BREAKTHROUGH ACHIEVED IN PEARL PRODUCTION THROUGH TISSUE CULTURE

The Central Marine Fisheries Research Institute has developed the technology for in vitro pearl production in the Indian pearl oyster, *Pinctada fucata* and in the abalone, *Haliotis varia* through tissue culture method.

The erratic nature of wild stock of pearl oysters in the natural beds along the Indian coastline neither supported the production of natural pearls nor the supply of enough oysters for cultured pearl production. In the context of the dwindling pearl production, the Institute entered into the arena of biotechnological research in tissue culture in 1996 by establishing a marine invertebrate tissue culture laboratory at the Tuticorin Research Centre to carry out basic research in in vitro pearl production.

Mantle tissue culture of the Indian pearl oyster, *Pinctada fucata* and the progastropod abalone, *Haliotis varia* was organized simultaneously. In the explant tissue culture, the cells proliferated in large numbers and produced two types of round cells, granular and agranular. These cells migrated away from the explants and multiplied in vitro. This resulted in the formation of a cell sheet. The round cells developed pseudopodia that later covered the entire surface of culture plates and formed an organic matrix and pearl sac. The granular cells consisting of granules became larger and released out the granules to form a nucleus for crystal growth.

In an organ culture, the mantle tissue of the pearl oyster/abalone and a sterile shell bead nucleus were placed in the culture flask containing a nutrient rich medium. This shell bead got coated with a distinct nacreous layer with organic matrix and a pearl sac was formed within 3 months. The mantle graft produced calcite and rhombohedral crystals. Polygonal prismatic layer was formed with thick interlamellar matrix at its boundary. The nacreous layer consisted more of calcium – 56% and 51% (wt.) in the pearl oyster and in the abalone respectively. The nacreous layers formed in *P. fucata* and *H. varia* were entirely different, indicating species specificity. The twin success achieved in these two animals at a time indicated the validity of the procedures. The present research in *P. fucata* and *H. varia* production is highly significant in view of the fact that culturing the mantle tissue in nutrient rich medium and achieving crystallization of nacre have not been reported hitherto.

The conventional method of production of cultured pearls involves huge sum of money for the collection and maintenance of oysters in the farm whereas tissue culture method is mainly confined to the laboratory. The basic technology developed through tissue culture method totally eliminates the dependence on natural environment for pearl production. Production of large sized pearls as well as more number of pearls is possible through in vitro culture. This also provides enough scope for manipulations during pearl production so as to produce pearls of desired colours. In the light of the success gained in this frontier area, further attempts will be made to standardise the technology so as to make it viable and transferable.
Lobsters form an important group of marine animals exported from India. During 2002 about 1364 t of lobsters were landed in India. The export value through foreign exchange during 2002 was about Rs. 83.46 crores, of which live lobsters constituted 173 t valued at Rs. 13.82 crores.

The fishery for lobsters has been showing fluctuations over the years. In Maharashtra, the landing decreased from 506 t during 2001 to 402 t in 2002 while in Gujarat, the decline was from 297 t to 241 t. Tamil Nadu, Andhra Pradesh and West Bengal showed marginal increase. The overall decline was from 297 t to 241 t. The Indian squid, Sepia lessoniana, constituted 173 t valued at Rs. 13.82 crores.

In the recent years, lobster fattening has become a livelihood activity among coastal fisher folk. Lobster fattening initiated as a subsidiary activity to offset the reluctance of fishers to release undersized lobsters back into the sea. It was at that point of time, a good idea to maintain them in captivity and fatten them by providing adequate feed so that they could be exported live as and when they reach marketable size. Many communities found this a lucrative activity. With support from governmental agencies and research institutions, lobster fattening spread like wildfire along the fishing villages of the southeast and southwest coasts. Many governmental agencies and NGOs are now advocating large-scale lobster fattening as a 'mariculture activity'. As a result of this, investments running to several lakhs are being made in coastal villages for grow out/fattening tanks with seawater pumping facility and recycling systems. Targeted fishing for juvenile lobsters is being carried out for stocking such large commercial ventures. Juveniles caught from the east coast are transported across the country to grow out sites in the west coast.

It is time that we realize the dangers of such massive lobster-fattening programmes. What was initially thought of as a conservation/livelihood activity, has now become a stock destructive/commercial activity. Targeted fishing for juvenile lobsters is a resource unfriendly and perhaps dangerous activity and if such targeted fishery is continued, then the wild stock and their reproductive activity and replenishment capacity will be adversely affected. It is likely that the stock of lobsters in the wild may be completely eliminated in course of time.

