Bay of Bengal Large Marine Ecosystem Project

Meeting on BOBLME engagement in the International Indian Ocean Expedition 50th anniversary initiative (IIOE-2)

17-18 March 2015 • Bangkok Thailand

BOBLME-2015-Ecology-55

BOBLME contract: LOA /RAP/2015/10

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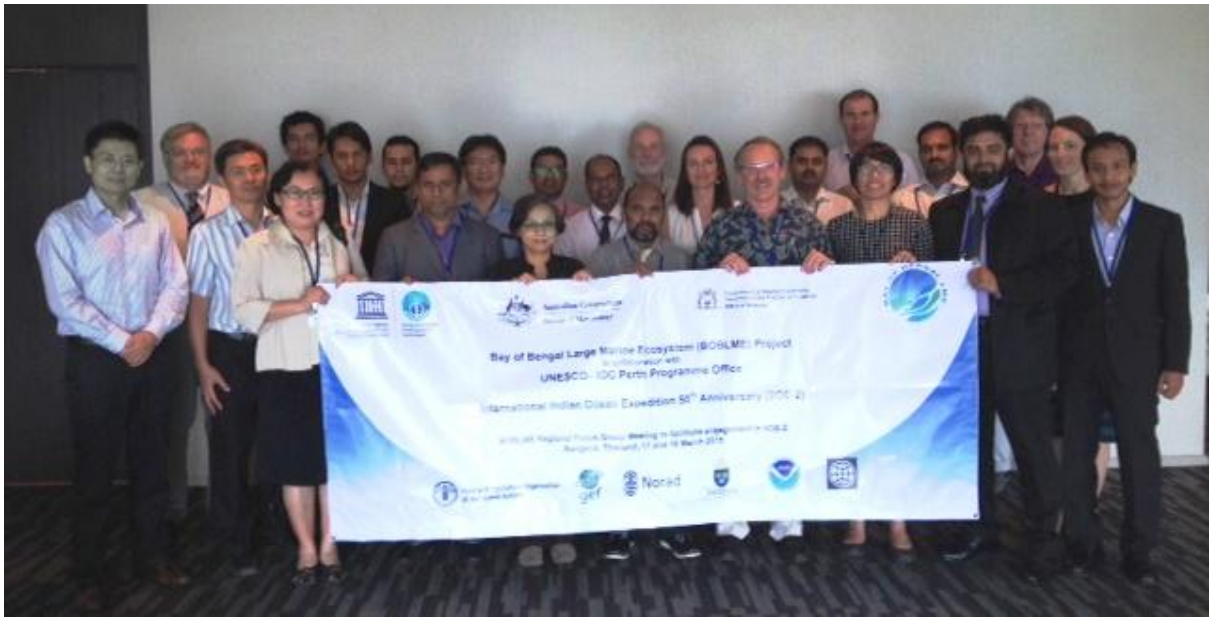
Report from the BOBLME regional focus group meeting to facilitate engagement in the International Indian Ocean Expedition 50th anniversary initiative (IIOE-2)

Bangkok, Thailand, 17 and 18 March 2015



Report dated–16 June 2015

Prepared by Louise Wicks & Nick D'Adamo

Perth Programme Office in support of the IOC of UNESCO

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Acronyms used

ADCP	Acoustic Doppler Current Profiler
ADU	Associate Data Units
ASCLME	Agulhas and Somali Current Large Marine Ecosystems project
ASIRI	Air Sea Interactions in Northern Indian Ocean
BENTHIC	Benthic Records of Marine Environment, Climate & Ecosystem in the Eastern IO since the last deglaciation
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BOB	Bay of Bengal
BOBLME	Bay of Bengal Large Marine Ecosystem
BPPT	Agency for Assessment and Application of Technology
CLIVAR	Climate and Ocean: Variability, Predictability and Change
CSIR-NIO	Council of Scientific and Industrial Research – National Institute of Oceanography
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTCZ	Continental Tropical Convergence Zone
CTD	Conductivity, Temperature, Depth (an oceanography instrument)
DBCP	Data Buoy Cooperation Panel
EEZ	Exclusive Economic Zone
EIOURI	East Indian Ocean Upwelling Research Initiative
ENSO	El Nino-Southern Oscillation
EWIN	Widya Nusantara Expedition
FAO	Food and Agriculture Organization
FIO	First Institute of Oceanography
GEF	Global Environment Facility

GEOTRACES	International Study of the Marine Biogeochemical Cycle of Trace Elements and their Isotopes
IIOE-2	Second International Indian Ocean Expedition
IMOS	Australia's Integrated Marine Observing System
IMSF	Institute of Marine Sciences and Fisheries
INCOIS	Indian National Centre for Ocean Information Services
IOAF	Indian Ocean Academic Forum
IOC	Intergovernmental Oceanographic Commission
IOD	Indian Ocean Dipole
IODE	International Oceanographic Data and Information Exchange
IODP	Integrated Ocean Drilling Program
IOGOOS	Indian Ocean Global Ocean Observing System Regional Alliance
IOP	Indian Ocean Panel of IOGOOS/CLIVAR
IORA	Indian Ocean Rim Association
IPC	Interim Planning Committee of the IOC
ITCOocean	International Training Centre for Operational Oceanography
JUVO	Java Upwelling Variations Observations
KIOST	Korean Institute of Ocean Science and Technology
LIPI	Indonesian Institute of Sciences
LME	Large Marine Ecosystem
MMS	Maldives Meteorological Service
MOMSEI	Monsoon Onset Monitoring and its Social and Ecosystem Impact
MPA	Marine Protected Area
MRC	Maldives Marine Research Centre
MYCON	Malaysia Coastal Observation Network
NASA	National Aeronautics and Space Administration
NIO	National Institute of Oceanography
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Centres
NORI	National Oceanographic Research Institute
ODP	Ocean Data Portal
OFS	Ocean Forecasting System
OMM	Ocean Mixing and Monsoons
OMZ	Oxygen Minimum Zone
ONR	Office of Naval Research
OTN	Ocean Tracking Network
PMBC	Phuket Marine Biological Centre
PMEL	Pacific Marine Environmental Laboratory
POGO	Partnerships for Observation of the Global Oceans

PPO	Perth Programme Office, in support of the IOC of UNESCO
RAMA	Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction
RTC	Regional Training Centres
SAP	Strategic Action Programme
SAPPHIRE	WIO Strategic Action Programme Policy Harmonisation and Institutional Reforms Project
SCOR	Scientific Committee on Oceanographic Research (SCOR)
SEAFDEC	Southeast Asian Fisheries Development Centre
SEAGOOS	South East Asian Global Ocean Observing System Regional Alliance
SIBER	Sustained Indian Ocean Biogeochemistry and Ecosystem Research Project
SIO	Southern Indian Ocean
SOP	Standard Operating Procedure
SPACES	Science Partnership for the Assessment of Complex Earth System Processes
SPDC	The Science Plan Development Committee under the leadership of SCOR
SST	Sea Surface Temperature
UNEP	United Nations Environment Programme
UNESCO	United Nations Organization for Education, Science and Culture
USA	United States of America
WESTPAC	IOC Sub-Commission for the Western Pacific
WIO	Western Indian Ocean
WIOURI	Western Indian Ocean Upwelling Research Initiative
YMC	Year of the Maritime Continent Initiative

1. Introduction

Since 2011, the Intergovernmental Oceanographic Commission (IOC) in collaboration with the Scientific Committee on Oceanographic Research (SCOR) and the Indian Ocean Global Ocean Observing System Regional Alliance (IOGOOS) has been leading the planning for a second International Indian Ocean Expedition (IIOE-2). IIOE-2 is a collaborative international oceanographic and related climate science research program that will be undertaken throughout the Indian Ocean over the period 2015-2020. IIOE-2 seeks to extensively explore and study the Indian Ocean through the use of the latest ocean science technology (e.g. satellite imagery, robotic instrumentation, improved data processing and oceanographic modelling technologies) to open up a new understanding of the ocean and coupled climate processes both globally and regionally. Significantly IIOE-2 seeks to initiate a number of international collaborative projects which have strong capacity development components to ensure the transfer and on-going application of IIOE-2 derived science to developing countries in particular, but also to the broad global audience of researchers, managers in marine related industries and government agencies, as well as to the general public.

The planning for IIOE-2 has engaged a broad range of stakeholders from around the Indian Ocean, mainly through voluntary international reference groups and also through a number of geographically focussed and nationally initiated meetings and briefings. The Commonwealth Bureau of Meteorology, Australia, working through its Perth Programme Office (PPO) in support of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, has been extensively engaged in IIOE-2 planning. The PPO has played a key role in IIOE-2 planning on behalf of the IOC and has also engaged with the SCOR led Science Plan Development Committee on the development of an overarching IIOE-2 Science Plan, and has also lead the support for the IOC led Interim Planning Committee – group of experts (IPC) (as designated at the IOC Executive Council Meeting No 47, 2014) in their development of IIOE-2 Implementation Plans and governance arrangements. The IPC's Report, incorporating the SCOR developed IIOE-2 Science Plan, was submitted to the 28th session of the IOC Assembly in June 2015 in support of a draft resolution for the IOC to formally adopt IIOE-2 as an IOC supported program over the period 2015-2020, in partnership with SCOR and IOGOOS.

The PPO met with the Bay of Bengal Large Marine Ecosystem (BOBLME) Project officers in October 2014 during the annual IOGOOS series of meetings to discuss opportunities for engaging better with BOBLME countries throughout the finalisation of IIOE-2 planning and subsequent implementation. The BOBLME Project is working with Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand to lay the foundations for a coordinated programme of action designed to better the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries. The BOBLME Project has already aligned itself with the competent bodies, initiatives and organisations in the region, including the IOC (and its PPO), IOGOOS and SIBER to assist in the implementation of its programs and objectives. A partnership between the PPO and the BOBLME Project under the auspices of IIOE-2 presented itself as a mutually beneficial opportunity to further the objectives of all parties.

2. Objectives

Among a broad range of objectives, the BOBLME Project Sub-component 3.1 aims to contribute to the understanding of the large-scale processes and dynamics affecting the BOBLME and its living resources. These broad objectives align with the scientific objectives of IIOE-2. IIOE-2 over the period 2015-2020 will extensively explore and study the Indian Ocean, including its north eastern basin, the Bay of Bengal, to improve our understanding of the ocean and coupled climate processes both globally and regionally. IIOE-2 will also aim to incorporate an extensive capacity development

component which will facilitate the transfer of any new science and data outputs to all nations in such a way that this information can be utilised for broad socio-economic benefit.

This collaboration between the BOBLME Project and the Bureau of Meteorology, working through its PPO will facilitate a close relevancy between BOBLME objectives and the planned research and outputs under IIOE-2. The PPO is in the best position to facilitate these opportunities for the BOBLME Project due to its extensive involvement in all aspects of IIOE-2 planning since 2011, which has been undertaken at the international level through its three main sponsors – the IOC, SCOR and IOGOOS.

