Intergovernmental Oceanographic Commission

INFORMATION REPORT OF THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC) of UNESCO TO THE ANNUAL MEETING 2021 OF SCOR

I. Introduction

This information report aims at providing information to the SCOR 2022 Annual Meeting on substantive activities of the Intergovernmental Oceanographic Commission (IOC) of UNESCO that align with SCOR's on-going or planned activities. Reference is also made to relevant activities in the context of the United Nations Decade of Ocean Science for Sustainable Development. The report does not include consideration of an institutional nature in relation to cooperation between IOC and SCOR.

The IOC and SCOR have long successfully cooperated and thereby strengthened research and scientific programmes:

- **Harmful Algal Blooms** – The current decadal IOC-SCOR research programme to meet societal needs in a changing world, entitled **GlobalHAB**, launched its science and implementation plan in 2017
- **Time Series** – IOC expert group to investigate Climate Change and Global Trends of Phytoplankton in the ocean, in particular the coastal ocean (TrendsPO, 2016) (the Group continues the comparative analysis and synthesis of long time series data sets compiled by **SCOR WG137**, and expands the focus not only to the continental shelf and open oceans, but **also to estuarine and upstream freshwater ecosystems**)
- The IOC working group on **Multiple Ocean Stressors** (2018), with leading contributions by members of the SCOR WG149
- **Open Science Conference on Eastern Boundary Upwelling Systems (EBUS): Past, Present and Future**
- **Integrated Ocean Carbon Research** (IOC-R, 2019) (through IOCCP)
- The joint **Second International Indian Ocean Expedition**

II. Activities involving close cooperation and coordination between IOC and SCOR

Harmful Algal Blooms
The IOC is coordinating and developing its work on HAB through the IOC Intergovernmental Panel on HABs (IPHAB). A number of Task Teams, working groups and activities are

operating and reporting to the IPHAB. A core activity is the development of a 'Global HAB Status Report' which is 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. The development of this report is intimately linked with the systematic compilation of HAB data in OBIS and the IOC Harmful Algal Event Data base HAEDAT and is funded by Flanders and cosponsored by the IAEA. The first Global HAB Status Report was launched June 2021. Data is compiled annually and online data updated..
The long-term focus of the IOC Harmful Algal Bloom (HAB) programme is on improved understanding of the factors controlling HAB events and thereby improving management and mitigation options. The scientific key questions have for more than a decade been addressed jointly with SCOR through research programmes. The current decadal IOC-SCOR research programme to meet societal needs in a changing world, entitled GlobalHAB, launched its science and implementation plan in 2017 (www.globalhab.info). GlobalHAB is reported on in detail directly by the GlobalHAB SSC.

Time Series
As from 2016, an expert group has worked specifically to investigate Climate Change and Global Trends of Phytoplankton in the ocean, in particular the coastal ocean (TrendsPO). The Group continues the comparative analysis and synthesis of long time series data sets compiled by SCOR WG137, and expands the focus not only to the continental shelf and open oceans, but also to estuarine and upstream freshwater ecosystems where perturbations from terrestrial, atmospheric, oceanic sources and human activities converge to cause changes that ramify across local and global scales. TrendsPO has a special issue of the Journal of Plankton Research in preparation for expected release 2022.

Index of Coastal Eutrophication, SDG 14.1.1
IOC-UNESCO supports the development of the indicators for SDG 14.1.1, for which UNEP is the custodian agency. A task force, which includes experts from the IOC-UNESCO Nutrients and Coastal Impacts Research Programme (N-CIRP), the UN Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection, supported by the Group on Earth Observation (GEO) Blue Planet, has been established to provide the technical expertise during the course of the development of the methodology for the indicator. The core focus of IOC-UNESCO is to contribute to the development of the Index of Coastal Eutrophication (ICEP). ICEP is expected to be fully developed for validation by end 2023.