The Minimum Legal Size for export for four species of lobsters has been implemented by Ministry of Commerce. However, in the absence of a Minimum Legal Size for capture, which is to be introduced by respective State government, exploitation of undersized lobsters will continue. In the case of Panulirus homarus, the major species of lobster along the southwest and southeast coast, export of < 200 g is prohibited. However, catching and trading for less than the MLS are still continuing. Operation of trammel net, a destructive gear for lobster fishing, needs to be banned as more than 50% of the catch consists of undersized lobsters not suited for export.

Perhaps it would be necessary to ensure that fishing for lobsters below the above legal size should be banned forthwith. Lobster fattening can be promoted as a livelihood activity, but the minimum size for initiating the fattening programme should be the same as the legal export size. Higher values can be realized by fattening lobsters beyond the minimum size and only this kind of activity should be promoted in lobster fattening. It is high time that the concerned agencies take appropriate action to prevent the lobster export industry from future collapse.

Mohan Joseph Modayil

**RESEARCH HIGHLIGHTS**

**Cephalopod stocks under exploitation pressure**

Investigation carried out under the Institute project on the resource characteristics of cephalopods from 6 centres along the west coast and 5 centres along the east coast of India conducted during 1997-2002, indicated that some of the stocks are under heavy exploitation pressure. The Indian squid, Loligo duwaei, stocks at Vishakhapatnam, Kakinada, Mumbai, Mangalore and Calicut are under heavy exploitation pressure. Similarly, the cuttlefish, Sepia aculeata, stock in Rameswaram and S. pharaonis stock in Vizhinjam are also being exploited above the optimum level, whereas S. pharaonis stock in Cochin and S. aculeata stock in Visakhapatnam are underexploited. In general, octopuses are lightly exploited along both the coasts.

**Good news from cephalopod culture front**

The Vizhinjam Centre of CMFRI has achieved a breakthrough in the rearing and breeding of the commercially important big finned squid Sepioteuthis lessoniana. A methodology was evolved for the mass collection of egg capsules from the wild by providing artificial substrata. The collected egg capsules were incubated and spawned under captivity. The hatchlings were reared using live food organisms in the initial stages and slowly weaned to trash fish. They showed good growth rate and attained more than 100 g in three months. These squid attained maturity and started laying egg capsules on the 105th day of rearing. They showed repeated spawning at an interval of 7-8 days. Spawning of the squid S. lessoniana under captivity is reported for the first time in India. The technology developed can be further refined for commercial production as well as for sea-ranching them in their natural habitat for stock enhancement.

Rearing of Cuttlefish was also accomplished at the Vizhinjam Research Centre of the Institute. The Cuttlefish Sepia pharaonis was reared from egg to marketable size of more than 500 g under captive condition.

Adult cuttlefish, Sepia pharaonis produced at Vizhinjam R.C.
Prospects of using Ulva faciata extract in diet as an immunostimulant for shrimp

Laboratory and farm trials were undertaken on the use of Ulva faciata for disease management and growth enhancement in Penaeus monodon. Crude extract of Ulva faciata incorporated in feed @ 1g/kg shrimp using gelatin as binder improved the total haemocyte count, agglutination titre, bacterial clearance, bacterial activity and phagocyte rates. In the farm trial, shrimps fed Ulva-incorporated diet showed improved growth rate, an increase of about 9g average body weight compared to control shrimp.

Record size oil sardine landed

Sardinella longiceps TL 272 mm

The largest oil sardine (Sardinella longiceps) ever recorded from Indian waters was netted by a purse snoner off Malpe at 30nm on 8th September. The fish measured 272 mm in total length and weighed 150 g in wet condition.

Mullet harvest from IVLP farms

Results obtained from the demonstration farms carrying out scientific monoculture of Mugil cephalus under the IVLP programme clearly showed that scientific culture yield more profit than the traditional methods. The gross return per hectare is estimated to be around Rs. 4,65,000 with an average yield of 4,050 kg/ha. The fish attained an average weight of 450 g in 10 months.

Campaign launched on 'Responsible Fisheries'

A campaign conceived as a series of co-learning workshops to make the fisherfolk aware about responsible fisheries management, undertaken under the NATP/CGP project 'Designing and validation of communication strategies for responsible fisheries - A co-learning approach' has been initiated. The first workshop in the series was conducted for 48 persons representing different stakeholders from the fisheries sector at Kozhikode during 12-14 August. The workshop in which scientists from CMFRI and CIFT acted as facilitators was organized in association with the NGO, MCITRA.

