THE MARINE FISHERIES INFORMATION SERVICE: Technical and Extension Series envisages dissemination of information on marine fishery resources based on research results to the planners, industry and fish farmers and transfer of technology from laboratory to field.

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3. Unusually Heavy landings of Juvenile catfishes at Rameswaram

Front cover photo:
Vietnamese surgical equipments used for implanting nucleus in pearl oyster. Seen in the middle are two spherical nuclei.

Back cover photo:
The pearl oyster culture raft fabricated by the trainees who attended the International Training Course on Pearl Oyster Farming at Tuticorin.
Introduction

The International Training Course on Pearl Oyster Farming and Pearl Culture was organised by FAO/UNDP Regional Sea Farming Development and Demonstration Project of Network of Aquaculture Centres of Asia (NACA) and the Central Marine Fisheries Research Institute, Cochin (CMFRI) at the Shellfish Research Laboratory of CMFRI at Tuticorin from 1 - 2 - 1991 to 28 - 2 - 1991. Among the NACA Member countries, very few countries possessed the knowledge of pearl culture and India came forward to disseminate the technology. The response to depute the candidates by member countries was overwhelming and one of the best for similar training programmes. Even France, a non member country was willing to depute candidates but they could not be accommodated. The FAO/UNDP provided the funding for the training course. Except for a couple of guest lectures, the entire training programme was conducted by the Scientists of CMFRI who have developed and continuously refined the pearl culture technology during the last 18 years.

Inaugural function

The inaugural function was held at Tuticorin on 1 - 2 - 1991 at 11.00 hrs.

Welcome address

Dr. P. S. B. R. James, Director, Central Marine Fisheries Research Institute, Cochin welcomed the gathering. In his welcome address he gave a brief resume of various mariculture activities of CMFRI. He stated that Tuticorin is one of the important centres of CMFRI and specialised in shellfish research especially in mariculture of molluscan species. Among the various technologies developed at the Institute, the one on pearl production achieved at Tuticorin in 1973 was unique. Given the erratic nature of pearl oyster fisheries in the natural beds of the Gulf of Mannar, the Institute focussed its attention to hatchery technology for production of pearl oyster seeds which was successfully achieved in 1981. This success has helped to overcome the dependance on nature for pearl oysters and also helped the Institute to embark upon a programme of sea ranching of hatchery produced pearl oyster seed in the natural grounds so as to enhance the production from nature.

Presidential address

The function was presided over by Dr. P. V. Dehadrai, Deputy Director General (Fisheries), Indian Council of Agricultural Research, New Delhi. In his presidential address he thanked Dr. Chen Foo Yan for his efforts to organise the training programme at CMFRI. Then he recalled the story of pearl fishery at Tuticorin in the past and the productive nature of Gulf of Mannar. The traditional pearl fishery enjoyed an international pearl trade. For the past three decades, the pearl banks are barren with little hope of revival of pearl fishery in the immediate future. The situation, therefore, warranted to go for cultured pearl production which has been achieved in several countries. At this juncture he suggested two things i) to conserve the natural resources as they yield highly prized natural pearls and ii) to give biotechnological approach to the process of pearl production through specific studies on nature of nacre secretion, texture, colouration etc.

Inaugural address

Dr. V. Shanmugasundaram, Vice Chancellor, Manonmaniam Sundaranar University, Tirunelveli compared very fittingly the invocation song written by Sundaranar in his creation called 'Manonmaniam' to this function, concerned with pearl production. The poem depicts that Tamil Nadu was great at one time when the pearl trade was at its peak. Now, he said, Sundaranar's anxiety comes true by this training course. As an
economist he said that the need of the hour is ‘Go for massive production of pearls! Flood the market with pearls!! Bring back the glory of Tamil Nadu!!!!

**Felicitations**

Shri S. Ansar Ali, Collector, Chidambaram District gave his felicitation address in which he told that Tuticorin, once famous for pearl oysters, pearl fisheries and natural pearls was badly affected on the ecological front. He cited an example of removal of coral reefs for lime and other purposes which greatly damaged the ecology of this region. He appealed that some action must be taken at higher level. He pointed out that prawn culture is gaining momentum in the district. Similarly, he wished that pearl culture should pick up and he assured his support.

Dr. Chen Foo Yan, Project Co-ordinator, Regional Sea Farming Development and Demonstration Project, Bangkok said that sea farming programmes under NACA have been undertaken in different parts of the world. He listed out the countries where training courses are offered on specific sea farming aspects. He said that very few countries possess the pearl culture technology but it was India which readily came forward to conduct this course. He thanked Dr. P. S. B. R. James, Director, CMFRI who is also the National Coordinator for the Project and Indian Council of Agricultural Research for kindly offering to conduct this programme. He exclaimed that of all the training courses under sea farming projects, this training on pearl oyster farming and pearl culture received tremendous response from South East Asian countries. As a result, two candidates from France could not be accommodated in the training.

Dr. K. A. Narasimham, Principal Scientist and Officer-In-Charge of the Tuticorin Research Centre of CMFRI, introduced the trainees. Dr. K. Satyanarayana Rao, Head, Molluscan Fisheries Division, CMFRI, Cochin gave vote of thanks.

**Countries participated**

In this training programme, a total of 26 participants from ten countries participated. Among them, three came from Bangladesh; three from Peoples Republic of China; one from Malaysia; two from Philippines; two from Thailand; four from Indonesia; three from Myanmar (Burma); three from Republic of Korea; three from Vietnam and two from India.

**Accommodation and transport**

The participants were accommodated in Hotel Sugam and Hotel Dhanam at Tuticorin. Boarding facilities were provided to suite the taste of different nationals at the respective hotels. On all the working days transport facilities were provided to the participants to come to the Laboratory and to go back to the hotels. During intervening holidays they were taken to different places of scientific and historical importance.

**The training programme**

The training course was of four weeks duration from 1-2-1991 to 28-2-1991. After the inaugural function, Dr. P. S. B. R. James, Director, CMFRI gave a lecture on the mariculture research in general and molluscan culture in particular in CMFRI. Dr. K. Alagarswami, Director, C. I. B. A., Madras gave a talk on the indigenous pearl culture technology and status of Mandapam and the production of excellent cultured pearls. He declared that the technology adopted was the one developed by the CMFRI, is viable and yielded good results.

