TESTIMONY BY

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BEFORE THE

Subcommittee on Water, Oceans and Wildlife
U.S. House Committee on Natural Resources

On

H.R 1314, Integrated Coastal Ocean Observing System Act Amendments 2019
and
H.R. 2405, National Sea Grant College Program Amendments Act of 2019

May 8, 2019
Washington, DC

AOOS
Alaska Ocean Observing System

IOOS
Integrated Ocean Observing System

Chairman Huffman, Ranking Member McClintock, Congressman Young, and Members of the Subcommittee:

My name is Molly McCammon, and I have been executive director of the Alaska Ocean Observing System for the past 15 years, based in Anchorage, Alaska. Thank you for inviting me to participate in this hearing on the reauthorization of the Integrated Coastal Ocean Observing System Act and the national Sea Grant Program. The Alaska Ocean Observing System (AOOS) is the Integrated Ocean Observing System (IOOS) Regional Association (RA) in Alaska, mandated by Congress to work with the federal agencies, local and state governments, tribes and private industry to coordinate statewide monitoring for Alaska's nearly 44,000 miles of coastline and offshore environments, which is larger than the combined seaboard of the United States. We are co-located in Alaska with Alaska Sea Grant and enjoy a close partnership and numerous collaborations with that organization.

OUR OCEAN AND COASTAL CHALLENGES

The challenges we face in ocean, coastal, and Great Lakes monitoring, science and policy, and management of ocean and coastal resources in the coming years are large. In Alaska, our waters have been experiencing dramatic changes in the past decade. Already we are seeing extremely low sea ice extent in the winter, particularly in the Bering Strait and Chukchi Sea, as well as later freeze-up dates in the fall, thus paving the way for longer – and potentially riskier - Arctic navigation seasons, with an increased likelihood of a nearly ice-free Arctic in this century. Warmer ocean temperatures are changing commercial, recreation and subsistence fisheries, and creating increased risks for harmful algal blooms and impacts to shellfish, which are also potentially impacted by ocean acidification.

Alaska is not alone in experiencing changes. Routine and recurrent flooding and sea level rise are affecting millions of people and billions of dollars of infrastructure across the U.S. Harmful algal blooms are occurring more often and lasting longer. Changing water temperatures are causing shifts in fish and marine mammal habitats. Ocean acidification is already affecting a wide range of ecosystem components in the ocean. Timing and intensity of extreme weather events are having negative impacts on coastal communities and businesses in the Gulf and Atlantic Coasts.

The effects of all of these phenomena—and others—will become more pronounced in the future and will have significant impacts to coastal residents and communities, affecting tourism, local infrastructure and flood management, fishery harvests, and aquaculture development. We will need better and more integrated data and information about our coasts and Great Lakes, with enhanced weather forecasts to provide early warning of events to aid preparedness and response. Stakeholders will need ready access to ocean and coastal data and information, and assistance in understanding and interpreting these products so they can make informed decisions.

THE INTEGRATED OCEAN OBSERVATION SYSTEM (IOOS)

The U.S. Integrated Ocean Observing System (IOOS) is an innovative national-reginal partnership that works together to deliver timely and reliable information on our oceans, coasts and Great Lakes. It is a partnership of 18 Federal agencies[1] and 11 Regional Associations[2] that work with the public and private sectors to design, maintain and deliver information. IOOS is stakeholder-driven, science-based and policy-neutral.

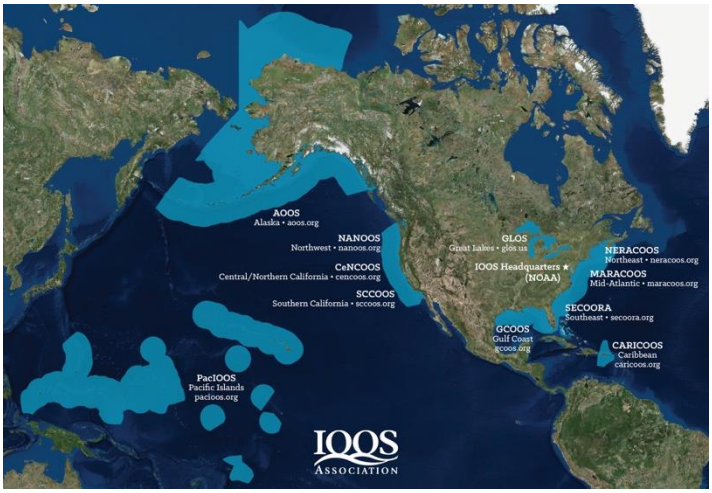

Fig. 1. Map showing the 11 Regional Associations in the IOOS Program.

