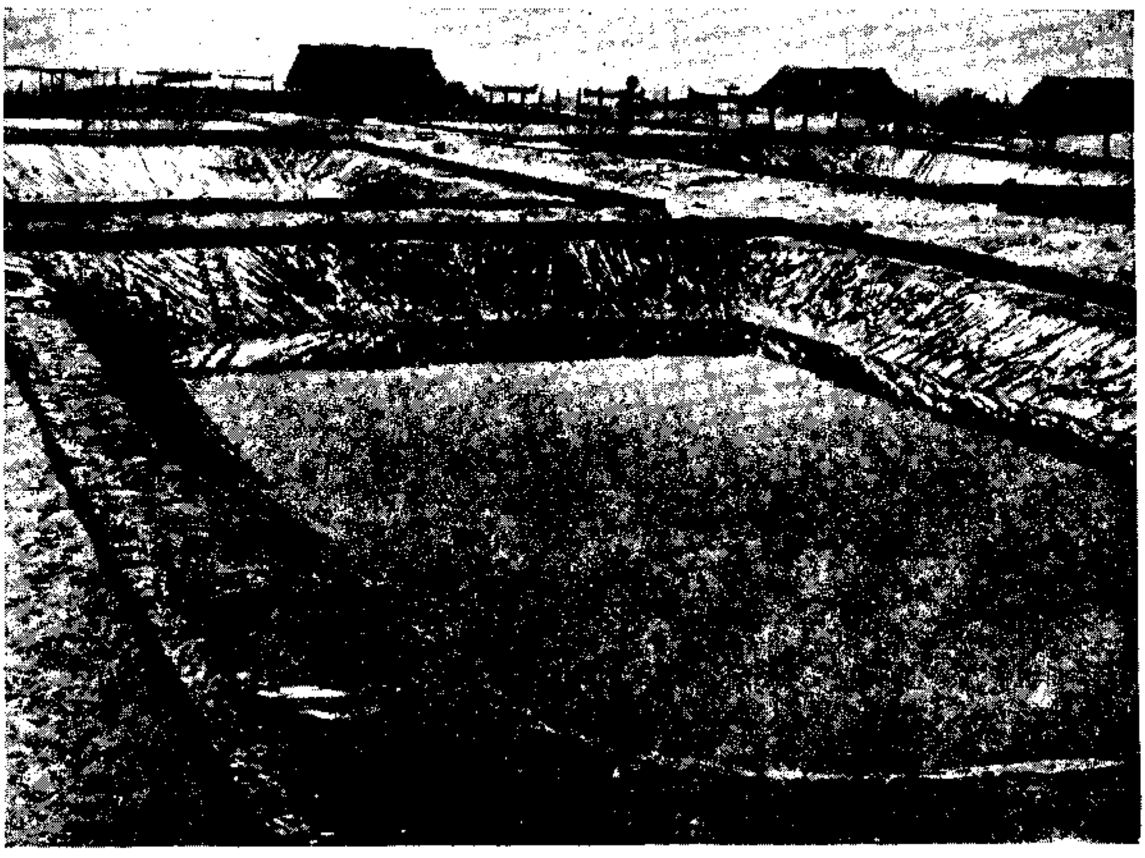


Fig. 1 A view of the polythene lined ponds.

* Prepared by R. S. Lal Mohan and K. Nandakumaran, Calicut Research Centre of CMFRI

bottom of the excavated pond. After levelling properly, the pond is provided with the polythene lining.

