ICAR

CMFRI newsletter

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KARAPAD CREEK EDIBLE OYSTER FARM

Numerous rectangular iron-framed trays of nylon netting, serially arranged on racks made up of casuarina poles erected across the creek, hold thousands of oysters. These oysters, collected from natural beds when they were only 25-35 mm in length, recorded faster growth rate when compared to those oysters growing in the wild. This enhanced growth rate is due to the relatively favourable conditions prevailing in the farm, such as lesser competition for food and greater protection from fouling organisms. With every incoming tidal flow the creek is naturally replenished with fresh food. The trays are so arranged as to expose the oysters during low water so that the settlement of fouling communities on them will be minimal. This is the first time that an attempt is made in India to raise commercial quantities of edible oysters by culture methods. (See article on next page.)

Why we suggest

LARGE-SCALE CULTIVATION OF EDIBLE OYSTER

Despite their great popularity as a sought-after delicacy if not a luxury food item in almost all other countries, edible oysters are traditionally looked down upon in India as an inferior food, accepted only by the poor-class inhabitants of the coastal regions. This prejudice which stems from an inaccurate understanding of this rather high-quality marine food can, however, be removed by a more intimate knowledge of this fascinating animal of the sea. Once it suits the Indian palate edible oyster will easily and quickly assume a place in our rural economy. Extensive beds of naturally occurring oysters can easily be exploited with minimal input and vast stretches of our unused estuaries can be successfully utilised for culturing these animals with large-scale employment possibilities. The oysters thus produced can not only be a continuing source of superior yet cheap protein to our country but also a reliable foreign-exchange earner.

Edible oysters are bivalve molluscs constituting the genus *Crassostrea* (meaning, thick oyster) which has more than ten species distributed in various parts of our coasts. They are adapted to muddy estuarine waters though some, like the rock oyster, are found distributed all along the coasts where there are rocky or hard substrata. Of these species, the commercially important ones are: *Crassostrea madrasensis, Crassostrea cucullata, Crassostrea gryphoides* and *Crassostrea discoidea. C. madrasensis* (which is considered synonymous with *C. virginica* by some of the later authors) is the common brackishwater form found in natural beds at Sonapur, deltas of Godavari and Krishna, Gokulapalli, Pulicat, Ennore, Madras, Cuddalore and Mandapam region on the east coast and along the coasts of Kerala, North Kanara and Ratnagiri on the west. They are also found in Port Blair, Andamans. *C. cucullata* (because of the generic differences which have recently become known, this species has been separated from the genus *Crassostrea* and is renamed as *Saccostrea cucullata*) is the popular Indian rock oyster found abundantly distributed all along the east and west coasts. *C. gryphoides* and *C. discoidea*, on the other hand, have more restricted distribution.

Unlike the members of the genus *Ostrea* which are adapted to clearwater environments, *Crassostrea*, equipped as they are with their specialised exhalant chambers (promyal chambers), are better adapted to muddy estuarine waters. Nevertheless, like all other members of the family Ostreidae, they too have lost their foot in the course of evolution and with it their ability to move. They lie resting on the bottom throughout their adult life, restricting the luxury of movement purely to their larvae. They have only one muscle, the strong adductor muscle, which they use for closing and opening their hard calcareous valves. Its place of attachment on the shell is often visible as a dark scar. With the help of this muscle the oysters can keep their valves tightly closed and can remain so for quite a long time. This is their natural form of protection not only from their predators but also from substances in water which are detrimental to their existence.

The shell of the oyster is extremely variable in shape. If grown on pebbly ground without being crowded they tend to become round. If they are grown on relatively soft mud they tend to be long and narrow which is the case also when they are grown in clusters. If they are grown in low salinity the shells are soft and in high salinity, hard and brittle. When the animal is attached to a hard solid object the left valve, with which the animal is always attached, will follow precisely the contour of that object. The shell in the younger animal is covered by a thin horny layer called periostracum which is likely to get worn off in older ones.

Brackishwater oyster with right valve removed.

Inside the shell is the animal which being an invertebrate has no bone or internal skeleton. The body, or the visceral mass as it is called, is covered by two thin lobes called mantles that can be separated except for a short distance on

the head. The mantle is responsible for the production of the shell. The mantle edges on either side get fused at a point above the adductor muscle. This mantle junction serves to separate the area of the exhalant or outgoing water current from the inhalant or incoming water current. Along the edges of the mantles are the sensory tentacles by the aid of which the animal is able to detect the changes in the chemical composition of the water which flows over it. Lying in the mantle cavity are leaf-like respiratory organs called gills which are arranged in a defenite system. The entire gill can be compared to a folded sieve through which the water is strained. The whole of this gill system is abundantly provided with tiny hairs called cilia which function in unison, the combined effort of which brings about the required flow of water in a defenite direction, to carry the food and oxygen needed by the animal. The food, consisting of diatoms (microscopic unicellular plants) and other suspended particles in water, is sieved out and guided to the mouth through special ciliated grooves. An average-sized oyster can thus filter about 20 to 30 litres of water per hour.

The sexes are separate, determinable only on close examination. However, hermaphrodites — the individuals in which the reproductive elements of both the sexes are present — do occur occasionally. The change of females to males and males to females, induced by the environment, is also not uncommon. In areas with good food supply the population has generally more females than males and reverse is the case in areas with poor food supply.

The number of eggs produced by an average-sized oyster is surprisingly enormous — estimated at hundreds of thousands. But this varies considerably with the size of the animal. The egg laying is generally triggered by the surrounding salinity. If the optimum condition in salinity is not reached in the surrounding water, the animal has the capacity to retain the eggs for considerable time, and, if need be, to resorb the eggs without shedding. The fertilization of the eggs takes place externally in water. The fertilized egg soon hatches out into a tiny larva called veliger (of size about 1|300 inch). The larva soon develops a bivalve shell and swims about by means of a swimming organ called velum. In about a few days' time the larva grows into a young oyster measuring about one-hundredth of an inch and approaches the end of its free-swimming life. This young one which is called a "spat" is ready to become attached. It is now in a critical stage in the life history of an oyster in that the larva now should come across a solid object within a relatively short time or it will perish. If it comes across such an object it clings to it with its adhesive foot. This may then crawl about to find a suitable spot — a clean and hard surface — where it can settle for the rest of its life. If the surface proves to be unsuitable the larva will slip off and will continue floating in search of another object. Finally, if it is able to reach the desired spot within the limited time, it lies down on its left side — never on the right — and gets attached to the surface with the aid of a quick-setting secretion of its own, called cement. The oyster is now attached for its life. This process of transition from the free-swimming to the attached life of an oyster is called "spatting" or "setting". Soon after the oyster gets set, a drastic change takes place in its anatomy. The foot and the velum being of no more value get lost, so also the miniature eye (which was heretofore present). Gradually the shell begins to get hard and calcareous. The growth of the oyster is extremely variable, being governed by highly variable factors like substratum, salinity, temperature, turbidity and above all, availability of food.

The meat of the oyster is low-caloried and highly palatable if grown in ideal conditions. It consists of 8-11% proteins, various carbohydrates and minerals. The fat content is less than 2.5%. The oysters are as rich in copper and iron as an equivalent portion of liver. Furthermore, they contain much manganese, calcium, phosphorus and many times more iodine than beef. Their calorie rate is even superior to that of milk as the calories are derived from proteins as opposed to fats. Even the so-called "fat" oyster has a minimal quantity of fat in it. Oysters are nearly pure protein so that they are ideal for slimming. Because of these low-calorie values the oysters are a most suitable diet for those who fight obesity. It is very well-known to the coastal folks that these bivalves are very good for those who suffer from chronic stomach trouble. This is because, the absence of fat makes them more nutritious and easily digestible.

However, the texture and quality of the meat are generally decided by the source they come from, and to a greater extent by the biological phase of the animal itself. The white or cream-colored meat that almost fills the shell, of the maturing oyster grown on clean hard surfaces possesses a superior flavour and is the most palatable. Those growing on muddy bottoms are likely to gather plenty of mud and sand both on and inside the shell, which will have to be removed by laborious process of cleaning. The oysters are less fit for eating during reproductive phases when they look rather unappealing. After spawning they are very thin and may be poor in quality. The mineral and heavy-metal contents of the meat also vary with the environment. The oysters grown in waters

contaminated by industrial wastes may accumulate iron and copper and other inorganic constituents like cadmium, chromium, nickel and others. The excessive accumulation of copper will give a green colour to the meat and will diminish its texture and flavour. Excessive bloom of some of the planktonic elements in water will also cause green-coloured meat.