IOOS collects and delivers data and information needed to increase understanding of our oceans, coasts and Great Lakes so that decision-makers can take action to improve safety, enhance the economy and protect the environment. IOOS information aids safe and efficient maritime operations including improved oil spill response and enhanced search and rescue capabilities; preparation and response to hurricanes, coastal storms, and impacts of waves and sea level rise on coastal communities; and the detection of harmful algal blooms and ocean acidification and potential impacts on marine resources

The robust national network of regional coastal observing systems, of which AOOS is one, is essential to IOOS. The regional component enhances the ability of the federal agencies to provide the depth and scale of information needed to solve national issues that manifest themselves at the regional and local levels. U.S. territorial waters range from the cold waters of the Beaufort and Chukchi Seas in the Arctic to the warm waters of the tropical Pacific Islands. The Great Lakes, with over 10,000 miles of coastline, are the world's largest system of freshwater lakes. Each region is characterized by unique geological, physical and chemical properties, biological productivity and human uses. The complexities of the coastal environment

[1] The IOOS Federal agencies include: National Oceanographic and Atmospheric Administration, Dept of the Interior, National Science Foundation, National Aeronautics and Space Administration, Environmental Protection Agency, Bureau of Ocean Energy Management, Marine Mammal Commission, Jt Chefs of Staff, Oceanographer of the Navy, U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Geological Survey, U.S. Department of State, Dept of Transportation, FDA, Dept of Energy, U.S. Arctic Research Commission, U.S. Dept of Agriculture, National Park Service.

[2] The eleven IOOS regions are: Alaska Ocean Observing System (AOOS), Caribbean Coastal Ocean Observing System (CARICOOS), Central and Northern California Ocean Observing System (CeNCOOS), Gulf of Mexico Coastal Ocean Observing System (GCOOS), Great Lakes Observing System (GLOS), MidAtlantic Regional Association Coastal Ocean Observing System (MARACOOS), Northwest Association of Networked Ocean Observing System (NANOOS), Northeastern Regional Association of Coastal and Ocean Observing System (NERACOOS), Pacific Islands Ocean Observing System (PacIOOS), Southern California Coastal Ocean Observing System (SCCOOS), and South East Costal Ocean Observing Regional Association (SECOORA).

and the inherent variability in regional ecology call for a partnership that not only cuts across federal agencies but also reaches out to regional managers, academia, industry, non-governmental organizations and the general public. The IOOS Program provides that structure.

The information needs are diverse because they are derived from a broad range of coastal users. Users include mariners who need access to the latest sea state conditions; fishermen who must plan their days at sea; resource managers who need definitive ecological trends and risk factors; federal agency personnel who need data for modeling and prediction; emergency managers who need forecasts and predictions to protect public health and safety; private industry who need data for site planning and operations; and the general public who want to plan for coastal activities, recreation and tourism.

IOOS OBSERVING TECHNOLOGIES AND TOOLS

The IOOS Regional Associations are a blend of people, technology and systems designed to collect ocean and coastal observing data and transform those measurements into useful information readily accessible to people who work, manage, or recreate on our waters. IOOS uses three primary observing technologies:

- High Frequency Radars (HR radars). IOOS operates the nation's only network of HF radars to provide continuous, real-time mapping of the speed and direction of surface currents. These radars are land-based and can provide information over a large area. The US Coast Guard uses the data to reduce the size of their search area thereby saving lives. NOAA uses the data to guide their response during oil spills. Thanks to IOOS, new radars will soon be deployed in Alaska's Bering Strait.
- Profiling gliders. Cost-effective, safe and flexible, gliders are revolutionizing ocean observing. Gliders are underwater robots that can be equipped with a variety of sensors to observe subsurface conditions in near real-time. Gliders are being used to monitor the heat content of the ocean in order to better forecast the intensity of hurricanes in the Gulf of Mexico, to detect harmful algal blooms in California, and to monitor water quality in the Great Lakes. In Alaska and the Northeast Atlantic, passive acoustic devices mounted on gliders can detect the presence of marine mammals, including the endangered Northern Right Whale. The information illuminates how marine mammals, especially those that may be threatened or endangered, interact with and adapt to changing environmental conditions, and is used to prevent interactions with offshore wind and oil and gas developments.
- Moorings. Also known as buoys, moorings are used to deploy sensors both above and below the water surface and at incremental depths underwater to measure conditions such as weather, temperature, salinity, currents, pollution, harmful algal blooms, and sound. These data are used by many including fishermen, aquaculture operations, scientists, recreational boaters and others. Lobster fishermen in the Northeast rely on the NERACOOS buoys to provide hourly updates on sea state conditions for their safety at sea.

