



SCOR Annual Meeting 2023

17-19 October 2023

Guayaquil, Ecuador

Wyndham Guayaquil Puerto Santa Ana (Hybrid Format)

Salon Las Peñas

<https://scor-int.org/events/scor-2023-annual-meeting/>

Block Agenda

| | Mon, 16 October | Tues, 17 October | Wed, 18 October | Thurs, 19 October |
|-----------|---|--|--|--|
| AM | SCOR Executive Committee Closed Meeting | Opening of 2023 meeting: Reports from SCOR President, SCOR Executive Director, SCOR Capacity Development Committee, ad hoc Finance Committee | Reports from current SCOR Working Groups and projects (remote presenters) | Reports from SCOR Partner Organizations Meeting Summary |
| PM | SCOR INOCAR Symposium on Marine Sciences in Ecuador | Discussion of new working group proposals Reports from affiliated organizations | Reports from current SCOR Working Groups and projects (remote, in person, and recorded presenters) Reports from Affiliated Projects | SCOR Executive Committee Closed Meeting |

SCOR Annual Meeting Day 1. Tuesday, 17 October 2023.

Chair: Sinjae Yoo / Note taker: Peter Croot

| Time | Topic | Presenter |
|--------------|---|--|
| 9:00 | Welcome and introduction to agenda In Memoriam | Yoo |
| 9:15 | Report from SCOR President | Yoo |
| 9:30 | Report from SCOR Executive Director | Twigg |
| 9:45 | Report from SCOR Capacity Development Committee | Zitoun |
| 10:00 | Report from the SCOR ad hoc Finance Committee | Myers |
| 10:15 | <i>Presentation of new Working Group proposals:</i> Each presentation will be 10 minutes , plus time for questions (3-5 minutes) following each presentation. Coordinating the Development of Gridded Four-Dimensional Data Products from Biogeochemical-Argo Observations (4D-BGC) Assessing Microplastic Impacts & Transport in Upwelling Systems (AMITUS) | Cheah Peeken |
| 10:45 | BREAK (30 minutes) | |
| 11:15 | <i>Presentation of new Working Group proposals, Continued:</i> Data Insight through the Value of Eco-marine-robotics (DIVE) Foraminifera in Extreme and Rapidly Changing Environments (FIERCE) Fine-scale near-surface stratification in the Polar Oceans (FINESS) Global Library of Underwater Biological Sounds (GLUBS) Towards best practices for Measuring and Archiving Stable Isotopes in Seawater (MASIS) Monitoring Ocean Health: Assessing the global state and trend in phytoplankton biomass and biodiversity (MOHealth 2024) NEw physiological Metrics for Oceanography from 'Omics (NEMOO) | Moran Sicre Aliani Moran Croot Gobin Yoo |
| 13:00 | LUNCH (60 minutes) | |
| 14:00 | <i>Presentation of new Working Group proposals, Continued:</i> Oceanic Salt Intrusion into Tidal Freshwater Rivers (SALTWATER) Studying Worldwide Impacts of Calcification Trends on CHanging Climate (SWITCH) TRACE element SAMplers and sensORS, A step change to observing and understanding trace metal biogeochemistry in the ocean (TRACESAMORS) | van Haren Aliani Croot |
| 14:45 | <i>Ranking and discussion of new Working Group proposals</i> | SCOR Executive and National Committees |
| 15:30 | BREAK (30 minutes) | |

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|-------|---|--|
| 16:00 | Ranking and discussion of new Working Group proposals, Continued | |
| 16:30 | Affiliated organizations reports (Part 1) IABO – Biological Oceanography IAPSO – Physical Oceanography IAMAS – Meteorology and Atmosphere | Gobin van Haren Penner (Recording) |
| 17:00 | Adjourn for the day | |

SCOR Annual Meeting Day 2. Wednesday, 18 October 2023.

Chair: Sinjae Yoo / Note taker: Peter Croot

| Time | Topic | Presenter / EC liaison |
|-------|--|--|
| 9:00 | Introduction to Day 2 session WG and project presentations will be 5-8 minutes , followed by time for questions following each presentation and comments/recommendations by EC liaison. | Yoo |
| 9:10 | Group 1. Presenters joining remotely from Asia WG 148 IQuOD | Cheng/van Haren |
| 9:20 | Group 2. Presenters joining remotely from Europe GEOTRACES – Trace elements and isotopes IMBeR – Integrated Marine Biosphere Research SOLAS – Surface Ocean-Lower Atmosphere Study GlobalHAB – Global Harmful Algal Blooms IOCCP – International Ocean Carbon Coordination Project | Casciotti/Croot Claydon/Aliani Guieu/Flossmann Berdalet/Yoo Telszewski/Moran |
| 10:30 | BREAK (30 Minutes) | |
| 11:00 | Group 2. Presenters joining remotely from Europe, Continued WG 152 ECV-Ice WG 159 DeepSeaDecade WG 161 ReMO WG 166 DMS-PRO WG 167 RUSTED | Fripiat/van Haren Hilario/Gobin Robinson/Gobin Galí Tàpias & del Valle/Peeken Perron/Sicre |
| 12:00 | Group 3. Presenters joining remotely from North and South America SOOS – Southern Ocean Observing System IQOE – International Quiet Ocean Experiment | Schloss /Cheah Tyack/Uku |

| | | |
|-------|---|---|
| | JCS – Joint Committee on Seawater WG 155 EBUS WG 165 MixONET | Pawlowicz/van Haren Escribano/Sicre McManus/Peeken |
| 13:00 | LUNCH | |
| 14:00 | Group 3. Presenters joining remotely from North and South America, Continued WG 163 Clce2Clouds WG 157 MetaZooGene WG 160 ATOMIX | Steiner & Willis/Croot Recording (O'Brien)/Gobin Recording (Bluteau)/van Haren |
| 14:30 | Group 4. Recorded presentations COBS – Changing Ocean Biological Systems WG 156 Chlorophyll Fluorescence WG 158 C-GRASS WG 162 OASIS WG 164 ConCENSUS | Recording/Yoo Recording/Uku Recording/Aliani Recording/Peeken Recording/Gobin |
| 15:15 | BREAK (30 Minutes) | |
| 15:45 | Group 5. Presenters on site (EC liaison or attending member) IIOE-2 – Second International Indian Ocean Expedition WG 150 TOMCAT WG 151 FeMIP WG 153 FLOTSAM | Sicre Cheah Tagliabue/Moran Aliani/Peeken |
| 16:30 | Affiliated Projects IOCCG InterRidge | Lovindeer/Yoo Lee/Cheah |
| 17:00 | Adjourn for the day | |

SCOR Annual Meeting Day 3. Thursday, 19 October 2022.

Chair: Sinjae Yoo / Note taker: Peter Croot

| Time (am) | Topic | Presenter / EC liaison |
|------------------|--|---|
| 9:00 | Introduction to Day 3 session Presentations will be 5-8 minutes , plus time (~2-5 minutes) for questions following each presentation and comments/recommendations by EC liaison. | Yoo |
| 9:10 | <i>Partner organization updates</i> IOC – Intergovernmental Oceanographic Commission GESAMP WG 38 – Atmospheric Input of Chemicals to the Oceans POGO – Partnership for Observation of the Global Ocean SCAR – Scientific Committee Antarctic Research Future Earth-OceanKAN PICES - North Pacific Marine Science Organization WCRP / CLIVAR – World Climate Research Program ISC – International Science Council | Sicre Jickells /Aliani Krug /Aliani Griffin /Peeken Alexandroff /Twigg Recorded (Chiba) /Moran Recorded /Flossmann Visbeck /Sicre |
| 10:30 | BREAK (15 minutes) | |
| 10:45 | <i>Partner organization updates, Continued</i> | |
| 11:00 | Future SCOR meetings: <ul style="list-style-type: none"> • Qingdao, China 2024 • Colombia 2025 • Host for 2026? | Open discussion |
| 11:15 | Summary of recommendations and close of general meeting | Yoo |
| 12:00 | LUNCH (60 minutes) | |
| 13:00 | SCOR closed Executive Committee meeting | Executive Committee |

SCOR Annual Meeting 2023

ANNOTATED AGENDA

Tab 1 - Opening topics

1.1. Welcome and Introduction to the agenda - Yoo

Welcome to the second hybrid mode meeting of the SCOR annual meeting. We will have participants meeting in person in Guayaquil, Ecuador as well as online from many time zones. The purpose of the annual meeting is for SCOR to select new working groups to fund, to receive updates and provide recommendations or advice to working groups and projects, and to hear about the activities of partner organizations. These presentations also provide an opportunity for the SCOR community to learn more about the activities of the projects and partners.

The agenda and written reports and presentations are available to review in advance of the meeting on the annual meeting webpage (<https://scor-int.org/events/scor-2023-annual-meeting/>). Presentations have 10 minutes including presentation and Q&A. In some cases, reports will be made via recording or via the SCOR Executive Committee monitor.

In Memoriam – Obituary for scientists involved with SCOR

SCOR pays tribute to the life and contributions of members of the oceanographic community who passed away in the last year:

Dr. Patricio Bernal (Chile) – 11 October 2022

Patricio Bernal (Chile) was the Science Director for the CSIRO-Australia program on Coasts and Oceans, and a researcher at the Faculty of Biological Sciences of the Pontificia Universidad católica de Chile. He was a full member of SCOR WG #73 on Ecological Theory in Relation to Biological Oceanography, and he was the Executive Secretary for the IOC-UNESCO. At IOC, he pushed the development of a global tsunami warning and mitigation system, and was instrumental in launching the Assessment of Assessments of the ocean, paving the way to the current series of the UN World Ocean Assessments.

Prof Will de Ruijter (The Netherlands) – 12 January 2023

Dr. Will de Ruijter (The Netherlands), was a Professor in physical oceanography at the Institute for Marine and Atmospheric Research (IMAU) of Utrecht University, The Netherlands. He was a full member of SCOR WG #136 on Climatic Importance of the Greater Agulhas System. His colleague Thomas Röckmann, Director of IMAU nstitute for Marine and Atmospheric research Utrecht, Department of Physics, Utrecht University, wrote: "Over his long and eminent career, Will has made landmark contributions on a broad range of topics, including the dynamics of currents and fronts in the Dutch coastal zone and, in particular, the Agulhas System off South Africa. Will leaves a large legacy in the Physical Oceanography, Coastal Oceanography and Climate research fields through his scientific papers, through his students, and through his national and international leadership. Many were strongly influenced by his great physical intuition, broad vision and kind personality. He will be sorely missed."