Harvesting of the oyster is done mainly by hand-picking, although sophisticated implements are being widely introduced for the purpose in most of the countries where the oyster-culture industry is far-advanced. The entire harvested oysters in India are marketed raw in shell, which naturally restricts their sale to market centres and towns near the coast. Modern refrigeration methods may extend this range quite futher, but live oysters cost more to transport than shucked ones because of their shell weight. In countries like Japan the oyster meat is processed in several ways which include smoking, canning whole oyster, freezing et cetera.

Apart from providing the highly needed meat to meet our increasing demand, the oyster can have other revenue-earning uses too. In proportion to the growth of the industry there will be increasing quantities of shell as by-product. These shells can be a valuable raw material for poultry and animal feeds, lime, fertilizers, cement, pharmaceuticals and road construction. Oyster shell can also be used as cultches in oyster-culture industry.

Although edible oysters in extensive beds are still awaiting exploitation in India, being sedentary animals with no ability to escape capture to any minimal degree, they will not be in a position to withstand for more than a limited time the full-fledged fishery envisaged. Secondly, as mentioned earlier, the quality of meat of these wild oysters varies widely with the highly varying environment, which is indeed very undesirable, as the success of a fishery, like any other industry, is depending on the existence of a reliable consumer market which in turn depends upon the stability of product quality. This assumes greater significance in the context of our present industrial growth, when the estuarine and shallow water environments are likely to get more and more contaminated by industrial wastes which will affect the oyster growth adversely. While the overfishing possibility can apparently be overcome to a satisfactory extent by fishery regulations, the only solution to the second and more serious problem of stabilising the quality is scientifically planned cultivation.

The feasibility of scientifically designed oyster farming in India has been pointed out by Hornell as early as in 1910. But no serious efforts have been made along these lines for all these years probably because of the lack of proper consumer demands. Different methods of oyster culture can be adopted to suit the different needs. Japan, a country far advanced in these lines, has evolved very sophisticated methods as a result of which large quantities of oyster meat are produced annually not only to cope with the great demands of the home market but also for large-scale exportation. Raft culture, rack culture, stick culture and tray culture are some of the several methods generally adopted. Of these, the commonest and earliest is the raft culture. This is relatively an easy method in that it does not involve the process of transplanting. The seeds for the culture are the 'spat' obtained from natural beds with the aid of "cultches". The cultch is a substratum provided for the attachment of the larval oysters. Almost any solid object can act as a cultch since the larva will readily attach to it. But not many are

The oysters are brushed to remove dirt and epizoic organisms.

suitable as cultching material from the practical and economic point of view. As for example, the oyster shell itself when strung together like beads can be a very effective cultch and is very suitable from the cost and availability point of view but are so heavy that it would require heavy lifting gear while handling and very much flotation power if it is to be suspended from rafts. The common cultches that can be used are bamboo poles, tree branches, tiles, shells or stones. These cultches are suspended from rafts floating in water. If the rafts are set at the proper time and place, which can be decided by following the gonad condition of the oysters in the surrounding beds, enormous spatfall occurs on the cultches. The oysterlings thus collected are let to grow on the cultches till they reach marketable size, and then harvested. The rack and tray cultures, on the other hand, are different in that the spat which are set on the cultches are removed after a reasonable time to suitably prepared trays or racks kept in water. The oysters are grown and fattened in these containers. This method is superior because, even as in his land farms, the farmer can select the animals which will constitute his stock. So also, he will be in a better position to protect his stock by periodical removing of excessive deposition of dirt and epizoic animals and plants that would invade his oysters.

Central Marine Fisheries Research Institute, in a relatively short period of about two years, has made a leaping stride in the field of mariculture especially of mussels and oysters. The experiments done at Karapad Creek edible-oyster farm, on *Crassostrea madrasensis*, under the able leadership of Shri K. Nagappan Nair of Tuticorin Centre, have been mainly responsible for accomplishing the progress made in the oyster culture. Oysters of

(*Continued on page 9*)

First Pearl-culture Training Course Concluded

The first batch of nine pearl-culture trainees comprising mainly those sponsored by the governments of Gujarat, Kerala and Tamil Nadu (the detailed list has already appeared in these columns) has successfully completed the training course and has passed out on 14-3-77. The course was commenced at Tuticorin Centre on September 24, 1976. During this 6-month course the trainees were given full theoretical and operative training on the different aspects of pearl culture. All the trainees have by themselves produced pearls and have attained enough confidence to undertake the work independently.

said that the technique of pearl culture is known to us through the effort of Dr Algarswami who developed it for the first time in India. The fact that this know-how developed by the Institute is now handed over to others who may form the foundation for a future pearl-culture industry is indeed a commendable step. He congratulated the trainees and wished them success. Earlier, welcoming the participants, Director Dr Silas said that the Government of Kerala has already set up a pilot project on pearl culture at Vizhinjam utilising the expertise from the Institute, and the Government of Tamil Nadu is

(Left) Dr Silas welcoming the guests. (Right) A trainee receiving the course-certificate from Dr Prasad.

The trainees were awarded course certificates at a valedictory function held at Tuticorin Centre on 14 March, by Dr R. Raghu Prasad, Assistant Director General, ICAR. The function was presided over by Dr S. Krishnaswamy, Dean of the Biological Sciences, Madurai University. Delivering the valedictory address Dr Prasad also contemplating such a step. Dr K. Algarswami who was in charge of the training later presented a report. Shri K. Nagappan Nair, Officer-in-charge of the Tuticorin Centre, gave the vote of thanks.

The pearls produced by the trainees were kept on display during the function.

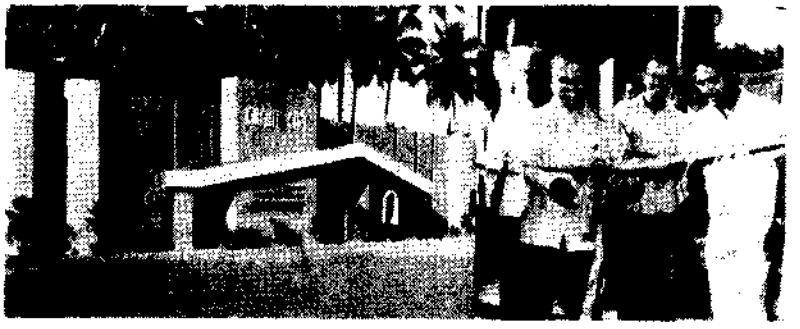
Krishi Vigyan Kendra

Under the recommendation of the visiting team of ICAR, a Krishi Vigyan Kendra (Agricultural Training Centre) has been started at Narakkal near Cochin. The Kendra aims at giving fishermen farmers management and operative training in mariculture, particularly that of prawns, mussels and oyster, fish and sea weed. Dr V. Balakrishnan, Scientist, is nominated as the officer-in-charge of the Kendra.

Exhibitions and Seminars

At Kasaragod

Central Marine Fisheries Research Institute has participated in an exhibition organised by a sister institute, Central Plantation Crops Research Institute, Kasaragod, on the occasion of celebrating the Diamond Jubilee of Coconut Research in India, between 27th December 76 and 8th January 77. Significant among the various exhibits displayed by our institute were those depicting the current activities and achievements in the field of mariculture, such as open-sea mussel culture, edible-oyster culture, pearl culture, eel culture, seaweed culture etc, which are particularly aimed at the integrated and rural development of our coastal areas. The exhibition attracted large number of people including dignitaries like Governor of Kerala, State Ministers and Union Ministers who evinced keen interest in this modern trend of Marine Fisheries Research. The Institute has won a merit certificate for the excellent displays — thanks to the organisers, Sarvashri V. Kunjukrishna Pillai, K. J. Mathew, K. Rengarajan, M. H. Dhulkhed, K. Sukumaran, V. Balakrishnan, A. Regunathan, N. Radhakrishnan and S. Ramamurthy.



A view of the CMFRI-CIFT pavilion. (Right) Dr M.S. Swaminathan opening the pavilion.

At Dhauli

Another important exhibition in which the Institute has prominently taken part was that organised by the Central Inland Fisheries Research Institute in connection with the laying of the foundation stone of the Freshwater Fish Culture Research and Training Centre of the latter at Dhauli, Bhubaneswar, Orissa, during 3-7 January 1977. The exhibition was inaugurated by the Prime Minister Shrimati Indira Gandh who earlier laid the foundation stone, on 3rd.

The trend of coastal aquaculture, recently evolved by the Institute, formed the main theme of the Institute's exhibits. A large number of people including the Prime Minister, Governor of Orissa, Chief Minister of Orissa, and the various delegates to the Indian Science Congress the annual session of which was then in progress at Bhubaneswar visited the exhibition. The Prime Minister while going round the stalls, showed deep interest in the various methods of aquaculutre adopted by the Institute. The pearl culture seems to have attracted Shrimati Gandhi's particular attention about which she made specific enquiries. The Prime Minister was accompanied by the Governor of Orissa, and Chief Minister of Orissa. Dr M. S. Swaminathan, Director General, ICAR, who showed them round has presented on behalf of the institute, a set of fine pearls artificially produced at our Veppalodai Pearl-Culture Farm to Smt. Gandhi.

