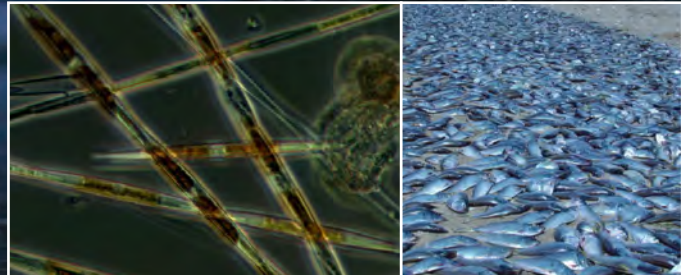


Intergovernmental Oceanographic Commission



Biennial Report 2014 – 2015



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Commission

Biennial Report
2014-2015

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Statement of the Chairman



Peter Haugan

The period 2014-2015 was challenging for both UNESCO and IOC. The funding crisis from a few years back was still having strong impact. However, emergency funds were made available and the IOC enjoyed strong support from the UNESCO Director-General as well as from Member States both at the IOC and UNESCO level. The desired balance between staff and program activities has implied a heavy burden on the IOC Secretariat. With the additional emphasis on regions called for by Member States, the size of the IOC staff in Paris is now at a critical level. On behalf of all Member States I would like to express warm thanks and appreciation to the IOC Executive Secretary during this period, first Dr Wendy Watson-Wright, then in the interim period Ms Flavia Schlegel and finally our new Executive Secretary during the last year Dr Vladimir Ryabinin for ably steering the organization during this time. They have been successful in maintaining the spirit and inspiration for the very worthy cause and objective of the Intergovernmental Oceanographic Commission.

The biennial report gives an overview of the broad scale of activities that the IOC is involved in. It deserves to be read in full and I will not point to any particular part as more important than others. Instead let me take a few moments to reflect on the situation that the global ocean and coastal areas and thereby our commission is facing. Humankind has always used the ocean. Transportation and fisheries were among the early ocean activities to satisfy human needs. As fisheries grew and some fish stocks began to dwindle, management procedures were developed and knowledge about the size and distribution of

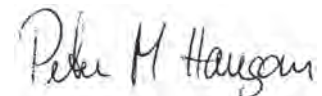
species was sought. Now we have realized that single species management is most often not enough and we have moved to multi species ecosystem based management.

In terms of the broader scale of human activities related to the ocean I suggest it is now time to move in a similar way from single sector approaches to a multisector ecosystem approach. In addition to a growing need for sustainable ocean transportation and fisheries, we have an increasing pressure from aquaculture, coastal urban development and exploration of living and non-living resources. These have to be developed while maintaining valuable ocean ecosystem services like human health and uptake of CO₂. The IOC has successfully pioneered the development of marine spatial planning and Member States are engaged in such activities in their coastal waters. Now we are also seeing increasing interest in the areas beyond national jurisdiction. These vast areas covering approximately 50% of the earth surface and with their great depths an even larger fraction of the living space for organisms, hold resources that may be crucial for sustainable development. But we still know very little about them and there is an obvious need for international collaboration on research to increase and share knowledge.

The IOC has a crucial role to play in this development and provides a unique platform for Member States. Building on the success of Global Ocean Observing System (GOOS) for the physical ocean environment, I suggest that the ongoing expansion to include biogeochemistry, biology and ecosystems, and

the sharing of biogeographic data through Ocean Biogeographic Information System (OBIS) and International Oceanographic Data and Information Exchange (IODE) will be crucial to serve several ongoing intergovernmental processes. By 2019 we aim to have defined essential ocean variables and related observation protocols for this broader range of topics. Then we will also be in a position to expand the systematic observation and data sharing with appropriate worldwide coverage.

The present IOC Medium Term Strategy is defined until 2021. With the many developments during the last year related to Agenda 2030, including the sustainable development goals, climate, disaster risk reduction and biodiversity, I suggest it is time also for the IOC to set targets for its contribution in the decade 2021-2030. We have a strong and recognized position. We are on our way to demonstrate through the International Indian Ocean Expedition II from 2015-2020 and in other programs how we can facilitate Member State cooperation on development and application of ocean science to serve management and society at large. I am looking forward to discussing with all Member States and interested parties how we can make IOC contribute in the best possible way short term as well as long term to achieve the ocean we need for the future we want.



Peter Haugan
Chair of IOC

Statement of the Executive Secretary



Vladimir Ryabinin

I joined IOC as its Executive Secretary on 1 March 2015. This biennial report 2014-2015 covers therefore the period of service of the previous Executive Secretary, Dr Wendy Watson-Wright, and, as well, an interim period of approximately two months, January and February 2015, during which the Assistant Director-General of UNESCO for Natural Sciences, Ms Flavia Schlegel, was acting as an interim Executive Secretary. I thank Dr Watson-Wright and Ms Schlegel very much for their support. Dr Watson-Wright ably steered the IOC ship during the dramatic financial storm that started in 2011. My deep gratitude goes to Wendy and to the previous IOC Chair Dr Sang-Kyung Byun and all the Vice-Chairs for their leadership, hard and productive work, and strong spirit – they all helped IOC to deliver and become even stronger despite the difficulties.

The year 2015, the first year of my work for IOC, was marked by a number of seminal events at the level of United Nations. On 25 September 2015, the United Nations General Assembly adopted by acclamation the set of 17 Sustainable Development Goals, including the stand-alone goal on the Ocean (SDG14). In December 2015, the Paris Climate Summit concluded successfully by a global agreement on actions to avert dangerous anthropogenic warming. The UN Conference in Sendai, Japan, in March 2015 defined a path to building effective disaster risk reduction systems. These new frameworks reinforce the IOC mandate to develop ocean observations, science, and services for wellbeing of people and protection of the Ocean.

The 21st century is often called as the century of the Ocean. To a large extent, the success of the sustainable development agenda will depend on our ability to rely on the life support provided to us by the Ocean and to protect the Ocean. The cardinal role of IOC in this process is explicitly stated in the Target 14.a of SDG1, which reads “Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission “Criteria and Guidelines on the Transfer of Marine Technology”,¹ in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing Small Island Developing States and least developed countries”.

In 2015, IOC Officers and its Secretariat continued the process of designing a stronger and more effective IOC. The main idea is to capitalize on IOC functions, i.e. ocean observations, research, decision making, assessment, governance, services, and capacity development, and use them all together to enable IOC Member States to create practical applications in the domains of food production, transport and trade, tourism, water management, energy, etc. The two mainstream strategies for achieving these objectives are integrated coastal zone management and maritime spatial planning. These frameworks for ocean-related decision-making need, however, to be expanded to embrace adaptation to climate change

and mitigation of the climate change and its negative consequences. Enabling climate predictions and using forward-looking strategies in coastal and ocean management must become a norm.

Benefits to be gained by all countries in the world through the ocean observations and knowledge and support to decision making are immense. To effectively facilitate them, IOC needs to grow. We also need big ideas and large-scale efforts and initiatives. At the beginning of 2016, IOC Officers and management of IOC Secretariat conducted a retreat (Gilleleje, Denmark, 5-8 January 2016), to which we invited Dr Gunnar Kullenberg, a former IOC Executive Secretary, as a consultant. The brainstorming facilitated and summarized by Dr Kullenberg was very fruitful and resulted in a new vision for IOC development that foresees a decadal initiative of ocean exploration, a study of economic return on investment into ocean observations and science, and consolidation of IOC activities around core requirements of Member States leading to creation of oceanographic products in support of sustainable development. One of the notions used at the retreat was the one of an assembly line that starts with overall international frameworks and ends with specific oceanographic products of direct benefit to Member States. Such organization of work may serve well and consolidate all IOC programmes and regional activities.

1. <http://unesdoc.unesco.org/images/0013/001391/139193m.pdf>
(bilingual English and French)

IOC has a noble and very challenging objective, to facilitate by international cooperation and coordination, the development of ocean observations and research, which is the core interest to the community of oceanographers, and to do so in such a way that informs the governments of most important issues related to the ocean and helps the governments to support perspective and practically useful ocean research. This important role of an intermediary requires a focus on communication. I hope very much that our new IOC communication strategy will soon be operational and successful.

I would wish to request very strong support to IOC from Ambassadors to UNESCO, from National Oceanographic Committees and other national contact points for IOC. Ocean is the future and we need to observe it, to know more about it, protect it and use it safely. This requires support from governments that need to be informed by Ambassadors and National focal points. I wish every success to the new

team of IOC Officers, headed by my most esteemed colleague, Professor Peter Haugan. For me personally, the most important revelation during 2015 was the IOC Secretariat team, an incredibly professional, hardworking and dedicated group of people serving the Ocean and IOC Member States. I thank the IOC Secretariat for this outstanding service and call on all of them to keep up the good work.

A handwritten signature in black ink, appearing to read 'V. Ryabinin', with a large, stylized initial 'V'.

Vladimir Ryabinin
IOC Executive Secretary

Introduction

Most of the activities described in this Report were conducted under the leadership of Dr Wendy Watson-Wright, the Executive Secretary of IOC during the years 2010-2014. Pending the arrival of the new Executive Secretary, Dr Flavia Schlegel, Assistant Director-General of UNESCO for Natural Sciences served as Executive Secretary ad interim from 12 January to 28 February 2015. Dr Vladimir Ryabinin started his work as the Executive Secretary on 1 March 2015. He is very grateful to Dr Watson-Wright for very ably leading the IOC during her tenure as well for her support during the transitional period. The smooth continuation of the IOC Secretariat work under the interim leadership of Dr Schlegel is also much appreciated by the IOC Secretariat and Dr Ryabinin.

Like UNESCO, IOC continued to work in 2014-2015 under the significantly reduced spending plan for the approved regular UNESCO 37 C/5 Programme and Budget (2014-2015) and with reduced staff. The Secretariat, guided by the IOC Assembly and adhering to the principles of the IOC Medium Term Strategy 2014-2021, has completed all planned tasks for the period and has achieved all assigned targets at the level corresponding to the available reduced budget.

IOC Vision

Strong scientific understanding and systematic observations of the changing world ocean climate and ecosystems shall underpin sustainable development and global governance for a healthy ocean, and global, regional and national management of risks and opportunities from the ocean.

Mission Statement

The purpose of the Commission is to promote international cooperation and to coordinate programmes in research, services and capacity-building, in order to learn more about the nature and resources of the ocean and coastal areas and to apply that knowledge for the improvement of management, sustainable development, the protection of the marine environment, and the decision-making processes of its Member States.

The Commission will collaborate with international organizations concerned with the work of the Commission, and especially with those organizations of the United Nations system which are willing and prepared to contribute to the purpose and functions of the Commission and/or to seek advice and cooperation in the field of ocean and coastal area scientific research, related services and capacity-building.

Budget

The anticipated regular budget for IOC for 2016–2017, as endorsed by the UNESCO Executive Board at its 196th session (April 2015), included a US\$ 1 M increase in the Zero Nominal Growth scenario. With this modest increase over the previously critically low numbers, there was no need for further staff reductions.

At its 27th session, the Assembly, through Decision 3.3(III) requested the UNESCO Director-General to consider, as a matter of priority, restoring the current IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE) Secretary's position as a full-time, regular programme funded, fixed-term post for the IOCARIBE Secretary in Colombia. With the budget approved by the UNESCO Executive Board at its 196th session this motion became possible. The Zero Nominal Growth Plus scenario, implied an additional increase of \$ 0.5 M and allowed reinforcement of the staffing of the Ocean Science Section, more substantial restoration of funding to core ocean research and observational activities at global and regional levels, strengthen tsunami preparedness with focus on Small Island Developing States (SIDS)

and Least Developed Countries and to better assist Member States in the work towards achieving Ocean Sustainable Development Goals.

The scope of requests for the IOC to deliver continued to increase. The regular budget remained at a low level. The IOC Secretariat continued to actively seek extra-budgetary resources and to lead in implementation of on-going extra-budgetary projects. This additional work helped the Secretariat to fulfil its core functions but at a cost of a significant expenditure of staff time and energy. The ability of the highly professional Secretariat staff to attend to ever increasing demands is limited. This situation requires an analysis of priorities of Member States within the domain of competence of the Commission. Given the relatively large number of intergovernmental and non-governmental organizations with ocean interests, it is also essential for IOC to identify areas of greatest importance, in which IOC can make a true difference given its mandate, strengths, taking into account the IOC Member State interests, and to strategically focus enough resources in these areas to keep IOC leading and visible.

Programme Implementation, Workplans and Strategic Review

The Executive Secretary began a series of consultations with Member States and leading officers of programmes, in which IOC is involved, with a view of consolidating the Commission activities and seeking support of Member States and partners in distributing

the workload and finding new ways of maintaining the activities of the Commission. Secondment of qualified staff to IOC Secretariat and opening of satellite offices in Member States are also desirable.

For IOC to be able to deliver in accordance with expressed wishes of IOC Member States, it is important to continue strengthening its functional autonomy within UNESCO. There is a need to reduce the level of ambiguity with regard to the authority of the IOC Assembly and its Executive Council within the UNESCO governance, consider means to safeguard the IOC budget, strengthen the ability to effectively and efficiently execute contractual obligations and reporting to external donors, and establish more clear boundaries with the UNESCO Sector of Natural Sciences, (despite excellent relations and very fruitful cooperation with the Sector), particularly in terms of reporting and budget.

Another motivation for IOC to strategically review its plans and activities is the emerging post 2015-development agenda, including the 2014 Small Island Developing States Accelerated Modalities of Action (SAMOA Pathway), the Sendai Framework for Disaster Risk Reduction 2015-2030, and the 21st session of the Conference of the Parties (COP-21) climate agreement of 2015. In particular, the rapidly developing agenda for sustainable development has a strong bearing on the ocean. As the only specialized UN organization in ocean sciences, observations, services, technology transfer and capacity development, IOC is expected to contribute to the achievement of several sustainable development goals (SDG) including the stand-alone SDG on the ocean. The IOC Medium-Term Strategy (2014–2021) includes a number of objectives that are relevant for sustainable development. While the strategy was adopted only one year ago, it is appropriate to ask if it reflects the aspirations of Member States in light of the post-2015 development agenda.

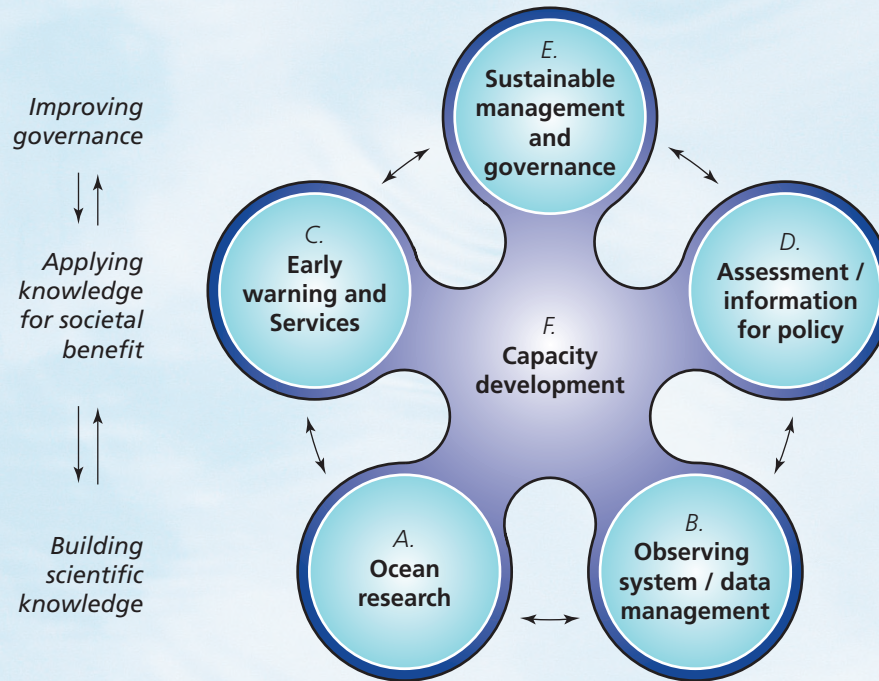
The IOC Secretariat will strive to help Member States in strengthening their oceanographic agendas. This requires active dialogue with Member States.

The Executive Secretary thanks the U.K. National Commission for UNESCO for their policy brief N°13, *An evaluation of the Intergovernmental Oceanographic Commission's role in global marine science and oceanography*, February 2015 and encourages Member States to review it. We need similar input and guidance from other Member States, from both developed and developing countries, groups of States such as SIDS, regional and technical subsidiary bodies, and also we may benefit from recommendations of IOC-affiliated programmes and initiatives on how to maximize the role of IOC in their work given the low level of regular funding. These discussions may inform further deliberations under the theme “Future of IOC” with an active input from the new Officers of the Commission elected in 2015 by the Assembly.

In 2014, the structure of the IOC Secretariat was changed. It now includes four functional units at central headquarters, a small Operational Support Unit, regional offices for subcommissions, and IOC staff in programme and UNESCO field offices. There are seconded experts and interns. One of the challenges for IOC will be to ensure that there is sufficient interaction, cooperation and coordination between all secretariat structures. Cooperation and coordination is needed to make sure the output of the work by the secretariat is larger than the sum of its parts. IOC also needs to develop its communication capacity and expand its network of affiliates including reaching out to early career oceanographers.

The main body of the IOC Biennial Report 2014-15 is structured according to the six IOC “functions” in the Medium-Term Strategy, 2014-2021 (IOC/INF-1314).

