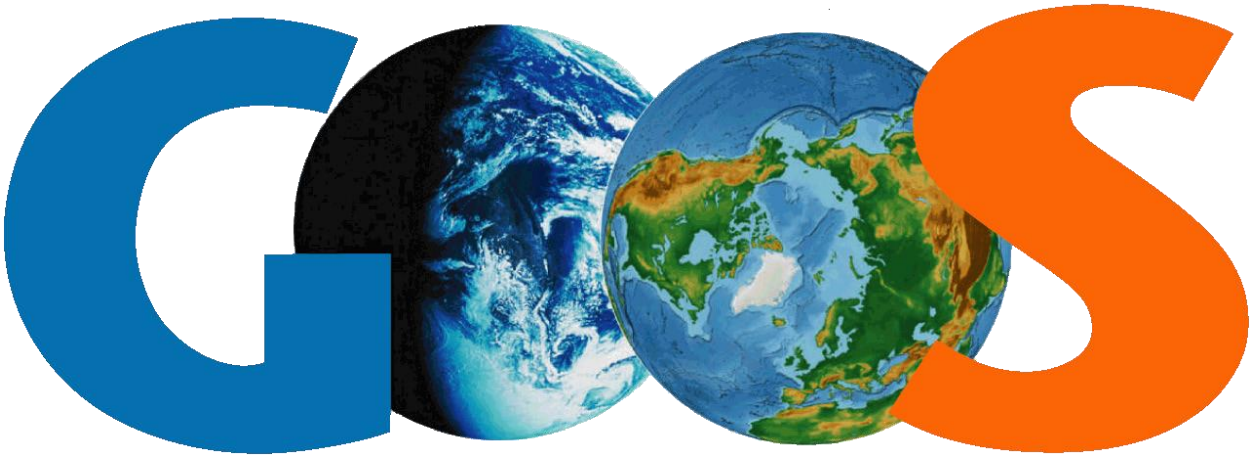


GOOS Biology and Ecosystems Expert Panel:

April 2016

http://ioc-goos.org/biology

Historically, ocean observations have not included comprehensive, systematic, long-term monitoring of Biological and Ecological parameters.

The ocean is changing in response to our increasing use. More and more people are depending on the oceans for food, transport, renewable energy, recreation, conservation, waste disposal, and other economic, social and cultural uses. As changes occur, life within the ocean is being affected, with potential consequences for the valuable services it provides from food to the oxygen we breathe.

Continuous, long-term observations are needed in order to know if, and how, ocean life is responding to human use, as well as to effectively mitigate or manage adverse changes, predict potential future changes and plan accordingly. Not all ocean life can be monitored everywhere, anytime, nor needs to be. Relevant changes in marine biodiversity, its function, and the services it provides can be detected by monitoring some of its essential variables

Through the establishment of the Biology and Ecosystems Panel (BioEco), the Global Ocean Observing System (GOOS) is launching an initiative that will provide a better, clearer understanding of ocean ecosystems through a sustained and targeted global ocean observation system. GOOS BioEco is composed of Biology and Ecosystem experts from across the globe who provide guidance to the GOOS network regarding essential ocean variable (EOV) identification, implementation (e.g. observations and technology), and best practices. Results from these observations will serve as the foundation for implementing policy based on science that promotes a healthy and sustainable ocean ecosystem for years to come.

The GOOS BioEco Panel aims to develop and coordinate international efforts to implement a sustained and targeted global ocean observation system of biological and ecosystem EOVs, driven by societal needs. This information is crucial to inform priority scientific and societal questions that will facilitate critical policy development and management decision-making on ocean and coastal resource sustainability and health.

In addition to being scientifically credible in terms of providing an indicator of change, these EOVs should be based on (1) their relevance in helping to solve science questions and addressing societal needs, (2) their contribution to improving management of marine resources, and (3) their feasibility and practicality for global measurement in terms of cost, available technology, and human capabilities. To identify biological and ecosystem EOVs, the Panel followed a DPSIR process (Drivers-Pressures-State-Impact-Response). Societal drivers and pressures requiring sustained global ocean observations were identified by analyzing the goals and societal issues addressed by more than 20 major international bodies and/or conventions, either binding or non-binding.

The main drivers identified in these conventions are included in Table 1, and included development, sustainable use and conservation; improved access to scientific knowledge and data, including capacity building; and improved management through an integrated ecosystem approach. More specific drivers were prevention and mitigation of threats, food security and environmental quality.