Prof Mathieu Rouault (South Africa) – 17 January 2023

Mathieu Rouault (South Africa) was the director of the Nansen Tutu Center for Marine Environmental research and an associate professor in the Department of Oceanography, University of Cape Town. He was also the president of the South African Society for Atmospheric Science. In 2002, he was a POGO-SCOR fellow joining the PIRATA (Pilot Research Moored Array in the Tropical Atlantic) FR11 cruise, and receiving training in all aspects regarding deployment of the ATLAS system. His research was focused on ocean atmosphere interaction from numerical modelling to experimental work at sea, from meteorology and physical oceanography to climatology and the impact of climate change and variability on marine ecosystems and water resource. His colleague Juliet Hermes wrote: "... his work on air-sea interaction over the Agulhas was seminal. The oceanographic community in South Africa are all shocked and saddened by his untimely passing."

Prof. Bjorn Sundby (Canada) – 23 January 2023

Prof. Bjorn Sundby was a retired Professor from the Université du Québec à Rimouski (UQAR) and adjunct professor from McGill University in Canada. Bjorn served SCOR as Secretary between 1996 and 2000, as SCOR President between 2004-2008, and as SCOR Past-President between 2008 and 2012. He was a SCOR Nominated Member for Canada serving the Canadian SCOR Committee as Secretary between 1996-2000 and as Chair between 2003-2006.

Bjorn earned his PhD in physical organic chemistry from the University of Bergen (Norway) in 1966 and then moved to Dalhousie University in Halifax for a postdoctoral position. He was an oceanography research associate at UQAR from 1974 to 1980, and became Professor of Oceanography from 1980 to 1984. He was head of the Department of Chemical Oceanography and Marine Pollution at the Netherlands Institute for Sea Research from 1984 to 1987, and later on the Director of the Physical and Chemical Oceanography Branch at the Maurice Lamontagne Institute, Department of Fisheries and Oceans, Canada. He was Professor of Oceanography at the Institut des Sciences de la Mer de Rimouski (ISMER) associated to the UQAR from 1992 to his retirement in 2010, and an adjunct professor at McGill University in Montreal. His major scientific contributions are related to the importance of manganese to marine biogeochemistry, and how coastal sediments act as an important source of manganese for the deep ocean.

As pointed out by Cédric Magen, Bruno Lansard & Sean A. Crowe in their preface to Bjørn Sundby's Special Issue of Aquatic Geochemistry, Bjørn worked on a broad array of topics, including the marine phosphate cycle, processing of organic matter in permeable and soft sediments, transient diagenesis, the use of redox tracers as paleo indicators, micro-scale redox cycling in the rhizosphere, and the development of Au/Hg amalgam microelectrodes for measuring redox species at fine spatial scales. Through his extensive service to SCOR, Bjorn contributed to shape the focus of international oceanographic research and inform marine policy.

Prof. Miguel Dino Fortes (Philippines) – 30 April 2023

Dr. Miguel Dino Fortes (Philippines) was a Professor at the University of the Philippines, and a full member of WG #158, Coordinated Global Research Assessment of Seagrass System (C-GRASS). Miguel (Mike) was a tireless advocate for seagrasses, the people who depend on them, and for building the seagrass community of practice globally. Emmett Duffy, the co-chair of WG #158 would recall a moment during a C-GRASS meeting, with many small faces on the zoom screen, when Miguel greeted everyone by saying "Hello, beautiful people!" To Emmett, that set the mood in an important way for the WG interactions and he will strive to keep his example in mind. Miguel was the author of Seagrasses: A

resource unknown in the ASEAN, which was inspirational for generations to come working in seagrass beds and their relation to food security.

Prof. Vera Alexander (USA) – May 2023

Prof. Vera Alexander (USA), was a retired Professor of the University of Alaska Fairbanks. She was a member of the Scientific Steering Committee of the Census of Marine Life project, which was affiliated to SCOR from 2000 to 2010. In 1965, Vera was the first woman to earn a Ph.D. from the University of Alaska Fairbanks. She pursued field science, became the director of Institute of Marine Science, and the first dean of the College of Ocean Sciences and Fisheries.

Her distinguished scholarship, stewardship of marine science and influence in marine policy, has been recognized and honored nationally and internationally. Among her many achievements were 16 years of service on the Marine Mammal Commission, 12 years on the International Scientific Steering Committee of the Census of Marine Life, service as a founder, delegate and chair of the North Pacific Marine Science Organization (PICES), and the development and launch of the Research Vessel Sikuliaq.

1.2. Report of the SCOR President - Yoo

Since the last annual meeting in Busan in 2022, the Executive Director and Executive Committee have diligently worked to support and maintain various SCOR activities. Many SCOR activities have been restored to the state of pre-Covid time. I am pleased to report to you that SCOR is making every effort to advocate ocean science. As for myself, I attended the 32nd Session of the IOC Assembly held in June 2022 in Paris. During the meeting, progresses in various activities of IOC have been reported, the UN Ocean Decade in particular. The UN Ocean Decade has established many Decade Actions addressing the Ocean Decade Challenges. In the IOC Assembly, SCOR made a statement that it will keep supporting the Ocean Decade. Last year, I reported that SCOR participates in the proclamation of an International Year of Basic Sciences for Sustainable Development (IYBSSD) as a member of its SSC. IYBSSD has completed one full year of planned activity. In July I appeared in a talk show in KBS, a national TV network in Korea. I talked about climate change and marine ecosystems in this science communication program. In September, I gave a keynote speech on SCOR's activities at a conference commemorating the 50th anniversary of KIOST. I am participating in the panel of External Review of PICES (North Pacific Ocean Science Organization). This panel will assess its achievements and make recommendations for the future directions of the ocean science organization.

1.3. Report of SCOR Executive Director - Twigg

The Executive Director will provide an overview of the activities conducted under SCOR based on the reports received in advance of the annual meeting, as well as the activities of the Secretariat.

1.4. SCOR compiled capacity development activities - Zitoun

SCOR capacity development activities include a visiting scholar program, the POGO-SCOR fellowships, travel support to scientists from developing countries to attend meetings and conferences, and the Regional Graduate Networks in Oceanography. Additional capacity development activities are carried out by the SCOR projects through Summer Schools. The 2023 activities under these programs will be reviewed at the annual meeting.

SCOR also builds capacity through the encouragement of early-career and developing country scientists in SCOR Working Groups and projects.

1.5. Report of the 2023 ad hoc Finance Committee -

The ad hoc Finance Committee is comprised of nominated members who do not serve on the Executive Committee. Núria Casacuberta Arola (Switzerland), Marcela Cornejo D'Ottone (Chile), Dan Costa (USA), Brett Molony (Australia), and Paul Myers (Canada) compose the 2023 committee. They will report on their task to (1) review the 2022 auditor's report of SCOR's Finances, (2) review the final 2022 budget, (3) consider approval of the 2023 revised budget, (4) consider approval of the 2024 draft budget (including recommending how many working groups can be selected in 2023), and (5) determine dues increases for 2025.

Tab 2 - Working Groups

2.1 New Working Group proposals

2.1.1. 4D-BGC: Coordinating the Development of Gridded Four-Dimensional Data Products from Biogeochemical-Argo Observations - Cheah

Substantial advances in oceanographic observation have been made in recent decades, allowing scientists to address questions relating to ocean physics and biogeochemistry on previously unattainable spatial and temporal scales. Remote sensing technology (1970s-pres.) has enabled highly resolved views of surface ocean properties and the Argo array (2000s-pres.) has generated unprecedented ocean interior temperature and salinity observations. The Biogeochemical (BGC) Argo array has grown over the early 21st century, and its planned expansion will soon generate ocean interior carbon, oxygen, nutrient, and optical data with near-global coverage. Fourdimensional (4D; latitude × longitude × depth × time), gridded, and gap-filled data products of these ocean interior properties are being developed. These products will enhance data accessibility and ease data interpretation, transforming our understanding of ocean biogeochemical processes such as carbon fixation, export and remineralization, ocean acidification, deoxygenation, and nutrient cycling. Regular updates to these 4D-BGC products will allow scientists and decisionmakers to monitor changes to important biogeochemical processes in near-real-time. We propose a SCOR working group to facilitate discussion and coordination among different scientific communities around developing, validating, and distributing 4D-BGC products from observational datasets, with a focus on the BGC-Argo array. The emphasis on international and cross-disciplinary collaboration, aimed at addressing global oceanographic challenges, makes this topic highly suitable for a SCOR working group. The ultimate goal of this initiative is to significantly enhance access and utility of BGC observations through 4D-BGC products, and thus refine our understanding of ocean biogeochemistry, improve models and reanalysis products, and inform policy decisions.

2.1.2. Assessing Microplastic Impacts & Transport in Upwelling Systems (AMITUS) - Peeken

Upwelling Systems (UpS) are a key bridge between land, the open ocean, and the troposphere, with transport potential for microplastics. Here we focus on major UpS with significant exposure to plastics pollution; the eastern boundary UpS of the California, Humboldt, Canary, and Benguela Currents, and the seasonal upwelling system in the Gulf of Guinea (Fig. 1). Rivers and coastlines in UpS-bordering countries contribute tens of thousands of metric tons of plastic pollution per country each year to the ocean, but how much of this plastic arrives in the open ocean, in what form and by what pathways, remain open questions. In addition, because of their high biological productivity, which attracts commercial fishing activity, oceanic sources of plastic pollution in UpS could be significant. Satellite data indicate the UpS are hotspots of microplastics contamination. But baseline measurements of microplastics contamination of the water column are lacking in all UpS. Preliminary observational work suggests that high biological activity in the UpS could exacerbate and amplify microplastic biogeochemical impacts in these regions of commercial importance. Global ocean modeling tentatively confirms this, with global biogeochemical consequences that might rival the impacts of climate change. Given their potentially large role as a microplastic source to the Earth system, their vulnerability and economic importance, from a global perspective, it is important to understand how plastic pollution is impacting these systems and what mechanisms control its flow through them. This is the aim of AMITUS, which will bring together experts for a global synthesis.