Shri S. Mahadevan, Retired Principal Scientist, CMFRI, Tuticorin, recalled the declaration made by Dr. P. V. Dehadrai, D. D. G., ICAR, at the National Seminar on Shellfish Resources and Farming at Tuticorin in 1987 that the Tuticorin Research Centre would be recognised as an international centre for molluscan research. The entire credit goes to the ICAR, Director of the Institute and the scientists of the pearl culture team. Therefore he appealed to the scientists, not only to think of crisis of Gulf war but also the crisis of Gulf of Mannar where the absence of pearl oysters causes great concern.
pearl culture in the world followed by guest lectures on pearl oyster resources and Indian pearl fisheries by Shri S. Mahadevan, Retired Principal Scientist, CMFRI. The topics on taxonomy and distribution of pearl oysters were dealt by Dr. K. Satyanarayana Rao, ecology of cultivable mollusces by Dr. K. A. Narasimham, phytoplankton culture by Dr. C. P. Gopinathan and nutritional physiology of pearl oysters by Dr. D. Kandasami, scientists of the Institute.

Regular classes

Regular lectures and practicals on pearl oysters were conducted by Dr. A. C. C. Victor, Mr. A. Chellam, Mr. S. Dharmaraj and Mr. T. S. Velayudhan, scientists of CMFRI. The theory aspects covered the morphology, anatomy and biology of pearl oysters, histology of mantle and pearl sac, ecology of pearl oyster beds, biofouling and boring, tissue culture, pearl oyster farming, post-operative culture etc. In all a total of 22 lectures each of 1 - 1½ hrs duration were given.

Emphasis was laid on practical aspects of pearl culture. The practical classes dealt with morphology and anatomy of pearl oyster Pinctada fucata: graft tissue preparation and related aspects; pearl oyster surgery which included single, double and multiple implantation; post-operative culture of seeded oysters etc. In pearl oyster surgery, the trainees operated large number of oysters, performing single, double and multiple implantations. The total hours for operation on pearl oyster surgery was 25. Much stress was given on practicals, particularly surgery so as to improve the skill and also generate the confidence in the trainees to undertake pearl culture programmes in their countries. With regard to pearl oyster farming, the participants were taught practicals on the fabrication of culture cages, construction and mooring of the raft in the farm, farming methods and maintenance of the pearl oyster farm.

Practicals on pearl oyster hatchery

Practical aspects of pearl oyster hatchery were also taught. The aspects covered were induced spawning techniques, especially thermal stimulation, spawning behaviour of pearl oysters, fertilisation, cleavage, early development of larvae, estimation of larval density, feeding schedules and larval/spat rearing. The pearl oysters were spawned in their presence and they were able to trace the early larval developmental stages. In all, a total of 22 practicals were conducted, each of 3 hrs duration extending for 66 hours.

Group discussion

A group discussion was held on 15. 2. 1991 for an appraisal of the progress made in the training course, to invite suggestions for improvement and to exchange ideas. This proved fruitful both for the faculty members and the trainees.

Seminar by trainees

A seminar was organised on 21. 2. 1991 in which 10 participants, representing the ten countries, presented scientific papers, some with visual aids, pertaining to the status of pearl culture in their countries. The staff of the Research Centre participated in the Seminar. The discussions were very lively and useful in updating the knowledge on pearl culture in this part of the world. This seminar evoked so much interest that it was carried on for the whole day. The advances made by China in the field of pearl culture and pearl oyster hatchery were greatly appreciated.

Study tours and sight seeing

The participants went on a study tour on 9. 2. 1991 to Mandapam to see the commercial pearl culture project run by Tamil Nadu Fisheries Development Corporation. The work on nucleus implantation by the technicians of the above farm was demonstrated. They visited the pearl oyster farm at Krusadai Island. The stake method of rearing of mother oysters and seeded oysters was seen by them. They were much impressed by the activities of the project. The participants were also shown the research activities of the Regional Centre of CMFR Institute at Mandapam Camp. They had an opportunity to visit the excellent library and museum at the Centre.

On 10 - 2 - '91 the trainees were taken to Rameswaram had shown the important fish landing centres and Rameswaram temple. On return trip they were taken to Madurai. They visited the famous historical Meenakshi Temple and other important places. On 18. 2. 1991 the Southern Petro Chemical Industries Pvt. Ltd., Tuticorin were kind enough to invite the participants to SPIC. They were taken around the factories and SPIC Complex. In view of their visit
to SPIC an exhibition of cultured pearls and pearl ornaments produced by Tamil Nadu Pearls Ltd., was arranged at SPIC. It was an opportunity for the participants to see for themselves the Indian cultured pearls. As the exhibits were for sale, many participants went on a purchasing spree. The Chinese participants showed their knowledge in evaluating the quality of the pearls, thus helping the buyers.

On the special invitation from the respected Vice Chancellor of Manonmainam Sundaranar University at Tirunelveli on 23 - 12 - 1991, the participants visited the University on the same day. The University had arranged cultural programmes at Sarah Tucker College, Palayamkottai and in honour of the trainees hosted a special dinner. Each participant was given a memento in the form of 'Kuttuviplakku' (a lamp used for offering prayer) to cherish the memory of their visit.

On 25 - 2 - 1991, the participants were taken to the 'Lands end of India' that is, Kanyakumari. During this full day programme, they visited Vivekananda Rock Memorial, Gandhi Mandapam and Kanyakumari temple. They relaxed at the beautiful sandy beach and had a spectacle of the sun-set at the horizon.

On 26 - 2 - 1991 they were taken to the Fisheries College at Tuticorin. The activities were explained to them with particular emphasis on the research programmes of the college.

Cultural programmes

It was a pleasant surprise for the participants to see the 'Bharatha Natyam' for the first time. This first cultural programme was arranged in the evening by C. Kamakshi Vidyalaya, Tuticorin, on 8 - 2 - 1991. The Bharatha Natyam performed by Miss Bharati, a teacher of the school, was an excellent piece of entertainment for the participants. The other group dances and individual dances by the children of Kamakshi Vidyalaya added splendour to the evening. The colourful costumes of the artists enthrilled the foreign friends. On seeing the programmes the trainees admired them very much and spontaneously offered cash awards to the dancers as a gesture of their appreciation.

