WRITTEN TESTIMONY
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NATIONAL MARINE FISHERIES SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
ON
THE STATUS OF EASTERN OYSTER RESTORATION EFFORTS
IN THE CHESAPEAKE BAY
BEFORE THE
COMMITTEE ON NATURAL RESOURCES
SUBCOMMITTEE ON FISHERIES, WILDLIFE AND OCEANS
U.S. HOUSE OF REPRESENTATIVES

SEPTEMBER 10, 2008

Chairwoman Bordallo and members of the Subcommittee, thank you for the opportunity to testify on the status of native oyster restoration efforts in Chesapeake Bay. My name is Peyton Robertson, and I am the Director of the National Oceanic and Atmospheric Administration (NOAA) Chesapeake Bay Office. My office has supported oyster restoration, non-native oyster research, aquaculture development, and new management approaches for oysters in Chesapeake Bay. My testimony will address these activities as well as changes and new approaches that are underway.

Background

The Eastern (or native) oyster, *Crassostrea virginica*, has historically been considered a keystone species of the Chesapeake Bay, serving as a primary contributor to the Bay's filtration system and providing a rich and diverse habitat for many other species. In addition to its importance to the ecology of the Bay, the Eastern oyster has been an economically important fishery and remains a significant cultural symbol of the Chesapeake Bay region.

Oysters were once so abundant in the Bay that early explorers, including Captain John Smith, described the oyster reefs as extending above the water's surface. As for our Native American predecessors, the Algonquin place name *Chesepiook* has been interpreted to mean "great shellfish bay." The Chesapeake Bay oyster fishery developed into a large export industry during the 1800s, becoming the largest in the world at that time.

Oysters are important to the Bay for both commercial and ecological reasons. Bay-wide oyster revenue from annual landings has averaged $3.2 million per year in recent years (2000-2005), representing an average of 957,000 pounds per year. By contrast, in the early 1950s, landings ranged from nearly 30,000,000 pounds to more than 40,000,000

pounds per year. In addition to these commercial benefits, oysters provide significant ecological services to the Bay, providing food and habitat to other Bay species and filtering water—each oyster can filter up to up to five liters of water per hour. Oyster reefs support a diverse ecosystem, serving as protection for juvenile fish and substrate for other shellfish. They also protect shorelines through reduction of wave energy.

NOAA's Role

As a federal partner in the effort to protect and restore Chesapeake Bay, NOAA supports several significant activities with respect to oysters:

1. Native Oyster Restoration - NOAA funds native oyster restoration in support of the Chesapeake Bay Program Partnership, working towards the Chesapeake 2000 Agreement commitment: *"By 2010, achieve, at a minimum, a tenfold increase in native oysters in the Chesapeake Bay, based upon a 1994 baseline."*
2. Non-native Oyster Research – Congress has provided NOAA with $7.7 million dollars for research programs to develop the science necessary to assess the risk of the proposed introduction of the Asian oyster to Chesapeake Bay.
3. Support for Aquaculture Development – NOAA has supported several pilot efforts to develop additional oyster production capacity, evaluate legal obstacles to oyster aquaculture, and establish a framework for oyster aquaculture business development – commercial aquaculture may have the greatest potential for restoring an oyster industry to the Chesapeake Bay.

I will speak to each of these major roles:

1. Native Oyster Restoration

NOAA works with several key partners, including the Army Corps of Engineers, Oyster Recovery Partnership, and Virginia Institute of Marine Science, among others, to restore native oyster populations. The NOAA Chesapeake Bay Office has supported oyster restoration in both Maryland and Virginia since 1999.

<u>Maryland Activities</u>

In Maryland, native oyster restoration projects are implemented by the Oyster Recovery Partnership (ORP). The Oyster Recovery Partnership is comprised of the Chesapeake Bay Foundation, Maryland Department of Natural Resources, University of Maryland Center for Environmental Science, and U.S. Army Corps of Engineers, among other partners, and is led by an Executive Director and small staff. The Partnership relies on implementation support from all of its member organizations to carry out restoration projects. Between 1999 and 2008, a total of $17.3 million in NOAA funding, including $14.4 million in Congressional earmarks, supported the Partnership's work.

- To date, the program has rehabilitated over 1,100 acres of oysters, of which 915 acres are being actively managed as sanctuaries or harvest reserve sites.

- For the time period 2000 – 2008, 1.4 billion hatchery-raised oyster spat have been planted. There has been a shift in the program's focus to place greater emphasis on sanctuaries, with the majority of new plantings in 2008 being placed in sanctuaries.

