

# International Symposium on Ecosystem Approach to Fisheries in the Bay of Bengal Large Marine Ecosystem

21 December 2011, Chennai





*Published by:* Dr K Vijayakumaran, Director General, Fishery Survey of India  
and National Coordinator, BOBLME-India

*Edited by:* Dr Y S Yadava, BOBP-IGO and Dr V V Sugunan, BOBLME-India

*Layout and design:* S Jayaraj, BOBP-IGO

*Printed by:* L S Graphic Prints, Chennai

*For bibliographic purpose, this document should be cited as:*  
BOBLME, 2011. International Symposium on Ecosystem Approach to  
Fisheries in the BOBLME. 21 December 2011, Chennai, India. pp.28.

© BOBLME 2011

## PROSPECTUS

### Background

The Bay of Bengal Large Marine Ecosystem (BOBLME) Project is a regional initiative driven by a consortium of donors led by the Global Environmental Facility (GEF). The Project attempts to evolve a common strategy to the exploitation and management of shared marine resources of the Bay of Bengal on a sustainable basis. The Food and Agricultural Organization (FAO) of the United Nations is executing the project in eight countries namely Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand. The Project aims at building a Strategic Action Plan (SAP) for sustainable use of the marine resources of the Bay of Bengal by the member-countries on the basis of a sound understanding of the ecosystem as well as the socio-economic environment.

During the last three decades the concept of Large Marine Ecosystems (LMEs) has gained popularity in marine management all over the world. There are about sixty-four LMEs identified world over based on the unique bathymetry, hydrographical features and trophodynamics. Since 1990s, GEF has responded to the growing concerns and issues on management of LMEs, promoting an ecosystem-based assessment and management. In nearly twenty of these LMEs there are some international initiatives to address the transboundary issues and sustainable resource management.

The FAO has developed guidelines for the application of Ecosystem Approach to Fisheries (EAF) in the year 2003. It has been widely accepted that LMEs are ideal for operationalizing the concepts of EAF. In order to achieve its cherished goal of sustainable resource management, the BOBLME Project advocates EAF in the Bay of Bengal. As EAF envisages integrated development of natural resources on a sustainable and equitable basis, interaction among different sectors to seek and achieve synergies and trade-offs is a key element.

However, the level of awareness about the principles of EAF in the developing world, even among technocrats and policy makers, is rather low. Further down, at the grassroots level, strong messages need to be sent across communities transcending many geographical, cultural and political boundaries. Thus application of EAF principles on marine resource management is a tough task in a multi-stakeholder, multi-cultural environment such as the Bay of Bengal.

Recognizing the existing knowledge gap and overall lack of awareness, BOBLME-India is hosting an International Symposium on Ecosystem Approach to Fisheries in BOBLME (EAF-BOBLME) on 21 December 2011. This Symposium is pegged as an important event at the 9th Indian Fisheries Forum (9th IFF) to be held at Chennai during 19-23 December 2011.

## Objective

The BOBLME-India aims to create awareness on EAF among all sections of the society and build capacity among the people at various levels. The Symposium would facilitate researchers, planners and administrators to understand the concepts and principles of EAF so as to orient their actions towards EAF. This would eventually lead to creation of conceptual clarity and acceptance of EAF as the best option in addressing the problems in natural resource management in the BOBLME. The choice of 9th IFF is to reach out to larger audience and draw synergy from the partnership with other organizations. The Symposium particularly aims to:

- showcase the status of knowledge on the key features of BOBLME, which are relevant to the theory and practice of EAF;
- provide a platform for the leading professionals who work on different aspects relevant to ecosystem approach to exchange notes;
- give an opportunity for cross-section of fisheries fraternity at the 9th IFF to hear about the EAF from the torch-bearers; and
- add value to the SAP being developed by the BOBLME by sharing experience and catalyzing a shift in perception of stakeholders towards EAF.

## Strategy

The Symposium will bring a pool of experts from India and abroad who would enlighten the audience on the state of knowledge on different aspects of BOBLME. Senior researchers from prominent national institutions and agencies are being invited to showcase the state of knowledge related to Bay of Bengal in their area of specialization. Invited experts from abroad would also share the theoretical foundation and status of EAF in other LMEs. This would set the template for engaging the audience on a brainstorming session enabling the organizers to harvest ideas, which would enrich the knowledge and enhance present initiatives. As a conclusion, a panel of experts would discuss and consolidate the outputs to be factored into the existing initiatives for effective implementation of the EAF in BOBLME.

## Participation

All registered participants of the 9th IFF are entitled to participate in the Symposium. There would not be a special registration or selective entry to the Symposium. The presentation will be only by the invited speakers and the BOBLME Project would support their travel, stay and registration at the 9th IFF.

## **Venue and Time**

The 9th IFF is being held at IMAGE (Indian Bank Management Academy for Growth & Excellence) Auditorium, M R C Nagar, R A Puram, Chennai - 600 028, Tamil Nadu (Tel: 044 - 24934759 / 42035143) and the Symposium is also being held at the venue. The name of the conference hall will be announced in due course. The business hours for the Symposium would be 09:30 to 17:30. Further details can be obtained from the 9th IFF website as well as BOBLME-India website.

