Enhancing Coastal and Ocean Observing and Innovation: OAR and IOOS

Image: Coral reef ecosystem; Source

Biology

OVERVIEW

The diversity of life in our oceans and Great Lakes is fundamental to our well-being and prosperity. This diversity depends on, influences, and is influenced by climate, water quality, physical and chemical ocean state variables, and has significant and widespread human health and economic impacts, including provision of food, medicines, materials, and other services that sustain tourism and culture.

A discussion of existing collaborative efforts during the 2020 Workshops between the Oceanic and Atmospheric Research (OAR) and Integrated Ocean Observing System (IOOS) identified priority areas relevant for biodiversity research, observing, and technology development, such as: ecosystem dynamics and function; impacts to living resources from climate shifts and ocean acidification; use of new technologies and 'omics approaches for species identification and automated sampling; bioinformatics and data management; ocean sound and acoustics.

Changes in seasonal and longer-term variations in physical and chemical ocean conditions are affecting biodiversity in the ocean. While these physical and chemical conditions are often well-documented in long time series and ocean observing routines, significant gaps exist in our understanding of and ability to observe and document life in the ocean and Great Lakes. Stakeholders need to understand how changing environmental conditions—from climate change, human activities, ocean acidification and other factors—impact critical living resources for human livelihoods, conservation, research, ecosystem and ocean productivity management, and blue carbon monitoring.

Image: A colorful coral reef teeming with fish; Source

OPPORTUNITY

Enhancing IOOS and OAR collaborative efforts will:

- Advance the co-development of new technologies and best practices, from data collection to data sharing.
- Improve the integration of technologies and data across topical areas and platforms to address multiple stakeholder concerns.
- Incorporate species observations into models.
- Support stakeholder response to changing ocean conditions.

Objectives:

- Enhance alignment of stakeholder, research, and operational needs.
- Advance understanding and adoption of community-agreed data standards to accelerate interoperability with other data types and platforms and ensure wide accessibility through joint training, code sprints, and other activities.
- Align critical data across the National Oceanic and Atmospheric Administration's (NOAA) data management efforts to maximize data access and usability.
- Ensure sustained communication and coordination to maximize return on investment.
- Advance Marine Biodiversity Observation Network (MBON) partnerships to advance new technologies and best practices for 'omics applications, ocean acidification impacts, integrated ecosystem assessment, impacts to living resources from storms and other coastal hazards, and conservation and restoration goals.

NEXT

Priority recommendations:

- Document progress to date on automated biological sampling from in situ moorings, and long-range autonomous underwater vehicles (AUV, a robot that travels underwater without requiring input from an operator), and leverage opportunities to expand these capabilities.
- Create a process to foster ongoing collaboration that includes follow-up meetings focused on:
  - Automated sampling coupled with artificial intelligence.
  - Bioinformatics and data management.
  - 'Omics.
  - Ocean sound and acoustics.
  - Plankton dynamics, coral reef restoration, ecosystem function, and modeling.
  - Harmful algal blooms and biodiversity.
- Review and advance collaborative actions outlined in the NOAA 'Omics Implementation Plan.
- Identify shared stakeholder needs and gaps in information that can be addressed through collaboration.

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