Damsel fishes bred

Dascyllus aruanus

Broodstocks of the three spot damselfish, Dascyllus trimaculatus and the humbug damsel D. aruanus were developed at the Vizhinjam Research Centre. Both species are dioecious. Spawning was noted during morning hours and eggs were attached either to the sides of the tank or on the earthen pots provided inside the broodstock tanks. The average length of newly hatched larva of D. trimaculatus was 2.5mm and that of D. aruanus was 2.4 mm.

TRANSFER OF TECHNOLOGY

Training for practicing farmers

Krishi Vigyan Kendra of CMFRI at Narakkal imparted training to 501 persons by conducting 26 training courses. The number of courses and beneficiaries are as follows: Fisheries: 6- 120; Agriculture: 9-169; Home Science: 11-212.

Collaborative training programmes were conducted in association with three gram panchayats, two co-operative societies and two government agencies in preparation of shrimp pickle, cleaning powder, integrated pest management in vegetables, kitchen gardening and jasmine cultivation.

Training for rural women

Molluscan Fisheries Division conducted a one-day training course on 'bivalve farming' for the benefit of Shree Sokthi groups at Rottuvallikkadu of Ernakulam District on 2nd August. 105 women attended the programme.

Brackishwater Fish Farmers Development Agency, Kollam and Molluscan Fisheries Division of the Institute jointly conducted a one day training course on 'edible oyster farming' at Kollam for the benefit of 120 women representatives of various Shree Sokthi groups of Kollam corporation area on 29th August.

A three day training programme on 'Post harvest management of clam and shrimp products' was organized by the Socio-Economic Evaluation and Technology Transfer Division of the Institute from 25th to 27th August at Aror and Anjilikad under the NATP project on 'Studies on fisher women in coastal ecosystem of Andhra, Karnataka, Tamil Nadu and Kerala.'

Income generating unit established

The Self-Help Group of Edavanakad Grama Panchayat Karolomma Kadamba Shree unit which was imparted training and technical guidance by KVK, Narakkal in the preparation of value added products from shrimp and fruits has started a small scale unit. Sales of the piclles and jam prepared by the unit was inaugurated by Shri. T.A. Asokhan, Vice-President of the Grama Panchayat on 31st July.

Training for entrepreneurs and officials

Three short term courses were conducted by the Trainers' Training Centre of the Institute on the following topics:

Ornamental Fish Culture: A six-day programme was conducted at Callout for 14 entrepreneurs and 2 officials from Sate Fisheries Department on the breeding, rearing and management practices of ornamental fishes. The demand for the programme is by and large increasing as ornamental fish culture offer employment opportunity with limited expenditure and little land holding ensuring quick returns.

Live Feed culture: A ten-day course was conducted at the Mandapam Regional Centre of the Institute for 7 personnel from Madurai Kamaraj University and one shrimp farmer. Training was imparted on all aspects of culture practices and maintenance of phytoplankton and zooplankton organisms commonly used as live feed for shrimps and fish.

Histopathology of finfish and shellfish: A ten-day course was conducted at the Institute Headquarters by the Physiology, Nutrition and Pathology Division for 4 officials from MPEDA and one entrepreneur in practice, processing and staining of fish and shrimp tissues. The participants were trained at international standards to identify and differentiate normal tissues and tissues from disease affected organisms.

Training for scientist probationers

As part of the 76th FOCARS Training of National Academy of Agricultural Research Management (NAARM)
Farmers meet

Mariculture technologies developed by the Institute were taken to the farmers through organizing kisan melas at different centres.

At Puthuvype, the District's `special fish farmers' day was organized by the Institute in collaboration with CIFT, ADAK and State Department of Fisheries on 15th July. The participants were briefed about fish diseases, use of antibiotics, management aspects and quality control measures. The Director and scientists from the Institute interacted with the farmers and clarified their doubts.

Krish Vigyan Kendra of the Institute, in association with Krish Bhanans of Malipuram, Poothrikad and Kunrathunad conducted farmers' meets on Jasmine (3) and mushroom (2) cultivations during July-August. Of the 254 jasmine and 196 mushroom farmers who participated in the meet, 111 and 81 members respectively were women.

Farmers' day programme was arranged on 16th August at Puthuvype by KVK of the Institute in collaboration with Thapovanam, an NGO for youth development, on the occasion of the Karshaka Diwas, which falls on the new year day according to Malayalam calendar. The function was inaugurated by Shri. C.M. Devassy, Fanchayat President, Vyppen Block. An interactive session on cultivation of medicinal plants and its uses was held for 35 farmers who participated of whom 20 were women.

