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Hearing on Chesapeake Bay Oyster Restoration
Subcommittee on Fisheries, Wildlife and Oceans
House Committee on Natural Resources
September 10, 2008

Madam Chairwoman and members of the subcommittee, thank you for inviting me here today to offer my views on Chesapeake Bay oyster restoration. I do so on behalf of the Chesapeake Bay Foundation and our over 200,000 members living in all 50 states and many countries around the world.

CBF is a non-profit conservation organization dedicated to "Saving the Bay." We define this goal in the context of both a healthy estuarine ecosystem and the well-being of the citizens of the region who depend on this unique natural resource. The native Chesapeake oyster, *Crassostrea virginica*, plays a unique role for both. Accordingly, CBF has been an active advocate for native oyster restoration since the 1980s when the ecological importance of oysters first received widespread attention.

Restoring oysters is a fundamental part of saving Chesapeake Bay. Ecologically, the oyster could be described as the most important animal in the Bay. Its filter feeding removes overabundant algae from the water column, increasing water clarity and removing nitrogen. The reefs formed by oysters provide habitat for a diverse community of organisms. But overharvesting and mining in the nineteenth century diminished three-dimensional reefs and depleted oyster numbers. Sedimentation of the flattened reefs, continued harvesting, and the recent impacts of disease and pollution brought oyster numbers down to about one percent of their previous abundance.

Status and Effectiveness of Oyster Restoration in Chesapeake Bay

Movement of seed oysters to enhance harvest has historically been a common fishery practice in Chesapeake Bay, but restoration for the purpose of enhancing the oyster's ecological role was only first attempted in the early 1990s. The Washington Post mistakenly combined government expenditures for these two different activities to reach the conclusion that $58 million had been spent on restoration since 1994 with no discernable progress in oyster numbers. In fact, $41 million of those funds were spent supplementing the fishery, the benefits of which should be measured in catch and socio-economic value rather than in oyster population increases.

While still a sizeable figure, the $17 million spent on ecological restoration over those fourteen years represents a pilot-scale effort relative to the magnitude of the

problem. Nevertheless, progress has been made commensurate with the scale of investment to date.

Oyster restoration efforts have had success locally in several areas of the Bay. The Lynnhaven River in Virginia showed early success from the combined efforts of the state, CBF and other groups. CBF estimated that the tenfold goal had in fact been reached in that tributary. Similar effort in the lower Rappahannock River, VA, has also yielded results. While a political decision to open some of that area to harvest has tempered the results, oysters in that area have developed increased disease tolerance, likely in part due to restoration efforts. And the Great Wicomico River, VA, has recently been the target of a river-wide effort by the Corps of Engineers and other partners that has to date been successful at establishing vibrant reefs.

In Maryland waters over 1.4 billion seed oysters have been planted on over 1100 acres of reef through 2008. Not counting the record planting of over 400 million seed oysters in 2008, the University of Maryland conservatively estimated that over 200 million oysters persisted through 2007 from the previous decade's restoration efforts. Compared to a recent estimate of wild oyster numbers by the MD Department of Natural Resources, this represents a near doubling of the oysters in Maryland waters. While only a small portion of the roughly 200,000 acres of reefs once found in Maryland have been restored, this progress indicates that restoration can be successful under the right circumstances.

One source of confusion about restoration success is the biomass index used by the Chesapeake Bay Program to monitor progress toward its tenfold increase goal for oysters by 2010. The index is the only Baywide indicator of oyster abundance, and it is routinely cited as showing no progress to date. It is important to understand that the index is based on oyster numbers at "sentinel sites" separate from restored sites that only mirror restoration success through a reproductive signal. If "spatset" (the annual attachment of baby oysters to shell or other substrate, which results from oyster reproduction in a general area) increases at the sentinel sites, then the index goes up. The problem with this measure is that spatset is dependent on other factors besides oyster numbers. More importantly, much of the restoration work to date (and all of it in Maryland) has taken place where spatset is poor due to these other factors, meaning that progress will not be accurately reflected in the index.