Microplastics
Plastics form a large proportion of marine litter, and the widespread occurrence of macroscopic plastic debris and the direct impact this can have both on marine fauna and legitimate uses of the environment, sometimes remote from industrial or urban sources, has grown rapidly. Lately the existence of micro-plastics and their potential impact has received increasing attention. The extent of the impact of plastic litter in the oceans is uncertain, despite the considerable scientific effort that has been expended in recent years. GESAMP Working Group 40 on 'Sources, Fate and Effects of plastics and micro-plastics in the marine environment', led by IOC and UNEP, was initiated in 2012. The Working Group has recently published guidelines on how to monitor plastics in the ocean (read more here). The focus in 2019–2022 is on an overview of risks associated with marine plastic litter; environmental risk from nano- and microplastics; and human health risks associated with nano- and microplastics.

Deoxygenation
Deoxygenation is a global problem in coastal and open regions of the ocean, which 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 catalogued now. The recent expansion of hypoxia in coastal ecosystems has been primarily attributed to global warming and enhanced nutrient input from land and atmosphere. In order to improve the data availability and data quality of ocean oxygen data the members of the the IOC working group the Global Ocean Oxygen Network (GO2NE) contributed to planning of an ocean oxygen data portal and a corresponding white paper, which was published in December 2021. Further IOC continues to organize together with the members of GO2NE monthly webinars featuring young and senior scientists presenting the latest science on ocean and coastal deoxygenation. This webinar series continues to be a huge success with on average more then 100 participants. Over the past year scientists and other stakeholders from 95 countries joined. In addition, the IOC WG GO2NE succefully submitted a proposal for an Ocean Decade Programme – Global Ocean Oxygen Decade (GOOD). The planning of related activities started, such as stakeholder engagement and capacity development. A first GOOD newsletter was published in July 2022. In addition GO2NE contributed to a new OceanOPS report card focused on ocean oxygen, which was published in July 2021. The annual meeting was organized in May 2022 and meeting report was delivered. Furthermore, IOC supported the organization of the 53rd Liege Colloquium and co-organized one session and one panel discussion. Besides this IOC together with the GO2NE group is currently preparing the publication of 2-4 best practices papers and seeks to coordinate the data collection and data management of ocean oxygen data. A Steering Committee for the initiative is currently under construction. The IOC Secretariat together with GO2NE experts successfully submitted a session application for the ECCWO5 focusing on ocean deoxygention.

Multiple Stressors

The IOC working group, with leading contributions by members of the SCOR WG149, which now is a SCOR project, focusing on multiple stressors, established in 2018 met for the first time in March 2020 (online, due to the COVID-19 pandemic). The policy brief introducing the issue of multiple stressors on marine ecosystems – working title: ‘Ocean under Stress: A changing ocean at all locations’ is currently under preparation and was published in March 2022.

Open Science Conference on Eastern Boundary Upwelling Systems (EBUS): Past, Present and Future

IOC is actively engaged with the SCOR WG155, and a number of partners, in the organization of the “Open Science Conference on EBUS: Past, Present and Future Open Science Conference on EBUS” and the “Second International Conference on the Humboldt Current System”, to be held in Lima (Peru) 19-23 September 2022.

III. Other activities of actual or potential interest to SCOR

Ocean acidification

IOC actively supports ocean acidification science and observation at multiple levels. It hosts one part of the GOA-ON secretariat and co-organizes the activities under the GOA-ON Ocean Decade programme OARS. IOC has consolidated its role as leader in the field of research and observations underpinning the science base of SDG Target 14.3 - Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels. IOC has developed the indicator methodology for SDG 14.3.1, through collaboration with GOA-ON experts. Currently the indicator is classified as Tier II, however through activities such as continuous training of experts and capacity development among the responsible governmental bodies, it is expected that the number of datasets collected will increase and the indicator be upgraded. Together with its partners and the IOC sub-commissions, IOC will pursue the advancement of global OA observations and research, particularly in the areas in which such efforts are sparse, be it because of a lack of awareness, capacities, or access to technical resources. The Commission continues to foster capacity development and technical training in Member States using the newly developed OTGA introduction to ocean acidification. Furthermore, IOC will continue developing a federated data system to harvest

data from relevant national and international data centres, facilitating the data collection for the SDG indicator 14.3.1 and enabling experts to access data located in different places. In addition, IOC is co-leading the Informal preparatory working group for the Interactive Dialogue focusing on ocean acidification during the UN Ocean Conference. Additionally, multiple side events there and at the UNFCCC COP27 are envisaged. Another main activity will be the support to the 5th International Symposium on Ocean in a High CO2 World, planned for September 2022.

