



## National Innovations on Climate Resilient Agriculture [NICRA]



# ClimFish



NICRA Newsletter, CMFRI, Kochi

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## About NICRA

Govt. of India has accorded high priority on research and development to cope with climate change in agricultural sector. The Prime Minister's National Action Plan has identified agriculture as one of eight national missions. The project so far has benefitted several stakeholders across the nation.

National Innovations on Climate Resilient Agriculture (NICRA) is a network project of Indian Council of Agricultural Research (ICAR) aimed at enhancing resilience of Indian agriculture to climate change.

The project focuses on:

- enhancing resilience of Indian agriculture covering crops, livestock and fishery resources, to climate variability and change through development and application of improved production and risk management technologies
- demonstrating site specific farmer friendly technology packages to improve adaptive capacity to climate risks
- capacity building of scientists and stakeholders in climate resilient agricultural research and its application.

Strategic research component under NICRA is being carried out by 21 partnering institutes of ICAR out of which 7 are core institutes. CMFRI, Kochi is one among the core institutes with a team of 42 scientists led by Dr. P.U. Zacharia as Principal Investigator. With CMFRI, Kochi as Head-

quarters, the project is being operated along the Indian coast through the Regional centres at Mandapam, Visakhapatnam and Veraval and Research centres at Mumbai, Karwar, Mangalore, Calicut, Tuticorin and Chennai.

Several significant milestones have been made in the areas of capture fisheries, mariculture and technology demonstration in relation to climate variability. The project aims at evolving location-specific strategies for mitigation and adaptation of coastal fishing communities to climate change. The project also seeks to harness the beneficial effects of climate change through intensive studies on the impact of climate variables on reproductive behavior in commercially important and culturable fish resources.



### Principal Investigator's Desk

Dr. P.U. Zacharia, Head & Principal Scientist, Demersal Fisheries Division, CMFRI

It gives immense pleasure to launch the newsletter 'ClimFish' of the NICRA project component implemented at CMFRI, Kochi. This newsletter capsules the significant achievements and developments of the project carried out at CMFRI headquarters and its implementing regional research centres.

Given the extensive dimensions of the



project and the vast subjects it deals with, there is always a need for a platform which consolidates and presents different research aspects covered in the context of climate vulnerability. Such a platform will serve easy dissemination of research findings and adaptation

measures evolved to different stakeholders.

I am very glad that release of the first issue of this newsletter coincides with the 4<sup>th</sup> Annual Workshop of NICRA.

I hope this newsletter will serve as an apt platform for scientists and researchers of CMFRI to publish highlights of research findings and innovations made under the NICRA project.

# Research Highlights

## Capture Fisheries

- Changes in distribution, catch and biological characteristics with emphasis on spawning of ten significant marine resources of finfish, shrimp and cephalopod were studied.
- Correlation studies were performed with climatic and oceanographic parameters at nine regional centres.
- Vulnerability assessment of coastal districts to climate change were carried out.
- Ocean acidification in different zones were studied.
- Intervention to increase carbon se-

- qustration by planting mangrove saplings was done.
- Catch effort standardization was done for all fishery resources in Kerala.
- Correlation studies of environmental parameters with biological data for assessing the impact of temperature rise on biology of marine fishes were done.



Ring seine operation

- Biology and trophodynamics of oil sardine, Indian mackerel, yellowfin tuna, skipjack tuna, barracuda, ribbon fish, threadfin breams, goatfish, croakers, lizardfish, penaeid prawns and squid are being studied all along the Indian coast.
- Life Cycle Assessment of Marine fisheries of Andhra Pradesh was done. Coastal vulnerability index of Tuticorin district assessed.

## Mariculture

- The response, especially of spawning, hatching efficiency and larval survival of cultivable species and live feed organisms to different seawater temperature were found out.
- Experiments were conducted on three species of microalgae, one species of copepod, one species of shrimp, one species of sand lobster, five species of ornamental fish and two species of food fish.
- Growth and multiplication of rotifers



Cage harvested cobia

- were assessed at different temperatures with algal feed.
- Impact of temperature and salinity on embryonic development and larviculture in cobia *Rachycentron canadum* was assessed.
- Impact temperature on larval development of silver pompano *Trachinotus blochii*.
- The average increase of 2°C in water temperature resulted in growth reduction.
- The reduced growth rate coupled

- with change in pigmentation of larvae is inferred as the resilience response of the silver pompano larvae to combat the temperature stress.
- Experimental evaluation of climate resilient live feeds for larviculture of cobia and silver pompano carried out.
- Trials on pen farming with milkfish *Chanos chanos*.
- Trials on Integrated Multi Trophic Aquaculture (IMTA) by integrating the seaweed *Kappaphycus alvarezii* with a finfish cobia.



## Scientist's/Investigator's Desk

Dr. V. Kripa, Head & Principal Scientist, Fishery Environment Management Division, CMFRI

Over the decades, the fishing community has felt the brunt of climate change, bearing extreme climatic events and frequent loss in fishing days due to bad weather. Through the NICRA project detailed study was made to understand the perception of fishers to climate change and assess its impact on fishing communities by tak-

ing district as a fundamental unit [Integrated District Level Adaptation & Mitigation (IDLAM)]. Analysis of the information collected from more than 5000 families by surveys in Gujarat, Karnataka, Kerala, Tamil Nadu and Vishakhapatnam. indicates that the level of awareness about climate change is low and in most villages, the



impacts are severe. Fisher families need alternate avocation to improve their financial status and there is an urgent need to develop schemes to empower fishers and infrastructure in fishing villages.

