

IOC report for SCOR, 2016

Ocean acidification

Ocean acidification (OA) is an emerging global concern and is a risk to marine biodiversity, ecosystems and human society.

The development of improved recommendations regarding biological observation to measure the impact of ocean acidification is strongly supported by the IOC-UNESCO. One element is the co-leadership in the biological working group of the Global Ocean Acidification Observing Network (GOA-ON). During the 3rd GOA-ON workshop, held in Hobart, Australia in May 2016, co-organized by IOC-UNESCO, several breakout groups focused on aligning measurements, updating recommendations and including new parameters, ecosystems to measure ocean acidifications and its impacts. The ideas compiled during the meeting focusing on biological measurements will be discussed in October 2016, when together with IAEA and other experts of GOA-ON IOC is currently organizing a workshop discussing this topic.

Since 2016 GOA-ON has 245 members, from 45 countries (2015: 150 scientists, 31 countries). New members from Latin America (members from: Chile, Venezuela, Ecuador, Nicaragua) and the Western Pacific (members from: Philippines, Malaysia, South Korea, Thailand, China) joined the network. In addition, a strong increase in African scientists joining the network was noticed. While before only experts from South Africa participated in the network now researchers from: Senegal, Egypt, Ivory Coast, Congo, Namibia, South Africa, Mauritius, Tanzania and Nigeria are part of the group.

Further IOC supported the inauguration meeting of the Latin-American Ocean Acidification Network (LAOCA Network) in December 2015. During two days a group of scientists 24 from seven Latin-American countries, including Argentina, Brazil, Colombia, Ecuador, Peru, Mexico, and Chile meet at the city of Concepcion, Chile to discuss the strengths and weaknesses of each country in relation to ocean acidification' research, and also defining the mission and goals of LAOCA Network. In addition, IOC is currently establishing an Ocean Acidification Observing Network in the Western Pacific, to detect the effects of increasing CO₂ concentrations on coral growth and survival.

Following the World Oceans Day in June 2015, the platform of the UNFCCC COP21 was used to raise awareness for ocean acidification, highlighting the anthropogenic impact on marine environment, which going to lose its capacity to act as a carbon sink. During the conference several high-level side events and workshops were organized with the support of IOC, resulting in an improved profile of IOC within the scientific and political community.

The IOC further supported the Ocean Acidification international Reference User Group (OA-iRUG). Following a meeting co-organized by IOC in July 2015 at UNESCO HQ 'Acting on Ocean Acidification: Improving prospects by planning ahead' was published with contribution from IOC.

The IOC also co-organized the XVI LATIN AMERICAN CONGRESS OF OCEAN'S SCIENCES (COLACMAR) AND XVI NATIONAL SEMINARY OF OCEAN'S SCIENCES AND TECHNOLOGIES (SENALMAR) 2015, in Santa Marta Colombia. The IOC representation included chairing the Ocean Acidification Symposium and also

presenting the keynote: Ocean Acidification - Connecting scientists to transfer knowledge at local, regional, global levels.

All these activities feed into the actions undertaken by IOC to equip countries to fulfill the agenda 2030, SDG 14 to protect the ocean and its resources.

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 highly 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. The in 2014 published manual is widely used, e.g. in Indonesia, Costa Rica, Philippines, USA, Indonesia, Australia, Kenya, Tanzania, Brazil, UAE, and Spain.

The 2015 annual workshop of the Scientific working group of the Blue Carbon Initiative with the support of IOC-UNESCO, took place in Zanzibar, Tanzania, September 2015.

Furthermore, IOC participated in a workshop to establish a Global Science and Data Network for Coastal Blue Carbon (SBC), to support carbon and greenhouse gas cycle science in coastal ecosystems and the application of high quality carbon data to conservation, sustainable management and related policy of those ecosystems in January 2016 in San Francisco.

De-oxygenation

De-oxygenation is a global problem in coastal and open regions of the ocean, and 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 with more than 600 systems now. 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 appreciated; the social and economic consequences have yet to be determined but are likely to be significant. To create awareness towards the impacts of deoxygenation on the marine environment and finally ocean and human health an IOC expert group – the Global Ocean Oxygen Network- was formed. The IOC Executive Council decided to support this activity during its 49th session.