Polythene film

After making trials with polythene film of different gauges of 75 to 150 microns thickness, it was found that 150 micron thick film was suitable. White and transparent polythene film was proved to be unsuitable as it could not withstand the heat of the sand during summer and started developing cracks. As the ponds were more than 20 m wide and the film of maximum width of 6 m only were available, the films, have to be joined in order to line the entire pond. This was done by fusing the free ends of the films by a hot iron. The free ends of the polythene film are kept in position with about 10 cm overlap. A cellophane paper is kept over the edges and the films are fused. Heat is applied till the overlapping portions of the polythene films get fused well. The cellophane paper can be removed after some time. Care should be taken that no sand particles are left in the area of fusion as it is likely to damage the film. The film should be dry and without any salt deposits while it is being fused

Paving the film

The lining of the ponds by the film is done by anchoring the free ends of the film around the pond by making a trench of 30 cm deep and 40 cm wide. The free ends of the film is anchored inside the trench and sand is placed over it. The lining should not be tight. After the completion of the lining the ponds can be bordered with laterite stones so as to prevent the sand being blown into the ponds (Figs 1 & 2). The bottom of the pond can be spread with sand of about 10 cm thickness so as to provide the culture animals with substrata. This will also help to prevent the heat being absorbed by the black polythene lining causing rise in the water temperature.

Sea water supply

Sea water is pumped into the ponds by a 5 h. p. diesel pump with 3″ suction and 2½″ delivery pipes. Alcathene pipe of standard quality is used (Apex brand). A foot valve is attached to a float anchored at a distance of 50 m from the surf. A polythene coated drum of 250 l capacity is used as a float. It is attached to a 5-toothed anchor weighing 75 kg with

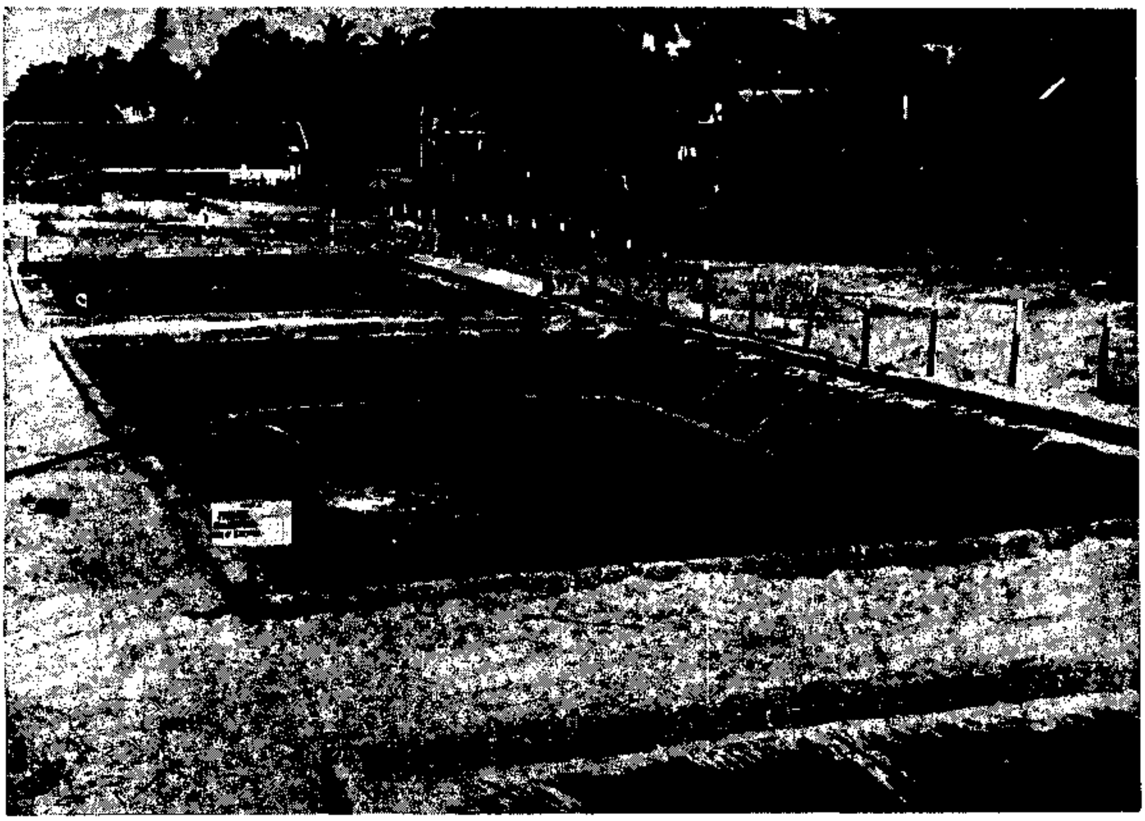


Fig. 2 A view of the polythene lined ponds.