## **Contacts**

### ***BOBLME-India***

#### **Dr K Vijayakumaran**

Fishery Survey of India

Botawala Chambers

Sir P M Road

Fort

Mumbai 400 001

India

Phone: +91 22 22617101

Fax: +91 22 22702270

Mobile: +91 9448312631

E-mail: vijayettan@yahoo.com

*www.boblmeindia.org*

### ***BOBLME-RCU***

#### **Dr Chris O'Brien**

BOBLME Project

C/o Andaman Sea Fisheries

Research Development Center

7 Moo 7 Sakdidej Road

Makham Bay, T. Vichit, A. Muang

Phuket - 83000, Thailand

Phone: +66 76 391861

Fax: +66 76 391864

Mobile: +66 844 395210

E-mail: chris.obrien@boblme.org

*www.boblme.org*

### ***9th IFF Secretariat***

#### **Dr E Vivekanandan**

Madras Research Centre of CMFRI

75, Santhome High Road

Raja Annamalai Puram

Chennai 600 028

India

Phone: +91 44 28293299

Fax +91 44 28294252

Mobile: +91 9444238648

E-mail: evivekanandan@hotmail.com

*www.9iff.org*

## PROGRAMME

Time	Session - 1	Chair: Chris O'Brein
09:30-09:40	G Syda Rao	Opening Remarks
09:40-09:50	K Vijayakumaran	Welcome and setting the stage
09:50-10:30	Kenneth Sherman	Large Marine Ecosystems: assessment and management practices for fisheries and other goods and services
10:30-11:00	Michael O'Toole	The development and implementation of the ecosystem approach to fisheries management in the BCLME
11:00-11:20	Tea/ Coffee	
	Session - 2	Chair: Rudolf Hermes
11:20-11:40	Chris O'Brien	The BOBLME Project: implementing an ecosystem approach to fisheries management
11:40-12:00	V Ramaswamy	Sediment flux to the Bay of Bengal and its impact on ocean biogeochemical processes
12:00-12:20	Sunil K Mohamed	Scope for improving fisheries governance in the context of ecosystem-based fisheries management along the Indian States of the BOBLME
12:20-12:40	P U Zacharia	Marine fish stock health status along the Indian States of BOBLME
12:40-13:00	G HariPriya	Coastal biodiversity and valuation: some perspectives from TEEB
13:00-14:00	Lunch	
14:00-14:20	Y S Yadava	Sustaining the Gulf of Mannar ecosystem and its resources

<b>Time</b>	<b>Session - 2 contd..</b>	<b>Chair: Rudolf Hermes</b>
14:20-14:40	J Samarakoon	Challenges in integrated coastal management in the BOB region
14:40-15:00	V Vivekanandan	Sustaining small-scale fisheries in the BOB region – Challenges
<b>Time</b>	<b>Session - 3</b>	<b>Panel Discussion</b>
15:00-16:00	Moderator	Y S Yadava
	Panelists	Rishi Sharma, Rudolf Hermes, V V Sugunan
16:00-16:20	Tea/ Coffee	
16:20-17:00	Panel Discussion contd..	
17:00-17:30	Y S Yadava	Summing up

***Dr Kenneth Sherman***

*National Oceanic and Atmospheric Administration  
Northeast Fisheries Science Centre  
Narragansett Laboratory  
28 Tarzwell Drive  
Rhode Island, 02887, USA  
Phone: (401) 782-3210  
E-mail: Kenneth.Sherman@noaa.gov*



Dr Kenneth Sherman B.S., M.S., D. Sc., is Director of the Narragansett Laboratory, National Marine Fisheries Service, Northeast Fisheries Science Center, National Oceanic and Atmospheric Administration (NOAA), and is an Adjunct Professor of Oceanography, University of Rhode Island Graduate School of Oceanography. His studies include comparisons among Large Marine Ecosystems (LMEs) in relation to the impacts of natural and human interventions on ecosystem productivity and biomass yields. He has served as chief scientist of the Antarctic Program of the National Marine Fisheries Service and scientific consultant to FAO on assignments in West Africa and South America. Dr Sherman holds the Gold, Silver and Bronze medals from the Department of Commerce for distinguished service, creativity, and leadership. He received the Oscar E Sette Award presented by the American Fisheries Society in 2006 in recognition of sustained excellence in marine fishery biology. In 2010 he was recipient of the Göteborg Award for Sustainable Development. He is a fellow of the American Association for the Advancement of Science, serves as a senior contributing editor for the Marine Ecology Progress Series Journal, is author of over 200 published reports on marine plankton, fisheries, and ecosystems, and is the series editor or co-editor of 14 Volumes on LME studies. He serves as scientific adviser to several UN organizations and the Global Environment Facility in the development and implementation of LME assessment and management projects in Asia, Africa, Latin America and eastern Europe. His most recently published paper in 2011 is: Sherman, K., J. O'Reilly, I.M. Belkin, C. Melrose, F. Friedland. 2011. The application of satellite remote sensing for assessing productivity in relation to fisheries yields of the world's large marine ecosystems. ICES Journal of Marine Science 68(4):667- 676.

## Abstract

### **Large Marine Ecosystems: Assessment and management practices for fisheries and other goods and services**

The global LME movement is engaged in the application of an ecosystem-based approach to support the assessment and management of the changing state of marine fisheries and other goods and services. The approach is based on the results of systematically monitored spatial and temporal suites of indicators of LME viz., (i) productivity, (ii) fish and fisheries, (iii) pollution and ecosystem health, (iv) socio-economics, and (v) governance. The multi-sectoral indicators provide the scientific and economic data for development and application of ecosystem-based models, assessments and evaluations in support of adaptive management actions leading to the recovery and sustainability of stressed LMEs. From a marine fisheries perspective, LMEs are important. An estimated 80 percent of annual fisheries catches are produced in the world's 64 LMEs. Financial support for the LME movement is provided by the Global Environment Facility and the World Bank. At present, 110 countries in Africa, Asia, Latin America, and Eastern Europe are participating in 17 LME projects supported by \$3.1 billion in grants and investment funds. GEF support is provided to country-driven projects that are introducing ecosystem-based practices to recover and sustain LME ecosystem goods and services being degraded by overfishing, coastal pollution, nutrient over enrichment, habitat degradation, biodiversity loss, and climate change. Recent results of the effects of climate change in relation to sustainability of fishery yields of LMEs are reviewed in relation to decadal-scale changes in primary productivity.

