Study of Harmful Algal Blooms and other Aspects of Sardine Habitats around the Indian sub-continent (SHABASHI)

Project Leader:
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Goa, India
<table>
<thead>
<tr>
<th>Participant</th>
<th>Institute/Country</th>
<th>Role in the project</th>
<th>Category</th>
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<tbody>
<tr>
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<td>NCAOR, Goa, India</td>
<td>Biology</td>
<td>NF-POGO alumni</td>
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<td>Project Leader</td>
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<td>Nandini Menon</td>
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<td>Research Fellow; Chemistry, Bio-optics</td>
<td>NF-POGO alumni</td>
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<td>SPATT bag analysis for toxins, HPLC</td>
<td>NF-POGO alumni</td>
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<td>H.B. Jayasiri</td>
<td>NARA, Sri Lanka</td>
<td>Biology</td>
<td>NF-POGO alumni</td>
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<td>Grinson George</td>
<td>CMFRI, Kochi, India</td>
<td>Sampling, Biology</td>
<td>NF-POGO alumni</td>
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<td>Gunjan Motwani</td>
<td>SAC, Ahmedabad, India</td>
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<td>NF-POGO alumni</td>
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<td>Aneesh Lotlikar</td>
<td>INCOIS, Hyderabad, India</td>
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<td>Sanjiba Baliarsing</td>
<td>INCOIS, Hyderabad, India</td>
<td>Sampling ; Link to SATCORE programme</td>
<td>NF-POGO alumni</td>
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<tr>
<td>B. Meenakumari</td>
<td>ICAR, New Delhi, India</td>
<td>Senior mentor</td>
<td>NF-POGO alumni</td>
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<tr>
<td>Satya Prakash</td>
<td>INCOIS, Hyderabad, India</td>
<td>Dissolved oxygen measurement</td>
<td>NF-POGO alumni</td>
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<td>Mini Raman</td>
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<td>Sampling, Bio-optics</td>
<td>NF-POGO alumni</td>
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<tr>
<td>Sarat Tripathy</td>
<td>NCAOR Goa, India</td>
<td>Bio-Optics</td>
<td>NF-POGO alumni</td>
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The proposed sites for time series data collection off India

The proposed sites for time series data collection off Sri Lanka
A brief introduction

- Project implemented in March 2015.
- Project Leader Dr. Ravidas Naik signed the contract on March 17, 2015.
- Research Fellow Mr. Shaju S. S. joined Nansen Environmental Research Centre India (NERCI) on March, 2015.
- Sampling in coastal waters off Kochi began in March 2015.
- Training workshop held at CMFRI (Central Marine Fisheries Research Institute) Regional Centre, Mandapam to familiarise protocols of sampling and analyses.
- Manuscript on HAB species, isolated from Goa waters is ready and it will be uploaded by end of June 2015.
- Method for SPATT bag toxin analysis is underway and it will be established very soon.
Objectives

- Analysis of the field data collected during the period of 2013 from Indian and Sri Lankan coasts using the new methodology developed in 2014 (continuation of work from 2013 and 2014) — yet to be done

- Screening of isolated cultures for their toxin potential and expansion of culture collection of harmful algal species — being continued at Goa

- Culture setup of HAB species to be established at Mandapam CMFRI also.

- HAB training course for Sri Lankan and Indian participants for establishment of common methodology for sampling and analysis, to be held in India in February – March 2015

- Conducted it in May 2015 (got delayed due to bureaucratic problems)
Objectives contd............

- Time series of SPATT bag sample collection on a monthly basis at an extended set of stations along the East and West Coasts of India and off Sri Lanka

- Due to excessive number of samples and only one person (Dr. Rajdeep Roy) to do the analysis, sample collection would be done only once in a season.

- Concurrent auxiliary data collection at SPATT bag sample collection sites, to include water samples for phytoplankton identification and HPLC pigments, relevant environmental variables (nutrients, oxygen, temperature) and possibly bio-optical measurements on an opportunistic basis.

- Being done.

- Study the inter-annual variation in non-harmful algal species in the diet of sardines, a culturally and economically important exploited species in India.

- Based on secondary data and the 3 months primary data collection, a paper was presented at a National symposium.
Significance of HABs in marine ecosystem health

- Paper presented at the National Seminar on Marine Ecosystem Health, March 2015 at CUSAT, Cochin.
- Authors: Nashad. M, Nandini Menon, Grinson George, Chitra Chandran
- Algae serves as food to commercially important fish, especially the pelagic herbivores.

