ANNOUNCEMENT OF FEDERAL FUNDING OPPORTUNITY

EXECUTIVE SUMMARY

Federal Agency Name(s): National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce

Funding Opportunity Title: FY2022 US Marine Life Observations: Coordinated Marine Biodiversity Observation Network (MBON) and Animal Telemetry Network (ATN) Activities to Ensure Resilient, Productive Ecosystems and Human Communities in the Face of Change

Announcement Type: Initial

Funding Opportunity Number: NOAA-NOS-IOOS-2022-2007005

Catalog of Federal Domestic Assistance (CFDA) Number: 11.012, Integrated Ocean Observing System (IOOS)

Dates: Full proposals must be received no later than 11:59 PM Eastern on Friday, 17 December 2021

Funding Opportunity Description: On behalf of the National Oceanographic Partnership Program (NOPP), NOAA and partner agencies, including the National Aeronautics and Space Administration (NASA), the Bureau of Ocean Energy Management (BOEM), and the Office of Naval Research request proposals that: (1) build upon the foundation established by the US Marine Biodiversity Observation Network (MBON), the US Animal Telemetry Network (ATN), and the US IOOS Regional Associations to work across sectors and disciplines towards an integrated, sustained marine life observing capability for the U.S. ocean, coasts and Great Lakes, from estuaries to the deep ocean; (2) advance technologies for efficient and/or automated collection of species and associated habitat observations; (3) enable open access to biodiversity data and information; and (4) utilize these observations, technologies, and data to address place-based (e.g., sanctuaries, reserves, protected areas, leasing blocks, etc) management, conservation and restoration needs.

NOPP anticipates making multiple awards, subject to the availability of funds, in amounts up to $500,000 per project per year for up to five years. Total estimated funding for all awards is up to $6M million per year. The number of awards is anticipated to range from approximately three (3) to twelve (12) and will be adjusted based on availability of funds. Proposals not funded in the current fiscal period may be considered for funding in the next fiscal period without NOAA or NOPP repeating the competitive process outlined in this announcement. Proposals that include a team leader component can request up to an additional $40,000 per year for that role in a separate budget (further details provided below).

Applicants are encouraged to visit marinebon.org and ioos.noaa.gov for more information about MBON, ATN and related activities. Applicants should note requirements later in the call for direct involvement of both resource managers (local, tribal, state and federal) and IOOS Regional Associations in proposal development and project implementation.

FULL ANNOUNCEMENT TEXT

I. Funding Opportunity Description

A. Program Objective

The US MBON was borne out of the Census of Marine Life and the recognition through the Census that while huge investments are made in ocean observing systems and biodiversity monitoring, there is no systematic and integrated global effort to observe life in the sea that can tell us about status, trends, shifts over time and importantly, how changes in marine life and habitats impact people. In May 2010, the NOPP and seven Federal agency co-sponsors convened a workshop titled “Attaining an Operational Marine Biodiversity Network” (https://cdn.ioos.noaa.gov/media/2017/12/BON_SynthesisReport.pdf). This workshop resulted in a solicitation to initiate a US MBON, which was to become a partner within the global Group on Earth Observations Biodiversity Observation Network (GEO BON) which had a pre-existing mandate for coordinating marine biodiversity observations around the world. In 2014, NOPP agencies initiated three US MBON projects to demonstrate how an operational MBON could be developed for the nation. In 2019, NOPP agencies awarded six new three-year US MBON projects covering the Arctic, northern and southern California Current, Pacific Northwest, Gulf of Maine, and South Florida. These six projects are now addressing specific needs of their collaborating federal, state and foundation partners.

The multi-agency U.S. Animal Telemetry Network (ATN) was established in 2016 to provide unity, stability and continuity to the national animal telemetry infrastructure; facilitate the systematic collection and accessibility of U.S. marine animal telemetry data; maximize collaboration/benefits of existing telemetry investments; establish an operationally-competent state-of-the art cyber location capable of providing adaptive, scalable data aggregation, management, sharing, accessibility and display; and bring permanence to a national baseline telemetry network. Federal agencies have identified tagging data of marine animals (e.g., pinnipeds, sharks, whales, fishes, turtles, and seabirds) supported and aggregated via an ATN as an efficient way to assess baseline animal movement and behavior in support of conservation and to apply the data to make informed decisions about the environment and the ocean that comply with ESA, Magnuson-Stevens Fishery Conservation and Management Act, the National Marine Sanctuaries Act, and the National Environmental Policy Act.

US MBON and ATN successes to date and themes on which this funding opportunity intends to build include:

- Producing, with NOAA CoastWatch, MBON Seascapes products derived from satellite and modelled data to map dynamic, changing ocean habitats (see: https://coastwatch.noaa.gov/cw/satellite-data-products/multi-parameter-models/seascape-pelagic-habitat-classification.html#:~:text=MBON%20Seascapes%20identifies%20spatially%20explicit,at%205%20km%20spatial%20resolution)
- Advancing methods and applications of a range of technologies and approaches - environmental DNA (eDNA), passive acoustics, animal telemetry, satellite remote sensing imagery, and artificial intelligence - to identify species and habitats and to assess and monitor biodiversity hotspots.
- Ensuring data and information are readily available to resource managers, scientists, educators, and the public in an easily digestible way through development of web-based, interactive tools in partnership with National Marine Sanctuaries and Integrated Ecosystem Assessment teams.
- Partnering with IOOS and the Ocean Biodiversity Information System (OBIS) to advance community understanding of best practices and standards for biological data management through training, code sprints, and other events to ensure widest access and interoperability across data types and platforms.
- Sharing project and partner data via the MBON Data Portal (http://mbon.ioos.us) and the

ATN Data Assembly Center (https://atn.ioos.us/), where users can search and download real-time, delayed-mode, and historical data for in-situ and remotely-sensed physical, chemical, and biological observations and regional animal telemetry; compare datasets across regions and disciplines; and generate and share custom data views.

- Innovative modeling approaches to contextualize and extend organismal and ecosystem-wide observations to enable regional understanding of dynamic biogeographic patterns and underlying oceanographic processes, conduct sustainable marine biological surveys, enhance monitoring methodology, and real-time synoptic ecosystem assessments.
- Addressing priority themes and recommendations identified during ATN/MBON Regional StakeholderWorkshops (https://cdn.ioos.noaa.gov/media/2021/08/ATN-Regional-Workshops-Summary.pdf) Creating opportunities to support student education and research to help build a future diverse, equitable, and inclusive blue workforce.