2.1.3. Data Insight through the Value of Eco-marine-robotics (DIVE) - Moran

New observational robotic platforms significantly enhance ocean observations and have the potential to fill the crucial data gaps near shore, off-shore and in the deep sea, as they are capable of reaching some of the most remote areas of the planet. However, these platforms are missing fundamental elements that are limiting their wide-spread adoption by marine scientists: cost, ease of operation, data validation, overall standardisation and interoperability. The primary outcome of an observational oceanographic mission are data and physical samples, but data policies applied in ocean sciences are not fully adopted in marine robotics, possibly compromising the quality of the data and limiting its broad use. This is because of the lack of data standards in marine robotics research. DIVE aims at advancing best practices used in the marine sciences data management and at ensuring their implementation by the marine robotics community. These practices will include categories such as mission planning strategies, operational procedures, sensor configurations, data formats and post processing standards. Within these categories, there will be instances of calibration and logging requirements, as well as data treatment and processing protocols, and finally dataset publication guidelines. Marine robot capabilities and the needs of oceanographic observations are continuously evolving; this co-evolution poses a considerable challenge when establishing comprehensive data and observational standards. Ultimately, inspired by successful programmes such as Argo, DIVE will explore existing standards that can be harmonised and established within internationally recognised bodies such as ISO (International Organization for Standardization) or IEEE (Institute of Electrical and Electronics Engineers).

2.1.4. Foraminifera in Extreme and Rapidly Changing Environments (FIERCE) - Sicre

Information contained in foraminifera shells is essential for understanding Earth's past climate system. Most foraminiferal proxies (indicators of, for example, temperature, productivity, or seawater chemistry) and calibration efforts have focused on tropical-subtropical planktic species that live primarily in the

sunlit ocean. There are limited foraminiferal proxies from species that occupy deeper habitats (below the sunlit mixed layer to ~1000m) and more 'extreme' environments currently experiencing rapid climate change (i.e., oxygen minimum zones, the ice-ocean interface, high-latitudes). The lack of proxies in deeper and extreme environments limits our ability to reconstruct past conditions and hampers future climate change prediction efforts in these regions. The multi-disciplinary FIERCE WG will test and fine-tune state-of-the-art research methods for studying FIERCE species at a workshop in Peru and with WG members in the Norwegian Arctic. A robust synthesis of research methods will be developed into best practice 'standard operating procedures' (SOPs) for studying FIERCE species, to be published in an open-access, online platform. The SOPs will be broadly applicable to all planktic species and many benthic foraminifera, which expands the outcomes of this project beyond FIERCE species. Our focus on foraminifera from understudied habitats will improve our understanding of the biology and ecology of planktic foraminifera living in these environments, closing a critical research gap, and vastly expanding the utility of fossil foraminifera beyond the ocean's sunlit mixed layer. Given the interdisciplinary and international nature of our vision, a SCOR working group is the best and most practical choice to achieve the proposed goals.

2.1.5. Fine-scale near-surface stratification in the Polar Oceans (FINESS) - Aliani

Summer sea-ice and snow melt in the Arctic can result in persistent, thin (< 1 m) meltwater layers under and around ice floes, with observations, albeit limited, going back to Nansen's Fram expedition in 1893. Similar layers have also been observed in the Antarctic sea-ice zone (e.g., Zemmelen et al., 2005), but they show much greater variability in duration and extent. In addition, increased freshwater release into the polar regions from glacial melt and riverine input can impact the coastal environments of Greenland, the Siberian Arctic, and Antarctica. The importance of such layers for many aspects of the Arctic system have recently been highlighted with interdisciplinary observations in pack- and landfast sea-ice. Yet historically, such observations are poorly described in the literature and measurements are challenging without disturbing the stratification. In particular, the current lack of representation of such thin meltwater layers in global and regional models is a significant limitation in understanding the climate system. This working group will synthesize the most important impacts of fine-scale salinity stratification in polar regions, and how they influence globally-relevant processes associated with exchange of gases, aerosols and energy across the water-ice-air interface. We will use existing observations to evaluate our current knowledge on physical, biological and chemical processes and facilitate recommendations on future observations, sampling and parameterizations in global climate models. We will build and strengthen existing cross-cutting relationships in this field through regular online meetings, and a series of workshops discussing new observations and relationships with existing datasets.

2.1.6. Global Library of Underwater Biological Sounds (GLUBS) - Moran

Aquatic environments encompass the world's most extensive habitats, rich with sounds produced by a diversity of animals. Passive acoustic monitoring is an increasingly accessible remote sensing technology that represents an unprecedented, non-invasive method to monitor these environments. Detection of sound-producing species assists in mapping their spatiotemporal distribution and biologically important areas. With worldwide biodiversity in significant decline and underwater soundscapes being altered as a result of anthropogenic activities, there is a need to document, quantify, and understand biotic sound

sources—potentially before they disappear. A vital step towards these goals is the development of an accessible platform that: 1) integrates and expands existing repositories to provide a global reference library of known and unknown biological sound sources; 2) houses a data repository portal for annotated and unannotated audio recordings; 3) develops artificial intelligence tools to extract and characterize sounds; 4) includes benchmark training datasets for signal detection and classification; and 5) promotes public awareness of aquatic sound. Although individually, these resources are often met on regional and taxa-specific scales, many are not sustained, and collectively, an enduring global database on an integrated platform has not been realized. A Global Library of Underwater Biological Sounds will address this by developing applications to complete items 1 to 4 and, in doing so, engage the general public through associated reference material. To complete this, our working group, currently placed under SCOR's working group 'International Quiet Ocean Experiment', includes expertise of bioacousticians, bioinformaticians, propagation experts, web engineers, and signal processing specialists (e.g., artificial intelligence).

2.1.7. Towards best practices for Measuring and Archiving Stable Isotopes in Seawater (MASIS) - Croot

The stable isotopic composition of seawater and the carbon isotopic composition of dissolved inorganic carbon are essential ocean tracers that have been widely measured since the 1960s. They are particularly important to measure well in times of wide-spread changes in the hydrological cycle, the biogeochemical cycles, as well as the anthropogenic carbon penetration and induced acidification of the oceans, because they serve as a fingerprint of these ongoing changes. However, substantial issues of data collection, quality control, and compilation exist: common reference materials in seawater are not widely available, analysis methods have strongly diversified, regular intercomparison exercises are lacking, and as a result, large differences exist between different data sets. These differences currently prohibit the community from making full use of the potential of stable isotopes to identify climatic changes. This working group is dedicated to remedying the current issues of data collection, quality control, and compilation of stable isotopes in seawater. First, we will assess the validation stage of the available stable isotopic datasets, as well as corresponding metadata. This effort will lead to a report of best practices from sample collection to measurement and quality control. Second, we will review current methods of bias adjustment in archives and make recommendations for the future to standardize these bias adjustments. Third, we will work towards complementing existing databases, with particular effort on surface ocean sampling data. In parallel with the aforementioned efforts, the working group will promote intercomparison exercises, and will actively carry out capacity-building.

2.1.8. Monitoring Ocean Health: Assessing the global state and trend in phytoplankton biomass and biodiversity (MOHealth 2024) - Gobin

During the Anthropocene our biosphere has been increasingly impacted by humans including significant impacts on ocean ecology (Bindoff et al., 2019). The cumulative impacts of these changes are not well predicted by even our most sophisticated models. There is a fundamental need for a monitoring program that allows these impacts to be observed. We require the data and tools to assess the impacts of these changes and guide responses including efforts to ameliorate, mitigate and manage. Wide consultation within the oceanic community has developed the essential ocean variables (EOVs) needed to underpin global oceanic monitoring (Miloslavich et al., 2018) including some for phytoplankton (Muller-Karger and

Kudela 2016). The current monitoring methods need a systematic review to ensure they are fit for purpose. This proposal is for a SCOR WG to review, further develop, test, and refine a set of plankton measurements that are a robust, reliable, and quantitative description of the state and trends in the ecological health of our oceans.

2.1.9. NEw physiological Metrics for Oceanography from 'Omics (NEMOO) - Yoo

The need to understand how ocean global change affects marine life has exposed gaps in our knowledge of fundamental principles. Although molecular biological techniques, particularly 'omics (genomics to proteomics), now dominate research in biological oceanography, physiological research has stagnated, leading to the assumption that physiology is outmoded. However, biological rates and biogeochemical fluxes remain the main currencies in biogeochemistry (BGC) models in which microbes play a central role. The question we aim to address – with a focus on marine microbes – is how to translate 'omics-based information on physiological potential into quantifiable physiological rates, and ultimately into BGC processes that can be represented in Earth system models. While 'omics has revealed patterns in marine microbial diversity and metabolic pathways, it largely provides only static snapshots of physiological potential. Studies that weave 'omics and physiological rates together provide greater insights and improved mechanistic understanding. But despite these advances, there is widespread frustration about the paucity of physiological metrics, as most of these metrics were devised before the molecular biology revolution. To improve our understanding of the roles of marine microbes in biogeochemical cycles, we need better tools to quantify physiological activity. Physiological rates quantify the integrated activity of proteins that drive marine BGC cycles and can bridge the gap between 'omics and biogeochemistry. We propose the development of a community and framework for co-designing physiological metrics as currency converters to link 'omics datasets and BGC models, a central aim of the international BioGeoSCAPES program.

