

# Role and Achievements of CMFRI in Marine Fisheries Sector



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## Introduction

The Central Marine Fisheries Research Institute (CMFRI) of India is the largest of the eight national fisheries institutes under ICAR with 10 regional and other /research centres located in almost all maritime States. During the last six decades, the Institute, through its research and developmental activities in marine fisheries, has been able to sustain the national marine fish production through development and implantation of resource management strategies and policy advisories to the Government of India and the maritime State Governments, for fisheries governance. The Institute has been responsible for developing time series database on marine fish production from the Exclusive Economic Zone (EEZ) of the country, their biology, distribution, abundance, fishery forecast, potential yield, stock assessment and in formulating management measures for sustainable marine fish production.

The Institute has successfully addressed issues of ecosystem health, biodiversity conservation and coastal pollution. The technologies developed for cage culture, culture of finfishes, pearl oyster farming and pearl production, and farming of mussels, clams, crabs, lobsters, sea cucumber and seaweeds and other cultivable organisms in open seas have opened avenues for entrepreneurship development, increased production, employment generation, women empowerment, uplift of the fisherfolk and growth of the fishing industry. The credit for earning substantial foreign exchange through large-scale shrimp farming in the country goes fully to the adoption of the hatchery technologies for shrimps developed by the Institute. The coastal mariculture development through bivalve farming is the outcome of CMFRI technology dissemination. The HRD and out-reach extension programmes of the Institute have an enduring brand identity.



Dr.G.Syda Rao, Director, CMFRI receiving the ICAR's Sardar Patel Outstanding Institute Award for the year 2006-07 from the Honourable Union Minister, Mr.Sharad Pawar



Fig.1: Lobsters harvested from Vizhinjam

### Open sea floating cage



Fig.2: Cage 1<sup>st</sup> Version: Visakhapatnam

### Launching of the sea cage on 11th Dec.2007



Fig.3: Cage 2<sup>nd</sup> Version:Visakhapatnam

### Open sea floating cage



Fig.4: Cage 3<sup>rd</sup> Improved version Visakhapatnam



Fig.5: Cage 4<sup>th</sup> Version: Mandapam



Fig.6: Cage Version 5: Munambum



Fig.7: Cage 6<sup>th</sup> Version: Karwar



### Mandate of the Institute

The CMFRI, with the following mandate, has a vision to ensure equitability and sustainability of the resources.

- To undertake basic, strategic and applied research in marine fisheries and mariculture;
- To monitor and assess the fisheries resources of the Exclusive Economic Zone (EEZ) and to understand the stock and its dynamics in relation to environment and human interventions;
- To develop and commercialise hatchery and production system technologies for finfish, shellfish and other commercial marine organisms in coastal and open seas;
- To undertake research on utilisation of potentially beneficial marine organisms
- To act as a repository of information on marine fishery resources with a systematic and analytical database for policy interventions and to carry out research on social and economic costs and benefits of marine fisheries;
- To conduct frontline demonstrations and training to develop human resource for R & D in capture fisheries and mariculture; and
- To create awareness and provide training and consultancy services.

### Establishments of CMFRI

The Institute has three regional centres at Mandapam Camp (Tamilnadu), Visakhapatnam (Andhra Pradesh) and Veraval (Gujarat) and seven research centres at Mumbai (Maharashtra), Goa, Karwar and Mangalore (Karnataka), Calicut and Vizhinjam (Kerala), Tuticorin and Chennai (Tamil Nadu). Besides, there are 15 field centres located along the Indian coast to collect the marine fish landing statistics.

There are ten Divisions in the Institute, as mentioned below.

- Fishery Resources Assessment Division (FRAD)
- Demersal Fisheries Division (DFD)
- Pelagic Fisheries Division (PFD)
- Crustacean Fisheries Division (CFD)
- Molluscan Fisheries Division (MFD)
- Fishery Environment and Management Division (FEMD)
- Socio Economic Evaluation and Technology Transfer Division (SEETTD)
- Marine Bio-technology Division (MBTD)
- Mariculture Division (MD)
- Marine Bio-diversity Division (MBD)

### Research Projects of the Institute

The Institute is carrying out research projects in different disciplines related to marine fisheries management. The projects include in-house, sponsored and consultancy projects. Presently the institute is carrying out 15 Divisional projects, 15 Inter-Divisional projects, seven consultancy projects and 28 sponsored projects. The sponsoring agencies include Indian Council of Agricultural Research - Net work Projects (8 numbers), Department of Animal Husbandry, Dairying & Fisheries (02), National Agricultural Innovation Projects (06), Marine Products Export Development Authority (01), Department of Science and Technology (02), Department of Bio-technology (02), Ministry of Earth Sciences (06), Ministry of Environment and Forests (01) and Ministry of Agriculture (01).