IOC Functions in the IOC Medium-Term Strategy, 2014-2021



The IOC Medium Term Strategy 2014-21 is organized in a conceptual framework of functions required to advance towards the IOC Vision:

- A) Foster ocean research to strengthen knowledge of ocean and coastal processes and human impacts upon them [Ocean research]
- B) Maintain, strengthen and integrate global ocean observing, data and information systems [Observing system / data management]
- C) Develop early warning systems and preparedness to mitigate the risks of tsunamis and ocean-related hazards [Early warning and services]
- D) Support assessment and information to improve the science-policy interface [Assessment and Information for policy]
- E) Enhance ocean governance through a shared knowledge base and improved regional cooperation [Sustainable management and governance]
- F) Develop the institutional capacity in all of the functions above, as a cross-cutting function [Capacity Development]

These functions correspond broadly to existing and on-going IOC programmes, components of programmes and mechanisms of cooperation, such as the GOOS, the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) and the International Oceanographic Data and Information Exchange (IODE), the Ocean Biogeographic Information System (OBIS), the Tsunami Intergovernmental Coordination Groups (ICGs), World Climate Research Programme (WCRP) and the Ocean Sciences programme, Integrated Coastal Area Management (ICAM), Harmful Algal Blooms (HAB), and Capacity Development (CD).

Function A

Ocean research – Fostering ocean research to strengthen knowledge of ocean and coastal processes and human impacts upon them

Climate Change



IOC provided leadership and contributed to the international debate on the importance of the ocean dimension in the new climate change regime that emerged from the UN Framework Convention on Climate Change (UNFCCC) COP-21 process (Paris, Nov–Dec 2015). Scientific knowledge was communicated in many events leading up to and during the COP-21, emphasizing the importance

of the marine environment to a broad community, including stakeholders and policy makers. In June 2014, IOC facilitated the launch of an Ocean Climate Platform, which brought together representatives from the research community and civil society with the aim of placing the ocean at the heart of international climate change debate, as well as raising public awareness on these issues. On 8 June 2015, with the support of France, Sweden, Monaco, Flanders (Belgium) and the Ocean-Climate Platform, IOC organized a World

Ocean Day (WOD), which was recognized as an official COP-21 event, entirely dedicated to the ocean-climate issues. The programme of the Day included 4 scientific workshops, three roundtables, a UNESCO Open Campus for youth, and a concluding high-level political segment in the presence of HSH Prince Albert II of Monaco, H.E. President Remengesau of Palau, H.E. President Michel of Seychelles, as well as ministers and ambassadors. The WOD provided an opportunity for a dialogue amongst stakeholders on the inclusion of ocean dimensions in the COP-21 process; on the contribution of ocean science to climate system knowledge, on the human and social aspects of climate induced changes in the ocean, as well as potential solutions; and possible actions and strategies to mitigate climate change.

Together with North Pacific Marine Science Organization (PICES) and International Council for the Exploration of the Sea (ICES), IOC convened the 3rd International Symposium on the Effects of Climate Change in the World's Ocean (Santos, Brazil, 23–27 March 2015). The local arrangements and logistics were coordinated by the Instituto Oceanográfico, Universidade de São Paulo. This



Symposium is a regular scientific meeting in the topic of climate change and a flagship symposium for IOC. The three main organizers (ICES, PICES and the IOC) agreed to work together towards the 4th edition of the Symposium in 2019.

IOC also contributed to the international scientific conference: “Our Common Future Under Climate Change” (7–10 July 2015), which was organized by France and hosted by UNESCO. Two sessions focusing, respectively, on ocean observation and marine ecosystems convened by IOC.

IOC continued to actively support to the World Climate Research Programme (WCRP), and allocation of additional regular programme resources in 2015 allowed IOC to contribute more than foreseen.

WCRP has an extensive portfolio of activities and has added two topics to their ‘Grand Challenges’ namely “Near Term Climate Prediction” to initiate and issue a real time Global Decadal Climate Outlook once each year from 2016 and onwards; and secondly on “Biogeochemical Cycles and Climate Change” which hopefully will link with Integrated Marine Biogeochemistry and Ecosystem Research. IOC participated in the review of the membership of the WCRP Joint Scientific Committee and suggested measures ensuring improved geographical and gender balance on the Committee at the same time keeping the oceanography as a core discipline represented on the Joint Scientific Committee. The IOC also hosted the International Polar Partnership Initiative meeting in February 2014.

Ocean Acidification

Ocean acidification (OA) is a major global concern and a risk to marine biodiversity and ecosystems. It may impact human society in many ways. Addressing the needs for new research and networking, the IOC is co-leading the Global Ocean Acidification Observing Network (GOA-ON), which aims to coordinate and improve ocean observations to detect the impacts of ocean acidification. The GOA-ON roadmap was published in September 2014 and the most recent development was the establishment of a biological working group, co-chaired and coordinated by IOC-UNESCO, to improve measurements needed to detect the impact of increasing CO₂ levels on marine life. Furthermore, together with the support of the Ocean Acidification International Coordination Center of the International Atomic Energy Agency (IAEA), an OA session was organized at the Third International Symposium on the Effects of Climate Change on the World's Oceans in Santos, Brazil. To enhance awareness about OA among policy makers, IOC contributed to side events during the UNFCCC COP-20 in Lima, and COP-21 in Paris.

To address the issue of OA on coral reefs in the region, the IOC Sub-Commission for the Western Pacific (WESTPAC) has initiated, in collaboration with GOA-ON, the development of a joint long-term monitoring program/network. Given limited understanding about ecosystem responses to OA, against a critical need to develop meaningful projections on its future impacts on the marine

ecosystem, especially on coral reefs, WESTPAC organized two workshops “Research and Monitoring of the Ecological Impacts of Ocean Acidification on Coral Reef Ecosystems” (Phuket, Thailand, 19–21 January 2015 and 26-28 August 2015). These workshops provided an opportunity for all countries in the region to consolidate their OA research and monitoring efforts in order to ultimately enable resource managers, and policy makers to develop an effective long-term mitigation plan and to arrange adaptation strategies to benefit the region. The workshop reviewed existing practices on carbonate chemistry and laboratory analysis, and biological monitoring, and established working groups on: Total Alkalinity; Spectrophotometric pH; Biology; and Carbonate Collection and Handling. The workshops also stressed the need to build on existing coral reef monitoring initiatives and to develop a joint long-term monitoring program/network on the impacts of OA on coral reefs across the region. To this end, several pilot sites were selected as a starting point for developing the regional monitoring program/network. A table for monitoring capacity analysis was developed and will be distributed to participants willing to join the program development, with a view to analyzing the current monitoring capacity, identifying common monitoring methods, and providing input into the development of a consistent, comparable and cost-effective “Standard Operating Procedure (SOP)” for all pilot sites.



Ocean CO₂

The IOC–Scientific Committee on Oceanic Research (SCOR) International Ocean Carbon Coordination Project (IOCCP) launched the Surface Ocean CO₂ Atlas (SOCAT) v3 in September 2015. Assembling this dataset has been a major undertaking by sea-going marine carbon scientists from across the world for the last several years. Due to the limited financial resources available, the IOC has provided only limited funding support to IOCCP, however the IOC cooperates with IOCCP in a number of activities such as International Group for Marine Ecological Time Series (IGMETS), GOA-ON, and GOOS. These activities are reported in other parts of this Report.

Microplastics

The Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) WG 40 ‘Sources, fate and effects of micro-plastics in the marine environment: a global assessment’ has completed its work under the leadership of the IOC-UNESCO. It will now start a second phase with a joint co-sponsorship by the IOC, UN Environment Programme (UNEP), and Food and Agriculture Organization of the United Nations (FAO). An immediate milestone for this group is to present a report on the impact of microplastics on fish by May 2016. The IOC is also acting as an advisory body on potential plastics projects funded by the European Union Joint Programming Initiative on Oceans (EU JPI Oceans). The IOC also supports

GESAMP Working Group 41 on marine geoengineering under the lead of International Maritime Organization (IMO) and supported by World Meteorological Organization (WMO). The objective is to better understand the potential environmental (and social/economic) impacts of different marine geoengineering approaches on the marine environment; and to provide advice to the London Protocol Parties to assist them in identifying those marine geoengineering techniques that might be sensible to consider for listing in the new Annex 4 of the London Protocol.



Biogeochemistry and ecosystems

Scientific research remains a major driver of ocean observations and a factor of sustainability of ocean time-series. Shipboard biogeochemical time-series programmes provide the oceanographic community with the multi-year, high-quality data needed for characterizing ocean biogeochemistry and ecosystem. Their renewed importance is related to the fact that they represent one of the most valuable tools to characterize and quantify ocean fluxes and their associated links to ecosystem functioning in a changing ocean. Under the auspices of the IOC, the International Group for Marine Ecological Time Series – IGMETS compiled data from more than 400 time series sites worldwide. The analysis of these data sets, to be published in November 2015 (<http://igmets.net/analysis-overview>), will help to distinguish between natural and human-induced change in marine ecosystems. The assessment of available data will help to understand marine ecosystem responses to a changing climate.



Nutrients

Nutrient over-enrichment of coastal ecosystems is a major global environmental issue, contributing to such problems as harmful algal blooms, dead zone formation, and fishery decline. Yet, quantitative relationships between nutrient loading and ecosystem effects are not well defined. The IOC Nutrients and Coastal Impacts Research Programme (N-CIRP) is focusing on integrated coastal research and coastal eutrophication, and linking nutrient sources to coastal ecosystem effects and management in particular. A key component in the implementation strategy is a four-year Joint UNEP-IOC Global Environment Facility (GEF) Project “Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution”, which was launched in March 2012. The IOC is leading the Project research component that delivers global and local models for impact of nutrient loading. As part of the implementation strategy for N-CIRP, IOC also actively participates in a UNEP-led ‘Global Partnership on Nutrient Management’ (GPNM) executed as a partnership of intergovernmental organizations, non-governmental organizations and governments. GPNM has an online information portal to enable GPNM partners to monitor progress on implementing activities related to the sustainable use of nutrients. The platform provides a knowledge hub, networking opportunities and promotes global discussions on sustainable nutrient management.

Ocean Science Report

The IOC Executive Council at its 47th session (Paris, 1–4 July 2014) accepted the new Global Ocean Science Report (GOSR) proposal (IOC/EC-XLVII/2 Annex 8). Following the recommendations of the Open-ended Intersessional Working Group, Executive Secretary sent Circular Letters Nos. 2553 and 2560 inviting Member States to financially support GOSR and to fill an ad hoc questionnaire. The

objectives, outline, and expected outcomes of GOSR were presented at the 16th UN Open-ended Informal Consultative Process meeting in New York. So far, IOC has received limited in-kind and financial support, however the interest of many countries in the questionnaire is encouraging. Using the limited extrabudgetary support received and the cooperation of other organizations, the Secretariat was able to develop some sections included in the outline. Nevertheless, the full completion of the GOSR requires additional financial support by Member States.

Ocean Research Conference

The 2nd International Ocean Research Conference (IORC) ‘One Planet, One Ocean’, organized by the IOC, the Oceanographic Society and hosted by the Fundacio Navegacio Oceanica, was held in Barcelona (Spain) on 17–21 November 2014. The five-day Conference provided an opportunity for the scientific community to come together to discuss international collaboration in marine science and technology for the coming decade. 590 scientists from 69 countries attended the scientific sessions. 450 abstracts were submitted. The gender ratio was 43% of women vs 57% of men respectively, which is quite an achievement. The IOC staff chaired theme sessions, workshops and intervened in the opening and closing sessions. The scientific quality of talks and posters was excellent. There was strong support to repeat the IORC every 4 or 5 years. The TV corner, which was produced for the Conference received a lot of positive feedback and was used again during other occasions.



In the Caribbean

The IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), jointly with IOC/ICAM specialists and in close cooperation with UN Development Programme (UNDP) GEF International Waters, are preparing a project proposal “Partnership for Sustainable Management of Ocean and Coasts in Latin America” for submission to GEF. The general objective of the project is to enable the Latin American region to collectively protect and manage its coastal and marine environment through inter-governmental and inter-sectoral partnerships. The project will strengthen legal framework and regulations, as well as develop implementation guidelines, decision support tools, and the needed information systems to implement and monitor, step by step, the elements of ICAM and Marine Spatial Planning (MSP) in the region. This will enable the countries and stakeholders to formulate a comprehensive national policy framework and coordinated strategy and master plans for coastal and marine resource management. The GEF contribution amounts to US\$ 10 million with US\$ 52 million co-financing by Member States. For this purpose an inventory of national, regional and global conventions, protocols, and regulations related to ICAM and of institutions, agencies and experts working on ICAM issues and topics was developed.

IOCARIBE acknowledged with satisfaction the successful completion of the “Sustainable Management of the Shared Living Marine Resources of the Caribbean Large Marine Ecosystem and Adjacent Regions” (CLME), a US\$ 58 million GEF-funded project, as well as the preparation of the Caribbean Large Marine Ecosystems Strategic Action Programme (SAP) and its technical approval by the CLME. The project entitled “Catalyzing implementation of the Strategic Action Programme for the Sustainable

Management of Shared Living Marine Resources in the Caribbean and North Brazil Shelf Large Marine Ecosystems” was formally endorsed by the GEF CEO on 4 March 2015. This project, for which IOC is the technical leading agency and a cooperating agency together with the UNDP, is a 5-year project that aims at facilitating the implementation of the 10-year politically endorsed SAP for the Sustainable Management of the Shared Living Marine Resources of the Caribbean and North Brazil Shelf Large Marine Ecosystems (CLME+ SAP). The project will serve IOCARIBE GEF eligible countries with partnerships established with non-GEF eligible countries such as the United States of America, UK, France and The Netherlands. The UNDP/GEF CLME+ Project is projecting an overall budget of US\$ 124 million

including co-financing of US\$ 111.8 million and a cash grant of US\$ 12.5 million from the GEF.

IOCARIBE has strengthened its co-operation with UNEP and other UN agencies, particularly in the GEF-financed “Integrating Water, Land and Ecosystems Management in Caribbean SIDS” (IWEco) Project, in which the IOCARIBE Project “Demonstrate Approaches for Nutrient and Sediment Reduction at Selected Pilot Study Areas in the Wider Caribbean” is one of the key components. GEF IWEco with a total budget of US\$ 88.7 million including cash and in-kind co-financing, with a total GEF requested cash allocation of US\$ 20.7 million, is currently under a review by the GEF Secretariat.

IOC in Yacht Races

As result of the Memorandum of Understanding signed with the Fundacio Navegacio Oceanica, all of the boats participating in the Barcelona World Race 2014/15 took part in scientific projects coordinated by the UNESCO-IOC. These included the deployment of Argo buoys in the South Atlantic and testing a prototype sensor to

sample microplastics in continuous mode. The results collected by the skippers represent an important and pioneering contribution and will play a fundamental role in the Barcelona World Race educational activities.



In the Pacific and the Indian Ocean

Serving as the IOC's regional subsidiary body in the Western Pacific and its adjacent regions, the IOC Sub-Commission for the Western Pacific (WESTPAC) has a dual role to fulfill. Firstly it coordinates and implements the IOC global programmes in the regional context, and secondly it develops, co-ordinates and implements required regional marine scientific research programmes based on priority interests of the Member States in the region.

In addition to developing a regional ocean acidification network and fostering scientific research on harmful algal blooms towards the attainment

of IOC global objectives, WESTPAC has been developing, coordinating and implementing various scientific programmes addressing region-specific priorities covering ocean process and climate, marine biodiversity and seafood security, and the health of ocean ecosystems. These programmes range from marine and coastal biodiversity and conservation, coral reef restoration, marine endangered species, coastal habitat mapping, upwelling studies, fluvial sediments to South China Sea and its Environmental Changes, to air-sea interaction in the Kuroshio extension.



2nd International
**Indian Ocean
Expedition**
2015-2020

<http://www.iioe-2.incois.gov.in/>

IOC, SCOR, and Indian Ocean GOOS (IOGOOS) formed an Interim Planning Committee for the Second International Indian Ocean Expedition (IIOE-2), chaired by Satheesh Shenoi (India). The Committee proposed structures for governance, science coordination, data and information management, capacity development, operational coordination, outreach and communications, resources and sponsorship, and transitioning science for societal benefit. An IOCAFRICA group of experts helped develop a plan for participation of the Western Indian Ocean countries in the IIOE-2 and identified six priority topics for the

region: habitat mapping and living resources inventory; connectivity and genetics; air sea interactions, climate variability and extreme events such as cyclones and storm surges; structural features of the Western Indian Ocean seabed; coastal and shelf hydrodynamics; and upwelling and food security. The launch of the IIOE-2 was held on the 4th of December 2015 in Goa, India, and benefited from coordination support from the Perth Project Office in support of the IOC and from India. IOCAFRICA and WESTPAC have both participated in the planning process.

Function B

Observing system / data management – Maintain, strengthen and integrate global ocean observing, data and information systems

Ocean Observation

The Global Ocean Observing System (GOOS) is co-sponsored by the IOC, the World Meteorological Organization (WMO), the United Nations Environment Program (UNEP), and the International Council for Science (ICSU). As reported to the Assembly at its 27th session in 2013, the full GOOS work plan, focused on sustaining present observations, expanding to new biogeochemical and biological parameters, and developing increased observing and information capacity, is not fully supported by the IOC regular programme budget. Priority has therefore gone to sustaining the ongoing activities of GOOS focused on observation of physical parameters, with fewer resources available for the GOOS Biogeochemistry and GOOS Biology and Ecosystems panel. Nevertheless, some activities have been able to proceed due to in-kind contributions from Member States to the GOOS programme.