NOAA funding principally supports hatchery production of oyster larvae, setting of larvae on shell, and transport and planting of spat-on-shell oysters. Funding from the Baltimore District of the Army Corps of Engineers has been helpful for this effort through the purchase and placement of shell as substrate. This effort has achieved gains in the production and deployment of juvenile oysters (spat), advanced the state of scientific knowledge, and demonstrated successful engagement of watermen in restoration activities. The Federal investment has supported the Partnership's dual-faceted restoration strategy - both short-term harvest for the benefit of the oyster fishery and longer term population gains to restore the ecological functions of oysters.

In addition to on-the-ground restoration, NOAA is represented on the Maryland Oyster Advisory Commission, charged with seeking new strategies to rebuild the Bay's oyster population. The Commission began meeting in September 2007 and provided an interim report to the Governor, General Assembly, and Secretary of Natural Resources in January 2008. Key points from the preliminary report about future actions include:

- A dramatic shift in strategy to restore oysters will be necessary to provide critical Bay filtering and habitat – past efforts to simultaneously rebuild populations and sustain a healthy fishery have failed to yield desired results for either the Bay or its watermen.
- The continued degradation of Bay water quality from land-based management decisions will further impede our ability to restore oysters – local land-use managers need to become better engaged.
- Establishment of effective sanctuaries is contingent on effective enforcement – limited resources for marine police have hampered these efforts.

NOAA is committed to completing the work of the Maryland Oyster Advisory Commission and supporting the state in implementing the new directions it will establish.

Virginia Activities

NOAA is working with partners in Virginia to advance oyster restoration on multiple fronts, including applied research, technology development, and progressive management approaches. For example, the Virginia oyster partners worked with industry to successfully convert a segment of oyster growers to producing spat-on-shell product for restoration use. This capacity is critically important, because research has demonstrated lower predation rates and total animal loss on restoration sites designed with spat-on-shell relative to those created with (cultchless) oysters that have not been set on shell. Industry in Virginia is now using this as a standard practice for plantings.

NOAA participated in Virginia's Blue Ribbon Oyster Panel to develop a new oyster management plan for the Commonwealth. The Blue Ribbon Panel completed its work in May 2007 and issued the following key recommendations:

- Expand spat-on-shell production
- Support expansion of private hatchery capacity in Virginia
- Enhance the role of aquaculture to support economic goals

In Virginia, from 2003 through 2008, NOAA awarded a total of $7.7 million to the Virginia Institute of Marine Science (VIMS) to support oyster restoration activities and aquaculture research. This support has helped achieve the following results:

- Rehabilitation of approximately 1,000 acres of native oyster beds.
- Development of standardized monitoring protocols of restoration sites.
- Measurable increases in the overall abundance of oysters in tributary-specific restoration projects from the addition of shell and oyster seed
- Support of private industry efforts to develop hatchery-based production capacity for restoration use, specifically to address the need for spat-on-shell for restoration projects. This hatchery-production will also help expand commercial aquaculture opportunities that complement restoration.

NOAA funding also supported the development and implementation of an integrated management strategy for the Rappahannock River, whereby clearly delineated harvest areas and sanctuary sites are managed on a rotational basis. This progressive approach allows older, potentially disease tolerant oysters to be placed and retained in sanctuaries where reproduction continues, while still affording some harvest by watermen. Recent evaluations of the Rappahannock stocks indicate that hundreds of acres of existing productive oyster bottom may only require small additions of shell periodically to remain productive and ecologically valuable.

Additionally, initial promising signals are being recorded in the Great Wicomico River – significant addition of shell and seed oysters, combined with a strong natural spat-set, have resulted in a large increase in the number of oysters in this sub-estuary. The long-term fate of these still relatively young oysters is uncertain given substantial disease pressures, but continued monitoring will allow for accurate assessments of performance over time.

2. Non-native Oyster Research

In response to the dramatic decline in our native oysters, Maryland and Virginia proposed to introduce reproductive populations of the Suminoe or Asian oyster, *C. ariakensis*, into the Chesapeake Bay. The Asian oyster is being considered as a way to revitalize the oyster industry and improve water quality in the Bay. However, considerable controversy exists over the proposed introduction because many questions remain about the environmental impacts of such an introduction. Beginning in fiscal year 2004, NOAA received funding to support a competitive Asian oyster research program to evaluate these risks.

In 2003 the U.S. Congress instructed the Army Corps of Engineers (Corps) to prepare an Environmental Impact Statement (EIS) to examine both the risks and benefits of

introducing this species to the Chesapeake Bay. The EIS is being conducted by the Corps as the lead federal agency, with the states of Maryland and Virginia serving as lead state agencies. NOAA is serving as a cooperating agency, coordinating research that will help ensure that sound science is considered in the assessment and decision making process.