Currently a first draft of a technical brief, summarizing the threat of decreasing oxygen concentrations in the coastal seas and open ocean, is under review by the group of experts. The publication is envisaged to be published late 2016. IOC further organizes the first official meeting of the expert group, which will be held 7-9 September 2016. Other actions in order to increase the visibility and to improve the understanding of scientists and decision makers and important stakeholders ought to follow.

Time Series

Since 2013 the establishment of an interdisciplinary IOC working group, the International Group for Marine Ecological Time Series (IGMETS), has offered the possibility to improve model projections and forecasts needed to understand open ocean and coastal changes. IGMETS has delivered several products as a global map, a global assessment, and an interactive visualizer. This group of experts was decided to be supported during the 49th session of the IOC Executive Council. IGMETS focuses on ship based time series globally, analyzing phyto- and zooplankton together with nutrients and physical information (temperature, salinity), and couples these global observations with synoptic satellite data to obtain spatially distributed information. The information provided addresses new scientific questions and serves a well-established community of practice related to ship-based time series.

The IGMETS report will publish its report in September 2016.

IOC Joint action with ICES and IMO on Ballast and other Ship Vectors

The ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV) critically reviews and reports on the status of shipping vector research with an emphasis on new developments in ballast water treatment technology, risk assessment, ballast water sampling devices, and selection of ballast water exchange zones. The WG also discusses and evaluates the sampling strategies to ensure that international guidelines are based on accurate scientific information, thereby helping to achieve consensus on difficult and technical issues.

The ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV) met at the Marine Protected Area of Tavolara Punta Coda Cavallo in Olbia, Italy, 14–16 March 2016, including a joint meeting on 16 March with the Working Group on Introductions and Transfers of Marine Organisms (WGITMO). WGBOSV connected with the GloBal TestNet organization (a consortium of ballast water treatment system testing organizations working together to standardize test procedures) by videoconference, to identify areas of coordination and collaboration under ToR c. Jointly with WGITMO, WGBOSV responded to a direct request received from ICES Bureau regarding development of questions that could direct the development of demonstration advice on “risk management of nonindigenous species associated with shipping in the Arctic”. In addition, jointly with WGITMO, WGBOSV identified key external researchers to invite to next year’s meeting in order to expand expertise on biofouling issues.

Two recommendations were developed at the meeting: (i) to initiate discussion/coordination with other Arctic organisations (e.g. Arctic Council working groups on the protection of the Arctic Marine Environment (PAME) and the Conservation of Arctic Flora and Fauna (CAFF)) with a view to jointly address non-native species issues in the Arctic; and (ii) to consider the following three questions as material for development of demonstration advice:

- How will climate change impact the risk of introduction, survival and/or establishment of marine non-native species in the Arctic?
- What management measures currently available in other marine environments are applicable for the Arctic?
- What future activities should be prioritized to manage marine NIS in the Arctic?

Full report at <http://www.ices.dk/community/groups/Pages/WGBOSV.aspx>

Nutrient's coastal Impacts research

Nutrient over-enrichment of coastal ecosystems is a major environmental problem globally, contributing to problems such 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 focussing 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 which 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) with 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.

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 started a second phase with a joint co-sponsorship shared by the IOC, UNEP and FAO. The WG 40 delivered a substantial report to the UNEA-2 May 2016. Material from a draft of the second GESAMP microplastics report was included in the UNEA-2 report, see [http://www.unep.org/gpa/documents/publications/Marine Plastic Debris and Microplastic.pdf](http://www.unep.org/gpa/documents/publications/Marine%20Plastic%20Debris%20and%20Microplastic.pdf)

From May 25-27, the MICRO 2016 international conference on microplastics was held in the UNESCO Biosphere reserve of Lanzarote, Canary Islands, Spain. MICRO 2016 provided an opportunity to share available knowledge, fill in gaps, identify new questions and engage the scientific community through the work presented and the Lanzarote Declaration, see <https://micro2016.sciencesconf.org/>

Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socio-Economic Aspects – World Ocean Assessment

