ICAR

# CMFRI newsletter

Number 6 April - September 1977

## BLENDING SEA FARMING WITH TRADITIONAL CAPTURE FISHERIES: A NEW CONCEPT

As a result of intensive managerial and research programmes, our marine fisheries gained admirable development through the past 30 years. Since our independence, marine fish production has increased nearly three-fold. This increase is mostly reflected on the export sector — from 15,705 tonnes valued at Rs. 391 lakhs in foreign exchange in 1961, the export has mounted to 62,151 tonnes valued at Rs. 17,986 lakhs in 1976. Many fish-processing and export industries have since got established, so also net-work of ancillary industries for boat building, fish-net manufacturing, and so on.

Nevertheless, the benefit of this development has not reached the million-and-odd active fishermen in the small-scale indigenous fisheries sector, whose per-capita income hardly improved through these years. Consequently, over three million, representing about 0.6% of our population, still live below the poverty line. This sad state of affairs is inspite of our hitherto accomplished programmes of mechanising a large number of fishing boats, supplying synthetic nets and net materials, salts and ice and providing improved facilities for handling fish, their transportation, distribution and marketing. The reason for this snail-slow progress of their economic conditions is to an extent due to their conservative nature and high rate of illiteracy still existing. They are not as yet very enthusiastic to change their traditional fishing methods, which is apparent from the fact that crafts and gears of age-old design, with considerable operational limits, are still in vogue, side by side with the most sophisticated ones in many parts of the country. However, modernisation of these fishing means and methods, which is possible only step by step due to many inherent problems, will not alone help solving the situation.

In a developing country like ours, any fishery programme should have in its priority finding ways and means of increasing production, improving rural economy, and developing large-scale employment opportunities. Marine fish production can be increased (a) by exploiting new resources; (b) by increasing the exploitation of the under-exploited resources; (c) by culturing suitable species in congenial environments. As it is the case in all of the developed and most of the developing countries, our major fishery resources are already under the stress of a level of fishing pressure beyond which it is not possible to exert any further without the risk of overfishing and depletion. New resources were discovered and their potentialities and characteristics were made known, based on which it had been possible to evolve suitable technology for their exploitation and utilisation. Expansion of the fisheries in the deepsea area alone still remains to be achieved, which, however, requires great capital input and, therefore, may not help bringing an immediate solution to the present problem.

Aquaculture, not only in fresh water, but also in the coastal saltwater and marine environments, has since gained world-wide approval as a quick method of increasing fish production. Realising its importance, the Institute took up series of investigations on the technical feasibility of mass-

culture of marine and brackishwater fishes, prawns, mussels, oysters and seaweeds, as a result of which, many a simple indigenous technique was evolved for their cultivation. Without much complicated management procedures, culture of species such as mullets and milkfish, with a production rate of 857.5 Kg|ha|annum, was made possible on a demonstration-basis. Eight of our commercially important prawns have been successfully reared from egg to marketable size under controlled conditions. It has also been demonstrated that by intensive culture of some of these species on scientific lines it would be possible to raise them at a rate of 1 to 1.5 thousand|kg|ha|annum, valued at Rs. 35000 to 50000. Fast-growing mussels have been mass-cultured on simple structures, even in open coastal waters, with an estimated yield, valued at Rs. 1.5-2 lakhs|ha|annum. It has been proved that, using very simple means, seaweeds can be cultivated with great economic advantage. The Institute is at present providing training to rural fishermen through short-term courses, based on the principle of 'learning while doing', in the culture of all these organisms.

Aquaculture can be carried out, without high expertise or huge capital inputs, as a profitable family avocation of the fisherfolks, during their leisure hours. Generally the fishermen leave for fishing early in the morning and return in the afternoon. Seldom do they venture a second trip, so that there will be plenty of time available for this occupation. Moreover, it is seen that all fishermen do not go for fishing the same day. Thus there will be some job-free men always. Women and children, with a little training can also be usefully engaged in such jobs as seed collection and day-to-day tending of the farms. Thus it is conceived that the blending of culture fisheries along with the normal capture fisheries would greatly help to enhance the production and earnings of the rural fishermen.

An operational research project on this basis is being drawn up for immediate implementation in some of our selected fishing villages. The first to be selected for this purpose is Kovalam, a fishing village 35 km south of Madras. The Institute has a field laboratory established in this village for carrying out investigations on the feasibility of mass-culturing mussels and prawns. As the project site is located very near this laboratory, the transfer of technology will be quick and effective.

Kovalam has 175 families comprising a total population of 975 fishermen. The per-capita income is Rs. 369|- per annum, the source of income being fishing.

The project has the following defined objectives:

1. To establish the possibilities of supplementing traditional fishing with mariculture in order to increase production and improve the socio-economic conditions of the fisherfolk.

2. Demonstrating the feasibility for the culture of mussels and other organisms such as prawns, fish, seaweeds etc. on large scale by transferring the technology available with the Institute.

3. To create sense of involvement and participation among local fishermen in this project by associating them from its initial stages so that the venture becomes self generating and will equip them to sea farming along with their traditional fishing.

4. To demonstrate the scope for overall improvement of the socio-economic conditions of the area through development of infrastructure for processing, marketing and better methods of utilisation.

5. To assess the direct and indirect impact of the project in the area, in comparison with the socio-economic conditions that existed prior to the implementation of the project.

The project is proposed to be taken up in a phased manner.

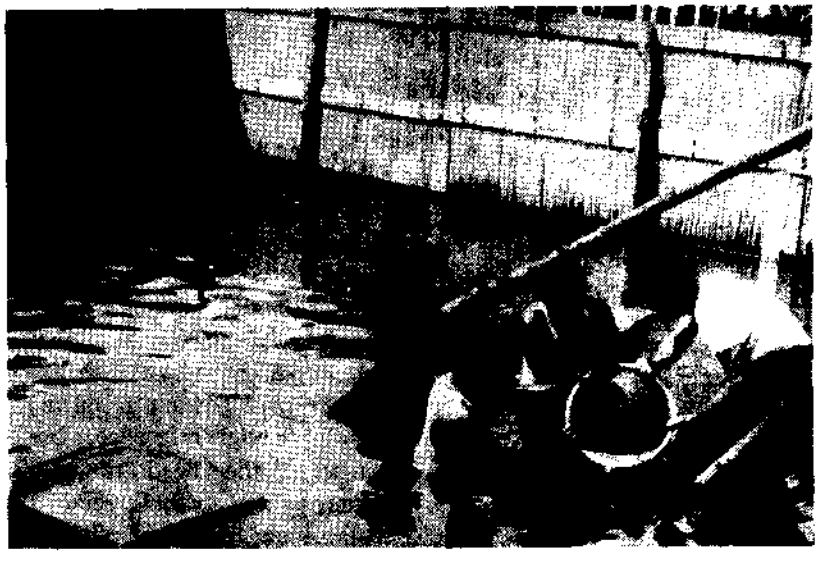
As the integrated development of fisheries by blending capture and culture fisheries for rural development is a new concept in the marine fisheries sector, the benefits accruing from the project is only an estimation at present. However, it is hoped that it would make a real impact bettering the rural economy. The success of this concept largely depends on the interest and involvement of the fishermen who will have to be induced to take up this venture and their interest sustained. To this direction, it is essential to provide the required assistance and incentives to the fishermen to meet the additional expenditure at least in the initial stages. Continuing rural development depends on the integrated action and co-operation of the technologists planners and financial institutes, besides the actual users.

