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SUBCOMMITTEE ON FISHERIES AND OCEANS
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U.S. HOUSE OF REPRESENTATIVE**

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Good morning, Mr. Chairman and members of the Subcommittee. Thank you for inviting me to discuss H.R. 3835 and the role of the National Oceanic and Atmospheric Administration (NOAA) in ocean exploration and undersea research.

I am Richard W. Spinrad, Ph.D., Assistant Administrator of NOAA's Office of Oceanic and Atmospheric Research. I was also a participant in the Presidential Panel for Ocean Exploration, which made recommendations to the President on ocean exploration in 2000. The Office of Oceanic and Atmospheric Research conducts the scientific research, environmental studies, and technology development needed to improve NOAA's operations and broaden our understanding of the Earth's atmosphere and oceans. NOAA's Office of Ocean Exploration and National Undersea Research Program are contained within the Office of Oceanic and Atmospheric Research. The Office of Ocean Exploration is NOAA's center for new activities to explore and better understand our oceans. The National Undersea Research Program currently supports NOAA's mission by providing undersea scientists with the advanced technology, such as submersibles and remotely operated vehicles, and expertise needed to work in the undersea environment.

I am pleased to be here today to discuss H.R. 3835, an act to establish a coordinated national ocean exploration program within NOAA. NOAA supports the intent of this legislation. Title I of the bill addresses ocean exploration; Title II addresses NOAA's complementary program in undersea research. Together, these two programs provide a solid foundation for the aggressive ocean exploration and undersea technology program for our Nation. Today, I will outline our current ocean exploration and undersea research programs, describe our planned merger of these programs, and explain why this legislation is important to NOAA.

In his preface to the President's Panel on Ocean Exploration report in 2000, former Secretary of Commerce Norman Mineta eloquently stated the importance of ocean exploration to our Nation's interests and future:

"Our nation's history, from colonization and westward expansion to the deployment of the Hubble telescope, is testament to the fact that America is a country of explorers. Our

pride as a nation is founded upon our yearning to make new discoveries and to seek out new knowledge. Exploration of the oceans responds to a growing national interest in our seas and an acknowledgement of their importance to our environment and quality of life.

We are growing in the awareness that the ocean influences our daily lives in hundreds of ways. From providing fisheries resources or cures for disease, to unlocking the secrets of long-term climate, we are constantly reminded of the ocean's importance in sustaining life. Truly, our economic, environmental, and national security depend on our ability to understand the ocean frontier, as well as balancing the competing interests of conservation and economics."

Historical Perspective

National interest in establishing a comprehensive ocean exploration program stretches back over 40 years. In the late 1960's, the Stratton Commission, in addition to providing the recommendation upon which the formation of NOAA was based, also initiated the International Decade of Ocean Exploration. The resulting programs dramatically enhanced understanding of the global climate system, geochemical cycling, ocean circulation, plate geodynamics, and life in extreme environments. Later in 1983, an interagency effort to comprehensively map the U.S. exclusive economic zone (EEZ) was initiated. Reconnaissance and low resolution surveys of much of the EEZ were conducted up through 1990.

This initial national interest in ocean exploration increased in 2000, when a Presidential Panel on Ocean Exploration convened by the Department of Commerce, called for a robust national ocean exploration program propelled by the spirit of discovery. The panel proposed a strategy of interdisciplinary expeditions, new partnerships, and integrated federal programs to characterize the vast array of biological, physical, and chemical environments of the oceans and foster the development of technology. These recommendations led to the establishment of the Office of Ocean Exploration within NOAA in 2001. In 2003, a National Research Council report reiterated the need for a comprehensive national ocean exploration program strongly linked to traditional research, with broad international partnerships, and a commitment to educational opportunities. This report was followed in 2004, by the U.S. Commission on Ocean Policy recommendation to establish an expanded ocean exploration program. In response to the report of the U.S. Commission on Ocean Policy, the Administration developed the U.S. Ocean Action Plan. Ocean exploration will be addressed in the context of the Ocean Research Priorities Plan, currently under development, which was called for as part of the U.S. Ocean Action Plan.

The Office of Ocean Exploration

The recent sustained national interest in ocean exploration has resulted in an exciting, successful ocean exploration program within NOAA. The mission of this program is to conduct interdisciplinary ocean exploration that provides scientific information as well as technical and educational leadership that contributes to NOAA's evolving environmental

and economic missions. The program pursues this mission by focusing on four key goals:

Explore unknown and poorly known areas of the ocean: Exploration science expands our understanding of what resources and processes are in the oceans. The wealth of living and non-living resources yet to be discovered holds vast untapped economic potential and offers new opportunities for medical science. For example, microbial organisms that thrive in deep-sea environments produce novel enzymes and other compounds as a consequence of living in extremes of temperature and chemistry which have significant potential for creating bioproducts for use in pharmaceutical and industrial applications. Recent screenings show that these marine samples are 20 times more active than their terrestrial counterparts.