Sarvashri S. J. Rajan, K. Rengarajan, A. Chellam and K. S. Sundaram deserve appreciation for making the exhibition a success, inspite of the great difficulty in maintaining live-tanks — the needed seawater had to be brought from the nearest coast 60 miles away from the exhibition site!

Some of the very distinguished visitors to the Kasargod exhibition: (From left to right) Shri N. N. Wanchoo, Governor of Kerala; Shri A. C. George, Former Union State Minister; Shri Syed Mohammed, Former Union State Minister and Shri Vakkom Purushothaman, and Shri N. Balakrishnan, Former Ministers of Kerala.

There was an exhibition and a seminar on Integrated Development Plan for Malappuram District and Fifth Anniversary of Farm and Home Programme of All India Radio

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GENERAL

Indian Council of Agricultural Research has extended its nomination of Dr E. G. Silas to serve as the Council's representative on the General Council of the Kerala Agricultural University, Mannuthy, for another term commencing from January 1977.

The Faculty of Marine Sciences of the Cochin University is reconstituted with Dr E. G. Silas as a member for a period of three years with effect from 2 March 77.

Director Dr E. G. Silas is nominated as a Member of the Professional Board of Studies for developing curriculum on 'Post-Graduate Diploma Course in Aquaculture and Fisheries Technology' of the University of Madras.

The Government of Kerala has nominated Dr Silas, Director, as a Member on The Committee on Fisheries and other Aquatic Resources constituted under the State Committee on Science and Technology.

The Director nominated Dr P. V. Ramachandran Nair, Scientist, to assist the Central Coordinating Authority for dealing with major oil spillages in seas.

Engagements

Dr Silas has attended the following:

The meeting with the Polish delegation on 13 and 14 October at Bombay in connection with the Industrial Fisheries Survey scheduled to be conducted along the NW coast.

Meeting convened by the Joint Commissioner (Fisheries), Ministry of Agriculture, on 30 November at New Delhi, in connection with the Indo-Polish survey of NW coast.

Meeting convened by the Secretary to Government of Tamil Nadu at Madras to discuss the feasibility of setting up a Marine National Park at Krusadi, on 6 December.

Selection Committee meeting of the Kerala Agricultural University at Trivandrum on 17 December.

Dr M. S. Prabhu, Scientist, addressed the Cochin East Rotary Club on 2 August on "The aims of fishery survey and statistics."

Dr K. Algarswami, Scientist, delivered a radio-talk in Tamil from AIR, Tirunelveli, on 11-12-76, under "Farm News" programme, on "Muthu Valarppu".

Dr Silas accompanied by Dr V. Balakrishnan attended an All India Workshop on Krishi Vigyan Kendra at New Delhi on 9-11 February.

CONSULTANCY

The following government departments, institutions, agencies and persons have received our services by way of consultation.

1. The Director, Bureau of Statistics & Economics, Orissa.
2. Dr William Edward, C|o Shri P. K. Ramanathan, Process Development, Central Food Technological Research Institute, Mysore-30.
3. The Member-Secretary, State Planning Board, Rajalakshmi Bldgs., Trivandrum-1.
4. Shri K. Radhakrishna, Scientist, National Institute of Oceanography, P.O. NIO, Dona Paula, Goa.
5. Dr A.M. Michael, Project Director, Water Technology Centre, ICAR, New Delhi-12.
6. The Voltas Ltd., Marine Products Division, Willingdon Island, Cochin-3.
7. The Deputy Director (Zonal), Dept. of Fisheries Kerala, Ernakulam.
8. Dr K. Satyanarayana, Research Officer, W.P. Centre (Marine) Forest Research Institute, Andhra University, Waltair.
9. Miss S. Krishnamma, Research Scholar, Department of Politics, University of Kerala, Trivandrum
10. The Project Coordinator, Central Food Technological Research Institute, Fish Technology Experiment Station, Mysore.
11. Shri M. Mukundan, Instructor, Central Institute of Fisheries Operatives, Cochin-16.
12. General Manager, Malankara Fisheries Project, Thottappally.

Training Given

Miss A. Nirmala Menon, Hydrologist of the Lobster Research Station of the Kerala Fisheries at Vizhinjam was given a 10-day training in phytoplankton taxonomy and plankton-culture techniques.

Polish vessel surveys northwest coast

Under a joint agreement between Poland and India, a Polish vessel, M.T.Murena, is at present conducting an industrial fisheries survey in the depth-zone, 30-200F, in the area between 15°N latitude and 24°N latitude. M.T. Murena, a B-23 type vessel of overall length 69.43 m and gross tonnage 1005 CRT with capacity for carrying 44 persons including scientists, will conduct a total of six 40-day voyages during the course of this year of which three will be devoted for ground fish and three for the rest. Three Indian scientists including a specialist in ichthyology|stock assessment and four Indian apprentices will participate in each voyage. The ichthyology|stock-assessment specialist will be nominated from CMFRI.

The aim of this Indo-Polish venture is mainly to assess the nature, quality and quantity of commercially exploitable fish and other living resources — demersal, columnar and pelagic — in the area specified, and to assess the factors contributing to the fluctuations in their availability in time and space.

The first cruise which was entirely devoted for the ground fish was between 8 January and 10 February, in which Dr S. V. Bapat of our Bombay Centre participated. The second, started a few days later in which Shri C. Mukundan from Cochin participates, is nearing completion.

Cyclone causes damage to fishing grounds

In the wake of the new year a severe cyclone hit Andaman Islands claiming three lives including two fishermen working in the coastal waters. Strong wind accompanied by heavy rains caused severe damages to trees and crops. Roofs of many buildings were flown off. As reported by Shri D.B. James, Scientist-in-charge of the Port Blair Research Centre of the Institute, several animals inhabiting the coral reefs were dead and washed ashore. Large lumps of living corals even up to 3 metre in diametre were dislodged and thrown on the beach by strong tidal waves. According to reports the worst-affected area was Little Andamans.

VISITORS

Those who visited the Institute during the period are:

1. R. Srivastava, Managing Director, Pondicherry Industrial Development Corporation, Pondicherry, 22-11-76.
2. Joseph C. Madamba, Director General, Philippine Council for Agriculture and Resources Research, Los Banos, Laguna, Philippines, 26-11-76.
3. J. Vander Meulen, FAO|UN Representative in India, 55 Lodi Estate, New Delhi, 3-2-77.
4. Freeman Compton, Centre for Development of Traditional Fishing Communities, RAS|HO (SW E) Colombo, Sri Lanka, 8-2-77.
5. Aeves Andrionov, ,, do -
6. Dr Leo Rijavec, UNDP|FAO Pelagic Fisheries Project, Cochin, 10-2-77.
7. Dr R. L. Kaushal, Vice Chancellor, Agricultural University, Jabalpore, 22-2-77.
8. Commander Narendra Singh, Director (Oceanography), Dept. of Science & Technology, New Delhi, 28-2-77.
9. Dr Rudolph Prakop, Department of Paleantology, National Museum Prague, Checkoslovakia, 15-3-77.
10. Dr Vaclav Pfleger, Department of Zoology -do-
11. J. D. Joysingh, Member-Secretary, Water Pollution Control Board, Kawdiar, Trivandrum, 18-3-77.
12. J. Vidal, C|O UNDP Bahrain, 21-3-77.

Dr C. Aikman, New Zealand High Commissioner in India and Mrs. Aikman visited the Mandapam Regional Centre of the Institute in December. The eel-culture experiments are explained to the distinguished visitors (centre) by Shri G. Venkataraman, Officer-in-Charge of the Centre (extreme right).

Implantation of multiple nuclei may enhance pearl production

More pearls can be produced in a single oyster at any one time by increasing the number of nuclei implanted in it, without affecting the quality of the pearls to the least. This will highly step up total pearl output and at the same time conserve the raw material. This has been proved by Dr K. Algarswami at Tuticorin, who has produced up to 5 pearls in a single oyster. In a recent communication he has published the advantages involved in adopting this multiple-nucleus-implantation technique. Nevertheless, it was observed by him that, interestingly enough, if the nucleii happen to be too close, compound pearls, usually of unequal sizes result — which he calls siamese twins and triplets.

Twin and triplet pearls.