The Third and Fourth Meetings of the GOOS Steering Committee (24–26 July 2014, Barcelona, Spain & 24–26 May 2015, Townsville, Australia) reviewed the GOOS work plan. The GOOS-SC adopted a draft GOOS Strategic Mapping to link three major GOOS

themes (climate, ocean services, and ocean health) to scientific applications, phenomena to sustainably observe, the Essential Ocean Variables (EOVs), and the observing networks that capture these EOVs. The Strategic Mapping captures the work of GOOS in identifying requirements, evaluating the observing system against performance targets, and in promoting standards and best practices in observation and data management and sharing. The Steering Committee agreed to principles for the affiliation of GOOS Projects, which help to focus funding agencies of Member States and the scientific ocean observing community on the development of particular areas of the observing system. It approved two GOOS projects. The first is the Tropical Pacific Observing System in 2020 (TPOS 2020, tpos2020.org) project, which will evaluate, and, where necessary, change, all elements that contribute to the Tropical Pacific Observing System based on a modern understanding of tropical Pacific science. The second new GOOS project is a Deep Ocean Observing Strategy (DOOS), which motivates physical, biogeochemical, and biological sustained observations of the deep ocean, linking it to societal issues and scientific challenges.

GOOS Strategic Mapping

The GOOS Strategic Mapping portrays the requirements put upon the GOOS system by high level mandates, societal drivers and all the way through to data dissemination requirements. The mapping isolates segments of GOOS by identifying elemental groupings and portrays their connections:

Themes: global mandates

Societal Benefits: issues of concern to public

Applications: information and tools made available

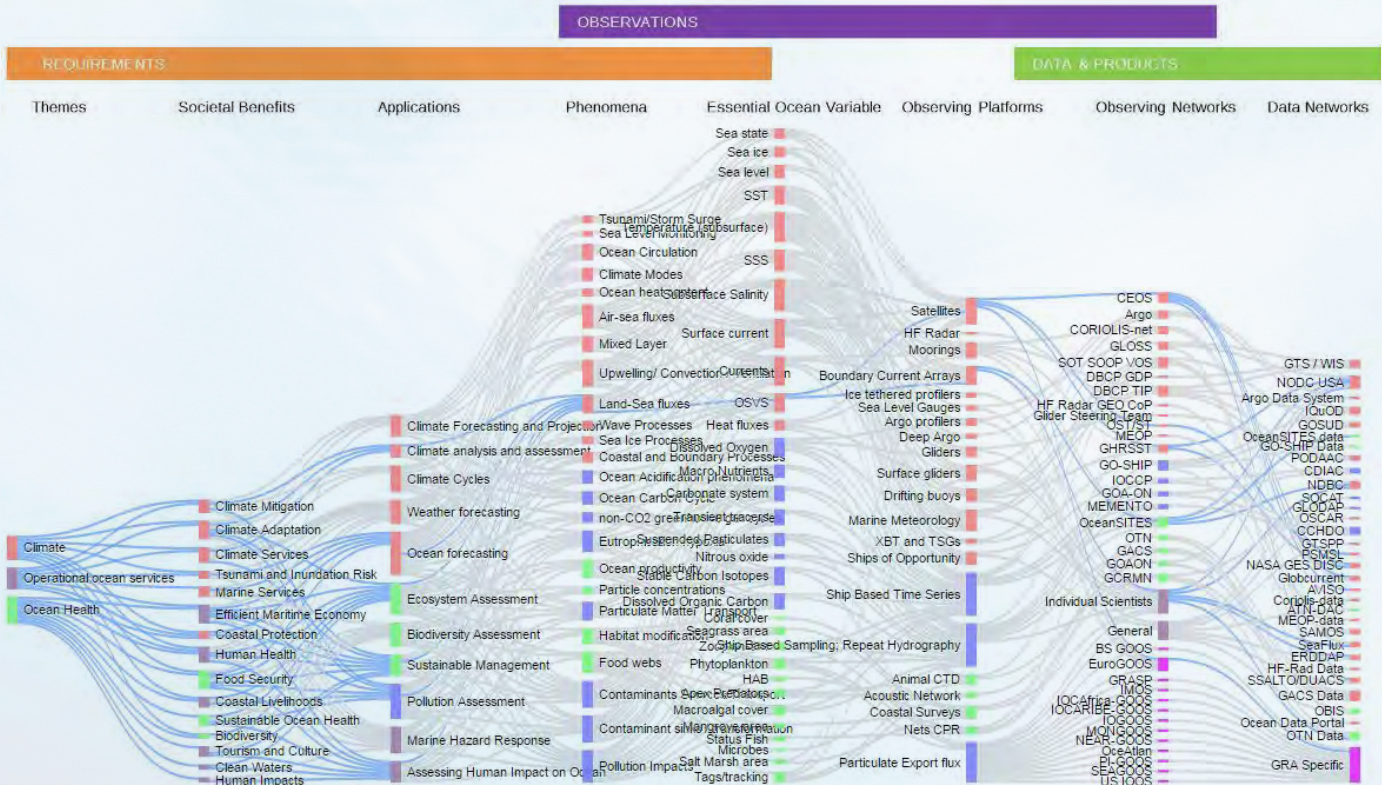
Phenomena: indicators of the state and health of the ocean

Essential Ocean Variables: observation requirements to achieve GOOS objectives

Observing Platforms: Instruments and platforms that provide EOVs

Observing Networks: consortia which coordinate operations and deployments of observing elements.

Data Networks: Data and product coordination and dissemination networks



Collectively the voluntary collaboration of *in situ* and satellite observing networks operated by individual Member States and contributing to GOOS and the Global Climate Observing System (GCOS) has grown stronger since mid-2014. Monitoring statistics of the status of the *in situ* networks maintained through Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) shows a relatively stable status reflecting continued Member State investment, with full core coverage by Argo floats, the surface drifter network coordinated by the JCOMM Data Buoy Cooperation Panel (DBCP) edging back to full coverage after a period of problems with short drifter lifetimes, completion of repeat hydrographic stations and continued maintenance of tide gauge stations. The coverage of the Tropical Pacific Ocean by moored instruments, reporting at less than 50% in 2013 and early 2014, has been restored to a sustained 80% capacity. This fulfills a pledge by the US National Oceanic and Atmospheric Administration to maintain these as a priority while the TPOS 2020 project makes recommendations for an evolution of the observing networks.

The GOOS programme through IOC is a beneficiary of and partner in a European Commission Horizon 2020 funded project, AtlantOS, focused on optimizing and enhancing the Integrated Atlantic Ocean Observing System. The overarching goal of AtlantOS, which will operate from April 2015 through March 2019, is the integration of the so far loosely-coordinated set of existing ocean observing activities into a sustainable, efficient, and fit-for-purpose Integrated Atlantic Ocean Observing System (IAOOS) contributing to GOOS. The project formally engages with partners in Europe, the USA, Canada, Brazil, and South Africa.

The three-year European Commission Group on Earth Observations (GEO) Earth Observing System of Systems (GEOSS) interoperability for Weather, Ocean and Water (GEOWOW) project was completed during the 2014-15 biennium. GEOWOW contributed to the



*Drifting Buoys readied for launch
©Pacific Gyer & JCOMMOPS*

development of ecosystem Essential Ocean Variables for GOOS, as well as enhanced the GOOS contribution to the GEO Blue Planet task. Its major contribution was the development of data infrastructure for ocean assessment, specifically the GEF Transboundary Waters Assessment Programme, allowing for interoperable sharing of data compatible with the International Oceanographic Data and Information Exchange (IODE) and GEO/GEOSS Common Infrastructure, and the potential for sharing algorithms as well as data behind ocean ecosystem indicators.

GOOS Programme coordination activities have been facilitated through improved communication tools for the ocean observing community, with the launch of a quarterly GOOS Update (ioc-goos.org/update) and a monthly webinar series focused on sharing information with the ocean observing community (ioc-goos.org/webinar). Announcements are being sent out on a dedicated email list (ioc-goos.org/join).

GOOS Panels and Regional Alliances



Deploying a plankton net at sea

The GOOS Physics and Climate Panel

(formally the GCOS-GOOS-WCRP Ocean Observations Panel for Climate, OOPC) held two sessions in the biennium: its 17th session in July 2014 (Barcelona, Spain) and its 18th session in April 2015 (Sendai, Japan). The sessions sought guidance on drivers and priorities from sponsors, and progressed major elements of the Panel work plan: reviewing existing and considering new ocean Essential Climate Variables (ECVs) and Physics Essential Ocean Variables (EOVs); developing and evaluating the design of ocean observing systems, considering developments in applications and technologies through workshops and evaluation exercises; and identifying and addressing gaps in the sustained observing system such as boundary currents, the deep ocean, and observations in coastal and shelf seas.

The GOOS physics and climate panel relies upon the WMO-IOC-ICSU-UNEP Global Climate Observing System (GCOS) Project Office to host the OOPC technical secretariat since early 2013, and has in doing so deepened the cooperation between GOOS and GCOS. The *GCOS Status Report*,² which outlines the requirements for GOOS physics and climate observations, was presented to the UNFCCC COP-21 in December 2015 in Paris, France. GCOS is now preparing for an updated Implementation Plan to be delivered in 2016, which will refine the actions needed to implement a global observing system for climate monitoring, research,

² Status of the Global Observing System for Climate (October 2015): http://www.wmo.int/pages/prog/gcos/Publications/GCOS-194_en.pdf (Executive Summary)

and projections; and increasingly responding to local concerns on adaptation to and mitigation of climate change.

The GOOS biogeochemical panel activities are being led by the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP; www.ioccp.org), which allows for leveraging of additional GOOS funding to perform work more efficiently than with a new panel. The comparability and traceability of nutrient data from sustained observations in the world's oceans and investigation of temporal and spatial changes due to the oceans' response to climate change and increasing carbon dioxide in the atmosphere are key issues for GOOS and IOCCP, which organized a nutrient observation international intercomparison exercise in 2014, led by Japan Agency for Marine-Earth Science and Technology. The IOCCP and GOOS biogeochemical panel met in April 2015 (Sendai, Japan), in parallel with the GOOS physics and climate panel in order to work on common issues related to climate. This led to a clearer definition of the nine biogeochemical Essential Ocean Variables (oxygen, macro nutrients, inorganic CO₂, transient tracers, particulates, nitrous oxide, Carbon-13, and dissolved organic matter) required to address the role of global ocean biogeochemical cycles in the climate system, the human impacts on ocean biogeochemistry, and ocean ecosystem health in the context of human impacts.

The GOOS biological and ecosystem panel will develop sustained monitoring needs for the living ocean environment. GOOS established the work plan for the new panel, cooperating with existing initiatives such as the Group on Earth Observations Biodiversity Observing Network (GEO BON) and IOC's OBIS. Australia (specifically, the Australian Institute of Marine Science and the University of Western Australia) committed in-kind support for a secretariat position for the GOOS Biology and Ecosystems Panel in March 2015, for a minimum of two years.

GOOS Regional Alliances (GRAs) are a major vehicle for the GOOS programme to achieve its goals at the regional level. While meeting physically only at a GOOS Regional Forum about once every two years (GRF-VII, 21–25 September 2015, Heraklion, Crete Greece), quarterly teleconferences led by the GOOS Regional Council chair (Zdenka Willis, USA) have allowed the GRAs to work actively and independently in the sharing of best practices and in mutual assistance in observations, data sharing and management, the provision of services, and in management and advocacy of sustained ocean observing systems within a national and regional context. The GRAs often have strong coastal ocean observing components, but agreed at the GRF VII to identify projects which maximize mutual local benefits while strengthening the global programmes of GOOS. During the 28th IOC Assembly in 2015, the Australian Integrated Marine Observing System (IMOS) was approved as a GOOS Regional Alliance.

Coordination with the World Meteorological Organization

The The IOC-WMO Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) Observations Programme Area (OPA) provides important implementation coordination for GOOS. The JCOMM Observations Coordination Group met on 27–30 April 2015 (Cape Town, South Africa), progressing a work plan that revolves around reviewing and evolving observing network goals in response to requirements, deepening common technical coordination through the JCOMM Observing Programme Support Centre (JCOMMOPS), standards and best practice, and measuring and managing performance and risks to sustainability.

JCOMMOPS, which provides direct technical coordination to most of the JCOMM *in situ* observing programmes, inaugurated its new offices on 18 March 2015. It is now hosted by the French Institute for Exploitation of the Sea (Ifremer) in Brest, France, improving opportunities for coordination with European *in situ* networks, and continuing to benefit from support from Collecte Localisation Satellites (CLS). It is entirely funded by voluntary Member State

contributions through IOC and WMO. New technical coordinators and staff have expanded the team to support the Data Buoy Cooperation Panel and the OceanSITES time series networks; coordinate the Voluntary Observing Ship programmes and continue development of observing system monitoring websites and databases.

The JCOMM Management Committee (MAN) meets to agree upon adjustments to the JCOMM-4 approved work plan. The JCOMM-MAN has established a Task Team on integrated marine meteorological and oceanographic services within the WMO Information System, in order to improve the interfaces between ocean data and service providers and meteorological information systems. The JCOMM-MAN also approved the expanded role of the JCOMM's Observations Programme Area Coordination Group (OCG) into areas concerning biogeochemistry, biology and ecosystems, i.e. to cover the domains of all three GOOS panels. These JCOMM services activities benefited from the secondment of a professional staff member by China to the IOC.

Sailing and Science: 27 Days to Cape Horn with Surface Drifters

Below the big continental capes, the number of volunteer ships contributing to the Global Ocean Observing System is very small. Regular shipping lines do not exist there anymore, mainly due to progress in transportation: engine powered vessels, and canals in Panama or Suez. A few sailing ships however can still be found in the Southern Ocean, even frequently, and some make valuable contributions to the observing networks

The Dutch tall ship *Bark Europa* sails every year from Europe to Antarctica and circumnavigated it in 2014, hosting stations for the Voluntary Observing Ship and JCOMM Ship-of-Opportunity Programme (SOOP) panel of the JCOMM Ship Observations Team (SOT), and deploying surface drifters and profiling floats for the JCOMM Data Buoy Cooperation Panel (DBCP) and Argo. We have also seen such contributions from yachts participating in round-the-world races in 2015, in particular Barcelona World and Volvo Ocean Race; during the 2015 UN climate conference in Paris, UNESCO's Intergovernmental Oceanographic Commission has signed a corresponding long-term agreement with the ocean racing community. *Haspa Hamburg*, a 52-foot long sail-training yacht owned by the German NGO Hamburgischer Verein Seefahrt, has on its way across the Pacific from New Zealand to Cape Horn in February 2016 also contributed to SOT and DBCP. These rather small vessels cannot deploy many instruments, but they are sometimes the only opportunity for a very long time in these remote areas. The IOC/WMO support centre, JCOMMOPS, in Brest, helps by setting up such operations.



Launching buoy off Haspa Hamburg in Southern Pacific;
© Hamburgischer Verein Seefahrt

Oceanographic Data and Information Exchange

2015 marked the 10th anniversary of the establishment of the IOC Project Office for the International Oceanographic Data and Information Exchange programme in Ostend, Belgium. The celebration event (Celebration Session and Scientific Conference) was held at the Provincial Court in Brugge on 16 March 2015. Attended by 161 participants the conference included 22 presentations on new developments in ocean data and information management and related products while also linking data with marine policy.

The 23rd Session of the IODE Committee was held in Brugge, Belgium in March 2015, following the Celebration event. The IODE Session was attended by 105 participants from 40 IOC Member States and 10 Organizations.

The Session adopted four decisions and five recommendations. The decisions establish inter-essional working groups to: (i) propose a re-structuring of IODE; (ii) revise the IOC strategic plan for oceanographic data and information exchange; and (iii) create an IOC communication and outreach strategy for data and information management, and also to formally establish OceanTeacher Global Academy as an IODE project.

The five recommendations concern ODINBlackSea, the establishment of the OceanExpert project, the establishment of the IODE project for an international quality controlled ocean database (IODE-IQuOD), the establishment of the IODE pilot project expanding OBIS with environmental data (OBIS-ENV-DATA) and the IODE work plan and budget 2015-2017.

The Committee elected Ms Cynthia Chandler (USA) and Mr Yutaka Michida (Japan) as IODE Co-Chairs. They replaced the outgoing Co-Chairs Ms Sissy Iona (Greece) and Mr Ariel Troisi (Argentina).

The new data centre type (Associated Data Unit), established at IODE-XXII (2013) has proved to be a successful and attractive structural element of IODE: by October 2015 a total of twenty Associated Data Units were established in USA, Denmark, Greece, Australia, Philippines, Georgia, Venezuela, Argentina, Malaysia, Ukraine, Barbados, Japan, Canada, Iraq, Colombia and Iceland.

While the OceanTeacher Academy proved to be a successful approach to address IODE training needs, a few downsides were also identified, namely the limited number of people trained from each country, language (courses were taught in English only) and the often long travel to Belgium.

*The IODE Celebration and Scientific Conference
@Jurgen de Witte/IODE*





The **OceanTeacher Global Academy** was formally launched in 2015. It is changing training culture from a “north to south” model to north-south, south-south, and south-north. Whereas training was traditionally provided by experts from developed regions the OceanTeacher Global Academy is actively promoting and making use of the expertise available today in many developing countries. Specifically, the OceanTeacher Global Academy will: (i) Promote the establishment, and assist with the start-up, of Regional Training Centres that will plan, organize and implement training courses that are of relevance and serve needs within their region and teach these in locally relevant languages; (ii) Promote the use

of local experts as lecturers and training assistants by the Regional Training Centres; (iii) Promote the collaboration between the Regional Training Centres by enabling (through advanced information technology) lecturers from multiple regions to contribute lectures; (iv) Further develop the OceanTeacher Learning Management System to cover multiple IOC (and associate) programmes. In 2015, 9 centres across the globe volunteered to host a regional training centre.