Ocean Mapping: Less than ten percent of the U.S. EEZ has been mapped with current technology, and many resources, habitats, and features remain undiscovered. Our ability to manage ecosystems is dependent upon our ability to define the area these ecosystems cover. In conjunction with other NOAA mapping efforts, ocean exploration routinely maps ocean areas during expeditions to discover and record the physical, biological, geological, archaeological, and chemical nature of the oceans. This information is critical for both expanding our understanding of the U.S. EEZ, and supporting future establishment of the U.S. continental shelf, where potential resources such as mineral deposits, valued at \$1.3 trillion, are estimated to exist.

New Technology: The Office of Ocean Exploration invests in new technologies for ocean discovery and to enhance the technical capability of the U.S. by promoting the development of improved oceanographic research, communication, navigation, and data collection systems, as well as underwater platforms and sensors. The program coordinates new technology needs and investments with other NOAA programs and other federal agencies through the National Oceanographic Partnership Program. A merger of NOAA's ocean exploration program and undersea research program, which I will discuss later, will enhance NOAA's ability to support emerging technology in these areas.

Education and Outreach: The President's Ocean Action Plan calls for promoting lifelong ocean education as essential for fostering a strong economy, promoting healthy ecosystems and preparing a competitive workforce with the scientific understanding needed to balance the sustainable use and conservation of our natural resources. The ocean exploration program is a leader in this effort dedicating 10 percent of its budget to education and outreach to improve ocean literacy in the U.S. and to stimulate interest in ocean science by bringing the excitement of ocean exploration to teachers and school children. The program's website (www.oceanexplorer.noaa.gov) is rated in the top five worldwide in its category, by a major international science education authority. This website, which includes teaching materials for educators, daily logs of expeditions, immediate reports of the discoveries, and live images of the sea floor, was visited by more than four million people last year. These efforts are inspiring a whole new generation to explore and work in the oceans which will help ensure that in the future the U.S. will have a competitive edge in the oceans and remain a global leader in ocean science and technology.

In less than five years, the Office of Ocean Exploration has been able to successfully leverage federal funding, equipment, and expertise to assemble multidisciplinary teams of scientist-explorers in support of more than 100 ocean expeditions and projects to poorly known areas of the ocean. These ocean expeditions have discovered many new marine ecosystems (including essential fish and coral habitats); new species of micro and macro-organisms; and chemical and geological processes that impact the oceans such as large quantities of carbon dioxide produced by underwater volcanoes. These expeditions have also mapped thousands of square kilometers of ocean floor that had never been mapped before, and, in so doing, discovered new landforms, including large submarine volcanoes.

NOAA's partnerships with academia, industry, ocean institutions and scientists from U.S. and international organizations are a vital component of NOAA's ocean exploration program. Together with our partners, NOAA increases our national understanding of ocean systems and processes by undertaking 6 to 10 major voyages of discovery per year and funding up to 25 additional missions and exploration-related projects per year. All expeditions are selected through a rigorous peer-reviewed process. The program spends approximately seventy percent of its funds outside of NOAA on science that benefits NOAA's understanding of the oceans and ecosystems.

Programs across NOAA benefit from new sources and scales of information generated by the Office of Ocean Exploration. These benefits include greater knowledge of living marine resources, their habitats, and ecosystems which enhance fisheries and ocean stewardship and comprehensive site surveys and inventories that inform management of NOAA's National Marine Sanctuaries. The program's characterization of the EEZ improves the management of habitat and marine resources, and by providing inventories of our Nation's submerged cultural and historical resources, the Office of Ocean Exploration aids in the preservation of this heritage. The Office of Ocean Exploration also provides important governance and scientific investigation in support of the international Census of Marine Life which is helping to identify important breeding areas and inform strategies for sustainable management.

The Office of Ocean Exploration's efforts are, in turn, supported by other programs within NOAA including the National Geophysical Data Center which provides vital data access, archive, and assessment support. NOAA has also assembled a team of data and information experts from its National Oceanographic Data Center, the National Coastal Data Development Center, and the NOAA Library to ensure the broadest public access and use of the results from its ocean expeditions. This team has developed procedures for ensuring archival and public access to the variety of the data products generated on these expeditions including underwater video which has become an important new source for quantitative data about the ocean environment, as well as for stimulating public interest and life-long learning.