At Vizhinjam Research Centre of the Institute, 40 people including farmers and officials from government agencies participated in the melas conducted on 26th September. The meeting was inaugurated by Dr. K. Shobana Kumar, DGM, Matisved, Trivandrum. Prof.(Dr.) Mohan Joseph, (Retd.) Director CMFRI presided over the programme. CMFRI presented the recent developments in mariculture made at the Institute and highlighted the technologies which could be adopted at artisanal/commercial/industrial scale. Various schemes earmarked for mariculture ventures were presented by Smt. Annie Alexander, Manager, NABARD and Shri. Mano Thangaraj, Chairman, District Planning Cell. The farmers presented their experiences on lobster fattening, fish aggregating devices and diseases free shrimp farming. The possibility of taking up the production of mabe (image) pearls as a cottage industry by a Self-Help Group and the Institute on a 50% investment-profit sharing basis is being explored.

Seminars

Divisional Seminars were held at the Institute Headquarters on the following topics:

- Artificial neural network and its application in fisheries - Smt. Mini K.G.
- Clam culture techniques - Dr. Shaji Joseph
- Development of technology for in vitro pearl production - Shri. S. Dhammaram and Smt. C.P. Suja
- Role of DNA in ratification of taxonomic status in fishes - Dr. P. Jayasankar

The points which emerged during the interactive sessions following the seminars were recorded for identifying researchable issues.

Programme Announcement
Seaweeds - 2004
National Symposium and Exposition

A national symposium on seaweeds, will be organized by the Seaweed Research and Utilization Association during 22-24 January 2004 at Cochin. Research papers are invited on Resources, Distribution, Morphology, Taxonomy, Biology, Chemistry, Physiology, Culture, Biotechnology and Utilization of marine algae. A special session will be held on problems of the seaweed-based industry, export policy and legal issues involved in seaweed cultivation and utilization. Intending participants may contact the Convener, Dr. M. Rajagopalan, Head, Fishery Environment Management Division, C.M.F.R.I., Kochi-682014, for further details.

Mega project proposed on mariculture of seaweed

With the aim to develop seaweeds as a cash crop, a round table conference was organized by NAAS and ICAR on 12th September at New Delhi. The confer-
ence inaugurated by Dr. S. Z. Qasim and presided over by Dr. S.N. Dwivedi was attended by scientists from CSMCRI, NIO, CMFRI, CIFT, various universities and entrepreneurs from seaweed based industries. An integrated approach involving mariculture, biotechnology and post-harvest technology was the topic for discussion. CMFRI is to take up a big budget Mission Mode project on mariculture of seaweeds along the Indian coasts.

**ACADEMIC NEWS**

**Ph. D. Awards**

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<tr>
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<td>Ms. Rachel Fernandez</td>
<td>Dr. E.V. Radhakrishnan</td>
<td>Neuroendocrine control of vitellogenesis in the spiny lobster</td>
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<tr>
<td>Ms. I. Sandhya Rani</td>
<td>Dr.(Smt.) V. Chandrika</td>
<td>Ecophysiology of pathogenic Vibrionaceae from cultured</td>
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<td>Smt. Girijakumariamma</td>
<td>Dr. A.P. Lipton</td>
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**OFFICIAL LANGUAGE IMPLEMENTATION**

**Translation training course**

The Institute under its quinquennial Hindi training programme organized a training course in translation for 23 officers of the Institute in association with Central Translation Bureau, New Delhi from 18th to 23rd August. The objective was to provide a positive knowledge in the official language implementation and promote the art of translation and writing. Shri. Nandakishore Chawla and Shri. M.M. Bhandekar, training officers of Central Translation Bureau, in association with CMFRI Hindi wing conducted the sessions.

**Winners of Rajbhasha competitions**

- Shri. M.M. Vanvi - Best performance in Hindi works by TOLIC, Veraval.
- Shri. G. Subramanya Bhat - First prize in Hindi translation by TOLIC, Mangalore and Second prize in Hindi essay writing by Airport Authority of India, Mangalore.
- Smt. Ali C. Gupta - Third prize in Hindi essay writing, TOLIC, Mangalore.

**Inspection**

The official language implementation activities of the Tuticorin Research Centre of the Institute were inspected by Shri. Vijayarajakumar, Research Officer for south west zone of the Official Language Department at Cochin under the Ministry of Home Affairs on 23rd September.

**Hindi Week 2003**

With the aim to accelerate the official transactions in Rashtrabhasha, 'Hindi Week' was observed during 15-20 September at the Headquarters, Regional and Research Centres of the Institute by conducting various literary activities and competitions in fine arts.