Blue Carbon
Coastal blue carbon ecosystems provide multiple ocean services, including long term carbon sequestration and food. However, destruction and degradation can make these ecosystems carbon dioxide emitters – turning them into carbon sources. IOC continues to support the Scientific Working Group of the Blue Carbon Initiative (BCI) in order to close existing knowledge gaps with regard to blue carbon ecosystems' carbon sequestration rates and storage, the spatial coverage of mangroves, seagrasses and tidal marshes, and new emerging blue carbon ecosystems, particularly species summarized under the term seaweed. The work of this WG will be complemented by the Policy WG and other awareness activities led by IOC's partners in the BCI, IUCN and Conservation International, as well as via the IOC's coordinating role in the International Partnership for Blue Carbon. IOC further engages in the development of a Blue Carbon Ocean Decade programme, which is expected to start in mid 2022. Topics addressed by this global endeavor will include: improved understanding of the net carbon removal potential of blue carbon habitats; support to evidence-based science-policy action for blue carbon habitat protection, restoration and creation, including the carbon sequestration and biodiversity aspects; improved understanding of land-sea connections for blue carbon ecosystem functioning and management; and emerging challenges as methane emissions and seaweed.

Integrated Ocean Carbon Research
The world ocean plays a critical role in the storage of carbon, including a very large portion of CO2 human-induced emissions. In addition to the role of plankton in the removal of seawater carbon into the deep ocean through the process referred to as the "biological pump", there is a need to understand and quantify the role of microbial processes in forming refractory dissolved carbon (r-DCO) and how this acts as a sink or a source of carbon, depending on location and conditions. The IOC working group on Integrated Ocean Carbon Research investigates all dimensions of ocean carbon, in support of the work of IOCCP, SOLAS, IMBeR, WCRP-CLIVAR, the Global Carbon Project, IPCC, and UNFCCC. It further includes the science underpinning sustainable management solutions in support of the UN Decade of Ocean Science for Sustainable Development's Challenge 5. IOC-R has already provided the theoretical science basis to develop a global network of surface ocean C observations, and additional similar efforts are planned for the deeper ocean and coastal areas. In the biennium, the IOC-R initiative will result into a Decade programme, reaching out further to other stakeholders than the scientific community.

Invasive alien species and other ocean stressors: Furthering the scientific knowledge and capacity basis in the Canary Current Large Marine Ecosystem (CCLME)
Since 2013, the IOC has worked in the implementation of the project *Enhancing oceanography capacities in the CCLME Western Africa countries*. The overall goal of its third phase (2018-2020) was to improve the existing knowledge on the possible effects of climate change on the Canary Current Eastern Boundary Upwelling System (EBUS) and to continue building regional science capacity in such knowledge. The inherent variability of EBUS poses indeed large challenges in projecting their responses to climate change and other ocean stressors. This has a direct impact on food security, livelihood systems of local populations, and economies.
Human-induced impacts add a layer of complexity to the systems. A new project has been recently approved, being funded by the Spanish Agency for International Cooperation

development (AECID). The project aims at furthering the scientific knowledge and capacity basis in the CCLME by adding a focus on the effects of multiple ocean stressors to the knowledge base of the Canary Current system. This new focus will include a collaborative approach to the question of invasive alien species (IAS), its connection with other ocean stressors, and assessment of and implications of IAS and other ocean stressors in the region. The project will facilitate the creation of an IAS group of experts and will provide improved access to scientific data, information and knowledge produced. Further, the project will contribute to science-based management of the CCLME by facilitating the co-design of a collaborative action in the context of the Ocean.