the aid of an iron chain. Nylon mosquito netting is tied to the distal ends of the suction and delivery tubes so as to prevent the fishes and other particles gaining entry into the pond. The water may be again filtered by a velon screen net at the outlet of the delivery tube. About 1.5 m depth of water is maintained inside the pond. Now the pond is ready for stocking.

Preliminary experiments of prawn and fish culture

A few preliminary experiments of culturing of the prawn *Penaeus indicus* in such ponds have given encouraging results. In a pond of 0.1 ha area 18,500 juveniles of 42 mm average size were stocked on 15–5–1980 at a stocking rate of 1,85,000 per ha. These prawns were initially raised in a nursery pond upto this stocking size, from seeds transported from the Prawn Culture Laboratory of CMFRI at Narakkal, Cochin. On 4–9–1980 when the pond was harvested 8,950 specimens of average size of 97 mm were obtained with a total weight of 50 kg (fig. 3). The count size of the harvested prawns was 179 per kg. The production rate works out to 500 kg per ha for 112 days, with a survival rate of 48%. The harvesting was done by cast netting after reducing the level of water in the pond by removing the polythene film from one side and allowing the water to get seeped off to a certain level. Artificially compounded feed of ground wheat preparation was given to the prawns.

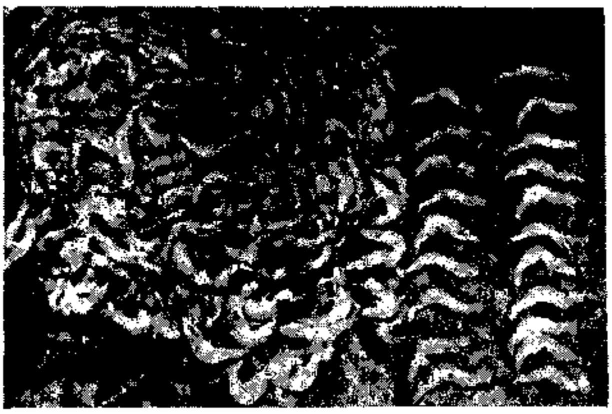


Fig. 3 Part of the prawn harvest

In another experiment in a pond of 0.01 ha area 1,900 juveniles of *P. indicus* of 42 mm average size were stocked on 17–5–1980 at a stocking rate of 1,90,000 per ha and on 4–9–1980 when harvested 1,856 specimens were obtained. They grew to an average size of 109 mm with a count size of 116 per kg. The total weight of prawns harvested amounted to 16 kg, giving a production rate of 1,600 kg per ha for 110 days at a very high survival rate of 98%. In another experiment of stocking the fingerlings of the milk fish *Chanos chanos* in a pond of 0.01 ha it was possible to grow the fish to a size of 422 mm in 526 days (Fig. 4).

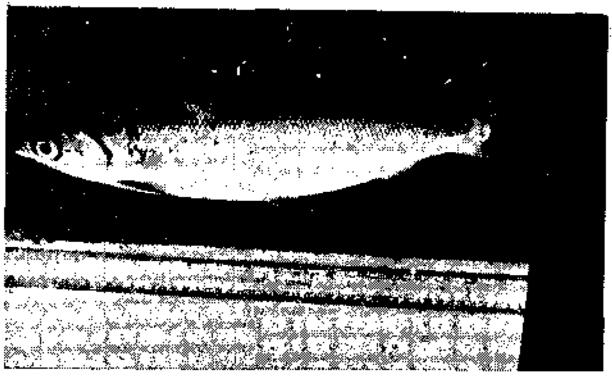


Fig. 4 *Chanos chanos* cultured in the fish pond.