At Headquarters, the week long programme was initiated with a Hindi poster competition on *Hindi day* for the dissemination of agricultural technologies. All the 16 posters conveyed the theme on the technologies developed by the Institute beautifully. The poster with the caption *Sagar sada bahar-Hamari rakhuvalu apikalushali* won the first prize.

A *Hindi workshop day* was held on 16th September, wherein 29 officers voluntarily participated in the workshop and in the test conducted thereafter. A *lab to land day* was observed by conducting essay competitions in all the major Indian languages on the proven technologies developed by the Institute with the aim to disseminate the same to the end users in their mother tongue. The prize winning essays were sent to reputed agricultural magazines for publication. Competitions in multi-lingual word processing conducted on the e-governance day proved that the information technology aids were fully accessible in Hindi. On the 'chaal Hindi anubhav day', an opinion polling was made to assess the quantum of work done in Hindi so as to streamline future programmes at the institute and individual levels.

The valedictory function of the week long celebration chaired by Dr. Mohan Joseph Modayil was held on 20th September. The chief guest, Dr. K. Gopakumar gave away the prizes to the winners of the various competitions held during the week and for the commendable work done in Hindi for the year. The *Rajbhasha* Rolling Trophy for the overall performance in implementation of the official language was secured by the Fishery Environment Management Division.

**Programme Announcement**

**National Official Language Seminar 2004**

The V Scientific Seminar of the Institute for the dissemination of marine fisheries researches in the official language Hindi will be organized at the Institute on 30th January 2004. The topic of the seminar is *Recent Advances in Mariculture*. Papers are invited in Hindi on the following themes: Sustainable fish farming technologies and grow out systems; Fish breeding and hatchery techniques, fish genetics, biotechnology and tissue culture; Aquaculture nutrition and health management; Mariculture economics, technology refinement and transfer and Modeling application for prediction and development. Intending participants are requested to send articles in Hindi (in floppy) by 31st December 2003 to the Assistant Director (OL), CMFRI, Kochi 682 014, Kerala.
INSTITUTE PUBLICATIONS

Status of Exploited Marine Fishery Resources of India

M. Mohan Joseph, A.A. Jayaprakash (Eds.)

This publication is the result of research carried out by CMFRI during the past several decades and attempts to bring out all relevant and up-to-date information pertaining to the exploited marine fishery resources. The book includes 34 chapters on various pelagic and demersal finfishes, crustaceans, molluscs, seaweeds, marine turtles, mammals, sectorwise production trends, environment, fisheries forecasting, economics and marketing. This compendium, profusely illustrated with 25 colour plates, would serve as a valuable reference book to resource managers, fishery scientists, developmental organizations, fishing industry and faculty and students of fishery science in India and neighbouring countries.

The publication is in Demy 1/8 size, 308 pages, case binding with laminated cover. Price: Inland - Rs. 800; Overseas - US$ 200.

Euphausiids of the West Coast of India

CMFRI Special Publication No. 78

K.J. Mathew, Gisha Sivan, P.K. Krishnakumar and Sony Kurialose

The book contains 22 chapters encompassing research results on Euphausiacea, a planktonic group of crustaceans, collected during the cruises of FORV Sagar Sampada from the Exclusive Economic Zone of the west coast of India. Being an important link in the food web between the phytoplankton and higher organisms including fishes, the euphausiids play a vital role in the marine economy. The publication which with ample illustrations gives an account of the distribution, ecology and some aspects of the biology of 17 species of euphausiids will be an authentic reference for the planktologists of the tropical seas and a valuable addition to any research library.

The book is in 1/4 crown size, 155 pages, printed on art paper. Price: Inland - Rs. 250; Overseas - US $ 80.

CMFRI Personnel Directory 2003

N. G. K. Pillai and U. Ganga (Eds.)

The directory, a handy aid in facilitating communication gives the list of personnel of all categories in CMFRI as on August 2003 along with useful numbers of other ICAR Fisheries Research Institutes in India.

IN-HOUSE EVENTS

The Institute celebrated the Independence Day on 15th August and observed the National Sadbhavanam Dusas on 21st August.

Documentary films screened

The animation film in Malayalam entitled Kunjumeneem Kothuvalayum (Tiny fish and mosquito net) produced by the Institute in collaboration with C-DIT, Trivandrum under the National Agricultural Technology Project 'Designing and validation of communication strategies for responsible/sustainable fisheries - A co-learning approach' was telecasted in the Doordarshan Malayalam channel on 1st July.