UN Decade of Ocean Science for Sustainable Development

The first 18 months of implementation of the Ocean Decade has represented a period of intense activity. After a successful launch in January 2021, in June 2021 the first results of the first Call for Decade Actions (No. 01/2020) that solicited close to 250 potential Decade were announced, with other announcements following throughout the period as submissions were analysed and endorsement decisions made. The second Call for Decade Actions No. 02/2021 was launched in October 2021 and closed on 31 January 2022. This Call solicited programmes contributing to Ocean Decade Challenges related to marine pollution, ecosystem management and restoration, and the ocean-climate nexus and solicited projects for 25 endorsed Programmes. In addition, funding streams from the AXA Research Fund and the MeerWissen Initiative were integrated into the Call for Decade Actions via a sponsored Call for Decade Actions mechanism. 38 Programme submissions and 134 project submsisions from lead partners in 33 countries were received in response to this Call. Approximately 70 additional submissions were received in response to the sponsored elements of the Call. To date, over 240 Decade Actions have been endorsed through the first Call for Decade Actions. These Actions cover all ten Ocean Decade Challenges and are being implemented by lead partners from over 40 countries.

The third Call for Decade Actions No. 03/2022 was launched on 15 April 2022 and is soliciting programmes contributing to Ocean Decade Challenges related to sustainable blue food and sustainable ocean economy, as well as projects for 16 endorsed Decade programmes. This Call also solicits in-kind or financial contributions to support Decade Actions in Africa and Pacific SIDS.

The newly formed Decade Advisory Board was convened in January 2022 for an initial briefing session and then met in-person for its first operational meeting in March 2022. At this meeting, the Board discussed recommendations related to the endorsement of Decade programmes from Call for Decade Actions No. 02/2021 and discussed a range of strategic issues related to measuring progress of the Decade, resource mobilisation, the role of indigenous and local knowledge in the Decade, and the means of increasing engagement of Small Island Developing States and Least Developed Countries.

28 National Decade Committees have been created and six regional taskforces are convening partners in the development and operationalisation of regional Action Plans and programmes. An African regional taskforce is being established to oversee implementation of the Ocean Decade Africa Roadmap. Five Decade Collaborative Centres have been endorsed as decentralized coordination hubs for the Decade.

Meetings of informal working groups on communications, technology and innovation, and monitoring and evaluation provided valuable input during this period. A Data Coordination Group was established in December 2021 to support development and operationalisation of the data, information and knowledge strategy for the Decade. The Ocean Decade Expert

Roster has been established to create a pool of experts to assist the IOC Secretariat with the identification of strategic targets for Ocean Decade Challenges, in the review of Decade programme submissions, and in regular review processes of the Decade.

There were intensive stakeholder engagement and outreach efforts during this period. In-person or hybrid events focusing on different aspects of the Ocean Decade were held at the IUNC World Conservation Congress (Marseille, September 2021), UNFCCC COP 26 (Glasgow, November 2021), and Monaco Ocean Week (Monaco, March 2022). The Ocean Decade had a central role in the One Ocean Summit in Brest, February 2022 and the 2022 UN Ocean Conference (Lisbon, June 2022). The revamped Ocean Decade website was launched in October 2021 and incorporates the Global Stakeholder Forum, an online community platform for exchange and collaboration which has over 4000 registered users. The GenOcean communications campaign was launched on 4 April 2022 and is the public facing communications campaign of the Decade that aims to incite the general public to take action based on enhanced ocean knowledge.

Mobilisation of resources remains a key challenge for the Decade during the transition from the planning phase to the action phase. The Ocean Decade Alliance has grown during this period and now numbers nine Patrons and fifteen institutional members. There have been significant efforts to engage philanthropic Foundations during this period, and an in-person meeting of the Foundations Dialogue was held from 1 – 3 June 2022 in Rabat, Morocco hosted by the Foundation Mohamed VI for the Protection of the Environment.

5

IV. Potential future IOC and SCOR cooperation

- **IOC comments on the new SCOR WG proposals**

  Of the 2022 SCOR Working Group Proposals two proposals in particular offer synergies with current priorities of IOC and would address so far unaddressed aspects and add momentum to progress in the respective research fields. This being noted bearing in mind SCOR's careful process for assessing and rating each proposal.

2.1.5. DEveloping Repositories for carbon FLUX quantification: Th-234 as a case study (**DEPOFLUX**) [Proposal]

2.1.7. Impact of biotoxins on marine apex predators in Upwelling Systems (**ToxMAP**) [Proposal]