Another cultural programme was arranged in a Kalyana Mandapam owned by Madura Coats who were kind enough to spare the building for the purpose on 15 - 2 - 1991. The participants, the staff of the Research Centre and their family members attended the function. This time the programme was performed by professionals namely 'Sivasukthi Dancing Group' of Tuticorin. A variety of typical tamil dances were performed. It was a treat for the visitors to watch the synchronisation of the movements in group dances. Enthusiastic participants gave cash awards and presentation materials to the artists and took a number of photographs. Participation of some of the trainees themselves in the cultural event was worth noting.

A final but small programme was arranged on 26. 2. 1991. During this programme Miss Bindu gave a dance recital and Miss Bharathi, a Bharatha Natyam and some other artists also gave dance performances. A song by Mr. Lid De Zheng, Chinese participant was a special attraction of this function.

Valedictory Function

Valedictory function of the International Training Programme on Pearl Oyster Farming and Pearl Culture was held at the Shellfish Hatchery Laboratory at 1000 hrs on 28 - 2- 1991. Dr. P. S. B. R. James, Director, CMFRI, Kochi, during his welcome address said that the training programme conducted there was a comprehensive one highlighting all aspect of pearl oysters farming and pearl production. This was the first international training course organised by the CMFR Institute. The sound technology developed at the Institute has been recognised the world over and the pearl oyster farming and pearl culture training course has been promoted as one of the important sea farming activities by the sponsors.

Valedictory address

Dr. S. N. Dwivedi, Additional Secretary, Department of Ocean Development, New Delhi, during his valedictory address, said that pearl oyster culture holds promise as an income generating activity in unpolluted coastal regions. He stressed for concerted action to have large scale demonstration units with people's participation. He emphasised two points. First is the research and development to attract the partnership of the farmers and the second is to demonstrate the economic viability of the project to make financial institutions interested in this venture. Pearl farming activity can be promoted as vocational training, leading to self-employment in
regions where the sea water is unpolluted. He stressed the need for transfer of technology to benefit the poor in the coastal regions. The pearl culture has the potential to open avenues for economic prosperity in rural coastal areas. He argued about the need for aquaculture estates and the partnership approach involving poor farmers and financial institutions. The group farming concept was ideal for getting institutional credit and research institutes should get the bankers and the farmers together. The course certificates and the surgical instruments sets were presented to the trainees by Dr. S. N. Dwivedi.

**Presidential address**

Shri R. Jayamohan Pillai, Chairman, Tuticorin Port Trust, Tuticorin presided over the valedictory function. In his address he expressed happiness that Tuticorin is internationally recognised as a centre for pearl culture programmes. It is no wonder that Tuticorin city itself is called 'PEARL CITY'. The city once famous for well organised pearl fisheries had a set back for the last three decades. It should not be long before the past glory is brought back to the city by CMFRI through pearl culture technology and pearl oyster breeding technology. He thanked Dr. P. S. B. R. James, for his efforts to impart the training to members from other countries. The scientists of the pearl culture project have brought out the manual on hatchery production of pearl oyster spat, *Pinctada fucata* and the Chairman released it on this occasion; he congratulated the scientists for their good work.

**Report on the training**

Dr. K. A. Narasimham, Officer-in-Charge, of the Research Centre of CMFRI, Tuticorin, presented the report on the training course. He brought to the notice of all concerned that the participants evinced keen interest in learning the techniques, extended full cooperation in the conduct of the programme and have put aside admirably all personal inconveniences.

**Impressions of the participants**

Shri M. N. Sarkar from Bangladesh said that the pearl culture technology developed here is something unique and should be useful for setting up of similar projects in his country. He further added that the techniques are quite simple and could be adopted easily.

Shri Li De Zheng of the People's Republic of China said that the four week training programme was useful and he would like to incorporate some interesting aspects learnt here in the pearl production in China.

Ms. Devakie, M. Nair from Malaysia told that it was a totally new experience for her and she was very confident of starting pearl culture in her country. At the moment there was no pearl culture activity in Malaysia. She would look for the availability of the species and would try to set up pearl culture, based on the technology learnt here.

Shri P. Shanmugam from Lakshadweep was confident of putting to use in the islands, what he learnt at Tuticorin.

For Ms. Daisy and Ms. Virginia from the Philippines, the training proved interesting but they were apprehensive to translate the technology in their country, as a different species of pearl oyster was cultured there, using the Japanese technology.

The overall impressions expressed by the participants were that the training programme was comprehensive and should be useful in developing pearl culture venture in their respective countries.

**Vote of thanks**

Dr. A. C. C. Victor, Scientist SG, CMFRI proposed vote of thanks to the Chief Guest, dignitaries, trainees and other members presented at the function.
Fig. 1. Dr. P. S. B. R. James, Director, CMFRI and National Coordinator FAO/UNDP Regional Sea Farming Development and Demonstration Project (NACA) welcomes the dignitaries, invitees and participants to the inaugural function.

Fig. 2. Dignitaries to the inaugural function: from left Dr. P. S. B. R. James, Dr. V. Shanmugasundaram, Vice Chancellor, Manonmaniam Sundaranar University, Tirunelveli (Chief guest), Dr. P. V. Dehadrai, Deputy Director General (Fisheries), ICAR and Dr. Chen Foo Yan, Project Co-ordinator, Regional Sea Farming Development and Demonstration Project, Bangkok.

Fig. 3. Dr. Chen Foo Yan makes the felicitation address.

Fig. 4. A view of the audience including the course participants.

Fig. 5. The trainees in the practical class.

Fig. 6. Trainees fabricating culture cages.
Fig. 7. The tissue grafting in progress.

Fig. 8. Raft construction in progress.

Fig. 9. The nuclei implantation process is being performed.

Fig. 10. The trainees with the newly fabricated raft.
Fig. 11. The floated raft anchored in the sea.

Fig. 12. At the valedictory function of the training course. Seated from left are Dr. P. S. B. R. James, Dr. S. N. Dwivedi, Additional Secretary, DOD and Shri R. Jaymohan Pillai, Chairman, Tuticorin Port Trust.

Fig. 13. The manual, "Hatchery Production of Pearl Oyster Spat: Pinctada fucata" prepared in the context of the training course is being released by the Port Trust Chairman by giving a copy to Dr. Dwivedi.

Fig. 14. One of the trainees giving his impressions on the course.

Fig. 15. The trainees were given kits containing the tools for tissue grafting and nucleus implantation.
Fig. 16. Mementos were presented to the trainees by the Director, CMFRI.