DR. E. G. SILAS
DIRECTOR, CMFRI

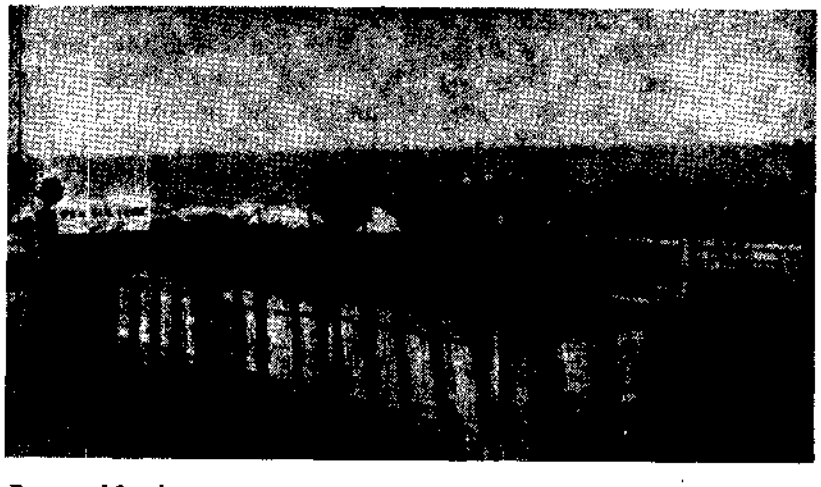
# PEN CULTURE

It is now well-known to aquaculture scientists that if suitable farming methods are introduced the extensive stretch of our coastal waters, lagoons, backwaters and marshes is capable of producing equal if not more food than the same area of land itself. It is therefore very appropriate that our scientists today turn much of their attention to this comparatively new field of development. Farming the protected backwaters and lagoons is easier to accomplish. But attempts to farm the more turbulent waters of the bays and open coasts often peter out in failure because of the unpredictable vicissitudes typical of these regions owing to the tidal and monsoon influences. Nevertheless, the need to meet this challenge should not be underrated since these areas can undoubtedly produce large quantities of food annually, which is in ever-growing demand for our protein-hungry population.

Efforts to cultivate the sedentary animals and plants on floating rafts and such structures in the bays and even in the open sea have been remunerative, and encouraged by these results, the Institute is now venturing large-scale farming of such species as mussels and oysters in some of our coastal regions. But farming the actively swimming fishes is entirely another matter, because the problems confronted are generally multifarious. Although we have in India species like milkfish and mullets, which are no less viable to cultivation than the popular yellowtails of Japan, the selection of methods that are suitable for stocking and rearing them in conditions characteristic to our coasts had been time-consuming. To construct suitable impoundments that would endure the numerous fouling organisms and above all the impact of tides and waves was an ardous task, not to mention the high costs involved.



*Releasing milkfish fry in pen*



*Pen at Mandapam*

In this context, the evolving of a pen that is suitable for the shallow bays of Mandapam and Tuticorin is a notable achievement. The pen is not only capable of withstanding the monsoon waves, but also economical. It is simple in design. The enclosure is built of double-layered, seasoned

split-bamboo screens which are fastened together with straps. The number of screens going into the making of a pen varies with the size of the pen. The pen is generally square with an enclosed area of up to 200 sq. m. The whole structure is propped well with casurina poles. All the materials are coated with coaltar along their submersible portion and with kriside above. A number of pens are built adjacent to one another in a row, the number depending upon the available area.

Such closed pens naturally necessitate stocking of the fry gathered from elsewhere. Yet, this is an improvement over the other alternative of keeping the pens occasionally open by providing gates and letting the tidal currents bring fry to the pen, which is disadvantageous in that many a few unwanted fishes which are potential competitions for food and harmful predators are brought in along with the desired species.

The pens are designed for culturing primarily the large-growing, white-fleshed milkfish, *Chanos chanos*. Even-though the fish has a very wide distribution along our coasts, this species does not breed in captivity. But they profusely breed in the inshore waters so that the fry are available in abundance close inshore, particularly during certain months. It grows fast and attains a size of over a kg in a year. The fish is tolerant to great changes in salinity and temperature. Being a herbivore it has no cannibalistic tendencies and, therefore, a large number can be stocked in a pen. The fish is an algal feeder. If sufficient care is taken to maintain adequate algal growth, it requires no supplemental feeding and 2 to 3 harvests are possible in a year. As the farming depends upon fry collected from the littoral waters, there is the possibility of developing accessory industries for the collection of fry in which trained women and children can be employed, as is the case in Philippines, Thaiwan and Indonesia where milkfish farming is a very lucrative industry.

The pen is also suitable for culturing other species like mullets and prawns. Further investigations are on the way to assess the economic feasibility of the project, under the leadership of Shri G. Venkataraman and Shri Shanmugham, Scientists of Mandapam Regional Centre, and Tuticorin Research Centre respectively. Shri Ameer Hamsa and Shri P. Nammalwar assist Shri Venkataraman.

## Indian Ocean Fishery Commission Meet at Cochin

The Indian Ocean Fishery Commission, a regional commission of the FAO, formed in 1967 and first met in 1968, is having its Vth meeting at Cochin between 19 and 26 October. The Commission was constituted (a) to promote, assist and coordinate national programmes over the entire field of fishery development and conservation; (b) to promote research and development activities in the area through international source, and in particular international aid programmes; (c) to examine management problems with particular reference, because of the need to take urgent action, to those relating to the management of offshore fisheries. IOFC has many Member nations, most of which are Indian Ocean countries, including India. This is the first of its sessions to be held in India.

In connection with the Meeting, a general organising committee and several subcommittees have been constituted by the Government of Kerala. Director, CMFRI, is a Member of the Conference Session subcommittee and is the Convener of the Souvenir subcommittee. A document of high standard, covering three decades' progress of Indian fisheries, is proposed to be brought out on the occasion, of which Director, Dr Silas, is the chief editor. Under agenda 8 of the meeting, on 'National and regional effects of an extended zone of jurisdiction of fisheries', the Director is invited as an Expert, to introduce the subject on the present knowledge of Indian Ocean Resources.

The session will be inaugurated by Shri A. K. Antony, Chief Minister of Kerala at a meeting presided over by Shri G. V. K. Rao, Secretary to the Government of India (Agriculture) at the Kerala Fine Arts Hall, Ernakulam, at 10.00 A.M. on 19-10-77. The rest of the sessions will be held at the CIFT auditorium, Cochin.

# Beche-de-mer

Beche-de-mer is a food product prepared from the body wall of the sea cucumbers, the sausage-shaped marine animals of the scientific class Holothuroidea. These animals, which themselves are at times referred to as beche-de-mer, are close relatives of the sea urchins and starfishes common in our coral reefs. After the viscera are removed, these animals are processed and dried, or smoked, and are ready for market. Beche-de-mer soup is very much relished in China and throughout eastern Asia. This protein-rich item is of late a gourmet item in many of the western countries. India is now earning a foreign exchange of about 20 lakhs Rupees by exporting this product.

*Freshly harvested sea cucumbers*

Beche-de-mer was almost unheard of in Andamans and Nicobar prior to 1975, when the Institute's Centre at Port Blair took steps to introduce the exploitation of this resource. As a result, last year alone, about 10 tonnes of it, valued at one lakh rupees, were sent to mainland for exportation. As there is a growing demand from the exporters, mainly from Bombay and Tuticorin, there is plenty of scope for expansion of this fisheries. At present there are about 40 species of holothurians in the Andaman and Nicobar islands. Of these, however, there are only half a dozen which are commercially important. These yield high quality beche-de-mer.

The sea cucumbers are highly practical for farming, because of their advantageous habits. Their movements are highly restricted since they are very slow-movers. They grow fast. Young ones can be collected in plenitude and can be stocked on mudflats. When these mudflats are exposed in low tides the animals seek protection by burying themselves in mud. There is practically no feeding problem since the animals are detrite feeders. The Institute is presently putting in efforts to this type of farming experiments, under the able supervision of Shri D. B. James, Scientist of Port Blair Centre.

## Pearl oyster reported from Calicut

The occurrence of the pearl oyster, *Pinctada fucata*, is reported from Calicut. While harvesting mussels in the farm, Dr P. S. Kuriakose collected a number of these oysters found settled on the culture ropes. The oysters were in the size range 8-55 mm. This is the first report of the species from this region. Their occurrence in this area is of interest in the context of the present efforts of the Institute to extend pearl culture, which is at present confined to limited areas like Tuticorin and Vizhinjam, to other centres where it is unknown.