2.1.10. Oceanic Salt Intrusion into Tidal Freshwater Rivers (SALTWATER) – van Haren

About two-thirds of global freshwater supplies come from surface waters such as the tidal fresh region of estuaries. Although much is understood of the salt transport by residual circulation and shear dispersion in the mesohaline region of estuaries, little is understood of the salt transport in the oligohaline and tidal fresh regions of estuaries where tidal dispersion and river flows are expected to be more important. This gap in scientific understanding has recently been exposed in a number of headline news reports on the salt contamination of drinking water supplies in tidal rivers. Three outstanding issues have been identified. First, there is a paucity of observational data to document the salt intrusion into tidal rivers. Second, the riverine/seawater mixture includes dissolved salts produced during runoffs from the land surface and has a relative salt composition different from that of seawater. Third, hydrodynamic models used to study the saltwater intrusion employ a number of numerical schemes, varying grid resolutions, and different parameterization schemes for unresolved subgrid processes. Given the general lack of observational data for the model validation, it is unclear how well these models capture the salt intrusion.

This SCOR Working Group will bring together an international team of experts to discuss recent research on the saltwater intrusion into tidal rivers around the world. Our goal is to develop a global synthesis of

this emerging topic, discern the roles of climate change and local anthropogenic processes, and develop tools for observing, modeling and analyzing salt intrusion into tidal rivers.

2.1.11. Studying Worldwide Impacts of Calcification Trends on CHanging Climate (SWITCH) - Aliani

Ongoing fossil fuel burning affects the flow of carbon between the air, ocean, soils and biosphere and results in global warming, rising sea levels and acidifying and deoxygenating oceans. Climate models predict the consequences of rising greenhouse gas concentrations and guide measures to keep global warming under control¹. The uncertainties associated with those models' outcomes are largely resulting from an incomplete understanding of the (biological) feedbacks within and between the various carbon sinks and sources^{2,3}. Among such feedbacks, those in the ocean may have a particularly large effect on carbon cycling due to the size of marine carbon reservoir. In particular:

An integrated understanding of marine calcification is of crucial importance to understand the future of the marine carbon cycle and ocean-based solutions. This proposal aims at this by integrating across the regions, disciplines, combining observations, modelling and experimental approaches. This can only be achieved by an interdisciplinary and international collaboration, ideally as a SCOR working group.

Field studies and laboratory experiments have indicated different and even opposing trends in the response of marine calcifiers under multiple stressors^{4,5}. This may well reflect the multiple, independent evolutionary developments of marine calcification⁶. This in turn, may mean that the mechanisms by which organisms form their calcium carbonate differs among taxa, and likely so does their sensitivity to carbon chemistry perturbations. This working group is dedicated to compare calcifying organisms and integrate knowledge on the basic mechanisms that are responsible for CaCO₃ precipitation and the implications for the global carbon export.

2.1.12. TRACE element SAMplers and sensORS, A step change to observing and understanding trace metal biogeochemistry in the ocean (TRACEAMORS) - Croot

The availability of essential trace metals (Fe, Zn, Co, Cu, Mn) controls primary productivity in up to half of the world's oceans and modulates the ecological framework of different ocean biomes. One of the biggest remaining challenges to improving our understanding of ocean biogeochemistry is the availability of accurate in situ techniques for the determination of the concentration and speciation of these essential trace metals. Our present understanding is constrained by limited temporal and spatial resolution observations, especially during critical seasonal and event-driven transitions in remote areas of the oceans. This is due to the absence of sensors that are suitably sensitive, selective and robust to determine elements at extremely low concentrations. Hence, the proposed topic will initiate international collaborations to foster the application and development of new samplers and sensors, for the determination of trace metal concentrations and speciation in specific parts of the ocean. The workgroup builds on the work of Grand et al. (2019) [1] OceanObs'19 paper recommendations on the creation of an international working group of trace metal sensor developers. Following a recent international meeting (TRACEAMORS, Brest 2022), our working group will focus on evaluating key analytical challenges with existing oceanographic sensors for trace metal analysis, review emerging sensing technologies in other disciplines and their potential for oceanographic use, and provide recommendations for inter-comparison with current remote samplers (target zones, deployment,

maintenance). The aim is to promote collaborative international research to instigate a step change in our ability to monitor trace metal dynamics.

2.2. Current Working Groups

2.2.1. WG#148. International Quality Controlled Ocean Database: Subsurface temperature profiles (IQuOD) – Lijing Chen/van Haren

International Quality controlled Ocean Database (IQuOD) group continues to develop, implement and document new techniques to provide an unbiased climate dataset of the highest quality, consistency, and completeness. The community has developed a machine learning approach for the assignment of “intelligent” metadata for XBT data and assigned the uncertainty for each individual measurement. The group has also evaluated the most effective combination of automated quality control (AutoQC) procedures for temperature profile observations. With these developments, the group has freely disseminated an interim version of the IQuOD global temperature profile database through NOAA/NCEI. IQuOD has been very active with an online meeting every month and has established collaboration with OTGA. An in-person meeting has been organized on July 10-11 in Potsdam, Germany 2023, and the steering team has discussed and decided the main activities for the following 1-2 years.

2.2.2. WG#150. Translation of Optical Measurements into particle Content, Aggregation & Transfer (TOMCAT) - Cheah

Nothing to report. Final plans to hold a summer school in South Africa did not materialize and thus no activities were conducted in the reporting period.

2.2.3. WG#151. Iron Model Intercomparison Project (FeMIP) – Tagliabue/Moran

In the last calendar year WG 151 has focused on finalizing its last task on ToR 4 – assembling knowledge on how biological processes around the ocean iron cycle are represented in ocean models.

2.2.4. WG#152. Measuring Essential Climate Variables in Sea Ice (ECV-Ice) – Fripiat/van Haren

The working group met online and virtually in 2023. Two peer-reviewed journal articles were published in the reporting period. The WG has started to create a guide of best practices for biological and biogeochemical studies (ToR #4) hosted on the ECV-Ice website as a living document. The first entry will be the Miller et al. (2015) methodological review from SCOR WG 140, and the results of additional methods evaluations and intercalibrations will be added, as they become available.

2.2.5. WG#153. Floating Litter and its Oceanic Transport Analysis and Modelling (FLOTSAM) – Aliani/Peeken

FLOTSAM focus was to identify gaps in knowledge of ocean dynamics that may affect litter distribution and transport; to improve modelling capabilities; to evaluate existing and emerging remote sensing (RS) technologies and to improve people’s awareness of marine debris. These objectives have been

accomplished with remarkable results, including highly cited papers and the development of new approaches in modelling. The WG's new perspectives in RS fostered dedicated funding programs from space agencies and innovative RS methodological guidelines (MOEJ in prep) and establishment of the IOCCG RSMLD Task Force. Maximenko et al., 2018 highlighted the urgent need of a global observing system for marine litter and SCOR acknowledged it, which led to the development of IMDOS. Startup meetings in this direction have been carried out and other actions are ongoing. IMDOS will be a major legacy as well as an ECOP (Early Career Ocean Professionals) network resulting from a dedicated workshop. FLOTSAM is also contributing to the UN Environment Programme (UNEP) Intergovernmental Negotiating Committee (Plastic Treaty).

2.2.6. WG#155. Eastern boundary upwelling systems (EBUS): diversity, coupled dynamics and sensitivity to climate change – Escribano/Sicre

The Eastern Boundary Upwelling systems (EBUS) SCOR WG 155 has been slowly making progress towards TOR's achievements. From the second half of 2021 and until September 2022 much time and effort were devoted to planning and organizing the EBUS Open Science Conference held in Lima, Peru which took place in September 2022. Five members of the WG 155 integrated the organizing committee of the Conference, Along with the Conference several members of the WG also met in person during half of a day. The meeting was mostly dedicated for discussion on the review paper. Recently published works and new information recommended updating the focus of the review with additional analyses to be included. Some progress has been made until present and the paper is at its final stage and expected to be ready for submission this year. The WG has also made progress in updating the website data source. The EBUS Conference was successful and one Special Issues is being prepared for the Journal Deep Sea Research Part II. Intended submissions were proposed by mid December 2022 and there is a list of about 80 potential manuscripts. The reviewing process is ongoing and expected to be completed by May 2024. Further information related to WG can be found in <http://www.igp.gob.pe/programas-de-investigacion/ciencias-de-la-atmosfera-e-hidrosfera/proyectos/SCOR>.

2.2.7. WG#156. Active Chlorophyll fluorescence for autonomous measurements of global marine primary productivity - Uku

WG156 is in its final reporting phase, with a major outcome being submission of the "Best-Practice" document (Application of Single Turnover Active Chlorophyll Fluorescence for Phytoplankton Productivity Measurements), which captures many elements of the original scope of work proposed. WG members are continuing data collection and dissemination activities that will contribute to a longer legacy of the terms of reference.

2.2.8. WG#157. Toward a new global view of marine zooplankton biodiversity based on DNA metabarcoding and reference DNA sequence databases (MetaZooGene) – O'Brien/Gobin

Planning and cooperation among WG157 members was carried out through email, virtual meetings, and an online collaboration space, with topic-related folders for sharing files and preparing documents and manuscripts. SCOR WG157 sponsored a symposium, New insights into biodiversity, biogeography, ecology, and evolution of marine zooplankton based on molecular approaches, in association with the

ICES Annual Science Conference (Hybrid; Dublin, Ireland; September 23, 2022). SCOR WG157 member, Mary Mar N. Payne (University of the Philippines) was hosted by SCOR WG157 member, Junya Hirai (University of Tokyo, Japan) for a collaborative research visit during March 24 – April 15, 2023. Support was provided by the SCOR 2022 SCOR Exceptional Scholar Program. Results from the project, Preliminary assessment of zooplankton biodiversity in Batan and Tangalan Bays (Aklan, Philippines) using DNA metabarcoding, are being prepared for publication. SCOR WG157 member Jenny Huggett convened and participated in meetings (both in-person and virtual) during 2023 to discuss implementation of DNA metabarcoding as a routine method for monitoring the marine environment in South Africa (see Huggett et al. 2022). At the Western Indian Ocean Marine Science Symposium (Gqeberha, South Africa; October 2022), collaborative meetings with UN Ocean Decade representatives sought to develop metabarcoding capacity throughout the Western Indian Ocean region. SCOR WG157 members and colleagues serve as representatives for the MetaZooGene UNOD Action (No. 102.2) and have attended numerous meetings with UNOD partner programs and projects, including regularly-scheduled, special-topic, and strategic meetings. The MetaZooGene Atlas and Database Web page: <https://metazoogene.org/mzgdgb> now includes zooplankton, benthic invertebrates, fish, marine mammals, and phytoplankton (aka microbes and protists).