Prospects

Some of these results would indicate that there is immense possibility of converting these derelict sandy shores to productive fish ponds by this method of providing a polythene lining. But constant monitoring of the temperature, salinity and dissolved oxygen of the water in the ponds is very essential. Though the water temperature was usually varying between 25 and 32°C, at times it shot up as high as 46°C at the bottom of the pond, resulting in mortality of the prawns. Such rise in temperature at the bottom was observed when there was rain followed by bright sunshine. This is probably caused by the less dense fresh water remaining at the surface and the denser saline water at the bottom preventing proper circulation of water and equal distribution of heat in the water mass, thus raising the temperature at the bottom. Immediate preventive measures like dragging a coir net along the bottom of the pond to make the temperature uniform will have to be taken.

Depletion of dissolved oxygen especially during the early hours of the day between 4 and 6 A.M. is another factor which has to be constantly watched. This may probably be brought about by high plankton productivity or the presence of organic debris. Constant monitoring of dissolved oxygen would indicate such depletion and when detected corrective measures have to be taken immediately by providing aeration of the water. Besides monitoring the environmental factors, suitable artificial feed at the required quantity is to be given for the stocked prawns to grow. With all these input of efforts the cost economics of the entire operations have to be properly worked out in order to decide the economic feasibility of undertaking large scale aquaculture in such ponds and this is in progress.

Valampuri (sinistral) chank fished off Tuticorin*

More than 10 lakhs of the dextral type of the sacred chank, *Xancus pyrum* (Linn.) are fished annually in the Gulf of Mannar and Palk Bay by the commercial chank diving fishermen. But it is very rarely, probably once in a decade or so, that a sinistral type is obtained. Valampuri chank, as it is locally known is held in high esteem, by Hindus as a harbinger of harmony and wealth. The previous occasion when a valampuri chank was fished at Tuticorin was on 25-4-1970 from a chank bed called "Vadaithundam."

On 11-12-1980 a perfectly shaped exquisite specimen of valampuri was fished from 'Cruxian paar' off Tuticorin, not very far from the area where the last one was obtained. Shri Siluvai Dawsan belonging to Enayam in Kanyakumari District picked it up at 15 m depth. The Fisheries Department of the Government of Tamil Nadu, as customary, paid a sum of Rs. 2,250/- to this diver towards the cost of this chank as the Government rules stipulate that any valampuri chank fished from the coastal waters of Tamil Nadu should be paid the value equal to the cost of 1,000 ordinary chanks of the dextral type. The chank measured 110 mm in length, 60 mm in breadth and 180 mm in circumference, weighing 225 g with flesh (Fig. 1 & 2).

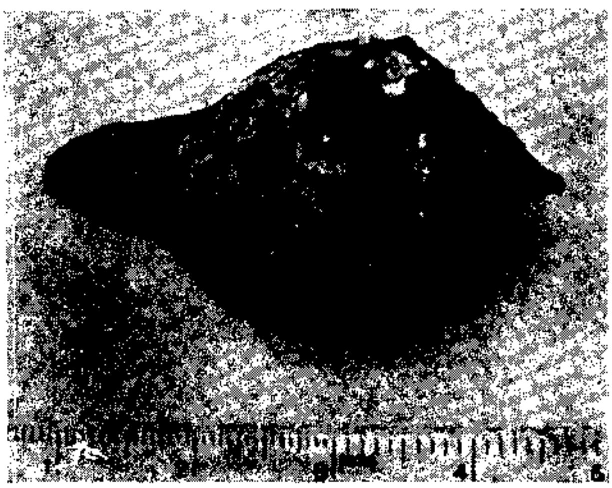


Fig. 1 Dorsal view

There was very little encrustation or overgrowths on the shell surface except polyzoan colonies which can be easily scraped off. The periostracum was in tact. The presence of the protoconch makes the specimen quite graceful. It is estimated that the disposal value of this chank in auction would be around Rs. 12,000/-.