***Dr Michael J O'Toole***

*Programme Manager  
Policy Support Measure  
Strategic Planning Services Division  
Marine Institute  
Oranmore, Co. Galway  
Ireland*

*Phone: 00-353-91-387445; Fax: 00-353-91-387445*

*Mobile: 085-8453942*

*E-mail: michael.otoole@marine.ie*



Dr Michael O'Toole is a programme manager with the Strategic Planning and Development Services at the Marine Institute in Galway, Ireland. He is responsible for policy research and coordination of projects in relation to the marine environment and climate change. Prior to this, he was employed by UNDP as Chief Technical Advisor for the Benguela Current Large Marine Ecosystem (BCLME) Project (2002 to 2008) and has been closely involved in all stages of development, management and implementation of the Project including the establishment of the Benguela Current Commission. Dr O'Toole also worked for two years (2001-2002) as Chief Technical Advisor with the FAO for the Bay of Bengal Large Marine Ecosystem (BOBLME) Project based in Chennai, India. He has been an active member of the IOC-UNESCO Consultative Committee of Large Marine Ecosystems over the last ten years and is currently co-chair of the ICES/LME Working Group on Large Marine Ecosystems Programme Best Practices. Dr O'Toole graduated from the National University of Ireland, Galway as a marine biologist and has a Ph.D. in Fisheries Oceanography from the University of Cape Town.

## Abstract

### **The development and implementation of the ecosystem approach to fisheries management in the Benguela Current Large Marine Ecosystem (BCLME)**

An ecosystem approach to fisheries (EAF) has been adopted by the nations of the world as being necessary for sustainable use of marine fisheries, and efforts are being made in most countries to make progress in its implementation. Angola, Namibia and South Africa, making up the coastal states of the Benguela Large Marine Ecosystem (BCLME), are committed to implementation of EAF and are making use of the opportunities presented by the GEF BCLME programme to strengthen progress towards this end. This paper describes a BCLME Project, which is at the core of these efforts and is examining the feasibility of implementing EAF in the Benguela region. The Project, a cooperative effort by BCLME, the management agencies of the three countries and FAO, started in January 2004 and will end in December 2006. Focusing on several of the major fisheries in each country, it has pursued a structured and participatory approach to identify and prioritise the gaps in the existing, largely conventional approaches to fisheries management and potential management actions necessary to address those gaps. Again using a participatory approach that has attempted to engage the range of stakeholders in each case, preliminary estimates of the costs and benefits of those actions have been made. Costs and benefits are being measured in terms of the broad objectives applicable in each fishery. In addition to a large number of issues directly related to the target species and conventional management, gaps have been found, as examples, in relation to bycatch of retained and non-retained species, including impacts of fisheries on species of conservation concern, interactions between fisheries, potential impacts of some gears on habitat and the impacts of non-fishery sectors on fish habitats and species. The detailed results, including potential management actions and their costs and benefits, are still preliminary but the issues and the broad management needs and possible actions that have been identified are highly informative. The process that has been developed provides a valuable framework for future refinement and implementation of EAF.

This abstract is based on a paper and presentation given at the 7<sup>th</sup> meeting of the United Nations open-ended Informal Consultative process on Oceans and the Law of the Sea held in New York, 12-16 June 2006 (Cochrane, K.L., C.J. Augustyn and M.J. O'Toole).

***Dr Chris O'Brien***

*Bay of Bengal Large Marine Ecosystem Project  
(BOBLME)*

*77 Moo 7 Sakdidej Road, Makham Bay  
T. Vichit, A. Muang, Phuket 83000  
Thailand*

*Phone: +66 76 391 861*

*Fax: +66 76 391 864*

*E-mail: [chris.obrien@boblme.org](mailto:chris.obrien@boblme.org)*



Dr Chris O'Brien has a Ph.D. in marine ecology from the University of New South Wales, and has worked at the science-management interface of fisheries for 20 years. Chris was involved in the introduction of ecosystem-based fisheries management in New Zealand and the Pacific; and more recently, as Deputy Secretary at the Indian Ocean Tuna Commission, he was part of the efforts to introduce ecosystem considerations into the management of the tuna fisheries of the Indian Ocean.

Currently, he works for FAO and is managing the Bay of Bengal Large Marine Ecosystem Project. The BOBLME Project began in May 2009 and one of its major aims is to implement an ecosystem approach to the management of two important regional fisheries in the Indian Ocean.

## Abstract

### **The Bay of Bengal Large Marine Ecosystem Project: implementing an ecosystem approach to fisheries management**

Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka, and Thailand are collaborating through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project to better the lives of their coastal populations by improving regional management of the Bay of Bengal environment and its fisheries.

BOBLME covers over 6 million km<sup>2</sup> of sea and is important in the lives of over 450 million people. The Bay of Bengal is a place where competition for the use of marine resources is extreme and there is entrenched poverty in the burgeoning coastal communities. It is also a place where there is a scarcity of fish for food, overfishing exists, important marine habitats are being degraded and lost, and there is serious pollution.

This presentation describes the strategies and challenges associated with working simultaneously in eight countries to implement the BOBLME Project, including how we are attempting to integrate ecological, economic, social, and governance elements into management platforms for two transboundary fisheries - hilsa and Indian mackerel. It also describes how we intend to build on national EAF practices already in place, and introduce programs to strengthen technical capacity and management capability and harmonize management practices so that effective regional management can be achieved.

***Dr V Ramaswamy***

*Geology Division, National Institute of Oceanography,  
Dona Paula, Goa - 403 004  
India*

*Phone: +91 832 2450429 (Work)*

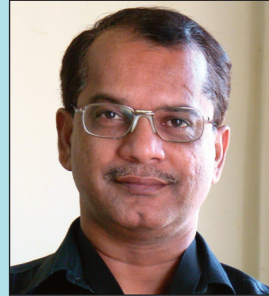
*+91 832 2458415 (Home)*

*Fax: +91 83 22450602*

*Mobile: +91 9890181194*

*E-mail: rams@nio.org*

*rams.goa@gmail.com*



Dr V Ramaswamy is working as a Marine Geologist at the National Institute of Oceanography, Goa, India since 1982. He is recipient of the CSIR Young Scientist Award in 1992. He has coordinated several national and international scientific programs in oceanography. He is the scientific representative of India for the IMAGES program and also steering committee member of the International Conference on Asian Marine Geology (ICAMG). He has been the chief scientist of several international scientific cruises in the Indian Ocean.