Building upon over 30 years of IODE experience in Capacity Development, the new OceanTeacher Global Academy (OTGA) started in 2014, aiming at establishing a network of Regional Training Centres (RTCs) across the world. Besides the already existing training centre in Belgium, 9 other countries volunteered to host an OTGA RTC: China, Colombia, India, Kenya, Malaysia, Mozambique, Senegal, South Africa and USA. OTGA is thus contributing to the promotion of the expertise existing in the countries.





The OceanTeacher e-Learning platform allows all training resources to be made available online and shared by all RTCs and thereby promoting the use of languages other than English (e.g. Spanish, French, etc.) as well as giving priority to local and regional case studies in order to better address their specific training needs. Although face-to-face (classroom) training is the main learning environment, the OceanTeacher e-Learning Platform can also support blended learning and exclusively online training. Additionally, videos of 'key-note lectures' and demos are also published

online. The use of videoconferencing to connect the different RTCs and to allow the participation of invited lecturers without traveling is also promoted.

Although the OceanTeacher Global Academy is a project from IODE, it provides a tool and a framework for capacity development activities, not only for IODE but increasingly also for other IOC programmes such as MPR/ICAM: Coastal and Marine Management and Planning, Harmful Algal Bloom and the Tsunami Warning System.

The OTGA project is coordinated by the IODE Project Office based in Ostend (Belgium) together with the IODE Steering Group for the OceanTeacher Global Academy project including representatives of all RTCs. Funding is provided by the Government of Flanders (Belgium) through the Flanders-UNESCO Science Trust Fund (FUST).

Through the biennium 2014-2015, IODE continued its re-organization focusing on product and service oriented projects both of global and regional focus. IODE now implements (or collaborates in) 21 global projects and also continues the development and implementation of 7 regional projects (the Oceanographic Data and Information Networks (ODINs)). IODE also continued its path towards restructuring that started with the Associate Data Units (ADUs). IODE-XXIII established three inter-sessional working groups that will lead to a more streamlined and result oriented IODE: (i) to propose the restructuring of IODE; (ii) to revise the IOC strategic plan for oceanographic data and information exchange; and (iii) to create an IOC communication and outreach strategy for data and information management.

Furthermore in line with the six functions defined in the IOC Medium-Term Strategy, IODE focuses strongly on providing data and information support to other IOC programmes. Examples in 2014-2015 are Harmful Algal event Database (HAEDAT) and South-East Pacific Data and Information Network in support to Integrated Coastal Area Management (SPINCAM). This will be continued in the next biennium.

The IOC Project Office for IODE will also continue to assist all IOC programmes with the hosting and technical management of their web sites and associated tools and products such as OceanExpert, OceanDocs, OceanDataPractices, OceanDataStandards, OceanDataPortal, etc.

World marine species distribution

The Ocean Biogeographic Information System (OBIS) is the world's largest online, open-access database on marine species distributions. OBIS provides taxonomically and geographically resolved data for over 46 million observations of 117,000 marine species integrated from over 1900 databases. Data are provided by a worldwide network of 500 institutions connected through 20 national, regional and thematic OBIS nodes. The data in OBIS continues to grow by ~3 million records per year, and about 100 scientific publications cite OBIS annually. The contribution of OBIS to Marine Scientific Research was appreciated by the United Nations General Assembly (A/RES/70/23) in December 2015.



OBIS catalogued a new amphipod: *Glossocephalus rebecca* from Monterey Bay region. [license CC-BY-NC-SA; credit Steven Haddock]

This level of data integration requires strict application of internationally agreed standards. The OBIS secretariat, hosted at the UNESCO/IOC project office for IODE, provides training and technical assistance to its data providers, guides new data standards and technical developments, and encourages international cooperation to foster the group benefits of the network. Data collected as part of marine biological research, and in environmental biology in general, often include more than biological parameters. Observations on habitat and physical and chemical measurements are collected to study the organisms in their environment, and details regarding the nature of the sampling or observation methods, equipment, and effort, can be vitally important for the proper representation of biological processes.

In the Pacific

The IOC Sub-Commission for the Western Pacific (WESTPAC) has been promoting the value of sustained ocean observations and services in the region through the coordination and development of the North East Asian-Regional GOOS (NEAR-GOOS) and South East Asian- Regional GOOS (SEAGOOS). NEAR-GOOS has been providing a variety of oceanographic data and products - mainly via its regional real-time data center and delayed-mode data center to serve the needs of a wide range of ocean users. Moreover, NEAR-GOOS has been endeavouring to engage broader observations communities by initiating joint observation programmes within the framework of NEAR-GOOS. “NEAR-GOOS Cross-Basin Climate Monitoring Section” was developed over 2014-2015 with objectives to improve the understanding of the response of regional seas in the NEAR-GOOS region to climate change.

OBIS users have noted witnessed that biological observations often are separated from associated physico-chemical data and sent to different data repositories. Upon request from the OBIS secretariat and its European node hosted at the Flanders Marine Institute (VLIZ, Belgium), the IOC Committee on IODE (23rd session, March 2015, Brugge) recognised the need to develop procedures and guidelines for managing and sharing these combined datasets while maintaining the disciplines and benefits of the current OBIS standard, based on Darwin Core, as well as and the exchange protocol based on Global Biodiversity Information Facility Integrated Publishing Toolkit (IPT). To investigate and develop these practices for combined datasets, the IOC Committee on IODE established a 2-year international pilot project “Expanding OBIS with environmental data (OBIS-ENV-DATA)”.

Meanwhile, WESTPAC has developed the SEAGOOS Ocean Forecasting Demonstration System, which is comprised of a web-portal delivering 12.5 km resolution Ocean Forecasting Demonstration System (OFDS) for the upper Gulf of Thailand and the Peninsular Malaysia eastern shelf (http://221.0.186.5/IOC-WESTPAC_OFDS/index.jsp). The system provides 3-day forecast products and downloadable archived data on the surface wave height, wind, current, sea temperature and salinity. Building upon previous accomplishments, all participating SEAGOOS countries decided to continue the development of the ocean forecasting system in the following key areas of work: extension of OFDS geographic; development of higher-resolution subdomain models; and improvement of current OFDS Web Portal services.

In Africa and adjacent Island States

The IOC Sub-Commission for Africa and the Adjacent Island States (IOCAFRICA) organized a Forum on the Future of Sustained Ocean Observations for IOC Group V (Africa and Arabs States) on 11–13 April 2015 in Nairobi, Kenya, with support from the Republic of Korea. The focus of the forum was on reviewing the current status of ocean observations in IOC Group V, identifying ocean observations and forecasting

requirements that contribute to environmental sustainability in the IOC Group V countries, elaborating elements of a core observation and forecasting system delivering societal benefits to the region, and enhancing opportunities for collaboration in the development of operational oceanography in the region.

In the Caribbean

IOCARIBE-GOOS was represented at the 5th and 6th GOOS Regional Fora. A database of all IOCARIBE Region coastal water level and meteorological stations has been developed and mapped. IOCARIBE-GOOS produced an inventory of operational and pre-operational oceanographic modelling capabilities, the Essential Observing Variables (EOVs) measured and observing resources and equipment, institutions and marine programmes (B.Sc., M.Sc. Ph.D. post-graduate), and expert groups by country in the Americas and the Caribbean. Model inventory will be posted on the Global Ocean Data Assimilation Experiment OceanView website.

The Group on Earth Observations (GEO) Oceans and IOCARIBE-GOOS coordinator are developing a GEO Coastal Ocean Pilot Project in the IOCARIBE Region. The pilot project plan will be based on the IOCARIBE-GOOS regional observing system following a “System of Systems” approach, utilizing existing observing systems and programmes with established user bases (like the CLME) which are in need of observing and modelling support. It will be tailored to provide meaningful and sustainable value for Caribbean Region marine ecosystems and the populations they impact.

Collaboration with the International Hydrographic Organization

The current version of the International Hydrographic Organization (IHO)-IOC General Bathymetric Chart of the Oceans (GEBCO) Guiding Committee Terms of Reference-Rules of Procedure (TOR-ROP) was last approved by the IOC Executive Council at its

41st session (Paris, 24 June–1 July 2008). Since that time, the activities of the GEBCO project have evolved, reflecting greater interest in mapping the seafloor by national and international organizations, governments and academia. The methods,

procedures and technology to map the seafloor have greatly changed, involving both shipboard methods and satellite remote sensing. In this light, GEBCO Guiding Committee perceived that a revision to the TOR-ROP was warranted. Interactions with IHO and IOC during 2013 also indicated that a revision to the GEBCO Guiding Committee TOR-ROP would be timely as it was recognized that there might be a need for improving the management of the GEBCO project. GEBCO Guiding Committee started the revision process at the 30th meeting (Venice, Italy, 11 October 2013) and finalized the proposal for TOR-ROP revision at its 31st meeting (Monaco, 13–15 June 2014), which was then proposed to the Executive Council for consideration at its 47th session (Paris, 1–4 July 2014) in accordance with the current TOR-ROP of GEBCO Guiding Committee. In its decision EC-XLVII, Dec.3.1(II), the Executive Council recognized the necessity for IOC Member States to further review the proposed revision contained in document: IOC/EC-XLVII/2 Annex 4 Rev.2 with sufficient time prior to re-examination by the Assembly at its 28th session (Paris, 18–25 June 2015).

In order to follow-up on decision EC-XLVII, Dec.3.1(II), IOC Circular Letter 2545, dated 27 October 2014, was issued to invite Member States to provide their inputs on the said document. By the end of 2014, eight Member States responded to the Circular Letter. During period between January and March 2015, the IHO and IOC secretariats conducted a careful joint examination of the document and inputs and/or comments from IOC Member States, paying a particular attention to divergent views that may have been expressed through this consultation. IOC was informed in September 2015 that IHO endorsed the revised TOR-ROP without any further

change on 11 September 2015. Upon the approval and endorsement by both IOC and IHO, the revised TOR-ROP entered in force as of 11 September 2015. In accordance with the revised TOR-ROP, the 32nd meeting of the GEBCO Guiding Committee was held on 8-9 October 2015 in Kuala Lumpur, Malaysia, and attended by IOC Secretariat as a permanent Observer.

Following Decision 6.2(II) of the IOC Assembly at its 28th session (Paris, 18-25 June 2015), the review group with regard to IOC's role and involvement in the GEBCO Project has been established. The review group is comprised of representatives designated by 15 Member States and one expert each nominated by the GEBCO Guiding Committee, and relevant IOC technical and regional subsidiary bodies (namely, GOOS, Global Sea Level Observing System, JCOMM, IODE, Working Group on Tsunami and other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG), IOCAFRICA, IOCARIBE and WESTPAC). During the intersessional period, a questionnaire survey was conducted to collect inputs concerning potential and existing user needs for GEBCO datasets and products from relevant IOC technical and regional subsidiary bodies. The review group received 14 answers to the questionnaire. The review group has evaluated the results of the survey, focusing on the relevance of the existing GEBCO products to relevant IOC activities, user's needs for GEBCO datasets and products, relevant capacity development needs, and possible cooperation among GEBCO and IOC technical and regional subsidiary bodies. These results will be considered by the Executive Council at its 49th session (Paris, 7-10 June 2016).

Function C

Early warning and services – Develop early warning systems and preparedness to mitigate the risks of tsunamis and ocean-related hazards

Tsunami Warning Systems

Since the 27th session of the Assembly, the tsunami programme has continued to progress despite the UNESCO's strained financial situation. The Tsunami Unit managed to keep the Intergovernmental Coordination Group (ICG) process for the four regional tsunami warning systems going over the past year. The 12th session of ICG of the North East Atlantic and Mediterranean Tsunami Warning and Mitigation System (ICG/NEAMTWS) was held from 16–18 November 2015 in Dublin, Ireland; the 10th session of the ICG for Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) held in Muscat, Oman, 24–26 March; the 26th session of the ICG for the Pacific Tsunami Warning and Mitigation System ICG (ICG/PTWS) was held from 22–24 April 2015 in Honolulu, USA, and the 10th session of the ICG for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS) was held on 19–21 May 2015, Philipsburg, Sint Maarten, Kingdom of the Netherlands.

Inter-ICG coordination and harmonization takes place in the Working Group on Tsunami and other Hazards related to Sea-Level Warning and Mitigation

Systems (TOWS-WG) which met twice in 2014-2015 in UNESCO, Paris and Morioka, Japan.

The Tsunami Unit has provided secretariat support to meetings of technical working groups and task teams under the four ICGs and the TOWS Working Group. For 2014 a total of 15 technical or sub-regional working groups, task teams and steering group meetings were convened and for 2015 this number was 20. A complete overview is available at www.ioc-tsunami.org.

The intergovernmental coordination process raises awareness about the tsunami threat and provides advocacy for nations' investments in early warning systems. In the past 10 years nations have invested considerably towards this aim. It is estimated that setting up the Indian Ocean Tsunami Warning System cost approximately US\$ 450 million over the past 10 years (most of the funds provided by Australia, India and Indonesia), and it is estimated that it costs between US\$ 50-100 million annually to maintain the system. The above numbers illustrate the significant national investments that contribute towards the four regional tsunami warning systems, including enhancements of their detection networks

(seismic and sea level observations), new buildings that house national tsunami warning centres, as well as education, awareness and preparedness-related activities. Two recent examples also illustrate this.

The first phase of Oman National Multi Hazard Early Warning System project (NMHEWS) concluded in 2015. Under a 2009 agreement with Oman's Ministry of Transport and Communication, IOC has been providing technical support for the NMHEWS development. The NMHEWS started its operational phase and the NMHEWS centre was officially inaugurated on 23 March 2015 back-to-back with an IOC organized scientific conference and the 10th Session of the ICG/IOTWS.

Regular Tsunami Exercise Tests

The regular conduct of Tsunami exercises is essential to ensure good communication links between the Tsunami Service Providers and the national Tsunami Warning Focal Points and National Tsunami Warning Centres and to maintain the operational readiness of the four regional tsunami-warning systems. Similarly, regular exercises contribute to the maintenance of end-to-end operational readiness including the link from the warning centre to community.

Tsunami wave exercises are designed to assess the effectiveness of communication flows among the stakeholders involved, country readiness, and the efficiency of emergency procedures. The exercises also create considerable awareness in the public. Recent Tsunami Wave exercises include: (i) IOWAVE14 for the Indian Ocean; (ii) NEAMWave14 for the North East Atlantic, Mediterranean and connected seas; (iii) PACWave15 for the Pacific Tsunami Warning System; and (iv) CARIBEWave15 for the Caribbean. The IOWAVE14 exercise had a high level of participation and it was encouraging to note the relatively high number of countries (74%) that

included their disaster management and emergency response organizations in the exercise.

In the preparation of NEAMWave14, an information workshop "Improving Tsunami Warning and Emergency Response in the North-Eastern Atlantic, Mediterranean and Connected Seas" on NEAMTWS and NEAMWave was held in Rabat (23–24 September 2014, Morocco). The workshop was organized by IOC together with the Islamic Educational, Scientific and Cultural Organization (ISESCO), the UNESCO for the Maghreb based in Rabat, and the Centre National pour la Recherche Scientifique et Technique of Morocco. The summary statement is available at the IOC Tsunami web page. The NEAMWave14 was marked by a strong participation of the civil protection authorities. In comparison to the first test NEAMWave12 organized in 2012, more Civil Protection Authorities (14 vs 5) took part in the exercise. This exercise was also an occasion to test the mainstreaming into the NEAMTWS system of the standard operational procedures of the Emergency Response Coordination Centre of the European Commission for providing international assistance through the Union civil protection mechanism in case of major disasters. The EU DG European Commission's Humanitarian Aid and Civil Protection department (ECHO) supported the coordination of the NEAMWAVE 14 exercise.

CARIBEWave15 was the fourth such exercise and 32 Members States and 16 territories participated in it. This represents a participation rate of 100% of all the ICG/CARIBE-EWS Members, for the first time in the history of the exercises. A total of almost 133,000 people participated, including over 98,000 people in Puerto Rico, 10,000 people in Venezuela, 8,600 people in Martinique, and 4,700 in the US Virgin Islands.

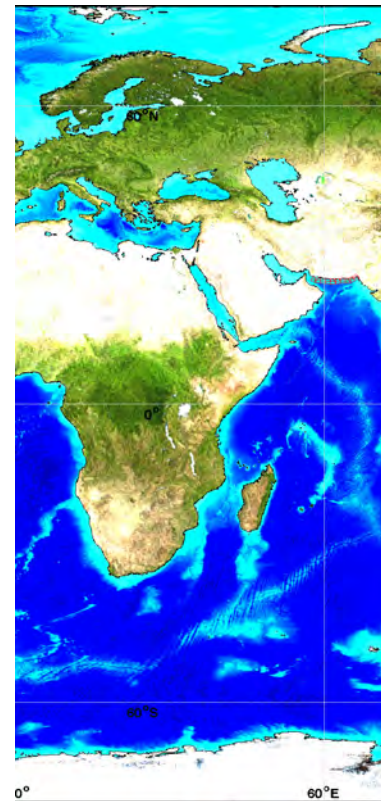
Sustaining and Improving Tsunami Warning Systems

For the tsunami programme there were many anniversaries in 2015. The three “youngest” regional tsunami warning systems in the Caribbean, Indian Ocean and the NE Atlantic, Mediterranean and connected seas all celebrated their 10-year anniversary. And the Pacific Tsunami Warning System celebrated its 50-year anniversary with a major conference titled “Making the Pacific Ready for the Tsunami Threat” in Honolulu, 20–21 April 2015. The conference was attended by 150 participants from 30 countries. In connection with the symposium the International Tsunami Information Center published the PTWS Commemorative Historical Book, “Pacific Tsunami Warning System, A Half-Century of Protecting the Pacific, 1965-2015 (ISBN 978-0-9962579-0-9)” recounting the establishment and evolution of the PTWS.

