

The IOOS Contribution to Biological Observing (“IOOS Biology”)
IOOS Biological Working Session Summary Report
September 18-19, 2018, Annapolis, MD

IOOS conducted a day and half working session at the 2018 IOOS Fall Meeting to explore how IOOS can address the growing need for biological observations at the local, regional, national and global levels. The working session was the first time that the IOOS Program Office staff and RA Directors explored together the need for biological information, including defining the unique role that IOOS can and should play in biology, and making recommendations for moving forward.

Vision and Mission for the IOOS Role in Biology

Vision: Diverse, healthy, vibrant, marine ecosystems that support robust/resilient coastal economies and communities.

Mission: IOOS promotes collection and sharing of information on ecosystems through integration of biological, biogeochemical, and physical observations and models; by leveraging partnerships, infrastructure and operations across disciplines and sectors.

The IOOS enterprise works at all levels, from regional to global, to identify and address the need for biological observations, data management and information products. IOOS deploys and maintains regional observing infrastructure, provides as a platform for testing of new technologies, promotes standardization and interoperability of observing methods and data management, develops data tools and products for use by stakeholders, and supports models to serve multiple user needs.

IOOS:

- Provides timely, relevant and operational information to promote ecosystem understanding, detect changes and decision-making,
- Integrates across agencies, disciplines, jurisdictions, geographies, and the public and private sectors,
- Serves as a trusted and neutral broker,
- Delivers reliable data that meets national standards through 11 certified Regional Information Coordinating Entities,
- Offers partners opportunities for fiscal management and for leveraging resources to sustain observations.
- Integrates, aggregates and provides ready access to data from disparate sources,

- Establishes and nurtures relationships with stakeholders across the nation, and
- Provides high resolution observations and information needed to address national missions with local and regional relevance.

The demand for biological observations and information comes from a variety of government agencies, researchers, NGOs, industry and the general public. Stakeholders fall into four broad categories:

1. Managers/Agencies: Federal, tribal, state
 - a. Public health: e.g., HABs, beach water quality, seafood safety
 - b. Regulatory: e.g., offshore energy and mineral (BOEM); water quality (EPA)
 - c. Management: Fisheries management (NMFS, regional councils, tribes, states) protected species (MMC).
 - d. Placed-based management : Sanctuaries, NERRS
2. Researchers: Process studies (e.g., NSF funding research, research cruises); integration of *in situ* data with remote sensing for ecosystem understanding and forecasting (e.g., NASA programs)
3. Public/private stakeholders: commercial and recreational fishermen, aquaculture, general recreation, education, tourism
4. NGOs: Surfrider, World Wildlife Fund, The Nature Conservancy

IOOS Biology: Current Status and Unique Contributions

The need for biological observations span a range of needs from monitoring and detection of harmful algal blooms, long-term fisheries sampling, coral bleaching, ocean acidification, detection of fish and protected species, biodiversity and emerging needs such as e-DNA. Several RAs work with citizen science groups to provide data services such as monitoring manatees or to capture local and traditional knowledge in the Arctic. See [this link](#) for a summary of current RA activities related to biological observations.

At the regional level, IOOS serves as a community convener, bringing together data providers, researchers, managers, private industry and stakeholders to understand the needs, set priorities and work together to find practical and sustainable solutions. IOOS regions design and operate observing systems, support models and forecasts to improve understanding and early notification of events, and the development of information products for stakeholders. This is done in collaborations with partners at research institutions, government agencies, NGOs, the private sector and stakeholders.

Recommendations

The following are recommendations identified at the working session for how IOOS can address the need for biological observations, data services and information products.

1. Document key stakeholder needs for biological information at the regional level

RESPONSIBLE PARTY: RAs with support from PO

TIMELINE: Ongoing - To be completed by all RAs by Oct 2019

UPDATE:

2. Emerging Technology: Develop mechanisms for technology transfer and lessons learned about emerging technology for biology.