IOC has been involved in the establishment and conduct of the Regular Process (RP) from the beginning. In 2005 the General Assembly, by resolution 60/30, requested IOC and the UN Environment Programme (UNEP) to serve as the lead agencies to carry out a three-year start-up phase, in cooperation with all relevant UN agencies and Programmes of the UN, to conduct an “Assessment of Assessments”. This was done through the work of an independent Group of Experts set up in 2006, that delivered its report to the UNGA in 2009. The report identified factors central to the quality of assessments, such as scientific credibility, policy relevance and legitimacy. The report also identified best practices, thematic, geographic or data gaps, scientific uncertainties, as well as research and capacity-building needs, particularly in the developing world. In 2010, the Ad Hoc Working Group after having considered the “Assessment of Assessment” report, recommended the launch of the 1st cycle of the Regular Process. Through UN Resolution 65/37 (adopted by the UNGA in December 2010), IOC together with UNEP, IMO, FAO were invited to provide scientific and technical support to the Regular Process.

From 2011 to 2015, the IOC Secretariat provided support to the Regular Process in the following manner:

- (i) Engaging Member States and their experts into the Process;
- (ii) assistance with the information (incl. communication) and data management aspects;
- (iii) the co-organization of regional workshops on the Regular Process under the auspices of UN;
- (iv) the conduct of capacity-building activities related to marine assessment in view of regional requirements;
- (v) the provision of assessment products, results and data upon request from the lead authors and experts in charge of the WOA report preparation;
- (vi) support to the WOA report editorial process;
- (vii) communication to scientific community and IOC Member States on the objectives of the Regular Process.

The WOA report was finalized by Group of Experts in September 2015 and considered by the UN Ad Hoc Working Group of the Whole at that time. UN Member States also decided that prior to launching a second cycle of assessment under the Regular Process, an evaluation of the 1st cycle of the Regular

Process implementation should be conducted, reviewing the effectiveness of the arrangements and drawing lessons for improving the next cycle of the Regular Process. Member States and relevant UN bodies were invited to provide their views which the IOC Secretariat did in March 2106. Those pertains primarily to the scoping process of the WOA, the nomination process to the Pool of Experts/ Group of Experts and working procedure of the Group of Experts; communication aspects, capacity building and the involvement of the UN technical agencies, bodies and programmes, as well as non-UN scientific bodies. [Ref. IOC/INF-1335: Views from the Intergovernmental Oceanographic Commission of UNESCO on lessons learned from the first cycle of the Regular Process (WOA-I)].

In August 2016, the UN Ad Hoc Working Group decided to launch the second cycle of the Regular Process (2016-2020). It is recalled that the General Assembly that in the first cycle, the scope of the Regular Process would focus on establishing a baseline. In subsequent cycles, the scope would extend to evaluating trends and identifying gaps. The assessment(s) prepared during the second cycle will play a decisive supporting role for other United Nations processes. Overall, the outcome of the assessment(s) should support policy development and decision-making at national, regional and global levels. Two major outputs are foreseen under the second cycle, (i) a Second World Ocean Assessment(s) to be initiated through a scoping exercise starting in 2017 supported through regional workshops which will, inter alia, help identify regional priorities; (ii) support provided by the Regular Process to support ocean-related intergovernmental processes, as appropriate (for eg BBNJ process, Agenda 2030, UNFCCC process, UNICPOLOS). A draft report presenting the recommendations for the second cycle is available at the following link.

http://www.un.org/depts/los/global_reporting/7th_adhoc_2016/RP_Advance_Unedited_2016.pdf

TWAP

IOC completed the implementation of the marine components of the Transboundary Water Assessment Programme (TWAP) funded by GEF. 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 LME commissions, as well as Member States.

Through a series of of core ecological, socio-economic and governance indicators for the marine environment (64 Large Marine Ecosystems and Open Ocean areas) using globally available datasets, the TWAP marine assessments identified the mounting cumulative impacts of climate change and human activities on ocean ecosystems and their impact on the ocean across or beyond national borders. This is resulting in deteriorating health and declining resource productivity, notably due to unsustainable

fishing and pollution. The lack of national engagement and globally-integrated governance of transboundary waters threatens to further amplify these negative impacts.