3. Approach

The Project approach incorporated the following activities:

- **Conduct a scientific workshop**

The PPO and the BOBLME Project jointly held a workshop from 17-18 March 2015 in Bangkok, Thailand to promote the IIOE-2 initiative, better define its relevance to BOBLME countries, and to facilitate and invite participants to further engage in IIOE-2. The PPO prepared all background information in preparation for the workshop, including identifying suitable invitees in collaboration with the BOBLME Project, and subsequently sent out and coordinated all invitations and responses. The BOBLME Project arranged the logistics for the workshop including the workshop venue, participant travel and accommodation.

The workshop was facilitated by PPO staff, including Louise Wicks, and chaired by Dr Nick D'Adamo and Professor Raleigh Hood. Sixteen scientists from seven BOBLME countries, in addition to a number of technical experts representing SCOR, IOGOOS and IOGOOS's scientific project alliances in IOP and SIBER participated. A list of workshop participants in provided in **Appendix I**. The workshop agenda is provided in **Appendix II** and detailed notes of the discussions under each agenda item provided in **Appendix III**.

- **Prepare a workshop report**

The PPO completed the detailed notes from the workshop (**Appendix III**) and compiled this workshop report which summarises the key conclusions of the workshop and identifies a number of initial opportunities for BOBLME countries to participate in planned research and capacity development activities in collaboration with other countries in the region. The PPO will continue to communicate and collaborate with the BOBLME Project following the submission of this workshop report to facilitate the on-going development of research initiatives and capacity development projects under the banner of IIOE-2 which will engage BOBLME countries over the period 2015-2020.

4. Outcomes

The workshop resulted in considerable engagement by the BOBLME country participants, both at a substantive level; including through detailed presentations on their institutional and/or countries' oceanographic scientific capabilities and desired outcomes, involvement and capacity development opportunities through IIOE-2; as well as at an insightful level in response to workshop presentations and resultant plenary discussions. This engagement will translate into an improved awareness and ability to engage in IIOE-2 amongst BOBLME countries in the future, as well as improved collegial relationships with scientists throughout the region.

The workshop successfully created a more representative constituency for IIOE-2 amongst BOBLME countries, and as a result will provide a positive input to IIOE-2 overarching objectives of engaging

and involving with the widest scientific constituency possible in all aspects of the research and post-research analysis activities undertaken over the course of IIOE-2's implementation.

The collaboration between the PPO and the BOBLME Project was mutually beneficial and both parties look forward to continued collaborations through IIOE-2. Phase 1 of BOBLME has not had a significant focus on physical and biogeochemical oceanography, but the collaboration between the PPO and BOBLME established through this project offers the potential for future collaborations which could facilitate and provide a stronger oceanographic focus during Phase 2 BOBLME, expected to start in 2016.

5. Conclusions

The following conclusions were drawn from the discussions undertaken throughout the 2 day focus group workshop. See **Appendix III** for the complete summary of workshop discussions.

- BOBLME countries at individual institutional levels continue to invest in considerable research activities in the Indian Ocean and there are many examples of large-scale collaborative projects that have delivered multiple benefits to many countries in the region. This positive engagement and participation will be built upon throughout the implementation of IIOE-2.
- The six overarching science themes for IIOE-2 have been intentionally developed through the scientific planning process to be broad and inclusive of all possible research objectives such that interested parties that wish to engage in IIOE-2 are able to identify and select scientific relevancies for their own respective interests. The six theme headings are **Human impacts; Boundary current dynamics, Upwelling variability and ecosystem impacts; Monsoon variability and ecosystem response; Circulation, climate variability and change; Extreme events and their impacts on ecosystems and human populations; and Unique geological, physical, biogeochemical, and ecological features of the Indian Ocean**. As anticipated, throughout the course of the workshop, the relevancy of each theme to differing countries' research priorities and plans emerged and in this sense it was broadly accepted that any nation's research will have relevancy to IIOE-2.
- The already active engagement of BOBLME countries in supporting IndOOS was acknowledged (i.e. BOBLME supported deployment RAMA data buoy in 2013, Argo floats, tide gauges) as well as activity in oceanographic research programs (i.e. ASIRI programs, MOMSEI, East Indian Ocean Upwelling Research Initiative -EIOURI). These activities (if on-going) already place BOBLME countries as important contributors to IIOE-2.
- Member States' adherence to the IOC's data policy remains an on-going issue for the IOC and can result in data not being freely or openly available. This issue is particularly prevalent to data collected within EEZs (i.e. 25% of the northern Indian Ocean lies within the EEZs of littoral countries). This issue will be further explored by the IPC throughout the final planning stages. It is however incumbent upon all scientists to educate their colleagues and governments that oceanographic data in general is not sensitive, but if freely available can help in economic development.
- The need for partnered research in coastal regions with Open Ocean monitoring was widely acknowledged as important to ensure the identification of similarities and differences in these two environments. In this context, the importance of sharing this data to enable regional understanding was also highlighted.
- A strong message from the workshop was the need for IIOE-2 governance structures to play a leading role in IIOE-2 advocacy. The relevancy of the scientific research for social and economic development and the strong leverage opportunity available for countries investing in IIOE-2 as a result of the broad number of countries involved as important components of this advocacy message.

- The workshop highlighted the considerable capacity development activities and opportunities that already exist amongst BOBLME countries and it was concluded that if a mechanism to capture and disseminate these opportunities was developed, it would be of great benefit to all.
- The workshop highlighted a clear need for capacity development projects to be run within the region and geared for longer-term duration. Targeting capacity development opportunities at undergraduate levels was also strongly supported as offering good opportunity to translate into longer term benefits as well as being highly effective.
- The workshop also identified the following capacity development topics of being of particular importance/interest to BOBLME countries:
    i. Ocean forecasting and management
    ii. Hydrographic surveys
    iii. Ocean data management and sharing
    iv. Fisheries management
    v. Particular targeting young scientists (i.e. undergraduate and PhD level)

  These should be the focus of any subsequent discussions between the PPO and the BOBLME Project on how to move forward on a capacity development program under IIOE-2.
- Overall it was agreed that the success of IIOE-2 in unlocking an improved understanding of the oceanographic and coupled climatic phenomena that relate to the BOB region will be dependent upon each country's advocacy and participation and that regional collaborations like the BOBLME Project will play a critical role in facilitating this participation and turning the research outcomes into socio-economic benefits for all.

6. Recommendations

The following recommendations are drawn from the workshop discussions and provide a number of opportunities (if undertaken) to further the collaborative scientific research and capacity development opportunities through IIOE-2 in the BOBLME region.

- The BOBLME Project is recommended to maintain its IOGOOS associate member status and actively seek opportunities to attend IOGOOS meetings and present on related activities. IOGOOS will be one of the three primary sponsors for IIOE-2 and will therefore play a central role in facilitating research and capacity development opportunities over the duration of IIOE-2.
- The Indian Ocean Rim Association (IORA) Chairmanship is to be transferred to Indonesia at the end of 2015. Indonesian scientists attending the workshop are strongly encouraged to continue their communications with relevant Indonesian officials and where possible to discuss opportunities for IIOE-2 activities to provide tangible benefit to IORA's objectives.
- The BOBLME Project is strongly encouraged to commence dialogue with Indonesia's Indian Ocean Academic Forum (IOAF), established under IORA, to explore opportunities for how this forum and the BOBLME Project could work together for the exchange of scientific information, joint research and development, training and capacity development activities.
- Participants are encouraged to initiate conversations and research collaborations based upon the following offers/opportunities identified during the workshop:
    i. CSIR-NIO has a strong interest in collaborations – making facilities and ships available on joint research projects and willing to host workshops/meetings at CSIR-NIO to develop collaborations. The training facilities of the ITCOoceans facility are also available, particularly through in-house expertise in remote sensing, modelling and ocean observations.

ii. India's first cruise under IIOE-2 will be launched at the Goa symposium on 4 December 2015 and up to 50% of the berths on that cruise will be available for the international scientific community. Discussions directly with Indian oceanographic scientific institutes are encouraged and/or through scientific alliances such as IOGOOS, SIBER and IOP.

iii. EIOURI will be a major program under IIOE-2 and the research objectives and activities are still under development. All participants are encouraged to engage with EIOURI program leaders to discuss opportunities for collaboration. In particular opportunities for EIOURI to include research around the Sri Lankan dome and the Gulf of Martaban were highlighted and require country or science champions to work these opportunities into the science planning process.

iv. NIO is proposing a cruise in July/August 2015 and it may provide opportunities to link with CSIRO's Bio-Argo project. The same cruise could also provide opportunities for Indonesian scientists to take part, including undertaking pre-cruise training in Goa.

v. A number of scientists at the workshop expressed interest in the development of a research project on near shore upwellings associated with the Wyrtki jets around the Maldives. Interested individuals are encouraged to continue discussions and work towards a research project plan.

vi. There are numerous opportunities for scientific collaborations to occur which take advantage of the location of countries around the Indian Ocean to act as launching sites for oceanographic research (i.e. Maldives ideal location from which to launch gliders). These discussions should be pursued through the community established through this workshop.

vii. An opportunity for Phuket Marine Biological Centre project cruise (re Paleo-climate research in Andaman Sea and Bay of Bengal) to include collaboration with Bangladesh and Myanmar scientists was identified. The BOBLME Project, and participants present at the workshop from these countries are encouraged to continue discussions to realise this opportunity.

viii. A Southern Indian Ocean survey will be undertaken by RV Dr Fridtjof Nansen this year and there is currently an open expression of interest for scientists to participate. The cruise is proposed to depart Indonesia 28 June and arrive in Mauritius 16 July, with 10-15 berths anticipated to be available. Opportunities for this cruise to help in re-establishment of RAMA moorings were also cited and should be explored.

ix. Open dialogue is encouraged between the Bangladesh Navy and interested countries regarding Bangladesh's proposed new survey vessel and expressed opportunities for research in particular in the northern Bay of Bengal. Any potential collaboration needs to address issues of interest to Bangladesh and to facilitate some capacity development for vessel personnel in the operation of survey equipment and other ship infrastructure.

x. India's publication of the Indian Ocean Bubble newsletter provides an on-going opportunity for IIOE-2 related planning and research activities and outcomes to be reported upon for a broad audience. All participants are encouraged to support this publication through the submission of relevant articles and to widely distribute the newsletter amongst their networks in support of overarching IIOE-2 advocacy.

xi. Availability of IOC WESTPAC's network of Regional Training Centres (RTCs) as centres for capacity development for WESTPAC countries, but with possibility of extension to other countries around the Indian Ocean should be explored. Other WESTPAC activities such as MOMSEI and regular training on harmful algal blooms were also

highlighted as opportunities for BOBLME countries and an open dialogue to pursue opportunities is encouraged.