2.2.9. WG#158. Coordinated Global Research Assessment of Seagrass System (C-GRASS) - Aliani

Building on momentum from the C-GRASS in-person workshop coordinated with the International Seagrass Biology Workshop 14 (ISBW) and World seagrass Association in Annapolis, August 2023, the group has made progress on a draft MS developing and promoting specifications for the GOOS seagrass cover and composition Essential Ocean Variable (TOR objective 2), and an associated data schema (TOR objective 3). A second manuscript is in progress comparing seagrass dynamics based on remotely sensed data with those based on in situ data (TOR objective 1). Informal gatherings brought several members of the group together to discuss seagrass coordination at the World Conference on Marine Biodiversity in Malaysia in July 2023; and the Community of Practice plans to have a final working group meeting at ISBW 15 in Napoli, Italy, in June 2024 (TOR objective 4).

2.2.10. WG#159. Roadmap for a Standardised Global Approach to Deep-Sea Biology for the Decade of Ocean Science for Sustainable Development (DeepSeaDecade) – Hilario/Gobin

The principle aim of this working group was to deliver an overarching plan that formed the basis of deep-sea biological research for the next decade. That plan was developed and delivered at the start of the UN Ocean Decade in the form of a peer reviewed publication (Howell et al., 2020). This publication formed the basis of an application to the IOC to endorse a new UN Ocean Decade global programme “Challenger 150”. The SCOR working group then served as the steering committee of that programme, establishing the programme, building a long-term management structure, and continuing to address the working group TORs through that Programme. This year sees the final year of the SCOR working group, and as such the group has formally handed over its role as steering committee to the new management structure for Challenger 150. In addition, the group has focused its efforts on TOR 5: to actively facilitate efforts to build capacity in developing nations for deep-sea science. The WG used the Challenger 150 Programme as a vehicle to help engage a wider audience and ultimately to enact any plans developed, ensuring longevity of the working groups efforts and SCOR’s investment.

2.2.11. WG# 160. Analysing ocean turbulence observations to quantify mixing (ATOMIX) – Bluteau/van Haren

Over the last 12 months, the ATOMIX working group has met virtually on a regular basis to fulfil their terms of references. Notable advancements in the last 12 months include: 1. Producing benchmark datasets which are available on the wiki. 2. Testing of the benchmark datasets by members of the working groups. Results of this ongoing exercise are guiding refinements in the best practice flow charts and quality-control indicators and flags. 3. Drafting of best practices manuscripts to describe benchmarks and processing steps. 4. Brainstorming and collating existing materials for teaching core principles of processing turbulence analysis to develop capacity in estimating mixing.

2.2.12. WG# 161. Respiration in the Mesopelagic Ocean (ReMO): Reconciling ecological, biogeochemical and model estimates – Robinson/Gobin

The WG held 10 online WG meetings at approximately monthly intervals between June 2022 and June 2023, in addition to focused subgroup meetings to progress particular deliverables. The monthly meetings include a seminar which is recorded and made available via the website and YouTube channel <https://www.remo-scor-wg161.com/about-3>. Their mentoring scheme continues <https://www.remo-scor-wg161.com/copy-of-home> and discussions within the WG have contributed to 2 review papers published in Annual Review of Marine Science (Herndl et al., 2023 and Iversen, 2023). Their major activity this year has been a 6 day training course in Las Palmas, Gran Canaria for 10 international early career researchers in person and another 29 students online. This involved hands on practical experience of methods used to measure mesopelagic respiration, seminars on using BGC Argo data, calculating AOU budgets and using models and 8 lectures. The course instructors included 12 members of the WG and 4 members of the research teams of the WG members. Lecture recordings, the Argo data seminar and the AOU budget seminar are available online <https://www.remo-scorwg161.com/about-8>.

2.2.13. WG# 162. Developing an Observing Air-Sea Interactions Strategy (OASIS) – Peeken

The WG has completed ToR #1 by publishing a synthesis of the recommendations from over 40 OceanObs19 community white papers. Progress has continued on the other ToR. The UN Ocean Decade has endorsed 3 UN Decade Projects under the auspices of the UN OASIS Decade Program. These include “A regional coupled atmosphereocean model” (led by Lucas Harris, NOAA GFDL, USA), “Southern Ocean Flux Capability Working Group” (led by the Southern Ocean Observing System, Australia), and “Uncrewed Surface Vehicle Network for GOOS” (led by Adrienne Sutton, NOAA PMEL, USA). In Feb 2024, OASIS is organising a SCOR WG face-to-face meeting at Ocean Sciences Meeting in New Orleans.

2.2.14. WG# 163. Coupling of ocean-ice-atmosphere processes: from sea-ice biogeochemistry to aerosols and Clouds (Clce2Clouds) – Steiner & Willis/Croot

Clce2Clouds has been actively working on the five TORs. A key goal of Clce2Clouds is to improve communication and understanding among ocean, sea-ice and atmospheric scientists with respect to the exchange processes between interfaces and their impacts on clouds in the polar regions. Hence, a key

output is a series of tutorial talks and a tutorial-style review paper to bridge knowledge gaps among communities. The tutorial material targets both early career researchers and senior scientists with expertise in only one of the domains. Throughout the first meetings tutorial talks have been developed and recorded to share via the Clce2Clouds website. Based on the content of those talks a manuscript is in preparation. In addition, discussions in the three Clce2Clouds subgroups (sulfur cycle, nitrogen cycle, primary aerosols) have evolved to develop coupled conceptual models, considering both poles as well as different seasons. Manuscripts to describe these conceptual models are now in preparation.

2.2.15. WG# 164. CoNCENSUS: Advancing standardisation of COastal and Nearshore demersal fish visual CENSUS techniques

Over the last year the WG has focussed on advancing ToR-3 (data management) and ToR-4 (research field mapping). The WGs's initial review of available data to address ToR-1 led to the decision that more existing datasets needed to be sourced, processed and incorporated into the analysis. The current community engagement processes from ToR-4 are directly contributing towards additional data acquisition. A WG meeting was held in Hobart, January 2023 following the International Temperate Reef Symposium. The meeting was attended by four CoNCENSUS members, a guest researcher and one early career researcher. The meeting focussed on advancing the Data management system (ToR-3) and resulted in the production of a draft proposal and workflow for the system. For ToR-4 the WG has completed a comprehensive (1,475 documents) bibliometric analysis of the nearshore fish visual census field research landscape, employing epistemic methods and the online platform, Cortext. The results highlight how the underwater visual census research field has grown over the last 70 years in terms of research topics, sampling methods and global participation. This analysis will form the basis of a questionnaire survey. To strengthen the global community of practice the WG provided training to researchers from Namibia, South Africa, Comoros, Seychelles, Maldives and India through a combination of field expeditions and workshops.

2.2.16. WG# 165. Mixotrophy in the Oceans – Novel Experimental designs and Tools for a new trophic paradigm (MixONET) – McManus/Peeken

MixONET entered the second year in January 2023. Major highlights include publication of the first ever comprehensive Mixoplankton Database (MDB) [ToR1] and delivery of a special session – The New Paradigm Testing the Resilience of Our Science in the UN Ocean Decade - at the ASLO Aquatic Sciences meeting 2023. Santoferrara [USA] was awarded a grant from the “Exceptional” Call for SCOR Project and Working Groups Scholars to work with Unrein [Argentina]. Santoferrara's 12-day visit to Argentina included laboratory work at the INTECH institute and the UNNOBA University, both in the province Buenos Aires, a talk for the INTECH Waters research group, and knowledge exchange with graduate students. The goal of the project was to design and test a methodology to isolate and identify nano-mixoplankton, using a combination of feeding experiments, flow cytometry and DNA metabarcoding [ToRs2&3]. Several experiments were carried out between February and March 2023. The mixoplankton were successfully quantified, sorted and sequenced, obtaining promising results. As part the ocean literacy and capacity building aspirations of MixONET [ToR4] Santoferrara delivered a 'Mixoplankton' module within the 2 week 'Marine Microbiology and Biogeochemistry' OTGA course in the medium of

Spanish while Mitra [UK] hosted a POGO-SCOR funded Fellow, Sangeeta Naik [India] for 8 weeks from 30th January 2023.

2.2.17. WG# 166. Developing resources for the study of Methylated Sulfur compound cycling PROCesses in the ocean (DMS-PRO) - Galí Tàpias & del Valle/Peeken

DMS-PRO initiated its activities in January 2023. During this initial period, the group has deployed a strategy to work effectively towards its objectives by (1) creating four thematic teams, (2) setting up internal communication and online collaboration platforms, and (3) trying to establish a regular meeting schedule within each team. The four teams are Standard Operating Procedures, Database, Communication & Outreach, and Funding & Endorsement. Each team has 2-3 coordinators, and coordination among teams is ensured by the co-chairs and by the participation of each member in more than one team. According to the work plan, the group has placed efforts on the core terms of reference, T1-T3, which include the elaboration of a Standard Operating Procedures (SOP) document and the creation of a database for methylated sulfur cycling rate measurements

2.2.18. WG# 167. Reducing Uncertainty in Soluble aerosol Trace Element Deposition (RUSTED)

RUSTED was established in October 2022. In the past nine months much of RUSTED's activities have focused on introducing their goals and establishing collaborative links with the scientific community. Additionally, the groundwork for outputs including a literature review of aerosol leaching methods, the aerosol database, and a RUSTED Special Issue are underway. Two virtual and two hybrid meetings for all members, plus three co-chair meetings have been held since October 2022. The WG held a meeting and hosted a session at the ASLO Aquatic Sciences Meeting (ASM) in Palma de Mallorca, Spain.