Animal telemetry has long been acknowledged during MBON workshops and scoping as a key method to understand animal behavior, distributions, aggregations and movement. This call for proposals seeks to bring together communities of MBON and ATN practitioners together, building on efforts such as BioTrack (https://marinebon.org/pages/biotrack/). The ATN was established in 2016 to create an alliance of collaborating partners that enables science by assembling these national capabilities into a cohesive network, complete the network incrementally where needed, and provide a stable, unifying, long-term underlying infrastructure including a data aggregation and management capability for it. ATN is being implemented on three foundational pillars: 1) building alliances and collaborations, 2) providing telemetry data aggregation, management, display and delivery, and 3) funding high priority baseline animal telemetry observations and supporting sentinel science (eg Hazen et al 2019; https://doi.org/10.1002/fee.2125).

This call particularly encourages *integrative approaches* that fuse MBON and ATN activities with other networks and observations, including: ‘omics, passive acoustics and soundscape metrics, satellite observations (e.g., seascapes, ocean color, sea surface temperature (SST), sea surface height (SSH), other), and imagery (e.g., from remote operated vehicles (ROVs) or Imaging FlowCytobots (IFCBs), arising from estuaries to the deep ocean. Any integrative approach should employ Big Data and cloud-based solutions where needed to aggregate, process, and synthesize data from different methods or providers with a goal of documenting changes in biodiversity in space and time.

Additionally, deep-sea coral and sponge communities are recognized as particularly valuable and vulnerable marine ecosystems and primary conservation targets. Projects that develop approaches to extend characterization and monitoring of biodiversity to vulnerable, biogenic deep-sea habitats are encouraged. As human activities and climate change increasingly affect deep-sea ecosystems, there is an increasing need to understand changes to their associated habitats and species. Establishment of reference sites and developing techniques to measure essential ocean variables for key biodiversity components will inform spatial planning and impact assessment for activities that impact the deep seabed.

The sponsors recognize that information about marine habitats and species biodiversity are required (even foundational) to guide and inform management and conservation decisions, and that considering and including management and decision-making “resource managers” at the beginning of the process can make this scientific information more “actionable” or “operational” in a management context. Therefore, this call places a priority on projects that: 1) align the scale

of biological observations with the scale needed for management decisions and actions, focus on a specific management issue(s), and include a resource manager as part of the team, 2) measure biology and biodiversity and not just physical/environmental factors that act as proxies for biology and biodiversity, and 3) translate the data analyses to actionable information of use to managers. Example applications include informing National Marine Sanctuary condition reports, ecosystem-based management, and Marine Protected Area designation or management; providing updates to ecosystem status reports; identifying species migratory pathways and important habitat use areas and how these might be changing as a result of climate forcings.

B. Program Priorities:

Biological and physical measurements that characterize and inform ecosystem status, trends and services which provide benefits to humans are critical to inform decision-making regarding ocean uses such as fisheries, tourism and recreation, energy production, and mineral extraction, as well as to enable protection, restoration and response or adaptation to change. Long-term observations of living organisms, animal movement, and ecosystems - preferably over decades and across trophic levels from microbes to marine mammals - improve our understanding of ecosystem function and assessment of anthropogenic effects in the face of a naturally variable system. A strong focus on biodiversity, including taxonomic, genetic, and functional diversity is required for proposals to be responsive to this funding opportunity (Duffy et al. 2013, https://doi.org/10.1525/bio.2013.63.5.8).

Biodiversity is defined as the variety of life, encompassing variation at all levels of complexity – genes species, ecosystems, and biomes – and including functional diversity and diversity across ecosystems. A growing body of research demonstrates that: (1) the maintenance of marine biodiversity is critical to sustain ecosystem and human health and resilience in a globally changing environment, and (2) the condition of marine biodiversity is a useful proxy for the health of ecosystems and their ability to provide ecosystem services. Thus, managing marine resources in a way that conserves biodiversity directly supports the global economy and the US Government's collective ocean management objectives. Marine life observations inform National Environmental Policy Act (NEPA) compliance, the National Marine Sanctuary Act and Marine Mammal Protection Act (MMPA), Essential Fish Habitat (EFH) and Endangered Species Act (ESA) consultations and compliance; they inform agencies' responses to climate change and actions that might impact critical habitats and resources and enable agencies to differentiate between naturally occurring changes and anthropogenic effects.

NOPP invites proposals from multi-sector, multi-disciplinary teams to build on, expand and link MBON, ATN, and partner activities toward an operational observing network providing needed marine life observations for the Nation and for users across the research to management continuum.

We are soliciting proposals for projects conducted in US waters only, defined as US coastal waters, Great Lakes, and exclusive economic zone (EEZ). While this solicitation targets projects in US waters only, activities supported in this call will advance international efforts to understand marine biodiversity and its changes from the local to global levels. US MBON actively contributes to the Group on Earth Observations Biodiversity Observation Network (GEO BON) MBON thematic node. As core components of US IOOS, US MBON and US ATN actively contribute to the Intergovernmental Oceanographic Commission (IOC) via the Global Ocean Observing System (GOOS), the GOOS Biology and Ecosystem Panel, OBIS, and the emerging GOOS network, AniBOS. Further, US MBON is a core contributor to the Marine

Life 2030 Programme of the UN Decade of Ocean Science for Sustainable Development.

Proposed projects should be comprehensive to include data collection, management and product delivery activities and can consider incorporating any/all of the following:

- technology-based approaches - including satellite and acoustic telemetry, satellite remote sensing, 'omics, passive and active acoustics, imagery and optics, animal-borne sensors,uncrewed systems, artificial intelligence/machine learning, and cloud-based solutions - to expand and in some cases automate collection of biological observations and streamline access to those data;
- innovative data management approaches; and
- modeling to provide process or contextual understanding to observations as well as enable the integration of observations at different spatial and temporal scales and link physical, chemical, anthropogenic, and biological information with driving environmental and socioeconomic covariates.

Proposals should build on MBON and ATN outcomes and partnerships as noted in the Program Objectives section above.

Proposals must demonstrate specific contributions to the characterization and mapping of marine life as well as to the management of marine ecosystems, including of fisheries, protected areas, protected species and habitats, climate adaptation, impacts from offshore or deep ocean development, invasive species, etc.