The documentary film on CMFRI entitled Our Fish Our Wealth was screened for the staff members at Headquarters on 22nd July. The film of 45 minutes duration covers the gamut of activities pursued at CMFRI concerned with marine fishery resources management, fishery environment monitoring and mariculture.

Publications released

Dr. A.M. Krishnappa, Hon'ble Vice Chancellor of University of Agricultural Sciences, Bangalore released the following publications of the Institute in a function held at the Headquarters on 25th August: (i) The white paper on Status of Exploited Marine Fishery Resources of India (ii) Special publication on Euphausiids of the West Coast of India (iii) CMFRI Personnel Directory 2003 and (iv) Video film 'Our Fish our Wealth'.

The guest of honour of the day, Prof. (Dr.) Pandurangiah, Co-ordinator, World Bank Project on Watershed Management addressed the staff members on the importance of natural resource management.

HRD programme organised

FEEL Leadership training was conducted for 20 young scientists of the Institute at Headquarters from 16th to 20th September. The participants were guided to realize 'Self' and to develop and manage interpersonal relationships.

Dr. P. Parameswaran Pillai, Retd. Principal Scientist has joined the Vizhinjam Research Centre as ICAR Emeritus Scientist to work on the topic 'Resources of tunas and related species and their fisheries in the Indian ocean - an update'.

Onam celebrated

The CMFRI family celebrated Onam on 5th September under the auspices of the Staff Recreation Club at the Headquarters. A competition was held in the traditional floral carpet laying Pookalam followed by a sumptuous Onasadya. Games held for the staff members included a variety of novel group activities such as blind folded block building, dumb charade - proving communication skill without words, quiz - checking general awareness and dart throwing - testing aiming skill.

Women's Complaints Committee constituted

A committee has been constituted under the Chairpersonship of Dr. (Smt.) Mary K. Manuserry to redress the complaints of women employees working in CMFRI. The committee will hear the grievances, conduct time frame investigations and provide counsel, medical and legal aid maintaining confidentiality.
PERSONALIA

Guests

Headquarters
Dr. Mali Boonyaratpatth, Fisheries Resource Management specialist and Dr. Supis Thongrod, Senior Fisheries Biologist from Department of Fisheries, Thailand.

Mandapam Regional Centre
Prof. T.J. Pandian, Madurai Kamaraj University, Madurai.
Dr. V. Sampath, Director, Department of Ocean Development, Chennai.
Dr. M.K. Srivastava, Director, DAC, Ministry of Agriculture, Govt. of India, Krish Bhavan, New Delhi.
Total visitors at this centre were 2328 of which 2054 were students from 37 educational institutions.

Vizhinjam Research Centre
Dr. S. Ayyapan, Deputy Director General (Fy.), Indian Council of Agricultural Research, New Delhi.
Shri. G. Chandrasekhar, Under Secretary, DARE, New Delhi.