## ICAR Research Complex

The administrative and managerial control of ICAR Research Complex, Port Blair, Andamans, has been transferred to CMFRI with effect from 1st April 1977.

## Open-sea green mussel culture proves profitable

From the overall experiments conducted at Calicut over the past one-and-half years, it has been seen that green-mussel culture on suspended substrata in the open coastal waters is economically feasible.

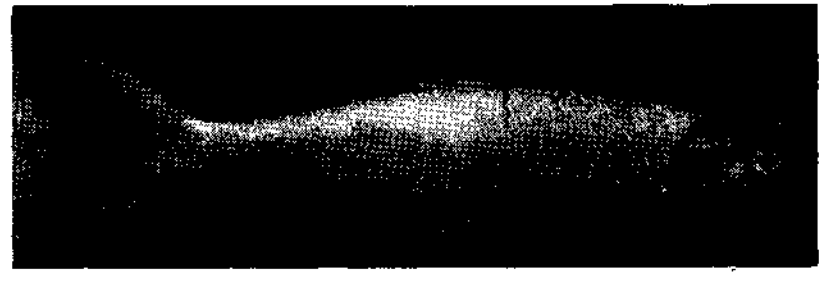
Encouraged by the results of the earlier experiments, 10 rafts covering an area of 450 sq. m were moored in the open sea, 4 km off Calicut. A total of 533 8-m ropes, each seeded with about 4 kg of spats, were suspended from the rafts in November 76. A fast rate of growth — an average of 12 mm per month — was observed during the following months. However, due to the fast-adding weights, some of the oil barrels which were being used as floats were unable to withstand the inclement SW monsoon and as a result, 357 of the ropes were lost along with the growing mussels. The remaining 176 ropes produced a total of 6.2 tonnes of mussels at the time of the harvest in May 77, 6 months after seeding. The average production was 35 kg per 8-m rope. At this rate of production, the lost ropes if included, the total yield would have been approximately 20 metric tonnes. The percentage edibility was 52. Estimating at this rate the total meat produced works out to roughly 10.4 metric tonnes from a meagre 450 sq. m area, in only half a year! However, these results are being tested by further-intensified experiments. The green mussel culture work at Calicut is being handled by Dr P. S. Kuriakose.

*Harvested mussels*

## New Project

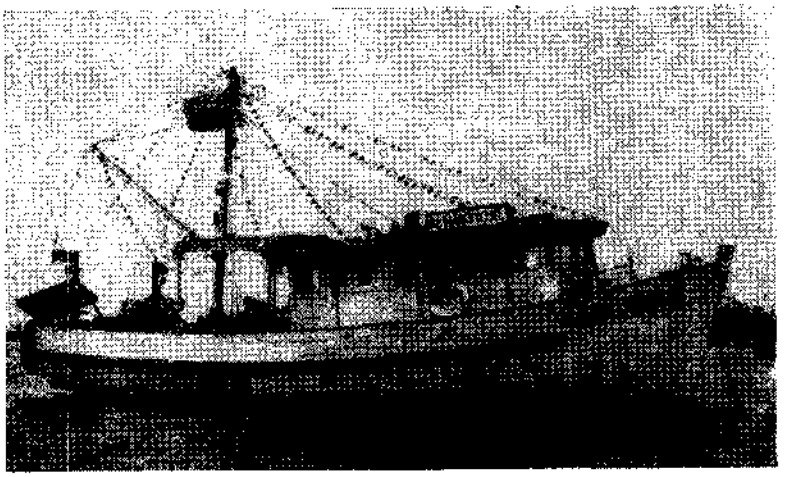
The Institute has drawn up a new project on induced breeding of *Chanos chanos*, the favourite fish for culture, particularly along the east coast. As the fish do not breed in captivity the culture is at present depending on fry collected from the wild, the occurrence of which is seasonal according to the breeding periodicity of the fish. Therefore, if it is possible to induce the fish to spawn in captivity, as is anticipated, the culture of milkfish will be on a new footing.

The project centre is Mandapam, where detailed experiments on induced breeding by pituitary injections will be carried out in culture pens, under the leadership of Dr Silas, Director. Shri G. Venkataraman will be the associate.



*Milkfish*

# Cadalmin II



Dr M. S. Swaminathan, Director General, ICAR, has formally inaugurated the Institute's 43½-foot Research Vessel, Cadalmin II at Mandapam Camp on 5 June. The vessel built by the Tamil Nadu State Fisheries Development Corporation at the Mandapam Boat Building Yard is fitted with a 88 BHP Ashok Leyland marine engine, a mechanical winch and a Simrad Echo Sounder. The vessel, designed for conducting exploratory demersal fishing and environmental investigations, has a small laboratory and capacity to accommodate seven persons including scientists.

Cadalmin II is at present engaged in exploratory fishing in Palk Bay and Gulf of Mannar under the supervision of Mandapam Regional Centre.

*Dr. Swaminathan switches on the engine of Cadalmin II*

**Pen Culture at new centres**

Pens have been erected at Kovalam (Madras) and Mulki (Mangalore) farms of the Institute and at a selected site in the Vembanad Lake, Cochin, for experimental culture, mainly of the milkfish and *Sillago*.

**Aquarium for Calicut Research Centre**

A partially-closed marine aquarium is established at the Calicut Research Centre. Sea water is pumped to tanks kept at high level from which regular circulation is maintained to various aquarium tanks. The aquarium is being used for stocking and rearing experiments.

**Challenger Report**

The complete Report on the Scientific Results of the Voyage of H.M.S. Challenger during 1872-76 is now added to the Institute's headquarters library. The report, originally published in 1895 and reprinted in 1965, is in 50 volumes.

## One More Feather in the Cap

Yet another breakthrough in marine prawn culture is achieved by the Institute when at its farm at Kovalam, Madras, it was possible to spawn and successfully rear the high-priced *Penaeus semisulcatus*. Gravid females collected from fishing grounds off Madras by Shri S. J. Rajan and transported to Kovalam field laboratory have spawned under controlled conditions, each of them releasing an estimated 2-2.5 lakhs of viable eggs. Within a few hours of spawning, the eggs have hatched into active nauplii. The larvae were reared by providing with suitable food and environment, to stockable postlarvae. The entire operation took only a fortnight.

*Penaeus semisulcatus*, which is referred to as 'Flower Naran' in our export terminology, is called *Valayamotyera* in Tamil Nadu where it is abundant and most sought-after. The prawn has been proved practical for farming, but had the erstwhile draw back, which is common to many other cultivable marine animals, that the young ones had to be collected from the wild at every time of stocking. The success arrived at in the present experiments is therefore an important stride in Indian mariculture.

Director Dr Silas in a press release has referred to this achievement as "an important milestone in the road to perfecting methods of mass-culture of commercial marine prawns of the country, at which goal much of the Institute's present efforts are aimed." He said that with this achievement in 'artificial' rearing of *P. semisulcatus*, we have evolved an indigenous technology of breeding and mass-culture of all our commercially important marine prawns, which will offer the base for a vastly developed industrialised cultivation of marine prawns in India.

The work on breeding and rearing of prawns at Kovalam, Madras has been chiefly handled by Shri K. Rengarajan, Shri K. Devarajan and their colleagues Shri S. Nayagam and Shri V. Selvaraj.

## Achievement Audit Committee at Kovalam

*Dr. Natarajan (left) and Dr. P.N. Ganapati examining the mussels cultured at the farm. Shri T. Tholasilingam, O.I.C., Madras Centre is also seen*

# TRAINING OFFERED

## Pearl culture

The second batch consisting of eight trainees completed the Pearl Culture Training Course offered by the Institute at Tuticorin. The trainees, deputed by the maritime states of Tamil Nadu, Karnataka and Maharashtra, underwent a 5-week intensive training in methods of oyster farming and production of pearls.