Tagging catfish

Mass-tagging of catfishes has been started at Waltair Centre under the leadership of Dr B. Krishnamoorthi, Officer-in-charge, to ascertain their migratory behaviour, growth and mortality rates etc. The two commercially important species which are being tagged are *Tachysurus thalassinus* and *T. tenuispinis*. These species together form about 25% of the total groundfish catches from the Andhra-Orissa coast. A coloured plastic tag bearing a number is attached near the tail of the fish. As the recovery of the tag is of utmost importance for the completion of the study all those who are associated with this fishery are solicited to look out for these fish and return if they come across them to the Waltair Research Centre of CMFR Institute, C|o Zoology Dept., Andhra University, Waltair, Visakhapatnam-3. A cash reward of Rs. 5|- can be collected for a fish with tag and Rs. 2|- for tag only. Those who return the tag by post have to furnish the date and place of recovery.

Exhibitions....

(Continued from page 6)

held at Malappuram between 28th November and 5th December 76. The Fisheries part of the exhibition and seminar included coastal fisheries in which the Institute was represented by the Calicut Research Centre.

At Goa

In the exhibition on Fisheries conducted under the auspices of Shree Damodar College of Commerce & Economics, Margoa, Goa, in January, the Institute was represented by the Goa Research Centre.

The Institute took part also in the following exhibitions: Exhibition in connection with the Centennary Celebrations of the Maharaja's College, Ernakulam, in January.

Ramnad District 25-Point Programme Special Multi-Media Exhibition held at Paramakudi in connection with the Harijan Week Celebrations, from 28 to 31 January 77.

Seminar

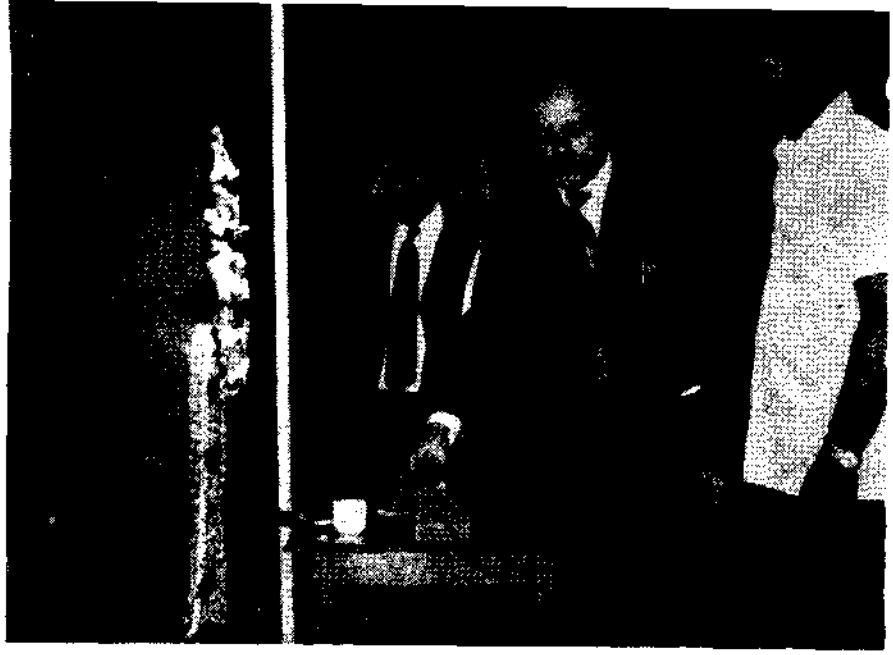
A seminar on 'Marine Algae' was held under the auspices of the Seaweed Research and Utilization Association of India at the Regional Centre of CMFR Institute, Mandapam, on 17-1-77. Papers by various scientists have been presented and discussed. Among them were papers presented by V. S. Krishnamurty Chennubhotla, S. Kalimuthu, M. Najimuddin and P. Selvaraj of the Regional Centre. The opinions of the various scientists were generally in favour of adopting measures for conserving the seaweed resources by preventing overexploitation.

Edible oyster....

(Continued from page 5)

marketable size, 100-110 mm in length, have been produced in the farm in less than 12 months, as against 15 months in the natural beds. Mortality rates which are normally as high as 25-30% naturally, have been brought down to less than a mere 5%. The percentage edibility (the weight of the edible portion expressed as a percent of total weight) which is a vital factor has, on the other hand, been considerably increased. In natural surroundings the weight of the meat of an average marketable oyster is 7.6 gm, forming about 6% of the total weight. Under cultured conditions this edibility factor was found to be enhanced to 8% (10 gm meat weight).

Further investigations are vigorously in progress to resolve problems such as evolving suitable methods for large-scale collection of spat both from nature as well as by developing hatcheries. The incidental problems like disease and predation are also being tackled. The detailed studies on ecological energetics — the transfer of energy from one food level to the other — in the farm, in relation to the natural surroundings, is also receiving attention to assess the production potential of the former. The scientists who are assisting Shri Nair are S|Shri S. Mahadevan, K. Ramadoss, M. E. Rajapandian, D. C. V. Easterson and D. Samuel.



Dr Swaminathan laying the keel.

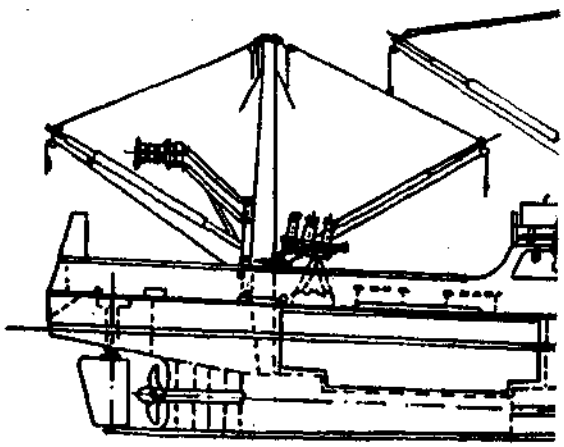
FISHERIES RESE

keel laid by Dr M. S. Swamina

Dr M. S. Swaminathan, FRS, Director General, ICAR, performed the formal keel-laying ceremony of the fisheries research vessel at the yard of M|s Garden Reach Shipbuilders and Engineers Ltd., Calcutta-24, on 26th February 1977 at 3.00 pm. While laying the keel, at a brief function attended by a distinguished gathering, the Director General said that Marine Fisheries Research which was taken over by ICAR as one of its programmes since 1967 has been making headway, but with a major handicap caused by the lack of a full-fledged research vessel of its own. This will, however, be overcome when this vessel is ready.

The vessel which will cost over one and a half crores of rupees will be owned by the Indian Council of Agricultural Research and will be used by Central Marine Fisheries Research Institute for biological- and fisheries-research purposes.

The vessel is designed for multiple type of fishing operations and research, e.g., trawling & purse seining and fisheries biological and environmental research. The vessel will be propelled by Controllable Pitch propulsion system

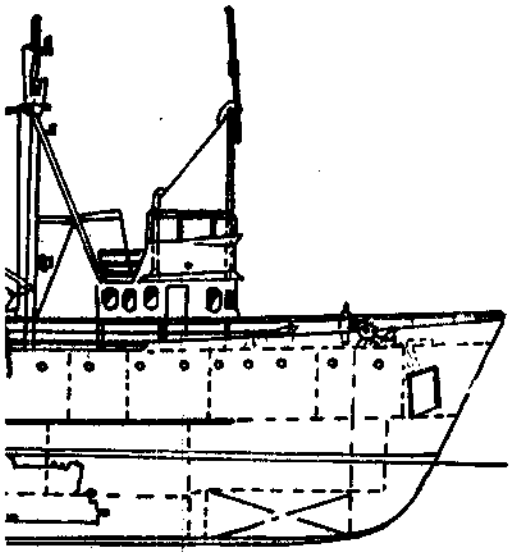


Main particulars of the vessel

Length O.A. ..	32.60 *metres*
Beam (Mld) ..	7.40 *metres*
Depth (Mld) to Main Deck	3.70 *metres*
Draft (mean) ..	2.70 *metres*

Below: (Left) Dr Swaminathan addressing the gathering. Seen on his left are Vice Admiral Kishen Dev and Dr Silas. (Middle) A view of the audience. (Right) Dr Swaminathan, Shri K.P. Singh and Dr Silas with Staff and Board Mem

.RCH VESSEL:



Speed (max.) .. 11 *knots*
Range (at economic cruising speed of 9 knots) .. 24 *days*
Complement:
Officers & crew .. 11
Scientists & Technicians .. 7

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allowing necessary speed variations for fishing operations and free running.

Memento: Vice Admiral Kishen Dev, Chairman, GRSE, presenting a silver plate to Dr Swaminathan, which is now kept at the Institute.