Tab 3 – Large-Scale Ocean Research Projects reports

3.1. GEOTRACES – Marine Biogeochemical Cycles of Trace Elements and Isotopes – Casciotti/Croot

The GEOTRACES programme has released three Intermediate Data Products (a new version of the GEOTRACES Intermediate Data Product 2021 was released in July 2023) and the next Intermediate Data Product is planned for release in November 2025. The GEOTRACES field programme progresses with 144 cruises completed, corresponding to 38 GEOTRACES sections (with 50 cruises), 41 process studies (with 65 cruises), 18 compliant datasets, as well as, 11 cruises completed as a GEOTRACES contribution to the International Polar Year (IPY). During the past year (May 1st, 2022 to April 30th, 2023), 3 new section cruises from Japan, Germany and USA (marked in orange in the Figure 1) and 3 process studies (1 from Australia, 1 from Germany (with 2 cruises) and 1 from USA (one of the two cruises is sailing when the report is being written) have been undertaken (see Data Management section below for further details). In addition, 5 new compliant datasets have been endorsed.

3.2. SOLAS – Surface Ocean – Lower Atmosphere Study – Guieu/Flossmann

During this reporting period, SOLAS started the strategic planning for its 3rd decadal science plan and organisational structure. Looking into the future, SOLAS launched several initiatives to further boost its

science, e.g., wildfire, Earth system modelling, microplastics, marine carbon dioxide removal (CDR), and long-term large-scale multi-platform campaigns in typical marine environments. SOLAS is determined to devote her major efforts in transforming sciences into societal solutions via engaging in, e.g. the United Nations (UN) Climate Change Conference, the UN Ocean Conference and the UN Decade of Ocean Science for Sustainable Development (hereafter: UN Ocean Decade). SOLAS established its future committee, the Early Career Scientist Committee (ECSC), in Jan. 2023. Seven events have been organised or are being planned by the committee, which shows the significant momentum of the committee to further strengthen SOLAS sciences and networks. SOLAS also made breakthroughs in engaging underrepresented regions and launched a Regional Panel in Southeast Asia in Mar. 2023, which consists of eight members from six countries. The panel has been working actively together on joint grant proposals and building connections with other international scientific organisations and research projects.

For science communication and capacity building, a quarterly series was newly launched in 2022 to foster discussions on cutting-edge scientific questions, provide researchers at all career stages with the opportunity to interact and build SOLAS community across the globe. Five seminars have been organised, which attracted nearly 1000 researchers from over 30 countries. With its first hybrid and 8th Open Science Conference (OSC) on 25-29 Sep. 2022 in Cape Town, South Africa, SOLAS offered the ideal programme for ~100 onsite and ~100 online scientists who wish to learn and exchange about innovative research in the field, present their findings, and connect with colleagues from all over the world. A dedicated Early Career Scientist (ECS) Day was organised by a group of ECS for the day before the OSC. The 9th SOLAS Summer School took place in Mindelo on Cape Verde, 5-15 Jun. 2023, which was organised by an alumni-dominated organising committee. The school hosted 66 students from 25 countries who had a chance to interact with 30 lecturers. Moreover, SOLAS and the University of Galway, Ireland, initiated the 1st run of the new Research Master of Science programme on Ocean, Atmosphere and Climate in Sep 2022. It will run in its 2nd round from Sep 2023.

3.3. IMBeR – Integrated Marine Biosphere Research – Claydon/Aliani

The restrictions on activities that IMBeR experienced in previous years due to COVID-19 were largely absent in 2022-2023, with in-person meetings, research cruises, and field work being more feasible over the period of this report. IMBeR was able to make progress towards achieving the objectives of the Grand and Innovation Challenges. Select activities include: IMBeR convened its 8th International ClimEco Summer School (ClimEco8), in Koper, Slovenia, to help develop the next generation of marine researchers who will be at the forefront of addressing ocean challenges. The summer school was attended by 46 marine science students, postdocs and early career researchers from 22 countries, and expanded participation into new geographic areas. Sponsorship was secured to support attendance of 19 participants. The 2023 ESSAS Annual Science Meeting was held as a hybrid meeting in June in Bergen, Norway (see full conference program). The sessions had strong links to Grand Challenge 1, Innovation Challenge 5, and Innovation Challenge 6. IMBeR's Interdisciplinary Marine Early Career Network (IMECaN) held a virtual workshop on 11 October 2022, that addressed Diversity, Equity, and Inclusion in interdisciplinary marine research.

3.4. IQOE – International Quiet Ocean Experiment – Tyack/Uku

The IQOE Science Committee (SC) met on 26–27 April 2023, in Woods Hole, Massachusetts, USA, chaired by Peter Tyack. All 10 SC members participated either in person or remotely. Meeting participants reviewed ongoing IQOE activities, evaluated the progress of IQOE after 8 years, and planned for the coming year. The Ocean Sound EOVI Implementation Plan has passed external review and the SC agreed to complete its approval in a few weeks after the SC meeting and to determine how IQOE can help implement recommended actions from the plan. The SC requested that pages be added to the IQOE Website for training opportunities and a portal for outreach materials (e.g., links to DOSITS, videos, and other resources). The SC discussed an IQOE activity to evaluate the effects of the COVID-19 pandemic on ocean sound levels, potentially through hiring a post-doctoral fellow to work on this activity. IQOE is forming a task team to accelerate the deployment of low-cost hydrophones for certain research applications (not requiring calibrated equipment), education, and citizen science. Ed Urban updated the SC on the development of the IQOE Hydrophone Metadatabase. The meeting concluded with a discussion of future activities of IQOE and final impressions from meeting participants. Participants agreed that IQOE has provided a unique framework for developing international cooperation on ocean acoustics and bioacoustics, and has built a foundation that will be important for the next several years of IQOE implementation.

3.5. IIOE-2 – International Indian Ocean Expedition 2 – Sicre

After two years of meeting online, a meeting was again held in person in Perth at the Indian Ocean Marine Research Centre (IOMRC), University of Western Australia (UWA) during 6th to 7th of February, 2023. Following the IIOE-2 SC-6 meeting, the integrated IIOE-2 meetings with IOGOOS, IORP, SIBER, IRF, IIOE2 were held back-to-back with meetings of the IndoOOS Resource Forum (IRF) (15th major meeting), SIBER (13th major meeting), IORP (18th major meeting), IOGOOS (18th major meeting) and KUDOS Workshop as part of the International Indian Ocean Science Conference (IIOESC-2023).

Recent efforts of the IIOE-2 WG-1 have revolved around integrating and promoting all aspects of IIOE-2 science to achieve a holistic view of the Indian Ocean System. In pursuit of the latter goal WG-1 has been promoting the development of synthesis papers and special issues focused on the Indian Ocean. WG-1 is also involved in supporting the efforts of IIOE-2 WG-2 (Data and Information Management). There has also been discussion on the future of IIOE-2 beyond 2025 together with ECS as well as if/how to engage in the UN Decade. These issues will continue to be discussed in a meeting scheduled in Hyderabad, India, 28-30 November 2023.

WG-2 is charged with early sharing of data using internationally agreed rules of data exchange. The draft data and information management policy was reviewed and finalized through consultations. The data policy was presented to the IIOE-2 Steering Committee during its 5th meeting held on March 21-22, 2022 and approved by the SC. Metadata portal to make oceanographic data from the region discoverable is hosted on IIOE-2 website (<https://iioe2.incois.gov.in/IIOE-2/data.jsp>). Metadata of 6 scientific cruises were uploaded on the web-site. A template was developed for submission of metadata. An e-mail notification was sent to all the IIOE2 Endorsed Projects PIs to submit the Metadata of the scientific cruises. The OMNI-RAMA Joint Indian Ocean Data Portal has been established between MoES and NOAA and launched mid-August 2021 (<https://incois.gov.in/portal/datainfo/buoys.jsp>) was updated regularly.

WG-3 is charged with developing and integrating web-based tools, databases and partnerships to enable a sufficient level of cooperation, resource-sharing, scientific collaboration and capacity alignment.

Tab 4 – Infrastructural Projects reports

4.1. SOOS – Southern Ocean Observing System – Schloss/Cheah

In 2022, Two major documents were finalised, approved and published; the SOOS Science and Implementation Plan (2021-2025) and the SOOS 5-Year Report (2016-2020). Production of these documents was led by the SOOS International Project Office (IPO), and benefitted from support and input from across the SOOS community. In addition to these publications, 2022 also saw the publication of the SOOS Data Policy, which was a significant contribution from the SOOS Data Management Sub-Committee (DMSC). Two SOOS-focused peer-reviewed publications were published in 2022: LaRue et al., 2022 showed the latest results from the Capability Working Group on Censusing Animal Populations from Space (CAPS) and Beadling et al., 2022 provided the 2021 update for the State of the Climate Report from the Bulletin of the American Meteorological Society (BAMS). Also 2022 saw the publication of the Southern Ocean Action Plan for the UN Decade of Ocean Science for Sustainable Development, in which SOOS is a key partner alongside many other Southern Ocean-focused stakeholder organisations. The first SOOS Symposium was held August 2023 in Hobart, Australia. The program included 12 parallel presentations including 4 panel discussions and ECR perspectives, 17 parallel sessions and 4 parallel workshops, 5 lunch meetings, a poster session, a trade exhibition, a data helpdesk, a dinner, and an ECR networking event.

4.2. IOCCP – International Ocean Carbon Coordination Project - Telszewski/Moran

In the past 12 months the IOCCP continued to support the development of a global network of ocean carbon and biogeochemistry observations, coordinate the development of globally acceptable strategies and provide technical coordination developing operating methodologies, practices and standards, homogenizing efforts of the research community and scientific advisory groups. In an effort to identify priority measurements for implementation of GOOS observations of ocean carbon and biogeochemistry, and to promote development and adoption of necessary measurements and measurement technology, in partnership with the GOOS BioEco Panel, EU ECOTIP Project and the EU4OceanObs Project, IOCCP developed concrete recommendations for enhanced and optimised design of plankton and related biogeochemical observations to enable better understanding and prediction of changes in carbon sequestration and related ecosystem services. These recommendations will ultimately inform the report on proposed revisions to the EOV and EBV frameworks which is due to be submitted by the end of 2023. Through continuous working collaboration with EU ICOS OTC, G7 FSOI, SOCONET, SOCAT and GCP to facilitate a dialogue with stakeholders to implement a scientifically and economically effective, fit-for-purpose observing system for ocean carbon and biogeochemistry IOCCP influenced a landmark decision by the World Meteorological Congress (May 2023) to approve new Global Greenhouse Gas Watch (GGGW), which will fill critical information gaps and provide so badly needed operational framework allowing to gradually transform ocean carbon observations from research-based to “operational” where by operational we mean operational resource mobilisation. Focused on biogeochemical Essential Ocean Variables and to help train the new generation of marine observers in the appropriate use of a suite of biogeochemical sensors, the IOCCP with generous co-sponsorship of the EU ICOS OTC, US NOAA GOMO,

OFI (Canada), and Carbon to Sea Initiative (USA), held the 3rd edition of the "Instrumenting our ocean for better observation: a training course on a suite of biogeochemical sensors"

4.3. COBS – Changing Ocean Biological Systems – Yoo

Revisions to the COBS membership are: Sam Dupont is a new co-chair. Stephanie Dutkiewicz, Miriam Seifert and Cristian Vargas joined as new members. COBS is built around five cross-linked teams. Each team developed a position analysis that was discussed at the AGM in spring 2023.