Projects that develop approaches to extend characterization and monitoring of biodiversity to vulnerable, biogenic deep-sea habitats are encouraged. As human activities and climate change increasingly affect deep-sea ecosystems, there is an increasing need to understand changes to their associated habitats and species. Establishment of reference sites and developing techniques to measure essential ocean variables for key biodiversity components, will inform spatial planning and impact assessment for activities that impact the deep seabed.

Resource managers must be engaged at all stages of the project, including serving as co-investigators or in other roles as part of the proposing team. Successful proposals will integrate observations and data across multiple scales of diversity (genetic to ecosystem), taxonomy (microbes to whales), movement, time, and space (from fine-grain data collected in-situ to coarser-grain in-water, airborne, and satellite remote sensing information) and integrate biological observations with information on environmental conditions.

Proposals that incorporate passive acoustic measurements - ambient levels and/or anthropogenic, biological and physical environmental soundscape components - are also of interest to sponsors. Ocean sound is an IOOS core biological variable and a GOOS Essential Ocean Variable. NOAA and partner agencies have expanded their capacity to collect and archive passive acoustic monitoring data in development of soundscape metrics for management applications - this is a growing area of interest.

Special consideration will be given to proposals that establish or enhance monitoring and place-based management of living resources in partnership with one or more of the following: US IOOS Regional Associations, BOEM Regional Teams from the Environmental Studies and Renewables Programs, the Marine Protected Areas Center, Marine National Monuments and National Marine Sanctuaries, Naval Ranges and Naval fleet areas of activity, NOAA Integrated Ecosystem Assessment program, the Smithsonian-led MarineGEO, the National Estuarine Research Reserves, the NASA Earth Science Division and associated activities at NASA

Centers including the Jet Propulsion Laboratory, and other state and federal management and stewardship programs.

Proposed efforts should identify and integrate data to characterize ecological baselines and inform about shifts in these baseline, to capture the status and trends of populations, and to understand the condition of habitats and ecosystems by:

- Integrating biodiversity and environmental observations and data to support specified management needs;
- Integrating across taxa - eg integrating microbial and benthic communities with higher trophic level observations to understand impacts from multiple stressors, including climate change and extreme events, ocean acidification, human activities, invasive species introductions, etc.;
- Integrating satellite and airborne remote sensing with in-situ observations to address relationships and connections between in-situ phenomena, observations and collections, and phenomena occurring at larger spatial scales and/or in areas lacking finer scale in-situ observations;
- Integrating observations of animal movements, behavior and vocalizations in relation to critical habitats to improve understanding of ecosystem function and dynamics and to identify biodiversity hotspots and shifts in biodiversity;
- Integrate existing federal agency monitoring data with other sources of biological, oceanographic or satellite data to increase spatial and temporal resolution and/or coverage; and/or
- Employing innovative techniques for data analysis and integration and methods that dynamically discover synergistic relationships among different data sets to add value to existing monitoring data.

As part of an integrated and operational observing system, funded projects must develop ties to other selected projects by engaging directly with the Federal Program Coordinator and Team Leader (if awarded), participating in regular cross-team meetings, and supporting the ongoing development of an integrated national network. Projects are expected to commit to integration and communication beyond their regional focus to support a national effort and make sufficient resources available to do so, e.g., for travel, network building, knowledge sharing, data integration, and product co-development. Funded projects cannot be isolated activities focusing solely on accomplishing their individual project's goals.

Regional Coordination Hubs

Proposals should emphasize regional stakeholder needs for actionable information along with data integration, coordination and products across large US regional-scale geographic areas in lieu of smaller geographic scale, research-centric activities. Proposals that focus on and allot resources for data integration, interpretation and product generation incorporating new or existing datasets and co-develop these products with resource managers may be most appropriate at these scales.

Data Management Plan

Data accessibility and strong data management based on standards and best practices and following the FAIR Guiding Principles (findable, accessible, interoperable, and reusable) are the foundation for success of any observing system. Projects must explain in the proposal how time and project resources will ensure alignment of applicable biological data to the Darwin Core dataset structure (https://obis.org/manual/dataformat/) for new data collections and whenever possible for existing data, and adherence of metadata to the ISO 19115 family of geospatial metadata standards endorsed by the Federal Geographic Data Committee.

All data collected must be either published on an ERDDAP server hosted by the project or project partners to enable ingestion to the MBON Portal and other repositories or submitted to the ATN Data Assembly Center (DAC - see https://atn.ioos.us/help/ for ATN Registration, Data Permissions, and Metadata Procedures). Data should be archived at the National Centers for Environmental Information (NCEI). The costs for data management, archiving, and access should be clearly articulated in the budget and reflected in the total project cost. If applicable, applicants are encouraged to address how historical or legacy data will be integrated into the project.

Applicants will provide the widest practical access to data collected and must include a Data Management Plan describing how these requirements will be satisfied. The Data Management Plan should be aligned with NOAA guidance at https://nosc.noaa.gov/EDMC/PD.DMP.php. The Data Management Plan should be submitted as a separate section of up to two pages describing the types of data and information to be generated during the course of the project (environmental and biological); the target date by which data will be shared on ERDDAP, aligned to Darwin Core and archived at NCEI (or other appropriate national data center, eg. NCBI for 'omics); the standards to be used for data/metadata formatting and content; policies addressing data stewardship and preservation; procedures for providing data access and security; prior experience in publishing such data; and an indication of the project member/level of funding dedicated for the data management components of the project. The data management plan should include an inventory of datasets collected (or planned to be collected), which will be updated yearly. Proposals should identify one or more members of the team to document and archive data in accordance with the plan and to ensure that the data products and visualization tools co-developed with the end-user resource manager participants in the project are made available via US IOOS portals, OBIS-USA (https://www.usgs.gov/core-science-systems/science-analytics-and-synthesis/obis-usa/contribute-data), and other data platforms.

NOAA Data Sharing Policy: Environmental (including biological) data and information collected or created under NOAA grants or cooperative agreements should adhere to the 2016 revision of the NOAA Data Sharing Directive (https://nosc.noaa.gov/EDMC/PD.DSP.php).

Resource Manager Engagement
Proposals must demonstrate potential for establishing long-term, sustainable monitoring through collection, integration and co-production of actionable information between resource managers and the science community via projects that are jointly scoped and designed to inform a resource management decision(s) and that include at least one resource manager on the proposal and project team. Proposals must identify at least one specific management need and describe the role of project methods, tools, data collection/integration, or products in addressing this(-ese) challenge(s).