To commemorate the 10th anniversary of the tragic 2004 Indian Ocean Tsunami, IOC in collaboration with the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG) organized an international conference in Jakarta, 24–25 November 2014 with the title: “The Indian Ocean Tsunami Warning and Mitigation System 10 years after the Indian Ocean Tsunami: Achievements, Challenges, Remaining Gaps and Policy Perspectives”. The conference was attended by 160 participants from 28 countries, 10 UN agencies, 10 media organizations and many Non-Governmental Organizations, research institutions, universities and private organizations. The conference reported on achievements of the last 10 years, highlighted gaps in the system and work that still needs to be done, and sought re-commitment of Member States and other partners to continue investing in the IOTWS to ensure its long term sustainability. The summary statement with key highlights and recommendations is available on the IOC Tsunami web-site.

New tsunami warning products were introduced in the Pacific on 1st October 2014. The new products issued by the Pacific Tsunami Warning Center have been developed in order to provide greater detail of estimated level of impact. While the old products were provided solely in text form, the new products contain both graphical and text information. The new products, while still conservative, are expected to reduce over warning. This is important because with every hour a tsunami warning remains in effect, a stretch from 500 km to 1000 km of additional coastline is placed in a warning depending upon where the earthquake occurred. It has been possible to develop these new products due to improvements in numerical modelling, an increase in the number of seismic, coastal sea level stations, and deep water buoys, the improvements in real-time transmission from the detection networks, and due to improvements in internet communication and bandwidth between Pacific Tsunami Warning Centre and the National Tsunami Warning Focal Points. Introduction of these products has been combined with several training courses for national agencies in the Pacific.

Progress has continued on the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) funded project on Tsunami Hazard Assessment in the Indian Ocean and for collecting eyewitness accounts and other information about the 1945 tsunami in the NW Indian Ocean (Makran area). A booklet titled “Remembering the 1945 Makran Tsunami –



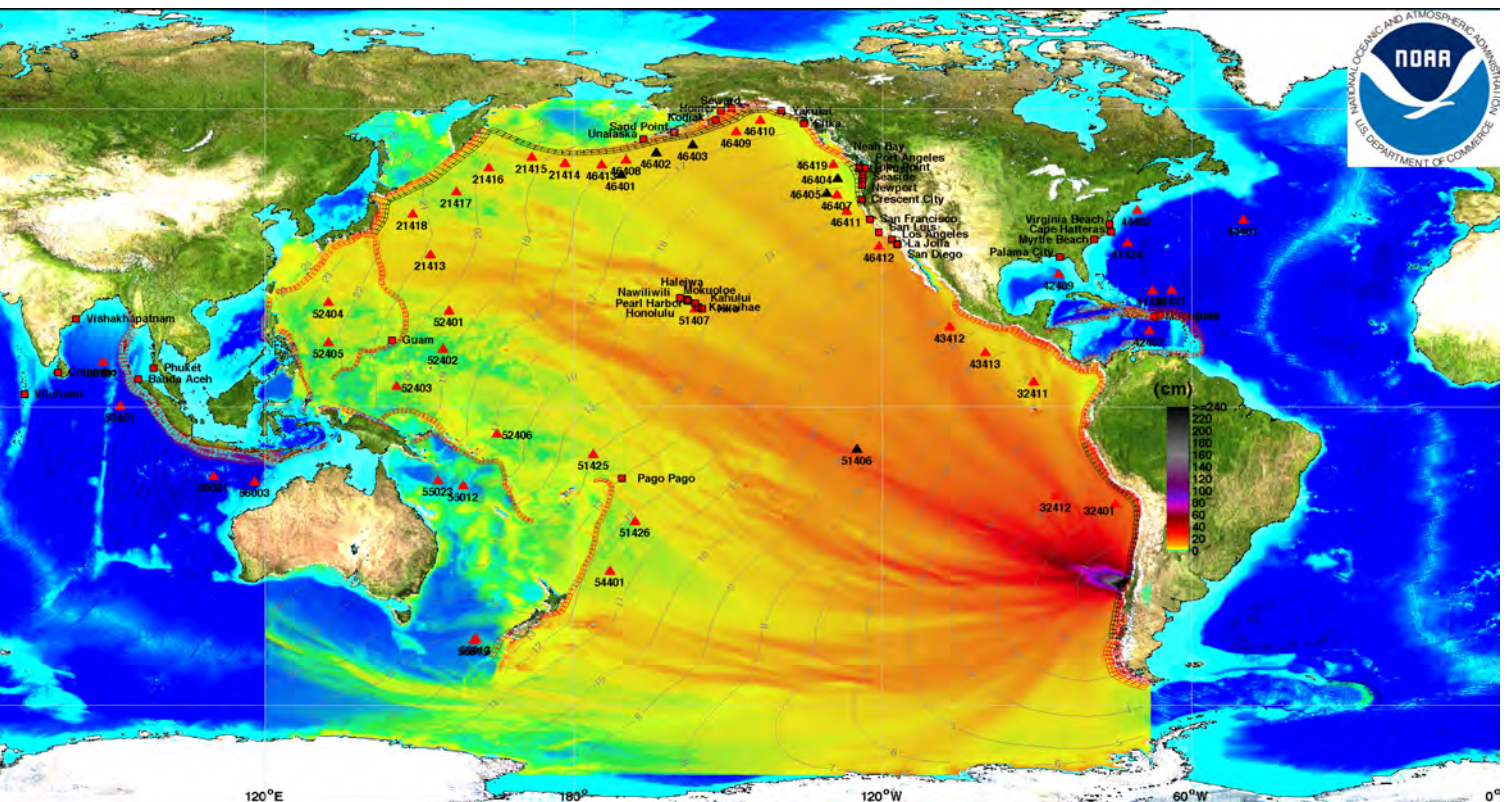
Interviews with Survivors Beside the Arabian Sea³ was published and the booklet captured nearly 100 accounts of the 1945 Makran disaster as told by eye-witnesses and second-generation survivors in Pakistan, Iran, Oman and India. The publication in English is available for download at the Indian Ocean Tsunami Information Centre website (<http://iotic.ioc-unesco.org/1945makrantsunami/1945-makran->

3 <http://unesdoc.unesco.org/ulis/cgi-bin/ulis.pl?lin=1&catno=232549> (published in Arabic, English and Persian)

tsunami-booklet.pdf) and versions in Farsi, Urdu, and Arabic have been produced.

The IOC Indian Ocean Tsunami Information Centre (IOTIC) was officially launched in Indonesia, Jakarta on 24 November 2014, at the 10-year conference to commemorate the 26 December 2004 Indian Ocean Tsunami organized by the BMKG Indonesia and IOC. To ensure the sustainability of IOTIC, Indonesia, through BMKG, has offered to host the IOTIC for the first five years (2016–2021) with the support of office space, staffs, and some funds for programme and activity. IOTIC also has received funding from

New Tsunami modeling methods are improving warning systems © NOAA



the Malaysian Fund in Trust to implement an extra budgetary project in 2015–2016 for south-south cooperation on “Fostering Tsunami Preparedness, Response and Mitigation in the Indian Ocean Small Island Developing States and Developing Countries”. This project aims to support the capacity building on tsunami preparedness of the Indian Ocean African countries and the Indian Ocean Small Island Developing States.

Raising Awareness for Tsunami Risk Reduction

In the Indian Ocean IOC UNESCO conducted the Regional Workshop on Coastal Hazard Assessment: Applications in Risk Assessment, Management and Mitigation, 2-5 June 2015, Colombo, Sri Lanka. The workshop was attended by 24 participants. The workshop addressed the topics and issues as described in the Revised Guidelines, “Tsunami Risk Assessment and Mitigation for the Indian Ocean: knowing your tsunami risk – and what to do about it” (UNESCO, 2015). The workshop succeeded in raising the participants’ levels of awareness and understanding of tsunami risk and mitigation within a context of Disaster Risk Reduction.

In the Pacific Ocean a Scientific meeting of experts for coordinated scenario analysis of future tsunami events and hazard mitigation schemes for the South China Sea region was held in November 2015, in Xiamen, China. Twenty-four participants shared state-of-the-art knowledge about the tsunamigenic sources in the South China Sea. The South China Sea region, which covers the South China Sea and its adjoining basins including Sulu Sea and Celebes Sea, is identified as one of the most vulnerable regions to major tsunamigenic earthquakes due to the high seismicity of the Manila Trench, Cotabato and Negros Trench and Sulawesi Trench. The Scientific meeting of experts resulted in a better understanding of the tsunami hazard and risk in the South China Sea region which will feed into the

planning for the establishment of the sub-regional Tsunami Advisory Centre, as well as allow Member States to better understand their level of tsunami exposure.

Through extra-budgetary projects and partnerships IOC/TSU has also maintained activities to raise the level of awareness and preparedness in Haiti and Dominican Republic (through EU DG ECHO funded projects) and Australia has continued its support for the year to the IOTWS secretariat.

Over 25 national and regional trainings (in support of hazard assessment, standard operating procedures, exercise planning and community preparedness) with over 600 trainees took place in 2014 and 2015, mainly in the Caribbean Sea and Pacific and Indian Oceans. The Tsunami Unit has organized and co-organized a number of other training activities – for a complete list please see the calendar at www.ioc-tsunami.org.

At the 3rd World Conference on Disaster Risk Reduction (WCDRR), Sendai, Japan, 14-18 March 2015, IOC co-organized a number of sessions that included as speakers or panellists the IOC Executive Secretary and several members of the Intergovernmental Coordination Groups for Tsunami Warning and Mitigation Systems, namely a Working Session on Lessons from Mega Disasters, a Working Session on Risk Identification and Assessment, a Working Session on Early Warning, and a Public Forum on Earthquake/Tsunami-disaster risk reduction by Early Warning and public awareness. The conference itself produced the Sendai Framework for Disaster Risk reduction (2015-2030) that includes a very clear recommendation on supporting the establishment of multi-hazard early warning systems.

Harmful Algal Bloom programme

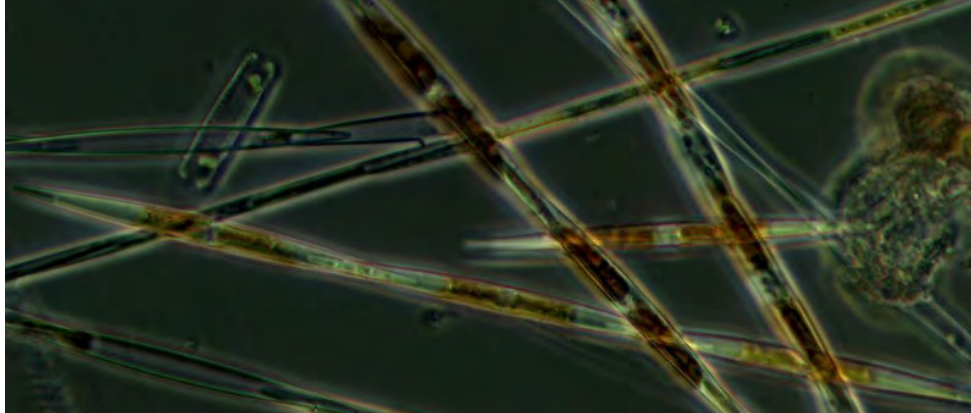
The long-term focus of the IOC Harmful Algal Bloom (HAB) programme, is on improved understanding of the factors controlling HAB events and thereby on the improvement of related management and mitigation options. The scientific questions have been addressed through the IOC-SCOR research programme GEOHAB (Global Ecology and Oceanography of HAB), which has seen a productive period leading up to a synthesis. This process included a conference in Paris in April 2013 which evaluated progress in our understanding over a decade and identified the major outstanding research questions in order to mitigate the effects of HABs. GEOHAB achievements have been synthesized and published as special issues of scientific journals and as a Scientific Summary for Policy Makers⁴. Another major outcome of the GEOHAB synthesis is the development of a new global approach to HAB research to meet societal needs in a changing world. This initiative following on from GEOHAB, and entitled GlobalHAB, will be developed and implemented jointly with SCOR. Ciguatera Fish Poisoning (CFP) is the most extensive human illness caused by harmful algae. The inability to conduct appropriate tests for the causative toxins leads to extensive closures of fisheries and lack of access to important food resources. Regions beyond those directly experiencing CFP are indirectly at risk via world-wide commerce in seafood. The Intergovernmental Panel on Harmful Algal Blooms (IPHAB) has initiated the development of a UN Coordinated Ciguatera Strategy involving the FAO and the IAEA. The engagement of the World Health Organization (WHO) is being actively pursued and

considered crucial for engaging communities across scientific disciplines.

The IOC Intergovernmental Panel on HABs (IPHAB) has initiated the development of a 'Global HAB Status Report' with the aims of compiling an overview of HAB events and their societal impacts; providing a worldwide appraisal of the occurrence of toxin-producing microalgae; and assessing the status and probability of change in HAB frequencies, intensities, and range resulting from environmental changes at the local and global scale. Linkages will be established with the Intergovernmental Panel on Climate Change (IPCC) reporting mechanism, which is increasingly focusing on biological impacts of climate change. The Status report will provide the scientific community as well as decision makers with a reference on HAB occurrence and impacts on ecosystem services. The development of the report is intimately linked with compilation of HAB data in OBIS and the IOC HAEDAT, which is funded by Government of Flanders (Belgium) and cosponsored by the International Atomic Energy Agency (IAEA).

Through two IPHAB Task Teams on Biotoxins and Algal Taxonomy, two working groups co-sponsored with the International Council for the Exploration of the Sea (ICES) and four regional IOC/HAB groups, the IOC is addressing specific needs for coordination, synthesis and advice on HAB observations, management and mitigation. A joint IOC-ICES-PICES conference on HABs and Climate Change was held 19–22 May in Gothenburg, Sweden, to develop proactive research strategies that build rigorous, testable hypotheses to guide scientists, managers and the public on projected environmental and HAB changes. Jointly with industry partners an international workshop was held in Muscat, Oman, April 2014, to identify research

4 <http://unesdoc.unesco.org/images/0023/002334/233419e.pdf>
(English only)



A common type of phytoplankton, Pseudo-nitzschia blooms may produce domoic acid, a neurotoxin that can cause amnesiac shellfish poisoning. ©NOAA

needs and solutions in relation to HABs and their potential impacts on desalination of seawater.

To enhance the capacity in Member States to establish and strengthen warning, forecasting and mitigation of harmful algal events, the IOC series of courses on HAB observations have been continued and are widely recognized as a reference for training in HAB monitoring. Three or four courses are held annually and there is a close cooperation with the IAEA in this respect. Courses include examination and are making use of the OceanTeacher platform as well as practical hands-on training. As part of the framework for this and other HAB activities, the 1995 agreement with the University of Copenhagen on the 'IOC Science and Communication Centre on Harmful Algae' was expanded in April 2014 to further facilitate implementation of programme activities and projects.

The HAB-Algas Nocivas del Caribe (HAB-ANCA) Working Group organized an IOC Regional Science Planning Workshop on Harmful Algae Blooms in the Caribbean and Adjacent Regions (Mexico City, 25–26 April 2013) with the sponsorship of Mexico's Ministry of Education. The Group published the book

"Ciguatera: Potential Risk for Humans: Frequent Questions" in Spanish and English. The Group is also working on the developing of the Latin American portal on Harmful Algae. During 2013–2015 HAB-ANCA experts have also published six articles in peer-reviewed journals on harmful algae and participated in nine international conferences and seminars in Austria, Colombia, Mexico, and New Zealand. To improve the Member States capacity on harmful algae analysis techniques, a "Toxic and Harmful Algae" Workshop was carried out in March 2014 in Colombia.

Responding to the recent occurrences of harmful algal blooms and associated massive fish mortalities in several WESTPAC countries, WESTPAC has been providing immediate technical assistance upon these countries' requests. Several national training workshops (in partnership with the University of Malaya, Malaysia (12–15 August 2014) and the National University of Singapore (18–22 August 2014)), expert missions and impromptu regional consultations were conducted to assist Member States to identify responsible species, analyse their causes, and provide possible mitigation measures, and enhance national capability for HABs monitoring.

Function D

Assessment and Information for policy – Support assessment and information to improve the science-policy interface

Ocean Assessments

IOC continued to follow closely the preparation of the World Ocean Assessment (WOA) report under the UN Regular Process. WOA will provide a sound scientific basis for decisions at the global level on the world's ocean and seas and a framework for national and regional assessments and management decisions. Although the UN General Assembly (UNGA) requested the completion of the first WOA by the end of 2014, some delays have been encountered. The Bureau of the UNGA Ad Hoc Working Group that governs the WOA process decided to postpone the review of the text to the period January–March 2015. IOC contributed to this review process by providing technical comments to the chapters related to its expertise. An IOC Circular Letter was also sent to IOC Member States in order to inform them on the review process and invite them to participate. As an observer, IOC continued to provide technical information and resources to the WOA Group of Experts. IOC also contributed financial resources to assist the UN Division for Ocean Affairs and the Law of the Sea (DOALOS) with the editorial process of the report. The finalized report of the WOA will be considered by the UNGA Ad Hoc Working Group in September 2015.