Toward progress on their ToR, MEDDLE (<https://meddle-scor149.org/>)-based workshops continue to be delivered. COBS members have published peer-reviewed scientific papers that explore the logic behind using specific experimental designs (eg. full factorial) to develop generalizable theoretical underpinnings for phytoplankton responses to 2 or more drivers, to explore the statistical power of different multidriver experimental designs. To disseminate the challenges and opportunities surrounding multiple drivers and ecosystems, members have focused on papers on experimental design or are undertaking exercises that reach out to specific communities by either bringing together ECRs in multidriver research, or reaching out to self-contained communities such as coral reef researchers.

4.4. GlobalHAB – Global Harmful Algal Blooms – Berdalet/Yoo

The GlobalHAB SSC held monthly virtual meetings and email communications since the last in person meeting in Glasgow, Scotland, UK in May 13-14, 2022. The third partial renewal of the SSC was completed in September 2023.

Several members of the GlobalHAB SSC (Elisa Berdalet, Dave Clarke, Bengt Karlson, Marc Suddleson and Maggie Broadwater) participated as authors in FAO, IOC and IAEA. 2023. Joint technical guidance for the implementation of early warning systems for harmful algal blooms. Fisheries and Aquaculture Technical Paper No. 690. Rome, FAO. <https://doi.org/10.4060/cc4794en>.

GlobalHAB in collaboration with GESAMP and the EuroSea European project, is working on the elaboration of a White Paper on current fundamental scientific understanding of Sargassum population dynamics and research gaps to complement the UNEP "SARGASSUM WHITE PAPER: Turning the crisis into an opportunity."

Upcoming activities: In November 2023, GlobalHAB is hosting an in person workshop in Hiroshima, Japan to foster the integration and the application qPCR/dPCR methodologies to improve HAB monitoring and to develop early risk alert systems, after a series of four virtual workshops. The GlobalHAB International Workshop on Solutions to Control HABs in Marine and Estuarine Waters will be held within the PICES Conference in October 2023. A white Paper on Fish-Killing Algal Blooms and Ichthyotoxins: Prevention, Mitigation and Control. This document is now under revision and it will be presented at the International Conference on Harmful Algae

4.5. JCS – Joint Committee on Seawater (IAPWS/SCOR/IAPSO) – Pawlowicz/van Haren

No in-person meetings of JCS occurred over the past year. A planned JCS virtual meeting for January 2023 was postponed. However, the proposed membership of the new Chemical Speciation Taskgroup has been finalized and they have been holding regular (monthly) virtual meetings as part of software finalization from the completion of SCOR WG 145, and the development of a website containing that

software (marchemspec.org). A draft JCS website, separate from <http://www.teos-10.org/>, has been completed, with plans to “go live” once arrangements for hosting and the provision of a suitable domain name have been finalized.

Tab 5 – Affiliated projects

Affiliated projects reports

5.1. IOCCG – International Ocean Colour Co-ordinating Group – Lovindeer/Yoo

The International Ocean Colour Coordinating Group (IOCCG) has been an affiliated project of SCOR since 1997, and is an associate member of the Committee on Earth Observation Satellites (CEOS). Committee members of the IOCCG are representatives from space agencies around the world as well as from the ocean colour research community. IOCCG promotes development and applications of science and technology that underpin remote sensing of ocean colour across all aquatic environments, including inland, coastal, and open-ocean. This occurs through coordination; training; liaison between providers (the space agencies) and users (scientists and professionals); advocacy; and provision of expert advice. This mandate is advanced through IOCCG working groups and task forces, as well as the CEOS Ocean Colour Radiometry-Virtual Constellation (OCR-VC). For the next two years, the focus of the OCR-VC will be the development of an Aquatic Carbon Roadmap to support the Global Stocktake within CEOS. The OCR-VC will also contribute to the development of the Aquatic Reflectance Product Family Specification for CEOS Analysis-Ready Data (ARD).

IOCCG initiated two new working groups on ocean primary production and classification of optical water types in aquatic radiometry. IOCCG also initiated two new task forces: Ocean Carbon from Space and Hyperspectral Remote Sensing of the Ocean.

The IOCCG Protocol Series are peer-reviewed *Ocean Optics & Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation*. Over the next three years, new protocol documents are anticipated that will focus on phytoplankton taxonomy and imaging, and on carbon.

5.2. InterRidge – International RIDGE Studies – Lee/Cheah

After 3 years of lockdown under COVID-19, things are starting to look up in early 2023. On February 28, 2023, an online Steering Committee Meeting was held. China expressed interest in hosting the InterRidge office for the next 3 years in Shenzhen. However, many young scientists expressed that reform of InterRidge is needed before seeking to solicit applications for the next InterRidge office. ‘Reform first’ was agreed upon by most members of the Steering Committee. An extension was given to the InterRidge Office in Korea until the end of the year (December 31, 2023). It was also agreed that a face-to-face meeting was needed for the Steering Committee members. As a result, the first offline meeting since the global pandemic will be held at Seoul National University in Korea from September 25-27. Some of the items that will be discussed during the September Steering Committee meeting include (1) reforming the governance of InterRidge (in particular, whether to separate the science and operation of InterRidge or not), (2) codifying InterRidge regulations into written text, (3) making a regular InterRidge Conference every 2 years, (4) drafting of The Next Decadal Plan (2024-2033), and other eminent issues. On June 8-9, a workshop on the Indian Ocean was held in Shenzhen, China, hosted by Jian Lin. On August 14-18, The

7th International Symposium on Chemosynthesis-Based Ecosystems (CBE7) will be held in San Paulo, Brazil.

5.3. GACS – Global Alliance of Continuous Plankton Recorders - Uku

GACS was unable to provide a written report to SCOR.

Affiliated organizations reports

5.4. IABO – International Association for Biological Oceanography – Gobin

During this performance cycle, IABO activities focused on these key areas: 1) organization of the 6 th World Conference on Marine Biodiversity (VI WCMB) held in Penang, Malaysia, on July 2-5 of 2023; 2) reviewing of SCOR Working Group proposals; 3) full implementation of the PeerJ-IABO Hub; 4) selection of the 2022 Carlo Heip awardee; and 5) IABO President elections for the 2024-2026 cycle.

The selected candidate for the 2022 Carlo Heip Award was Prof. Angelika Brandt. The award ceremony was carried out at the VI WCMB in Penang, Malaysia, during IABO's General Assembly.

The IABO President and Secretary General positions were up for renewal in 2023 and the new leadership was appointed during the General Assembly at the VI WCMB conference in Penang, Malaysia, on July 5th.

The elected candidate for the Presidency was Prof. Judith Gobin from The University of the West Indies in Trinidad and Tobago, who now serves as ex-officio on the SCOR Executive Committee.

The Association launched the IABO Hub (<https://peerj.com/hubs/iabo>) on December 21st of 2022 in partnership with PeerJ Publishing Group to facilitate publication of peer-reviewed articles from the IABO community on PeerJ's open-access journals with APC discounts and full fee waivers for selected countries. The launch of the IABO Hub has resulted in the growth of the Association's membership, promoting IABO announcements (e.g. Carlo Heip Excellence Award notifications, WCMB conferences, community workshops), and the collection of funding in the form of tokens that can be used toward publishing fees of submissions from registered IABO members from developing and least developed nations. The Editorial Board of the Hub is composed by members of the IABO Executive Committee and Task Groups to ensure that manuscripts submitted to this platform are reviewed by the IABO community.

5.5. IAPSO – International Association for the Physical Sciences of the Oceans – van Haren

IAPSO has the prime goal of 'promoting the study of scientific problems relating to the oceans and the interactions taking place at the sea floor, coastal, and atmospheric boundaries insofar as such research is conducted by the use of mathematics, physics, and chemistry.' IAPSO works mainly through 1) biennial scientific assemblies; 2) working groups; 3) commissions; 4) services; and 5) website information. Of special importance to IAPSO is the involvement of early career scientists as well as those from least developed countries.

IAPSO maintains formal liaison with other scientific commissions and committees. These include the ISC's Scientific Committee on Oceanic Research (SCOR), and UNESCO's Intergovernmental Oceanographic Commission (IOC).

The IAPSO Bureau was renewed in July 2023 during the IUGG General Assembly in Berlin. The new president, Hans van Haren (the Netherlands) now serves as ex-officio on SCOR's Executive Committee.

5.6. IAMAS – International Association of Meteorology and Atmospheric Sciences – Penner/Flossmann

IAMAS selected a new Bureau for 2023-2027. Andrea Flossmann (Germany) now serves as president and ex-officio member of the SCOR Executive Committee.

The IAMAS Early Career Scientist Medal was presented to Cheng Sun in 2023 for his significant contributions in the area of atmosphere-ocean interaction and climate dynamics.

IAMAS operates under a strategic plan adopted in 2019.