The findings from the open ocean and LME assessments present projections for disastrous escalation by 2030 and 2050 of the cumulative impacts of local and global hazards from tourism to climate change on marine ecosystems. The assessments nevertheless identify the important potential benefits of globally and regionally integrated governance to address these issues and should help strengthen countries' capacities to conserve and sustainably use the oceans, seas and marine resources. Maintaining the health and resource productivity of these transboundary water systems should help countries achieve global objectives to reduce poverty and hunger, and promote sustainable economic growth.

In order to conduct this assessment, IOC established a consortium of institutional partners and experts for the current Open Ocean and LMEs assessments (these include for e.g. NOAA, IGBP, GESAMP, UNEP-WCMC, University of British Columbia, National Center for Ecological Analysis and Synthesis (NCEAS), amongst others).

The final TWAP deliverables released in July 2016, include a set of technical assessment reports for LMEs and Open Oceans, as well as summary for decision-makers, and a data portal where indicators can be visualized and data downloaded (www.onesharedocean.org).

The TWAP Full size project was implemented by UNEP as Implementing Agency, UNEP's Division of Early Warning and Assessment (DEWA) as Executing Agency, and the following lead agencies for each of the water system categories: the International Hydrological Programme (IHP) of the UNESCO for transboundary aquifers including groundwater systems in small island developing states (SIDS); the International Lake Environment Committee Foundation (ILEC) for lake basins; UNEP-DHI Partnership - Centre on Water and Environment (UNEP-DHI) for river basins; and the IOC/UNESCO for large marine ecosystems (LMEs) and the open ocean. The institutional partnerships forged in this assessment are envisioned to seed future transboundary assessments.

OBIS (2015)

OBIS continues to grow with about 3 million species observations per year. It currently holds 45 million records, integrated from over 1800 datasets.

The financial situation of the OBIS secretariat is now looking much better, with the project coordinator's position being covered by UNESCO's regular programme budget. This position is combined (50/50) with GOOS, to support the newly established Biology and Ecosystems Panel of GOOS.

The mission of GOOS Biology is: "By OceanObs'19, identify at least one (set of) GOOS variable providing a change indicator, globally coordinated with a clear pathway to global coverage, including open access data, and reporting to support international reporting needs (including SDGs, CBD reporting needs, a future World Ocean Assessment, etc.) – i.e. a mature GOOS programme. A further 3 (sets of) GOOS

variables have been identified as pilot eEOVs with a clear pathway to progress them to mature variables.” More information can be found on <http://www.ioc-goos.org/biology>.

OBIS and GOOS Biology are heavily involved in the developments of GEO MBON (a marine Biodiversity Observation Network as part of the Group on Earth Observation), in collaboration with GEO Blue Planet.

OBIS has received funding from the Flanders Government (Flanders UNESCO Science Trust Fund) to develop information products and services to support major ocean assessments, such as the World Ocean Assessment of the UN regular process and those of the new IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services). Within this project, OBIS is currently developing customized information portals on particular geographic or thematic issues.

OBIS continues to be an important information source for the identification of Ecologically or Biologically Significant Areas (EBSAs) of the Convention on Biological Diversity (CBD).

A new pilot project has been approved by the IODE Committee (March 2015) to expand OBIS with additional data beyond species occurrence records (e.g. biological measurements, environmental measurements, water, sediment etc). The purpose is to ensure that mixed datasets (holding all measurements taken during a sampling event) are kept together; multiplying the value of these data for a multitude of science applications and ensuring that published results/analysis are reproducible.

IOC Capacity Development Strategy (2015)

During 2014-15 the Intersessional Working Group for the Development of the IOC Capacity Development discussed the proposal for the new IOC Capacity Development Strategy, to be implemented in the period 2015-2021.

The vision of IOC’s Capacity Development Strategy is derived from the IOC Vision and High-Level Objectives for 2014-2021 (Resolution XXVII-2, 27th Session of the IOC Assembly) and also from risks and opportunities related to ocean and coasts.