The valedictory function was held at Tuticorin Research Centre on 23 September, which was attended by the members of the present Achievement Audit Committee for the Institute. While welcoming the guests, Dr Silas stated that the Institute, which has since developed the technical know-how in several fields of sea farming, is keen on conducting similar training courses in coastal aquaculture so that the results of research will be carried soon to the end-users. Besides the two established training courses now being offered by the Institute, one in pearl culture at Tuticorin and the other in prawn culture at Cochin, it is intended to offer a course of training also in edible-oyster culture and underwater surveys by using SCUBA.

Dr P. N. Ganapathi, Chairman of the Achievement Audit Committee, in his valedictory address, congratulated the Institute for the work done on pearl culture. He hoped that this expertise would soon be transferred to the field of commercial production. Referring to aquaculture in general he said that there is vast potential for developing this in our coastal waters, lagoons estuaries and backwaters, and the production rate in these areas might be equal to that of the food crops on land.

Shri K. Chidambaram observed that in India natural-pearl fisheries have come to be only of academic interest during recent years. He was glad that CMFRI has not only succeeded in developing the technical know-how of cultured-pearl production, but also extends this know-how to the States through training courses. Commercial operations would now depend on the interest evinced by the States.

Prof. R. Natarajan of Annamalai University suggested that such vocational training courses may be offered as a routine to the postgraduate students of universities so that they will gain field and working experience in specialised areas. He also suggested the need for more interaction between the academic and professional scientists for their own mutual benefits.

Dr Prem Narain, IARS, also spoke. Dr Alagarswami presented the report and Shri Nagappan Nair gave the vote of thanks.

Those who underwent the training are:

1. Shri Anil Madhav Ranade, Marine Biological Station, Konkan Krishi Vidyapeeth, Ratnagiri.
2. Shri H. Umesh Shetty, Dept of Fisheries, Karnataka.
3. Shri B. M. Rajagopal, Dept of Fisheries, Karnataka.
4. Shri D. Gunalan, Dept of Fisheries, Tamil Nadu.
5. Shri M. R. Venkatanarayanan, Dept. of Fisheries, Tamil Nadu.
6. Shri V. A. Narayanankutty, CMFRI, Cochin.
7. Shri B. Narayana Rao, CMFRI, Waltair.
8. Shri P. Ramadoss, CMFRI, Calicut.

*The Scientists and pearl-culture trainees of Tuticorin Centre with the Achievement Audit Committee. Sitting: (from left), Dr R. Natarajan, Dr Silas (Director, CMFRI), Dr P. N. Ganapati, Mr. Chidambaram and Dr Prem Narain.*

## Summer Institute in breeding and rearing of marine prawns

A summer institute in breeding and rearing of marine prawns was conducted at Cochin between 11 May and 9 June, under the directorship of Director Dr Silas. The Institute was attended by 16 participants sponsored by the various state governments, universities and other institutions. The programme of the Institute included lectures in taxonomy, biology and ecology of the cultivable species of marine prawns and practical demonstrations and training in the collection of the spawners, their identification, transportation, breeding under controlled conditions and rearing of eggs and early larvae. Besides, the participants were also familiarised with the various aspects of industrialised farming.

At the end of the course an evaluation test was given to the participants. Certificates of completion were presented by Shri R. Madhavan Nair, the well-known industrialist and 'father' of the shrimp export industry in India, at a well-attended function which was presided over by Shri Sundaram IAS, Chairman of the Marine Products Export Development Authority on 8-6-77.

The participants of the summer Institute were:

1. Shri B. Venkatesh, Instructor in Fish Culture, College of Fisheries, Mangalore.
2. Dr Kulasekara Pandian, Scientist, CMFRI, Cochin.
3. Shri V. Venkatesan, Sr. Research Assistant, Dept. of Fisheries, Tamil Nadu.
4. Shri P. Karunakaran Nair, Sr. Technical Assistant, CMFRI, Cochin.
5. Shri V. Ramaiyan, Research Assistant, Centre of Advanced Study, Porto Novo.
6. Shri Mohamood Syed Faheem, Project Officer, Andhra Pradesh Fisheries Corporation Ltd., Kakinada.

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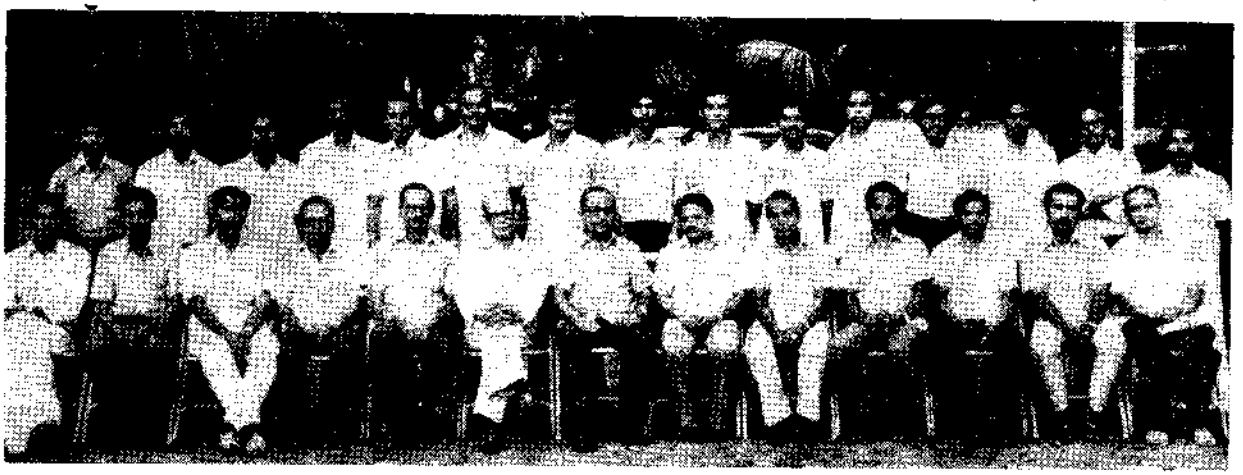

*The participants of the summer institute with the Director and members of faculty*

*Shri P. Karunakaran Nair, a participant, receiving certificate of completion from Shri R. Madhavan Nair. Dr P. Vedavyasa Rao, Scientist, who was in charge of organising the summer institute is seen in the centre.*

# KRISHI VIGYAN KENDRA

Ten farmer trainees, the first batch to undergo training in the Kendra, have completed their course in prawn and fish culture at Narakkal Prawn Culture Farm of the Institute. These trainees were selected from a batch of fishermen candidates from the locality by the Institute's experts, in collaboration with those from the Kerala State Fisheries. On the completion of the 1-month course, a valedictory meeting was held at Narakkal on 10th May with one of the trainees, Shri V. K. Gopi, in the chair. Shri N. K. Mohan, another trainee, was the principal speaker. Dr Silas and Shri Kumar Das, Joint Director of Fisheries, Govt. of Kerala, also spoke.

*Dr. Silas addresses the gathering. Sitting, from left, are Dr. V. Balakrishnan, Officer-in-charge of the Kendra and Shri Kumar Das, Joint Director of Kerala Fisheries.*

*Staff and trainees of Krishi Vigyan Kendra with the Director.*

**Gift to the library acknowledged**

The Institute gratefully acknowledges the receipt of 135 books, on marine fisheries and allied subjects, presented by The British High Commission under the ODM|British Council Books Presentation Programmes, to the Institute's Library.