Tab 6 – Intergovernmental and partner Organizations

Intergovernmental organizations reports

6.1. IOC – Intergovernmental Oceanographic Commission – Sicre

SCOR is historically a partner and strategic mechanism for the IOC to increase capacity to address critical ocean science issues for which the IOC secretariat does not have resources, mandate or human capacity to address alone and where, not the least, better and more valuable knowledge products can be delivered by joint activities. SCOR-IOC collaboration has both proven a valuable mechanism to address longer term research themes (programmes) as well as more targeted and time bound tasks (WG's). The most substantial collaboration currently is GlobalHAB which is coming to the end of its current ToRs. The IOC-FAO Intergovernmental Panel on Harmful Algal Blooms (IPHAB) requested the IOC-SCOR GlobalHAB Scientific Steering Committee to: (i) review the GlobalHAB Science and Implementation Plan with a view to present to IPHAB-XVII (in 2025) what it recommends as the main elements of an international HAB research programme after 2025 focusing on understanding HABs in the context of global sustainability; (ii) assess the ideal organization of and partnerships for such an international research programme after 2025; (iii) recommend to IPHAB-XVII whether an international HAB research programme after 2025 should be as a continuation under the name GlobalHAB or under a new name. GlobalHAB is currently engaged in the development and implementation of a co-designed UN Ocean Decade programme, the HAB Solutions Programme (HAB-S), to deliver solutions to sustainably provide safe seafood, drinking water and ensure healthy coastal socio-ecosystems. HAB-S would provide a wider context for a potential GlobalHAB or equivalent programme after 2025.

6.2. PICES – North Pacific Marine Science Organization – Chiba/Moran

PICES belongs to Smart Net, a UN Decade program to establish a global knowledge network for ocean science. Between the PICES and ICES networks, it covers much of the northern hemisphere. PICES has been expanding the network into the southern hemisphere. Under Smart Net, PICES/ICES joint expert groups contribute to thematic priority topics. Communication and capacity building initiatives contribute to cross-cutting themes. PICES seeks further partnerships through SCOR's network.

PICES has partnered with SCOR on capacity development and has a representative on SCOR's Capacity Development Committee. SCOR and PICES support capacity development at each other's scientific events. SCOR has provided support to one PICES conference in 2021, one PICES conference in 2023, with commitment to support the 7th International Zooplankton Symposium in 2024. PICES, in turn, has

supported summer schools of SCOR projects. SCOR also provided support to a session and workshop organized by the PICES Expert Group: Section on Ecology of Harmful Algae Blook in the North Pacific (S-HAB).

The PICES annual meeting is upcoming on 23-27 October in Seattle, USA. The meeting will engage local indigenous leaders.

6.3. GESAMP WG 38– The atmospheric input of chemicals to the oceans – Jickells/Aliani

During the past year GESAMP WG 38 has focused its attention on the following four areas: 1) Completion of a workshop in South Africa on the ocean management and policy implications of the air/sea exchange of nutrients and the development of paper(s) from that workshop; 2) Completion of a Summary for Policymakers for GESAMP Reports and Studies No. 109, “The Changing Acidity of the Global Atmosphere and Ocean and its Impact on Air/Sea Chemical Exchange”; 3) Began work on a GESAMP Reports and Studies document on the joint WG 38/40 workshop the atmospheric transport of microplastics to and from the ocean; 4) Organized a session on air/sea chemical exchange at the 2023 European Geosciences Union meeting.

Partner organizations reports

6.4. POGO – Partnership for Observation of the Global Oceans – Krug/Aliani

SCOR and POGO co-sponsor the POGO-SCOR Visiting Fellowship programme, as well as the International Quiet Ocean Experiment (IQOE). POGO and SCOR have also historically collaborated on capacity development efforts and support for GACS. POGO also contributed to the establishment of SOOS, and provided support with SCOR for early career scientists at the SOOS Symposium 2023. In 2023, 46 valid POGO-SCOR Fellowship applications (55% female and 45% male) were received from Asian (50%), Latin American (33%) and African (17%) candidates (Fig.2). Applicants proposed trainings of one, two or three months in oceanographic centres in Europe (61%), North America (17%), Asia (13%), Oceania (7%) and Latin America (2%).

POGO funded a Working Group to support the IQOE, which was instrumental in getting an Acoustic Essential Ocean Variable (EOV) accepted by GOOS, and encouraged its members to hosting an International Project Office for the programme, which led to the Alfred Wegener Institute recruiting 2 data managers to support IQOE and its Data Working Group in 2019/20. IQOE has promoted several initiatives such as virtual workshops, a Working Group on Data Management and Access, a Task Team on low-cost acoustic recorders for citizen science/educational purposes. In addition, IQOE supports the Global Library of Underwater Biological Sounds (GLUBS) and gathers publications and metadata for a Global Hydrophone Network. The final Ocean Sound EOV Implementation Plan is being finalised and soon will be published. More information on IQOE can be found at <https://www.iqoe.org/>.

6.5. ISC – International Science Council – Visbeck/Sicre

In 2022, the ISC made significant progress in its objective to engage with the intergovernmental system, enhance the impact of the Council, and strengthen the use of scientific evidence in policy and public action on the most pressing issues faced by societies today. Notably, the ISC is actively cooperating with

the United Nations system through engagement in numerous multilateral processes, such as the annual Multi-stakeholder Forum on Science, Technology and Innovation for the SDGs (STI Forum), the High-Level Political Forum (HLPF), the Sendai Framework for Disaster Risk Reduction, the United Nations Framework Convention on Climate Change (UNFCCC), and the Convention on Biological Diversity, co-organized with the International Union of Biological Sciences (IUBS), the Convention on Biological Diversity (CBD) Secretariat and other partners of the Fifth Science–Policy Forum on Biodiversity held at COP15. The ISC Governing Board announced the appointment of Dr Salvatore Aricò as Chief Executive Officer of the ISC, succeeding Dr Heide Hackmann. Over 200 events were featured on the ISC website this year, ISC welcomed a total of six new Full and Affiliated Members this year, the ISC released the Unlocking Science series jointly with BBC Storyworks, among other accomplishments.

6.6. SCAR – Scientific Committee on Antarctic Research – Griffin/Peeken

The mission of SCAR is to advance research in, from and about Antarctica and the Southern Ocean, and to promote scientific knowledge, understanding and education on any aspect of the Antarctic and Southern Ocean regions. To this end, SCAR is charged with the initiation and international coordination of Antarctic and Southern Ocean research beneficial to global society. SCAR provides independent and objective scientific advice and information to the Antarctic Treaty System and other bodies, and acts as the main international exchange of Antarctic information within the scientific community. Following the publication of the Southern Ocean Action Plan in April 2022, SCAR was approved to act as the Decade Collaborative Centre for the Southern Ocean Region (DCC-SOR) on World Oceans day, June 8th 2023. The first SOOS Symposium took place in August 2023, bringing together 300 researchers from 25 countries, on the theme of “Southern Ocean in a Changing World”.

6.7. Future Earth and the Ocean Knowledge Action Network - Alexandroff /Twigg

The Ocean Knowledge Action Network (KAN) brings networks together to share knowledge among those working to co-design ocean science and knowledge for sustainable development. The Ocean KAN focuses on building trust and relationships between its regional partners, UN Decade of Ocean Science-endorsed programmes, international networks, universities, and private sector partners. Highlights for the last year include: a special issue in the ICES Journal of Marine Sciences, a new International Panel on Ocean Sustainability (led by Ocean KAN members), mentoring and judging of the Ocean Hackathon in Malaysia, a keynote speech at the Ocean Hackathon Grand Finale (France), and the co-creation of a workshop on science storytelling with partners from the Seychelles, and the Western Indian Ocean Early Career Scientists Network.

Future Earth is a network of scientists, researchers, and innovators designed to provide the knowledge needed to support transformations towards sustainability. Their focus on systems-based approaches seeks to deepen our understanding of complex Earth systems and human dynamics across different disciplines and use this understanding to underpin evidence-based policies and strategies for sustainable development. Future Earth has participated in or coordinated several ocean-related events at the UNFCCC COP27 in Sharm el Sheik. Additionally, Future Earth was represented at CBD COP15 in Montréal, the IPCC 58 session, the Bonn Climate Change Conference, the UNFCCC SBSTA, the IPCC 10 in Bonn and IPCC meeting in Nairobi. In March 2023, Future Earth actively contributed to the UN Water Conference

by sending a delegation, and participating in side events. A joint statement was submitted by members of the Earth Commission and Sustainable Water Futures.

6.8. WCRP – World Climate Research Programme / CLIVAR – Flossmann

WCRP leads the way in addressing frontier scientific questions related to the coupled climate system — questions that are too large and too complex to be tackled by a single nation, agency or scientific discipline. Through international science coordination and partnerships, WCRP contributes to advancing our understanding of the multi-scale dynamic interactions between natural and social systems that affect climate. WCRP engages productively through these partnerships to inform the development of policies and services and to promote science education.

Currently, WCRP is in the process of implementing its new research strategy (WCRP Strategic Plan 2019-20282). Major elements of the Science and Implementation Plan are to strengthen support for core research, ensure engagement of the next generation of scientists and improve the diversity of WCRP leaders (across nations, regions, and disciplines), deepen our interaction with partners at national and international levels, and ensure that society has the climate knowledge that it needs for decision-making. WCRP has reoriented itself to ensure that there is the science, knowledge and understanding needed to target frontier problems, such as disaster risk reduction, climate adaptation, mitigation, and intervention strategies, that need to be solved together with partners for which WCRP’s core research continues to be essential for developing answers. The integral role of WCRP in developing knowledge of the climate system will result in an increased understanding of the Earth system, including of the complex interactions between the physical environment and society. These efforts will culminate in the WCRP Open Science Conference (<https://www.wcrpclimate.org/wcrp-osc23>), 23-27 October 2023 in Kigali, Rwanda, which will bring together more than 1400 participants both virtually and on-site from diverse research communities, programmes and partners to discuss the latest developments in climate science, with an emphasis on science-based information for decision making.

Tab 7 – Capacity-Development Activities

Capacity development activities are described in the presentations by Rebecca Zitoun, Chair, SCOR Capacity Development Committee and Lica Krug, POGO. Additionally, a report on the 2022 POGO-SCOR Fellowship program can be found at the following link: https://scor-int.org/wp-content/uploads/2023/09/POGO-SCOR-Fellowships_2022_Report.pdf.