His scientific interest is in marine sedimentary processes, especially the role of particles in ocean biogeochemical processes. He has carried out long-term studies on particle fluxes in the ocean using sediment traps. His present interest is in understanding the effect of mineral dust and anthropogenic aerosols on ocean productivity and rainwater chemistry.

## Abstract

### **Sediment flux to the Bay of Bengal and its impact on ocean biogeochemical processes**

Sediment forming minerals in the oceans are derived either from land or produced in the water column. The minerals delivered to the ocean interact with the biogenic particles to form large aggregates, which settle to form hemi-pelagic sediments, which are the long-term sink for many bio-geochemically active elements including carbon. The river discharge from six large rivers into the Bay of Bengal (BoB) has formed a large sediment deposit on the ocean floor called the Bengal Fan, which incidentally is larger than all the other deep-sea fan's put together. The sediment thickness in the northernmost part of the Bengal Fan is more than 20 km thick. The Ganges-Brahmaputra River currently transports  $\sim 1 \times 10^9$  t/yr of sediments to the margin, the highest in the world. About 80% of this load is delivered during the southwest monsoon making the system particularly sensitive to regional-scale climatic forcing. At present, the Ganges-Brahmaputra sediments are almost equally partitioned with roughly one third of the sediment being deposited in the delta, subaqueous delta, and submarine canyon-fan system. In the case of the peninsular rivers, the sediments bypass the narrow continental shelf with a substantial portion being deposited on the continental slope rendering them prone to slumping. The freshwater and sediment discharge into the BoB has changed considerably during the last 60 years due to increased agriculture as well as constructions of dams. The Bay also received a considerable amount of fine-grained particles through the eolian pathway. Concentration of natural and anthropogenic particles over the northern Bay is very high during October to May. Mineral dust particles from West Asia and Indo-Gangetic plains can be traced up to the northern part of the BoB. The high concentration of anthropogenic particles (urban, industrial and rural biomass burning) over the Indian subcontinent during winter is called the Asian Brown Cloud (ABC). The ABC has been linked to melting of glaciers in the Himalayas, reduced insolation, reduction of pH and monsoon precipitation. The freshwater and sediment fluxes from rivers influence the primary productivity and carbon fluxes in the BoB. The sharp changes in the salinity of the surface waters influence the phytoplankton productivity and alter the particulate organic carbon: particulate inorganic carbon ratios in settling particles, which in turn affects the oceans capacity to absorb atmospheric carbon dioxide. Foraminifera seem to be more sensitive to changes in salinity and saturation state as indicated by reduced foraminifera to coccolithophorid ratios during peak river discharge periods in the BoB. The nutrient-depleted freshwater, which forms a buoyant low salinity layer at the surface suppresses phytoplankton blooms. The superficial low salinity layer also caps the nutrient- and CO<sub>2</sub>-enriched subsurface water and prevents its entrainment into the euphotic zone. Long-term sediment trap studies are required to understand the impact of altered freshwater and sediment discharge on ocean biogeochemical processes.

***Dr Kolliyil Sunilkumar Mohamed***

*Head, Molluscan Fisheries Division*

*Central Marine Fisheries Research Institute (CMFRI)*

*PO Box 1603, Kochi - 682 018*

*Kerala, India*

*Phone: +91 484 2394867; 2394794 (Per)*

*Fax: +91 484 2394909*

*Mobile: +91 9447056559*

*E-mail: ksmohamed@vsnl.com; ksmohamed@gmail.com*



Dr K S Mohamed had his masters in marine biology in 1981 and Ph.D. in crustacean physiology in 1990 and working in CMFRI since 1986 on molluscan fisheries and mariculture. He currently heads the division of molluscan fisheries in CMFRI. He has contributed to understanding of Indian cephalopod biology and population dynamics. In mollusc mariculture, he has contributed to the growth of commercial bivalve mariculture in the country. He has interests in marine ecological modelling, particularly its application to fisheries management. He is the leader of a team of researchers from CMFRI working on trophic modelling of Indian marine ecosystems and has modelled the Arabian Sea ecosystem off Karnataka State, the northwest coast ecosystem and the Gulf of Mannar ecosystem. He has published more than 100 research articles in international and national journals.

Dr Mohamed is Secretary of the Marine Biological Association of India for the past 4 years. He has won the Jawaharlal Nehru Award for best Ph.D. thesis from ICAR in 1991 and the TVR Pillay Aquaculture Award 2011 for outstanding aquaculture research and extension. Recently he is also the member of the Technical Advisory Board of the Marine Stewardship Council (MSC), which is global non-profit organization fostering certification and ecolabelling of sustainable seafood.

## Abstract

### **Scope for improving fisheries governance in the context of ecosystem-based fisheries management along the Indian States of the BOBLME**

The annual average marine fish landings along the east coast of India (a significant part of the BOBLME) increased from 0.15 million t during 1950-59 to over 1.4 million t during 2009. Contribution of the east coast to the total all India marine fish production currently ranges between 40 and 45 percent. While growth in production has reached a plateau along the coasts of Tamil Nadu and Andhra Pradesh (southeast coast), it is also fast reaching a plateau along Orissa and West Bengal (northeast coast).