- The PPO, through liaison with the IPC and the prospective IIOE-2 International Project Office, is recommended to explore the opportunity and modality to maintain the SCOR developed IIOE-2 research inventory and to develop a new inventory of planned capacity development activities (i.e. capture diversity of activities to identify opportunities and gaps which future programs could address). Both could be expected to be essential reference documents to facilitate broad participation in IIOE-2.
- The PPO, through liaison with the IODE program, is recommended to explore opportunities for IODE training courses to be tailored to BOBLME data and information management requirements.
- All participants are strongly encouraged to build communication and outreach components into any research proposals they prepare as a means of supporting the broader global outreach of IIOE-2 over the period 2015-2020. Allocations could for example be included to capture video footage which provides an interesting insight into research activities, or other opportunities to engage with the media.
- All participants are requested to engage with their BOBLME national coordinators to advise them of the workshop and its outcomes. If broad support for this 'BOBLME oceanography working group' can be achieved – opportunities are likely to arise out of BOBLME phase 2 for continuing these initiatives.
- The participant statement from the BOBLME Focus Group meeting is provided in **Appendix IV** and all participants are strongly encouraged to broadly distribute the statement amongst relevant national networks as a means of advocating for high-level support for IIOE-2. In particular, the importance of advocacy with national IOC delegations and national IORA representatives is important for broadening awareness and support.
- All participants are strongly encouraged to advocate for the formation of their own National Committees under IIOE-2. In particular Indonesia's efforts in this regard, along with the USA's regarding the formation of a US project office are encouraged.

Appendix I Workshop participants

Name	Country/organization	Contact email
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Appendix II Final agenda for the BOBLME regional focus group meeting to facilitate engagement in IIOE-2

Final agenda

Version dated 18 March 2015

Chair: Nick D'Adamo (UNESCO/IOC Perth Programme Office)

Co-chair: Raleigh Hood (SCOR IIOE-2 Science Plan Development Committee)

Meeting notes/support: Louise Wicks (UNESCO/IOC Perth Programme Office)

BOBLME representatives: Chris O'Brien (Regional Coordinator), Rudolf Hermes, Sucharat Tongon

SCOR & SIBER representative: Raleigh Hood (University of Maryland)

IOGOOS representative: Mr Nagaraja Kumar (INCOIS)

IOP of IOGOOS/CLIVAR representative: Mike McPhaden (NOAA)

Day 1: 08:30-17:00

08:30-09:00	Registration (Inc. copying presentations to workshop laptop)
09:00-09:30	Welcome and opening comments (order TBA) (5 mins maximum each) • Nick D'Adamo, IOC PPO • Chris O'Brien, BOBLME • Raleigh Hood, SCOR & SIBER • Mr Nagaraja Kumar, IOGOOS • Mike McPhaden, IOP and IOGOOS
09:30-09.50	Scene setting presentation - Nick D'Adamo (20 mins) • Review and finalise meeting agenda and goals • Report on IIOE-2 planning to date • Overview of Interim Planning Committee (Group of Experts) process
09.50-10.10	IIOE-2 draft Science Plan - Raleigh Hood (20 mins) • Brief overview of process for development of draft Science Plan • Overview of the IIOE-2 Science themes as detailed in the draft Science Plan • Snap-shot of next steps in finalisation of the plan • Initial thoughts on some key science issues for BOB in the context of IIOE-2
10.10-10.30	Morning tea
10.30-10.50	Indian Ocean Observing System: overview and focus on BOBLME region – Mike McPhaden (20 mins)
10.50-12.00	Country/stakeholder presentations (each 10 mins presentation + 10 mins discussion) 3 x presentations • Bangladesh – Prof M. Shahadat Hossain (University of Chittagong). *Ocean Science in Bangladesh: Education and research at the IMSF, University of Chittagong* • India - Dr Damodar Shenoy (NIO). *CSIR-NIO contributions to IIOE-2* • Indonesia – Dr Anna Kuswardani (Research & Development Centre for

	Marine & Coastal Resources). *Indonesia's Research Activities in the Eastern Indian Ocean region*
12.00-13.00	Lunch
13.00-15.00	Country/stakeholder presentations continued (each 10 mins presentation + 10 mins discussion) 6 x presentations • Indonesia – Dr A'an Johan Wahyudi (LIPI). *Research Centre for Oceanography. Indonesian Institute of Sciences (LIPI)* • Maldives – Prof. Shiham Adam (Marine Research Centre). *Maldives Marine Research Centre* • Maldives – Dr Zahid Hameed (Maldives Meteorological Service). *Status of Marine Research in the Maldives* • Sri Lanka – Dr M.F.M. Fairoz (Ocean University of Sri Lanka). *Status of Oceanographic and Marine Ecosystem research in Sri Lanka* • Thailand – Dr Penjai Sompongchaiyakul (Chulalongkorn University) & Dr Ukkrit Satapoomin (Phuket Marine Biological Centre) • Rachelle Lauro (Indigo V Expeditions). *The Contribution of Citizen Oceanographers to IIOE-2*
15.00-15.30	Afternoon tea
15.30-16.10	Country/stakeholder presentations continued (each 10 mins presentation + 10 mins discussion) • Malaysia – Dr Mohd Fadzil (University Malaysia Terengganu) • India – Mr Nagaraja Kumar (INCOIS)
16.10-16.30	Response to presentations - facilitated plenary discussion on BOBLME needs and capabilities in IIOE-2 - Nick D'Adamo and Raleigh Hood (20 mins)
16.30-16.45	Summary and consolidation of key outcomes from Day 1 - Nick D'Adamo (15 mins)
	Meeting close

Day 2: 09:00–16:30

09.00-09.15	Overview of key dates leading to launch of IIOE-2 – Nick D'Adamo (15 mins) • IOC Assembly, June 2015 • Goa symposium, December 2015 • Overview of anticipated meeting outcomes (workshop report, participants statement)
09.15-09.45	Case study – Eastern Indian Ocean Upwelling Research Initiative (EIOURI) - Raleigh Hood (30 mins) • An overview of this international collaborative research initiative as an example of the types of large-scale projects being undertaken as part of IIOE-2
09.45-10.00	Case study – Indian Ocean Bio-Argo Project – Louise Wicks (15 mins) • An overview of the Australian component of the IO Bio-Argo project on behalf of CSIRO principal scientist Dr Nick Hardman-Mountford
10.00-10.30	Overview discussion on how other countries are so far planning engagement in

	IIOE-2 (30 mins) • USA (Mike McPhaden/Raleigh Hood) • Germany (Raleigh Hood) • India (Nagaraja Kumar) • Australia (Nick D'Adamo) Plenary discussion on countries committed to engaging in IIOE-2 (15 mins)
10.30-11.00	Morning tea
11.00-11.30	Overview discussion on how other countries are so far planning engagement in IIOE-2 continued • RV Dr Fridtjof Nansen (Rudolf Hermes) • Bangaldesh (Commander Abedin)
11.30-12.00	IIOE-2 Data and Information Management – Nick D'Adamo/Louise Wicks (30 mins) • Data issues: Where are the data? Making oceanographic data from the IIOE-2 (and the Indian Ocean in general) accessible both to discovery and re-use with a spotlight on the availability of IIOE data. Plenary discussion on data/information issues (30 mins)
12.00-13.00	Lunch
13.00-13.15	Plenary discussion on the development of a participant statement
13.15-13.45	Plenary discussion on on-going and planned research activities as relevant to IIOE-2 in the BOBLME region, with the goal of embracing and organising these activities as part of larger coordinated projects/programs, and developing comments on SCOR's draft IIOE-2 Science Plan – (30 mins)
13.45-14.30	Plenary discussion on capacity development opportunities as relevant to BOBLME region through IIOE-2, with the goal of identifying a suite of potential capacity building projects to be pursued through IIOE-2, including potential funding partners – (45 mins)
14.30-15.00	Afternoon tea
15.00-15.30	Identification of missing stakeholders/countries and how to engage them, including strategies to motivate the formation of IIOE-2 National Planning Committees by BOBLME countries – Nick D'Adamo (30 mins)
15.30-16.00	Free ranging plenary discussion on any issues of importance to BOBLME stakeholders arising from the previous sessions – Nick D'Adamo (30 mins)
16.00-16.30	Summation and final reflections • Chairs - Nick D'Adamo & Raleigh Hood • BOBLME Secretariat - Rudolf Hermes/Chris O'Brien
	Adjourn and close of meeting

Appendix III Detailed notes from the workshop

BOBLME regional focus group meeting to facilitate engagement in the International Indian Ocean Expedition 50th anniversary initiative

(IIOE-2), Bangkok, Thailand, 17 and 18 March 2015

Workshop notes

Chair: Nick D'Adamo (UNESCO/IOC Perth Programme Office)

Co-chair: Raleigh Hood (SCOR IIOE-2 Science Plan Development Committee)

Meeting notes/support: Louise Wicks (UNESCO/IOC Perth Programme Office)

BOBLME representatives: Chris O'Brien (Regional Coordinator), Rudolf Hermes, Sucharat Tongon

SCOR & SIBER representative: Raleigh Hood (University of Maryland)

IOGOOS representative: Mr Nagaraja Kumar (INCOIS)

IOP of IOGOOS/CLIVAR representative: Mike McPhaden (NOAA)

Day 1: 08:30-17:00

08:30- 09:00	Registration
09:00- 09:30	Welcome and opening comments (5 mins maximum each) • Nick D'Adamo, IOC PPO • Chris O'Brien, BOBLME • Raleigh Hood, SCOR & SIBER • Mr Nagaraja Kumar, IOGOOS • Mike McPhaden, IOP and IOGOOS The workshop opened with Dr Nick D'Adamo introducing himself and welcoming all participants, in particular his co-chair Dr Raleigh Hood and expert input by Dr Mike McPhaden. He particularly thanked the BOBLME secretariat and Rudolf Hermes for facilitating the PPO/BOBLME collaboration, which resulted in this workshop. Nick then introduced Louise Wicks and invited her to provide some context for the focus group workshop. Louise re-iterated Nick's welcome to all participants and thanked the BOBLME for the opportunity to run this workshop and outlined what its objectives were. Rudolf Hermes thanked both Nick and Louise for the facilitation of this workshop and provided some context for the BOBLME program. Rudi outlined that BOBLME is currently putting forward proposals to its key sponsors for phase 2 of BOBLME. Phase 1 has not had a significant focus on physical oceanography, but projects such as this one could potentially provide an underpinning component for a more oceanographic focus in Phase 2. BOBLME is one of 66 LME's around the globe and one of only 20 of these, which receives funding by GEF. Rudi made note of all countries that are part of BOBLME and that all are engaged with the aim of benefitting the Bay of Bengal (BOB) and that the BOBLME provides the platform for better regional cooperation. Generally the LME's operate to a 5 module approach, the design spear headed by Ken Sherman, of which large-scale processes and oceanography is one. The work of BOBLME during Phase 1 has had a particular fisheries focus, but other LME's such as ASCLME have had an oceanography focus. All LME projects undertake a transboundary diagnostic analysis and from this analysis