NOAA's research has been aimed at the priorities identified by the National Research Council (NRC) and the Scientific and Technical Advisory Committee (STAC) of the Chesapeake Bay Program, as well as guidance from the International Code of Practice on the Introductions and Transfers of Marine Organisms (ICES Code of Practice). Research results have been reviewed quarterly – designed to facilitate timely discussions of research results among scientists and managers, and speed the transfer of information to the EIS evaluation process. A written summary for each of these quarterly reviews is available at our website: http://noaa.chesapeakebay.net/readingroom.aspx

Research to date has produced a series of findings:

- Like the native oyster, non-native oysters also suffer from diseases, primarily a parasite name *Bonamia.* While this parasite does not appear to affect the native oyster, it may cause mortality of the non-native oyster in higher salinity waters. And though it has not been found in Chesapeake Bay, it could potentially spread into the Bay from North Carolina waters.
- Infestation by common shell-boring polychaete worms is more common in the non-native oyster due to thinner shells. These blisters can reduce the value of oysters sold in the shell and weaken shells, which could increase mortality.
- After early post-settlement and through two years of age, the Asian oyster *C. ariakensis* generally grows faster than the native oyster *C. virginica*, but to a degree that varies with salinity. Growth rates of the two species are most divergent at high salinity, and the difference is less pronounced or even negligible at lower salinities. Thus, the difference would be more pronounced in Virginia waters.
- Greater susceptibility to predation may negate some of the Asian oyster's growth advantage in parts of the Bay, depending upon the suite of predators present and their preference for one oyster species over the other.
- There appear to be differences among (1) different strains of the non-native oyster, and (2) native and non-native oysters, in larval behavior. These differences make the potential dispersal of non-native oysters from Chesapeake Bay to nearby estuaries difficult to predict.
- Interactions between the two species are likely, but their outcome is hard to predict. Similarities in larval settlement cues and substrate preferences suggest that Asian and native oysters would settle together, resulting in competition for limited habitat and the potential for a variety of interactions between the two species. The possibility also exists that Asian oysters might eventually increase the amount of habitat for native oysters.

This science is providing an important basis for evaluating the risks associated with the proposed introduction of the Asian oyster.

3. Aquaculture

Based on technological advances and work on disease-resistant and triploid oysters, commercial aquaculture has been shown to have high potential for restoring an oyster industry to Chesapeake Bay. However, while aquaculture shows great promise for sustaining the oyster industry, issues such as legislative uncertainty (e.g., leasing laws and pricing of leases), use conflicts (e.g., land development adjacent to aquaculture facilities), and limited production capacity remain significant obstacles to accelerating aquaculture development.

NOAA has supported many projects over the past five years to examine the potential of aquaculture, including a planning process to identify how federal resources could be leveraged to increase oyster aquaculture production for both restoration and commercial production in the Chesapeake Bay region. In fiscal year 2006, NOAA Sea Grant awarded funds to the Maryland and Virginia Sea Grant Programs - extension agents from both states will lead a community effort to develop a plan detailing opportunities for investment to promote oyster aquaculture. The plan is due in the fall of this year.

NOAA recently provided support for development of an "Oyster Aquaculture Business Plan" in Maryland; the results of which will be provided to the Maryland Oyster Advisory Commission for incorporation into their final report.

NOAA has also supported several trials that have shown promise for developing oyster aquaculture. Industry members have used hatchery strains and wild broodstock to grow oysters in racks or cages at much faster rates than traditional on-bottom rates. As an example, the Chesapeake Bay Foundation used diploid wild Lynnhaven stock in cages and within fourteen months produced a market-sized crop. Though labor intensive and requiring significant up-front investment, aquaculture provides a much more consistent return than traditional on-bottom harvest can currently provide. NOAA's non-native research program also demonstrated that triploid native oysters (used in side-by-side trials with triploid non-native oysters), can grow to market size in as little as 18 months, averting the onset of disease.

In a broader context, NOAA has a long and rich tradition in aquaculture, from agency support for cutting-edge science and research to federal policymaking. The agency is focused on creating domestic supply to meet the nation's growing demand for seafood, establishing aquaculture as a viable technology for replenishment of important commercial and recreational marine fisheries, and creating opportunities for the United States to engage the global aquaculture community through scientific and technological exchange. Through in-house and cooperative research and competitive grants programs such as the *National Marine Aquaculture Initiative* (NMAI), NOAA enables coastal and onshore marine shellfish and finfish farming, as well as enhancement (hatchery) activities that support commercial and recreational fishing and the restoration of some endangered species.

Worldwide, aquaculture is a $70-billion-per-year enterprise, and almost half of the seafood consumed worldwide is farmed. The largest single sector of the U.S. marine aquaculture industry is molluscan shellfish culture (oysters, clams, mussels), which accounts for about two-thirds of total U.S. marine aquaculture production. Current production takes place mainly in coastal waters under state jurisdiction, as is the case for oysters in the Chesapeake Bay.