Above: Signing of the agreement by Shri K. P. Singh, Secretary, I.C.A.R. and Vice Admiral Kishen Dev.

of GRSE.

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CONTENTS

Also 14, short Notes.

SUBSCRIPTION RATE, PER ANNUAL VOLUME (Inclusive of forwarding charges):

Inland: Rs. 55-00 Foreign: US $ 7-00

Orders along with advance payment to be sent to The Director, CMFR Institute, P. O. Box 1912, Cochin 682018.

STAFF NEWS

Induction into Agricultural Research Service

All those scientific staff of the Institute who satisfy the minimum qualification and are holding the posts in pay-scale 425-700 and above are inducted to the cadre service. The initial constitution of the service is as follows:

Scientists in S grade

1. Shri N. Surendranatha Kurup
2. Shri N. Neelakanta Pillai
3. Shri G. P. Kumaraswamy Achari
4. Shri K. G. Girijavallabhan
5. Shri K. Y. Telang
6. Shri Kuber Vidyasagar
7. Shri G. Sudhakara Rao
8. Dr. P. A. Thomas
9. Shri D. B. James
10. Shri C. Suseelan
11. Shri K. N. Rajan
12. Shri V. Thangaraj
13. Shri R. Marichamy
14. Shri D. Sivalingam
15. Shri V. Kunjukrishna Pillai
16. Shri C. P. Gopinathan
17. Dr. P. Parameswaran Pillai
18. Shri M. Devaraj
19. Shri K. J. Mathew
20. Dr. M. K. George
21. Shri K.M.S. Ameer Hamsa
22. Shri R. Sarvesan
23. Shri P. Devadoss
24. Shri M. Sreenivasan
25. Dr. V. Sriramachandra Murty
26. Shri K. S. Sundaram
27. Shri K. Devarajan
28. Shri G. S. Daniel Selvaraj
29. Shri M. M. Meiyappan
30. Shri S. Muthusamy
31. Shri K. K. Appukuttan
32. Shri K. V. Somasekharan Nair
33. Shri Alexander Kuriyan
34. Shri T. M. Yohannan
35. Shri A. Charles Christian Victor
36. Shri A. Regunathan
37. Shri P. Livingstone
38. Shri K. K. Sukumaran
39. Shri D.C.V. Easterson
40. Shri R. Thiagarajan
41. Shri S. Shanmugham
42. Shri P. Natarajan
43. Shri P. Nammalwar
44. Shri K. Prabhakaran Nair
45. Shri P. V. Sreenivasan
46. Shri S. Lazarus
47. Shri A. A. Jayaprakash
48. Shri Mohammad Zafarkhan
49. Shri M. Kathirvel
50. Shri K. Rengarajan
51. Shri S. Krishna Pillai
52. Shri K. Narayana Kurup
53. Shri G. Nandakumar
54. Shri K. Ramadoss
55. Shri V. S. Rengaswamy
56. Shri M. Rajagopalan
57. Shri K. J. Joseph
58. Shri R. Soundararajan
59. Shri Y. Appanna Sastry
60. Shri N. Kaliaperumal
61. Shri Pon-Siraimeetan
62. Shri P. N. Radhakrishnan Nair
63. Smt. K. Vijayalakshmi
64. Smt. T. S. Naomi
65. Shri N. Gopinatha Menon
66. Smt. B. Prasanna Kumari
67. Dr. P. S. Kurjakose
68. Shri M. E. Rajapandian
69. Shri K. Balan
70. Smt. V. Chandrika
71. Shri I. David Raj
72. Shri C. V. Mathew

Scientists in S—1 grade

1. Dr. S. V. Bapat
2. Shri G. Venkataraman
3. Dr. M. J. George
4. Dr. G. S. Sharma
5. Shri K. Nagappan Nayar
6. Dr. B. Krishnamoorthi
7. Dr. B. T. Antony Raja
8. Dr. M. Vasudeva Pai
9. Dr K. Algarswami
10. Dr V. Balakrishnan
11. Shri K. Venkatanarayana Rao
12. Shri V. Balan
13. Dr P. V. Ramachandran Nair
14. Dr S. Ramamurthi
15. Shri M. Mydeen Kunju
16. Dr P. Vijayaraghavan
17. Dr N. Radhakrishnan
18. Dr (Mrs) P. V. Kagwade
19. Shri M. S. Muthu
20. Dr M.D.K. Kuthalingam
21. Dr P. Vedavyasa Rao
22. Shri M. Mahadevan
23. Shri C. Mukundan
24. Shri K. N. Krishna Kartha
25. Dr K. Radhakrishna
26. Shri C. P. Ramamirtham
27. Shri D. Sadananda Rao
28. Shri K. Rangarajan
29. Shri V. S. Krishnamurthy Chennubhotla
30. Shri M. H. Dhulkhed
31. Shri K. C. George
32. Dr K. Venkatasubha Rao
33. Shri G. Subbaraju
34. Shri N. S. Radhakrishnan
35. Shri G. Luther
36. Shri P. Bensam
37. Shri P. Sam Bennet
38. Shri V. M. Deshmukh
39. Dr K. Satyanarayana Rao
40. Shri M. S. Rajagopalan
41. Shri V. Ramamohana Rao
42. Shri A. Noble
43. K. A. Narasimham
44. Shri S. K. Dharmaraja
45. Shri J. C. Gnanamuttu
46. Shri V. N. Bande
47. Dr T. Appa Rao
48. Shri G. G. Annigeri
49. Shri S. Reuben
50. Dr M. M. Thomas
51. Shri R. S. Lal Mohan
52. Dr C. S. Gopinatha Pillai
53. Shri K. Dorairaj
54. Shri M. Kumaran

Scientists in S—2 grade

1. Dr. G. Seshappa
2. Shri K. H. Mohamed
3. Dr A. V. S. Murty
4. Shri T. Tholasilingam
5. Dr M. S. Prabhu

Scientists in S—3 grade

1. Dr E. G. Silas
2. Dr K. V. Sekharan

Direct Recruitment to the S-1 Grade Through ASRB

Shri G. Sudhakara Rao, 22-12-76

Shri Alexander Kuriyan, 18-12-76

Dr V. Sriramachandra Murty, 22-12-76

Shri P. V. Sreenivasan, 22-12-76

Shri G. Muthiah, 5-1-77

Shri A. Chellam, 22-12-76

Miss R. Padmini, 16-12-76

Shri E. V. Radhakrishnan, 23-12-76

Miss Gracy Mathew, 23-12-76

Shri G. Gopakumar, 30-12-76

Miss Mary K. Manisseri, 4-1-77

Dr E. Vivekanandan, 29-12-76

Shri M. Rajamani, 30-12-76

Shri Gonuguntla Syda Rao, 5-1-77

Shri Kakati Vithal Sankarrao, 7-1-77

Shri V. Thangaraj Subramanian, 15-1-77

Shri A. Lakshminarayana, 10-1-77
Shri P. Muthiah, 12-1-77
Shri N. Ramachandran, 12-1-77
Shri Sushanta Kumar Chakraborty, 14-1-77
Shri Madan Mohan, 15-1-77
Shri Deshmukh Vinay Dattatraya, 17-1-77
Dr S. Kulasekara Pandian, 29-1-77
Shri G. Mohanraj, 29-1-77

Direct Recruitment to S-2 Grade

Dr S. V. Bapat, S-1, as S-2 at Bombay, 27-12-76
Shri G. Venkataraman, S-1, as S-2 at Mandapam Camp, 20-12-76
Shri K. Nagappan Nayar, S-1, as S-2 at Tuticorin, 22-12-76
Dr P. V. Ramachandran Nair, S-1, as S-2 at Cochin, 18-12-76
Dr P. Vedavyasa Rao, S-1, as S-2 at Cochin, 20-12-76
Dr K. Alagaraja, S-1, as S-2 at Cochin, 30-12-76

Promotions

Shri S. Nagarajan, Junior Clerk, as Senior Clerk at Mandapam Camp, 4-12-76

Shri M. Velu, Junior Clerk, as Senior Clerk at Vizhinjam, 4-12-76

Shri K. Arumugham, Junior Clerk, as Senior Clerk at Cochin, 4-12-76.

Shri V. S. Subramanian, Junior Clerk, as Senior Clerk at Cochin, 8-12-76.

Shri M. Selvadhas, Senior Clerk as Assistant on ad hoc basis at Vizhinjam, 8-12-76.

Shri R. Kuppuswamy, Senior Clerk, as Assistant on ad hoc basis at Mandapam Camp, 8-12-76.

Shri K. Gopalakrishnan Nair, Senior Clerk, as Assistant on ad hoc basis, 6-12-76.

Shri K. Rama Naik, S.S. (Supporting Staff) Grade I, as S.S. Grade III at Mangalore, 4-12-76.