Selected projects must conduct their work with resource managers actively involved throughout the life of the project to develop, demonstrate and enable sustained uses of the observations, data and products to meet user needs. Proposals should provide statements from the resource manager(s) describing the management concern to be addressed, their data and product needs and expectations, and their level of involvement in the project.

Applicants are encouraged to work with a boundary organization that can assist at the interface between science and policy, to link data generation with data needs of users to address research and management questions, and to determine what data products and types are

needed.

IOOS Regional Association Engagement
Applicants must ensure one or more IOOS Regional Association(s) (RAs) in the geographic area of coverage is involved in proposal development and as part of the project team, as IOOS regional infrastructure, data management capabilities, and processes for stakeholder engagement (including local, tribal and indigenous communities) have been identified as critical to sustained, long-term management of marine life observations for the Nation. Applicants must work with the RA(s) while drafting the proposal to determine how best to leverage and build on IOOS RA capabilities relevant for this call, for the scope of the project, and to meet identified resource manager needs.

Selected projects must conduct their work with the IOOS RA(s) actively involved throughout the life of the project, with funding commensurate with their role. Proposals should provide statements from the IOOS RA Director(s) describing their commitment to and level of involvement in the project. Applicants are requested to contact the RA(s) early in the proposal drafting process.

Team Leader Option within a Proposal
This funding opportunity also invites proposals for a Team Leader to assist the US MBON Federal manager by providing scientific leadership and coordination across all of the projects selected through this competition, and coordinating and integrating these with existing efforts in consultation with the IOOS Office. Proposals that include a team leader component can request up to an additional $40,000 per year for that role in a separate included budget.

The Team Leader will: foster efficient communications across all activities funded under this announcement, organize team meetings and related activities, and coordinate across projects to build awareness of scientific results and end-user applications. Proposals with a Team Leader option should have a separate section of up to two additional pages that describes only the activities to be undertaken by the designated Team Leader. They should specifically address the following:

- Qualifications and leadership skills of the proposing Team Leader, including knowledge of MBON, ATN, IOOS, and other relevant interagency efforts;
- A clear articulation of the proposed Team Leader's vision for integrated biological observations and their contribution to Federal agency missions and broader user needs; and
- A description of the approach to team leadership, how interactions with the project teams and federal program management will be conducted, and suggestions for team coordination and meetings.

The budget section of Team Leader proposals must include an additional, detailed budget for Team Leader activities and a narrative and justification for the Team Leader's work. This budget, narrative, and justification must be separate from those of their project activities. The funding agencies reserve the option to invite a Team Leader from among the funded teams should proposals of adequate merit and suitability not be received for the Team Leader role.

Additional Requirements

C. Program Authority

Statutory authority for this project is provided under the Coordinated Ocean Observations and Research Act of 2020, S. 914.

II. Award Information

A. Funding Availability

NOPP anticipates making multiple awards, subject to the availability of funds, in amounts up to $500,000 per project per year for up to five years. Total estimated funding for all awards is up to $6M million per year. The number of awards is anticipated to range from approximately three (3) to twelve (12) and will be adjusted based on availability of funds. Proposals not funded in the current fiscal period may be considered for funding in the next fiscal period without NOAA or NOPP repeating the competitive process outlined in this announcement. Proposals that include a team leader component can request up to an additional $40,000 per year for that role in a separate budget (further details provided below).

There is no guarantee that funds will be available to make awards for this Notice of Funding Opportunity or that any proposal will be selected for funding. If an applicant incurs any costs prior to receiving an award agreement signed by a NOAA grants officer, the applicant does so at the applicant's own risk. In no event will NOAA or the Department of Commerce be responsible for any proposal preparation costs. Recipients and subawards are subject to all Federal laws and agency policies, regulations, and procedures applicable to Federal financial assistance awards. Applicants must be in good standing with respect to all existing NOAA awards in order to receive funds.

B. Project/Award Period

Applicants may request support for projects that do not exceed five years. Funding is contingent upon availability of funds and the satisfactory performance of the recipient, and is at the sole discretion of NOAA and its NOPP partner agencies.

C. Type of Funding Instrument

NOAA will issue a cooperative agreement, therefore, the Federal government will be substantially involved by, for example, coordinating partners and teams to accomplish the work; assisting with technical aspects of the project; and/or coordinating access to Federal operational entities, data or facilities needed to support the work. Partner agencies reserve the right to award grants or contracts and other transactions as they deem appropriate.

If the non-Federal applicant is at an institution that has a NOAA Cooperative Institute (CI), it is allowed to submit applications that reference the CI by attaching a cover letter to the application stating its desire to have the application associated with the CI. This letter should specify the name of the cooperative institute, the CI cooperative agreement number, and the NOAA-approved research theme and task that applies to the proposal. The application will use the Facilities & Administrative (F&A, or indirect cost) rate associated with the main CI agreement. If the application is selected for funding, NOAA will notify the university that a separate award will be issued with its own award number. However, the award will include two Special Award Conditions (SACs): (1) the existing University/NOAA Memorandum Of Agreement (MOA) would be incorporated by reference into the terms of the competitive award, and (2) any performance report(s) for

the competitive project must follow the timetable of the funding program and be submitted directly to the funding program. Report(s) will be copied to the CI's administrator when due, to be attached to the main cooperative agreement progress report as an appendix. This will allow the CI to coordinate all the projects submitted through the CI, since the terms of these awards will specify that this is a CI project via the MOA.

III. Eligibility Information

A. Eligible Applicants

For all NOPP-funded activities, team efforts are required among at least two of the following three sectors: academia, industry (including Non-Governmental Organizations, or NGOs), and government (including Federal, state and local).

Eligible applicants for this competition are institutions of higher education, nonprofit and for-profit organizations, and State, local, and tribal governments. Federal agencies or institutions and foreign governments may not be the primary recipient of awards under this announcement, but they are encouraged to partner for funding with applicants, when appropriate.

If an applicant has a partner(s) who would receive funds, the lead grantee will be expected to use subcontracts or other appropriate mechanisms to provide funds to the partner(s). If a partner is a US Government agency, office, or laboratory, the US Government will transfer funds internally.

Applicants should note that paying for transportation, travel, or other expenses for any Federal employee are unallowable costs.