### Salient Research Achievements of the Institute

**(1) National Marine Fisheries Data Collection -India vs. Other major countries:** The peculiar aspect of Indian fishery scenario is the combined presence of fishers who pursue their profession for subsistence and also as entrepreneurial fishermen in every part of the country. The country's peninsular region is dotted with 1.332 landing centres of different capacities, activities and facilities. Keeping a tab on all these developments round the clock and throughout the year is nothing sort of a huge surveillance arrangement across half of the country's frontiers. Comparable scenarios are available in US, Australia, China and other countries, which have very long coast line. In USA, the major source of landing information which is handled by the Federal agency is the weight and value statistics provided by the seafood dealers of each constituent State. The National Marine Fisheries Service (NMFS) undertakes supplementary surveys to weigh off the methodological bias arising out while consolidating the census values provided by the various States. Australia too has a federal setup which consolidates inputs from various sources comprising the catch statements submitted by the vessel operators or by trip tickets issued to them. China's data collection mechanism has recorded sudden exponential spurt in landings after 1985. There have been criticisms about their modus operandi *vis-à-vis* data collection as the jump recorded in the

1985- 1998 period is a phenomenal 550%. Experts have questioned the data projected by the government based on this explosion in catch figures and the fleet augmentation which would have been required to trigger this jump.

In the case of Japan, the landing figures shown in their official site (Ministry of Agriculture, Forestry and Fisheries, Japanese Government) comprises species like Scad, Mackerel, Saury, Squids, Skipjack, Albacore, Yellowfin, Bluefin Tunas, Sardines etc based on market arrivals. There is no mention of any existing data accumulating forum at the landing point level. In Brazil, the landing statistics are being collected from 1958, basically from the fish markets. The data are supplied by the captains of the vessels which are collated later on. But studies revealed that there were discrepancies in these figures and the values were mostly underestimates. In UK, prior to 1984 all the catch information was voluntarily given to the Fisheries Departments of the constituent governments by the operators. Thereafter their Common Fisheries Policy (CFP) necessitated the pertinent data to be submitted by the vessels which contribute maximum to the UK landings. In the case of Norway, in legal framework of modern time could be traced back to 1960 when licensing of fleet followed by control of fishing pressure were introduced in quick succession. Under this, the licensed fleet has to declare their catch for each trip which is collated and considered for enumeration. The Italian setup too has a well laid licensing cum quota system in place for issuing licenses to long liners, seiners, recreational fishermen and unclassified groups also. New Zealand is guided by the Quota Management System (QMS) which was introduced in 1986 and it controls 90% of commercial fishery now. QMS leads to computation of Total Allowable Catches which generates Annual Catch entitlement (ACE) for individuals and companies. Thus this concept of self management in all these countries puts the entire onus on the fishermen who have to necessarily contribute to the data collection mechanism apart from proceeding for self imposed fishing pressure reduction plans as per the recommendations at their own volition. Hence the official statistics from these nations can technically qualify to be categorised as complete enumeration or census.

For a country like India, there is simply no way to get all the catches enumerated completely. Hence the role of survey becomes indispensable. With the advancements in craft mechanics, fishing outside the 12 nautical mile limit deep into EEZ is also quite prevalent off Indian coast. Hence any attempt to estimate the catch or landings from this type of setup should be vested with a central agency which has a compliant mandate. The best possible methodology would be the one which treats the whole coast as a "population" and goes ahead systematically to select units stage-wise thereafter. The methodology which is adopted by CMFRI has been precisely doing the same for the past five decades or so.

CMFRI's methodology evolved and perfected by its Fishery Resources Assessment Division (FRAD) has been revolving around two central pivots viz (i) Simultaneous consideration of space and time and (ii) Individual focus on gears/craft-gear combinations. The observations are taken by personnel employed specifically for this purpose with similar training and knowledge support status who in all probability are bound to note down the landing particulars with minimum observational error. Further, each and every record contributed by these field personnel are either based on their personal visual assessment or by their own account of activities over a period. Hence these are pure unadulterated primary data which has got huge relevance in estimation paradigms.