The main pressure identified was resource loss including habitats and biodiversity, with specific pressures including climate change, variability and ocean acidification; coastal development, pollution (including eutrophication), solid wastes and noise; invasive species; and to lesser degree mining.

Table 1 Summary of societal drivers and pressures identified and percentage of international bodies addressing each of them.

DRIVERS	%	PRESSURES	%
Knowledge: science / data access	74	Loss of resources: habitats / biodiversity	91
Sustainable use: biodiversity and resources	74	Climate change	48
Conservation: biodiversity and ecosystems	65	Pollution / eutrophication	48
Development: sustainable economic growth	61	Coastal development	39
Capacity building	57	Invasive species	35
Improve management: integrated ecosystem approach	61	Solid wastes	30
Threat prevention and impact mitigation	35	Ocean acidification	22
Food security	26	Extreme weather events	22
Environmental quality: health	26	Noise	22
		Mining	9

The current state of ocean observation of biological and ecosystem variables was assessed through an on-line survey completed by more than 50 major global and large-scale regional observing networks or programs. The survey compiled information on the extent of observations in terms of geographic area, temporal and spatial scales, biological and ecological variables measured for the different taxonomic groups and ecosystems, and data availability and readiness.

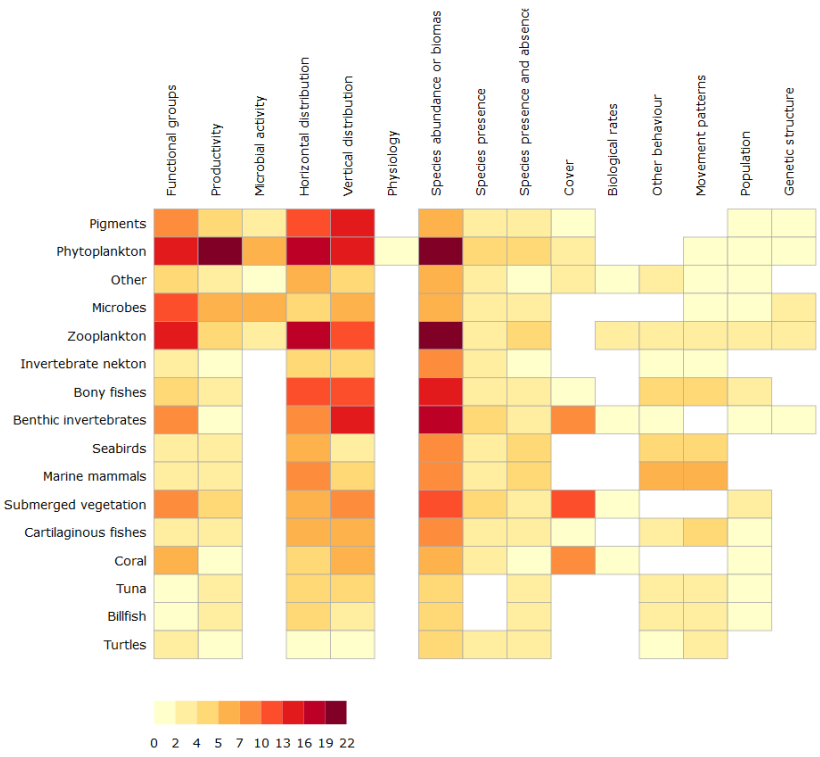


Figure 1. Summary of survey results showing the main variables measured for each of the taxonomic groups and ecosystems. The scale indicates the number of observing systems measuring each of them.

To identify EOVs, the Panel is also building on scientific expertise and existing frameworks such as the Australian Integrated Marine Observing System (IMOS), the US Integrated Ocean Observing System (IOOS), the Panel for Integrated Coastal Observations (PICO) plan, and the Southern Ocean Observing System (SOOS), among others. This process has led to nine proposed EOVs within two categories or phenomenon of interest (Table 2).

Table 2 Proposed EOVs for Biology and Ecosystem health of marine ecosystems.

STATUS OF FUNCTIONAL GROUPS	HEALTH OF LIVING ECOSYSTEMS
Phytoplankton biomass and productivity	Seagrass cover
Incidence of harmful algal blooms	Macroalgal cover
Zooplankton diversity	Live coral cover
Fish distribution and abundance	Mangrove cover
Apex predator distribution and abundance	

The variables identified with the highest level of readiness for implementation at a global scale were those related to zooplankton and coral reefs. These proposed EOVs will now undergo a process of consultation and validation with the scientific observing community who will build specification sheets within GOOS standards, including the concepts of readiness (Figure 2).