Clearly a better survey of oyster abundance is needed. One helpful measure due to be completed in the next year is a comprehensive assessment of restoration progress Baywide since 1990 that is being facilitated by Sea Grant with funding from the National Oceanic and Atmospheric Administration (NOAA) and the Keith Campbell Foundation for the Environment. CBF expects this effort to yield a better estimate of progress to date in oyster restoration.

Challenges and Opportunities for Oyster Restoration in Chesapeake Bay

Restoring oysters would be a relatively straightforward, if daunting, proposition if it were simply a matter of rebuilding their numbers from the ninety-nine percent depletion they suffered. But the Bay system has changed in ways that limit oysters' growth and survival and challenge restoration efforts.

Loss of hard substrate, particularly three-dimensional reef structures, is probably the biggest direct challenge to oyster restoration in Chesapeake Bay. Historic shell mining and 150 years of harvesting have worked down and largely destroyed the three-dimensional reefs that were once a major feature of the Bay. Over a century of sediment-laden runoff from poor land use practices in the watershed has buried reefs and continues to hamper spatset by covering available shell. Substantial effort and resources will be necessary to rebuild bottom substrate to provide beds for planting seed oysters and hard surface for spatset. Oyster shell is the preferred material, and every effort should be explored to increase its availability; but shell supplies are limited, and more effort will also be needed to explore and utilize alternative materials like recycled concrete, marine limestone and pre-cast concrete modules.

Nitrogen and phosphorus pollution dramatically increased after World War II leading to massive algae blooms and the annual formation of low oxygen "dead zones" in the Bay and its tributaries. Up to forty percent of the main Bay's volume can hold insufficient oxygen for oyster survival during the summer. Beginning in the same period, two diseases began causing periodic high mortalities for oysters in much of the Bay. Restoration in areas of low disease mortality, and practices like long term sanctuaries that encourage selection for disease tolerance, should be encouraged. While science has yet to directly document the linkage, it is possible, if not likely, that low oxygen stress makes oysters more susceptible to disease. In any case, improvement in Bay water quality will also boost prospects for oyster restoration.

Perhaps the broadest lesson from restoration efforts to date, and biggest challenge for the future, is one of scale. Most past reef projects have essentially been on a pilot scale, that is, of insufficient size to make a noticeable difference ecologically in their local waters. Where efforts have been concentrated like the Lynnhaven River (and now the Great Wicomico and Piankatank in Virginia and the Choptank and Chester Rivers in Maryland), results have been more demonstrable. On a Baywide basis $17 million over 14 years is just a beginning. A commitment of $17 million per year for several decades is more in line with the scale of the challenge. About $600,000 was spent to rebuild reefs in the Lynnhaven River through 2004, and systemic impacts including widespread spatsets resulted. The watershed of the Lynnhaven is 64 square miles, coincidentally one thousandth of the Bay's watershed. Therefore, an admittedly coarse extrapolation suggests that the magnitude of the Baywide challenge is on the order of $600 million.

On the policy front the dual objectives of maintaining a fishery and rebuilding oyster numbers has been particularly challenging. Compromises in funding, implementation and monitoring have been inevitable. More important is the question of

how much faster oyster numbers could be rebuilt without concurrent fishery removals. It has become almost dogma in the restoration community that economic and ecological objectives should now be separated. What this concept means in practice has not been completely worked out. Separate funding streams with the goal of eventual self-sustainability seem necessary. The more difficult policy issue is designating whether the most productive grounds, which by law have been largely reserved for the public fishery, will be used for harvest, sanctuary or aquaculture. Some progress working out these issues has been made in the Virginia Blue Ribbon Oyster Panel Report of 2007 and at the Maryland Oyster Advisory Commission, which is still at work. The ability of both to move forward with their recommendations is heavily dependent on funding.

