

Marine Biodiversity: from the Sea to the Cloud

Pole-to-Pole MBON & AmeriGEOSS

Praia do Segredo, São Sebastião, Brasil, August 6-10, 2018

The Pole to Pole Marine Biodiversity Observation Network of the Americas (P2P MBON) gathered researchers and managers from Canada to Patagonia and experts from other parts of the world, to discuss and converge on strategies for biodiversity monitoring and conservation in rocky intertidal areas and sandy beaches.

The P2P MBON workshop took place at the Centro de Biologia Marinha da Universidade de São Paulo (CEBIMar/USP) during the 2018 AmeriGEOSS Week. This activity focused on capacity building and applied science for conservation and management of marine living resources emphasizing on four key areas: 1) field data collection using existing, standardized protocols; 2) manipulation of tabular and spatial data for standardized data formats, such as Darwin Core; 3) publish datasets to the Ocean Biogeographic Information System (OBIS, IOC) using established tools for data sharing; and 4) training on data science tools (R, Rmarkdown, Github) to



P2P MBON participants on a field expedition (August 8): Centro de Biologia Marinha (CEBIMar) - Universidade de São Paulo, Praia do Segredo - São Sebastião

mine data, conduct data discovery and analysis, and produce reproducible research documents with interactive visualizations on the web. The effort included discussion of remote sensing observations, and strategies to develop indicators for Sustainable Development Goals and Aichi Biodiversity Targets. The P2P MBON activity was led by the Institute for Marine Remote Sensing (ImaRS; University of South Florida), CEBIMar and Instituto de Biociências (IB) of the University of São Paulo in coordination with OBIS, the Global Ocean Observing System for Biology and Ecosystems (GOOS Bio Eco), and EcoQuants. This workshop was a first step for the implementation of a global P2P MBON network.

The main goal of the P2P MBON is to develop a community of practice that helps nations to improve conservation planning and environmental impact mitigation, serve the scientific community, and satisfy commitments to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), Aichi Targets of the Convention of Biological Diversity (CBD), and the UN 2030 Agenda for Sustainable Development Goals (SDGs). The approach of the P2P MBON for achieving this goal is through: 1) enhancement of coordination of data collection among nations; 2) improved collection of harmonized data, and the development of data standards and methodologies for data management and dissemination

without compromising national concerns; 3) integration of physical and chemical data over time with biodiversity information to characterize status and trends; and 4) generation of products needed for informed management of the ocean.

A core goal of the workshop was to develop a framework for biodiversity monitoring of sandy beaches and rocky shore intertidal areas. Lectures and field data collection exercises included topics on physical features of these ecosystems as well as diversity surveys in these habitats. Participants were introduced to novel technological tools to measure intertidal body temperature of sessile intertidal animals using temperature loggers embedded inside limpet shells (i.e. Robolimpets).

The PanAmex initiative from MarineGEO was introduced as a way to understanding the effects of fishing pressure on fouling community development, exotic invasions and biodiversity based on predator exclusion cage experiments. The PanAmex experiment is currently being deployed at multiple sites in North America and thus the workshop provided an opportunity for extending to possible sites in Latin America and the Caribbean. Participants from Argentina, Brazil, Colombia, Ecuador, Costa Rica, US Virgin Islands, Chile and Uruguay will deploy PanAmex at their study sites during the austral summer, i.e. before March 2019.

Computer training exercises dedicated to the use of R routines that allow the transformation of spreadsheets of raw data into a Darwin Core-formatted file were carried out. These included the use of a more advanced learning module for matching lists of observed species with species catalogs in the World Register of Marine Species (WoRMS) and obtaining WoRMS species identifiers, a required field in the DwC schema and OBIS. Best led a practical session on Github workflows and creation of Rstudio Projects with the Git Repository using Rmarkdown as tools for collaborative research.

Eighteen P2P MBON members formalized their commitment to start (or continue) a monitoring program aimed at detecting changes biodiversity at their study sites following this set of essential principles: 1) use of common methods, 2) repeated sampling at the same sites, 3) similar seasonal and temporal sampling resolution, 4) data formatting following DwC schema, and 5) open data sharing via OBIS. Participating countries include Canada, USA (mainland and US Virgin Islands), Costa Rica, Colombia, Brazil, Ecuador (mainland and Galapagos Islands), Chile, Brazil, Uruguay and Argentina. The first step will be for P2P MBON members to carry out at least one biodiversity survey at three sites in selected localities before the end of 2018. All data will be uploaded to the P2P MBON Repository and OBIS by the end of February 2019.

P2P MBON will contribute to the development of a global network that monitors body temperature of sessile organisms in rocky intertidal habitats by deploying Robolimpets. Robolimpets will be provided by the manufacturer (<http://www.electricblue.eu/>) at no cost to the project to be deployed at multiple sites from Canada to Patagonia (also possibly Antarctica). These sensors will be deployed at these sites before the end of 2018 in areas where biodiversity monitoring currently exists. Data will be collected from sensors using the smartphone app from the manufacturer (<http://www.electricblue.eu/>) available on the Android app store.

A primary goal of the P2P MBON team is the development of biodiversity indicators relevant to national contributions to international policy frameworks such as Aichi Biodiversity Targets and UN Sustainable Development Goals. Successful conservation and management of marine biodiversity requires informative indicators to holistically assess biodiversity and detect changes in distribution and status. The objective is to propose new indicators based on sets of Essential Biodiversity Variables (EBVs) and Essential Ocean Variables (EOVs) related to species distribution. The effort links with the GEO BON MBON efforts to develop a web service to enable extraction of OBIS data and corresponding environmental values from satellite data (color, temperature, seascapes), etc., for predefined areas of interest such as jurisdictions (EEZ, LME, MEOW, EBSA, WDPA, etc.) or arbitrary polygons.

P2P MBON will hold annual workshops focused on the advancement of the network's objectives and output production. The agreed tentative date for the next workshop is March 12-14, 2019.

Please see [Workshop Report](#) for more details.



P2P MBON participants at CEBIMar - Universidade de São Paulo, Praia do Segredo - São Sebastião