

## **POGO Biological Observations Working Group 2019 Summary of Activities**

### ***Overview and Objective***

The POGO Biological Observations Working Group (WG) was proposed and approved at the January 2018 POGO Members meeting. The WG was formed as a result of the activities from the POGO Biological Observations Task Force from the previous year.

The WG continues to foster broader and more consistent coordination by POGO with its long-term partners in fostering ocean observation (e.g., GEO including Blue Planet and the Marine Biodiversity Observation Network/MBON, SCOR, IOC) in addition to new partners (e.g., ICES, PICES, coastal marine laboratory networks, LTER/iLTER). We believe this could dramatically accelerate the process of developing ocean biological observing capabilities for large scale and long-term observation. POGO has committed to a leadership role in providing this coordination. POGO can do this by fostering dialogues that will increase the pace of capability development, such as standards for biological measurement; validation, verification and intercalibration of techniques; sampling strategies; and development of data repositories.

This WG has set an agenda for collaboration, and has ensured that POGO is informed on the state of development of ocean biological observing systems. We will continue to do this. This group will work on behalf of POGO to partner with other organizations to foster workshops and other activities. Our next activity will be an international meeting on eDNA techniques in the fall of 2020. We will also continue to ensure that POGO is represented in international discussion of ocean biological observing capabilities and systems. It is essential that we be able to go from ocean biological observation to ecosystem understanding.

### ***Working Group Members***

Margaret Leinen (Chair), Scripps Institution of Oceanography/UC San Diego, USA  
Lisandro Benedetti Cecchi, University of Pisa, Italy  
Gabrielle Canonico, NOAA, USA  
Francisco Chavez, MBARI, USA  
Neil Davies, University of California Berkeley, USA  
Francisco Hernandez, Flanders Marine Institute, Belgium  
Jules Jaffe, Scripps Institution of Oceanography/UC San Diego, USA  
Craig Johnson, University of Tasmania, Australia  
Patricia Miloslavich, Universidad Simon Bolivar, Venezuela  
Frank Muller-Karger, University of South Florida, USA  
Eric Orenstein, Scripps Institution of Oceanography/UC San Diego, USA  
Julie Robidart, National Oceanography Centre, UK  
Chris Scholin, MBARI, USA  
Ben Scoulding, CSIRO, Australia  
Yoshihisa Shirayama, JAMSTEC, Japan  
Willie Wilson, University of Plymouth, UK

### ***2020 eDNA Workshop***

The WG plans to organize and host a workshop focused on eDNA in 2020. The use of environmental DNA (eDNA) in studies of marine ecosystems has blossomed over the past 5 years. This meeting brings scientists, engineers and natural resource managers together to present results from these studies with particular focus on areas where future efforts can accelerate/move the field forward. The opportunities provided by eDNA are many, including the ability to census marine biota across multiple trophic levels with a single technique. Species of special interest, including those that are commercially important, protected or invasive, can be quickly and easily targeted. The technique is also amenable to automation in situ and deployment on global observing systems. At this time there are significant challenges to making rapid and major advances. The eDNA community continues to debate best practices in field and laboratory methods, information management, and interpretation and use. The choice of genome targets is large and regionally dependent. This makes a choice for a standardized global set of targets difficult. Many bioinformatics pipelines are available, each providing slightly different results. The genomes for marine species, required to identify eDNA to species level, are woefully incomplete. eDNA also produces large quantities of data, which is a challenge for data management, analysis, and application. The ultimate goal of the meeting is (i) to promote coordination at leading sites where scientific capacity and ongoing time-series using conventional methods enable calibration of eDNA approach and assessment of its potential advantages, and (ii) to develop recommendations for best practices that allow comparison of observations across regions and over time, while advancing the science and applications of eDNA. The meeting will seek a strategy for the community to systematically work through challenges and focus on opportunities.

### ***2019 Machine Learning and Artificial Intelligence for Biological Observations Workshop***

The WG hosted a workshop at the Flanders Marine Institute to jump start analysis efforts with new machine learning and artificial intelligence (ML/AI) tools. The program brought together 41 scientists, representing 15 countries (including India, Mozambique, South Africa, Brazil, and Japan), to engage in hands-on training in acoustics, genomics, and imaging analysis techniques. The participants interacted with data sets curated by the organizers on Amazon Web Services in a series of guided exercises. The tutorials concluded with time for attendees to begin experimenting with their own data. This type of capacity building is critical as ML/AI techniques become more pervasive. Moreover, the WG views ML/AI approaches to data analysis as a necessary building block for future biological observations as hardware tools collect even larger data sets.

### ***Representation at meetings/events***

- Many members of the WG attended OceanObs'19 this past September. The meeting concluded with strong support for the development of regular, synoptic biological observations that will begin to improve our ability to see changes in ocean ecosystems with time and to understand which changes are due to which pressures on the ecosystems. In addition, OceanObs19 made a strong call for the development of eDNA

methodologies and measurement programs to enhance our understanding of biodiversity in the ocean and changes in biodiversity.

- WG Chair Margaret Leinen is on the Executive Planning Group for the UN Decade of Ocean Sciences. Planning meetings and workshops for the decade have all emphasized the importance of improvements to our ability to observe the biology as well as the biogeochemistry of the ocean.
- Frank Muller-Karger and Gabrielle Canonico represent the US Marine Biodiversity Observation Network (MBON) – including 6 new MBON projects (see <http://marinebon.org>) - as Team Leader and Program Manager, respectively. Frank is also involved at the GEO level as co-chair of the GEO BON MBON, and is a member of the IOC's GOOS Bio Eco panel. The GOOS Bio Eco panel has responsibility to implement the biological Essential Ocean Variables (EOVs) and also works to link these with the marine Essential Biodiversity variables (EBVs). There is a request by the Global Climate Observing System (GCOS) to draft technical specifications of the biological EOVs that also serve as Essential Climate Variables (ECVs) (these are plankton and “marine habitat properties”, the latest including cover and composition of hard corals, seagrasses, macroalgae and mangroves). Muller-Karger also developed a draft set of activities for POGO to test concepts on interoperability of biological data as a result of the WG meeting that took place immediately after OceanObs19. POGO is well placed to engage in a number of IOC, ESIP, and GEO collaborations intended to develop a data architecture initiative for biological observations. Similarly, discussions have started on the viability of a biodiversity data archaeology effort.
  - Gabrielle Cononcio will be co-chairing a Town Hall at Ocean Sciences 2020 titled “Expanding access to critical marine biological diversity observations”, which focuses on scoping this data archaeology effort.
- To avoid any conflict of interests related to funding issues, Patricia Miloslavich, formerly the International Project Officer for the GOOS BioEco Panel will step down from the POGO WG as she is taking the role of SCOR's Executive Director.