Shri M. Chinnasamy, S.S. Grade I, as S.S. Grade III at Mandapam Camp, 4-12-76.

Shri Soundararajulu, S.S. Grade I, as S.S. Grade III at Madras, 4-12-76.

Shri P. Alagarsamy, S.S. Grade I, as S.S. Grade III at Mandapam Camp, 4-12-76.

Shri Selvaraj Gomez, S.S. Grade I, as S.S. Grade III at Tuticorin, 4-12-76.

Shri H. Rajaram, S.S. Grade I, as S.S. Grade III at Mangalore, 4-12-76.

Shri H. Vasu, S.S. Grade I, as S.S. Grade III at Karwar, 4-12-76.

Shri C. V. Naik, S.S. Grade I, as S.S. Grade III at Karwar,

Shri V. Mohana Rao, S.S. Grade I, as S.S. Grade III at Waltair, 4-12-76.

Shri A. Raman, S.S. Grade I, as S.S. Grade III at Mandapam Camp, 4-12-76.

Shri M. Ibrahim, S.S. Grade I, as S.S. Grade III at Cochin, 4-12-76.

Shri N. Raveendranathan Nair, S.S. Grade I, as S.S. Grade III at Cochin, 4-12-76.

Shri M. Ramadassan, S.S. Grade I, as S.S. Grade III at Calicut, 4-12-76.

Shri N. Raveendran Andi, S.S. Grade I, as S.S. Grade III at Mangalore, 4-12-76.

Shri M. L. Antony, S.S. Grade I, as S.S. Grade III at Cochin, 4-12-76.

Shri K. K. Abdul Rahim, S.S. Grade I, as S.S. Grade III at Veraval, 4-12-76.

Shri K. Raju, S.S. Grade I, as S.S. Grade III at Calicut, 4-12-76.

Shri V. K. Krishnan Kutty, S.S. Grade I, as S.S. Grade III at Karwar, 4-12-76.

K. Kunju Kunju, S.S. Grade I, as S.S. Grade III at Minicoy, 4-12-76.

Shri K. Narasimhamurthy, S.S. Grade I, as S.S. Grade III at Waltair, 4-12-76.

Shri N. Vellaichamy, S.S. Grade I, as S.S. Grade III at Mandapam Camp, 4-12-76.

Shri K. Muthiah, LFA, as JSA at Panaji, 6-12-76.

Shri M. Najimuddin, LFA, as JSA at Mandapam Camp, 6-12-76.

Shri K. Balachandran, LFA, as JSA at Karwar, 8-12-76.

New appointments

Shri N. Thirupragasam Packiraj as LFA at Bombay, 21-9-76.

Shri T. A. Sankarankutty as Computor at Cochin, 12-10-76.

Miss P.L. Ammini as Computor at Cochin, 20-11-76.

Miss K. Santhakumari as computor at Cochin, 24-11-76.

Miss S. Girija Kumari as Junior Library Assistant at Cochin, 30-11-76.

Shri K. Santhi Prasad as Junior Clerk at Waltair, 8-11-76.

Shri K. Rama Naik, S.S. Grade III, as Junior Clerk at Cochin, 10-12-76.

Proforma Promotion

Shri P. Ramamurthi, Superintendent, now on other duty as Asstt Administrative Officer at the National Bureau of Soil Survey & Land Use Planning, Nagpur, as Assistant Administrative Officer on regular basis, 4-12-76.

Ad hoc Appointments Regularised

Shri L. Krishnaswamy as Stenographer at Cochin, 4-12-76.

Shri P. Muthu as Assistant at Mandapam Camp, 4-12-76.

Shri R.S. Guruvel now on other duty as Superintendent at the Sugarcane Breeding Institute, Coimbatore, as Assistant (on proforma promotion), 4-12-76.

Shri A. K. Balakrishna Pillai as Assistant at Cochin, 4-12-76.

Shri R. Narayanan as Assistant at Madras, 4-12-76.

Shri G. V. Pednekar as Assistant at Bombay, 4-12-76.

Shri V. Chemutty as Assistant at Calicut, 4-12-76.

Shri K. Maragathavadivelu as Senior Clerk, 4-12-76.

Shri B. Devadoss Puthran as Senior Clerk at Karwar, 4-12-76.

Shri R. Appa Rao as Senior Clerk at Waltair, 4-12-76.

Shri S. Jayachandran as Senior Clerk at Cochin, 4-12-76.

Shri V. Chandran as Senior Clerk at Cochin, 4-12-76.

Shri B. Koragu Naik as Senior Clerk at Mangalore, 4-12-76.

Shri S. Abdulla as Senior Clerk at Cochin, 6-12-76.

Transfers

Shri N. Thirupragasam Packiraj, LFA, from Bombay to Jamjira Murud.

Shri M. Jayachandran, LFA, from Bombay to Veraval.

Shri H. Kather Batcha, LFA, from Alibag to Janjira Murud.

Shri N. Gopinatha Menon, RA, from Mandapam Camp to Calicut.

Shri V. S. Rengaswamy, RA, from Calicut to Mandapam Camp.

Shri C. K. Krishnan, JSA, from Dahanu to Chowghad.

Shri S.R.C. Samuel, JSA, from Bombay to Cape Comorin.

Shri M. Sriram, JSA, from Jamnagar to Bombay.

Shri Sapan Kumar Ghosh, LFA, from Waltair to Junput.

Shri M. Gopala Prabhu, LFA, from Cochin to Goa.

Shri G. Surendranath, LFA, from Madras to Porto Novo.

Shri S. Subramani, LFA, from Madras to Srikakulam.

Shri Hameed Batcha, LFA, from Bombay to Dahanu.

Shri Savaria Yogesh Damodar, JSA, from Bombay to Veraval.

Shri K. B. Waghmare, JSA, from Bombay to Jamnagar.

Shri T. Chandrasekara Rao, LFA, from Junput to Ongole.

Shri K.V.S. Seshagiri Rao, JSA, from Srikakulam to Nellore.

Shri G. Balakrishnan, Technical Assistant, from Madras to Cochin.

Shri B. Bavanandam, Jr Clerk, from Cochin to Tuticorin.

Ad Hoc Appointments

Shri G. K. Kadalkar, Sr Clerk, as Assistant at Karwar, 20-1-77.

Shri N. Rajamuniswamy, Sr Clerk, as Assistant at Mangalore, 21-1-77.

Shri S. Subrahmanian, Sr Clerk, as Assistant at Cochin, 22-1-77.

Shri S. R. Narayanan, Sr Clerk, as Assistant at Tuticorin, 22-1-77.

Shri K. Kanakasabhapathy, Jr Library Assistant, as Sr Library-cum-Documentation Assistant at Cochin, 20-1-77.

Shri A. Muniswamy, S.S. Grade I, as S.S. Grade III at Tuticorin, 12-1-77.

Shri R. Nagan, S.S. Grade I, as S.S. Grade III at Colachel, 22-1-77

Shri R. Perumal, S.S. Grade I, as S.S. Grade III at Tuticorin, 28-1-77.

Shri J. Uthamanambi, Jr Clerk, as Sr Clerk at Cochin, 3-1-77.

Reliefs

Shri P. Ramamurthy, Officiating Administrative Officer, to take up the post of Assistant Administrative Officer at the National Bureau of Soil Survey and Land Use Planning, Nagpur, on deputation basis, 5-11-76.

Shri M. V. Soma Raju, JSA at Ongole, to take up the post of Marketing Officer at the Andhra Pradesh Fisheries Corporation on Foreign Service terms, 25-11-76.

Shri S. PL. Sethu, Officiating Superintendent, to take up the post of Assistant Administrative Officer at the Central Plantation Crops Research Institute, Kozhikode, on deputation basis, 23-10-76.

Shri R. S. Guruvel, Officiating Assistant, to take up the post of Superintendent at the Sugarcane Breeding Institute, Coimbatore, on deputation basis, 30-10-76.

Shri E. Dayanandan, Jr Clerk at Karwar, on resignation, 13-12-76.

Shri V.M. Dharmarajan, Jr Clerk at Cochin, on resignation, 31-1-77.