Fig. 17. A view of the gathering at the valedictory function.
A REPORT ON THE OFF-FLAVOURED OIL SARDINE, SARDINELLA LONGICEPS, CAUGHT OFF MANGALORE COAST IN MAY, 1991

The oil sardine, Sardinella longiceps is one of the principal species caught by the purse seiners operating from Mangalore. As the 1990-'91 fishing season witnessed a sharp decline in the catches of this species as compared to the fishery of 1989-90, there was good demand for the fish in local markets. On 3-5-1991, it was reported that the oil sardines landed by the purse seiners at Mangalore had a peculiar flavour described differently by the consumers as that of tender mango, diesel oil or mushy taste. Consequently, the dishes prepared from the fish were discarded unconsumed. A perusal of the literature shows that such a phenomenon of off-flavour in the oil sardine caught from the Indian coast has not been reported earlier.

On 3-5-91, 4 purse seine boats which operated off Panambur, Hejmadi and Kaup (located north of Mangalore) at a depth of 10-15 m landed an estimated 20 tonnes of oil sardine. The fish was as usual sold for Rs. 5/kg by auctioning to the local merchants. As there was good demand for the fish, most of the catch was sold locally and only a small quantity was transported to Karwar and Kerala. On 4-5-91, there was only stray landings of oil sardine, but on 5-5-91, the fishes caught from the same area and those caught off Kumbla, about 35 km south of Mangalore, on 9-5-91, had the same characteristic taste. Consequent to this the price fell from Rs. 5 to Rs. 2.50/kg and in the local markets there were only few buyers for the fish. During the period (3-5-91 to 10-5-91) about 50 tonnes of affected oil sardine was estimated to have landed.

The fresh fish did not show any sign of external spoilage or change in texture. However, on cooking, the peculiar taste was reported. There was also no report of any after effects on their consumption. The fishes were discarded mainly due to their non-acceptable taste.

The occurrence of off-taste in oil sardine was first reported on 3-5-91 from the areas north of Mangalore and subsequently from the southern region. The entire phenomenon lasted for about 8 days. The fishes caught on 11-5-91 were normal in taste.

The biological observation of the affected fish sample showed that the size range of the fish was 145-199 mm total length. The size group 170-174 mm was predominant on 4-5-91 and 5-5-91 and 180-184 mm on 6-5-91 and 7-5-91. Female fishes were more abundant on all the days. More than 80% of the males were in maturity stage II and the rest were in stage III. Among females, fishes of maturity stage II were predominant followed by spent recovery and stage III fishes. No external lesions or parasites were observed in the affected fish.

The gut content analysis of the fishes collected on 4-5 '91 and 5-5 '91 showed full stomach condition. The diatom *Coscinodiscus* spp. (60-180 μ) was the dominant food item (98%) in the stomach content. The other phytoplankters present in very few numbers were *Ceratium*, *Rhizosolenia*, *Planktoniella*, *Pleurosigma* and *Navicula*. Copepods and decapod larvae were also present in very small numbers. Strangely, large amounts of free oil was seen inside the stomach.

The analysis of the stomach contents of the fish obtained on 6-5 '91 and 7-5 '91 indicated empty stomachs. The total lipid content of the muscle tissues of Sardines was analysed from samples obtained four hours after its capture using the Chloroform-methanol method. The analysis showed very high lipid content in the muscle tissue (25.3 ± 12.1 mg /100 mg dry weight).

The surface and bottom seawater samples and surface plankton samples were collected on 5-5 '91 and 6-5 '91 from off Panambur (one of the areas from where the affected fish was reported) at 10 m depth to study the environ-

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**Plankton**

- Displacement volume 2.5 cc
- Total numbers/10 min haul 17,010
- Copepods 13.23%
- Chaetognaths 4.23%
- Decapod larvae 9.52%
- Lucifer 2.12%
- Medusae 0.53%
- Appendicularia 4.23%
- *Coscinodiscus* 65.14%
- Other diatoms Insignificant

Although large scale mortality of oil sardine between Mangalore and Mulky along the Dakshina Kannada coast due to contaminated foul discharge from the estuaries of the rivers draining into the sea south of Mangalore is on the record (Hornell, Madras Fish. Bull., 4 : 71 - 126, 1910), the off-flavour phenomenon as observed at present is not so far reported from this coast. While the exact reason for the present phenomenon could not be assigned from the data at hand, the presence of appreciable number of *Coscinodiscus* spp. in the plankton samples, the predominance of this diatom in the gut content and the relatively low silicate content and high transparency of the water would indicate the possibility of formation of a bloom of *Coscinodiscus* in the region just prior to the report of this phenomenon. The occurrence of such a bloom in the area is not unusual (Mathew et al., Mar. Fish. Infor. Serv., T & E Ser., 84 : 1988) and a *Coscinodiscus* bloom occurred last in the area during April-May, 1989. Further, it is interesting to note that *Coscinodiscus* being a disc shaped diatom has large number of oil filled vacuoles, which is an adaptation for its floatation. Feeding of such a lipid laden diatom could bring about changes in the chemical composition of fish flesh. Earlier studies on the seasonal lipid composition of oil Sardine muscle tissues have indicated only 5-8% lipid during the months of April and May (Sen and Chaluriah, *Paintindia*, 18 (4) : 39 - 41). However, in the present case, significantly higher content of lipid was observed in the muscle tissues. It is reported that high levels of lipid [above 25%] as observed presently would impart an oily flavour and give rise to a soft mushy taste (Howgate and Hume, *World Conference on Aquaculture Reviews*, Venice, 1981, 40 - 43). Whether such a condition might be the...
reason for the present off-flavour in the oil sardine needs further investigation. Moreover, most of the fish examined after 6-5-'91 had empty stomachs indicating the active avoidance of this food. Such active avoidance of blooms by oil sardines has also been reported earlier (Raja, Bull. CMFRI, 16, 1969).

Howgate and Hume (op. cit.) have reported that flavourous compounds in the water can be readily absorbed to the flesh causing taints. Taints can be caused from oil spills or phenols from industrial waste. It is interesting to note that the characteristic mango flavour/aroma could be caused by a phenolic compound. Although the Mangalore Chemicals and Fertilizer (MCF) factory discharges its effluents, mainly composed of urea and ammonia, into the near shore open sea, a few kilometers north of Mangalore, there is no report of the presence of any phenolic compounds in the effluent. Similarly, most of the local people believe that the peculiar taste in the fish could have been caused by the presence of oil contamination. However, none of the information gathered at present point to this. Moreover, none of the other pelagic fishes caught from the region during the period showed this off-taste.