Several studies have indicated that the abundance of oil sardine (*Sardinella longiceps*) in the south west coast of India is highly variable and environmental factors such as temperature, salinity, rainfall and availability of food seems to be the factors controlling its availability.
Large inter-annual variability in sardine catch has been noticed irrespective of an increased and sustained fishing efforts (Longhurst and Wooster, 1990; Srinath, 1998; Jayaprakash, 2002).
Sardine larvae are predominantly surface and column feeders, preferring phytoplankton dominated by diatoms such as *Fragillaria oceanica*, *Pleurosoma sp.*, *Coscinodiscus* sp. (Kuthalingam, 1960; Nair, 1959).

The earliest spawned surviving individuals will be recruited to the fishery by the end of the spawning period, which in turn determines the yearly landings. Thus, larval ecology decides the later abundance of recruits to the fishery.
As per the Hjort- Cushing hypothesis (Cushing, 1974; Hjort, 1914), the biology of sardine larvae is decided by an upwelling induced bloom; the bloom initiation time and intensity are the only variations that could account for changes in the food supply to sardine larvae. These variations in food supply between different years will be reflected in the larval development and further recruitment of sardines into the fishery.

Platt et. al (2003) has shown that survival of larvae of haddock depends on the timing of the local spring bloom of phytoplankton. Remotely sensed chlorophyll field is an useful indicator of the state of pelagic ecosystem and an efficient tool for predicting the food availability of fishes.

The fluctuation of fishery resource can be correlated with the variation of primary production in the area. This is expected to provide an excellent opportunity to plan and manage the fishery in the future years.

## Expected Milestones

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<th>1st quarter</th>
<th>2nd quarter</th>
<th>3rd quarter</th>
<th>4th quarter</th>
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<tbody>
<tr>
<td>1</td>
<td>Training programme</td>
<td>Sample collection and analysis</td>
<td>Laboratory culture of isolated harmful algae</td>
<td>Sample collection and analysis</td>
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<td>Start sample collection ✔️</td>
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<td>2</td>
<td>Procurement of cryocans and portable projector – <strong>Procured mesh for SPATT, micropipettes and other consumables</strong></td>
<td>Submit a report to Nano news letter</td>
<td>Sample collection and analysis</td>
<td>Final project report</td>
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<td>3</td>
<td>Outreach activity at Goa - <strong>Rescheduled for next quarter due to exams followed by summer vacations in schools</strong></td>
<td>Outreach activity at Kochi</td>
<td>Outreach activity in Sri Lanka</td>
<td>Submit a report to Nano news letter</td>
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International Training Course on "Basic Sampling Protocols for Harmful Algal Blooms (HAB) Studies: Taxonomy and Toxin" (Mandapam Regional Centre, CMFRI)

- NF-POGO Alumni Network for Oceans (NANO) International Training course
- Organized by Nansen Environmental Research Centre India (NERCI) between 12 - 15 May 2015

Dr. A. K. Abdul Nazar, Scientist in Charge & Organizing Secretary delivering the inaugural address
Shri. Shaju S.S., NERCI delivering the lecture

Dr. Grinson George, Senior Scientist & Patron of the training programme proposing a vote of thanks
Goals accomplished through the workshop

- The participants were given hands on training in sampling, preservation, processing and analyses of water samples for bio-optical and pigment studies.
- Training on phytoplankton taxonomy using conventional microscopy.
- Solid phase adsorption toxin tracking (SPATT) procedures for quantitative qualitative analyses of toxins released by harmful algal blooms practised.
- Hands on training were imparted to the participants on the use of High Performance Liquid Chromatography (HPLC) for quantitative estimation of pigments from water samples.
- HPLC equipment at Mandapam CMFRI was set to do the analysis of samples coming from the southern stations.
Work to be initiated

- Carry out dinoflagellate cyst analysis from sediment samples at selected sites to study incidences of past blooms.
- Bio-optical characterization of cultured harmful algal species, with a view to evaluating the potential for distinguishing them from other phytoplankton by remote sensing, and comparison with field observations.
- Carry out outreach activities to build awareness and literacy about Marine Science to the coastal communities in Indian states and Sri Lanka.
- Characterise the incidence of non-harmful phytoplankton blooms in Indian waters.
Way forward

- A pdf document on the sampling methods and analysis protocols for all parameters that would be measured in the project.
- Periodic (quarterly) review to assess the progress at various stations.
- Compilation of all quarterly reports and preparation of a manuscript based on the results
- Continuation of observations depending on the results already obtained and with availability of funding
- Establishment of a collection of harmful algal species cultures.
Thank you

Photo courtesy: http://www.awesoomeocean.com/2014/11/20/5-year-study-dives-red-tide-mysteries/