	produce a strategic action plan (SAP). This is what will be presented by BOBLME to its members next week and ultimately they are seeking the endorsement of all relevant ministers from member countries as a sign of endorsement of the SAP. Following this endorsement the SAP will be presented to GEF for funding. Rudi made particular note that IIOE-2 aligns with the SAP and will in fact support SAP implementation. In this regard BOBLME is looking forward to future collaboration with the PPO on IIOE-2. Rudi also acknowledged BOBLME's connections as an associate member of IOGOOS and previous participation in IOGOOS capacity development projects, as well as contributing to IndOOS through the RAMA moorings and the collection of ocean acidification data. Rudi closed his introduction by mentioning the forthcoming ecosystem survey within the Indian Ocean by a Norwegian funded ship in collaboration with Myanmar and that he would provide more details on this cruise in a later session of the workshop. Nick thanked Rudi for his comprehensive overview of BOBLME's work and also expressed the mutual desire of the IOC PPO's to work with the secretariat for the benefit of all member countries in the context of IIOE-2. Nick then introduced his co-chair Dr Raleigh Hood. Raleigh thanked the IOC PPO for the opportunity to co-host this workshop and outlined that he was also representing SCOR and SIBER and provided some background on how these groups have been engaged in IIOE-2. Nick then invited Dr Mike McPhaden to introduce himself. Mike outlined that he was present as a scientist of NOAA, but also in his capacity as an officer of IOGOOS and also as a member of IOP. Mike outlined his involvement in the Indian Ocean observing system (IndOOS) and the on-going interest and support IOGOOS and IOP has provided to the planning for IIOE-2. Nick then invited all participants to introduce themselves and the institutes and agencies that they derive from.
09:30- 09.50	Scene setting presentation - Nick D'Adamo (20 mins) • Review and finalise meeting agenda and goals • Report on IIOE-2 planning to date • Overview of Interim Planning Committee (Group of Experts) process Nick began by asking all participants if they had any amendments to the workshop agenda, which had been circulated prior to the workshop or if they wished to comment on the workshop's goals and context as had been previously outlined. There were no interventions. Nick then gave a comprehensive PPT overview of the background and planning that has occurred to date for IIOE-2. Key points from this presentation included: • That IIOE-2 is still under development/planning phase and that it is therefore an opportune time for BOB countries to engage and develop their own plans for engagement/participation both in terms of research and capacity development. • IIOE-2 has strong relevancy to a number of BOBLME areas of interest, in particular food security/fisheries and MPAs. • Noted the support that IIOE-2 has received via IOGOOS, SCOR and the IOC, but also through IORA. In this regard it was noted that Indonesia will take over the chairmanship of IORA from Australia at the end of this year and the important opportunities for linkages with BOBLME that this could facilitate, including through IIOE-2, as there are many overlapping members of both.

	• The role of SCOR through the development of the draft Science Plan was also outlined, along with the role of the IOC's implementation planning through the IPC (Group of Experts). Nick concluded by inviting participants to comment or ask questions. Professor M.F.M Fairoz remarked on the need for a large capacity development focus to support both science and societal needs in the BOBLME region and how IIOE-2 could contribute. Capacity development needs to be provided for within the region over the long-term and that any investments in research through IIOE-2 will be more than doubled if regional capacity is also developed. Nick concurred with these comments and also responded by stating that this was a consistent message of planning discussions to date and highlighted the role of the IPC in the development of a capacity development plan and also a data and information management plan.
09.50- 10.10	IIOE-2 draft Science Plan - Raleigh Hood (20 mins) • Brief overview of process for development of draft Science Plan • Overview of the IIOE-2 science themes as detailed in the draft Science Plan • Snap-shot of next steps in finalisation of the plan • Initial thoughts on some key science issues for BOB in the context of IIOE-2 Raleigh Hood gave a comprehensive overview of the draft IIOE-2 Science Plan that has been developed under the leadership of SCOR and through an IIOE-2 Science Plan Development Committee (SPDC). Key points of note from Raleigh's presentation included: • The emergence in October 2012 of the idea of forming a 'Reference Group' and convening meetings to explore and plan for IIOE-2. A number of reference group meetings and subsequent expedition planning meetings have been held since and collectively have contributed to the planning phase for IIOE-2. • The formation of the SPDC in 2014 by SCOR and the presentation of the first draft of the IIOE-2 Science Plan in Germany, September 2014. Following subsequent revisions, the draft IIOE-2 Science Plan was released for comment to the IOC and broader stakeholders on 10 February 2015. The public review and comment period closed on March 10, but Raleigh invited all participants at the workshop to submit any comments they have on the plan during the next 2 weeks so that they could still be considered as part of its finalisation. • The key motivation for undertaking IIOE-2 is that there are still important scientific questions that remain unanswered across the fields of geology, geophysics, atmospheric science, physical & chemical oceanography, biogeochemistry, ecology and fisheries. The Indian Ocean remains one of most under sampled ocean basins in the world. • The Science Plan has a strategy of embracing on-going and planned research activities in the Indian Ocean and stimulating new initiatives over the period 2015-2020. Its overarching goal is intended to be broad and it encompasses 6 scientific themes. There should be a home for everyone's research needs and proposed activities under the Science Plan. • The Eastern Indian Ocean Upwelling Research Initiative (EIOURI) – in planning since 2012; as well as a complementary Western Indian Ocean Upwelling Research Initiative (WIOURI) – in the early stages of its planning, are examples of two new research initiatives emerging under IIOE-2 and there is hope that more will similarly emerge.

	• Intended that existing monitoring, remote sensing and modelling programs will be incorporated into and strengthened by IIOE-2 (i.e. IndOOS). • IIOE-2 will also have an emphasis on inter-calibration to facilitate the sharing and comparison of results. • The Science Plan also highlights the importance of establishing an appropriate governance structure for the implementation of IIOE-2, including the development of a number of guiding documents (data & information management, capacity development, communication). Raleigh noted that these are the mandate of the IOC's Interim Planning Committee (Group of Experts) and that they are also charged with considering the IIOE-2 Science Plan and adopting it for the expedition. • The link between the Science Plan themes and societal and research drivers for BOB rim nations was also highlighted, in particular emphasising the relevance of theme 1 (Human impacts), and theme 5 (Extreme events and their impacts on ecosystems and human populations) and their associated issues/questions (i.e. how will climate change impact the frequency and/or severity of extreme weather and oceanic events, such as tropical cyclones and tsunamis in the Bay of Bengal). The plenary discussion following Raleigh's presentation raised the following points: • Indra Jaya highlighted the overlaps between IIOE-2 and the Year of the Maritime Continent (YMC) initiative (proposed April 2017–October 2018). Raleigh concurred that the two initiatives are complimentary and that YMC activities will be embedded in IIOE-2 (particularly through tight relationship between EIOURI and YMC). • M.F.M Fairoz highlighted the need for IIOE-2 to accommodate research on microbial processes at finite scales (i.e. mm, micrometres). There is strong relevancy for microbial research and its links to human/wildlife diseases in the BOB. Raleigh agreed that these issues are implicit in theme 6 of the Science Plan, but that they could be drawn out in more detail. He invited further written comments by Fairoz to ensure this is achieved. The agenda was slightly modified and the morning tea break taken here.
10.10- 10.30	Morning tea
10.30- 10.50	Indian Ocean Observing System: overview and focus on BOBLME region – Mike McPhaden (20 mins) Mike McPhaden provided an overview of the Indian Ocean Observing System (IndOOS) and how over the past 10 years it has developed to encompass a number of basin scale components (Inc. RAMA, XBT lines, SOP, Argo) and regional elements (inc. IMOS, MOMSEI). Key points from Mike's presentation included: • The multi-national, multi-institutional, multi-platform and multi-disciplinary nature of IndOOS. • BOBLME's active role through (collaboration between USA, India and BOBLME) in the RAMA array through the deployment of a data buoy in the Bay of Bengal in 2013 which provides real-time measurements of carbon and ocean acidification. The data is already showing seasonality to the current carbon cycle (transition season and SW monsoon). All data is freely available through NOAA's PMEL website. • A lot of IndOOS in-situ measurements are relevant to the BOB. Many Argo

	floats and surface drifters in BOB, but desirable to increase these numbers. A number of tide gauge locations, IX14 XBT transect between India and Myanmar provides fortnightly data. All data has open accessibility. • Two ASIRI programs (ASIRI-EBOB and ASIRI-OMM) involved BOB countries with the aim of improving the predictability of the North Indian Ocean Circulation and Indian Monsoons. • MOMSEI project (WESTPAC and SEAGOOS) and its objectives of increasing in-situ observations, promotion of research and building of regional scientific and technical capacity. • NOAA capacity building activities, including NOAA-Indonesia Ocean-Climate Observations, Analysis and Applications Partnership; DBCP western IO workshops. • IOPs 5 year plan, including completion of RAMA to contribute to IIOE-2, to hold a summer school in 2016, as well as a number of research objectives. The plenary discussion following Mike's presentation raised the following points: • Raleigh queried whether IndOOS data collected in EEZ's is openly accessible. Mike in response highlighted the complicated nature of open access to data within EEZ's and that each country takes a different approach – some allow access through bi-lateral/tri-lateral agreements for example. He also stated that the data in general is not sensitive and in fact open access could help in economic development. The opportunity for IIOE-2 to broaden accessibility to IndOOS data was raised. Nick concurred that this is an objective of IIOE-2 and could be addressed through the data and information management policy. • Rachelle Lauro raised the need for microbiological data to also be openly accessible in this context, further supported by M.F.M Fairoz. Mike concurred and further suggested that one of the outputs of this workshop could be a high level statement on the value of international collaboration in BOB region - including in facilitating open access to data. Sensitivities around the use of data for bio-prospecting were raised by Rachelle, and that the statement could mention that there would be no commercialisation of the data. Mike was supportive of a high level statement that didn't go to this level of detail. • Nick introduced the concept of preparing a participants statement out of the workshop, similar to one produced out of the Mauritius reference group meeting, and stated that this could include a high level statement about data accessibility. This topic was deferred for further discussion under another agenda item over the remaining day(s).
10.50- 12.00	Country/stakeholder presentations (each 10 mins presentation + 10 mins discussion) • Bangladesh – Prof M. Shahadat Hossain (University of Chittagong). Ocean Science in Bangladesh: Education and research at the IMSF, University of Chittagong. Professor Hossain gave a comprehensive overview of the Institute of Marine Sciences and Fisheries (IMSF) at the University of Chittagong. IMSF engages in a number of research activities of relevance to the Bay of Bengal/Indian Ocean region. This includes work with respect to defining Bangladesh's maritime area, the anticipated extent of coastal flooding associated with 1 m rise in sea level, analysis of the seasonal and geographical distribution of tropical cycles and long-term collaborative studies on seasonal SST variability in the Bay of Bengal, as well as historical trends in

	pH and SST in the northern Bay of Bengal. Many of the pH and SST studies are utilised in understanding fish habitat and ranges for important subsistence stocks, but more research is required due to the economic and social dependency on them. Marine Spatial Planning is also underway in Bangladesh, through work with the FAO. In terms of IMSF's expectations from IIOE-2, Professor Hossain highlighted the needs for capacity building in ocean forecasting and management, hydrographic surveys, ocean data management and fisheries management and to develop the blue-economy. The faculty resources (staff, laboratories and libraries) of IMSF were highlighted as potential contributions to IIOE-2. In the following plenary discussion Nick highlighted that IIOE-2 will aim to provide opportunities for professional and student fellowship through programs such as POGO. Professor Hossain welcomed these opportunities and also highlighted that Bangladesh's Navy undertakes a lot of research. Rudi asked for an update on the National Oceanographic Research Institute (NORI) and Prof. Hossain advised that 5 research officers have been appointed and site construction is underway, likely taking several more months to a year until completed. • India - Dr Damodar Shenoy (NIO). CSIR-NIO contributions to IIOE-2. Dr Shenoy began his presentation by giving an overview of some of the characteristics of the Bay of Bengal and how increased urbanisation and industrialisation around the region are impacting upon BOB's biogeochemistry and ecosystems. NIO has (and continues to) undertake a number of research activities in the BOB including the original IIOE, RAMA moorings etc. While considerable data is continuously recorded in BOB and available, process studies are missing, but are also constrained by the fact that 25% of the northern IO lies within the EEZ's of littoral countries. Research within these regions is essential to understanding the processors occurring in IO (currents, transport pollutants). NIO in this regard pursues/undertakes collaborative MoUs with countries such as Sri Lanka, Kuwait, and Qatar. In terms of what CSIR-NIO can offer to IIOE-2, Dr Shenoy outlined their desire to undertake collaborative research (i.e. gather new data and understand processes of regional importance) of direct benefit to all IO rim countries and help in the building of country capabilities through IIOE-2 as occurred in India under IIOE-1. Projects such as an Ecosystem Characterisation of Indian Coastal Waters were highlighted as of interest to NIO, and NIO offered its facilities and ships as inputs to a collaborative project. Dr Shenoy concluded by stating that NIO would be willing to host a workshop at CSIR-NIO in Goa as a means of initiating such a project. In the following plenary discussion Mike McPhaden congratulated NIO on their proposed launch of IIOE-2 in December 2015, including the commencement of an inaugural cruise under IIOE-2. Dr Fairoz also congratulated NIO on their research collaborations/MoUs with neighbouring countries and looks forward to continuing these collaborations for the mutual benefit of all involved in IIOE-2. Rudi Hermes further requested that India consider opportunities for collaboration with Myanmar by stating that India has a great capacity to help in the development of oceanographic expertise in Myanmar and cited opportunities through the proposed RV Nansen cruise. • Indonesia – Dr Anna Kuswardani (Research & Development Centre for Marine