Aquaculture holds a lot of promise as an alternative for the public fishery. CBF has operated an off-bottom oyster farm in Virginia for eight years and has demonstrated the efficacy of the approach as a commercial enterprise. Several so far successful aquaculture businesses have gotten their start during this period as a result of the CBF example. Growing oysters in the water column increases their growth rate such that they reach marketable size before significant losses due to disease. The same potential has been demonstrated for traditional on-bottom oyster farming using triploid (sterile) native oysters, which shift their energy from reproduction to growth. Furthermore, using clustered "spat-on-shell" instead of individual (cultchless) oyster seed helps protect the oysters from predation on the bottom. Breaking down policy barriers and increasing hatchery capacity seem to be the biggest challenges to stimulating more commercial aquaculture.

Whether to Introduce the Asian Oyster

The slow recovery of the native oyster and research results showing better survival and growth rates of the Asian oyster have led some to advocate the introduction of the latter to the Bay system. CBF views any proposal to introduce a non-native species skeptically because of the many examples worldwide of ecological crises resulting from such introductions. By definition non-native species have developed in different ecosystems, and how they will respond to exposure to new species and processes is largely unpredictable. For ecologically keystone species like the oyster the stakes are even higher.

However, because oyster filtering and reef-building are so important to the Bay, and because oysters have historically supported such a valuable fishery in the Bay, CBF has supported the development of an Environmental Impact Statement (EIS) to investigate this particular proposal since 2003 when it was first proposed by both states. A draft EIS is due to be released for public review on October 17, 2008.

Substantial research and analyses have gone into the EIS. Seven different alternatives to the proposed action covering scenarios involving the native Chesapeake oyster as well as the Asian oyster were evaluated (including a moratorium on the native oyster public fishery). Potentially powerful analytical tools including an oyster demographic model and an ecological risk assessment were developed. Any decision on

whether to proceed with an introduction should await the EIS release and make maximum use of these analyses and findings.

The fundamental question regarding the proposed introduction is what risk it may pose for the native oyster or for the Chesapeake Bay or coastal ecosystems. Some have argued that the Asian oyster should be introduced unless the EIS proves there will be a problem. However, responsible stewardship of the Bay calls for the burden of proof to be on the proposed action. In other words, the EIS or science in general will need to prove, or demonstrate within acceptable bounds of certainty, that the introduction will not pose a substantial problem.

In the absence of conclusive information a public policy decision of the magnitude of a non-native introduction must be based on the precautionary principle. In effect, this means it must be conservative with respect to our natural resources and err on the side of the Chesapeake ecosystem.

Another question that must be asked is what resources it would take to undertake an introduction. Would the Asian oyster require the same degree of substrate creation as the native oyster? Could the Asian oyster thrive in a high sediment, low dissolved oxygen environment, or would it require improvements in these habitat features? How much hatchery capacity and other implementation resources would an introduction require. For each of these practical considerations the question must be asked, have we undertaken the same level of investment in the native oyster yet?

Concluding Comments

Thank you, Madam Chairwoman for the opportunity to provide the views of the Chesapeake Bay Foundation on oyster restoration. I offer the following concluding comments:

1. There is no silver bullet solution to oyster restoration. Nonetheless, aggressive and effective oyster restoration is critical to the ecological restoration of the Bay.
2. Public investment in native oyster restoration will need to be scaled up considerably, as well as concentrated on an area-specific basis, so that restoration work can yield systemic and measurable results.
3. Poor water quality and sedimentation are key habitat limitations for oysters and will hamper restoration if they are not addressed.
4. Economic and ecological objectives in oyster restoration, including funding streams, implementation and monitoring, should be separated.
5. The burden of proof should be to demonstrate within reasonable certainty that a non-native introduction will not cause a significant problem for the Chesapeake or coastal environments.
6. The development of commercial oyster aquaculture in Chesapeake Bay with particular attention to limiting factors such as hatchery capacity, availability of suitable grounds and historic regulatory impediments, should be encouraged.
7. More representative Baywide assessments of oyster abundance are necessary to reliably chart the course of restoration.