The authors are grateful to Dr. P. V. Rao, Officer-in-charge, MRC of CMFRI, Mangalore for providing facilities and for correcting the manuscript.
UNUSUALLY HEAVY LANDINGS OF JUVENILE CATFISHES AT RAMESWARAM*

At Rameswaram landing centre in the south-east coast of India, 26.7 tonnes of juvenile catfishes in the total length range of 85 - 230 mm were landed by mechanised trawlers at a C. P. U. E. of 35 kg. These units have operated about 30 km south-east off Rameswaram in the Palk Bay (9° 15' N; 79° 35' E) at a mean depth of 8 m, where the ground is muddy. Of the three species occurring, Tachysurus tenuispinis (107 - 215 mm TL) formed about 70%, T. maculatus (85 - 148 mm TL) 21% and T. thalassinus (150 - 230 mm TL) 9%. The length frequency distributions of T. tenuispinis and T. maculatus are given in Fig. 1. On no other occasion, such heavy catches of juvenile catfishes have occurred during 1988 - 1990 in the entire Rameswaram Island and Mandapam landing centres.

Besides the above observation in trawl landings, on 14-12-90 and 15-12-90, 250 kg of juvenile catfishes at a C. P. U. E. of 5 kg were caught, in 'Disco nets' operated at about 10 km south-east off Mundurayarchathiram (near Dhanushkodi) in the Palk Bay in approximately the same ground, at 10 - 14 m depth, which is rather unusual in this gear. T. tenuispinis formed 80% and was in the range of 110 - 190 mm TL.

Considering the fact that T. tenuispinis and T. maculatus form only about 2 and 1%, respectively of all catfishes landed by commercial trawlers and drift gill netters in this region, these observations are noteworthy. T. tenuispinis is known to be a migratory species and occurs in abundance during different periods in Visakhapatnam, Calicut, Cochin and Goa. It is apparent that the heavy landings of the juveniles of T. tenuispinis and T. maculatus during the present observations would have migrated to this region from elsewhere.

* Prepared by P. Jayasankar and M. Bose, Regional Centre of C. M. F. R. I., Mandapam Camp - 623 520.
तारली सर्फीनेला लीगिसेस मंगलूर में कोष संगठन के द्वारा पकड़ी जाने वाली मुख्य जाति है। 1989-90 की अवधि 1990-91 के अनुसार मृत्यू में इस जाति का प्रकार बहुत कम थी। लेकिन 3-5-91 कौंस में कोष संगठन के जरिए पकड़ी गयी तारली जब बड़ी ही अधिक विद्वानों से जल्दी ही इसके दृष्टि के बारे में रिपोर्ट मिलने लगी। कुछ कोषों के अनुसार इन्हें नाम आया था किल्ले आइल्ड या पूरा का लाभ था।

तारली मछली के इस दृष्टि के कारण बजर में इस मछली का भाव जल्दी गिरा गया। पहले प्रति कि जाने के लिए 5 जं. पर तेजी में तारली का भाव अधिक 2.5 रु. हो गया। 3-5-91 से लेकर 10-5-91 के दौरान यहाँ इस प्रकार के करीब 50 टन मछली का अभाव हुआ।

मछली के बाद आकर में कोई अंतर नहीं था। इसका दृष्टि प्रकाश ने वाल में ली गयी जैसा था। इसे खाने में कोई पुरा प्रयास भी नहीं दिखाई पड़ा। इस परियोजना को एक विषेषता यह था कि इस प्रकार का दृष्टि 3-5-91 से 10-5-91 तक पकड़ी गयी मछली में देखा गया। 11-5-91 को पकड़ी गयी तारली को कोई दृष्टि नहीं था।

दृष्टि चार्गित मछलियों के बीच के जैसे निर्देशन से यह देखा गया कि इन मछलियों के अधार 145-199 मी में देखा गया। पकड़ में तेजी जाति की मात्रा अधिक थी।

पूर्व जाति में 807. प्रोदर्स्प्या की दूसरी अभाव में और काफी तीसरी अभाव में। रंगी जाति में इस प्रोदर्स्प्या की मात्रा अधिक थी और बाकी अदरक्षित और तीसरी अभाव की थी। इन में कोई वाही चोट या परजीवियों का प्रयास नहीं दिखाई था।

दिनांक 4-5-91 और 5-5-91 को पकड़ी गयी मछलियों के आकार नहीं का विशेषण करने पर भेट भारा हुआ दीखा पड़ा। पतझड़कन जैसे कोपिसिंडिक्सक स्थापित थीं। प्रमुख आकार नहीं था। सेंसिटिम्यू, एक्स्ट्रेक्टनिम्यू स्लाउटिम्यू, स्लाउटिम्यू और नाइक्क्ला आमाहाय में देखा गया। एक प्रमुख शब्द यह था कि आमाहाय में बड़ी मात्रा में तेल था। 6-5-91 और 7-5-91 को प्राण मछलियों के आमाहाय खाली थे।

प्रायोगिक रिपोर्ट में अयोग्य के लिए पतझड़ 3-5-91 और 6-5-91 के उपरी और नीचे तक के भीतर जल और साथ के जलपायों पर अयोग्य बनाया। ताली में तहत जल का ताप प्रयाग 34.8 और 33.6, सल्फाट्रा 36.34 और 35.53 पी ठी, विलियन आक्रोजन 4.09 और 3.59, पिलो, तिथि, एस. 8.07 और 8.15 था। फोस्फेट, नाट्रियम, ब्रॉन्यूट और अम्ल यादि और औषधीय उपकरण थी। लेकिन थिकित स्वस्थ रूप से खाना नीचे था। जल की पारंपरिक स्वस्थ थी। पल्लक निश्चित करने पर मछलिदर्शक के यह पी थी जो उपस्थिति प्रयाग दीख पड़ी। लेकिन देखने का बाल यह था कि मछलिदर्शक के नीचे एडियोस्कशन (aerolas) जब अनुसन्धान वे तब पीले रंग के क्विप्लेस्कों (chromatophores) उपस्थित थे। तारली में यह थिकित जल की स्वस्थ का लक्षण है।