Marine fisheries in the region are governed by the respective Marine Fishing Regulation Acts (MFRAs) enacted during the nineteen eighties. The Act is under revision, and has scope for incorporating many principles and concepts of the ecosystem based fisheries management (EBFM). The goal of any fisheries management exercise is to maximize the economic opportunities and benefits within sustainable harvesting limits and fisheries Monitoring, Control and Surveillance (MCS) are the most critical facets to achieve this goal. While monitoring of catch and effort expended are an on-going process by Central and State agencies, it is control and surveillance measures which are woefully inadequate. The meagre harvest control measures in place are rendered un-implementable by lack of agreement among stakeholders and fishery managers. Therefore, as a first step, it is proposed that a 3-tier governance system with Village Fisheries Councils (VFC), followed by District Fisheries Councils (DFC) and State Fisheries Councils (SFC) be created keeping in view the participatory management concept under EBFM. These councils should have representation from fishers, fishery officers, NGOs and scientists. The Council's decisions then become binding on all players and would have adequate scientific back stopping. Another concept which needs attention is that of removing fuel and other negative subsidies and offering financial incentives to those stakeholders who follow the MFRAs and practice responsible fishing. These and other concepts such as a very modern satellite based VMS (vessel monitoring system), license buy-back schemes, high incentives for deep sea fishing, zoning of fishing grounds and creation of mariculture parks are discussed in this paper.

***Dr P U Zacharia***

*Central Marine Fisheries Research Institute  
Demersal Fisheries Division*

*PB No 1603, Kochi - 682 018, Kerala India*

*Phone: +91 484 2394061*

*Mobile: +91 9495149414*

*Email: zachariapu@yahoo.com*



Dr P U Zacharia- Senior Scientist and a fishery biologist, is at present serving as the Head of the Division of Demersal Fisheries at CMFRI. Having served in various capacities at different centres of CMFRI, Dr Zacharia brings with him a vast compilation of field experience over two decades. Dr Zacharia has spent a good amount of his time studying the marine fisheries of Karnataka and surveyed the entire coast to assess the biodiversity. Later he moved to Tamil Nadu and as the principal investigator of a project focused on the development of marine fisheries off Tamil Nadu coast. He has contributed in the reassessment of fisheries potential of the State's waters as well as the capacity utilisation of the crafts being presently used in the State and developed management advisories for sustainable utilization of the resources.

Dr Zacharia is jointly responsible for the development of the first trophic model from Indian waters. His contributions vary from stock assessment of demersal fishes, biodiversity of marine and estuarine fauna, impact of bottom trawling on marine benthos and trophic modelling of various Indian marine ecosystems. He has co-authored article on the relevance of ecosystem-based fisheries management and its need to implement in Indian waters. He has about 70 publications to his credit.

Dr Zacharia is currently the editor of the Journal of the Marine Biological Association of India.

## Abstract

### **Marine fish stock health status along the Indian States of BOBLME**

The basic requirements for planning assessments of fish stocks are information on biological data of fish in terms of species, their abundance, distribution, maturity, size, feeding and status of exploitation. Stock assessment can be either simple, based on fishery when catch and CPUE decline indicates that fishery is collapsing, or can be more exhaustive with detailed information on fishery and biology of the species in the stock. Doing single species management by keeping fishing mortality at or below  $f_{MSY}$  and also keeping fleet capacity in line with the potential of the resource is the key to ecosystem approach to fisheries management (EBFM or EAF).

Monitoring of fish stocks on a continuing basis has been carried out in India and the status of different fish stocks has been ascertained. The eastern side of India bordering the BOBLME is home to a number of fish species. The marine fish production increased from 0.15 m t during 1950-59 to 1.4 million t in 2009. In the north-eastern BOB comprising West Bengal and Orissa, Hilsa shad, Bombay duck, catfish, penaeid and non-penaeid shrimps form important fisheries, while in the south-eastern part consisting of Tamil Nadu, Andhra Pradesh and Puducherry, Indian oil sardine, lesser sardines, silverbellies, mackerel, penaeid shrimps and cephalopods are important. Stock status of twenty five species from the southeast coast has been evaluated. It was observed that ten stocks were moderately exploited, eleven fully exploited and four over-exploited. Fisheries of the northeast coast are less studied and hence the assessment has been made on informal methods such as indicators. These stocks were moderately exploited. The northeast coast does not have the problem of overcapacity, whereas in southeast coast 17 species show signs of overcapacity, a situation that warrants action.

Analysis of the mean trophic index of the fish catch from east coast of India bordering the BOBLME revealed that “fishing down the food web” exists in the southeast coast with the mean trophic index decreasing at the rate of 0.04 per decade even though the landings increased. There was marginal reduction along the northeast coast too, but for the increase in between. To assess the catch stock status and trends in the BOBLME region a simple method which was applied for the west coast is proposed in the paper, the input for which are long time-series data preferably over 30 years, the maximum catch and the recent 3 year average catch.

***Dr Haripriya Gundimeda***

*Department of Humanities & Social Sciences*

*Indian Institute of Technology Bombay*

*Powai*

*Mumbai - 400 065*

*India*

*Phone: +91-22-2576 7382 (Work)*

*+91-22-2576 8863 (Home)*

*E-mail: gharipriya@gmail.com*



Dr Haripriya Gundimeda is working as an Associate Professor at the Indian Institute of Technology Bombay, India. She has been the co-coordinator for the Project, ‘The Economics of Ecosystems and Biodiversity’ (TEEB). Earlier, Dr Haripriya has been a visiting scholar at University of Colorado, Boulder, LSE, and University of Gothenberg.

She has been the recipient of Sir Patha Dasgupta Research and Writing Fellowship for the year 2010-11. Her main areas of research have been green accounting, mitigation aspects of climate change, energy demand and pricing, valuation of environmental resources, and issues relating to the development in India.

## Abstract

### **Coastal biodiversity and valuation: Some perspectives from TEEB**

The value of coastal biodiversity is often not recognized and quantified as a result of which these ecosystems are at greater risk. Valuation of biodiversity helps in promoting local development, human well-being, economic growth and stability while maintaining environmental sustainability. The paper emphasizes that we can build effective incentive structures once the values are recognized. The paper explores how valuation of biodiversity (with special reference to coastal biodiversity) helps in management and conservation of biodiversity using successful examples from different parts of the world.