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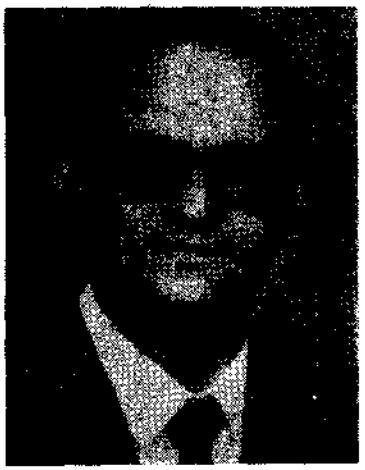
**Summer Institute**
(*Continued*)

7. Shri M. I. Patel, Senior Research Assistant, Marine Biological Research Station, Port Okha.
8. Shri Y. A. Trivedi, Asstt. Research Officer, Marine Biological Research Station, Port Okha.
9. Shri P. B. Tandel, Asstt. Supdt. of Fisheries, Dept. of Fisheries, Karnataka.
10. Shri K. S. Joseph, Research Officer, Dept. of Fisheries, Kerala.
11. Shri P. Muthiah, Scientist, CMFRI, Cochin.
12. Shri A. V. Kulkarni, Fisheries Training Officer, Dept. of Fisheries, Maharashtra.
13. Shri Ameer Hamsa, CMFRI, Cochin.
14. Shri S. Shanmugham, Scientist, CMFRI, Tuticorin.
15. M. S. Sivaraman, Sub-Inspector of Fisheries, Dept. of Fisheries, Pondicherry.
16. Shri P. C. John, Lecturer in Zoology, C.M.S. College, Kottayam.

**Dr. M. S. Prabhu appointed as Director, PFP**



Dr M. S. Prabhu, Scientist, who is at present heading the Fisheries Resources Assessment Division, is appointed as Director of UNDP|FAO Pelagic Fishery Project, Cochin. Dr Prabhu is expected to join the new post during the first week of October.

Dr Prabhu joined the Institute in 1947. He underwent advanced training in Canada, under Colombo Plan, in Ground-fish Research and Fishery Management Policies. He was away on deputation as Director of Fisheries, Govt. of Goa, Scientist and Project Leader in the National Institute of Oceanography, and Professor and Head of the Dept. of Fisheries, University of Calicut. It is with experience of over 30 years in fisheries research, teaching and administration, Dr Prabhu is now taking up the new responsibilities.

## ACHIEVEMENT AUDIT COMMITTEE

An Achievement Audit Committee is appointed by the ICAR to conduct the achievement audit of CMFRI for the period 1972-77. The Committee is constituted of the following:

Dr P. N. Ganapati, Emeritus Professor, Andhra University .. Chairman

Dr D. J. Mehta, Director, CSMCRI, Bhavanagar .. Member

Dr Prem Narain, Sr. Professor, IARS, New Delhi .. Member

Shri K. Chidambaram, Retd Director, MPEDA, Cochin .. Member

Dr R. Natarajan, Director, Centre of Advanced Study in Marine Biology, Porto Novo .. Member

The terms of reference of the Committee are:

1. To review the progress of implementation of the recommendations made by the previous Achievement Audit Committee.
2. To scrutinize the research programmes of the Institute keeping in view the recent developments in marine fisheries and future requirements particularly for the preparation of the Sixth Five year Plan of the Institute
3. To examine whether the allocation of research projects between the members of the staff is reasonable.
4. To examine whether there is adequate coordination between the work of the Institute and that of other institutes dealing with similar problems and between the Institute and developmental agencies.
5. To examine the facilities available at the Institute and its Research Centres in respect of laboratory accommodation, apparatus, equipment, field facilities, library etc., and their utilization.
6. To examine whether results of researches of proved economic|practical value have been passed on to the industry|fish culturists for general adoption.
7. To examine any other aspect which is considered relevant for the optimum working of the Institute and to make recommendations thereon.

*Issued*

INDIAN JOURNAL OF FISHERIES

**Vol. 22, Nos. 1 & 2, 1975**

**Issued August 1977**

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The Director,

*CMFR Institute,*
*P. O. Box 1912,*
*Cochin 682018.*

# CONSULTANCY

The Institute was consulted by the Pondicherry Industrial Promotion Development and Investment Corporation Ltd., for technical advice regarding the setting up of a prawn-culture farm in Pondicherry. Shri M. S. Muthu and Shri S. Rajan, Scientists of the Institute, were deputed to visit all the estuaries and backwaters in the territory to select suitable places for the farm sites. Two suitable places were selected, one near Chunnambar estuary in Pondicherry and the other in Arasalar estuary in Karakkal. Further services are being rendered to develop the farms.

The following government departments, institutions, agencies and persons also received our services by way of technical consultancy.

1. Officer-on-special-duty, Directorate of Fisheries, Orissa, Cuttack.
2. Director of Fisheries, Andhra Pradesh, Hyderabad.
3. Director of Fisheries, Kerala, Trivandrum.
4. The Consultant, Marine Products Export Development Authority, Cochin.
5. The Director, Bureau of Economics & Statistics, Govt. of Andhra Pradesh, Hyderabad.
6. Shri R. P. Kumar, Konkan Fisheries Private Ltd, Fatima Building 1st Floor, Thompson Street, Vishakhapatnam.
7. Shri John Kurian, Centre for Development Studies, Trivandrum-11.
8. Dr P. Loaharanu, Food Preservation Section, International Atomic Energy Agency, F.A.O., IAEA, Vienna, Austria.
9. The Director of Statistics, Government of Tamil Nadu, Madras.
10. The Director of Fisheries, Govt. of Karnataka Bureau of Economics and Statistics, Bangalore.
11. The Assistant Director, Dept of Statistics, Central Statistical Organisation, Ministry of Planning, New Delhi.
12. The Project Director, Pre-Investment Survey of Fishing Harbours, Ministry of Agriculture, Govt. of India, Bangalore-52.
13. Prof. K. V. Sivayya, Head of the Dept of commerce, Andhra University College of Arts, Commerce & Law, Waltair, Vishakhapatnam.
14. The Development Officer, Andhra Pradesh State Financial Corporation, Hyderabad.
15. Dr M. N. Moorjani, Project Coordinator & Head, Discipline of Meat, Fish and Poultry Technology, CFTRI, Mysore.
16. The Director of Fisheries, Orissa, Cuttack.
17. Shri Devidas G. Watekar, Goa.
18. Shri B. S. Kakule, Panjim, Goa.
19. Y. A. Trivedi, Prawn-culture Research Station, Bhavanagar.
20. Manager, Preeminent Air Conditioning & Refrigeration Engineers, Madras.
21. Shri A. Balwani, Planning Division, Rallis India Ltd, Bombay.

*Prawn-culture experiments are explained to Shri R. Madhavan Nair when he visited the Narakkal farm*

# GENERAL

The Director General, ICAR, has nominated Dr Silas as Member of the Committee constituted to review the present position regarding collection and utilisation of fish genetic resources and to prepare a project for doing this on a coordinated basis.

The State Fisheries Advisory Board of the Government of Kerala has been reconstituted of which the Director, CMFRI, is renominated as a Member.

Dr Silas, Director, has been nominated to act as a Member on the Expert Committee constituted to advise the Kerala Agricultural University on the organisation of a full-fledged Department of Fisheries.

Dr Silas is nominated as Member, Steering Committee on Fisheries Development of the Kerala State Planning Board.

Director has nominated Dr P. Vedavyasa Rao, Scientist, to represent the Institute as a Member of the Sub-Committee on Exploratory Survey of Marine Fisheries, Government of India, in the place of late Dr K. V. Sekharan.

**Engagement**

Dr Silas attended the following:

The first meeting for the periodic inspection of construction work of the research vessel at M/s. Garden Reach Shipbuilders, Calcutta in April

51st Meeting of the Executive Committee of the Kerala Agricultural University, Trichur, in April.

19th Meeting of the Tamil Nadu State Fisheries Research Council on 4 May.

Scientific Panel for Fisheries Research Meeting at Delhi, on 6-7 May.

Meeting of the Polish Survey Advisory Committee on 18 June.

Kerala Agricultural University Meeting as ICAR Representative, on 15 July.

Seminar on Adopting Technology for the Rural Development, organised by the Centre for Development Studies, at Trivandrum on 28-29 July.

Meeting arranged by the Chief Secretary, Government of Kerala, regarding Indian Ocean Fishery Commission Meeting, on 4 & 29 August.