Appointments in connection with reorganisation of Technical Services

Shri P. Karunakaran Nair, Research Assistant, as Sr. Technical Assistant (T-4)

Shri K. V. George, Research Assistant, as Sr Technical Assistant (T-4)

Shri G. Balakrishnan, Research Assistant, as Sr Technical Assistant (T-4)

Shri Varughese Philipose, Research Assistant, as Technical Assistant (T II-3)

Shri T. Prabhakaran Nair, Research Assistant, as Technical Assistant (T II-3)

Shri U. K. Satyavan, Research Assistant, as Technical Assistant (T II-3)

Shri K. Rajasekharan Nair, Research Assistant, as Technical Assistant (T II-3)

Shri G. M. Kulkarni, Research Assistant, as Technical Assistant (T II-3)

Shri W. Venugopalan, Research Assistant, as Technical Assistant (T II-3)

Shri S. Srinivasarengan, Research Assistant, as Technical Assistant (T II-3)

Shri K. Ramachandran Nair, JSA, as Technical Assistant (T II-3)

Shri S. Kandasami, JSA, as Technical Assistant (T II-3)

Shri A. C. Sekhar, JSA, as Technical Assistant (T II-3)

Shri P. Sadasiva Sarma, JSA, as Technical Assistant (T II-3)

Shri P. Karunakaran Nair, JSA, as Technical Assistant (T II-3)

Shri P. K. Mahadevan Pillai, JSA, as Technical Assistant (T II-3)

Shri K.N. Rasachandra Kartha, JSA, as Technical Assistant (T II-3)

Shri R. Reghu, JSA, as Technical Assistant (T II-3)

Shri K. Ramakrishnan Nair, JSA, as Technical Assistant (T II-3)

Shri R. Bhaskaran Achari, JSA, as Technical Assistant (T II-3)

Shri N. Retnasamy, JSA, as Technical Assistant (T II-3)

Shri A.A.P. Mudaliar, JSA, as Technical Assistant (T II-3)

Shri K. C. Yohannan, JSA, as Technical Assistant (T II-3)

Shri T. Girijavallabhan, JSA, as Technical Assistant (T II-3)

Shri R. Guruswami, JSA, as Technical Assistant (T II-3)

Shri M. Babu Philip, JSA, as Technical Assistant (T II-3)

Shri A.A. Thankappan, JSA, as Technical Assistant (T II-3)

Shri K. Nandakumaran, JSA, as Technical Assistant (T II-3)

Shri N. P. Kunhikrishnan, JSA, as Technical Assistant (T II-3)

Shri R. Ganapathi, JSA, as Technical Assistant (T II-3)

Shri P. Ananda Rao, JSA, as Technical Assistant (T II-3)

Shri A. Chellam, JSA, as Technical Assistant (T II-3)

Shri M. V. Somaraju, JSA, as Technical Assistant (T II-3)

Shri M. Ayyappan Pillai, JSA, as Technical Assistant (T II-3)

Shri M. Barudeen, JSA, as Technical Assistant (T II-3)

Shri V. K. Balachandran, JSA, as Technical Assistant (T II-3)

Shri M. Mohamed Sultan, JSA, as Technical Assistant (T II-3)

Shri T. G. Vijaya Warrier, JSA, as Technical Assistant (T II-3)

Shri J.J. Joel, JSA, as Technical Assistant (T II-3)

Shri A. Hanumantha Rao, JSA, as Technical Assistant (T II-3)

Shri A. Bastin Fernando, JSA, as Technical Assistant (T II-3)

Shri C. V. Seshagiri Rao, JSA, as Technical Assistant (T II-3)

Shri V. Gandhi, JSA, as Technical Assistant (T II-3)

Shri S. G. Vincent, JSA, as Technical Assistant (T II-3)

Shri K. K. Balasubrahmanian, JSA, as Technical Assistant (T II-3)

Shri D. Narayanasamy, JSA, as Technical Assistant (T II-3)

Shri P. M. Aboobacker, JSA, as Technical Assistant (T II-3)

Shri K.V.S. Seshagiri Rao, JSA, as Technical Assistant (T II-3)

Shri S. Kalimuthu, JSA, as Technical Assistant (T II-3)

Shri A. Raju, JSA, as Technical Assistant (T II-3)

Shri D. Kandasami, JSA, as Technical Assistant (T II-3)

Shri K.N. Gopalakrishnan, JSA, as Technical Assistant (T II-3)

Shri E. K. Raveendran, JSA, as Technical Assistant (T II-3)

Shri S.B. Chandrangathan, JSA, as Technical Assistant (T II-3)

Shri G. C. Lakshmiah, JSA, as Technical Assistant (T II-3)

Shri I. P. Ebenezer, JSA, as Technical Assistant (T II-3)

Shri C. T. Rajan, JSA, as Technical Assistant (T I-3)

Shri S. Siddalingaiah, JSA, as Technical Assistant (T I-3)

Shri S. Manivasagam, JSA, as Technical Assistant (T I-3)

Shri S. Kunhi Koya, JSA, as Technical Assistant (T I-3)

Shri V. Suresh, JSA, as Technical Assistant(T I-3)

Shri K. Soman, JSA, as Technical Assistant(T I-3)

Shri R. Vasantha Kumar, JSA, as Technical Assistant (T I-3)

Shri C. K. Krishnan, JSA, as Jr. Technical Assistant (T-2)

Shri J. L. Oza, JSA, as Jr. Technical Assistant (T-2)

Smt. K. Koumudi Menon, JSA, as Jr. Technical Assistant (T-2)

Shri M. Shriram, JSA, as Jr. Technical Assistant (T-2)

Shri M. Vijayakumaran, JSA, as Jr. Technical Assistant (T-2)

Shri K.S. Krishnan, JSA, as Jr. Technical Assistant (T-2)

Shri K. Asokakumaran Unnithan, JSA, as Jr. Technical Assistant (T-2)

Shri P. Ramadoss, JSA, as Jr. Technical Assistant (T-2)

Miss S. Lakshmi, JSA, as Jr. Technical Assistant (T-2)

Shri S. K. Balakumar, JSA, as Jr. Technical Assistant (T-2)

Smt. C. Nalini, JSA, as Jr. Technical Assistant (T-2)

Shri P. Ramalingam, JSA, as Jr. Technical Assistant (T-2)

Shri S. Dharmaraj, JSA, as Jr. Technical Assistant (T-2)

Shri K. Tholasidas, JSA, as Jr. Technical Assistant (T-2)

Shri A. Ganapathi, JSA, as Jr. Technical Assistant (T-2)

Shri B. Narayana Rao, JSA, as Jr. Technical Assistant (T-2)

Shri C. Kasinathan, JSA, as Jr. Technical Assistant (T-2)

Shri Joseph Xavier Rodrigo, JSA, as Jr. Technical Assistant (T-2)

Shri K. Ramasomayajulu, JSA, as Jr. Technical Assistant (T-2)

Shri K. P. Viswanathan, JSA, as Jr. Technical Assistant (T-2)

Shri C. Thankappan Pillai, JSA, as Jr. Technical Assistant (T-2)

Shri Joseph Andrews, JSA, as Jr. Technical Assistant (T-2)

Shri K. Chittibabu, JSA, as Jr. Technical Assistant (T-2)

Shri S. Russel Conrad Samuel, JSA, as Jr. Technical Assistant (T-2)

Shri N. Jayabalan, JSA, as Jr. Technical Assistant (T-2)

Shri P. Radhakrishnan, JSA, as Jr. Technical Assistant (T-2)

Shri V. Selvaraj, JSA, as Jr. Technical Assistant (T-2)

Shri K. Dhanaraju, JSA, as Jr. Technical Assistant (T-2)

Shri V. A. Narayanan Kutty, JSA, as Jr. Technical Assistant (T-2)

Shri K. Muniyandi, JSA, as Jr. Technical Assistant (T-2)

Shri N. Sundaram, JSA, as Jr. Technical Assistant (T-2)

Shri S. Vijayabaskar, JSA, as Jr. Technical Assistant (T-2)

Shri V. Sivaswami, JSA, as Jr. Technical Assistant (T-2)

Shri N. Palaniswami, JSA, as Jr. Technical Assistant (T-2)

Shri K. Muthiah, JSA, as Jr. Technical Assistant (T-2)

Shri K. Ramadoss Gandhi, JSA, as Jr. Technical Assistant (T-2)

Shri T. Chandrasekhara Rao, JSA, as Jr. Technical Assistant (T-2)

Shri K. Balachandran, JSA, as Jr. Technical Assistant (T-2)

Miss K. Kanakagam, JSA, as Jr. Technical Assistant (T-2)

Shri D. Sundararajan, JSA, as Jr. Technical Assistant (T-2)

Shri D. Vincent, JSA, as Jr. Technical Assistant (T-2)

Shri J. R. Ramalingam, JSA, as Jr. Technical Assistant (T-2)

Shri M. Najmudeen, JSA, as Jr. Technical Assistant (T-2)

Shri K. B. Waghmere, JSA, as Jr. Technical Assistant (T-2)

Shri Y. D. Savaria, JSA, as Jr. Technical Assistant (T-2)

Shri G. Subrahmania Bhat, JSA, as Jr. Technical Assistant (T-2)