**Dr Y S Yadava**

*Director*

*Bay of Bengal Programme Inter-Governmental Organisation  
91, Saint Mary's Road, Abhiramapuram, Chennai - 600 018  
India*

*Phone: +91 44 24936188; 24396294*

*Fax: +91 44 24936102*

*Mobile: +91 9841042235*

*E-mail: [yugraj.yadava@bobpigo.org](mailto:yugraj.yadava@bobpigo.org)*



Dr Yugraj Singh Yadava, 58, has had 35 years of experience in fisheries and aquaculture. Starting his career as Scientist with the Indian Council of Agricultural Research in 1976, Dr Yadava has held important management positions of Advisor Fisheries to the North-Eastern Council, Fisheries Development Commissioner and Member Secretary, Coastal Aquaculture Authority in the Government of India. Dr Yadava is now heading a Regional Fishery Body, the Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO), which works in four countries (Bangladesh, India, Maldives and Sri Lanka). Dr Yadava also has the credit of establishing the BOBP-IGO in April 2003 from the former Bay of Bengal Programme of the Food and Agriculture Organization of the United Nations.

Dr Yadava's scientific and developmental works *inter alia* include studies on large river ecosystems and their floodplains; popularization of sustainable aquaculture practices in rural areas; formulation of management plans for important fish stocks such as sharks and hilsa (*Tenualosa ilisha*) in the Bay of Bengal region; safety at sea of small-scale fishers; popularization of the Code of Conduct for Responsible Fisheries, including the Ecosystem Approach to Fisheries; capacity-building in the BOBP-IGO member-countries on elimination of Illegal, Unreported and Unregulated Fishing and Monitoring, Control and Surveillance; alternate/additional livelihoods opportunities for small-scale fishers; etc.

Besides working in the BOBP-IGO member-countries, Dr Yadava has also worked under different projects in Indonesia, Japan, Philippines, Thailand and Vietnam. Well-known in the national and international fisheries, Dr Yadava has contributed to several expert consultations, ad-hoc working groups, inter-governmental meetings, regional and global conferences, GEF- funded Large Marine Ecosystem Project, etc. A cogent and prolific writer, he has published about 150 papers in books, research journals, scientific and popular magazines and reports. Dr Yadava also edits the *Bay of Bengal News*, a popular journal of the BOBP-IGO.

## Abstract

### **Sustaining the Gulf of Mannar ecosystem and its resources**

The Food and Agriculture Organization of the United Nations (FAO) has been at the forefront of developing the Ecosystem Approach to Fisheries Management (EAFM) and the Bay of Bengal Large Marine Ecosystem (BOBLME) Project is building on this by applying it to some of the important fisheries and critical habitats in the Bay of Bengal (BoB) region. Project subcomponent 2.4 of the BOBLME Project relates to ‘Collaborative Critical Habitat Management’ and supports the promotion of multi-national approaches to manage and address issues affecting transboundary coastal/marine eco-systems within the broader BOBLME region. Accordingly, the Gulf of Mannar (GoM) has been identified as an area of focus and the BOBLME Project is collaborating with the Bay of Bengal Programme inter-Governmental Organisation (BOBP-IGO) on Sustaining the Gulf of Mannar Ecosystem and its Resources programme of work.

The GoM is an ecologically important critical habitat shared by India and Sri Lanka. The Gulf is an inlet of the Indian Ocean, between southeastern India and western Sri Lanka and supports a diverse and productive community of marine life. The Gulf has rich inshore fishing grounds, exploited by artisanal and commercial fishers. Studies on the GoM have found that the rich bio-diversity of the Gulf is under pressure from anthropogenic interventions and sub-optimal implementation of existing management measures. The fact that the GoM is economically important for India and Sri Lanka and provides a host of ecological services, it is in the best interest of the two countries to design a roadmap for optimal utilization of the ecological and economic services of the GoM while ensuring its pristine conditions.

Within the framework of the BOBLME Project, the first Consultation on the GoM was held in early September 2011 in Rameshwaram, India where senior representatives of the Governments of India and Sri Lanka and other key stakeholders met to develop a roadmap/framework for fostering cooperation in management of the GoM ecosystem. The Consultation concluded with (i) a status report on the GoM, including the environment, fisheries, socio-economic importance and governance; (ii) Identification of major information gaps and issues pertaining to the GoM with national and transboundary implications; (iii) development of a mutually acceptable roadmap/framework for continuing dialogue and undertaking activities to enhance cooperation in management for sustaining the GoM ecosystem and its resources; and (iv) improved understanding on the EAFM. As a step forward the second Consultation on the GoM is scheduled in early 2012 in Sri Lanka.

***Dr Jayampathy Samarakoon***

*Freelance Consultant, Integrated Coastal Management  
Consultant, World Conservation Union (IUCN) Sri Lanka &  
Ecosystems and Livelihoods Group (IUCN) Asia  
39A, Inner Fairline Road, Dehiwela  
Sri Lanka*

*Phone: +94 112739249*

*Mobile: +94 0776975816*

*E-mail: jayampathysamarakoon@gmail.com*



Dr Samarakoon works as a freelance consultant in integrated coastal resources management in South Asia. He did his postgraduate studies in the United States on a Fulbright Award and spent a year with the Tropical Coastal Management Centre, University of Newcastle-upon-Tyne on a Senior Commonwealth Fellowship. He led the review of best practices in community-based integrated coastal management in South Asia for BOBLME/FAO. He did the preparatory studies on coastal ecosystems for the first Coastal Zone Management Plan of Sri Lanka. He served as a member of the first Task Force on Integrated Coastal Management (UN GESAMP) in 1995.

He worked as a consultant to the Bangladesh Water Development Board on Integrated Planning for Sustainable Water Management in the South-western Region and subsequently served on the Project Identification Mission for Integrated Coastal Zone Management in Bangladesh. He worked in India as a consultant with the Sustainable Coastal Protection and Management Project for the Ministry of Environment and Forests in Maharashtra, Goa and Karnataka States.