We will see more opportunity for learning and discovery through ocean exploration when a new vessel dedicated to ocean exploration joins the NOAA fleet. After conversion, a former Navy vessel will be commissioned and named NOAA vessel *Okeanos Explorer*.

The vessel will be available in late 2007 or early 2008 to serve the Nation as a premier ocean research platform to conduct critical deep-sea missions including ocean floor mapping and biological and chemical oceanographic research. The vessel will also be equipped for “telepresence”, a communications technology that allows shore-side scientists, teachers, and students to connect in near real-time with scientists at sea and to view images from the ocean and seafloor using high-speed internet and satellites. The near real-time data and images are transmitted to science command centers ashore where teams of scientists augment the work of scientists and explorers at sea. By bringing multiple high-quality video streams and sensor data from the remote seafloor to scientists, teachers, and students on shore, the potential exists to revolutionize oceanographic research and ocean education. “Telepresence” technology was successfully pioneered on a NOAA-sponsored expedition to the deep sea hydrothermal vent field known as the "Lost City" on the Mid-Atlantic Ridge in July 2005.

NOAA’s ocean exploration program is a national program that provides the opportunity of discovery to our partners in academia, federal and state agencies, and industry. No other federal dedicated source of funding or logistics exists for discovery-based ocean science. The economic and social benefits of discovery are significant and the promise of future discovery is clear; wherever the program has looked, new discoveries and information have been found.

National Undersea Research Program

Title II of H.R. 3835 addresses the National Undersea Research Program (NURP), which has served NOAA and the Nation for over 25 years as an underwater research and technology program. Placing scientists underwater, either directly or remotely through the use of advanced technologies, the program focuses its considerable expertise and connections to the academic community on NOAA’s undersea research agenda. In recent years, the program has functioned through a network of 6 regional centers and an institute, hosted primarily by universities. Two centers are located on the West Coast in Hawaii and Alaska, and four are located on the East Coast in North Carolina, New Jersey, Connecticut, and Florida. The West Coast Centers have historically been fully funded; however, the four East Coast centers experienced significant budget reductions in FY 2006 that will impede their ability to support NOAA’s mission if continued in FY 2007. I request your support for the FY 2007 President’s Budget request, which would fund the National Undersea Research Program at \$9.152 million.

NURP has a proven record of providing the advanced technologies and infrastructure necessary to support undersea operations for both the academic community and NOAA. The program’s established processes and regional structure have provided a mechanism for enabling competitive, high-quality research to be directed at exploration and undersea technology development as well as emerging management issues relating to the oceans. Through ownership or leasing, NURP has provided undersea systems that work from the coast to the deep sea. For example:

- NURP owns and operates the Aquarius, the world's only underwater science laboratory, located in the Florida Keys National Marine Sanctuary. Aquanauts live

on and study sensitive coral reef ecosystems threatened by natural and human-caused impacts and are able to perform studies not possible through traditional diving techniques.

- NURP operates undersea remotely operated vehicles (ROVs) and autonomous undersea vehicles (AUVs) that are controlled by computers, battery powered, and independent of the surface. These vehicles increase the access of researchers to the depth and breadth of the oceans.
- NURP owns and operates the Pisces IV and V, human occupied submersibles, which enable scientists to explore the deep ocean-depths down to 4,500 meters (15,000 feet). In partnership with the Office of Ocean Exploration in the summer of 2005, the Pisces submersibles completed a historic expedition to the South Pacific where scientists examined more than 20 previously unexplored sub-sea volcanic ecosystems. The program also provides scientists with access to research submarines including the Alvin, Johnson Sea-Link, and Delta submersibles.
- NURP, as the lead office for fulfilling NOAA's statutory responsibility to improve the safety and performance of civilian divers, has supported advanced diving techniques which enable researchers to explore and characterize little known habitats such as deep corals.
- NURP supports new undersea techniques and technologies which address emerging ocean exploration and undersea ocean observing, sampling, monitoring and modeling issues for the National Ocean Service and the National Marine Fisheries Service within NOAA.

In 2007, NOAA will further address the need for ocean technology development by refocusing the priorities, direction, and partnerships of its National Undersea Research Program and merging it with the Office of Ocean Exploration as confirmed by Congress in 2005. The new ocean exploration and advanced technology development program will enhance the nation's capacity for ocean exploration and research by directing the undersea research program's efforts towards undersea technology development and its application to ocean exploration, research, and assessments.