Shri Varughese Jacob, Computor, as Computor (T II-3)

Shri G. Krishnan Kutty Nair, Computor, as Computor (T II-3)

Shri P. Sivaraman, Computor, as Computor (T II-3)

Shri V. Rejendran, Computor, as Computor (T II-3)

Smt. V. P. Annam, Computor, as Computor (T II-3)

Smt. P.R. Krishnakumari Amma, Computor, as Computor (T-2)

Shri A. Kanakkan, Computor, as Computor (T-2)

Shri S. Haja Najemuddin, Computor, as Computor (T-2)

Shri C. J. Prasad, Computor, as Computor (T-2)

Shri T. A. Sankaran Kutty, Computor, as Computor (T-2)

Miss P. L. Ammini, Computor, as Computor (T-2)

Miss K. Santhakumari, Computor, as Computor (T-2)

Shri C. Balasundaram, LFA, as Jr. Technical Assistant (T-2)

Shri L. Jeyasankaran, LFA, as Jr. Technical Assistant (T-2)

Shri L. Chidambaram, LFA, as Jr. Technical Assistant (T-2)

Smt. C. M. Allikunju, LFA, as Jr. Technical Assistant (T-2)

Shri A. Deivandra Gandhi, LFA, as Jr. Technical Assistant (T-2)

Shri O.M.M.J. Habeeb Mohamed, LFA, as Jr. Technical Assistant (T-2)

Shri M. Selvaraj, LFA, as Jr. Technical Assistant (T-2)

Shri S. K. Karunakaran, LFA, as Jr. Technical Assistant (T-2)

Shri R. Thangavelu, LFA, as Jr. Technical Assistant (T-2)

Shri A. Srinivasan, LFA, as Jr. Technical Assistant (T-2)

Shri T. S. Balasubrahmanian, LFA, as Jr. Technical Assistant (T-2)

Shri V. Thanapathi, LFA, as Jr. Technical Assistant (T-2)

Shri M. R. Arputhraj, LFA, as Jr. Technical Assistant (T-2)

Shri H. Kather Batcha, LFA, as Jr. Technical Assistant (T-2)

Shri M. M. Sapre, LFA, as Jr. Technical Assistant (T-2)

Shri K. Ramachandra, LFA, as Jr. Technical Assistant (T-2)

Shri S. Palanichamy, LFA, as Jr. Technical Assistant (T-2)

Shri M. Gopala Prabhu, LFA, as Jr. Technical Assistant (T-2)

Shri S. Seetha Raman, LFA, as Jr. Technical Assistant (T-2)

Shri M. Jayachandran, LFA, as Jr. Technical Assistant (T-2)

Miss K. Umakumari, LFA, as Jr. Technical Assistant (T-2)

Shri N. S. Viswanath, LFA, as Jr. Technical Assistant (T-2)

Shri Sapan Kumar Ghosh, LFA, as Jr. Technical Assistant (T-2)

Shri Hameed Batcha, LFA, as Jr. Technical Assistant (T-2)

Shri G. Surendranath, LFA, as Jr. Technical Assistant (T-2)

Shri S. Subramani, LFA, as Jr. Technical Assistant (T-2)

Shri N. Thiruprakasam, Packiaraj, LFA, as Jr. Technical Assistant (T-2)

Shri K.L.K. Kesavan, Artist, as Artist (T-2)

Shri K. Muniyandi, Artist, as Artist (T-2)

Shri M. A. Vincent, II Class Driver, as Driver (Boat) (T-1)

Shri M. Musthaffa, Serang, as Driver (Boat) (T-2)

Shri A. Pathrose, Serang, as Driver (Boat) (T-2)

Shri S.G. Kalgutkar, Serang, as Driver (Boat) (T-2)

Shri S. Mohammed Shaffee, Bosun, as Bosun (T I-3)

Shri P. Ferozkhan, Bosun, as Bosun (T I-3)

Shri K. K. Prabhakaran, Cook (Boat), as Cook (Boat) (T-1)

Shri E. Sivanandam, Cook (Boat), as Cook (Boat) (T-1)

Shri C. K. Dandapani, Serang, as Serang (T-1)

Shri C.M. Jainulabdeen, Serang, as Serang (T-1)

Shri K. Kanakasabhapathi, Sr. Library Assistant, as Sr. Library Assistant (T II-3)

Shri E. Johnson, Jr. Library Assistant, as Sr. Library Assistant (T II-3)

Miss S. Girija Kumari, Jr. Library Assistant, as Jr. Library Assistant (T-2)

Shri M. Alagarsamy, Motor Driver, as Motor Driver (T-2)

Shri K. Karuppaiah, Motor Driver, as Motor Driver (T-2)

Shri P. C. Appukuttan, Motor Driver, as Motor Driver (T-2)

Shri A. Kondan Cheftiar, Motor Driver, as Motor Driver (T-2)

Shri K. P. Velu, Motor Driver, as Motor Driver (T-2)

Retirement

Shri P. Nagan, Fieldman at Tuticorin, retired after completing 22 years of service at the Institute, 30-9-76.

Weddings

Kumari P. K. Sreedevi, Jr Clerk at Cochin, with Shri Vasudevan, on 13-11-76 at Trichur.

Shri K. Nanda Kumar, Technical Assistant at Cochin, with Kumari Ambika, on 17-11-76 at Guruvayur Temple.

Kumari K. Kaumudi Menon, JSA at Calicut, with Shri Gangadharan, on 30-1-77 at Calicut.

Shri K. K. Appukuttan, Scientist at Vizhinjam, with Kumari Radhamani, on 5-2-77 at Quilon.

Land for Laboratories

The Institute has acquired 7.33 acres of land at Karapad near Tuticorin for constructing permanent laboratory buildings and residential accommodation for Tuticorin Research Centre. The land was formerly owned by the Karapad Salt Factory.

At Waltair too a land covering 1.2 acres has been acquired by the Institute, to house the permanent laboratories of its Waltair Centre. The land situated in the Andhra University Campus has been taken on lease from the University. There is also a proposal for further acquisition of lands to accommodate residential buildings.

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I, K. N. Krishna Kartha, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Sd/-

K. N. Krishna Kartha

Publisher, CMFRI Newsletter

Date: March 1977

Grand Kathakali performance

The Institute jointly with the Central Institute of Fisheries Technology staged a well-attended entertainment programme at the CIFT premises on the evening of 5-11-76 in connection with the ICAR Directors' meet. There were a number of items, like Bharata Natyam and other classical dances, which received the ovation of the learned audience. Among these was a spectacular Kathakali dance by Shri Unnikrishnan, a research scholar at the Institute working for his doctorate who took up Kathakali as a hobby and underwent the traditional early training in this arduous dance course. With systematic training Unnikrishnan has attained a high standard of performance in this classical dance and has appeared on stage on many occasions along with professional artists.

Unnikrishnan as Ravana. Appearing in the role of Rambha is the guest-artist Kum. Sujatha.

Our Library...

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OBITUARY

We record with profound grief the sudden demise of Dr Karimpana Vayalil Sekharan, M.Sc., Ph.D., Scientist S-3, on the evening of Friday, 25th of March 1977.

Dr K. V. Sekharan who was heading the Fishery Biology Division since his appointment as Senior Fishery Scientist on June 2, 1972, joined the Institute on 4-12-1951 as a Research Assistant. He was promoted to Assistant Research Officer on 19-7-57. On 9-10-63 he was appointed in the post of Junior Fishery Scientist. Subsequently, he was on foreign service as Professor of Fisheries at the University of Agricultural Sciences, Bangalore, during 30-6-70—1-6-71 and at University of Calicut, during 2-6-71—1-6-72. While he was JFS, he was also officiating as Officer-in-charge of our Centres at Mangalore, Cannanore, Waltair and Vizhinjam.

Dr Sekharan, who has since become well-known in the field of fishery biology, started his service in the Institute with his work on the biology and fishery of lesser sardines at Mandapam. Later he took up investigations on the oil sardine of the Kerala coast and mackerel of the South Kanara coast, and resolved many problems relating to these important pelagic fisheries. His papers on their population dynamics have raised him to the calibre of an international scientist. Besides being responsible for building up a strong fishery biology division in the Institute, he had also been instrumental in drawing up syllabi for Fisheries Biology for graduate and postgraduate courses for different universities who have Fisheries Science on their curriculum.

Dr Sekharan, 52, leaves behind his wife, son and daughter. In a tribute paid to his memory, the staff of the Institute resolve to carry forward his aspirations under the path-finding light kindled by him. The fond memory of his will be cherished by the staff of the Institute.

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Pictorial Encyclopedia of Fishes	..	S. Frank
Icthyology	..	Karl F. Lagler etc.

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