- a. Review results of the Ocean Technology Transfer project such as those involving the Imaging FlowCytobots and Environmental Sample Processor and make recommendations for how the technology could be expanded to other regions.

1. Identify potential funding to integrate existing IFCB efforts into an operational network, expand deployments to other regions, and develop appropriate workflows. Engage with IFCB experts.

2. Address data services and classification needs

- b. Identify how the IOOS PO can foster transitioning technology to operational status or transfer of lessons learned from the results of the OTT projects. IOOS should coordinate with partners such as NCCOS, MBON and others to move technology that is ready forward into operations.

RESPONSIBLE PARTY: Targeted Working Group of RAs and IOOS PO

TIMELINE: Call with IFCB RAs about lessons learned - by Jan 2019

Process for lesson learned with OTT

UPDATE:

3. Harmful Algal Blooms: Advance IOOS efforts in coordination with NOAA and other agencies to detect and respond to HABs

- a. Develop a short white paper that outlines the contributions of IOOS in detection and forecasting of HABs and it's partnerships with NCCOS, CO-OPS, research institutions and others. The paper should identify the need for filling observational gaps, data management and communication, modeling and forecasting and explore developing a "R&D transfer node" that would provide one-stop shopping for information.

- b. Prepare for possible supplemental funding

- c. Address HAB related data management needs

RESPONSIBLE PARTY: Small Working Group to draft concept paper

TIMELINE: Jan 2019

UPDATE:

4. Fisheries Data: Expand access to fisheries data for partners.
 - a. Work with Frank Schwing of NMFS to develop partnership with RAs and NMFS to locate, access, host, and make accessible fisheries data to IOOS regions and partners.
 - b. Explore role that IOOS can play in NMFS' Integrated Ecosystem Assessments (IEA):
 - i. Understand work underway with California Current and Florida Keys Integrated Ecosystem Assessment (IEA) programs as an example of how IOOS can contribute
 - ii. Explore partnership with IEAs in additional regions, including support for web-based tools and conceptual models for regional indicators

RESPONSIBLE PARTY: Ops Division RAs,

TIMELINE: Initial call with NMFS (Nov 2018), Call with all RAs planned for Jan 2019, Project Proposal by late spring 2019 in prep for FY 20

UPDATE:

5. Ocean Noise: Explore IOOS role in observations of ocean sound
 - i. Identify RAs current role in ocean sound, identify stakeholder needs, and explore possibility of site-specific demonstration project(s) to integrate sound data into products, with NMFS as user.
 - ii. Exploring possible collaborations with NOAA and Interagency efforts (Gabrielle)
 1. Ocean Noise and Marine Life Task Force (Fed Agencies- Gabrielle and Bill IOOS reps)
 2. NOAA Ocean Noise Reference Network (Jason Gedamke) and NOAA Ocean Noise strategy
 3. BOEM - Atlantic - for offshore wind and leasing, biodiversity around structures

RESPONSIBLE PARTY: Ops Div and RAs

TIMELINE: Call with Jason Gedamke at NMFS and RAs in Dec 2018, 2nd call with BOEM, RAs and other in Jan 2019

UPDATE:

6. Data Management: Promote data standards and best practices
 - a. Adopt and advance Darwin Core and ERDDAP

- i. RAs conduct regional Darwin Core and ERDDAP training (working closely with the IOOS PO and OBIS)
 - ii. The SOS-ERDDAP transition includes discussion of biological data
- b. Invest in regional capacity to ingest and distribute biological data
 - i. Continue \$15K per region for biodata integration and stakeholder engagement
 - ii. Engage IOOC on shared language around data standards/requirements for federally-funded activities
- c. Articulate purpose and audience for various portals for regional and national portals.
- d. Develop an IOOS Biological Data Portal that links existing biological portals (e.g., OBIS, MBON, ATN, RA, etc) to minimize duplication and confusion
 - i. Develop clear statement of the roles of OBIS (global), MBON (national and global) and IOOS.
 - ii. Key themes new ideas, next steps
- e. Develop business model for data services for data integration, seek ways to encourage data sharing through permit requirements (interagency activity including NMFS PARR, BOEM studies, ATN)
- f. Initiated a data archeology effort
 - i. Advocate with other agencies and parts of NOAA that RAs are able to do this. Labor intensive but there are tools to help
 - ii. Need agency policy to push openness of data.
 - iii. Incentivize data sharing- give PIs a DOI Need better story to convince PIs to contribute