	& Coastal Resources). Indonesia's Research Activities in the Eastern Indian Ocean region. Dr Kuswardani's presentation provided an overview of the IO related research activities undertaken (past, present and future) by Indonesia's Research & Development Centre for Marine & Coastal Resources, many of which are of relevance to IIOE-2. Key institutional driver is sustainable fisheries resources. Projects outlined were: • Upwelling research in the Indonesian Seas (Java Upwelling Variations Observations (JUVO). Deployment subsurface ADCP mooring system. Contribution to IndOOS. Research is a collaboration with China. 3 cruises since 2012 and a further cruise planned for end of March 2015. Future research objectives under JUVO will include combining JUVO data with ocean numerical models to help in the development of fishing ground prediction. • MOMSEI has involved a number of joint cruises (2010-2012), summer schools and associated capacity development activities. Further cruise in 2013 generated oxygen profiles, revealing high sub-surface oxygen levels and a number of eddies. A cruise will be undertaken in June 2015 (22 days) and include a number of activities including CTD casts, water sampling, and video plankton recording. • Benthic records of marine environment, Climate & ecosystem in the Eastern IO since the last deglaciation (BENTHIC). Collaboration between Indonesia and China. Research focus in West Sumatra (Phase I 2014-2015) and South of Java coast (Phase II 2016-2017). • Benoa port-based catch monitoring program & observer program (IO Tuna Monitoring). Undertaken 2005-2010, continued 2010-2015. Scientific observers are on-board to monitor catch and undertake ocean observations. • Stock assessment in fisheries management area 572, 573. Technical workshop proposed 2015 involving Indonesia, China, USA and representative of Ocean Tracking Network (OTN). Dr Kuswardani also noted Indonesia is to take over chairmanship of IORA in November 2015 and to assist the Indonesian academic community has established the Indian Ocean Academic Forum (IOAF) – a forum for the exchange of scientific information, joint R&D, training and capacity building.
12.00- 13.00	Lunch
13.00- 15.00	Country/stakeholder presentations continued (each 10 mins presentation + 10 mins discussion) • Indonesia – Dr A'an Johan Wahyudi (LIPI). Research Centre for Oceanography. Indonesian Institute of Sciences (LIPI). Dr Wahyudi outlined the institutional history leading to the establishment of the Indonesian Institute of Sciences (LIPI) in 2001. He then went on to outline LIPI's research agenda for 2015-2019 – 5 research groups: • Mariculture and bioprospecting • Marine resources and ecosystem health • Marine biodiversity and conservation • Marine pollution and bioremediation • Oceanography and global climate change

	Dr Wahyudi then outlined research areas which could contribute to IIOE-2. These included: • Widya Nusantara Expedition (EWIN). Underway since 2007 and investigating range of issues inc. oceanographic and biogeochemical processes, plankton dynamics, migratory species, larval dispersal, marine biodiversity and geology etc. 2015 focus – Chapter 1: Eastern IO (to inc. physical oceanography, plankton dynamics, particulate organic matter, nutrient flux, geological profiles, benthic biota, stock assessments of tuna). Chapter 2: Northern Sumatran Waters (to inc. profile physical oceanography, plankton dynamics, geological profiles, coastal biodiversity). In the plenary discussion that followed Mike McPhaden asked whether national coordination/discussions on IIOE-2 were occurring. Dr Wahyudi responded that many organisations are working together within Indonesia (i.e. BPPT) and they also collaborate with KIOST. Prof. Indra Jaya added that Indonesia undertakes oceanographic activities under the international collaborative framework of the IOC. Indonesia's IOC focal point is Dr Zainal, who is also the focal point for IIOE-2. Discussions are still underway, but it is likely that Indonesia will develop a national committee to IIOE-2. Dr Shenoy enquired as to the number of research vessels in Indonesia and Prof. Jaya confirmed that they have around 12 research vessels. • Maldives – Prof. Shiham Adam (Marine Research Centre). Maldives Marine Research Centre. Louise Wicks gave a presentation on behalf of Prof. Shiham Adam. It outlined the history and status of the Maldives Marine Research Centre and described the 4 sections/programmes of the MRC (oceanic fisheries research, coastal (coral reef) fisheries research, coral reef research and mariculture R&D). Details of previous cruises by RV Sonne were also provided and the main issues confronting the Maldives that could be explored through IIOE-2 outlined. Fisheries are a significant socio-economic driver for the Maldives and hence strong interest in more fisheries research (i.e. important live bait secondary fishery – research fishery dynamics and primary productivity). In the following plenary discussion Mike McPhaden outlined a potential research project of near shore upwelling associated with the Wyrtki jets. Raleigh responded that this could be captured in the SCOR Science Plan. Rudi Hermes added that Prof. Adam welcomes further research a collaborations with BOBLME partners and also expresses interest in the capacity development opportunities through IIOE-2. In reference to capacity building, Nick encouraged the BOBLME Secretariat to write to the IOC Executive Secretary to request that BOBLME countries have an opportunity to contribute and comment on the capacity development plan that will be developed under IIOE-2. • Maldives – Dr Zahid (Maldives Meteorological Service). Status of marine research in the Maldives. Dr Zahid gave an overview of the Maldives territory: 99% of the Maldives is sea area, with the land only being ~3 m above sea level making it one of the most low lying countries in the world. These unique features make climate research and related issues (i.e. sea level rise, flooding, beach erosion, coral bleaching) particularly important areas of interest for the Maldives. The Maldives Marine Research Centre is the only research institute in the Maldives

	and undertakes research into coral reefs, reef and pelagic fishes and mariculture. Areas of focus include forecasting potential fishery zones for tuna fisheries, research surveys to identify other potential fishery species, and strategies to maintain baitfish populations as important secondary fisheries in the region. The Maldives Meteorological Service (MMS) oversees a meteorological observation network across their territory. The climate section of the MMS has the mandate to undertake climate research, but currently not doing so due to lack of human resources. Many areas of interest (i.e. air-ocean interaction, disaster mitigation) and the MMS have a vision to establish a Climate Research Centre for collaborative research. Dr Zahid reported on current discussions with FIO in China regarding a 2 year pilot program ('The impact of Asian monsoon on the central tropical Indian Ocean'), which will help in strengthening of research relationships and could be a contribution to IIOE-2. Dr Zahid concluded by outlining the capacity building needs of the Maldives, particularly in the areas of ocean observations (currently no observations in Maldivian seas and MMS very keen to est. ocean observing network) and in the building of human resources (more staff training required up to graduate level to conduct climate and marine research). In the following plenary discussion Mike McPhaden supported the need for international collaboration to help in research around the Maldives and queried the availability of tertiary education options. Dr Zahid responded that the University in the Maldives is only 5 years old and current courses are not tailored to oceanography or meteorology. • Sri Lanka – Dr M.F.M. Fairoz (Ocean University of Sri Lanka). Status of oceanographic and marine ecosystem research in Sri Lanka. Dr Fairoz began his presentation by outlining the numerous international research collaborations that Sri Lanka scientists are involved in (i.e. circulation systems and hydrography in Northern IO, internal waves and mixing around Sri Lanka dome, prediction of IO monsoon, basin-scale high resolution modelling of BOB freshwater plume, near surface circulation off Sri Lanka from surface drifters). Dr Fairoz then went on to describe an Ocean University project, involving microbial monitoring of Sri Lankan coral reefs (includes water sampling, coral recruitment, and collection of physical and chemical data). The project is a collaboration with Scripps Institute of Oceanography and uses standard research methods to facilitate comparison of Sri Lankan data with data collected by Scripps elsewhere. Results to date indicate that the dominance of algae in coastal areas is prohibiting coral development and through a meta-genomic approach they are investigating the relative levels of organic carbon in higher vs lower algae dominated areas. Dr Fairoz concluded by stating that Ocean University would welcome more collaborative research under IIOE-2. Raleigh Hood asked about the likely sources/triggers of algae growth and Dr Fairoz responded by citing the influence of freshwater runoff. He went on to reconfirm the importance of biogeochemical data in understanding these issues and that research is also looking at *E. coli*. Links to these issues in the SCOR Science Plan themes were discussed. • Thailand – Dr Penjai Sompongchaiyakul (Chulalongkorn University) & Dr Ukkrit Satapoomin (Phuket Marine Biological Centre). Dr Sompongchaiyakul began the presentation by outlining a number of national (i.e.