IOC led the implementation of the marine components of the Transboundary Water Assessment Programme (TWAP) funded by GEF. The project started in March 2013 with the establishment of technical expert groups for Open Ocean and Large Marine Ecosystems. A second meeting of the two working groups took place at IOC in April 2014. The project provided a number of core ecological, socio-economic and governance indicators for the marine environment (66 Large Marine Ecosystems and Open Ocean areas) using globally available datasets. To achieve this integrated assessment, IOC has created a partnership with a number of scientific institutions that are providing technical inputs and indicator-based products (National Oceanic and Atmospheric Administration (NOAA), GESAMP, International Geosphere-Biosphere Programme (IGBP), University of British Columbia, UNEP, World Conservation Monitoring Center (WCMC), Centre for Resource Management and Environmental Studies (CERMES), among others). These assessment product (technical reports and data) are available on <http://onesharedocean.org> and have been unveiled at the recent GEF International Water Conference (May 2016, Sri Lanka) and UN Environment Assembly (Nairobi, May 2016). From the IOC perspective, TWAP

is the first integrated and global marine assessment that the Commission is leading, and the results produced have the potential to inform a number of ocean governance mechanisms; these include the GEF, other UN agencies with an ocean mandate, other global assessment processes such as WOA and Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES), regional seas organizations, and Large Marine Ecosystems (LME) commissions as well as Member States.

The Ocean Biogeographic Information System (OBIS) contributes to the science-policy interface by supporting global and local assessments and providing data for global ocean decision-making. For example, OBIS data are used by Member States' national reporting on the status of biodiversity for the Convention on Biological Diversity (CBD). Three chapters in the first UN WOA used data from OBIS, and the open ocean component of the GEF TWAP includes a biodiversity baselines chapter entirely based on OBIS. The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) will organize a set of regional and sub-regional assessments as well as a global assessment that will include a review of the status of biodiversity and ecosystem services of the ocean (as agreed during the 4th IPBES Plenary, Feb 2016, Malaysia). UNESCO is one of the four UN agencies that co-host IPBES and provides technical and scientific support to the IPBES task force on data and knowledge. This task force delivered a data management plan, and OBIS is mentioned in Annex I of the plan as one of the key strategic partners of IPBES in the data and knowledge area. OBIS also contributes directly to species conservation policies (e.g. Endangered Species Act, National Environmental Policy Act and the Marine Mammal Protection Act in the USA and the EU Marine Strategy Framework Directive). In addition, OBIS contributes to the identification of Ecologically or Biologically Significant Areas (EBSAs), led by the secretariat of the CBD. A joint IOC-CBD circular letter



Jellyfish [Phyllorhiza punctata]

was issued (no. 2586, 12 August 2015) containing background information on the EBSA process and the summary report of the Conference of the Parties of the Convention on Biological Diversity approved EBSAs resulting from the nine regional EBSA workshops. The letter also indicated that OBIS has been one of the primary data sources for the EBSA workshops, and requested that additional data will be contributed to OBIS. Mr Pieter Provoost (OBIS data manager) attended the CBD expert meeting “Experiences and lessons learned on the scientific methodologies and approaches on the description of EBSAs”, held in Berlin, Germany on 22–24 February 2016. One of the outcomes is that links will be established between the EBSA repository and the EBSA area statistics on the OBIS portal. Importantly, the 20th CBD-Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) meeting (UNEP/CBD/SBSTTA/20/3,

Canada) will request the CBD Executive Secretary to provide, in partnership with IOC/OBIS amongst others, an “EBSA information curator” with detailed guidelines on information collection, protocol for data quality control, guidelines for gap analysis, and relevant training opportunities, subject to available financial resources.

In addition, more products supporting ocean assessments are under development through the project “Development of Information Products and Services for Ocean Assessments (DIPS-4- Ocean Assessments) funded by the Flanders’ Government (Belgium) through FUST (UNESCO/Flanders Fund-in-Trust for the support of UNESCO’s activities in the field of Science. DIPS is composed of two components: (i) the development of marine biodiversity indicators based on OBIS to serve major global assessments on the state of the marine environment, such as the UN WOA, and those that are planned as part of the recently established IPBES; and (ii) the development of the first IOC-UNESCO Global Harmful Algal Bloom Status Report, which will provide an overview of HAB events and their societal impacts; the occurrences of toxin-producing micro algae (via OBIS) and an assessment of the status and probability of change in HAB frequencies, intensities, and range resulting from environmental changes at the local and global scale.

Blue Carbon

The Blue Carbon Initiative established in 2011 by the IOC, the International Union for the Conservation of Nature (IUCN) and Conservation International (CI) works to develop management approaches, financial incentives and policy mechanisms for ensuring the conservation, restoration, and sustainable use of coastal blue carbon ecosystems. The IOC is strongly involved in the Blue Carbon Scientific Working Group, which provides the scientific foundation for the Blue Carbon Initiative by synthesizing current and emerging science on blue carbon and by providing a robust scientific basis for coastal carbon conservation, management, and assessment. Priority research of the Scientific Working Group functions in close partnership with the Initiative’s Policy Working Group. Internationally applicable standards for quantifying and monitoring carbon storage, sequestration, and emissions in coastal ecosystems on regional and local scales were identified and the manual “Coastal Blue Carbon: methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrass meadows” was published and launched at the last meeting of the Scientific working group of the Blue Carbon Initiative in Rio Grande, Brazil, in October 2014. The distribution of the Manual via internet in its pdf format is ongoing.

<http://thebluecarboninitiative.org/>



<http://thebluecarboninitiative.org/new-manual-for-measuring-assessing-and-analyzing-coastal-blue-carbon/>

Hypoxia



Hypoxia can cause mass fish kills.

De-oxygenation is a global problem in coastal and open regions of the ocean. It has led to expanding areas of oxygen minimum zones and coastal hypoxia. In the coastal ocean, the number of reported dead zones has increased exponentially since the 1960s, the latest reported number being 479. The recent expansion of hypoxia in coastal ecosystems has been primarily attributed to global warming and enhanced nutrient input from land and atmosphere. The global extent and threat to human health and marine ecosystem services of ocean deoxygenation are just beginning to be realized, and its social and economic consequences have yet to be determined (but are likely to be significant). Therefore the IOC supports a group of scientists trying to create awareness about deoxygenation among policy makers and the general public by publishing a scientific fact sheet on deoxygenation via the 'Ocean and Climate' platform and as well by helping to establish a global network of experts within this field.

Ecosystem Indicators

Expanded human uses of the ocean exert tremendous pressures on marine ecosystems. Combined effects of climate change and other stressors were reported in marine productivity, biodiversity, species distribution, bio-invasions and fish stocks. IOC is working to understand and quantify the effects of stressors on the marine ecosystems goods and services and on social-ecological systems at the regional and global scales. The LME programme and the IOC project IndiSeas are developing ecosystem indicators to be used as proxies to evaluate the status of the world's exploited marine ecosystems with account of multiple stressors. This is a necessary step towards efficient ecosystem-based management. The IOC activities aim to identify indicators based on modelling and comparative studies and their potential to inform ocean management. In February 2015, the IOC published the "Directory of Atmospheric, Hydrographic and Biological datasets for the Canary Current Large Marine Ecosystem" (Technical Series)⁵ which identified a total of 425 datasets, 27 databases and 21 time-series sites available in the Western African Countries embracing the Canary Current Large Marine Ecosystem (CCLME) area, and in April 2015 IOC published a related review "Oceanographic and biological features in the Canary Current Large Marine Ecosystem" (Technical Series)⁶.



Mangroves at Chettuva, India

5 <http://unesdoc.unesco.org/images/0023/002314/231430e.pdf> (English only)

6 <http://unesdoc.unesco.org/images/0023/002332/233299e.pdf> (English only)

Function E

Sustainable management and governance-Enhance ocean governance through a shared knowledge base and improved regional cooperation

Marine Spatial Planning

Through the work of the Marine Policy and Regional Coordination (MPR) section, a new set of international guidelines on Evaluating Marine Spatial Plans (IOC Manual and Guide, 70)⁷ was published in October 2014 as the outcome of a two-year project funded by the Moore Foundation. A content-rich website on the evaluation of marine spatial plans has also been developed through an effective partnership among IOC and OpenChannels with grant funds from the Moore Foundation. The MSP concept advocated by IOC is based on a process that brings together multiple users of the ocean—including energy, industry, government, conservation and recreation sectors—to make science-based coordinated decisions about how to use marine resources sustainably. Through the planning and mapping process of a marine ecosystem, planners can consider the cumulative effect of human activities on the ocean. The intended result of MSP is a more coordinated and sustainable approach to how the ocean is used—ensuring that



http://www.unesco-ioc-marinesp.be/marine_spatial_planning_msp

while marine resources and services are utilized within clear environmental limits allowing marine ecosystems to remain healthy and biodiversity to be conserved.

In January 2015, IOC obtained a new Grant from the Moore Foundation to conduct a project on global assessment and dissemination of MSP. The IOC-MPR is currently documenting the international practices of marine spatial planning (MSP) advances through: (i) documentation of ocean planning practice worldwide; and (ii) a summary of “lessons learned” from over 40-50 global initiatives and an online update of the UNESCO Guide to MSP (2009) including a remodeling of the UNESCO website and a joint publication on the OpenChannels website. This project will also allow IOC to strengthen the international network of MSP practitioners through convening of the second international IOC conference on MSP in 2017 and subsequent documentation and publications.

⁷ “A Guide to evaluating marine spatial plans”, <http://unesdoc.unesco.org/images/0023/002332/233299e.pdf> (English only)

Integrated Coastal Area Management Indicators

The Southeast Pacific data and information network in support of integrated coastal area management (SPINCAM) project, funded by the Government of Flanders, Belgium (2013–2015), is coordinated by IOC with the support of the regional coordinator of the Permanent Commission for the Southeast Pacific (CPPS). SPINCAM has lately focused on the development of a harmonized methodology to design a new set of indicators for regional, national and local levels that would demonstrate the progress of work on both the SPINCAM national and regional atlases. During the last year, the partners of SPINCAM have developed a common core set of indicators on population dynamics, efficiency on traditional fisheries sustainability, coastal infrastructures, key coastal ecosystems, coastal economy and coastal vulnerability to inform the implementation of national and regional coastal management policies.

At national level, SPINCAM, through the involvement of local authorities and stakeholders, has reinforced the multi-scale approach to develop a core set of indicators for their own managerial needs. The municipalities of Algarrobo, El Quisco and El Tabo in Chile, Guapi in Colombia, Churute Ecological Reserve in Ecuador, Las Perlas Archipelago in Panama and the Bay of Sechura-Piura in Peru are the five pilot case studies at local scale.

The SPINCAM Regional Atlas (www.atlasspincam.net) remains a pillar of the project's communication strategy together with the social and expert networks. In addition, SPINCAM launched in November 2015 the first publication on coastal and marine indicators for the Southeast Pacific (<http://unesdoc.unesco.org/images/0024/002430/243002M.pdf>) and lately finalised the publication on local experiences on integrated coastal area management within the five pilot case studies of SPINCAM (<http://unesdoc.unesco.org/images/0024/002437/243759s.pdf>).

SPINCAM is currently implementing the capacity development strategy approved in December 2014 in Guayaquil, Ecuador. Since July 2013, SPINCAM provided support in the organization of numerous training activities in Spanish and English (See Annex of Meetings and Activities).

SPINCAM is currently strengthening the institutional and scientific networks in the Caribbean, with participation of Colombia and Panama in the second phase of the Caribbean Marine Atlas and the recently launched Caribbean Large Marine Ecosystem Project that will enhance regional coastal and ocean governance. The new Caribbean Large Marine Ecosystem Project will enhance regional coastal and ocean governance. In the Southeast Pacific with the Humboldt Large Marine Ecosystem Project and the FUST Project Biosphere Reserves as a Tool for Coastal and Island Management in the South-East Pacific Region on coastal biosphere reserves conducted under the auspices of the Man and Biosphere Programme of UNESCO, have high interest to interact with SPINCAM in the Southeast Pacific Region and use the data infrastructure already established.

The future of SPINCAM involves a long-term strategy with a programme approach, for both coastal management and marine spatial planning in the Southeast Pacific, in recognition of the geographical coverage, magnitude and complexity of the environmental problems of the region's ocean and coasts. Work will support sustainable growth of coastal, marine and maritime areas, recognizing the importance of these settings as drivers of the regional economy, with great potential for innovation and growth in line with the Convention for the Protection of the Marine Environment and Coastal Areas of the Southeast Pacific, commonly known as the Lima Convention

Marine Policy and Regional Coordination Section

Marine Policy and Regional Coordination (MPR) is participating in the successfully created consortium of AQUACROSS (2015–2019), European Union's Horizon 2020 project, led by Ecologic Institute Berlin, which aims to support EU efforts to enhance the resilience and stop the loss of biodiversity of aquatic ecosystems, including coastal and marine waters, as well as to ensure the ongoing and future provision of aquatic ecosystem services. The project focuses on advancing the knowledge base and application of the ecosystem-based management concept for aquatic ecosystems by developing cost effective measures and integrated management practices. IOC is leading

the design and implementation of the information platform as a support to the scientific knowledge pillar of the project by providing a single point of access to both the internally produced and external data compiled by project partners, scientists and general public. The information platform adheres to both the Infrastructure for Spatial Information in the European Community Directive and the Open Geospatial Consortium principles regarding interoperability. A beta version of the information platform will be presented at the AQUACROSS Consortium Meeting that will take place in Alcalá de Henares (Spain) the last week of June 2016.



AQUACROSS considers the EU policy framework for aquatic ecosystems and builds on knowledge stemming from different sources to develop innovative management tools, concepts, and business models for aquatic ecosystems at various scales. MPR will be in charge of the development of the information platform, the coastal team and the pilot case study related to green and blue water infrastructures of the transcontinental biosphere reserve of the Mediterranean Andalusia (Spain) – Morocco. It thereby provides an unprecedented effort to unify policy concepts, knowledge, and management concepts of freshwater, coastal, and marine ecosystems to support the cost-effective achievement of the targets set out by the EU 2020 Biodiversity Strategy.

in April 2015 the MPR submitted, a new Community of Practice Project for Large Marine Ecosystems, to be implemented by IOC in partnership with NOAA, ICES, UNDP, and IUCN, to the Large Marine Ecosystem (LME) programme funded by the Global Environment Facility (GEF). Two consultation meetings were held at IOC in July 2013 and January 2014 with partners and LME stakeholders to discuss project strategy, objectives and activities. IOC will provide the Secretariat of the Project and will lead the establishment of a Global network of LME practitioners through enhanced sharing and application of knowledge and information tools. In 2014, NOAA passed on to the IOC the responsibility of organizing the LME Consultative Committee. A new planning committee led by IOC has been established to prepare the LME Committees with NOAA, ICES, IUCN, GEF, and LME project representatives. The 16th Annual LME Meeting took place in Paris (July 2014) and the 17th Annual LME Meeting will also take place in Paris in September/October 2015.

Marine Biodiversity

The 70th session of the United Nations General Assembly (A/RES/70/23) noted with appreciation the contribution of the Ocean Biogeographic Information System (OBIS) of IOC-UNESCO to marine scientific research. Through an international network of scientists and data centres, OBIS provides a global data and information sharing platform and a data clearing house mechanism for marine biodiversity research data in all ocean basins (See also OBIS under IOC function B and F). Negotiations at the United Nations for a new legally-binding instrument under the UN Convention on the Law of the Sea (UNCLOS) to conserve and sustainably use marine biodiversity in areas beyond national jurisdiction

(BBNJ) has started under a Preparatory Committee, established by UNGA resolution 69/292 of 19 June 2015. Defining new provisions based on the IOC Criteria and Guidelines for enhanced implementation of Capacity Development, Transfer of Marine Technology as well as international cooperation on Marine Scientific Research to support equitable access and benefit sharing and ensure equitable participation of all states in a new implementing agreement are currently under discussion. OBIS might be well placed to respond to the requirements deriving from a new implementing agreement under UNCLOS.

UN Sustainable Development Goals

In the follow-up to Rio+20 UN Conference on Sustainable Development, IOC has continued to engage in a number of UN processes related to the ocean. With regards to the Sustainable Development Goals (SDGs), IOC is co-leading the UN Ocean Task Support Team (TST) mandated to provide scientific and technical information upon request to the Member States negotiating the formulation of SDGs. The TST provided technical advice on potential ocean targets and indicators that could be integrated in a standalone ocean SDG. In July 2014, the UN Open Working Group led by Member States agreed on a set of 17 draft SDGs, including one goal dedicated to the ocean (SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development). Under SDG 14, several proposed targets relate to the mandate of IOC, and particularly target 14.a that calls for **“...increase scientific**



knowledge, develop research capacities and transfer marine technology taking into account the *“Criteria and Guidelines on the Transfer of Marine Technology”*⁸, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular Small Island Developing States and Least Developed Countries .”

8 IOC/INF-1203; <http://unesdoc.unesco.org/images/0013/001391/139193m.pdf>(English/French)

On 21 April 2015, together with the UN DOALOS, IOC organized a side event entitled “Building ocean knowledge, technology and capacity towards achieving sustainable development of the ocean and seas” on the margins of the SDG negotiations in New York. The event co-moderated by UN Ambassadors of Korea and Fiji was the occasion to highlight the role of IOC in capacity development and ocean sciences.

Through the MPR section, IOC participated as a panellist in the 16th meeting of the Informal Consultative Process on Ocean Affairs and the Law of the Sea (UNICPOLOS), which in 2015 was focused on oceans and sustainable development. IOC’s presentation was on Technology Transfer and Marine Science as Enabling Measures for Sustainable Development. A new IOC brochure on IOC’s contribution to Transfer of Marine Technology⁹ was prepared and launched at UNICPOLOS on this occasion.