Programme Participation
Prof. (Dr.) Mohan Joseph Modayil, Director
FAO sponsored National Workshop on 'Best practices in financial support for women in coastal fishing communities' and presented a paper (1-4 July).
Discussion regarding the outstanding advances and audit paras pertaining to CMFRI at New Delhi (11 July).
'Special Fish Farmers Day' organized by CIFT, CMFRI, Kerala State Fisheries Department and private agencies at Poboya fish farm in Mala (Trichur Dist.) and delivered keynote address on fish culture, fish diseases, their prevention and control (15 July).
Discussion with NGO's and visits at Porayar, Chidambaram and Marine Biodiversity Centre, Annamalai University in connection with TIFAC Project of Department of Science and Technology (16-18 July).
Discussion on research programmes with the Chairman, RAC of CIBA and Director, CIBA at Chennai (19 July).
Meeting on entrusting the work related to recruitment/examination of administrative category posts on uniform pattern to ASRB, organized by ASRB at Project Directorate of Biological Control (PDBC), Bangalore (23 July).
ICAR Institute's Directors' Meeting at New Delhi (25-31 July).
Inaugural ceremony of the International Symposium on 'Freshwater prawns' at Cochin and chaired the session 'Biology and Capture Fisheries' (20 & 21 August).
Book releasing ceremony of 'Seafood Safety' by Prof. K.V. Thomas, Hon'ble Minister for Fisheries & Tourism, Govt. of Kerala at CIFT, Cochin (22 August).
Valedictory function of the International Conference on 'Fish Diseases' organized by Department of Aquatic Biology, Kerala University and gave felicitations (25 August).
Round Table Conference on Seaweed at National Academy of Agricultural Sciences, New Delhi (12 September).
Inaugurated the ICAR sponsored short-term course on 'Taxonomy and biodiversity of fishes and crustaceans' at College of Fisheries, Panangad and gave inaugural address (17 September).
Presided over the Kisan Mela organized by CMFRI in order to understand the problems and issues facing the sector at Vizhinjam Research Centre of CMFRI (29 September).
Dr. N.G.E. Pillai, Principal Scientist & Head, Pelagic Fisheries Division and Dr. M. Srinath, Principal Scientist & Head, Fishery Resources Assessment Division.
Technical Workshop of the Fisheries Resource Information System and Tools (FIRST) at Worldfish Centre, Penang, Malaysia (10-15 August).
Dr. N.G.K. Pillai, Principal Scientist and Dr. T.V. Sathanandan, Sr. Scientist.
Review meeting of the NATP Project 'Integrated National Agricultural Resources Information System' (INARIS) at CMFRI, Cochin (30 September).
Dr. R. Paul Raj, Principal Scientist & Head, Physiology Nutrition & Pathology Division.
Chairing the session 'Nutrition, feeds and feed additives' in the International Symposium on Freshwater Prawns organized by College of Fisheries, Panangad (21 - 23 August).
Dr. R. Paul Raj, Dr. A.P. Lipton, Principal Scientists and Dr. P. Jayasankar, Senior Scientist.
Workshop organized by NAAS on 'Priorities of Research and HHD in Fisheries Biotechnology' at CCMB, Hyderabad (24-27 August).
Dr. R. Sathidas, Principal Scientist & Head, SEEDT and Dr. S. Ashahela, Scientist (SS).
Project Co-ordination Committee Meeting organized by District Co-operative Bank, Kakkkanad (30 August).

Dr. L. Krishnan, Principal Scientist, Demersal Fisheries Division
Served as the Facilitator for the three-day training programme on 'FEEL Leadership' conducted at CMFRI, Cochin (18-20 September).
Meeting on 'Current Trends in Telecom Scenario' conducted by BSNL at Kochi (24 September).
Dr. P.C. Thomas, Dr. K.C. George, Dr. A.P. Lipton, Principal Scientists, Shri. N.K. Sanil and Dr. K.S. Shobhana, Scientists (SS).
Participated and presented papers related to various aspects of fish and shellfish diseases in the International Conference on 'Disease Management for Sustainable Fisheries' (ICON-DMSF, 2003) at Trivandrum (25-28 August).
Dr. K.S. Shobhana, Scientist (SS)
International Symposium on 'Freshwater Prawns' organized by College of Fisheries, Panangad (21-23 August).
Dr. P. Kaladan, and Dr. Reeta Jayasankar, Sr. Scientists.
Round Table Conference on 'Seaweed' at National Academy of Agricultural Sciences, New Delhi (12 September).
Dr. P. Kaladan, Sr. Scientist.
Network Project Meeting on 'Seaweed as Fodder' and presented a project proposal at Krishi Anusandhan Bhavan (II), New Delhi.
Dr. Shoji Joseph, Scientist (SS)
National Seminar on 'Reef Ecosystem Remediation' and presented a paper on 'Conservation and management of reef associated molluscs for sustainable utilization' at SDMRI, Tuticorin (24-26 September).
Smt. Sheela Immanuel, Scientist (SS)
Annual Review Meeting at IISR, Rozhikode and presented the Annual Report of the IVLP Project (22-24 September).
Dr. Vijaya Kumar V.P., Scientist.
Annual Review Meeting conducted at KVK, Pondicherry and presented the Annual Report of the ATIC (16-17 September).
Dr. C. Ramachandran and Smt. N. Aswathy, Scientists.
Training programme in official language on 'Post Harvest Technologies in Marine and Inland Fishes of India' at CIFT, Cochin (25 August - 4 September).
Dr. N. Kalaparambil, Principal Scientist & SIC Mandapam Regional Centre.
Workshop on 'Coastal Vegetation' at the National Institute of Oceanogra-
phy, Goa and delivered a special lecture on 'Seaweed culture in India - Present status and prospects' (22 August)

- National Seminar on 'Reef Ecosystem Remediation' at the Suganthi Devadason Marine Research Institute, Tuticorin and delivered a special lecture on 'Conservation and management of seaweed resources for sustainable utilisation' (25 September)

Dr. V.D. Deshmukh, Principal Scientist
- State level meeting on 'Management of Marine Fisheries and Regulation' at Department of Fisheries, Govt. of Maharashtra (29 August)