	inter-annual variability of ENSO, IOD, monsoon variability and extremes, national fisheries research surveys in Thai EEZ and Myanmar EEZ) and multinational (i.e. joint survey BIMSTEC member countries on BOB marine resources, IOC/WESTPAC MOMSEI project and others) research activities related to ocean and climate sciences that Thailand is participating in. The multinational studies include joint research with China, Germany and Denmark. A number of capacity building activities also occur (i.e. Thai-China joint lab for climate & marine ecosystems, UNESCO/IOC Regional Training Centre on Ocean Dynamic and Climate). Dr Sompongchaiyakul then went on to outline the desired contribution of IIOE-2 to Thailand's societal needs in the areas of climate prediction, disaster risk reduction and capacity building for young scientists. The IIOE-2 Science Plan themes (2, 3, 5, and 6) were also highlighted as of most interest/relevancy to Thailand. Dr Ukkrit Satapoomin then presented on the Phuket Marine Biological Centre which undertakes research in the Andaman Sea across 6 major areas of research as part of Thailand's Marine and Coastal Resources Research and Development Institute. Research in the Gulf of Thailand is primarily undertaken by the Marine and Coastal Resources Research and Development Centre. The PMBC is the focus of the Thai-China Cooperative Program on Marine Research (2012-2017) and also hosts the Thailand-China joint laboratory on climate and marine ecosystems. Projects include the Ocean Forecasting System (OFS) in order to develop ocean forecasts for both Gulf of Thailand and Andaman Sea, Paleo-climate research in the Andaman Sea & BOB (proposed cruise 2016-2017??), climate and oceanographic forcing of plankton and coral in cooperation with Woods Hole Oceanographic Institute and a project to develop a network of monitoring sites for ocean dynamics and ocean acidification observations. In conclusion Dr Satapoomin presented on collaboration with German scientists to investigate the effects of internal waves on sedimentology build up, bedforms and sediment transport on the shelf of the Andaman Sea. A request for a cruise on RV Sonne has been submitted and if successful the project will be able to build upon existing data (CTD transects, bathymetric mapping) in the delivery of project objectives. In the following plenary discussion Wenxi Zhu described the network of regional training centres (RTCs) under development in the WESTPAC region, each of which will work with different institutes and have different topics, but with an overall focus on engaging and helping young scientists in the WESTPAC region. The centres could be opened up to include other countries around the IO. Wenxi also described the work behind the development of the proposed regional ocean acidification monitoring network, being based upon existing reef monitoring systems and how a workshop with NOAA scientists helped identify a number of future pilot monitoring sites and protocols for monitoring which will enable the collection of consistent baseline data. Mike McPhaden noted the re-occurring discussion on the need for capacity development within the BOB region, but also noted that the discussions had also revealed that a considerable amount of capacity development is already occurring. He noted the value of the research inventory process as part of the development of the SCOR Science Plan and suggested that a similar inventory exercise related to capacity building would be beneficial. Nick D'Adamo agreed and reminded participants of the role of the IPC in preparing all necessary component plans (i.e. capacity development, data management) for IIOE-2 and suggested that this recommendation should be forwarded to the IPC. Rudi Hermes further noted that while there may be quite a lot of capacity development activity occurring in BOB, there is considerable demand for these types of activities and this could be an area of

	increased focus under BOBLME Phase 2. He also asked if the proposed PMBC project cruise (re Paleo-climate research in Andaman Sea & BOB) could collaboratively engage Bangladesh and Myanmar. In response Dr Satapoomin noted that this was possible. Dr Shenoy made a comment with respect to the MOMSEI transects and the on-going uncertainly as to what happens to the water that spills over the 90 east ridge and enters the Andaman Sea. Dr Fairoz noted the importance of establishing monitoring networks in coastal systems as indicators/in order to compare with what is happening in the open ocean and that this type of program could nest under IIOE-2 and that the data collected could be made electronically available to all. Prof. Hossain also advised of a joint Bangladesh – China proposal to examine the freshwater effects in the BOB. • Rachelle Lauro (Indigo V Expeditions). The contribution of citizen oceanographers to IIOE-2. Ms Lauro outlined the motivation of Indigo V Expeditions to build a network of citizen oceanographers to undertake marine micro biome sampling off world cruiser yachts through the use of standardised techniques and technologies. A pilot cruise under this objective successfully undertook microbiological sampling in the Chargos during 2013 and a trace metal study (iron) across the world's busiest shipping lane have already been completed. Indigo V Expeditions is currently developing new technology (ocean sailing micro biome observatory) which will ensure standardisation of the collection of all biological data. Ms Lauro concluded by stating that there are a number of challenges for citizen oceanographers in contributing to IIOE-2, including the extent of EEZs (requirement to adhere to Nagoya protocol with respect to access to genetic resources), coordinating with IIOE-2 infrastructure and securing sufficient funding. In response to plenary discussion, Rachelle advised that until the sampling technology is developed, samples are hand collected via strict protocols and then sequencing is undertaken either in Singapore or by partner research institutes. She also advised of the proposed development of a data management system. Opportunities for citizen science to contribute to marine plastic sampling was also raised by a number of participants, and while this is not the current focus of Indigo V, Rachelle noted future opportunities for sensor technology are under development, as is chemical measurements. Mike McPhaden asked if an increase in primary productivity in dirty water had been identified through sampling thus far. In response Rachelle noted that the data revealed that microbial communities are organised in very separate and distinct ways, i.e. separate communities inside Chagos atoll vs. outside. Dr Fairoz reflected on his earlier comments in support for the need for coastal monitoring and open ocean monitoring to identify these differences and for more data in general to be collected and shared so that regional understandings can be developed.
15.00- 15.30	Afternoon tea
15.30- 16.10	Participant presentations continued • Malaysia – Dr Mohd Fadzil (University Malaysia Terengganu) Dr Fadzil provided an overview of Malaysia's activities with respect to ocean

observations as undertaken by the Institute of Oceanography and Environment at University Malaysia Terengganu. The institute includes 4 specific programs: physical & geological oceanography; biological oceanography & biodiversity; satellite oceanography & marine information; and chemical oceanography & marine pollution. Dr Fadzil also outlined a number of research activities including:

- 2 month long Strait of Malacca Expedition on RV discovery which included over 100 stations, stopped at many islands, studied corals and also conducted an outreach program for school children. The coral studies identified a distinction in coral types in the Strait, with corals in the northern end more like the Indian Ocean species, and those in the southern end more like the Pacific Ocean.
- Activities of the Malaysia Coastal Observation Network (MYCON) – continuous data collection. Incorporates range of observations via scientific cruises, use of wave gliders and in-situ data/ocean buoys, lab analysis etc.
- Involvement in regional collaborative work including: MOMSEI; Ocean Forecasting System (OFS) as shown in Thailand SEAGOOS demonstration system, from which they plan to develop more localised models for own use; and upwelling studies under IOC WESTPAC to investigate seasonally driven upwelling.

Malaysia also has a marine portal database which collects all Malaysian related ocean data and satellite imagery.

In the plenary discussion following Dr Fadzil's presentation Rudi enquired whether Malaysia's oceanographic community was involved with sister LME project (Sulu-Celebes Sea LME) and the science opportunities that program could provide, i.e. research into the genetic stock structure of mackerel could be supplemented to oceanographic research in terms of understanding how stocks are separated by current boundaries.

- India – Nagaraja Kumar (INCOIS)

Nagaraja Kumar provided an overview of India's Science Plan for IIOE-2, driven by evolving outstanding scientific questions which through developments in oceanography (i.e. sustained observations, ocean modelling and forecasting) can be tackled. The key questions relate to the following research areas:

- Understanding air-sea interactions; deep ocean circulation; biogeochemical processes; benthic ecology of OMZ; hydrodynamics and biogeochemistry of southern subtropical IO; SW Tropical IO; and the largest Geoid low on earth.

India has significant institutional capacity to undertake IO research through INCOIS (Ocean Observation Information & Advisory Services) and its support of a number of major on-going Indian programmes (i.e. SIBER, CTCZ, GEOTRACES). They are also involved in a number of major collaborations (i.e. RAMA, Bay of Bengal Boundary Layer Experiment) and provide access to oceanographic data (via Ocean Data Services – all data outside EEZ freely available, within EEZ data shared through bilateral arrangements). Facilities such as the International Training Centre for Operational Oceanography (ITCOocean) will also be important inputs to IIOE-2 and could be used as a regional capacity building centre. Mr Kumar also highlighted India's contributions to IIOE-2 in terms of research vessels, satellite missions, data management, and future deployments. The Goa symposium will also be the launch of India's first cruise under IIOE-2 and 50% of berths will be available for the international scientific community. Indian is also supporting communications through an IIOE-2 website and the Indian Ocean Bubble newsletter.

	In the following plenary discussion Mr Kumar reported that their national committee to IIOE-2 is preparing an Indian Science Plan. He also stated that the scope of support that the ITCOocean training centre could provide to the region includes training in remote sensing, modelling, and ocean observations (all in-house trainers) and much more through bringing in international expertise. Support generally includes covering logistics (accommodation, meals) of international students/trainees (normally 30-35 participants). Dr Fairoz queried the positioning of the sensor (mooring) deployment in the southern IO (below Sri Lanka) noting that if it were closer to Sri Lanka the results would be a good input to numerous Sri Lankan studies. Mike McPhaden responded by stating its location is outside of the Sri Lankan EEZ (moorings are generally located outside of EEZs) and that all placements are cited to achieve an overall even - basin scale distribution.
16.10- 16.30	Response to presentations - facilitated plenary discussion on BOBLME needs and capabilities in IIOE-2 - Nick D'Adamo and Raleigh Hood (20 mins) Nick D'Adamo opened the discussion by thanking all participants for their excellent presentations on capabilities and needs under IIOE-2. He proposed that this workshop produce a participant statement as a mechanism for advocating for high level support for IIOE-2, he encouraged all participants to consider how they could return to their home countries/institutes and plan for coherent national engagement in IIOE-2 and he welcomed Indonesia's transition into the Chairmanship of IORA at the end of 2015 and noted IORA's already supportive statements about IIOE-2. Nick further encouraged BOBLME countries to take an interest in the work of the IPC over the next few months, to review the SCOR IIOE-2 Science Plan in detail and to also consider the ideal geographical positioning of many BOB countries to be launching sites for observations (i.e. Maldives ideal location to launch gliders). Raleigh followed by re-iterating the complexity of issues surrounding EEZ access and data sharing that had been raised several times during participant presentations and suggested that the participant statement could include a statement on this in the spirit of encouraging open, free and timely access to data under IIOE-2 research. He also highlighted the opportunities for scientific research around the Maldives that had been raised and encouraged participants to consider how they could motivate/contribute to research in this region. He concluded by stating that collating and documenting current and future capacity building activities in an inventory may be a useful way of capturing the diversity of activities already underway as a means of identifying gaps which future programs could address. In the following plenary discussion, the development of a participant statement from the workshop was endorsed and Nick agreed to circulate a draft statement, working in issues identified during the day's discussions, for everyone's review and further revision at a session in Day 2.
16.30- 16.45	Summary and consolidation of key outcomes from Day 1 - Nick D'Adamo (15 mins) Nick thanked everyone again for their energetic participation and discussion and closed the meeting.
	Meeting close