IOC continues to be active in inter-agency mechanisms such as UN-Oceans whose new terms of reference were endorsed by the UNGA resolution 68/70 in December 2013. The UN DOALOS has assumed secretariat function, and members will appoint a chair for each meeting of UN-Oceans. IOC Executive Secretary participated in the annual UN-Oceans meeting hosted by IMO on 20 March 2015, London, U.K. Reports of the UN-Oceans meeting are posted on the UN- Oceans website (www.unoceans.org).

9 IOC Brochure 2014-3; <http://unesdoc.unesco.org/images/0023/002325/232586e.pdf>

In Africa and Adjacent Island States

The implementation of the project on Integrated Data and Information Products and Services for the Management of Ocean and Coastal Zones in Africa (ODINAFRICA-IV) continued with the development of Coastal and Marine Atlases, African Register of Marine Species, Library catalogues and literature repositories. Workshops were organized on: Coastal and Marine Atlases development; Marine Information Management and Websites development; Marine biogeography; and Ocean Data Portal Development. The products and services developed in all the phases of the Ocean Data and Information Network for Africa (ODINAFRICA) have been reviewed and are available online through a revamped ODINAFRICA website www.odinafrica.org

In the Pacific

The IOC Sub-Commission for the Western Pacific (WESTPAC) has been spearheading marine science development and cooperation in the Western Pacific and adjacent regions. In partnership with Member States in the region, WESTPAC has continued its efforts in the development, coordination and implementation of considerable activities across its three key thematic areas, namely: ocean processes in the Indo-Pacific region; marine biodiversity and food security; and ocean ecosystem health. On the occasion of its 25th Anniversary, WESTPAC organized a wide range of commemorative events at regional and national level, including joint cruises, workshops, a symposium, trainings, and publications. These activities

convincingly demonstrate the great importance of regional cooperation to the sustainability of marine and coastal resources.

The WESTPAC Symposium has evolved as a largest gathering in the region for marine scientists and competent government officials to advance ocean knowledge, promote multi-disciplinary and multi-national cooperation. The highlight of WESTPAC's accomplishment over 2014-2015 was the successful organization of the 9th WESTPAC International Scientific Symposium, which took place in Nha Trang, Vietnam, 22–25 April 2014. The Symposium was hosted by the Government of Vietnam, through its Vietnam Academy of Science and Technology (VAST). It attracted immense global interest with around 600 scientists and government officials from 21 countries within and outside the WESTPAC region. Fifty young scientists were funded from WESTPAC Young Scientist Travel Grant with the generous financial support of the Government of Vietnam, the Korea Institute of Ocean Science and Technology, and the State Oceanic Administration of China. The first-ever Research Directors' Forum provided a unique open-ended platform for directors from marine scientific institutes, academic faculties and operational agencies in the region to build and enhance networks, exchange the strategic directions of respective institutions, identify scientific and technical challenges, and inspire regional action for future collaboration. The Forum culminated in the signing of the Joint Statement of Research: "A Healthy and Safe Ocean for Prosperity in the Indo-Pacific region". The Statement can be found at <http://iocwestpac.org/news/392.html>.

To strengthen the science-policy interface, the tenth Intergovernmental Session of WESTPAC took place in Phuket, Thailand, 12-15 May 2015, generously hosted by the Government of Thailand. The session brought together national competent governmental agencies and scientific communities, aiming to improve science-policy interface, advance international cooperation on marine science, observations and services, and to improve institutional capacities to address critical challenges to sustainable development in the Western Pacific and its adjacent regions. In addition, WESTPAC celebrated its 25th Anniversary by organizing a wide range of commemorative events at regional and national level, including joint cruises, workshops, a symposium, trainings, and publications. Please refer to its 25th Anniversary brochure (<http://iocwestpac.org/page/521.html>)

In the Caribbean

The IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE) is contributing to the UN Department of Economic and Social Affairs led Global Sustainable Development Report (GSDR) which integrates existing assessments, reviews and future predictions by the scientific community on sustainable development. GSDR was submitted to Third Session of the High-level Political Forum on Sustainable Development (HLPF) in June 2015.

Function F

Capacity Development- Develop the institutional capacity in all other functions of IOC, as a cross-cutting function

Capacity Development Strategy

At its 28th Session, the IOC Assembly adopted the IOC Capacity Development Strategy (2015-2021) through Resolution XXVIII-2. The Strategy was published as IOC/INF-1332.¹⁰

Over the past 55 years Member States have derived numerous benefits from IOC's capacity development from the first International Indian Ocean Expedition 1962-1965 to the revitalisation of African marine science coordination and establishment of the global tsunami warning network including the monitoring/forecasting networks that save lives (See Function C). Reinforced partnerships between IOC and its Member States, other UN agencies, donors, and the scientific community have been the cornerstone of this success.

During this period, the transformation of ocean science capabilities, accelerating threats to ocean health and ecosystem services, and the growing challenge of sustainable development require the IOC and its Member States to accelerate the pace of IOC capacity development. Resource constraints, both staff and funding, limit IOC's ability to mobilise

the necessary partnerships to address Member State science and services that will enhance human welfare and sustainable economic development.



IOC Capacity Development Strategy 2015-2021

IOC has a unique international niche in ocean science, services and capacity development: (i) fostering international cooperation for sustained observations of the oceans; (ii) generating oceanographic data and information products and services and interaction between research, operational, user communities and decision-makers in order to derive maximum societal benefit from new knowledge to achieve IOC's High Level Objectives. The IOC will mainstream its natural

¹⁰ <http://unesdoc.unesco.org/ulis/cgi-bin/ulis.pl?lin=1&catno=244047> (published in English, French, Spanish and Russian)

and social science approach to capacity development in its Member States and, in particular, in Priority Africa, SIDS and Gender Equality. 2015 will mark the establishment of the Post-2015 Development Agenda, which is expected to be integrated as Sustainable Development Goals (SDGs).

This strategic framework provides six outputs and numerous activities. These outputs call for:

(i) investing in people and the institutions of which they are a part; (ii) enhancing access to scientific tools and methodologies; (iii) reinforcing IOC's capabilities to provide services to Member States; iv) enhancing the communication between scientific and policy makers communities; (v) expanding ocean literacy in civil society and; (vi) mobilizing resources to accomplish these goals.

Capacity Development Activities

The IOC addresses the UNESCO Global Priority Africa through actions in the domain of marine sciences and operational oceanography, with a special emphasis on aspects dealing with the impacts of adaptation to climate change in the coastal zones and on enhancement of capabilities to safeguard marine resources. The IOC is developing the project 'Enhancing Oceanography' capacities in Western Africa countries (funded by Spain) in the CCLME area. So far IOC has organized two workshops on 'Data availability' and 'Upwelling and environmental indices' in Dakar (September 2013) and Casablanca (April 2014), respectively. This project has rescued data from 18 different research surveys carried out in the CCLME and also has quality controlled the data from 90 surveys. A first product of this project is the inventory of the existing data-sets: a "Directory of Atmospheric, Hydrographic and Biological data sets for the Canary Current Large Marine Ecosystem".

A central role for the OBIS secretariat is to enhance Member State's capacity to manage, publish, access and use marine biodiversity data. Training course material (Powerpoint presentations and videos) are made available through the OceanTeacher classroom. In addition, OBIS is supporting Capacity Building activities as part of the Sustainable Ocean Initiative of the Convention on Biological Diversity (CBD-SOI:

Vision and Mission

Vision Statement: "Through international cooperation, IOC assists its Member States to collectively achieve the IOC'S high-level objectives (HLOs), with particular attention to ensuring that all Member States have the capacity to meet them."

Mission Statement: "The IOC will undertake relevant actions to assist Member States with developing and sustaining the necessary capacity to undertake activities necessary to achieve the IOC vision at the national level as well as at the international cooperation level."

In 2014, the UN General Assembly adopted the Oceans and the law of the sea Resolution (A/RES/69/245) which reiterated the essential need for cooperation, including through capacity building and transfer of marine technology, **"to ensure that States, especially developing countries, in particular the least developed countries and small island developing States, as well as coastal African States, are able both to implement the Convention and to benefit from the sustainable development of the oceans and seas, as well as to participate fully in global and regional forums and processes dealing with oceans and law of the sea issues."**



OceanTeacher training course on using and contributing data to the Ocean Biogeographic Information System (OBIS), Ostend (Belgium)

<https://www.cbd.int/soi/aligned-initiatives>). The OBIS SG Chair Prof. Klein has been teaching courses using OBIS and GIS as a tool for MSP at workshops in Peru, Rep. of Korea and Madagascar, as well as part of a SPINCAM training course in Ecuador.

Capacity-development activities are a cornerstone in the IOC HAB activities. The focus of the training courses and their location are demand-driven and the

courses have become widely recognized for training of scientists and regulatory agency people carrying out HAB monitoring. The majority of the courses make use of the OceanTeacher web-based learning platform and include qualification by examination. These activities, at the regional and global level, and their long-term sustainability are greatly facilitated by long-term commitment of a network of Member State institutions.

In the Pacific

The IOC Sub-Commission for the Western Pacific (WESTPAC) employs adaptive and self-driven approaches to capacity development in the region with guiding principles to focus on regional and national needs, to foster North-South and South-South cooperation, and to link trainings to the attainment of research goals addressing critical challenges to sustainable development in the region.

WESTPAC has been endeavouring to develop the IOC Regional Network of Training and Research Centres (RTRCs) on Marine Sciences. Wide support for this self-driven capacity development initiative was well received as demonstrated in the ASEAN-UNESCO indicative Joint Programme of Action (2014–2018), the Joint Statement of WESTPAC Research Directors Forum (<http://iocwestpac.org/news/392.html>), and the recommendations of the WESTPAC 9th International Scientific Symposium (<http://iocwestpac.org/news/398.html>).

Since the inauguration of the IOC Regional Training and Research Center on Ocean Dynamics and Climate (RTRC-ODC) in 2011 at the First Institute of Oceanography, State Oceanic Administration of China, the Centre has been organizing regular annual trainings on ocean dynamics, air-sea interactions and numerical modelling. The regular training at the ODC Center attracts the interest of young researchers, demonstrated by the ever-increasing number of applicants from a wide geographical range. The host institute and the Government of China renewed their commitment, through the exchange of letters with



The IOC WESTPAC Advisory Committee meeting in Phuket, Thailand (December 2014)

IOC at the WESTPAC-X, to the Regional Training and Research Center and its associated activities for the next 6 years (2015-2020)

Meanwhile, Indonesia, Japan, Malaysia, Thailand and Vietnam are taking efforts to establish Regional Training and Research Centres (RTRC) based on their own scientific specialization and regional recognition. The level of support to these initiatives was shown by the strong attendance at the “International Feasibility Study Workshop towards the establishment of an IOC RTRC” held in Kashiwa, Japan. Participants positively reacted to Japan’s efforts to establish an RTRC that will help develop regional capacity and conduct research into coastal and marine sustainability science.

Regular training opportunities have been developed and organized in WESTPAC Member States on a rotational basis in order to enhance their capacity for conservation and sustainable development of their coasts and marine biodiversity and resources. Those activities over the last intersessional period are listed in the online annex of Events and Meetings at the end of this publication.

In Africa and Adjacent Island States

The Second Sino-Africa Forum on Marine Science and Technology was co-organized by the IOC Subcommission for Africa (IOCAFRICA) and the Adjacent Island States and the State Oceanic Administration of China (SOA). It was hosted by the IOCAFRICA on 9–10 April 2015 in Nairobi, Kenya. Participants from Angola, Cameroon, Cote d'Ivoire, Egypt, Kenya, Madagascar, Mozambique, Nigeria, Tanzania, Togo, Tunisia and China attended the

forum. The participants agreed on the establishment of a Joint Coordination Committee to ensure the development and implementation of the China-Africa work programme, based on the priority areas identified at the first forum in 2013. These include: biogeography and biodiversity surveys, development of marine natural products, extreme events, climate change scenarios, marine biotechnology, resource assessment, blue economy, ocean energy, and ocean governance and policy.

Other Initiatives implemented by IOCAFRICA include the following. Collaboration is active between the ocean and climate communities with the focus on improving climate prediction through incorporation of ocean data. This work is implemented with the Intergovernmental Authority on Development's (IGAD) Climate Prediction and Application Centre – ICPAC



Third Intergovernmental Session of the IOC Sub-commission for Africa and the Adjacent Island States in Nairobi, Kenya (May 2015)

and the Western Indian Ocean Marine Science Association (WIOMSA). An Ocean forecast workshop was organized for the Western Indian Ocean region to provide input for the Greater Horn of Africa Climate Outlook Forum in August 2014. A marine mammal survey was undertaken with the Canary Current Large Marine Ecosystem project aboard the RV *Fridjhof Nansen*. An artwork competition for children and youth was organized to mark the 2014 World Ocean Day and African Day of Seas and Oceans, and the best artwork was published in the book “The stories of Africa’s Oceans and Coasts – as told by its children and youth”.¹¹

¹¹ <http://unesdoc.unesco.org/images/0023/002338/233802e.pdf> (published in English)

In the Caribbean

During the recent years the financial, in-kind contribution and secondment of experts by IOC Member States, donors, and expert networks, the backbone of IOCARIBE scientific activity, have been instrumental for the development and implementation by IOCARIBE regional programmes and projects. The other main component that facilitated the IOC Sub-Commission for the Caribbean and Adjacent Regionswork was the co-operation with other UN Agencies and Programmes such as WMO, UN Environment Programme (UNEP), UN International Strategy for Disaster Reduction, UNDP, UN Office for Project Services, International Atomic Energy Agency (IAEA), the World Bank International, regional organizations (Governmental Organizations and Non-Governmental Organizations), and the work with national agencies and UNESCO National Commissions.

IOCARIBE, in close cooperation with the Colombia's IOC Focal Point, the Colombian Ocean Commission (CCO), participate in an exhibition promoting IOC's activities in the Caribbean Region under the framework of the International Event "Sail Cartagena de Indias 2014" (15–19 May, Cartagena, Colombia). Thousands of people visited the Exhibition, and the sailing ships and vessels from Argentina, Brazil, Chile, Colombia, the United States, Neitherlands, Honduras, England, Mexico, Peru, the Dominican Republic, and Venezuela gathered in Cartagena in an effort to strengthen international cooperation among nations with interests in the ocean.

IOCARIBE SIDS actively participated in the UN SIDS Conference (September 2014, Samoa). UN Member States formally adopted the Small Island Developing States Accelerated Modalities of Action (or SAMOA Pathway). Proper management of the world's ocean

is critical for human well-being in SIDS, as they strongly depend on the ocean for food, livelihoods, economic development and essential ecosystem services, including carbon sequestration. The ocean is also a source of their identity and a foundation for unique island cultures. SIDS nations have identified addressing the gap in ocean science capacity as a prerequisite for sustainably managing the vast ocean spaces and resources under their national jurisdiction.

Caribbean SIDS were represented at the Yeosu International Ocean Forum and Roundtable 2014 (Yeosu, Korea, 21–24 October 2014). SIDS vulnerability to climate change and its impact on their economies and sustainable development were clearly recognized in the Yeosu Initiative. Partners and stakeholders agreed on the importance of supporting SIDS actions for their sustainable development. Special attention was given to the SIDS Samoa Conference 2014 Declaration.

The José Benito Vives de Andrés Marine and Coastal Research Institute (INVEMAR) in Santa Marta, Colombia was selected to host an IOC OceanTeacher Global Academy (OTGA) Regional Training Centre (RTC). INVEMAR has great potential to become a regional "hub" for ocean science/management related training for Spanish speaking countries in Latin America. The first OTGA Training Course in Spanish on Marine Spatial Planning and Integrated Coastal Area Management was organized by the INVEMAR, IOC, and SPINCAM with the support of the Government of Flanders (Belgium) and was held in Santa Marta on 25–29 May 2015.

The Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions, in collaboration with national, regional, UN and

international partners, carried out a series of capacity development activities. Within the framework of the project “Consolidating Haitian capacities for tsunami early warning and preparedness” (2013–2014), several workshops were organized in Haiti to enable full scale tsunami SIMEXs (simulation exercises) with thousands of participants, especially from schools

located in tsunami prone areas. In the Dominican Republic, jointly with the UNDP, UNESCO and IOC implemented the Disaster Preparedness ECHO programme project “National institutions prepared and communities resilient to earthquakes and tsunamis in urban environments in the province of Puerto Plata” (2013-2014).

Annexes

FUNDING FOR IOC PROGRAMMES¹²

General overview

This Biennial Report describes a wide spectrum of activities that highlight the relevance of the programmes delivered by the Intergovernmental Oceanographic Commission (IOC) of UNESCO in 2014-2015. Programme implementation and related staff costs during this period were financed from regular programme allocation approved by the General Conference of UNESCO as part of the Organization's programme and budget for 2014-2015 (37 C/5), and from extrabudgetary resources, notably those provided by IOC Member States and partner organizations through their voluntary contributions to the IOC's Special Account and to specific projects/funds-in-trust. This financial report does not consider other contributions (either cash or in-kind) provided by Member States but that do not transit through the IOC of UNESCO's accounts. More detailed financial information, including the very substantial direct funding of the IOC offices in Ostend and Perth can be found in the 'Report on budget execution 2014-2015 and outline of 2016-2017 budget' prepared for the 49th Session of the IOC Executive Council (document IOC/EC-XLIX/2 Annex 2).