The CMFRI's scheme involves 10 States including Puducherry, which encompasses 54 districts of these coastal States. The island areas viz., Lakshadweep and Andaman & Nicobar are not covered by CMFRI. The 10 States are further divided into 108 zones which are basically geographic continuums with homogeneity of fishing practices and resources. These 108 zones account for 1,330 and odd landing centres and within each zone, strata (maximum three) are formed in such a way that within each stratum of zone variability in number of crafts and that of quantum of catch over a period would be minimum. Hence the landing centres in the first stratum would be those with more number of crafts and a higher quantum of catches. These are dynamically fixed based on biennial reviews. There is a possibility of change in locations of landings depending upon the market accessibility and seasonal sea

State	Number of landing centre days (LCD)	Number of landing centres (LC)	LCD:LC ratio
West Bengal	190	58	3.275
Orissa	272	62	4.387
Andhra Pradesh	1069	243	4.399
Tamil Nadu & Pondicherry	1485	386	3.847
Kerala	938	178	5.270
Karnataka	675	87	7.75
Goa	91	34	2.67
Maharastra	807	154	5.240
Gujarat	607	67	9.060

Months	Number of landing centres covered
January	522
February	530
March	490
April	448
May	488
June	507
July	490
August	530
September	523
October	530
November	530
December	546

Region	Number of SCZ	Centre days in 2009	Percentage of coverage*
North East	2	56	10.76923
South East	13	610	18.04734
South West	15	682	17.48718
North West	11	665	23.25175
Total	41	2013	18.88368

\*Assuming 260 fishing days in a year omitting seasonal bans and holidays

Stratum	Number of LCD covered	Number of Landing Centres	Coverage (%)	Coverage under pair-day (%)
1	626	27	7.728395	14.49074
2	157	40	1.308333	2.453125
3	155	111	0.465465	0.872748

incursions. Another special provision in the scheme is the focus on mechanised centres where bulk of landings takes place throughout the year. There are 41 such identified centres with a regional breakup of two in North East, 13 in South East, 15 in South West and 11 in North West. For all practical purposes these are assigned a status equal to a separate zone and assured repeated visits to these centres are planned every month.

The CMFRI methodology based on landing-centre unit concept, advocates a trip comprising two consecutive working days to cover 24 hours of fishing activities.

That means a month is divided into sets of two consecutive days and the field personnel stay the interregal night at the landing point to cover the night landings also. Thus in a two day visit first hand account of the landing activities are recorded by the designated staff of CMFRI. As most of the landing centres have declared routine fishing holidays of three to four days in a month, the effective number of fishing days in a month is 26 which means that there would be a possibility of 13 pairs of observations in a fishing month. As per the CMFRI's schedule, of the 13 pairs of days, nine are allotted to each field official, which



amounts to a temporal coverage of 69% for the zonal month. Of course this does not include the ultimate first stage unit of landing centre days, which when converted would be 26 times the number of landing centres in the stratum. For example the MH1 zone of Sindhudurg district of Maharashtra has 8 landing centres in stratum I (as of 2009) and it would account for 208 landing centre days or 104 centre-pair day. If one enumerator is allotted to the stratum, he can cover a minimum of 9 pair days which comes to 8%. Purely from the spatial point of view there is a distinct possibility of covering all the centres in a month. Even within the temporal strata of 10 days each 33% of the landing centres can be covered in one set of 10 days within a month. As per assumptions of homogeneity within a stratum and 10 day strip, this sampling proportion is good enough to assure a healthy estimate of the parameter under focus i.e. landed quantity of a particular species by an unit.

Towards better understanding of the coverage dynamics, the attention is drawn to the survey schedule undertaken by CMFRI during the calendar year 2009. The the number of landing centre days covered state-wise and month-wise are given in Table-1.

From this Table it can be seen that the coverage ranges from a minimum of 34 landing centre days in Goa to a maximum of 386 in Tamilnadu. Further the average number of days per landing centre in a year is consistently hovering across all the States except Gujarat where it is maximum at about 10 days. Here these figures include coverage to very small centres too, whose contribution to national landing figures will be very negligible. But coverage to these centres also ensures the evenness required to ensure the unbiasedness of the estimated figures.

It can be noticed that the months of April to July have a moderate dip in coverage as these months coincide with the seasonal fishery regulations in East and West coast. (Table-2)

Assuming an average of 24 crafts are covered in a landing centre visit, with the total of 6,134 landing centre days, the total number of crafts covered works out to 1,47,216 which is 57 % of crafts reported in the 2005 census. Hence, despite the enormity of the exercise and severe bottlenecks in having qualified manpower,

CMFRI's mission has been accomplishing the task with greater technical perfection than any such parallel attempt can boast of.