B. Cost Sharing or Matching

There is no requirement for cost sharing.

NOPP appreciates that applicants may seek additional support (in-kind or cash) for development of Marine BON demonstration projects. While a cost share of funding is not required, applicants are requested to provide a description of complementary funding and in-kind contributions from project partners.

C. Other Criteria that Affect Eligibility

None

I. IV. Application and Submission Information

A. Address to Request Application Package

Application packages are available online as part of the NOFO announcement on grants.gov and will only be accepted via submission through www.grants.gov.

B. Content and Form of Application

Applicants must be responsive to all requirements stated in this announcement or their application will not be considered.

FULL APPLICATION:

The proposal narrative must total no more than 15 pages (double-spaced, 12-point font). The 15-page limit does not include the proposal title page, a table of contents, the data sharing plan, the project summary referenced below under item two (2), and any required appendices. Appendices should be limited to:

- Materials that directly support the main body of the proposal (e.g., support letters, resumes, references, lists of data sources, and maps), which may not exceed 20 pages in length;
- Detailed Budget (see guidance at: https://www.noaa.gov/organization/acquisition-grants/how-to-apply); not to exceed 10 pages. In addition to an overall budget, an SF-424A must be submitted for each year of the proposal. Applicants must also provide a separate budget for each subcontract. SF-424As will not be included in the page count of the proposal or appendices. For your convenience, sample forms and instructions to on how to fill out the forms can be found online at https://www.grants.gov/web/grants/forms.html;
- Environmental Compliance materials, including all of the information referenced in Section C (NEPA) below.

Applicants should paginate their proposal and any appendices. Appendices may be paginated as standalone documents (individually) or collectively. Applicants should present their work plan in priority order and identify options for scalability such that if less money is available than is requested the process of modifying proposals is simplified.

All funding application packages must contain the following components:

a. Title Page (Proposal Cover Sheet). Include proposal title, complete contact information for the Principal Investigator and Financial Representative, duration of proposed project, funding type (cooperative agreement), applicant type (i.e. cooperative institute (see section C. Type of Funding Instrument), non-profit, state, etc.) and funding request. If funds are to be transferred to a NOAA partner on the project, also state the amount to NOAA on the cover.
b. Project Summary. Provide a one-to-two-page summary of the proposed project. The summary should be prepared to be readable to a broad audience and contain the following sections:

    Project Name/Title

    Primary Contact (name, address, telephone, fax, e-mail)

    Primary Recipient Institution

    Other Investigators (name, affiliated institution or agency)

    Brief Project Summary including objectives and intended benefits

    Partners

c. Project Description. All project descriptions (proposals) must include the following sections:

Goals and Objectives. Describe in the narrative the specific project goals and objectives to be achieved. Goals and objectives should be specific for each year of the work plan presented. Recipients will be required to submit semi-annual progress reports in which progress against these goals and objectives will be reported.

Background. Provide sufficient background information for NOAA and non- NOAA reviewers to assess independently the significance of the proposed project. Summarize the problem to be addressed and the status of ongoing efforts to address the identified needs.

Audience. Identify specific users of the results of the project, describe how they will use the results, and identify any training that will be needed for users to make full use of the results.

Approach. Provide a work plan that: identifies specific tasks to be accomplished; explains the technical approach (including quality assurance) needed to accomplish the tasks; identifies partner roles and contributions, including resources; and identifies potential obstacles to successful completion of the goals and objectives. Describe how resource managers are involved in the planning and design process. The work plan must include a data management plan which clearly addresses data management requirements and the steps to be taken to achieve efficient and effective data access/sharing through US IOOS and archiving that is compliant with Federal regulations as indicated in the Data Sharing Plan Policy under “Other Information”, below. In addition to the data management plan, name one data manager point of contact (POC), and include plans to identify and disseminate at least one data set per year. The identification of data sets should be submitted as an independent table to be updated yearly as categorical inventories. Roles, responsibilities and contributions of Federal partners must be clearly identified.

Benefits. Identify, with a high degree of specificity, the users of the information derived from the work, and the benefits that will be achieved for those users, as well as society as a whole. Document how valid user requirements are guiding the proposed work. Describe how the information from the project will be delivered to those users, and any special considerations or requirements for ensuring or improving the delivery of information.

Milestone Schedule. Display timelines for major tasks, target milestones for important intermediate and final products including deliverables and key project outcomes. Milestones should include expected readiness level achievements.

Project Budget. Guidance on how to prepare a project budget is available on the NOAA Grants Management Division website here: https://www.noaa.gov/organization/acquisition-grants/how-to-apply. Provide a budget description that follows the categories and formats in the NOAA grants package (SF-424A) and a brief narrative justification of the budget. An SF-424A must be submitted for each year of the project as well as for each subcontract.

The budget narrative must also provide, to the extent possible, detailed information on travel, including costs, a description of anticipated travel, destinations, the number of travelers, and a justification of how the requested travel is directly relevant to the successful completion of the project. If actual trip details are unknown, applicants must state the basis for the proposed travel charges. Applicants should allocate travel funds for any coordination meetings at regional or national levels. Foreign travel must receive prior approval, and therefore, should be

included in the proposal to avoid having to request prior approval after the project starts.

If a NOAA or another non-NOAA Federal partner is requested to perform any work as part of the project, please be advised that the work to be performed and resources required must be reflected separately in the project description and partner budget. The budget should clearly show where all funds will go and how the funds will be used.

For a NOAA partner, applications for Federal assistance (SF-424 and SF-424A) must show the total amount less that which would go to the NOAA partner. Detailed budget and budget justifications within the proposal should show the total amount, including that which would go to the NOAA partner, and should include text stating that the applicant wishes for NOAA to retain those funds and transfer them to the NOAA partner.

For a non-NOAA Federal partner, applications for Federal assistance (SF-424 and SF-424A) must show the total amount including that which would go to the non- NOAA Federal partner. Detailed budget and budget justifications within the proposal should show the total amount, including that which would go to the non-NOAA Federal partner. NOAA will not retain the funds and transfer them to the non-NOAA Federal partner. That transfer will be the responsibility of the awardee.

Additional detailed budget information, including a description of complementary funding and in-kind contributions from project partners, should be included in an appendix (see IV.B.4 for additional information).