Along with the above, IOOS uses a wide range of other observing technologies such as satellites, shore stations, sensors mounted on ferries and other ships of opportunity, and community-based citizen science observations.

REGIONAL CERTIFICATION

All 11 Regional Associations are now certified as a Regional Information Coordinating Entity (RICE) under the ICOOS Act, meeting rigorous federal standards for organization structure and data management and quality control. At the regional level, tribal, state and local agencies can quickly access relevant local and regional data combined with federal data to inform planning and decision making. For example, in Alaska vessel tracking data are combined with data showing subsistence harvest areas to create oil spill risk assessments.

Data from the certified IOOS regional associations are of the same high quality as those served by the federal government and are quality-checked and archived with NOAA's National Center for Environmental Information for long-term storage and access. This means that partners can use the data without spending time and resources on additional quality control. Each region develops tailored information product to address the needs of specific users while conforming to national standards and requirements.

All RAs maintain and operate regional data centers that serve regional data and include visualization tools and information products tailored to the needs of local users. Data portals serve forecasts, real-time and historical data assets from federal, tribal, state, and regional governments, research institutions, private industry, non-governmental organizations and citizens. The data centers are designed to help users find, access, and analyze data for planning, research, decision making and emergency response.

IOOS data standards and protocols enable innovation by making data readily available through regional and national data assembly centers and then storing them at Federal archives for long-term access. Federal agencies can now access non-federal data for use in forecasts and models. NOAA's National Weather Service routinely accesses over 13 million marine data sets from non-federal sources because of IOOS standards[3].

DELIVERING THE BENEFITS

Every day, people rely on the IOOS data and information products. Across the nation's coastal waters and Great Lakes, fishermen, shipping companies, aquaculture businesses, weather forecasters, public utilities, tourism operators, search and rescue teams, and others use IOOS data to make informed decisions. Here are a few examples:

- Shipping Safety and Efficiency. In partnership with NOAA and the U.S. Army Corps of Engineers, IOOS supports the Precision Navigation System for oil tankers entering the Port of Long Beach. The system helps port authorities determine if conditions will allow deep-draft vessels to safely enter the port, reducing the need for offshore lightering and saving millions of dollars annually.
- Aquaculture and Ocean Acidification. In partnership with NOAA's Ocean Acidification Program, IOOS supports regional coastal acidification networks that work with scientists, industry (including shellfish farmers), managers and others to understand regional impacts, identify research and monitoring needs for detecting corrosive waters, and work towards adaptation responses and mitigation solutions. NANOOS in the Pacific

[3] NOAA's National Data Buoy Center IOOS GTS Statistical Reports. www.noaa.gov

Northwest has taken the lead in working with shellfish hatcheries to mitigate the intake of acidic waters at these sites.

- Storm Forecasting and Preparedness. IOOS data from moorings and gliders monitoring sea temperatures in the Gulf of Mexico is now used to forecast hurricane intensity with greater accuracy. State and local governments use IOOS data and tools to prepare and respond to storms and flooding in all regions.
- Tourism. Tourism businesses use the forecasts and real-time data to plan safe boat excursions and to minimize harm to beach-goers from riptides and poor water quality.
- Safety and National Security. The U.S. Coast Guard uses the real-time surface current information to decrease the size of their search area, thereby increasing the success of potential rescues. Naval Station Norfolk uses IOOS data to determine whether the fleet should remain in port during extreme storms. The Coast Guard will soon have access to AOOS current data at the major chokepoint for ships transiting the Arctic through the Bering Strait.
- Sea Level Rise. IOOS regional sea level data and forecasts allow managers to prepare and respond to the risk of floods. In California, information and forecasts from wave buoys provide early warnings to municipal officials when conditions indicate that wave run up may flood Highway Route 1. AOOS is working with state and federal agencies to test new technologies for monitoring water levels that are cheaper and less power hungry than typical tide stations and can be used in areas with seasonal sea ice.
- Harmful Algal Blooms. Harmful algal blooms (HABs) are highly variable with differences in species, toxins, habitats and impacts requiring a regional approach to timely and reliable detection and forecasting. IOOS regions work with Federal and state partners to deploy sensors, manage data and develop decision support tools. In California where *Pseudo-nitzschia* is a major public health threat, the two IOOS regions have supported the California Harmful Algal Bloom Monitoring and Alert (Cal-HABMAP) that conducts weekly nearshore surveys at major piers and harbors. The model, C-HARM that forecasts blooms is now being transitioned to NOAA for ongoing operations.