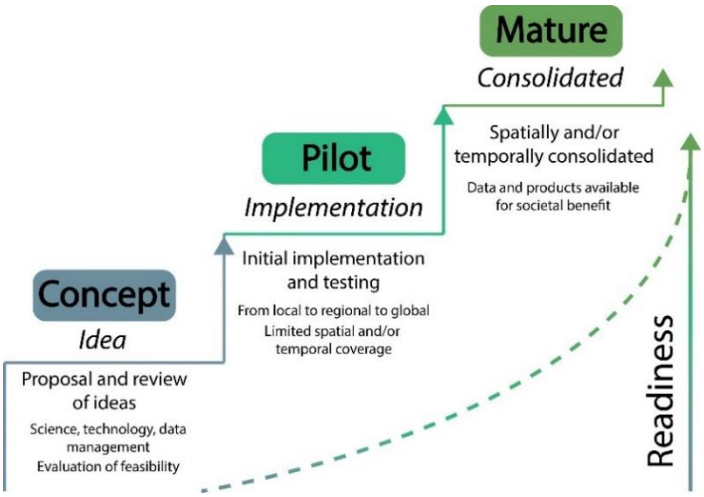


Figure 2. The concept of readiness levels (Modified from FOO 2012).

The next steps in the action plan of the GOOS BioEco Panel are to:

- Complete specification sheets for proposed EOVs
- Revisit EOVs incorporating comments from broader marine community
- Facilitate regional and global integration of existing biological observing networks to increase their value and reach
- Develop new, global biological observing networks as necessary to support sustained measurement of biological essential ocean variables

- Improve the communication of results from sustained monitoring of biological variables, thus increasing their contribution to decision making at local, national, and global scales

The outcome of these activities will be the development with the international community of an observation network of essential ocean variables to inform management of potential shifts of critical marine resources, encouraging best practices, standardization, and development of technology to facilitate sampling. This collective approach will strengthen data sharing and interoperability, and enhance capacity building and technology transfer.

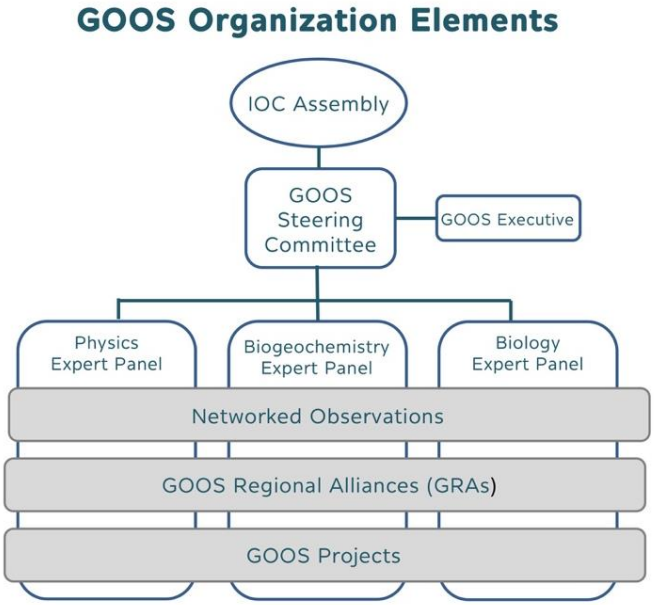
Summary of GOOS Panels

The GOOS is a sustained global collaborative system for observations, modeling, and analysis of marine and ocean variables to support research and operational ocean services. GOOS coordinates observations across three critical cross-cutting themes: Climate, Real-Time Services, and Ocean Health. These themes are addressed by three discipline-based Expert Panels: Physics, Biogeochemistry, and Biology and Ecosystems.

Of the three panels, the Physics and Biogeochemistry Panels were built on existing structures - the Physics Panel on the Ocean Observations Panel for Climate (OOPC) and the Biogeochemistry Panel on the International Ocean Carbon Coordination Project (IOCCP). The Biology and Ecosystems Panel was formed in 2015 and draws on the experience from the last decade of research best practices in this field. This panel is a unique entity, not directly associated with another organization.

GOOS Background & Governance

The modern GOOS governance model optimizes collaboration and integration across many existing observing system elements and communities. The current GOOS structure (right) is characterized by different groups focused on observation execution, innovation, and scientific oversight. Within this structure, Expert Panels provide Scientific Oversight.



FOO 2012. A Framework for Ocean Observing. By the Task Team for an Integrated Framework for Sustained Ocean Observing (IFSOO).UNESCO 2012 (IOC/INF-1284). DOI: 10.5270/FOO

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