- Appendices - Resumes. Provide resumes of the Principal Investigator for the project and other key personnel critical to the success of the project. Ensure that resumes address qualifications relevant to conducting the proposed work.
- Detailed Budget Information, Including budgets of subawards and contracts, detailed information on travel, etc. Information should include the names of all entities receiving funds, the locations of the entities receiving funds (city, State, and Congressional district), and the locations of the primary places of performance under the contract/subaward. In this appendix, the budget narrative also shall clearly identify the priority and cost of separable elements of the proposed work, and shall identify the elements of the project that the cooperator would recommend for revision or elimination in the event that sufficient funding is not available for all proposed activities.

C. Submission Dates and Times

Full applications must be received by 11:59 PM Eastern on December 17, 2021. Applications received after this deadline will not be considered for funding. For applications submitted through Grants.gov a date and time receipt indication is included and will be the basis of determining timeliness. Hard copy, faxed or emailed copies of applications will not be accepted.

D. Intergovernmental Review

Funding applications to NOAA are subject to Executive Order 12372, Intergovernmental Review of Federal Programs." It is the State agency's responsibility to contact their State's Single Point of Contact (SPCO) to find out about and comply with the State's process under EO 12372. To assist the applicant, the names and addresses of the SPOCs are listed on the Office of Management and Budget's Web site www.whitehouse.gov/omb/grants/spoc/.

E. Funding Restrictions

None

F. Other Submission Requirements

FULL APPLICATION:

Application packages must be submitted through Grants.gov/apply. No e-mail or fax copies will be accepted.

Applicants using Grants.gov must locate the downloadable application package for this solicitation by the Funding Opportunity Number or the CFDA number (11.012). Applicants will be able to download a copy of the application package, complete it off line, and then upload and submit the application through Grants.gov.

Grants.gov will provide information about submitting a proposal through the site as well as the hours of operation. After electronic submission of the application, the person submitting the application will receive within the next 24 to 48 hours two e-mail messages from Grants.gov updating him or her on the progress of the application. The first e-mail will confirm receipt of the application by Grants.gov, and the second will indicate that the application has been either successfully validated by the system prior to transmission to the grantor agency, or rejected due to errors. After the application has been validated, this same person will receive another e-mail when the application has been downloaded by the Federal agency.

To use Grants.gov, applicants must have a Dun and Bradstreet Data Universal Numbering System (DUNS) number and be registered in the Central Contractor Registry (CCR). Allow a minimum of five days to complete the CCR registration. (Note: Your organization's Employer Identification Number (EIN) will be needed on the application form.)

Please refer to important information in "Submission Dates and Times" above to help ensure your application is received on time. Please be advised that potential funding applicants must register with Grants.gov before any application materials can be submitted. An organization's one-time registration process may take up to three weeks to complete, so please allow sufficient time to ensure applications are submitted before the closing date. Grants.gov contains directions for submitting an application, the application package (forms), and is also where the completed application is submitted.

V. Application Review Information

A. Evaluation Criteria

1. Importance/relevance and Applicability (25 percent): This criterion ascertains whether there is intrinsic value in the proposed work and/or relevance to NOAA, federal, regional, state, or local activities. This includes importance and relevance to the program priorities listed above. The PI's record of making data accessible to and usable by the scientific and resource management communities in the past will be

considered when evaluating the importance and relevance of the application.

2. Technical and Scientific Merit (25 percent): This assesses whether the approach is technically sound, if the methods are appropriate, and whether there are clear project goals and objectives. Reviewers will evaluate proposals based on the efficacy of the proposed activities and steps for (1) formulating research questions relevant for identified end-users and management decisions and determining methods to address them, (2) identifying approaches for translating research, observations and data into information products, and (3) identifying strategies and processes to transfer and apply the findings and products to support resource management decisions.
3. Overall Qualifications of Applicants (20 percent): This assesses whether the applicants possess the necessary education, experience, training, facilities, and administrative resources to accomplish the project. For purposes of this competition, reviewers will evaluate the capability and composition of the project team to complete the proposed work based on (1) their past accomplishments and subject matter expertise, (2) their experience with collaborative activities linking science to management and ensuring stakeholder engagement, and (3) their demonstrated capability to transfer and apply research, observations and products in a resource management context.
4. Project Costs (10 percent): This assesses whether the budget is realistic and commensurate with the needs and timeframe of the proposed work.
5. Project Team Integration (20 percent): This assesses how well the project team is integrated. For purposes of this competition, reviewers will evaluate proposals based on (1) the assigned roles and responsibilities of project team members, (2) the degree to which the end-user resource manager is an equal partner and integrated member of the project team, (3) how the team intends to use the plans generated by this project in the future, and (4) how ownership of those plans would be shared among the partners.

B. Review and Selection Process

An initial administrative screening is conducted to determine compliance with requirements and completeness. The merit review process will then be conducted by the National Oceanographic Partnership Program (NOPP) sponsors and support team with input from the funding agencies and other interested NOPP agencies. All proposals will be evaluated and individually scored in accordance with the assigned weights of the above evaluation criteria by at least three independent peer evaluations. The merit review ratings are used to produce a rank order of the proposals. The Selecting Official(s) will consider the rank order of proposals against the selection factors listed below. The Selecting Official shall award in the rank order unless the proposal is justified to be selected out of rank order based upon one or more of the selection factors. The Selecting Official or designee may negotiate the funding level of the proposal.

C. Selection Factors
   1. Availability of funding
   2. Balance/distribution of funds:
      a. Geographically
      b. By type of partners
      c. By project types
      d. By research areas
      e. By type of institutions

3. Duplication of other projects funded or considered for funding by NOAA/federal agencies
4. Program priorities and policy factors
5. Applicant's prior award performance
6. Partnerships with and participation of targeted groups
7. Adequacy of information necessary for NOAA staff to make a NEPA determination and draft necessary documentation before recommendations for funding are made.

D. Anticipated Announcement and Award Dates

The start date on proposals should be June 1, 2022; or the first day of the month of any month after June 2022, but no later than August 2022.

VI. Award Administration Information

A. Award Notices

Applications recommended for funding by the selecting official(s) will be forwarded to the appropriate agency grants management or procurement offices. The applicant will be notified by the NOPP by e-mail that their application was recommended for funding. The applicant must be aware that the notification by the NOPP office is NOT the official award notice. Official notification happens only when the applicant receives an award notice from a federal grants or procurement officer (NOAA funding awardees will be notified by a grants officer), either by postal mail or electronically.