Meeting of the Board of Studies in Languages, Arts, Science, and Commerce, University of Madras at Madras, on 11 August.

ICAR Regional Committee Meeting at Bangalore, on 17 August.

Planning Commission Meeting at New Delhi, on 25 August.

ICAR Director's Conference at Jhansi, on 15 September.

Dr Silas recorded a radio talk on 16 July for the A.I.R. programme "Vayalum Veedum", to be relayed on 31.7.77.

## Rural radio science gathering on pearl culture

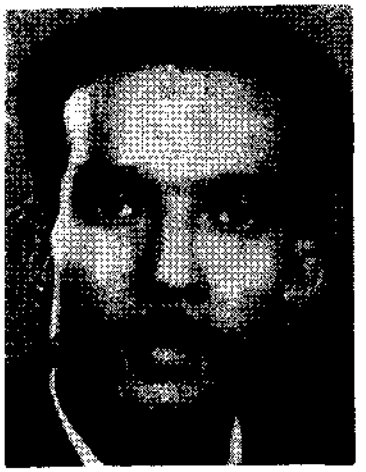
Following a radio talk on pearl culture in Tamil, Shri K. Alagarswami answered the questions of the participating villagers in a Question-Answer Session of the All India Radio scheduled to broadcast on 4-10-77 at 9.30 pm from Madras-A. The Institute had also arranged an exhibition on the topic in which the villagers evinced keen interest.

*Dr Alagarswami explaining to the villagers the technique of pearl production.*

## VISITORS

Those who visited the Institute during the period are:

1. Mr John L. Harmer, Attorney at Law, Sun Harbour Industries, California, on 28-4-77.
2. Mr R. E. Chapman, Sun Harbour Industries, California, on 28-4-77.
3. Mr Henry R. Branstetter, Sun Harbour Industries, California, on 28-4-77.
4. Mr Ebrahim Abdul Rahim, Fisheries Resources Bureau, Bahrain, on 28-4-77.
5. Mr T. Zeinkiever, Ex-Advisor, Polish Consulate Bombay, on 18-5-77.
6. Mr John E. Frazer, Staff Writer, Readers Digest, on 23-5-77.
7. Dr Robin Hillas, IDRC, Singapore, on 10-6-77.
8. Dr A. C. Winsor, FAO (IOP), Rome, 8-7-77.
9. A Bulgarian Delegation consisting of Mr K. Kutzanov, Bulgaria; Mr B. V. Sokoior, Bulgaria; Mr Valtohann, Bulgarian Embassy, New Delhi; and Mr J. B. Daryani, New Delhi, on 26-7-77.
10. Commodore Talibuddin, Naval Officer, on 9-8-77.
11. Mr Maher Mourad Shafik, Cairo, Egypt, on 23-8-77.
12. Mr Mamdouh Thobet Kheir, Cairo, Egypt, on 23-8-77.
13. Mr A. M. Pradhanan, Nepalese Scientist, on 24-8-77.
14. Mr Moin Shah, Nepalese Scientist, on 24-8-77.
15. Mr K. R. Kesharaj, Nepalese Scientist, on 24-8-77.
16. Mr O. Bakarae, Chief Fisheries Officer, Logos, Nigeria, on 17-9-77.
17. Mr Surendranath Ramgoolam, Mauritius, on 19-9-77.
18. Mr Gordon M. Medford, Ministry of Education and Culture, Barbados, on 19-9-77.



Dr C. S. Gopinatha Pillai, Scientist, attended the Third International Coral Reef Symposium held at Fisher Island Station, Miami, Florida, during May 23-27, in the capacity of an Advisor. The Symposium was sponsored jointly by the University of Miami, U.S. Geological Survey and Smithsonian Institution. He was an invited speaker at the opening plenary session. He had presented a paper "Structure, formation and species diversity of South Indian corals" at the Symposium.

### Gold medal awarded

Calicut Research Centre of CMFRI is awarded Gold Medal for their exhibits at the Calicut Health Education & Industrial Exhibition, 1977.

## Shipboard Training Abroad

Dr G. Luther and Shri A. Noble, Scientists of the Institute, are deputed to undergo training on board R. V. Explorer, a research vessel of the Department of Agriculture & Fisheries for Scotland, UK, during her voyages in the west coast of Scotland and the North Sea, in October-November. Dr G. Luther is to participate in the cruise along the west coast of Scotland during October 11 to November 2 when the vessel will be undertaking the larval herring survey and Shri Noble to participate in the cruise in the North Sea during November 8-30 when the vessel will conduct the pre-recruitment survey. The deputation of the scientists is in acceptance of the offer made by The Intergovernmental Oceanographic Commission, Paris, to impart training to the scientists from the developing countries aboard research vessels from Scotland (UK) during 1977.

*Shri A. Noble*

# STAFF NEWS

## Fresh batch of A.R.S. Probationers (Scientists S-I)

The following 5 out of the 7 A.R.S. Probationers allotted to the Institute have joined.

Shri M. Vijayakumaran, Fish and Fisheries Science, 1-9-77.

Dr L. Krishnan, Fish and Fisheries Science, 19-9-77.

Smt. S. Lalitha Devi, Fish and Fisheries Science, 19-9-77.

Shri A. R. Thirunavukkarasu, Fish and Fisheries Science, 21-9-77.

Shri Syed Ahmedali, Agricultural Chemistry, 26-9-77.

## Appointments

Smt. S. Daisy as Sweeper at Mandapam Camp, 1-3-77.

Shri S. Raju as Driver (Boat) (T I) at Mandapam Camp, 28-3-77.

Shri V. Krishnasamy as Administrative Officer at Cochin, 1-4-77.

Miss Alice Valooran as Junior Clerk at Cochin, 7-4-77.

Miss K. C. Karthiayini as Junior Clerk at Cochin, 7-4-77.

Miss N. Ambika as Junior Clerk at Cochin, 12-4-77.

Shri N. Govindan as Junior Clerk at Cochin, 12-4-77.

Shri V. P. Unnikrishnan as Junior Clerk at Narakkal, 12-4-77.

Shri K. A. Kunju Mohamed as Junior Clerk at Cochin, 13-4-77.

Shri M. Regunathan as Junior Clerk at Vizhinjam, 25-4-77.

Miss M. M. Theresakutty as Junior Clerk at Cochin, 2-5-77.

Miss K Santha as Junior Clerk at Cochin, 2-5-77.

Shri A. Yagappan as Junior Clerk at Mandapam Camp, 4-5-77.

Shri M. Adimoolam as Supporting Staff Grade I (Cook) at Mandapam Camp, 4-5-77.

Miss N. Kamala as Junior Clerk at Mandapam Camp, 10-6-77.

Shri G. Angaiah as Sweeper at Mandapam Camp, 10-6-77.

Smt. J. Kondamma as Sweeper at Mandapam Camp, 10-6-77.

Shri Balamamundinathan as Assistant (ad hoc) at Narakkal, 18-7-77.

Shri A. Subramanian as Daftry at Cochin, 18-7-77.

Shri M. Ibrahim as Deckhand at Cochin, 22-7-77.

Shri V. Maria Alvaris as Deckhand at Cochin, 22-7-77.

Shri K. S. Leon as Deckhand at Cochin, 25-7-77.

Shri M. Moideen Abdulkader as Deckhand at Mandapam Camp, 26-7-77.

Shri N. K. Gopalakrishnan as Deckhand at Cochin, 26-7-77.

Shri V. Vedanayagam as Deckhand at Mandapam Camp, 27-7-77.

Shri B. Mohan as Oilman at Mangalore, 27-7-77.

Shri U. B. Sadasiva as Lascar at Mangalore, 27-7-77.

Shri P. Munisamy as Deckhand at Mandapam Camp, 28-7-77.

Miss M. Vallimayil as Junior Library Assistant at Mandapam Camp, 1-8-77.

Shri S. Erishikesan as Junior Clerk at Cochin, 1-8-77.