NATIONAL COORDINATION

NOAA serves at the lead federal agency for the IOOS enterprise. The IOOS Program Office (PO), housed in NOAA's National Ocean Service, coordinates, manages and administers all aspects of the program. The PO has developed standards for data management, including the development of national data assembly centers for gliders, HF radars and animal telemetry. Biological observations are a growing issue and the PO is supporting efforts for expanded integration of observations of marine biological diversity, eDNA, and sound by working with other NOAA offices and federal agencies. The IOOS Program Office helps link the assets and expertise of the federal agencies with the local knowledge, needs and infrastructure provided by the Regional Associations at the regional level.

IMPORTANCE OF H.R. 1314

Prior to the passage of the Integrated Coastal Ocean Observing System (ICOOS) Act of 2009, ocean and coastal observations were dispersed, not easily accessed, and funded primarily through short-term research grants. Oceanographic and coastal data were collected by multiple federal agencies but were not coordinated nor could they be integrated across agencies. There were few sustained monitoring stations that gathered the long-term data sets necessary to document trends,

understand how changes impact our economy and ecosystems, and develop the predictive capacity to provide alerts and warnings. The ICOOS Act of 2009 sought to remedy that situation by designing a program that would bring together the multiple federal agencies with regional expertise and interests to build a comprehensive observing and monitoring program that could serve multiple purposes. The ICOOS Act of 2009, which H.R. 13141 reauthorizes, established the framework the system needed. The Act:

- Created the Interagency Ocean Observing Committee to provide high-level policy direction of the program and to coordinate the data and observing needs of the 18 Federal agencies;
- Designated NOAA as the lead agency for IOOS to develop policy, coordination and program implementation;
- Established the regional structure of IOOS and the criteria for certification;
- Created a System Advisory Committee to advise the IOOC and the Administrator of NOAA on the administration, operations, management and system, including the integration of assets and data management; and
- Provided for the financing and cooperative agreements with Federal and state or public or private organizations necessary to implement the IOOS.

H.R. 1314 would reauthorize IOOS and remedy two administrative issues. First, it would stagger the terms of the advisory committee to ensure consistency. Second, it would clarify the language regarding the transfer of money between agencies and non-federal partners. As an interagency program, this clarification is important to the program's operations. A third need, not included in the current draft, is to also clarify the participation of federal agencies on IOOS regional association boards. This is especially important for regions such as Alaska, where the coordination of both federal and state management and observing activities and the equal participation of federal and state agencies is critical.

THE SEA GRANT COLLEGE PROGRAM (SEA GRANT)

Fifty years ago, the National Sea Grant College Program (Sea Grant) was authorized by P.L. 89-688. The Sea Grant College Program Act authorizes the awarding of grants and contracts to initiate and support programs at Sea Grant colleges and other institutions for research, education, and advisory services in any field related to the conservation and development of marine resources. As a joint federal and state program, Sea Grant provides support and solutions for the issues affecting coastal communities, including the Great Lakes, to benefit coastal communities and economies, and environmental quality.

Sea Grant supports a variety of marine issues such as sustainable fisheries and aquaculture, resilient communities and economies, healthy coastal ecosystems, and environmental literacy. The Sea Grant Knauss Fellows and other fellowship programs, aid in workforce development and in strengthening the development of informed policy and management. As liaisons between researchers and communities, Sea Grant ensures that science and research answer problems identified by stakeholders. The network of extension agents and researchers work closely with and to respond to the changing needs of our coastal communities.

Sea Grant is a source of trusted expertise. Sea Grant brings the expertise of a network of universities, research institutions, faculty, students, staff, and facilities, with on-the-ground and

in-the-field knowledge. This knowledge, bolstered by established ties and credibility with communities and community leaders, results in the conversion of science and technology into practical use and informed decision making. As a facilitator, Sea Grant engages partners, stakeholders, and constituents to understand issues, develop approaches that are responsive to their specific needs and can address the needs facing the nation in a flexible and responsive manner.