B. Administrative and National Policy Requirements

DEPARTMENT OF COMMERCE PRE-AWARD NOTIFICATION REQUIREMENTS FOR GRANTS AND COOPERATIVE AGREEMENTS.

The Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements contained in the Federal Register notice of December 30, 2014 (79 FR 78390) are applicable to this solicitation and may be accessed online at http://www.gpo.gov/fdsys/pkg/FR-2014-12-30/pdf/2014-30297.pdf.

UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS.

Through 2 C.F.R. § 1327.101, the Department of Commerce adopted Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 C.F.R. Part 200, which apply to awards in this program. Refer to http://go.usa.gov/SBYh
and http://go.usa.gov/SBg4.

DOC TERMS AND CONDITIONS

Successful applicants who accept a NOAA award under this solicitation will be bound by Department of Commerce Financial Assistance Standard Terms and

Conditions. This document will be provided in the award package in NOAA's Grants Online system at http://www.ago.noaa.gov.

LIMITATION OF LIABILITY

Funding for programs listed in this notice is contingent upon the availability of appropriations. Applicants are hereby given notice that funds may not have been appropriated yet for the programs listed in this notice. In no event will NOAA or the Department of Commerce be responsible for proposal preparation costs. Publication of this announcement does not oblige NOAA to award any specific project or to obligate any available funds.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

NOAA must analyze the potential environmental impacts, as required by the National Environmental Policy Act (NEPA), for applicant projects or proposals which are seeking NOAA federal funding opportunities. Detailed information on NOAA compliance with NEPA can be found at the following NOAA NEPA website: http://www.nepa.noaa.gov/, including our NOAA Administrative Order 216-6 for NEPA, http://www.nepa.noaa.gov/NAO216_6.pdf, and the Council on Environmental Quality implementation regulations, http://energy.gov/sites/prod/files/NEPA-40CFR1500_1508.pdf. Consequently, as part of an applicant's package, and under their description of their program activities, applicants are required to provide detailed information on the activities to be conducted, locations, sites, species and habitat to be affected, possible construction activities, and any environmental concerns that may exist (e.g., the use and disposal of hazardous or toxic chemicals, introduction of non- indigenous species, impacts to endangered and threatened species, aquaculture projects, and impacts to coral reef systems). In addition to providing specific information that will serve as the basis for any required impact analyses, applicants may also be requested to assist NOAA in drafting an environmental assessment, if NOAA determines an assessment is required. Applicants will also be required to cooperate with NOAA in identifying feasible measures to reduce or avoid any identified adverse environmental impacts of their proposal. Failure to do so shall be grounds for not selecting an application. In some cases if additional information is required after an application is selected, funds can be withheld by the Grants Officer under a special award condition requiring the recipient to submit additional environmental compliance information sufficient to enable NOAA to make an assessment on any impacts that a project may have on the environment. selected, funds can be withheld by the Grants Officer under a special award condition requiring the recipient to submit additional environmental compliance information sufficient to enable NOAA to make an assessment on any impacts that a project may have on the environment.

REVIEW OF RISK

After applications are proposed for funding by the Selecting Official, the Grants Office will perform administrative reviews, including an assessment of risk posed by the applicant under 2 C.F.R. 200.205. These may include assessments of the

financial stability of an applicant and the quality of the applicant's management systems, history of performance, and the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-Federal entities. Special conditions that address any risks determined to exist may be applied. Applicants may submit comments to the Federal Awardee Performance and Integrity Information System (FAPIIS) about any information included in the system about their organization for consideration by the awarding agency.

DATA MANAGEMENT PLAN

Data accessibility and strong data management based on standards and best practices and following the FAIR Guiding Principles (findable, accessible, interoperable, and reusable) are the foundation for success of any observing system. Projects must explain in the proposal how time and project resources will ensure alignment of applicable biological data to the Darwin Core dataset structure (https://obis.org/manual/dataformat/) for new data collections and whenever possible for existing data, and adherence of metadata to the ISO 19115 family of geospatial metadata standards endorsed by the Federal Geographic Data Committee.

All data collected must be either published on an ERDDAP server hosted by the project or project partners to enable ingestion to the MBON Portal and other repositories or submitted to the ATN Data Assembly Center (DAC - see https://atn.ioos.us/help/ for ATN Registration, Data Permissions, and Metadata Procedures). Data should be archived at the National Centers for Environmental Information (NCEI). The costs for data management, archiving, and access should be clearly articulated in the budget and reflected in the total project cost. If applicable, applicants are encouraged to address how historical or legacy data will be integrated into the project.

Applicants will provide the widest practical access to data collected and must include a Data Management Plan describing how these requirements will be satisfied. The Data Management Plan should be aligned with NOAA guidance at https://nosc.noaa.gov/EDMC/PD.DMP.php. The Data Management Plan should be submitted as a separate section of up to two pages describing the types of data and information to be generated during the course of the project (environmental and biological); the target date by which data will be shared on ERDDAP, aligned to Darwin Core and archived at NCEI (or other appropriate national data center, eg. NCBI for 'omics); the standards to be used for data/metadata formatting and content; policies addressing data stewardship and preservation; procedures for providing data access and security; prior experience in publishing such data; and an indication of the project member/level of funding dedicated for the data management components of the project. The data management plan should include an inventory of datasets collected (or planned to be collected), which will be updated yearly. Proposals should identify one or more members of the team to document and archive data in accordance with the plan and to ensure that the data products and visualization tools co-developed with the end-user resource manager participants in the project are made available via US IOOS portals, OBIS-USA (https://www.usgs.gov/corescience-systems/science-analytics-and-synthesis/obis-usa/contribute-data), and other data

platforms.

DATA SHARING POLICY

1. Environmental data and information collected or created under NOAA grants or cooperative agreements must be made discoverable by and accessible to the general public, in a timely fashion (typically within two years), free of charge or at no more than the cost of reproduction, unless an exemption is granted by the NOAA Program. Data should be available in at least one machine-readable format, preferably a widely-used or open-standard format, and should also be accompanied by machine-readable documentation (metadata), preferably based on widely used or international standards.