RESPONSIBLE PARTY: Ops Div/RAs scoping group to review and prioritize recommendations

TIMELINE: Convene by Feb 2019

UPDATE:

7. Data product development and sharing: Enhance biological information products
- g. Explore multi-regional products. Identify existing products that can be easily shared, explore shared development of Apps
 - h. Product development training. Training on end-to-end best practices on how to develop a product with outside experts.
 - i. Develop synthesized products that provide seamless product integration (e.g., whale movement across regions)
 - j. Explore new business models for products such as “Willingness to Pay, Service Level Agreements, etc. Engage market expert to provide recommendations.

- i. Enhance visualization for products

RESPONSIBLE PARTY: Ops Div, RA scoping group to review and prioritize recommendations with above

TIMELINE:

UPDATE:

7. Address need for hyperspectral and higher spatial and temporal data for biology in coastal zone and Great Lakes - drones, aircraft, satellite

- a. Understand how NASA is addressing this in their long range planning

- b. Work with ACT to implement recommendation from their drone workshop

RESPONSIBLE PARTY: Subject Matter Experts, ACT, others

TIMELINE: 2019

UPDATE:

8. Integrate existing local observing and citizen science into a regional portals with linkage to the global. (Possible foundation proposal)

RESPONSIBLE PARTY: RAs, PO, others

TIMELINE: 2019

UPDATE:

9. Convene community workshop and writing team to develop IOOS Biology implementation plan that engages Federal agencies, RAs and subject matter experts.

RESPONSIBLE PARTY: Ops Div with RAs

TIMELINE: TBD FY 20

UPDATE:

10. Global engagement - enhance communication with GOOS; engage IOOS PO with RAs and relevant GOOS regional bodies at Ocean Obs 19.

RESPONSIBLE PARTY: Ops Div with RAs

TIMELINE:

UPDATE:

Summary Chart for Recommendations

Build on the OTT successes for biological technologies - starting with IFCB	Ru, Barb, Henry, Clarissa, Jan, Kelli, NCCOS, MBON	Initial call by Dec 2018
Detecting and responding to HABs (Barb, Clarissa, Jan, Kelli, Ru and others)	Barb, Clarissa, Jan, Kelli, Ru and ...	Jan 2018
Adopt and advance Darwin Core and ERDDAP	IOOS PO - Ops Division	
Work with NMFS to locate, access, host, and distill data	Frank Schwing, Gabrielle, Josie, RAs	Dec 2018
Explore IOOS role in sound - active and passive, telemetry - emerging and of interest	Gabrielle, Josie, RAs	Ongoing
Data product development and sharing		
Identify need for hyperspectral and higher spatial and temporal data for biology in coastal zone and Great Lakes		
eDNA, 'nomics, etc	Gabrielle, MBON	<u>Ongoing</u>
Integrate existing local observing and citizen science into a regional portals with linkage to the global (proposal to a Foundation?)		
Develop an IOOS Biological Data Portal that links existing biological portals (e.g., OBIS, MBON, ATN, RA, etc) to minimize duplication and confusion	Ops Division	
Initiate a data archeology effort (requires funding)	Ops Division	

Convene community workshop and writing team to develop IOOS Biology plan	Gabrielle, Josie	
Enhance communication with GOOS; engage IOOS PO with RAs and relevant GOOS regional bodies at Ocean Obs	Derrick, Gabrielle	