Day 2: 09:00–16:30

09.00- 09.15	Overview of key dates leading to launch of IIOE-2 – Nick D'Adamo (15 mins) • IOC Assembly, June 2015 • Goa symposium, December 2015 • Overview of anticipated meeting outcomes (workshop report, participants statement) Nick reminded all participants about the IOC Assembly meeting in June 2015 at which IIOE-2 will be considered with a view to the IOC creating a new program for its implementation, and that the likely launch of IIOE-2 will be at the Goa symposium in November-December 2015. Nick then gave participants an overview of the PPO's agreement with BOBLME regarding this workshop and its anticipated outputs in the form of a workshop report and some longer term discussions regarding the identification of opportunities for BOB countries to participate in IIOE-2 research activities and/or capacity building projects. Rudolf Hermes reflected on discussions yesterday regarding the development of an inventory of capacity development needs amongst BOB countries and suggested that a small consultancy could be a good mechanism of achieving this. Rudi then voiced his support for all attendees when they return home to advocate for IIOE-2 through their IOC delegates and in particular being mindful of their backgrounds (i.e. Bangladesh and Myanmar IOC delegates are from Ministry of Transport, so additional briefing may be necessary). Nick thanked Rudi for his intervention and re-iterated the importance of workshops such as this for general advocacy for IIOE-2.
09.15- 09.45	Case study – Eastern Indian Ocean Upwelling Research Initiative (EIOURI) - Raleigh Hood (30 mins) • An overview of this international collaborative research initiative as an example of the types of large-scale projects being undertaken as part of IIOE-2 Raleigh Hood presented on an emerging process study under IIOE-2 – EIOURI (CLIVAR-IMBER/SIBER supported project). Its focus is on the Sumatra/Java upwelling systems and its relations/links to large-scale circulations and variability, including in the Bay of Bengal and West/North-west Australia. Ocean models show that a large eddy forms off the Lombok Strait and that during IOD years the eddy can extend along the Sumatran coast. This is associated with a very strong chlorophyll and productivity response and has even been linked to spikes in the sardine fisheries catch in years when the upwelling is strong. The Science Plan for EIOURI is under development (via Weidong Yu, due for completion in April) and follows on from 5 workshops/meetings of interested scientists engaged in the project so far. The core scientific questions of the study relate to theme 2 of the SCOR IIOE-2 Science Plan. The EIOURI pilot cruise will be through MOMSEI and Japan will also contribute through the RV Mirai during 2017. Raleigh invited and encouraged any individuals to get in contact with him if they would like to participate in EIOURI – as the Science Plan is still under development; it is an excellent time for interested scientists/institutes to contribute. In the following plenary discussion Nick D'Adamo noted the links between EIOURI objectives and discussions yesterday around the Sri Lankan dome and suggested that through the agency of BOBLME, this aspect could be included. In response, Raleigh

	welcomed this suggestion, noting that it would require a 'champion' to help with the necessary input to the Science Plan etc. Rudolf Hermes further suggested that Myanmar may also be interested, citing the Gulf of Martaban as a potential area of interest (highest chlorophyll content in BOB, could be the result of high river inputs or localised upwelling in NW monsoon). He further suggested that this could be facilitated bilaterally with NOAA as they also have an interest in this region (Double Java region). Indra Jaya queried whether there were any plans for long term monitoring of the water column through EIOURI and Raleigh responded that the focus is on near-surface mooring observations with the aim that this will provide some insight into what is happening at depth. Mike McPhaden added that the EIOURI Science Plan does not address how the research will be undertaken at this stage, this is still under development.
09.45- 10.00	Case study – Indian Ocean Bio-Argo Project – Louise Wicks (15 mins) • An overview of the Australian component of the IO Bio-Argo project on behalf of CSIRO principal scientist Dr Nick Hardman-Mountford. Louise Wicks gave a presentation on CSIRO's involvement in the Indian Ocean Bio-Argo project on behalf of CSIRO principal scientist Dr Nick Hardman-Mountford. She reported that the project is a collaboration between CSIRO, CSIR-NIO and INCOIS and the PPO and will involve coordinated bio-float deployments (2014-16), develop protocols for deployments and data collation, and facilitate wider collaboration to help in the development of an Indian Ocean Bio-Argo network. So far the project has been modelling ideal deployment strategies in eddies (park depth to maximise profile period) and the CSIRO's proposed dates for deployments in the southern IO and Java/Sumatra upwelling are still to be determined. In the plenary discussion that followed Mike McPhaden asked how the scientists in the project were going about deployments of Bio-Argo floats in EEZs. Indra Jaya responded by stating that there are a number of established protocols for scientific deployments of floats in Indonesia's EEZ. They do take some time to be approved, but generally do not hinder the scientific objectives of the deployment. Damodar Shenoy cited a proposed cruise by India in July/Aug of this year around the Java region and that is provides a good opportunity for the two countries to work together and invited further discussions and cooperation in this regard, citing also that it could also provide opportunities for capacity building. Damodar reported that the cruise plan is still under development and offered one suggestion for collaboration - for Indonesian scientists to fly to Goa few weeks before cruise starts to undertake necessary training, and then to join the cruise. Happy to have further discussions on the logistics of this suggestion. The discussions concluded by Nick requesting that Dr Nick Hardman-Mountford provide an update on the Bio-Argo project at the IOGOOS meetings in Goa in Nov/December 2015.
10.00- 10.30	Overview discussion on how other countries are so far planning engagement in IIOE-2 (30 mins) • USA (Mike McPhaden/Raleigh Hood) Raleigh Hood reported that the USA has been actively engaged in promoting IIOE-2 since 2013 and since then has had several meetings/briefings, presentations to high level committees, published articles (i.e. EOS article) etc. The current focus of US advocates is to secure funding for an IIOE-2 project office and planning committee.

	Raleigh reported that there are tentative commitments of support from a number of institutions (NASA, NOAA, and ONR) and if this support can turn into a commitment the project office would coordinate US efforts (in accordance with an US Science Plan for IIOE-2), represent US community at international forums, liaise with IOC committee and SCOR committee etc. Mike further added the interest of the US Department of State in IIOE-2, largely in its capacity development mandate, citing this as a potential opportunity to help in capacity development objectives in this region. • Germany (Raleigh Hood) Raleigh Hood reported on the significant input Germany is proposing in IIOE-2 including several cruises and research projects (i.e. IODP Leg 359 in Oct 2015, neogene environmental changes in the Maldives, SPACES Southern African/German program – capacity building, proposals for ship time on RV Sonne). Of particular note is the proposed German IIOE-2 joint initiative, which will form a research cluster and coordinate and develop a framework for an integrated German IO study including biogeochemistry cycles, physical oceanography and paleoceanography. A white paper is currently in preparation for the integrated German study. Several German scientists have also been involved and continue to be involved in the planning of IIOE-2 (i.e. SCOR Science Plan Development Committee, International Symposium Planning Committee for Goa symposium). • India (Nagaraja Kumar) Nagaraja referred participants to his presentation on Day 1 for details. • Australia (Nick D'Adamo) Nick reported on the on-going work of the PPO in the planning of IIOE-2, facilitated through the support of their Australian sponsors (Bureau of Meteorology and Western Australian Government). He also outlined the range of meetings and informal discussions that Australian scientist with the support of the PPO have held with respect to coordinating Australian involvement in IIOE-2 and that it was likely an Australian National Committee for IIOE-2 will be formed. In the plenary discussion that followed, the following was noted: • Discussions yesterday alluded to the emergence of an Indonesian national organising committee. Further details unknown at this stage. • There was considerable interest from participants to get a clearer understanding of research projects and capacity building activities being proposed by countries to enable connections/opportunities to be identified, in particular for less developed countries. M.F.M Fairoz for example cited Sri Lanka's interest in working with India and how they could work together to incorporate Sri Lankan research interests (i.e. Sri Lankan dome) with Indian proposed research activities. This is important for negotiations with potential funding agencies (i.e. FAO, UNEP). This was noted and in response Raleigh suggested that when countries national plans are released that these opportunities will become clearer. Nick also recommended that countries need to be proactive and approach other countries to discuss collaborative opportunities – this workshop has opened up these lines of communication and the best focal points are now known. Nick also cited the IPC as another vehicle to champion capacity building opportunities – as they will be developing a capacity building plan. He suggested that the Sri Lankan IOC delegation could raise these issues for the IPCs attention. • Raleigh Hood cited SCORs cruise inventory (available through Ed Urban or on

	the SCOR website) as a good reference point, but that the longer term maintenance of this inventory will need to be dealt with and in the first instance will be considered by the IPC. It is critical that the sponsors of IIOE-2 (i.e. IOC) keep track of what is happening and allow general access to this information. Nick agreed that it is the aspiration of the IOC to maintain this kind of inventory on behalf of all member states, but that there are no resources to do so at the moment. He further noted that an international project office for IIOE-2 will need to be established to run all aspects of IIOE-2. Again this is something for the IPC and then the IOC Assembly to deliberate upon in June 2015. Some concern regarding the status of the IPCs work was expressed by Wenxi Zhu, and Nick re-iterated that the IPCs task is challenging but that they will develop a short strategic plan for the IOC Assembly that will refer to recommended governance arrangements, budget needs, etc.
10.30- 11.00	Morning tea
11.00- 11.30	Overview discussion on how other countries are so far planning engagement in IIOE-2 continued. Rudolf Hermes gave a presentation on the proposed southern Indian Ocean survey by the RV Dr Fridtjof Nansen. The cruise is Norway's first contribution to IIOE-2 and will survey the SIO Gyre and sample plastics, plankton, and physical oceanography and investigate the role of meso-pelagic fish in the food chain of the Gyre. Scientists from both sides of the Indian Ocean are invited to express interest in participating in the cruise (Nansen will cover travel and sea allowance for 10-15 berths), departing Indonesia 28 June and arriving Mauritius 16 July. A further planning meeting will be held in May 2015. In the following plenary discussion Rudi confirmed that the Nansen's activities are generally African focused and therefore connected to SAPPHIRE, and in this regard Nick requested Rudi pass on Mike Robert's interests in developing WIOURI and how the Nansen could contribute. Mike McPhaden noted the possibility of the Nansen's route in June/July helping to re-establish some RAMA moorings (55 east originally established by ship many years ago) and committed to following up on this prospect. Commander Abedin provided some insight into Bangladesh's naval capabilities, which report through the Ministry of Foreign Affairs. He advised that a survey vessel is likely to be commissioned by the end of 2015, but noted that they lack the man power to effectively operate the vessel and would like to establish a model for collaboration with others which would enable their people to be trained in how to operate the vessel for survey work (capacity building exercise). He also noted their interest in collaborations on scientific work in the northern part of the BOB and suggested that the new vessel could collect samples on behalf of the international scientific community, further noting that some bureaucratic issues are still to be resolved, but that if the research data/outputs are of direct interest to Bangladesh, getting high level support will be easier. In response, Raleigh noted the proposed UK study in the northern BOB into the interactions between low oxygen zones and the shelf being led by Greg Cowie with participants from India and Bangladesh (Kawser Ahmed). Damodar Shenoy further added that Greg Cowie had recently visited NIO with respect to this study and reiterated India's interest in studies in the northern BOB and to work collaboratively with Bangladesh following any invitation.