NOAA believes that commercial aquaculture can play a significant role in increasing oysters in Chesapeake Bay but to fully realize this potential, regulatory uncertainties such as leasing laws and production capacity obstacles must be overcome.

Lessons Learned

Based on our collective experience with the broad range of partners and extensive activities described in this testimony, we have learned valuable lessons that can inform future efforts to restore oysters. These lessons fall into the discrete categories of restoration science and management approaches, including aquaculture development.

Restoration Science

- Large-scale oyster restoration in Chesapeake Bay is contingent on large quantities of oysters for restoration, including larvae production in hatcheries, sufficient substrate for setting, and adequate infrastructure to move and place seed oysters in the Bay.
- Placement of oysters on the bottom for natural grow-out requires up-to-date and accurate information on bottom conditions, including substrate type and condition, as well as circulation and currents (for larval transport).
- Silt and sediment are covering historical oyster bars – over the last 25 years, Maryland oyster bar habitat has decreased from 200,000 acres to just 36,000 acres. Without sufficient further protection and restoration of habitat, neither native nor non-native restoration efforts will be successful. Land managers need to be better engaged in reducing and mitigating habitat losses.
- Oyster restoration is complex, requiring multi-faceted strategies in a wide range of conditions in Chesapeake Bay. Higher salinity waters create higher reproduction potential, but also have higher disease incidence, leading to lower survival. Lower salinities have lower disease levels and higher survival rates, but also have low potential for reproduction.
- Disease resistance will only develop if there is a sufficient population of older oysters that develop such resistance over time, remain viable and succeed in producing successive generations of resistant strains. The practice of “bar cleaning” for disease in Maryland has not proven effective for reducing disease pressure.
- Commercial aquaculture, including off-bottom culture, can play a significant role in increasing oysters in the Bay.

Management Approaches

- Oyster restoration requires "adaptive management" – we need sufficient flexibility to alter approaches and refine efforts based on thoughtful monitoring, analysis and evaluation of results.
- The concept of "managed reserves" has provided benefits for oyster harvesting, but does not appear viable as a means for rebuilding sustainable oyster populations on large scales.
- As restoration efforts continue, it will be important to further delineate and separate economic and ecological objectives, ensuring that there are means for both protecting a way of life for working watermen and ensuring the viability of long term, self-sustaining oyster populations.
- Preservation of existing, living reef footprints is critical to maintain the remaining oyster habitat in Chesapeake Bay - increasing the size and number of sanctuaries is appropriate in order to provide a reasonable chance of a reproductively viable population.
- Existing management efforts are challenged by limited capacity to enforce requirements and adequately monitor results.
- Aquaculture shows great promise for sustaining the oyster industry but policy uncertainties and limited production capacity remain significant obstacles to accelerating aquaculture development.

Future Directions

These lessons learned provide a sound basis on which to plan for the future. We generally know what has worked and what has not. Much of the new direction for oyster restoration will be determined as a result of the Environmental Impact Statement (EIS) currently under development by the U.S. Army Corps of Engineers. NOAA has contributed to the science that will inform the policy decision on a preferred alternative. I believe Col. Dan Anninos of the Army Corps will testify further on the status of the EIS.

In addition to the EIS, NOAA continues to serve as a federal partner in the Chesapeake Bay Program. With the recent release (by the Environmental Protection Agency) of the "Chesapeake Action Plan," NOAA is poised to contribute significantly to the implementation of several of the key strategic themes outlined in the Plan, particularly with respect to ecosystem-based fisheries management. The Plan also describes a vision for new, shared leadership – NOAA looks forward to working closely with the Army Corps of Engineers, states, and other oyster partners to ensure that the best available science is brought to bear on future restoration activities.

As already described in this testimony, NOAA is actively participating in the state policy forums that will set the agenda for oyster restoration in the future. NOAA's strengths in restoration science and monitoring will continue to play an important role in new endeavors, including the potential for larger scale and more geographically-specific approaches being developed by the states.

Conclusion

Madam Chair Bordallo and members of the Subcommittee, I appreciate this opportunity to testify before you on the subject of oysters in the Chesapeake Bay, a living resource that we all would like to see come back. NOAA looks forward to working with you and our oyster restoration partners to address the complex and sometimes competing objectives of sustaining a successful oyster industry, while also recovering the oysters' critical ecosystem functions. NOAA believes that targeted, scientifically sound, and cost-effective restoration is important – particularly the protection and improvement of fully functioning habitats, which are paramount to the overall effort to restore the Bay. NOAA's full range of programs and partnerships, from coastal management to ecosystem science, can be leveraged to meet the challenges ahead.