दस्तावेज कनेक्ट टच को मांगने और कल्की के बीच नदियों के ज्वारामंडलियों से संबद्ध विकसित कार्य सदृश में सिलेने से तारली मछली की भारी मात्रा में नाले के बारे में पहले ही हिस्से किया है। लेकिन तारली मछलियों में इस प्रकार के दृष्टि देखने में यह पहली रिपोर्ट है। इस परियोजना का संसाधन वहां की जाति के कारण वस्त्र का रूप नहीं होता है। लेकिन प्रकाश मछलियों में मछलिदर्शक की वास्तव स्वस्थ, तारली के आमाहाय में इसकी आवश्यकता, थिकित होने की कठिनाई और जल की पारंपरिक आदि यहाँ इस क्षेत्र में इस परियोजना को रिपोर्ट के द्वारे मछलिदर्शक के संसाधन उपयोग की उपरांत करता है। मछलिदर्शक का एयरोलस 1989 और मासक नीचे भी नहीं दिखाई पड़ा। मछलिदर्शक डिस्क (diatom) को आकारवाले डाइटम (diatom) है और इसे अंगिल ईस्ट घरी घाटनियों (vacuoles) होते हैं। ऐसे लिपिद (lipid)पी जल को खाने पर मछली के पीस में रासायनिक परिवर्तन आता है। रिपोर्ट का भी है कि लिपिद के आवश्यक से तेल का खेत और गृहदार (mushy) स्वाद खदा हो सकते हैं। लेकिन तारलियों
का दृष्टिकोण का कारण से हुआ है या नहीं। कई ने अपने की जैच आवश्यक नहीं कहा कि 6-5-91 के बाद निरीक्षण की गई मुख्य तथापि के पेट छात्र थे।

होटल और स्वास्थ्य ने रिपोर्ट की है कि जल्द के सुचारू मुख्य होते से भारी मान्यता के मौसम में प्रवेश करने वाले मौसम की स्थिति का समाचार है। स्वास्थ्य ने माना है कि यह मौसम का यह दृष्टिकोण तेज़ है।

रामेश्वरम में पारी मात्रा में निकोर शिशुगढ़ियों का अवतरण *

भारत के दक्षिण – पूर्व क्षेत्र के रामेश्वरम अंतर्गत केंद्र में उन्नीसवीं शताब्दी द्वारा की गई 26.7 टन निकोर शिशुगढ़ियों का अवतरण हुआ। इन तेज़ी के प्राप्ति रामेश्वरम से 30 कि. म. दूरी पर पाक खाली में 8 मि. बसराई के पक्षियों के सेंटर था।

इन परिसरों में प्राप्त मुख्य जातियों टेन्टिमुरास टेन्टिमुरास (सफ लंबाई 417-215 मि. मी.), टाइतेनिसिस (सफ लंबाई 185-148 मि. मी.) और टाइ. टेन्टिमुरास (सफ लंबाई 150-230 मि. मी.) थे। इनका पत्थर प्रतिपादन 70, 21 और 9 थे। निकोर शिशुगढ़ियों का इस प्रकार का मार्ग अवतरण रामेश्वरम और बंदर में हो इसे फ़िल्टर कर्ने जाती है।

प्राकृतिक शुभोत्सव का पालन और मुक्ता संरक्षण पर आपातकालीन अंतर्द्वन्द्वीय सेंचुरी की रिपोर्ट *

मुक्ता शुभोत्सव का पालन और मुक्ता संरक्षण पर एक अंतर्द्वन्द्वीय प्रक्षेपण केंद्र के हंगाम की मानकीकरण के संपर्क में ए. ए., आर. डी. और ए. ए. ने दो प्रकार की शुभोत्सव का प्राप्ति की है।

केंद्र के आयोजन के हेतु ए. ए., आर. डी. और ए. ए. ने दो प्रकार का संचालन किया है। इसलिए, इस तकनीकी जीवन के प्रारंभ के कारण उन्नीसवीं शताब्दी में अपने तकनीकी उन्नयन को संचालित करने में उत्सुक था। प्रक्षेपण को संचालन के लिए अंतर्द्वन्द्व का प्रयोग ए. ए., आर. डी. और ए. ए. ने किया। दो अंतर्द्वन्द्वीय प्रक्षेपण का विकास शासन का विस्तार और अंतर्द्वन्द्व चुराया जा रहा है।
उद्धाटन

प्रिंसेस कॉर्स का उद्धाटन एक फरवरी 1991 को दृढ़ताकृति में किया।

स्वागत भाषण

श्री श्री. एस. श्री. आर. जेसा, निदेशक, केंद्रीय मातिस्की अनुसंधान, कोर्पस ने मार्गदर्शकों का स्वागत किया। अपने स्वागत भाषण में उन्होंने सी एम ए एफ आई के बिंदु संघर्ष संघर्ष किया का कार्य प्रस्तुत किया।

उन्होंने कहा कि उन्होंने सी एम ए एफ आई के क्षेत्र में दृढ़ताकृति केंद्र का प्रमुख स्थान था। उन्होंने कहा कि यह कार्य क्राउन अनुसंधान में विशेष तौर पर मातिस्की जीवित जीवन के संदर्भ में विशेषता बन गया है।

संस्थान द्वारा किरदार निभाये तकनीकियों ने, 1978 तक दूर भर उपयोग के किरदार के लिए विनिर्माण केंद्र बन गया।

नामांकन संस्थान द्वारा प्रकाशित संस्थान के साथ एक गति का संबंध रखा। इसके लिए दृढ़ताकृति केंद्र में दृष्टि की रचना करने लगा।

अपनी भाषण

श्री एस. श्री. गैड टार्ट, उपदेशक, दृढ़ताकृति ने अपने भाषण में कहा कि दूरे दृष्टि की मुख्य धारा है और मातिस्की ने पारिस्थितिक दावों का बुद्ध अस्त का है।

दूरे निर्धारण और अन्य उपयोगों के लिए प्रौद्योगिकी के हटाने से इस क्षेत्र की पारिस्थितिक दावों के लिए प्रगति की धारा आया है जिसे रोकने के लिए आवश्यकता की जानी आवश्यक है।

उन्होंने कहा कि इस शिल्प में मूल धारा जब है और धीरे-धीरे मुक्ता संस्था और उन्होंने अपने तरफ से इसलिए आवश्यक सहायता देने की बाद की थी।