The vision statement of IOC’s Capacity Development Strategy is: *“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.”* Furthermore, the mission statement of IOC’s Capacity Development Strategy states that *“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.”*

The IOC CD Strategy defines 6 main outputs, each output including a number of activities to be developed towards pursuing IOC’s CD vision. The outputs are: 1) Human resources developed; 2) Access to physical infrastructure established or improved; 3) Global, regional and subregional mechanisms

strengthened; 4) Development of ocean research policies in support of sustainable development objectives promoted; 5) Visibility and awareness increased; and 6) Sustained (long-term) resource mobilization reinforced.

One key element towards the implementation of this CD Strategy is the development of sustained partnerships, where SCOR can play an important role. Such partnership(s) can involve, inter alia, joint fellowships and grant/travel awards as well as sharing/exchange of experts contributing lectures/contents to training courses and programmes, etc.

The new IOC Capacity Development Strategy, to be implemented in the period 2015-2021, was approved by the Member States in June 2015 during the IOC 28th Assembly.

OceanTeacher and OceanTeacher Global Academy (2015)

In 2014-15 OceanTeacher – IODE’s Capacity Development (CD) tool – started the implementation of a new phase in Capacity Development. The new OceanTeacher Global Academy (OTGA), funded by the Government of Flanders (Belgium), aims at creating a network of Regional Training Centres (RTCs), thus moving from a centralized model to a distributed model for its CD activities.

The OTGA Project (2014-18) will:

- 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 the needs of the target region;
- promote the use of local experts as lecturers/training assistants by the RTCs;
- promote the collaboration between the RTCs by enabling (through advanced information technology) lecturers from multiple regions to contribute lectures; and
- further develop the use of the OceanTeacher Learning Platform.

During 2014 all candidate RTCs were visited and assessed for their adequacy to become part of the OTGA network of RTCs. The candidate RTCs spread across the globe, including Colombia, USA, Senegal, South Africa, Mozambique, Kenya, India, Malaysia, China and the already existing one in Belgium. In late 2014 a proposal from Samoa was also received.

In January 2015 the OTGA Steering Group (SG) met for the first time. During this meeting the partners had the opportunity to meet and discuss some of the challenges of the project, including that the number of RTCs is twice as many as expected (the project expected 5 RTCs, while 10 applications were received). The OTGA SG agreed on the following main activities for 2015:

- Each RTC to organise at least one training course on an IODE-related topic;

- Definition of an 'OTGA Global and Regional Communication and Outreach Strategy' (implementation to start early 2016);
- Launch the regional training needs surveys.

The OTGA SG will meet again during the first quarter of 2016.

During the 2014-2015 the OceanTeacher Learning Platform has been improved and expanded to include courses from other IOC Programmes, and it now includes specific sections for the Harmful Algal Bloom (HAB), Coastal and Marine Management and Planning (MPR/ICAM), Tsunami and JCOMM, besides IODE. Altogether, over 20 new courses were added in 2014-15.

In December 2014, during its 69th General Assembly, the UN Member States expressed their appreciation for IOC contribution towards CD through OT.

The OTGA SG calls for members from the SCOR community to contribute to OceanTeacher as lecturers.

IIOE-2

The IIOE-2 continues to be co-championed by SCOR, IOC and IOGOOS. This report does not repeat SCOR's input on IIOE-2, but mentions a few salient IOC specific points as a supplement.

IOC Executive Council (EC) June 2016, Again supported the IIOE-2, as effected via an EC Resolution on IIOE-2.

The IOC, through the Executive Secretary in his capacity as Co-Chair of the IIOE-2 Steering Committee, along with support of the IIOE-2 Australia Node of the IIOE-2 Joint Project Office, supported the IIOE-2, particularly the establishment of the Steering Committee for IIOE-2. Part of this support, included the Executive Secretary sending an IOC Circular Letter to IOC Member States calling for nominations for Chairs of the IIOE-2 Science Themes and Working Groups of the Executive Level of the IIOE-2 Steering Committee. Another Circular Letter was sent to the same constituents calling for nominations for Membership to those same Science Themes and Working Groups. The IOC continued to support IIOE-2 via the Australia Node of the IIOE-2 Joint Project Office, located within the IOC's Perth Programme Office (PPO). Part of that support included the Head of the IOC PPO as IOC IIOE-2 Coordinator, along with the IOC's 2016 cash allocation of \$25K USD from its central budget to support IIOE-2 via the Coordinator's function.