During the post-Indian Ocean Tsunami period he worked with the IUCN: Mangroves for the Future (MFF) Programme and the Ministry of Environment, Sri Lanka to prepare the National Strategy and Action Plan – An ecosystem-based integrated coastal management in Sri Lanka. He also assisted the Ministry of Environment, Energy, Water and Transport, Government of Maldives under the IUCN-MFF to draft the National Strategy and Action Plan.

His current work is focused on assisting small-scale coastal fishers to become more aware of the social-ecological systems implications for acquiring sustainability for their livelihoods.

## Abstract

### Challenges in integrated coastal management in the BOB region

The major challenges in Integrated Coastal Management (ICM) in the BOB include (i) the tendency to dilute the position of human well-being at the local-level within a cascade of geographic scales (micro- to the BOBLME) that relate directly and indirectly to coastal small-scale fisher livelihoods, (ii) conflicts among plurality of jurisdictions within national setting for effective enforcement (*i.e.* effectiveness of regulation of multiple land uses in the perspective of cross-boundary dynamics of coastal ecosystems), (iii) inadequate harmonization between technocratic approaches to management and inclusiveness in terms of political ecology, governance, and predictable loss of resilience of coastal ecosystems and associated communities in terms of risk (harm to life and property) in the face of hazards, and (iv) the neglect of chronic disasters such as pollution that persistently diminish natural capital. Most challenges are associated with the difficulty of understanding and dealing with the BOBLME as a complex system (as distinguishable from a complicated system). This is facilitated by recognizing local coastal ecosystems as social-ecological systems (SESs) nested within larger systems whose problems may be prioritized by way of diagnostic approaches.

The BOB is home to the largest concentration of coastal poverty, particularly because of the size of populations in Bangladesh, India and Myanmar. Recent weather events such as Nargis and Aila in Myanmar and Bangladesh respectively and the impact of the Indian Ocean Tsunami in India and in Sri Lanka starkly demonstrated the high level of exposure and vulnerability of coastal populations and resulting risk to life and property. ICM is challenged with increasing the resilience of such coastal populations, by assimilating lessons from the sub-region (*e.g.* Bangladesh) as appropriate in the face of climate change as a part of diagnosis of problems in SESs and for setting standards.

ICM thus is challenged to put in place long-term processes of counter change, where necessary, that recognize and reconcile, among others, (i) geo-spatial and temporal changes that are occurring in the local ecosystems within national boundaries attributable to both unintended and intended causes, (ii) providing spatial identity to all communities associated with the ecosystems, (iii) recognizing the economic contribution (mainly fishery earnings) from these natural assets while identifying alternative livelihoods, and (iv) mainstreaming such integrated (cross-disciplinary) findings in national policies.

The FAO BOBLME Project is in a unique position to contribute positively towards ICM at multiple levels.

***Mr V Vivekanandan***  
*43, Asan Nagar*  
*Vallakadavu P.O*  
*Trivandrum - 695 008*  
*Kerala, India*  
*Phone: +91-9847084840*  
*+91-9677034670*  
*E-mail: vivek@siffs.org*



A mechanical engineer with post graduation in Rural Management, Mr V Vivekanandan has worked in the South Indian Federation of Fishermen Societies (SIFFS) for over 25 years, initiating programmes in fish marketing, boat building, micro-finance, development of fish marketing societies, socio-economic research, experiments in community-based resource management, etc. After stepping down from SIFFS, he works as a part-time consultant on fisheries livelihoods and management. He spends the rest of his time supporting many fishworker associations and networks.

He has recently set up the Fisheries Management Resource Centre (fishMARC), an NGO supporting new initiatives for the fishing communities in India, and is its honorary secretary. He is also the Convener of the National Coastal Protection Campaign (NCPC), a network of NGOs and fishworker organisations across the coast. He is also a member of the International Collective in Support of Fishworkers (ICSF).

He is currently a member of the National Coastal Zone Management Authority, Govt of India and a member of the National Task Force of the Bay of Bengal Large Marine Eco-system Project in India.

## Abstract

### **Sustaining small-scale fisheries in the Bay of Bengal region – Challenges**

Small-scale fisheries (SSF) is the backbone of the fisheries of all the countries of the BoB region, where large populations depend on fisheries for livelihoods. Small household production systems continue to dominate despite the ongoing modernization of fisheries for the last 40 years. However, small-scale fishers face myriad problems in these countries and their importance in fisheries is declining. In the face of a variety of threats to livelihoods, their very existence as a community is at stake. In most countries, the rise of an industrial or a semi-industrial fleet has created conflicts over fish resources and has reduced availability of resources for the SSF. The degradation of the sea bottom habitat due to bottom trawling in coastal waters and over-fishing by the mechanized fleet has created a sense of fish scarcity among the small-scale fishers. Measures to protect SSF from competition from bigger units have been put in place by many Governments, but these have not been very effective. This has resulted, in many countries, the competitive response from the SSF of motorization of small craft, new gear technologies and increases in depth/distance of fishing. In some countries modernization of SSF has not necessarily been a competitive response to large units, but has taken place as result of state policies to upgrade SSF.

The modernization of the SSF, while it has helped it survive and even improve itself, has brought many new problems. Sea safety and transborder fishing are two of them. An even bigger challenge is that over-capacity is being felt in many of the SSFs in the region and there is a lack of clarity on managing SSF itself. The system tends to be open access, even if there are social barriers to entry in some countries. Where there are long traditions in fisheries and traditional systems of management, state interventions have often ignored them and they have declined. The imposition of top-down fisheries management in their place has not been very successful. In recent years, threats to SSF from non-fishery sources have increased significantly. The demand for multiple uses of coastal space and resources is threatening the very existence of many fishing village communities. Industrialisation, port infrastructure, urbanization, coastal pollution, tourism development, etc., have started to displace fishing communities in pockets and are also negatively impacting on fishing itself. In some areas, fishers feel that fish depletion is more due to coastal projects than due to over fishing. Natural disasters and the threat of sea level rise complete the picture of SSF under siege.