उपनीत बात, पूरा, शंकरजी, जितेंद्र, दृढ़ताकृति ने कहा कि अन्य मुक्ता संस्था ने घोषणा एवं निर्देश परियोजना बांटो के लिए एस. ए. ए. के अभ्यास विभाग में मूल धारा कार्य करते गये। इन में मुक्ता संस्था ने टॉपिक का प्रयोग करने वाले देश बहुत कम है और भारत इस पर कोई चलाए सीखो अपने आप।

उन्होंने कहा दूरे का अभ्यास मुक्ता संस्था द्वारा परियोजना का प्रयोग करने वाले देश बहुत कम है और भारत इस पर कोई चलाए सीखो अपने आप।

उन्होंने कहा कि अन्य मुक्ता क्षेत्र परियोजनाओं पर आधारित सार्वजनिक दास्तां की शुरुआत में मुक्ता संस्थान संस्थान पर आधारित इस क्षेत्र द्वारा रूप अनिवार्य दृष्टि का धारा आवश्यक है।

श्री श्री, विधारण, भविष्य निदेशक, मेगेनेटिकल इंस्ट्र्यूमेंट्स, दूरे निपटे ने महत्वपूर्ण क्षेत्र में मूल धारा का उल्लेख करने के लिए उपनीत "सुकागार तेल" इनिंगड" का उल्लेख करते हुए कहा कि यहीं कार्यक्रम किया
भाषिदार देशों का नाम

इस प्रशिक्षण कार्यक्रम में 10 देशों से 26 भाषिदार भाषा लिये। भाषिदार देश बांग्लादेश, न्यूजीलैंड, फिजियोपोलीस, न्यूजीलैंड, इंडोनेशिया, बर्मा, कोरिया, वियन नामांकन और भारत थे।

प्रशिक्षण कार्यक्रम

प्रशिक्षण की अवधि 1-2-91 से 28-2-91 तक 4 हफ्ते थी। उद्घाटन समारोह के बाद या. थी. आर. जेम्स, फिलिग्रास, सी. एन. एफ. आर और सी. एन. एफ. आर ने सी. एन. एफ. आर या ने सी. एन. एफ. आर ध्वनि संवर्तन पर समान्त तौर पर और मोहक संवर्तन पर विलक्षण किये जाने वाली अनुमान कार्यक्रमों पर प्रकाश दाने। इसके बाद या. अल्फा वर्मी, विद्वान, सी. आई. थी. ए. चैलेंज, या. ए. थेरेलेस, सी. एस. मार्डेस, फिलिपिन संवर्तन वैज्ञानिक सी. एन. एफ. आर और सी. एन. एफ. आर के सन्नाटारा रंग, या. के. ए. नरसिंह, या. थी. गोपीनाथ, या. बी. कांदपाय आदि संस्थान वैज्ञानिकों ने युक्त हुक्ते के विषय फालू और प्रशिक्षण दिया।

प्रशिक्षण कार्यक्रम

युक्त हुक्ते के विषय फालू और प्रशिक्षण कार्यक्रम या. ए. री. बिकट, या. ए. चेलेंज, या. ए. थेरेलेस, या. बी. एस. बेलारुस आदि वैज्ञानिकों के बारे में। इसे से लेकर ढेर घटे तक के 22 समाधान कार्य कम या. युक्त हुक्ते के आहुरी-विश्लेषण (Morphology), रूढ़िवाद-विश्लेषण (Anatomy) और जीविश्लेषण (Biology) में दो या तीन शॉप (Pearl Sac) के उत्तर विश्लेषण, युक्त हुक्ते संस्तर के पारंपरिक विश्लेषण, युक्त हुक्ते पालन, पूर्व क्वियातिक संवर्तन आदि विषय के बारे की व्याख्या की गई।

युक्त हुक्ते के प्रायोगिक फलों का हर अभिक धारा दिया गया था। इस प्रायोगिक मदद में युक्त हुक्ते पीड़ा की पृथक-पृथक् आकृतिविश्लेषण और ठारितवा विश्लेषण संस्तर प्रयोग, पृथक-पृथक् की हैरानी और संस्तर बढ़ाएँ। युक्त हुक्ते हर्षाक्षार, शूल, फालू का पूर्व क्वियातिक संवर्तन आदि शामिल थे। प्रायोगिक कार्य के युक्त हुक्ते हर्षाक्षार पर ही विशेष धारा दिया गया।

इस के लिए 25 प्रशिक्षकों का उपयोग किया गया। प्रशिक्षकों में नियुक्त हुक्ते आन्विकवाद बढ़ाया उनकों द्वारा अनुसंधान के संचार को संयोजन का सहायक, राष्ट्र के निर्देश और चारों की रीति, बृहद रीति तथा युक्त हुक्ते फालू का अनुसंधान आदि के जरिए मे सिखाया गया।

युक्त हुक्ते स्पॉटक्लस्थेल पर प्रायोगिक कार्यक्रम

इस में अनुसंधान प्रतिभागियों विशेष तानिय उद्धीप्त, युक्त हुक्ते फालू के अंतिकला, प्रत्येक (Fertilisation), स्पॉट (Cleavage), पाच विषयों की शीर्ष व्यापी, इंस्क्रिप्शन स्पॉट (Larval density) का आकलन, और तिमहे को और स्पॉट (Spat) का पालन-वाणी रीति आदि समाधान गया।

प्रोफेसर पर यूँ हारो चार्च

इस प्रशिक्षण से है प्रशिक्षण अनुमान करने में भाषिदारों के उद्धीप्त मौलिक और विचार विश्लेषण के लिए एक समूह चार्च 15-2-91 को चलाया। दोनों संस्थान सदस्यों और प्रशिक्षणियों के लिए वह लाभदायक रही।

प्रशिक्षणियों द्वारा संगीर्ष

दिनांक 21-2-91 को चार्च की यह संगीर्ष में अन्य देशों की प्रशिक्षण अनुमान करते हुए 10 देशों के एक एक भाषिदार ने अपने देशों के युक्त हुक्ते की स्थिति के संबंध में वैज्ञानिक उपहारें सुझाव किये। अनुसंधान केन्द्रों के कर्मचारी भी हृत संगीर्ष में भाग लिये। युक्त हुक्ते संवर्तन और युक्त हुक्ते स्पॉटक्लस्थेल पर ही बारा हारी की गधी प्रशिक्षण की खुल प्रशिक्षण हुई।