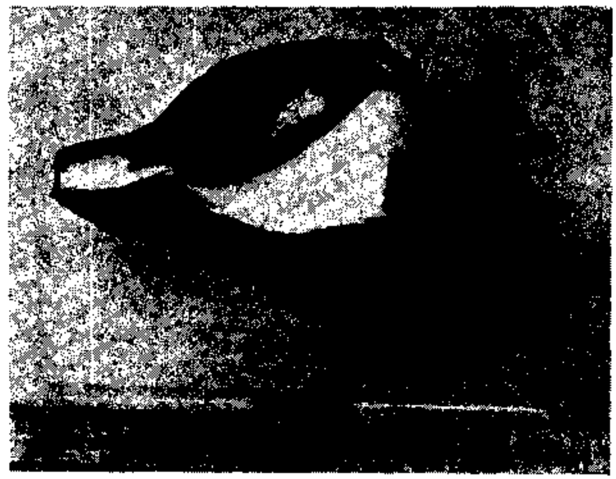


Fig. 2 Ventral view

*By S. Mahadevan and K. Nagappan Nayar.

Safety of food irradiation process underlined by three international organizations

No toxicological hazard is caused by irradiating, for conservation, any food up to a dose of 10 kilogray (1 Megarad), and hence foods treated in this way no longer need to be tested for toxicity. At present, for approximately 95 per cent of food items to be treated by irradiation, the dose needed is much lower than 10 kilogray. This clearance was given by a Joint Expert Committee on the wholesomeness of Irradiated Food (JEFCI), which is supported by the Food and Agriculture Organization (FAO), the World Health Organization (WHO) and the International Atomic Energy Agency (IAEA). The JEFCI, founded in 1961, recommended already in 1976 strawberries, papaya and chicken, and provisional acceptance of irradiated rice, onions and cod-redfish mixture treated at levels of irradiation below 10 kilogray. Based on its recommendations, 22 countries, among them Bulgaria, Canada, France, Hungary, the Netherlands and the USSR, have already given clearance for unconditional or provisional irradiation conservation for foods such as deep-frozen meals in hospitals, cod and haddock fillets, chicken, spices, strawberries, mushrooms, onions and potatoes.

Food irradiation has added a new dimension to the methods of preventing food spoilage. It is a physical process which can destroy spoilage and pathogenic microorganisms in food, disinfest insects in cereals, peas, beans, lentils and dried food, extend shelf-life of fresh fish, fruits, vegetables and improve the wholesomeness of various foodstuffs, etc. without leaving any residue. The food retains essentially all its nutritional and sensory quality. This process could add much to the reduction of post-harvest food losses and would therefore increase available food supply to mankind.

The conclusion that toxicological testing is no longer necessary for foods conserved by a dose of not more than 10 kilogray is expected to facilitate the wider use of food irradiation. This conclusion will be forwarded to the Codex Alimentarius Commission, the executive body of the Food Standards Programme of the FAO and WHO.

Press release from International Atomic Energy Agency (IAEA), Vienna, 4 December, 1980.

California Abalone Form Hybrids in Washington

Back in 1958 scientists from the Washington State Department of Fisheries transplanted some California red abalone to the San Juan Archipelago. The purpose was to determine if this commercially valuable species could thrive in Washington. Subsequent sampling revealed only a few remaining.

But recently sport SCUBA divers (abalone are harvested by divers) have retrieved what appear to be hybrids of the red abalone and the native pinto abalone, University of Washington Sea Grant researchers feel that they have the potential to become an economic enterprise there.

This reminds us of an accidental seafood transplant dating back a few years. In the days when luxury liners plied the Atlantic the ships, among other gourmet items, carried eastern U.S. hard clams live. As they approached Southampton they threw the leftovers over the side.