Shri P. M. Hariharan as Oilman at Cochin, 1-8-77.

Shri M. Xavier Mohandas as Oilman at Tuticorin, 1-8-77.

Shri S. Muthumari as Lascar at Tuticorin, 1-8-77.

Shri Mohan E. Durgegar as Lascar at Karwar, 1-8-77.

Smt. N. Sarada as Sweeper at Calicut, 1-8-77.

Shri Gangadhar B. Naik as Junior Clerk at Karwar, 3-8-77.

Shri C. H. Vamana Naik as Watchman at Mangalore, 4-8-77.

Shri Mery Naraiya as Sweeper at Cochin, 5-8-77.

Smt. Mery Rayalamna as Sweeper at Cochin, 5-8-77.

Shri M. Madusudanan Nair as Watchman at Narakkal, 19-8-77.

Shri M. K. Bharathan as Lascar at Cochin, 20-8-77.

Shri V. Dharma Rao as Motor Driver at Waltair, 8-9-77.

Shri R. Kanakaraju as Watchman at Waltair, 8-9-77.

Shri P. S. Sudarsanan as Superintendent at Narakkal, 9-9-77.

Shri A. Subramanian as Fieldman at Cochin, 24-9-77.

## Promotions

Shri I. Parameswaran, Junior Clerk, as Senior Clerk at Cochin, 14-4-77.

Smt. T. Madhavi, Junior Clerk, as Senior Clerk at Cochin, 14-4-77

Smt. T. K. Ponnamma, Junior Clerk, as Senior Clerk at Cochin, 14-4-77.

Shri Bavanandan, Junior Clerk, as Senior Clerk at Tuticorin, 14-4-77.

Shri S. K. Murali, Junior Clerk, as Senior Clerk at Cochin, 14-4-77.

Shri K. Kumaran, Supporting Staff Grade I, as S.S. Grade III (Fieldman), 21-4-77.

Shri S. Periaswamy, Watchman, as S.S. Grade II (Daftry), 25-5-77.

Shri S. Muthuramalingam, Peon, as S.S. Grade II (Daftry), 25-5-77.

Shri M. V. Somaraju, Junior Technical Assistant, as Technical Assistant (T II-3) at Waltair, 1-6-77.

## Postings

Shri K. V. George, Senior Technical Assistant (T-4) and Shri P. Karunakaran Nair, Senior Technical Assistant (T-4) to work in Krishi Vigyan Kendra, 1-1-77.

## Tansfers

Shri C. Johnson, Junior Clerk, from Vizhinjam to Mandapam Camp.

Shri P. Selvaraj, Junior Clerk, from Mandapam Camp to Calicut.

Shri S. Pitchai, Junior Clerk, from Mandapam Camp to Vizhinjam.

Shri A. Hanumanda Rao, Technical Assistant (T II-3), from Machilipatnam to Nellore.

Shri P. Ramalingam, Junior Technical Assistant (T 2), from Nellore to Waltair.

Shri A. C. Sekhar, Technical Assistant (T II-3), from Waltair to Madras.

Shri K. Ramakrishnan Nair, Technical Assistant (T II-3) from Colachel to Cape Comorin.

Shri I. P. Ebenezer, Technical Assistant (T II-3), from Colachel to Cape Comorin.

Shri Jacob Jerold Joel, Technical Assistant (T II-3), from Colachel to Cape Comorin.

Shri J. L. Oza, Junior Technical Assistant (T 2), from Dumas to Bombay.

Shri S. Seetha Raman, Junior Technical Assistant (T 2), from Bombay to Dumas.

Shri N. Thiruprakasam Packiaraj, Junior Technical Assistant (T 2), from Janjiramurud to Bombay.

Shri C. Kasinathan, Junior Technical Assistant (T 2), from Mandapam Camp to Madras.

Shri L. Sathan, Sweeper, from Cochin to Mandapam Camp.

Shri M. Vellayan, Sweeper, from Calicut to Mandapam Camp.

Shri M. Jayachandran, Junior Technical Assistant (T 2), from Bombay to Veraval.

Shri Dharma Rao, Motor Driver, from Waltair to Kakinada.

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Details are given in the Office Circular No, 11-3/75 Estt. dated 26-8-1977

Services of Shri K. P. Joseph, Motor Driver, terminated, 7-7-1977.

Shri N. Thiruprakasam Packiaraj, Junior Technical Assistant, relieved on resignation, 10-6-77.

Shri N. S. Viswanath, Junior Technical Assistant, relieved on resignation, 18-7-77.

### New Chairman for the Grievance Cell

Dr A. V. S. Murthy, Scientist S-2, is elected as the Chairman of the Grievance Cell on 22-9-77.

*Pearl-culture trainees at work*

### Rejoined

Shri K. Venkatanarayana Rao and G. Subbaraju, Scientists S-1, who were on deputation to Govt. of India Pelagic Fisheries Project, Cochin, have rejoined the Institute after completing their term, 1-7-77.

### Cash award

Dr V. Balakrishnan, Scientist S-1, received a cash award for topping the list of successful candidates in Hindi Praveen examination of the Directorate of Education, New Delhi, from Cochin area during December 1976.

### Weddings

Kum. R. Chandrika, Junior Clerk at Headquarters, is married to Shri T. V. Sundaran of Quilon, on 3-5-77.

Dr E. Vivekanandan, Scientist S-1, married Selvi Visalam, on 15-9-77.

### OBITUARY

We regret to announce the sad and untimely demise of Shri C. K. Kesavadoss, Supporting Staff Grade III, of Bombay Research Centre, on 26-9-77.

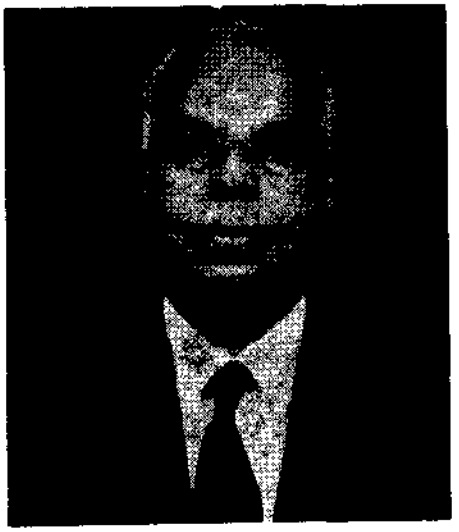
### Qualified for Ph. D.

Shri G. Luther, Scientist S-1 of Vizhinjam Centre, is qualified for the Ph. D. degree in Zoology of the Andhra University.