अध्यात्म ज्ञान और सैर-सापत

लोकलनाट मानकीकरण द्वारा निर्माण के लिए रात्रिका संरचना के रिकार्ड वाली क्षेत्र में युक्त हुक्ते संवर्तन परियोजना देखने के लिए भाषिदारों ने 9-2-91 को एक अध्यात्म चार्च की। वे यूक्तीदीर्घा में केन्द्रीय
शृंखला फार्म में भी गया। इसके बीच में घड़ीय केन्द्र के अनुसंधान कार्यक्रम और कहाँ के पुस्तकालय एवं संग्रहालय देखने का सुविधा भी उनको मिला।

10-2-91 को इस गुना ने राजस्थान के रेलवे अध्यक्ष के छात्रों का संदर्भ में किया। दूरदरों के सहेज में केन्द्रीय इन्स्ट्रोलॉजिस ने संभाषण पुस्तकों और मुक्त माध्यमों की एक प्रदर्शनी का प्रवास करके भागीदारों को अभिमान किया था। वह उनके लिए भारत में संभाषण पुस्तकों को देखने का सुविधा था।

मनोविज्ञान दिवस विविधायित के कुलपति के बिष्य निमित्त पर भागीदारों ने 23-12-91 को विविधायित का संदर्भ में किया। इन भागीदारों के अध्यक्ष विविधायित के एक सांस्कृतिक कार्यक्रम का आयोजन के बिष्य निमित्त थे। भागीदार को साधन के रूप में एक एक "कलाविभिन्नता" दिया गया।

दिनांक 25-2-91 को भागीदारों को कम्प्यूटरी ध्वनि और 26-2-91 को दूरदरों के एकेंडर कार्यक्रम का संदर्भ में किया।

समापन समारोह

मुक्ता शृंखला पालन एवं मुक्ता संवर्धन में अन्तरराष्ट्रीय प्रशिक्षण कार्यक्रम का समापन समारोह 28-2-91 को दूरदरों ने मुक्तान्न शृंखला केन्द्र के कार्यकारी प्रामाण्य स्थल-स्थान प्रमुखों में चिन्ता किया।

द्र. पृष्ठ दिव्यांग सर्वश्रेष्ठ चेहरा, दीपक, सी.एम.एफ. अरुण जेन्स, अनुवादक, सी.एम.एफ. एफ. अरुण जेन्स ने उनके स्वागत में कहा कि मुक्ता शृंखला पालन और मुक्ता संवर्धन पर चलाया गया गर्व प्रशिक्षण कार्यक्रम अन्तरराष्ट्रीय रूप से का फल एक कार्यक्रम है। इस कार्यक्रम के जुड़े संस्थान द्वारा विकसित तकनीकी जो सारे संसार में शीर्षकता मिलती है।

समापन अनुसंधान

द्र. पृष्ठ एफ. नरानिहार ने समापण में कहा कि मुक्ता शृंखला संवर्धन के अवसर में यह अद्वितीय कार्य ज्ञात है। लोगों के सहयोग से वह लोगों के निर्देश देने के नियम की आवश्यकता को उन्होंने जोर किया।

द्र.एफ. नरानिहार जो एक भाषा अनुसंधान के बिष्य निमित्त थे उनके स्वागत में कहा कि मुक्ता शृंखला पालन और मुक्ता संवर्धन के लिए दूरदरों को आवश्यक मात्रा उपलब्धि का कार्यक्रम और दूरदरों के लिए विभिन्न शृंखलाओं को इस में रूप देना करने हुए उनसे निर्दिष्ट सहायता लिया जाना था। दूरदरों के निर्देश देने के लिए उनके द्वारा दूरदरों का सुविधा पर उन्होंने बाबा दिया।

अध्यक्ष पृष्ठ दिव्यांग

श्री आर. जब्बोदान पिल्लू, एन.एफ. दूरदरों ने मुक्ता संवर्धन का अवसर पद अपना लिया।

"दूरदरों का इस कार्यक्रम से अन्तरराष्ट्रीय तल पर मुक्ता संवर्धन कार्यक्रम के साधन प्रदान किया गया। मुक्ता में संवर्धन कार्यक्रम का प्रशिक्षण शीर्ष की विद्युत है। विद्युत और उपयोग का हालांकि यह अध्यक्ष पृष्ठ दिव्यांग के संसार में दावेदार है। उन्होंने यह भी कहा कि यह भी उनके द्वारा तकनीकियों की बहुत सहायता है और उन्होंने यह भी कहा कि उनके द्वारा तकनीकियों की सहायता है।

पृष्ठ दिव्यांग पर रिपोर्ट

द्र. पृष्ठ एफ. नरानिहार, प्रभावी अध्यक्ष, दूरदरों ने समापन पर एक रिपोर्ट प्रस्तुत की।

भागीदारों के बिष्य

बंगालवेश के आये हुए श्री एन.एम.एन. मुक्ता के लिए ढाका के बिष्य निर्देशन एवं उपयोगी उपयोगकर्ता का उपयोग अन्तर्राष्ट्रीय तारीख के अनुसार करना है।

चीन के श्री शी एन. जेन्स ने कहा कि प्रशिक्षण कार्यक्रम बहुत विश्वसनीय एवं उपयोगकर्ता का उपयोग अन्तर्राष्ट्रीय तारीख का कार्य करना है।
GUIDE TO CONTRIBUTORS

The articles intended for publication in the MFIS should be based on actual research findings on long-term or short-term projects of the CMFRI and should be in a language comprehensible to the layman. Elaborate perspectives, material and methods, taxonomy, keys to species and genera, statistical methods and models, elaborate tables, references and such, being only useful to specialists, are to be avoided. Field keys that may be of help to fishermen or industry are acceptable. Self-speaking photographs may be profusely included, but histograms should be carefully selected for easy understanding to the non-technical eye. The write-up should not be in the format of a scientific paper. Unlike in journals, suggestions and advice based on tested research results intended for fishing industry, fishery managers and planners can be given in definitive terms. Whereas only cost benefit ratios and indices worked out based on observed costs and values are acceptable in a journal, the observed costs and values, inspire of their transitionality, are more appropriate for MFIS. Any article intended for MFIS should not exceed 15 pages typed in double space on foolscap paper.