In the long term, the restructured undersea research program will build upon a strong East and West Coast presence and add elements incorporating the expertise and remaining infrastructure preserved in FY 2006. The full details of the restructuring have not yet been determined and will depend upon several factors including input from the regional undersea research centers and the extramural community, opportunities within the combined National Undersea Research Program and Office of Ocean Exploration, and the amount of expertise and infrastructure preserved from the undersea research program.

NOAA's Views on H.R. 3835

NOAA supports the intent of this legislation to establish a coordinated national ocean exploration program within NOAA. This legislation would elevate the importance of science-based ocean exploration, and undersea technology development as a vital national activity and strengthen federal efforts to pursue and support it. H.R. 3835 recognizes the critical components of NOAA's current ocean exploration activities,

including the development of new undersea technologies, outreach, and education. As part of its responsibilities NOAA supports the authorization of interdisciplinary exploration to expand our knowledge of the ocean's living and nonliving resources.

H.R. 3835 advances undersea technology development and furthers support for undersea research and exploration by mandating that the program "make available the infrastructure and expertise to service the undersea science needs of the academic community." The legislation supports two of the most successful and unique aspects of the National Undersea Research Program: (1) harnessing the nation's extramural, academic expertise to provide solutions to NOAA's undersea challenges, and (2) conducting an open, competitive process for allocation of resources. It also supports the important program areas of undersea science-based education and outreach programs to enrich ocean science education and public awareness, and the discovery, study, and development of natural products from ocean and aquatic systems.

We do recommend that the following change to the bill be considered. While NOAA agrees with the goal of Section 104, to promote coordination, such a statutory requirement is unnecessary and would duplicate existing efforts. NOAA currently coordinates with other federal agencies on ocean exploration activities and plans for the future. In addition, the coordination among federal agencies mentioned in the bill will increase under the auspices of the new National Science and Technology Council's Joint Subcommittee on Ocean Science and Technology. The functions of the Joint Subcommittee on Ocean Science and Technology include identifying national ocean science and technology priorities and facilitating the coordination of interdisciplinary ocean research, ocean technology, and infrastructure development.

Section 107 authorizes appropriations to carry out the National Ocean Exploration Program in increasing amounts from \$30,500,000 in fiscal year 2006 to \$71,917,000 in fiscal year 2015, including \$33,550,000 for fiscal year 2007. The Administration requests that the authorization levels in the bill be consistent with the President's FY 2007 Budget Request, which provides \$15,128,000 for the Ocean Exploration Program.

In light of the National Undersea Research Program restructuring effort, the language of H.R. 3835 remains pertinent with few changes. The purpose of the National Undersea Research Program remains consistent with Title II of the Act, to "increase scientific knowledge essential for the informed management, use and preservation of oceanic, coastal and large lake resources through undersea research, exploration, education and technology development." However, NOAA requests that particular named equipment not be enacted into law so that the program can best maintain the flexibility required to meet rapidly changing technological developments and needs.

Section 207 authorizes appropriations to carry out the Undersea Research Program in increasing amounts from \$12,500,000 in fiscal year 2006 to \$29,474,000 in fiscal year 2015, including \$13,750,000 in fiscal year 2007. The Administration requests that the authorization levels in the bill be consistent with the President's FY 2007 Budget Request, which provides \$9,152,000 for the National Undersea Research Program in FY

2007. In addition, the bill includes authorization language and authorization for appropriations for the National Technology Institute. The Administration requests this language be removed to remain consistent with the President's Budget, which does not provide funding for the National Technology Institute.

NOAA also notes that in Section 207, all funding is directed to regional centers leaving no funding for administration of the program. Program administration should be provided, with a cap of ten percent of appropriated amounts. NOAA supports an undersea research program that is national in scope. The Administration requests in the authorization of funding that no specific percentage of funding be authorized to either the West Coast or East Coast Regional Centers. This change would allow NOAA the flexibility to address research and technology needs from a national perspective covering our interests in the Atlantic, Pacific, Gulf of Mexico, and Great Lakes.

Conclusion

NOAA supports elevating the importance of ocean exploration based on sound scientific research as a vital national activity and endorses the strengthening of federal efforts to pursue and support it. H.R. 3835 recognizes the critical components of NOAA's current ocean exploration activities, including the development of new undersea technologies, and outreach and education programs. We are encouraged that the House of Representatives is considering this legislation to promote the importance of ocean exploration, and maintain and strengthen our ability to generate new ocean knowledge. The U.S.'s strength and leadership in the oceans depends on our Nation's ability to generate and harness the latest in scientific and technological developments and to apply these developments to real world applications such as the management of our coastal and marine resources. A national ocean exploration and undersea technology development program is vital to sustaining the scientific advancement and innovation needed to maintain our Nation's competitive edge in ocean science and technology.