Dr. K.V.S. Nair, Principal Scientist & SIC, Veraval Regional Centre
- 'Sustainable Fisheries in Gujarat' conducted by Fishworkers Forum at Veraval (14 July)

Dr. N. Viswambharan
Asst. Adm. Officer
CMFRI, Cochin
15.9.2003

Dr. M. Shanmughavel
T-1-3 (Refrigeration Mechanic)
Mandapam Regl. Centre
01.1.1995

Shri. Vinod P. Bagayatkar
LDC
Mumbai Res. Centre
12.8.2003

Shri. M. N. Sathyam
SS. Gr. I (Messenger)
Calicut Res. Centre
01.9.2003

Dr. Kajal Chakraborthy
Scientist
CMFRI, Cochin
25.08.2003

Shri. V. Venkatesan
Scientist
Mandapam, Regl. Centre
25.08.2003

Dr. Kagal Chakraborty
Scientist
CMFRI, Cochin
25.08.2003

Shri. Madhu V.R.
Scientist
Veraval Regl. Centre
25.08.2003

Ms. Paramitha Banerjee
Scientist
Mumbai Res. Centre
25.08.2003

Smt. A. Usha Rani
SS. Gr. I (Messenger)
Tuticorin Res. Centre
12.09.2003

Shri. K.C. Gopalan
SS. Gr. IV (Deckhand)
CMFRI, Cochin
30.09.2003

Shri. M.R. Bharathan
SS. Gr. IV (Deckhand)
CMFRI, Cochin
30.09.2003

Shri. K. Govindan
SS. Gr. II (Khansama)
Mandapam Regl. Centre
31.07.2003

Shri. G. Ankalat
SS. Gr. III (Safaiwala)
Mandapam Regl. Centre
31.07.2003

Shri. G.S. Daniel Selvaraj
Principal Scientist
CMFRI, Cochin
31.07.2003

Shri. A. Chellam
Principal Scientist
Tuticorin Res. Centre
31.07.2003

Shri. A. Chellam
Principal Scientist
Tuticorin Res. Centre
31.07.2003

Shri. T.N. Padmanabha Kurup
Asst. Admn. Officer
Veraval Regl. Centre
30.09.2003

Shri. P.I. Koya
SS. Gr. IV (Lab Attendant)
CMFRI, Minicoy
01.08.2003

Voluntary Retirement

Shri. P.I. Koya
SS. Gr. IV (Lab Attendant)
CMFRI, Minicoy
01.08.2003
### TRAINING PROGRAMME SCHEDULE (KRISHI VIGYAN KENDRA)

<table>
<thead>
<tr>
<th>Month</th>
<th>Topic</th>
<th>No. of Courses</th>
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<td>Mushroom cultivation</td>
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<td>Coconut cultivation</td>
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<td>Grape squash preparation</td>
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<td>Fish wafer preparation</td>
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<td>Poultry farming</td>
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<td>Feed management in shrimp farming</td>
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<td>Nutrient management in coconut farms</td>
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<td>Banana cultivation</td>
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<td>Orange squash preparation</td>
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<td>Fish pickle preparation</td>
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<td>Jasmine cultivation</td>
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<td>Clam pickle preparation</td>
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<td>Mango squash preparation</td>
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<td>Crab farming and fattening</td>
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<td>Jasmine cultivation</td>
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In addition to the above training programme, need-based training programmes will be conducted in collaboration with Vypin block, gram panchayaths and krishi bhavans in Ernakulam District and Brackishwater Fish Farmers Development Agency for farmers sponsored by Agriculture Department, Mithra Kisans under the National Water Shed Development Programme and trainees sponsored by non-government organizations.
Shri. Nandkishore Chawla, Training Officer, CTB, New Delhi addressing the staff at the valedictory function of the Translation Training Course in Hindi

Hindi Week Celebrations:
At Vizhinjam, Prof. (Dr.) C.G. Rajagopal, Principal of Sanskrit College & Dean of University of Kerala (Retd), addressing the staff
At Veraval, Dr. K.V.S. Nair giving away the prize to Shri. M.M. Vanvi who secured First Prize in six competitions held during Hindi Week

Dr. M. Rajagopalan receiving the Rajbhasha Rolling Trophy secured by FEM Division from Dr. K. Gopakumar, former DDG(Fy.) ICAR on the valedictory day of the Hindi Week celebrations at Headquarters

Shri. G. Subramanya Bhat (Top) and Smt. Alii C. Gupta (Bottom) receiving prizes for Hindi essay writing competitions conducted at Mangalore by Airport Authority of India and TOLIC respectively

Aiming skill competition in progress