11.00- 12.00	IIOE-2 data and information management – Nick D'Adamo/Louise Wicks (30 mins) Louise Wicks gave a presentation on behalf of Peter Pissierssens of IOC's International Oceanographic Data and Information Exchange (IODE) project on the various activities of IODE's network and how they may suit the data and information management requirements of IIOE-2. This included information on IODE Associate Data Units (ADU), National Oceanographic Data Centres (NODCs), the Ocean Data Portal (ODP) and activities like the Ocean Teacher Global Academy. In the following plenary discussion Rudi enquired whether IODE could develop a dedicated training course for BOBLME needs, and Nick responded that it may be possible and he would be happy to follow up. The broader issue of whether IIOE-2 should use distributed information system infrastructure vs. centralised infrastructure (i.e. SCOR GEOTRACES) for the management of all IIOE-2 related data was discussed by Raleigh, citing that if a centralised system was to be developed it would be a large task requiring considerable resources. Nick stated that these sorts of issues were to be considered by the IPC. Raleigh suggested that IODE could also perform an important role in ensuring that IIOE-2 data is freely available in a timely manner. Mike added that data management is intimately linked to capacity development – if individuals can't work with data and understand it, they are less able to contribute to it being freely available. Capacity development activities should therefore be targeted in this area.
12.00- 13.00	Lunch
13.00- 13.15	The development of a participant statement from this workshop was discussed in plenary. The following issues were raised in terms of its development: • Issues of data availability and accessibility and their links to capacity development should be included. • Concerns were raised by several participants about the inclusion of the list of workshop participant names and their affiliation at the end of the statement as it may give a misleading impression of 'official' institutional endorsement. It was agreed that individual names would be taken off the statement and reference instead be to 'the participants of the BOBLME focus group meeting.' The workshop report would contain the list of participants. • Rudi Hermes states he had a number of minor comments and would email these to Nick. In conclusion, Nick agreed to accommodate all issues raised on the draft participant statement and circulate it to everyone for their final endorsement before it is finalised. This would likely occur as part of the workshop report preparation process.
13.15- 13.45	Plenary discussion on on-going and planned research activities as relevant to IIOE-2 in the BOBLME region, with the goal of embracing and organising these activities as part of larger coordinated projects/programs, and developing comments on SCOR's draft IIOE-2 Science Plan – (30 mins) Raleigh Hood spoke to this agenda item by reminding participants of the SCOR developed IIOE-2 cruise spread sheet (to be circulated via email to everyone at the end of the workshop) and requested that all participants complete this spread sheet with details of their institutions and/or countries proposed activities of relevance to IIOE-2. Many important activities had been raised throughout the workshop and it is important that these are captured in a standard way for broader

	communication/follow-up. Nick further added that it is important for citizen science initiatives to remain engaged in IIOE-2 discussions and where possible for them to also complete the spread sheet. He concluded by noting that the IIOE-2 page on the PPO's website will remain updated as to status of IIOE-2 planning activities and that he and Louise are available at any time to help out.
13.45- 14.30	Plenary discussion on capacity development opportunities as relevant to BOBLME region through IIOE-2, with the goal of identifying a suite of potential capacity building projects to be pursued through IIOE-2, including potential funding partners – (45 mins) Nick opened up the discussion by reminding all participants of the IPCs role in developing a capacity development strategy for IIOE-2, as well as the IOC's process of revising their capacity building strategy which will also be a good reference document. Nick noted the various capacity building opportunities that had emerged through the preceding discussions and also gave an overview of the DBCP Capacity Building Task Team's Western Indian Ocean (WIO) capacity building workshop series and its relevancy in bringing awareness and understanding of IndOOS. Wenxi Zhu then outlined a number of ways in which WESTPAC activities could provide assistance to BOBLME. He sighted in particularly MOMSEI, ocean model development through their RTC, regular training on harmful algal blooms and coral reef restoration techniques. He concluded that WESTPAC would be meeting in 2 months to develop a forward plan of capacity building activities, opportunities for BOBLME would be part of this proposal and participants should visit the WESTPAC website for updates. Nick responded by welcoming IOC WESTPACs involvement and encouraged Wenxi to facilitate WESTPACs formal input into the development of the IIOE-2 capacity development plan, making sure links to WESTPAC training programs are explicit. The need for long term training opportunities (i.e. undergraduate degrees, PhDs) was raised as a requirement for many nations by Zahid and Nick concurred that this is a consistent message through IIOE-2 planning discussions and the expedition frameworks will seek to address this through capacity building programs such as student mentorships. The need for the sharing of information on proposed IIOE-2 activities was reiterated as an opportunity to link with capacity development. Raleigh suggested that the IPC could be requested to develop a capacity building inventory, in parallel to maintaining the SCOR research inventory as a way of helping developing countries to engage in IIOE-2. Nick then discussed the potential governance structures for IIOE-2, reiterating that the structure presented to participants was by no means finalised/agreed and should be considered as a model for explanatory purposes at this stage. Participants were then invited to raise any issues for discussion. Rachelle Lauro questioned how IIOE-2 will undertake outreach activities, suggesting that the media is very interested in science that occurs on yachts and noting that if scientists could be equipped with Go-pro's – they could themselves take carriage for the collection of a large amount of media material. This suggestion was acknowledged, but Nick also reiterated that the IPC will be challenged to develop and then fund a communications and outreach plan for IIOE-2. Rudi suggested in response that perhaps scientists proposing research activities under IIOE-2 need to clearly include a budget for communication and outreach. Raleigh noted that this is already standard practice in

	US funding proposals. The challenge will be providing guidance to scientists to help them include this in their own funding proposals, perhaps this can be provided by the IIOE-2 governance structure. If this is achieved, in effect IIOE-2 will have funding for broader education and outreach. In terms of the IIOE-2 governance structure, the following suggestions were raised: • Rudi suggested adding UN Ocean Atlas somewhere • Damodar suggested that countries participating in IIOE-2 should be part of the highest level governance body. In response Mike McPhaden argued that the overarching governance structure shouldn't be nationally focussed. • Magnus Torell suggested that their needed to be more focus in the governance structure on the translation of IIOE-2 science to managers. Nick concurred and indicated it was implicit in 'knowledge management', but perhaps should be more clearly stated.
14.30- 15.00	Afternoon tea
15.00- 15.30	Identification of missing stakeholders/countries and how to engage them, including strategies to motivate the formation of IIOE-2 National Planning Committees by BOBLME countries – Nick D'Adamo (30 mins) Nick opened the discussion under this item by inviting participants to identify whether important stakeholders from their own countries may be missing from IIOE-2 discussions to date, and encouraged participants to initiate discussions with these individuals/institutions when they return home. In response Damodar Shenoy committed to having a dialogue with the Indian navy as one example. Wenxi Zhu asked participant to carefully consider who stakeholders are, suggesting that 'interested partners' may be better terminology. He also encouraged participants to broaden their dialogue with Ministries that are more socially/economically focussed as it is important for scientists to relate research to societal and economic benefits to obtain support. Damodar Shenoy agreed stating that in India ministerial groups asks scientist to state what the outcomes 'for the common man' will be. IIOE-2 will therefore need to have a plan for how all of the science will be synthesised into a form that its outcomes on society and the economy can be presented to participating governments. Indra Jaya concurred and noted the importance of IIOE-2 governance structures working closely with organisations such as IORA. He further suggested that the help of social scientists may be necessary. Indonesia is already considering how their engagement in IIOE-2 could be used to strengthen their forthcoming chairmanship of IORA. Mike McPhaden commented that it is essential science invests in the future with the expectation of socio-economic benefit (i.e. better management practices, improved economies). It can be hard to foresee this sometimes, but perhaps with IIOE-2 the IPC can reflect on the benefits of IIOE (i.e. for India – it is a capability in modern oceanography) and use these in 'selling' IIOE-2 better. M.F.M Fairoz suggested that communication/outreach (i.e. documentaries) are a better tool than scientific reports – perhaps country wide communication materials need to be developed to disseminate what is going on. Mike McPhaden noted the importance of clearly stating a countries leveraged benefit for being involved in IIOE-2 – any individual countries investment is leveraged many times over because so many countries are going to be involved. IIOE-2 benefits will be returned in multiple ways because of involvement of different institutions, scientists etc.

	In closing Nick agreed that the IPC needs to consider how to achieve this. He further suggested that this meetings participant statement could include the following text "Strongly recommend IPC oversee development of a plan that will articulate the benefits of IIOE-2 to society". Rudi suggested that GEF preferred terminology 'Science-Policy interface' may be good to work in and he agreed to help capture this in the revision of the statement. Raleigh closed this session by reminding all participants that it is up to everyone to be pro-active, citing that the countries that have formed national committee's to IIOE-2 have only done so because their scientists have gone home and pushed for it.
15.30- 16.00	Free ranging plenary discussion on any issues of importance to BOBLME stakeholders arising from the previous sessions – Nick D'Adamo (30 mins) No specific discussion was recorded here. These issues had been raised in previous sessions sufficiently.
16.00- 16.30	Summation and final reflections • Chairs - Nick D'Adamo & Raleigh Hood • BOBLME secretariat - Rudolf Hermes/Chris O'Brien Nick opened the discussion by stating that from the IOC's perspective this meeting had been very productive and made positive contribution to the IIOE-2 planning process. He thanked everyone for their collegial participation, their informative presentations and particularly thanked Raleigh and Mike for attending and continuing to provide their experience and perspectives. He also thanked the BOBLME secretariat for enabling this focus group workshop to happen and for their insights throughout. Raleigh thanked Nick for leading the meeting and for his drive behind all of the IIOE-2 reference group meetings to date. Rudi concluded by expressing the secretariat's appreciation for everyone's participation and contributions and for how everyone will carry this forward. He noted that this is only the second time that something like a BOBLME oceanography working group has met before. He requested that everyone seek interaction with their BOBLME national coordinators to advise them of this workshop and its outcomes and he hopes to see everyone again in a new phase of BOBLME.
	Adjourn and close of meeting

Appendix IV Participants statement

Participants statement

BOBLME regional focus group meeting to facilitate engagement in the International Indian Ocean Expedition 50th Anniversary Initiative (IIOE-2),

Bangkok, Thailand, 17 and 18 March 2015

The participants of the BOBLME regional focus group, meeting to facilitate engagement in the International Indian Ocean Expedition 50th anniversary initiative (IIOE-2), Bangkok, Thailand, 17 and 18 March 2015, after recognizing the frank and successful work done so far, are pleased to thank the organizers, the invited experts and the BOBLME secretariat as the host and patron of the BOBLME Project.

We strongly support the establishment of an IIOE-2 for 2015-2020, as a unique opportunity for regional collaboration in marine research, training, capacity development and societal application, in alignment with the Resolution of the 47th meeting of the executive council of the IOC of UNESCO in 2014.

We reaffirm our commitment to undertake the IIOE-2 under a spirit of mutual cooperation and partnership and we support this important scientific endeavour to enhance our understanding of the Indian Ocean for the betterment of the environment per se and of the human communities that rely on and are affected by the Indian Ocean, in support of the implementation of the BOBLME Strategic Action Programme.

We urge and will endeavour to work with our own national Governments, relevant institutions, scientific communities and the IOC to support IIOE-2 through opportunities available to them, including the IIOE-2 Interim Planning Committee (Group of Experts) established by the IOC.

To this end, we will endeavour to catalyse and harness national coordination in our countries in addition to building and supporting an environment of international and regional cooperation both in undertaking scientific research and in the open access to associated data, in support of the implementation of the BOBLME Strategic Action Programme and to promote coherent and integrated engagement in the IIOE-2.

We urge prospective stakeholders in IIOE-2 from countries that will bring ocean observing, associated infrastructure, research and related capacities to the Indian Ocean under the IIOE-2, to facilitate the collaborative engagement of those stakeholders unable to engage in the same manner. All opportunities for collaborative programs and projects, at both strategic and tactical levels, under IIOE-2 should be encouraged and pursued.

Statement finalised on 15 June 2015

Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project to lay the foundations for a coordinated programme of action designed to better the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

The Food and Agriculture Organization (FAO) is the implementing agency for the BOBLME Project.

The Project is funded principally by the Global Environment Facility (GEF), Norway, the Swedish International Development Cooperation Agency, the FAO, and the National Oceanic and Atmospheric Administration of the USA.

For more information, please visit www.boblme.org

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