The paper discusses the above problems/challenges and suggests ways and means to sustain SSF in the region and to improve the lot of the fishing communities.

## Panelist

***Dr Rishi Sharma***

*Stock Assessment Coordinator*

*Bay of Bengal Large Marine Ecosystem Project (BOBLME)*

*C/o Andaman Sea Fisheries Research Development Center*

*77 Moo 7 Sakdidej Road, Makham Bay*

*T. Vichit, A. Muang, Phuket 83000*

*Thailand*

*Fax: +66 76 391864*

*Mobile: +66 854803989*

*E-mail: [rishi.sharma@boblme.org](mailto:rishi.sharma@boblme.org)*



Dr Rishi Sharma is the current Stock Assessment Coordinator with BOBLME. He has a Ph.D., and an M.S. in Quantitative Ecology and Resource Management from the University of Washington, Seattle, WA, USA where he worked under Dr Ray Hilborn and Dr Robert Francis for his graduate research relating climate forcing to global and local conditions affecting productivity of fish stocks in the Pacific Northwest (west coast of the US, and Canada).

Dr Sharma's background is in mathematics, statistics and fisheries management. He has worked and chaired International Scientific Commissions supporting Pacific Salmon research in his previous experience while in the US and Canada, and has extensive work experience in computer models assessing stock biomass estimates. Dr Sharma has worked on population ecology, ecological statistics, and stock assessment models for over 15 years and has numerous publications on these subjects in peer-reviewed journals and the grey literature on these subjects.

At the Bay of Bengal Large Marine Ecosystem Project, Dr Sharma brings some of his expertise in building capacity in the region and developing regional assessment models for Indian Mackerel (*Rastrelliger kanagurta*), and Hilsa Shad (*Tenualosa ilisha*).

## Panelist

### ***Dr Rudolf Hermes***

*Bay of Bengal Large Marine Ecosystem Project (BOBLME)  
C/o Andaman Sea Fisheries Research Development Center  
77 Moo 7 Sakdidej Road, Makham Bay  
T. Vichit, A. Muang, Phuket 83000  
Thailand  
Phone: +66 76 391 861; Fax: +66 76 391864  
Mobile: +66 844395209  
E-mail: [rudolf.hermes@boblme.org](mailto:rudolf.hermes@boblme.org)*



Dr Rudolf Hermes holds a Master's Degree in Biology from Bonn University and a Doctorate in Natural Sciences (Marine Fisheries and Zoology) from Hamburg University. From 1979 until 2004, he worked in fisheries and coastal resources development, research and management in several projects of bilateral cooperation, seconded through the German Technical Cooperation (GTZ), mainly in the Philippines, Indonesia and Papua New Guinea. This work included assignments with Departments of Science and Fisheries, at national and provincial levels, with NGOs, and as Associate Professor at the University of the Philippines.

From 2005 onward, he worked as a consultant for FAO in post-tsunami relief and rehabilitation, both in Aceh/Indonesia and FAO-HQ based, in Monitoring and Evaluation, as Chief Technical Officer, and engaged in project concept development and formulation, as well as in coordination of disaster response in fisheries. Since May 2009 he is the Chief Technical Advisor of the Bay of Bengal Large Marine Ecosystem Project.

## Panelist

### ***Dr Vasu Sugunan***

*Bay of Bengal Large Marine Ecosystem Project (BOBLME)*

*National Technical Advisor- India*

*10 A, Green Hills, Kakkanad*

*Kochi - 682 030, Kerala*

*India*

*Phone: +91 484 2972104*

*Mobile: +91 9446038918*

*E-mail: vasu\_sugunan@yahoo.com*



Born in 1948 in Kerala, India, Vasu Sugunan has a Master's Degree in Marine Biology from the University of Kerala and Ph.D. from the University of Calcutta. A well-known fishery scientist and science manager, Dr Sugunan has been working in India and abroad in various capacities for the last four decades. He is an internationally renowned expert in reservoir fisheries and authored more than 100 publications including two FAO Technical Papers. He has earlier occupied positions such as FAO Andrew Mayer Fellow; Director, Central Inland Fisheries Research Institute, Barrackpore; Theme Leader, CGIAR Challenge Program on Water and Food; and Assistant Director General, Indian Council of Agricultural Research. Dr Sugunan is well-travelled and has been decorated with fellowships of many professional societies and prestigious awards, including the ICAR Team Award for outstanding research and the Aquaculture Award of the Ministry of Commerce, Government of India.

Currently, he is working as National Technical Advisor to the Bay of Bengal Large Marine Ecosystem (BOBLME) Project, a position he assumed in October 2010.





### ***BOBLME-India***

**Dr K Vijayakumaran**  
Fishery Survey of India  
Botawala Chambers  
Sir P M Road, Fort  
Mumbai 400 001  
India

Phone: +91 22 22617101

Fax: +91 22 22702270

Mobile: +91 9448312631

E-mail: [vijayettan@yahoo.com](mailto:vijayettan@yahoo.com)

[www.boblmeindia.org](http://www.boblmeindia.org)

### ***BOBLME-RCU***

**Dr Chris O'Brien**  
BOBLME Project  
C/o Andaman Sea Fisheries  
Research Development Center  
7 Moo 7 Sakdidej Road  
Makham Bay, T. Vichit, A. Muang  
Phuket 83000, Thailand

Phone: +66 76 391861; Fax: +66 76 391864

Mobile: +66 844 395210

E-mail: [chris.obrien@boblme.org](mailto:chris.obrien@boblme.org)

[www.boblme.org](http://www.boblme.org)

### ***9th IFF Secretariat***

**Dr E Vivekanandan**  
Research Centre of CMFRI  
75 Santhome High Road  
Raja Annamalai Puram  
Chennai 600 028  
India

Phone: +91 44 28293299

Fax +91 44 28294252

Mobile: +91 9444238648

E-mail: [evivekanandan@hotmail.com](mailto:evivekanandan@hotmail.com)

[www.9iff.org](http://www.9iff.org)