To get an idea of the extent of coverage of mechanised centres which contribute to more than 65 percentage of the national landings, the frequency of visits made to single centre zones (SCZ) in the country in the year 2009 was collated and is given in Table-3

It can be seen that at the primary sampling unit level the coverage of mechanised/heavy landing centres is about 19% which is considered as a good enough coverage in a year. Further the fact that these centres contribute to around 70% of landings make the coverage higher than its actual figure.

To understand the coverage at the other zonal level, the case of Kerala in 2009 was taken up. Table-4 provides the stratum wise coverage figures:

It can be seen with proportional probability of selection with respect to previous landing records, the first stratum comprising single centre zones and other major landing centres still have a healthy coverage of 8% whereas it is very poor in the least intensive stratum 3. A simple average of these three indicates an overall coverage of 3.2 %. But a more realistic average would be the one weighted against the proportionality of total State's landing which is maximum in stratum 1. The weighted average is 6.3%.

To summarise, the coverage in the strict statistical sense is around 3-4% overall and is at a healthy 7-8% if the list is restricted to those landing centres which contribute to 85-90% of total annual landings. These rates of coverage for a national level survey are deemed to be statistically sufficient.

2) Hence in view of these figures it can be understood that the statistically sound sampling plan devised and implemented by CMFRI has a robust coverage of all types of landing centres and that too evenly throughout all fishing months which yields an unbiased estimate of the average landings per craft for each species with estimable precision which can put the annual landing figures in an interval with 95% of confidence. Hence purely on the counts of robustness, unbiasedness and measurability of precision CMFRI estimator is no less

positioned among the global estimators of marine fish landings.

(3) The marine fish landings along Indian coast during 2009 are provisionally estimated at 3.163 million tonnes.

(4) Laboratory studies on the effect of sea water temperature on phytoplankton showed that the growth rate is faster and the cycle is completed faster at higher temperature. (29°C). The species dominance changes between the temperatures. This indicates the potential changes at the base of the marine food web due to global warming.

(5) To predict changes in fish abundance with relevance to climate change, simulations were created for North West coast of India by using **Ecopath analysis**. The analysis showed that the biomass of oil sardine is likely to increase in future even under very high fishing pressure. Simulations indicated that other fisheries groups in the ecosystem may not be impacted immediately by climate change.

(6) Area likely to be submerged due to 0.3 m, 0.6 m, and 1 m sea level rise was assessed for the fishing villages in 5 coastal districts of Maharashtra. It was found that 8 fishing villages in Thane district will be affected more due to sea level rise in the future.

### Mariculture and Marine Biotechnology

(1) About 500 kg of cultured lobster was harvested from a floating cage launched at Vizhinjam, Kanyakumari and Mandapam under the project funded by Ministry of Agriculture. Each of the lobsters attained an average weight of 200-350g in four and half months with 85% survival.

(2) Green mussel (*Perna viridis*) has been spawned and larvae were reared successfully to settlement of spat at the VRC of CMFRI, Visakhapatnam in August 2009 and about 10.4 million larvae were reared in the hatchery.

(3) The seeds of the swimming blue crab, *Portunus pelagicus* were successfully produced under controlled conditions in the crustacean hatchery of the New Hatchery Complex at Mandapam Regional Centre of CMFRI during October, 2009. A total of 2,719 baby crabs were produced. The

## Fishing Chimes

survival rate ranged from 4.5% to 16.8%.

(4) Open sea floating cage farming demonstration project, sponsored by the National Fisheries Development Board, was operated by the Central Marine Fisheries Research Institute at Balasore, Orissa. The project started in February 2009 and harvest was carried out in November 2009. About 3.1 t of fish was harvested (Weight. range 0.55 g- 1.1 kg).