Sea Grant's success is routed in its dedication to its stakeholders. The network of local and regional extension agents work closely with fishermen, aquaculturists, state agencies, local agencies, citizens and businesses to understand their needs and to develop science and information services to address those needs. These needs are growing as the desire for information and services about our oceans and coasts is rapidly increasing.

State and regional research will be needed to assist communities to understand and adapt to sea level changes, increased coastal storms, diminishing ice, coral bleaching, harmful algal blooms and to support coastal economies including fisheries and aquaculture. How these changes impact communities will vary state by state and can be best addressed through the Sea Grant partnership that fosters strategic partnerships with federal, state and local agencies, and private sector partners. A major focus of Sea Grant is to support implementation of the Weather Forecast Research and Innovation Act of 2017 by informing observations and minimizing the impacts of extreme weather and water events. Another major focus is to use the research, extension, and education capacities of Sea Grant to increase the economic contributions of our domestic fisheries and ocean resources to reduce our seafood trade deficit with safe and sustainable domestic seafood production.

As an example, Alaska Sea Grant uses its federal funding, which leverages additional state and private dollars, to provide workforce development, coastal economic development, and community resilience tools. Sea Grant trains young fishermen on the business of fishing and provides tools, worksheets and marketing and business advising services through the Fish Biz website and the Alaska Young Fishermen's Summit, in addition to a range of "wrench turning" classes on motor repair and other boat systems. Alaska Sea Grant is helping the mariculture industry in Alaska - shellfish and seaweed - to grow into a multi-million dollar industry by working to break down barriers to business. When coastal communities ask "how are we going to respond to climate change?", Alaska Sea Grant, along with the NOAA-funded Alaska Center for Climate Adaptation and Policy, provides tools and guidance through the newly developed resilience-focused program, AdaptAlaska.

IOOS AND SEA GRANT AS COMPLEMENTARY PROGRAMS

The Integrated Ocean Observing System and the National Sea Grant Program are unique NOAA programs in that they address national issues that manifest at the regional, state and local levels. By working with regional and state experts, management agencies, industries and stakeholders, IOOS and Sea Grant are able to address local priorities that are critical to public and private sector constituents and coastal communities throughout the United States. The programs have developed cost-effective partnerships among state universities, state and local governments, NOAA, and coastal communities and businesses.

IOOS and Sea Grant are complementary programs that both connect Federal expertise with regional and state needs to provide critical data, targeted and meaningful research, and extensive outreach and education capacities to assist communities and stakeholders to make decisions and to adapt to changing circumstances. The collaborations between these programs are many. They include:

- Shared representation on governing boards. For example, AOOS and SECOORA sit on their regional Sea Grant advisory committees, and the regional Sea Grant directors sit on their boards.
- Shared and coordinated approaches to outreach and education. For example, the Great Lakes Regional Association uses its regional Sea Grants to provide input into their water quality and boater safety products.
- Shared projects to address sea level rise, ocean acidification, harmful algal blooms and aquaculture. For example, in Alaska AOOS and Alaska Sea Grant are working collaboratively to respond to emerging concerns in the Arctic related to harmful algal blooms and ocean acidification. In the Caribbean, Sea Grant and IOOS are co-sponsoring the development of a nearshore breaker forecast to inform surfers and others about dangerous conditions.
- Shared extension agents. In the Pacific Island, PacIOOS provides support to Sea Grant extension agents to serve as on-the-ground liaisons to the local communities and stakeholders as well as providing technical support for operations and maintenance of PacIOOS instrumentation in these locations.

Sea Grant experts provide insights into the needs of stakeholders for observations and information and their expertise in stakeholder engagement has improved the IOOS information products. Together, the two programs are greater than the sum of their parts, in terms of their impact and usefulness to the coastal and Great Lake communities we serve. IOOS' strengths lie in providing observations and data and information products at a regional level to meet stakeholder needs. Sea Grant focuses on identifying research needs and using their marine extension agents to provide more localized engagement with stakeholders.

CONCLUSION

For the last three years, the Administration has proposed to eliminate funding for the Sea Grant Program and to drastically cut funding for IOOS. However, these extramural programs deliver vital ocean and coastal data and information, create jobs, and improve safety and environmental quality. They are making a difference to the people who live and work on our oceans, coasts and Great Lakes on a daily basis. Each year, Congress has restored funding to these programs and we, and the people we serve, thank you. Passing these bills with strong authorization levels will signify the importance of the programs and ensure their stability for the next five years.

I appreciate the opportunity to speak to you today about the importance of the Integrated Ocean Observing System and the National Sea Grant Program. Thank you for your time.