2. Proposals submitted in response to this Announcement must include a Data Management Plan of up to two pages describing how these requirements will be satisfied. The Data Management Plan should be aligned with the Data Management Guidance provided by NOAA in the Announcement. The contents of the Data Management Plan (or absence thereof), and past performance regarding such plans, will be considered as part of proposal review. A typical plan should include descriptions of the types of environmental data and information expected to be created during the course of the project; the tentative date by which data will be shared; the standards to be used for data/metadata format and content; methods for providing data access; approximate total volume of data to be collected; and prior experience in making such data accessible. The costs of data preparation, accessibility, or archiving may be included in the proposal budget unless otherwise stated in the Guidance. Accepted submission of data to the NOAA National Centers for Environmental Information Notice of Federal Funding Page 26 of 30 (NCEI) is one way to satisfy data sharing requirements; however, NCEI is not obligated to accept all submissions and may charge a fee, particularly for large or unusual datasets.

3. NOAA may, at its own discretion, make publicly visible the Data Management Plan from funded proposals, or use information from the Data Management Plan to produce a formal metadata record and include that metadata in a Catalog to indicate the pending availability of new data.

4. Proposal submitters are hereby advised that the final pre-publication manuscripts of scholarly articles produced entirely or primarily with NOAA funding will be required to be submitted to NOAA Institutional Repository after acceptance, and no later than upon publication. Such manuscripts shall be made publicly available by NOAA one year after publication by the journal.

INDIRECT COST RATE

An applicant with a current Federally-approved indirect cost rate that is proposing indirect costs in its budget should include a copy of the approved rate with its application. If an applicant has not previously established an indirect cost rate with a Federal agency they may choose to negotiate a rate with the Department of

Commerce or use the de minimis indirect cost rate of 10% of Modified Total Direct Costs (as allowable under 2 C.F.R. §200.414). The negotiation and approval of a rate is subject to the procedures required by NOAA and the Department of Commerce Standard Terms and Conditions. The NOAA contact for indirect or facilities and administrative costs is: Lamar Revis, Grants Officer, NOAA Grants Management Division, 1325 East West Highway, 9th Floor, Silver Spring, MD 20910, or lamar.revis@noaa.gov.

MINORITY SERVING INSTITUTIONS

The Department of Commerce/National Oceanic and Atmospheric Administration (DOC/NOAA) is strongly committed to increasing the participation of Minority Serving Institutions (MSIs), i.e., Historically Black Colleges and Universities, Hispanic-serving institutions, Tribal colleges and universities, Alaskan Native and Native Hawaiian institutions, and institutions that work in underserved communities.

FREEDOM OF INFORMATION ACT (FOIA)

In the event that an application contains information or data that you do not want disclosed prior to award for purposes other than the evaluation of the application, mark each page containing such information or data with the words "Privileged, Confidential, Commercial, or Financial Information - Limited Use" at the top of the page to assist NOAA in making disclosure determinations. DOC regulations implementing the Freedom of Information Act (FOIA), 5 U.S.C 552, are found at 15 C.F.R. Part 4, which sets forth rules for DOC to make requested materials, information, and records publicly available under FOIA. The contents of funded applications may be subject to requests for release under the FOIA. Based on the information provided by the applicant, the confidentiality of the content of funded applications will be maintained to the maximum extent permitted by law.

C. Reporting

Award recipients are subject to NOPP and partner agency requirements for periodic reporting.

NOAA awardees will be required to submit financial and performance (technical) progress reports electronically through Grants Online. Instructions for submitting financial and progress reports will be provided by the NOAA Grants Management Division as part of the award terms and conditions.

VII. Agency Contacts

For questions regarding this announcement, contact: Debra Esty, at debra.esty@noaa.gov.

For questions of a technical nature, contact: Gabrielle Canonico at gabrielle.canonico@noaa.gov

VIII. Other Information

A. Applicant Information

Applicants' names will be released by the NOPP, which will be managing the merit review process. NOAA will not release the names of applicants submitting proposals for any other purpose unless ordered by a court or requested to do so by an appropriate NOAA official and administrative protocol.

Applicants can use the public search feature at: https://grantsonline.rdc.noaa.gov/flows/home/Login/LoginController.jpf to find information about NOAA awards or go through the Freedom of Information Act process to request information about grant competitions. More information about the NOAA FOI process is online at http://www.rdc.noaa.gov/~foia/.

Applicants are required to answer the NEPA questionnaire indicated in this Notice of Funding Opportunity (NOFO). Applicants should answer the NEPA questions to the best of their ability with as much detail as possible. Having a fully completed NEPA questionnaire is not one of the minimum requirements for submission and review of the proposal. Further analysis of NEPA considerations will be completed with applicants selected for funding during the negotiation process.

Some of the questions may overlap with material provided in other parts of the application. This overlap occurs because the answers to the questionnaire are provided to NOAA staff, who do not review the other parts of the application. If appropriate, the applicant may copy the information from other parts of the application and paste it into the answers to the questionnaire. Many questions have a “yes” or “no” response. If the response is “no” the applicant does not need to elaborate on their answer. If the response is “yes” the question will have a second part asking the applicant to provide more information.

You are only required to provide information that is specifically requested in the NOFO to which you are applying. The applicable questions are inserted directly into the NOFO (see below) with reference to the OMB Approval Number (0648-0538) - for more details see: https://www.nepa.noaa.gov/docs/NOAA-Grants-Questionnaire-final.pdf

Paperwork Reduction Act Statement: Public reporting burden for this collection of NEPA information is estimated to average 3 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other suggestions for reducing this burden to NOAA NEPA Coordinator, NOAA Office of Program Planning and Integration, SSMC 3, Room 15700, 1315 East West Highway, Silver Spring, MD 20910. The information collection does not request any proprietary or confidential information. No confidentiality is provided.

Notwithstanding any other provisions of the law, no person is required to respond to, nor shall any person be subjected to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number. The valid OMB Control Number is 0648-0538, which expires on November 30, 2021.

D. References

Recent US MBON publications are available here:
https://marinebon.org/pages/publications/

Duffy, J.E., L.A. Amaral-Zettler, D.G. Fautin, G. Paulay, T.A. Rynearson, H.M. Sosik, and J.J. Stachowicz. 2013. Envisioning a marine biodiversity observation network. BioScience 63: 351-361.

NOPP 2010. Attaining an Operational Marine Biodiversity Observation Network (BON) Synthesis Report. Steering Committee: Linda Amaral-Zettler, J. Emmett Duffy, Daphne Fautin, Gustav Paulay, Tatiana Rynearson,
https://cdn.ioos.noaa.gov/media/2017/12/BON_SynthesisReport.pdf