### New Heights Reached

**Bar coding of tunas:** Gene sequencing of 5 species of tuna for genetic bar-coding was carried out and these are deposited with the gene bank of National Centre for Biotechnology Information (NCBI). Web page: <http://www.ncbi.nlm.nih.gov/taxonomy>

S.No	Species Name	Accession Number
1.	<i>Auxis rochei</i>	ACCESSION GQ199626
2.	<i>Auxis thazard</i>	ACCESSION GQ199627
3.	<i>Euthynnus affinis</i>	ACCESSION GQ199628
4.	<i>Katsuwonus pelamis</i>	ACCESSION GQ199629
5.	<i>Thunnus albacares</i>	ACCESSION GQ199630

### New Initiatives of the Institute

- Database on species-wise landings has been created in 2007.
- Initiated digitisation of historic landings data sheet.
- Policy briefs to maritime States based on 50 years data prepared (Brief related to Kerala already released)
- Eco-labelling (MSC certification, authorisation) done.
- **Fish watch:** Having blazed an illustrious trail for more than six decades, CMFRI has initiated a new system of field information dispensation on a near real time basis. As the first phase of this effort, the landing figures and the landing centre price range of important resources at six major fishing harbours of the country are being published as "Fish Watch" in CMFRI website. The landing figures are given in kg starting from 12:00 noon of the first calendar day to 12:00 noon of the subsequent day. These figures are updated at every 1600 hrs on working days on as and where available basis.

### New Products

CMFRI has developed Green mussel extract (Cadalm GME) as an import

substitute nutraceutical for the treatment of Rheumatic arthritis and all kinds of joint pains. It is being marketed on all India basis.

Another important product is ornamental fish feed (Cadalm Varna) useful for both marine and freshwater fish. The cost per kg is about Rs.400 compared to Rs.4,000 of imported feed. These technologies are ready for transfer.

### Launching of CMFRI trade mark-Cadalm

#### New Initiatives: Climate change and its impact on marine fisheries

- Small pelagics are able to adapt advantageously to seawater warming; Coral reef cover in the Indian seas is likely to reduce after 2040; Phenological changes such as shift in spawning

season towards cooler months are evident in a few demersal fish stocks.

- These changes will alter marine ecosystem structure and function; and may erode economic returns of fishermen.
- Fishing and climate change are strongly interrelated and must be addressed jointly.
- Reducing fishing mortality in the majority of fisheries, is the principal means of reducing the impacts of climate change.
- Reduction of fishing effort maximises sustainable yields, helps adaptation of fish stocks and marine ecosystems to climate impacts, and reduces greenhouse gas emission by fishing boats.
- Most effective actions which we can take to tackle climate impacts are to adapt Code of Conduct for Responsible Fisheries and Integrated Ecosystem-based Fisheries Management.
- Support energy efficient fishing craft by evolving emission standards and promoting of static gear.
- Cultivate aquatic algae and plants for carbon sequestration, food and pharmaceutical purposes.
- Establish Weather Watch Groups for fisheries sector.

- Evolve decision support and disaster management systems.
- Develop a compendium on indigenous traditional knowledge in the fisheries sector and explore opportunities for its utilizations.
- Intensify efforts to increase climate literacy among the stakeholders in fisheries sector.

### New Horizons in Sea Farming

- Mariculture through open sea cage culture demonstrations initiated at Veraval, Mumbai, Karwar, Mangalore, Cochin, Kanyakumari, Chennai, Kakinada, Visakhapatnam, Srikakulam and Balasore
- Very good success achieved in sea farming of sea bass at Balasore and for Lobster at Vizhinjam, Kanyakumari and Mandapam. Other experiments with mullets and in polyfarming are in progress.

### Library and Documentation

- The digital version of all CMFRI publications since 1954 was released by, Deputy Director General (Fy) on 20th August 2009
- Arrangements are being made to keep digital version of more than one lakh pages of scanned documents via INTERNET
- CMFRI has taken steps to digitise all important National Publications in Fisheries published during 1800-1900 (Madras Fisheries Bulletins, Records of Indian Museum, Report on the pearl oyster fisheries of Gulf of Mannar, Memoirs Indian Museum etc)
- The Institute publishes following journals, periodicals and special publications.
  - Indian Journal of Fisheries
  - CMFRI Special Publications
  - CMFRI Bulletins
  - CMFRI Books
  - Marine Fisheries Information Service
  - CMFRI Newsletters
  - CMFRI Annual Reports
  - CMFRI Research Projects
  - CMFRI Research Highlights
  - CMFRI Miscellaneous Publications
  - Efforts are in progress to publish *Indian Journal of Fisheries* through SPRINGER from January 2011.



**Launching of CMFRI Trademark - Cadalmin**

The Central Marine Fisheries Research Institute (CMFRI) has officially registered a trademark entitled 'CADALMIN' for the products and services of the institute

The official registration of trademark 'CADALMIN' was done in the office of the registrar of Trademarks, Chennai, India.

The applications were filed under the guidance of the approved license holding agency, 'Trademark for India' in two classes 31 and 35 covering the food for fish, seeds, trading and marketing.