## Technology Demonstration

- Empowered coastal fishermen to harness positive impact of climate change by capture based aquaculture, technologies of sea cage farming of high-value fishes like Cobia and Pompano, low-cost cage construction, mooring of cages in the sea; mussel and seaweed farming and integration of cage farming with Pokkali farming.
- In Kerala, field demonstrations were carried out in three new Pokkali

farms by integrating cage farming of pearl spot, mullet and pompano along with Pokkali farming and the profit increased to 1.30 lakhs/ha.

- Pompano (*Trachinotus blochii*) introduced for culture in low saline waters for first time in Kerala which is performing well in Pokkali fields.
- Conducted awareness programme and demonstration of cage culture potential for high value fishes.
- Participatory programmes in associ-

ation with state government of Goa are being carried out actively by Karwar Research Centre of CMFRI.



Cage Culture Demonstration

## Climate Resilient Products/Prototypes Developed

### 2011-12

- Database on primary and secondary sources of climatic and oceanographic parameters.
- Identification of favourable climatic factors for small pelagic species.
- Compendium on ITKs of fishermen to climate change.
- Fabrication of low cost cage and mooring system developed.
- Mussel and seaweed integrated farming.

### 2012-13

- Capture based aquaculture.
- Low cost cage farming.
- Demonstration of Pokkali farming integrated with finfish farming.

- Red snapper as suitable species for estuarine areas in CBA.
- Silver pompano successfully bred and farmed in brackishwater ponds.

### 2013-14

- Developed software "Fishery Biology Data Analysis and Repository System".
- Carbon dioxide flow regulator and recorder (prototype-1) for the controlled flow of CO<sub>2</sub> gas and measuring the volume of the gas released in to the seawater.

### 2014-15

- Carbon footprint in life cycle of marine fisheries.
- Tool for finding SST from Air temperature.

- Biochars from agricultural/mariculture wastes/residues.
- Vulnerability indices of coastal villages estimated (TN, AP).
- Identification of climate resilient food crops.
- Integrated Multi-Trophic Aquaculture of seaweed and cobia.
- Feed 'Pearl Plus' developed for pearl spot.



Pearl Plus: Formulated Feed

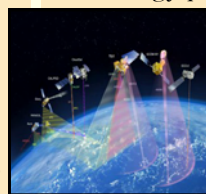


## Researcher's Desk

Rojith.G, Research Associate, NICRA, CMFRI

In the context of climate change and its impact on global and regional level, it is of necessity to develop climate resilient strategies and products. Exploration of non-conventional bio-resources for carbon sequestration is of significance. We foresees seaweed farming as a climate resilient strategy for Indian coastal waters and publication has been accord-

ingly made. Besides the present applications, seaweeds need to be developed as feedstocks for bioenergy production. Seaweed biochar is a sustainable climate resilient product and other maricultural residues can also be converted into biochars owing to the multiple benefits of carbon sequestration, water and nutrient holding capacity, etc.



Technology plays significant role in strategic climate resilience and research should focus on exploring Remote Sensing and GIS for applications such as potential fishing zone identification, variability of chlorophyll, coastal vulnerability assessment, modeling, etc.

## Awards & Recognitions

⇒ **Best Paper Award** for oral presentation on “Distributional shift of pelagic Indian oil sardine and Indian mackerel towards northern Indian ocean: a climate change induced scenario?” authored by Zacharia P.U., Rekha J. Nair, Somy Kuriakose, J. Jaysankar, A.P. Dinesbabu, Sujitha Thomas, S.J. Kizhakudan, T.M. Najmudeen, Anulekshmi Chellappan and Mohamed Koya, K., at the international Conference on ‘Ecosystem conservation, Climate change and Sustainable development (ECOCASD-2013)’, at Thiruvananthapuram.

⇒ **Best paper award** for Oral presentation on ‘Coastal Fishers perception on Climate change causes and effects: A PARS methodology framework’ authored by Shyam S. Salim, Kripa, V., and T.V. Ambrose, at the International Symposium on Greening Fisheries: Towards Green technologies in Fisheries, Technical Session 4: ‘Action Blue’-Special Initiatives for a Better Tomorrow in Fisheries in 2013, at Kochi.

## Announcements

### 4<sup>th</sup> Annual Workshop of NICRA at CMFRI, Kochi.

The ‘Fourth Annual Workshop of NICRA’ is scheduled to be held at Central Marine Fisheries Research Institute (CMFRI), Kochi, Kerala during **August 13 and 14, 2015**. The workshop will be inaugurated by Dr. S. Ayyappan, Secretary (DARE) and various technical thematic sessions will be chaired by the respective DDGs/ADGs.

Inaugural session shall be followed by a general session after which several concurrent sessions are planned. There shall be a special lecture on climate change on the day one of the event. Concurrent sessions shall be continued on day two. The event shall conclude with plenary and way forward sessions.

Posters from participating institutes highlighting the salient features shall be exhibited during the event. The event shall also facilitate the release of publications related to the NICRA project.



### Way forward....

- Marine Climate Card Series
- Catch forecast
- Species vulnerability
- Coastal vulnerability & preparedness
- Mariculture for alternate livelihood
- Carbon footprint and protocols for green fishing
- Adaptation framework

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### NICRA Image Gallery



Fishing Vessel *Silver Pompano* procured under NICRA



Central Fishery Biology Lab Established at CMFRI Headquarters.



Environmental Chamber at Mandapam Regional Centre.



Climate Change Awareness Workshop at Alleppey, Kerala.



Entrepreneurship Development Programme at Kochi



Awareness programme at Veraval



Farmgate Inauguration at Kochi