FISHERY DATA CENTRE, CENTRAL MARINE FISHERIES RESEARCH INSTITUTE, COCHIN—682018

## PROVISIONAL ESTIMATES OF MARINE FISH LANDINGS IN INDIA DURING 1976 (FIGURES IN TONNES)

| Sl. No. | Name of Fish | West Bengal | Orissa | Andhra | Tamil Nadu | Pondicherry | Kerala | Karnataka | Goa | Maharashtra | Gujarat | Andamans | Lakshadweep | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Elasmobranchs | 493 | 2,974 | 6,688 | 21,813 | 165 | 7,308 | 1,489 | 1,108 | 7,089 | 7,896 | 72 | 354 | 57,449 |
| 2. | Eels | 1 | 1 | 205 | 710 | 6 | 10 | — | 1 | 4,168 | 3,283 | 1 | — | 8,386 |
| 3. | Cat fishes | 785 | 1,988 | 6,131 | 5,766 | 66 | 12,743 | 4,279 | 916 | 9,522 | 2,140 | 19 | — | 44,355 |
| 4. | *Chirocentrus* | 251 | 517 | 1,837 | 2,358 | 63 | 807 | 184 | 64 | 2,409 | 2,155 | 33 | — | 10,678 |
| 5. (a) | Oil Sardines | — | — | 112 | — | — | 123,937 | 41,451 | 1,063 | 2,377 | — | — | — | 1,68,940 |
| (b) | Other sardines | 12 | 1,657 | 23,220 | 28,836 | 1,839 | 34,305 | 641 | 14,144 | 1,963 | 8 | 86 | — | 1,06,711 |
| (c) | *Hilsa ilisha* | 799 | 5,477 | 280 | 25 | — | 12 | — | — | 154 | 1,098 | — | — | 7,845 |
| (d) | Other *Hilsa* | — | 129 | 1,815 | 2,671 | 121 | — | 30 | — | 661 | 3,367 | 28 | — | 8,822 |
| (e) | *Anchoviella* | 6 | 339 | 11,309 | 9,015 | 178 | 9,987 | 54 | — | 209 | — | 118 | — | 31,215 |
| (f) | *Thrissocles* | 1,397 | 106 | 1,763 | 9,580 | 565 | 2,732 | 900 | 351 | 1,276 | 269 | — | — | 18,939 |
| (g) | Other clupeids | 1,790 | 772 | 8,410 | 18,160 | 1 | 1,174 | 457 | 936 | 16,944 | 11,098 | — | — | 59,142 |
| 6. (a) | *Harpodon nehereus* | 2,253 | 87 | 214 | — | — | — | 7 | 46 | 49,470 | 34,998 | — | — | 87,075 |
| (b) | *Saurida & Saurus* | — | 1 | 166 | 943 | 105 | 99 | 187 | 28 | 1,089 | 2,797 | — | — | 5,415 |
| 7. | *Hemirhamphus & Belone* | — | 1 | 14 | 821 | 2 | 141 | 87 | 9 | 30 | 101 | 35 | 33 | 1,274 |
| 8. | Flying fish | — | — | — | 1,412 | 165 | 1 | — | — | — | — | — | 41 | 1,619 |
| 9. | Perches | 1 | 31 | 1,751 | 6,119 | 769 | 3,069 | 454 | 311 | 1,460 | 4,641 | 142 | 296 | 19,044 |
| 10. | Red mullets | — | 1 | 553 | 717 | 77 | 2,577 | 145 | — | 497 | 680 | 2 | 58 | 5,307 |
| 11. | Polynemids | 69 | 244 | 1,813 | 2,227 | 26 | 122 | — | — | 4,125 | 6,230 | — | — | 14,856 |
| 12. | Sciaenids | 4,066 | 333 | 10,891 | 12,101 | 434 | 6,955 | 3,216 | 3,084 | 19,781 | 28,698 | 5 | — | 89,564 |
| 13. | Ribbon fish | 701 | 130 | 12,443 | 21,830 | 428 | 7,687 | 583 | 2,158 | 10,052 | 12,341 | — | — | 68,353 |
| 14. (a) | *Caranx* | — | 147 | 3,047 | 8,114 | 501 | 10,478 | 656 | 949 | 1,179 | 1,642 | 125 | 94 | 26,932 |
| (b) | *Chorinemus* | 37 | 237 | 1,820 | 740 | 2 | 265 | 80 | 100 | 121 | 14 | — | — | 3,416 |
| (c) | *Trachynotus* | — | — | 1 | 32 | — | — | — | 3 | 3 | — | — | — | 39 |
| (d) | Other carangids | — | — | 5 | 1,039 | — | 6 | — | — | 654 | — | — | — | 1,704 |
| (e) | *Coryphaena* | — | 2 | 89 | 120 | 7 | 56 | — | — | 2 | — | — | — | 276 |
| (f) | *Elacate* | — | — | 14 | 249 | — | 106 | 32 | — | — | 14 | — | — | 415 |
| 15. (a) | *Leiognathus* | 219 | 378 | 3,876 | 33,986 | 482 | 2,727 | 4,086 | 1,125 | — | — | 117 | — | 46,996 |
| (b) | *Gazza* | — | 1 | 48 | 7 | — | — | — | 3 | — | 908 | — | — | 967 |
| 16. | *Lactarius* | — | 1 | 1,718 | 888 | 121 | 468 | 216 | 561 | 643 | 7,765 | — | — | 12,381 |
| 17. | Pomfrets | 586 | 10,699 | 4,088 | 942 | 44 | 799 | 438 | 261 | 17,979 | 2,116 | 30 | — | 37,982 |
| 18. | Mackerel | — | 425 | 2,084 | 12,016 | 1,598 | 19,978 | 22,455 | 8,173 | 1,944 | — | 77 | 87 | 68,837 |
| 19. | Seer fish | 287 | 940 | 3,412 | 4,335 | 28 | 5,936 | 1,341 | 714 | 2,116 | 1,634 | 93 | 1,291 | 22,127 |
| 20. | Tunnies | — | 84 | 334 | 3,349 | 1 | 12,880 | 576 | 23 | 463 | 734 | 13 | 20 | 18,477 |
| 21. | *Sphyraena* | — | 1 | 187 | 1,780 | 15 | 494 | 9 | — | 50 | 9 | 49 | — | 2,594 |
| 22. | *Mugil* | 2 | 5 | 892 | 326 | 4 | 26 | 6 | 4 | 191 | 1,097 | 101 | — | 2,654 |
| 23. | *Bregmaceros* | — | — | — | — | — | — | — | — | 380 | — | — | — | 380 |
| 24. | Soles | — | 6 | 56 | 1,042 | 254 | 3,567 | 637 | 312 | 1,553 | 2,969 | — | — | 10,396 |
| 25. (a) | Penaeid prawns | 2,139 | 688 | 8,833 | 10,156 | 93 | 34,478 | 2,594 | 4,981 | 40,772 | 11,497 | 39 | — | 1,16,270 |
| (b) | Non Penaeid Prawns | 2,708 | 100 | 2,275 | 194 | — | 55 | — | — | 63,702 | 7,778 | — | — | 76,812 |
| (c) | Lobsters | — | — | 3 | 632 | 33 | 50 | 8 | 5 | 419 | 1,491 | — | — | 2,641 |
| (d) | Crabs & other Crustaceans | — | 23 | 329 | 18,804 | 516 | 1,316 | 156 | 1,060 | 51 | 224 | — | — | 22,479 |
| 26. | Cephalopods | — | 27 | 242 | 1,663 | 211 | 872 | 3,067 | 238 | 2,488 | 2,286 | — | 40 | 11,134 |
| 27. | Miscellaneous | 6,809 | 1,271 | 8,353 | 13,528 | 1,203 | 22,824 | 4,762 | 424 | 25,615 | 7,316 | 149 | 258 | 92,512 |
| | TOTAL | 25,411 | 29,823 | 1,31,321 | 2,59,046 | 10,123 | 3,31,047 | 95,283 | 43,155 | 2,93,601 | 1,71,294 | 1,334 | 2,572 | 1,394,010 |



## Dr N. Kesava Panikkar

**We record the sad demise of Dr N. Kesava Panikkar on 24th June 1977.**

Dr Panikkar was one of the architects of the development of Indian fisheries as a whole and the fisheries research in particular. He played a vital role in the establishment of the centrally administered fisheries institutes and headed the Central Marine Fisheries Research Institute as Director for a period of 7 years, from 1951 to 1957. As the Fisheries Development Advisor to the Government of India he was responsible for the planning and development of fisheries at the Centre, in the States and in the universities. During the early nineteen-sixties, he founded the National Institute of Oceanography and was its Director until his retirement in 1973, when he was appointed as a Member of the National Commission on Agriculture. As Vice Chancellor of the University of Cochin he gave a new orientation to the University and was instrumental in starting several need-based applied courses. He was Chairman and Fellow of several national and international scientific societies and organisations. He was the guiding force in the development of marine sciences in India, and of late had been deeply involved in matters relating to the Law of the Sea. The demise of Dr Panikkar causes an irreparable loss to the Nation.

We convey our heartfelt condolences to his bereaved family.

**Our Library....**

*(Continued from page 20)*

| | |
|---|---|
| Power Transmission and Automation for Ships and Submersibles | .. I. M. Datz |
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