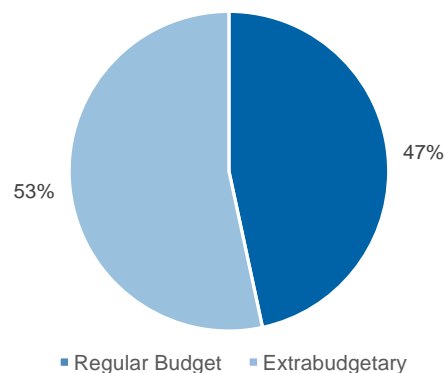


Chart 1. 2014–2015 Expenditure by source (Regular Programme vs Extrabudgetary) – **Total: \$20,482,171.52**

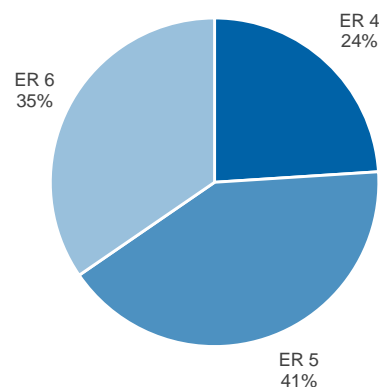


Chart 2. 2014–2015 Expenditure by Expected Result (all sources of funding)

¹² All figures in this report were reviewed by the Bureau of Financial Management of UNESCO. Authoritative figures are those contained in the financial statements prepared by the Bureau of Financial Management.

In accordance with the decisions by the UNESCO Governing Bodies to move towards a results-based budgeting approach, the IOC programme and budget for 2014–2015 are structured by expected results.

Regular Programme

In the Zero Nominal Growth draft budget of \$ 653 M for the biennium 2014–2015 presented by the Director-General to UNESCO Member States, the budgetary allocation to the IOC for the biennium 2014–2015 was of \$ 12 M, which implied a nominal increase of approximately \$ 0.5 M compared to the previous biennium.

On this basis, the IOC Secretariat developed a budgetary proposal for consideration by the IOC Assembly at its 27th session (Paris, 26 June–5 July 2013) – document IOC-XXVII/2 Annex 4 and Addendum. The proposal was guided by a series of underlying principles and the analysis of the budgetary trends of the past years, with a view of ensuring programme continuity, while also proposing some new initiatives. The proposal provided clear and transparent information on the intergovernmental component of the programmes and its related costs, as well as on the legal commitments of the Commission, in order to allow the Governing Bodies to make informed decisions. Following the lessons learned in dealing with the financial constraints of the 2012–2013 biennium related to the suspension of the USA contributions, all efforts were made to reduce the costs of statutory meetings and operating/running costs through a number of cost-efficiency measures.

In the ZNG \$ 507 M Expenditure Plan for 2014–2015 adopted by the General Conference of UNESCO at its 37th session and based on the anticipated cash inflows, the actual 2014–2015 budgetary allocation to the IOC was reduced to \$ 8.6 M, or 72% of the fully-funded UNESCO Programme and Budget, 2014–2015 (37 C/5).

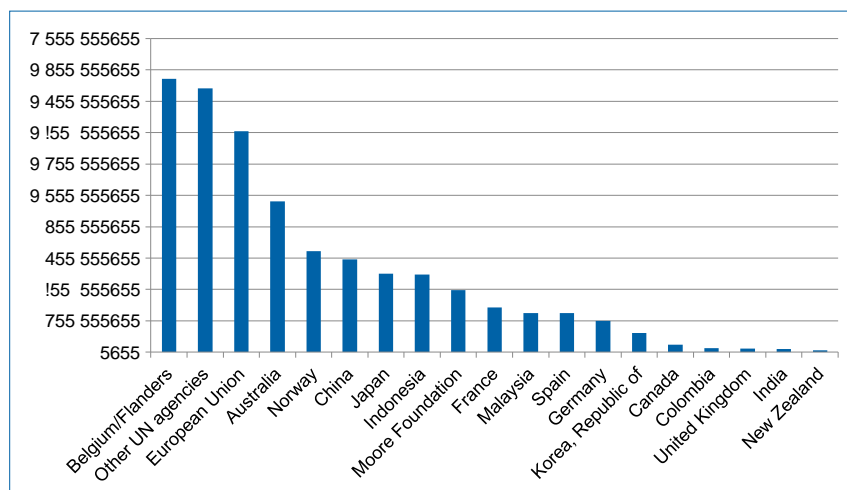
This decision was brought to the attention of the IOC Member States at the 47th session of the IOC Executive Council (Paris, 1–4 July 2014), in document IOC/EC-XLVII/2 Annex 3 Rev., which also provided information on the Secretariat restructuring as well as the detailed analysis of the impact of this budgetary reduction on programme delivery under each expected result and function. In its Resolution EC-XLVII.2 the Executive Council expressed 'great concern for the impact of the financial difficulties of UNESCO on the delivery of the IOC programmes, with the reduction of the IOC budget from \$ 12,026,200 in the approved Programme and Budget for 2014–2015 (37 C/5) to \$ 8,643,600 under the \$ 507 M expenditure plan for 2014–2015 (or 72% of the 37 C/5 approved)'. It also expressed 'great dissatisfaction with the fact that the budgetary allocation to the IOC for the biennium 2014–2015 at the level of 72% of the 37 C/5 approved is not consistent with the recommendations of the 5th special session of UNESCO Executive Board (Paris, 4 July 2013) to allocate between 100% and 80% to high priority Expected Results, like those of the IOC'.

The Executive Council recognized 'the efforts of the IOC Executive Secretary to maintain programme continuity under these challenging circumstances and the difficulty to fully implement the guiding principles adopted by the IOC Assembly at its 27th session (Resolution XXVII-2(C), Annex 2), given that the Assembly provided its recommendation on a scenario with an allocation of 86% (and not 72%) of the 37 C/5 approved budget.' It welcomed the programmatic choices of the IOC Executive Secretary and endorsed the Programme and Budget for 2014–2017 and workplans for 2014–2015 contained in document IOC/EC-XLVII/2 Annex 3 Rev. as a measure to ensure programme continuity at essential level and consistent with the priorities of the IOC Medium-Term Strategy, 2014–2021 (IOC/INF-1314).

In April 2015, the UNESCO Executive Board at its 196th session approved the Director-General's proposal to reinforce the IOC programme budget through an additional allocation of \$500,000.00 from the Emergency Fund. In July 2015, the Director-General

approved a further increase of \$632,000.00 as a result of an internal house-wide reprogramming exercise. This brought the total resources available for regular programme operational budget to \$3,088,921.00, or 80% of the 37 C/5 approved (fully-funded).

	37 C/5 Approved	\$507 M Expenditure Plan	Final allocations (with reinforcements)	
	\$	\$	\$	as % of 37 C/5 Approved
Operational budget	3,855,200	1,816,600	3,088,921	80%
Staff	8,171,000	6,827,000	6,632,076	81%
TOTAL	12,026,200	8,643,600	9,720,997	81%



3. Main extra-budgetary donors – based on 2014–2015 income to the IOC Special Account and to the Funds-in-Trust - **Total of \$ 9,778,221.90**

Extrabudgetary funding

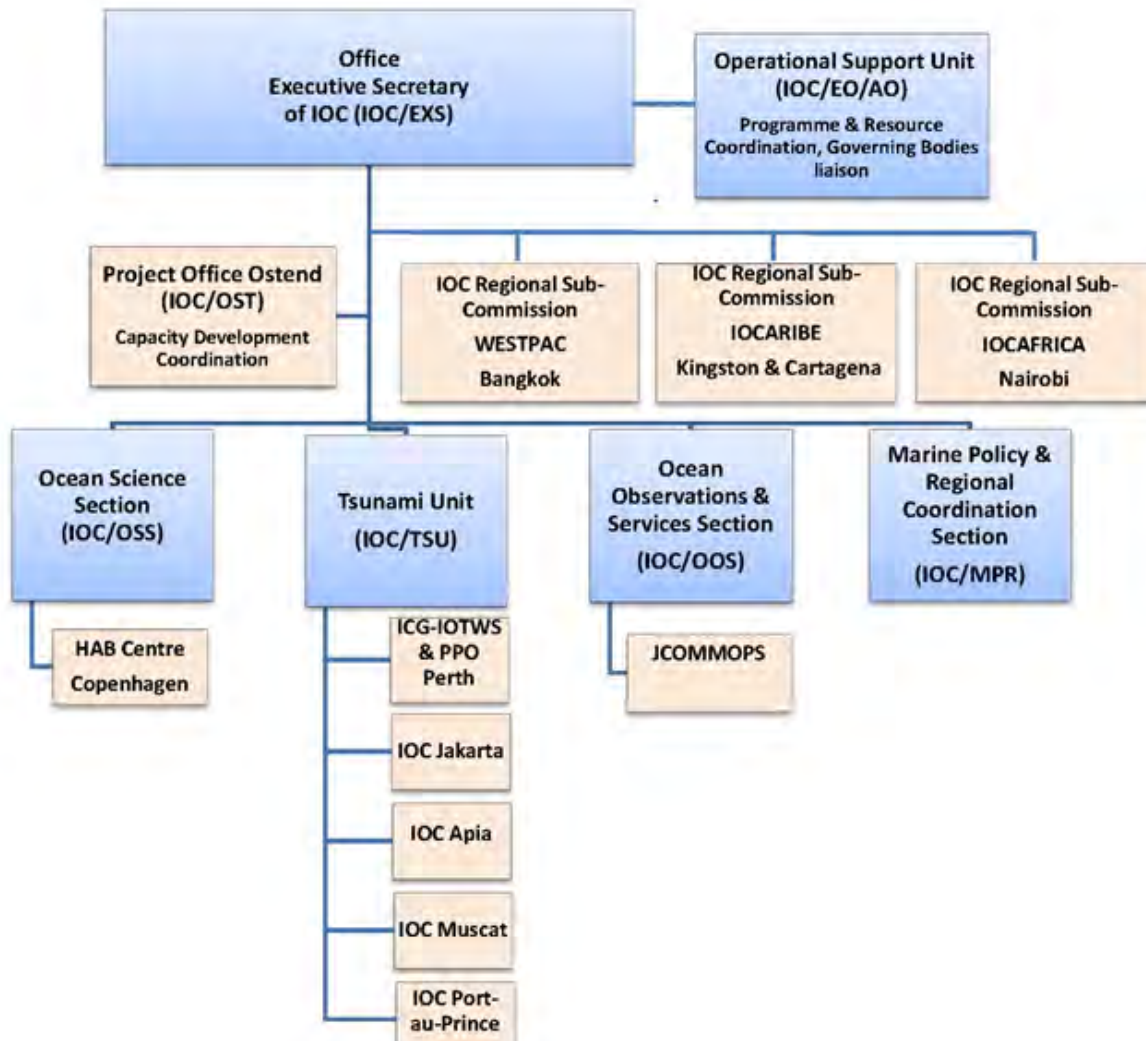
IOC's extrabudgetary resources include voluntary contributions of two types: contributions to the IOC Special Account and contributions to specific projects under funds-in-trust agreements. Details on both types of contributions can be found in the 'Report on budget execution 2014-2015 and outline of 2016-2017 budget' prepared for the 49th Session of the IOC Executive Council (document IOC/EC-XLIX/2 Annex 2).

Overview of the IOC Staffing Situation

The cash flow difficulties faced by the Organization in this biennium also had a considerable impact on the IOC staffing situation.

In addition to two professional posts (Executive Officer and JCOMM coordinator) and two general services posts (one in Ocean Observations Section and one in Ocean Science Section) abolished in 2013, two Chart additional general services posts had to be abolished

The IOC organizational chart below shows the revised Secretariat structure, following the restructuring:



in 2014 (one in Ocean Observations Section and one in the Office of the Executive Secretary).

In order to ensure as least some level of sustainability for the operational programmes, the restructuring of the Secretariat was proposed by the Executive Secretary of IOC and approved by the Director-General of UNESCO. The detailed information on this restructuring was provided to the IOC Executive Council at its 47th session in document IOC/EC-XLVII/2 Annex 3 Rev. As a result of this restructuring, two new professional posts were open for recruitment from 1 January 2015 to support the priority areas of NEAMTWS/JCOMM and OBIS/OOS. The post of the Head of the IOCARIBE Secretariat could not, however, be restored to a full-time position. However, thanks to the reinforcement from the Emergency Fund approved by the UNESCO Executive Board at its 196th session in April 2015, it was possible to restore the full-time IOCARIBE Secretary position in Cartagena at the end of 2015, with the full-time post being approved in the IOC budget for 2016–2017 (38 C/5 \$518M Expenditure Plan).

In this context of continuous understaffing in many core areas of activities, extra-budgetary contributions from Member States are of particular importance, including through secondments and non-reimbursable loans.

On-Line Annex

Publications:

<http://www.ioc-unesco.org/IOC-AR-2014-2015-Publications>

Events and Meetings:

<http://www.ioc-unesco.org/IOC-AR-2014-2015-Events>

List of Acronyms

AtlantOS	Optimising and Enhancing the Integrated Atlantic Ocean Observing Systems
BMKG	Indonesian Agency for Meteorology, Climatology and Geophysics (Badan Meteorologi, Klimatologi, dan Geofisika)
CBD	Convention on Biological Diversity
CCLME	Canary Current Large Marine Ecosystem
CFP	Ciguatera Fish Poisoning
CLME	Caribbean Large Marine Ecosystem
COP21	The 21st session of the Conference of the Parties (UN Conference on Climate Change)
DOALOS	Division for Ocean Affairs and the Law of the Sea (UN)
EBSA	Ecologically or Biologically Significant Marine Area
ECHO	European Commission's Humanitarian Aid and Civil Protection department
EOVs	Essential Ocean Variables
FAO	Food and Agriculture Organization of the United Nations
FUST	Flanders-UNESCO Science Trust Fund
GCOS	GOOS and the Global Climate Observing System
GEBCO	General Bathymetric Chart of the Ocean
GEF	Global Environment Facility
GEO	Group on Earth Observations
GEOHAB	International Science Programme on the Global Ecology and Oceanography of Harmful Algal Blooms
GEOSS	Global Earth Observation System of Systems
GEOWOW	GEOSS Interoperability for Weather, Oceans and Water
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (IMO-FAO-UNESCO-WMO-WHO-IAEA-UN-UNEP-UNIDO)
GOA-ON	Global Ocean Acidification Observing Network
GOOS	Global Ocean Observing System
GOSR	Global Ocean Science Report (IOC)
GPNM	Global Partnership on Nutrient Management
GRAs	GOOS Regional Alliances
GRF	GOOS Regional Forum

GSDR	Global Sustainable Development Report
HAB	Harmful Algal Blooms
HAB-ANCA	HAB Alga Nocivas de Caribe
HAEDAT	Harmful Algal Event Database
IAEA	International Atomic Energy Agency
ICAM	Integrated Coastal Area Management Programme (IOC)
ICES	International Council for the Exploration of the Sea
ICG	Intergovernmental Coordination Group (for regional tsunami warning systems) (IOC)
ICSU	International Council for Science
IGMETS	International Group for Marine Ecological Time Series
IHO	International Hydrographic Organization
IMO	International Maritime Organization
INVEMAR	The José Benito Vives de Andrés Marine and Coastal Research Institute
IOCAFRICA	IOC Sub-Commission for Africa and the Adjacent Island States
IOCARIBE	IOC Sub-Commission for the Caribbean and Adjacent Regions
IOCCP	International Ocean Carbon Coordination Project
IODE	International Oceanographic Data and Information Exchange (IOC)
IOGOOS	Indian Ocean GOOS
IOTIC	IOC Indian Ocean Tsunami Information Centre
IOTWS	Indian Ocean Tsunami Warning and Mitigation System (IOC)
IPBES	Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services
IPHAB	Intergovernmental Panel on Harmful Algal Blooms (IOC)
IUCN	International Union for the Conservation of Nature
IWEco	Integrating Water, Land & Ecosystems Management in Caribbean SIDS (GEF project)
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM In-Situ Observing and Platform Support Centre
LDCs	Least Developed Countries
LME	Large Marine Ecosystems
MPR	Marine Policy and Regional (IOC)
MSP	Marine Spatial Plan (IOC)
N-CIRP	Nutrients and Coastal Impacts Research Programme
NEAMTWS	Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected (IOC)

NEAR-GOOS	North East Asian-Regional GOOS
NMHEWS	National Multi Hazard Early Warning System project
NOAA	National Oceanic and Atmospheric Administration (USA)
OA	Ocean acidification
OBIS	Ocean Biogeographic Information System (IOC)
ODIN	Oceanographic Data and Information Network (IOC)
ODINAFRICA	Ocean Data and Information Network for Africa (IOC)
OFDS	Ocean Forecasting Demonstration System
OOPC	Ocean Observations Panel for Climate
OTGA	OceanTeacher Global Academy (IOC)
PICES	North Pacific Marine Science Organization
PTWS	Pacific Tsunami Warning and Mitigation System (IOC)
RTRCs	IOC Regional Network of Training and Research Centres
SAP	Strategic Action Programme
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
SCOR	Scientific Committee on Oceanic Research
SDG	Sustainable Development Goals
SEAGOOS	South East Asia GOOS Regional Alliance
SIDS	Small Island Developing States
SOA	State Oceanic Administration (China)
SOT	Ship Observations Team
SPINCAM	South-East Pacific Data and Information Network in support to Integrated Coastal Area Management
TOR-ROP	Terms of Reference-Rules of Procedure
TOWS-WG	Working Group on Tsunami and other Hazards related to Sea-Level Warning and Mitigation Systems (IOC)
TPOS	Tropical Pacific Observing System
TST	United Nations Ocean Task Support Team
TWAP	Transboundary Waters Assessment Programme
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
UNICPOLOS	Informal Consultative Process on Ocean Affairs and the Law of the Sea
VOS	JCOMM Voluntary Observing Ship Scheme
WCRP	World Climate Research Programme
WESTPAC	IOC Regional Secretariat for the Sub-Commission for the Western Pacific
WMO	World Meteorological Organization
WOA	World Ocean Assessment (UN)
WOD	World Ocean Day
ZNG	Zero Nominal Growth



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