Now, it so happened that for decades fisheries scientists had been trying to transplant the hard clam to English waters, but to no avail.

Time passed. Then, lo and behold, bottom trawlers began coming up with hard clams along the old dumping line. The critters had adapted on their own in appreciation of not being eaten.

Sea Technology, 21 (4): p 55, April 1980

BOOKS

Advances in Marine Biology: Volume 17. Edited by J.H.S. Blaxter, F.S. Russel and Maurice Yonge. Academic Press, London, pp:516, 1980.

This is the 17th volume in the series and contains three articles. The first one is by Dr. Llewellya Hillis-Colinvaux on the ecology and taxonomy of *Halimeda.* It is a comprehensive review of work on the species of this solitary group of green calcareous marine algae of the tropical reefs, living in the same depths as reef-building corals and playing an important role in the productivity of these waters. The second article by Dr. R. C. Newell and Dr. G. M. Branch reviews the influence of temperature on the maintenance of metabolic energy balance in marine invertebrates. In the final article Dr. L. Stewart describes the attempts to acclimatize salmonids in the southern hemisphere especially in Tasmania, New Zealand and Falkland Islands during the last century and early part of this century. According to him the failure to establish most salmonid species lies in the influence of oceanic circulation on the seagoing phase of feeding and growth. These authoritative reviews will be of interest to marine biologists, fish biologists, oceanographers and ecologists.

Marine pollution: Functional Responses: Edited by W. B. Vernberg, F. P. Thurberg, Anthony Calabrese and F. J. Vernberg, Academic Press, New York. PP 454, 1979.

This volume contains 22 papers presented at a symposium entitled "Pollution and Physiology of Marine organisms" held at Hobcaro Barony, South Carolina in November 1977. It is divided into four parts viz. Petroleum Hydrocarbons, Metals, Pesticides and PCBs and Multiple factor interactions.

Marine Toxins and other Bioactive Marine Metabolites: By Yoshiro Hashimoto, Japan Scientific Societies Press, Tokyo, pp 369, 1979.

This book deals with toxic organic compounds from either marine or freshwater organisms. In addition to toxins, a large number of compounds with a wide spectrum of biological activity are also included. The toxins are divided into three categories, those that cause food poisoning, those that are administered by means of venom apparatus and others. The book also includes material on the histological, epidemiological, pharmacological, ecological and biological aspects of the toxins.

Hydrocarbons and Halogenated Hydrocarbons in the Aquatic Environment: Edited by B. K. Afghan and D. Mackay, Plenum Press, New York. pp 588, 1980.

This is the sixteenth volume of the series, Environmental Science Research. The Volume discusses the characterisation, identification and analysis of hydrocarbons and halohydrocarbons in the aquatic environment. Advanced techniques for monitoring the distribution, incidence, biological effects and environmental pathways of these pollutants are evaluated. The volume contains the papers selected from those presented at the international symposium on the Analysis of Hydrocarbons and Halogenated Hydrocarbons in the Aquatic Environment, May 23-25, 1978 at Toronto. It is divided into five categories.

Errata — *Mar. Fish. Infor. Serv. T & E Ser. No.* 24, *October*, 1980

On the basis of "FAO Species Identification sheets for Fishery Purposes" (Vol. I, 1974, Fishing Areas 57 & 71) of the family Ariidae by T. Wongratana, U. Bathia and R. Taylor (Sheet No. ARIID Ari 3) the catfish collected off Mangalore was identified as *Tachysurus maculatus*. In the meantime we have sent specimens of this species to Dr. K. C. Jayaram, Deputy Director, Zoological Survey of India, Calcutta, who is carrying out a review of the Family Tachysuridae of this region and he informs us that the correct identification of the specimen is *Tachysurus tenuispinis*. We would request readers who had already received No. 24 of MFIS to make a note of the change of identification.

— E. G. S., P. P. P., M. H. D., C. M. & G. S. R.

Compiled and prepared by M. J. George & G Subbaraju.
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