• Consent received from Springer and Approval from ICAR is being sought.

**New Responsibilities of the Institute**

1. The DAHD&F, Ministry of Agriculture, has constituted a three member Technical Committee to assess the Impact of fishing ban and to review its duration at national level, comprising Director, CMFRI, Kochi, Director General, FSI, Mumbai and Joint Commissioner (Fisheries), DAHD &F, Ministry of Agriculture (MoA), New Delhi. The Director, CMFRI is the Chairman of the Committee
2. The DAHD&F, Ministry of Agriculture has constituted a Technical Committee to revalidate Potential Yield and to suggest optimum fleet size in Indian EEZ. CMFRI is a member in the Committee and the process is in progress

**Thrust areas of the Institute Projections for the next ten years**

1. Propagation of open sea cage farming and expansion of small-scale sea farming activities such as those of mussels, edible oysters, clams, pearl oysters, lobster/crab fattening, seaweed farming, marine ornamental fish farming, artisanal cage culture and Integrated Multi-Trophic Aquaculture (IMTA) systems with finfish, shellfish and seaweeds.
2. Development and commercialisation of seed production technologies for marine finfish (Cobia, pompano, Red snapper and greasy grouper and shellfish, blue swimmer crab and sand lobster)
3. Successful R&D efforts for the retrieval of juveniles of high value finfish like seerfish, pomfrets, ghol, koth and use them for farming.
4. Expansion of catches of Yellowfin tuna, mesopelagic fish and oceanic squids

(likely to contribute #10% to the Indian marine fisheries catch)

5. Annual capture fisheries to reach 4 million tonnes.
6. Artificial reef (FAD) installation all along the coasts for resource enhancement, improved productivity and biodiversity

Average Number of publications for the last five years by the staff of the Institute

• Research Papers in National Journals	42
• Research Papers in International Jn.	09
• Technical articles	48
• Proceedings of seminar etc.,	31
• Popular articles	62
• Books, book chapters, manuals etc.,	06
• Total number of Annual publications	209

**Technologies transferred during the last ten years:** These are: 1) Mussel Culture; 2) Edible Oyster Culture; and 3) Ornamental fish seed production

**Technologies available for transfer by the Institute:** These are: i) Open sea cage farming sea bass & Lobsters; ii) Marine Ornamental Fish Culture; and iii) Ornamental fish feed.

**Immediate Needs of the Sector**

**Capture Fisheries:** The needs of this sector are : 1) Revalidation of annual harvestable potential yield of marine fisheries resource of Indian EEZ; 2) Adaptation of fisheries to climate change; 3) Capacity building in biodiversity conservation; 4) Structural change in the socio economic status of the marine fisheries sector; and 5) Estimation of state-wise harvestable marine fishery resources and optimum fleet size.

**Culture Fisheries:** The needs of the sector are: 1) To keep pace with the

developments in global mariculture scenario, our scientists should be better empowered at international level; and 2) Co-operation in the technological, marketing and other aspects among the different countries of the Asia-Pacific Region is of paramount importance for the development and expansion of mariculture in India.

**Awards and Honours**

CMFRI was presented the Outstanding ICAR Institution Award for the Year 2007.

**Krishi Vigyan Kendra**

The Krishi Vigyan Kendra, Ernakulam has organised training programmes for different categories of beneficiaries, Front Line Demonstration Programmes, On-Farm Testing programmes and other extension programmes aimed at promoting area development, employment generation, and increasing production in agricultural and allied sectors through technology assessment / refinement / upgradation and popularisation with organisations like Directorate of Marketing and Inspection (DMI), Ministry of Agriculture, Kerala Agricultural University and other organisations.

• A total of 57 training courses for 1,378 villagers including 10 courses in Fisheries for 306 persons, 28 courses in Agriculture for 666 persons and 19 courses for 406 persons in Home Science were organised during 2008-09

**Japan, Orissa Joint Project on Dolphins**

The Chilika Development Authority (CDA) and University of Tokyo, Japan has recently agreed in principle to jointly conduct a study on the behaviour of the endangered Irrawaddy Dolphin population in the Chilika lake, Asia's largest brackishwater lagoon. Named 'Underwater Acoustic Study', the exercise will continue for two years.

Professor T. Ura of University of Tokyo and Dr. A.K Patnaik, Chief Executive of CDA signed an Agreement. As per the agreement signed, the University of Tokyo would put to use an array of customised hydrophones developed by its researchers under the lake waters to capture the images of the day-to-day activities of dolphins.