

Education, Health, and Environmental Affairs Committee
Maryland State Senate
Senate Bill 405—Nonnative Oysters-Introduction
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Senator Hollinger and members of the Committee, thank you for the opportunity to provide information related to the potential introduction of nonnative oysters into the Chesapeake Bay. I want to emphasize that I am speaking neither in support of nor opposition to Senate Bill 405, but I believe that the perspectives of the scientific community on the evaluation of the risks and benefits of introducing reproducing, nonnative oysters are germane to your considerations.

Scientific Evaluation of Introducing Asian Oysters

We are fortunate that a thorough assessment of the potential risks and benefits of a species of oyster—referred to as the Suminoe oyster (*Crassostrea ariakensis*) to avoid confusion with other species of oysters native to Asian waters that are commercially exploited—was produced by the prestigious National Research Council (NRC) of the National Academies of Sciences and Engineering. I have had the honor of chairing four NRC committees on different subjects over my career and have great respect for the independence, objectivity and rigor of this process. NRC studies are not research as we typically think of it, but involve fact-finding review of the literature, ongoing research and opinion, leading to specific recommendations concerning public policy options and needed research. They are produced by distinguished scientists who are carefully selected for a balance of expertise and perspective. Great care is also given to the independence of the study; notably the committee that produced the Suminoe oyster report included only one individual from the Chesapeake Bay region.

The NRC report¹ was publicly released in late 2003, but the genesis of the assessment was in 2001, during the Glendening Administration, when there were strong differences of opinion between Maryland and Virginia state governments concerning the risks of aquaculture trials in Virginia. At that time, the Maryland DNR took a very risk-averse position on Suminoe oysters, not granting permission for research in Maryland even under secure laboratory conditions. Because of the conflicting policy perspectives, the NRC was urged to undertake the assessment by the Chesapeake Bay Commission, the Chesapeake Bay Program, the Chesapeake Bay Foundation and Senator Mikulski and did so under the sponsorship of the Environmental Protection Agency, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, National Fish and Wildlife Federation, Maryland Department of Natural Resources, Virginia Department of Environmental Quality, and Maryland Sea Grant. In essence, there was extremely broad if not universal consensus that taking stock of the state of knowledge and the questions

¹ National Research Council. 2004. Nonnative oysters in the Chesapeake Bay. National Academies Press, Washington, D.C.

that should be addressed before making decisions on the widespread culture or release of Suminoe oysters was a very important and timely thing to do.

In brief, the NRC committee examined three management options, including both prohibition of the introduction of nonnative oysters and proceeding with the introduction of reproductive diploid oysters. It recommended the middle-road option of continuing the open-water aquaculture of sterile, triploid oysters while engaging in a parallel program of strategic research that would support a risk assessment of the potential introduction of reproductively capable diploid Suminoe oysters in the Bay.

Just to clarify this, all the field trials on growth and survival of Suminoe oysters that have been conducted since about 2000 have involved oysters artificially developed to contain three sets of chromosomes (triploid) rather than the usual two (diploid) and thus would not produce gametes and be capable of reproduction. The aim of these studies has been to explore the possibility of aquaculture of disease-resistant oysters that grow fast and would not escape into the wild.

The perspective of the NRC was that this process of expanded triploid aquaculture, strategic research, and risk assessment of the introduction of reproductive diploid oysters would take six to seven years. The NRC listed among the critical risks that should be addressed:

1. the introduction of diseases;
2. competition with the native oyster or fouling of boats, marina and other marine structures;
3. dispersal of nonnative oysters outside the Bay where competitive displacement of robust native oyster populations might occur;
4. low market demand for nonnative oysters;
5. susceptibility to endemic pathogens, parasites, or fouling organisms or to lower consumer acceptance;
6. abandonment of attempts to restore native oysters; and
7. conflicts with the conservation ethic for maintaining native species.

It is important to understand that although the Japanese or Pacific oyster (*Crassostrea gigas*) has been purposefully introduced and established reproductive populations in the Pacific Northwest, Europe, Australia and New Zealand, the Suminoe oyster has apparently not established naturalized populations nor is it in active aquacultural cultivation anywhere outside of the Asian coast. Although it is sometimes asserted that the so-called Oregon strain has been successful in the Northwest, there is little evidence that it has established self-sustaining populations there. Furthermore, while the Japanese oyster is viewed favorably as the mainstay of the oyster industry in the Pacific Northwest, Ireland, and France, for example; it is regarded more as invasive problem in the North Island of New Zealand, Australia, and Holland.

In the concluding chapter of its report, the NRC listed some unrealistic expectations and common misconceptions, which the committee portrayed as five “myths:”

1. Declines in the oyster fishery and water quality of the Chesapeake Bay can be quickly reversed.
2. Oyster restoration, whether native or nonnative, will dramatically improve water quality in the Chesapeake Bay.
3. Restoration of native oyster populations has been tried and will not work.
4. The Suminoe oyster will rapidly populate the Bay, increasing oyster landings and improving water quality.
5. Aquaculture of triploid Suminoe oysters will solve the economic problems of a devastated fishery and restore the ecological services once provided by the native oyster.

The NRC suggested that we should treat these expectations with healthy scientific skepticism. Instead of assuming them to be true or even likely, we should regard them as revealing major gaps in knowledge and uncertainty confronting a decision whether to introduce the Suminoe oyster into the Chesapeake Bay.

Subsequent to the release of the NRC report, the Scientific and Technical Advisory Committee² of the Chesapeake Bay Program held a workshop involving virtually every scientist in anyway engaged in research on oysters or associated Bay ecology to identify and prioritize research related to evaluation of the risks and benefits of introducing diploid Suminoe oysters. Mindful of the states’ desires to complete a risk assessment and Environmental Impact Statement (EIS) as expeditiously as possible, the report of the STAC workshop focused its attention on the high and essential priority research that could be completed in a five-year program, leaving out “nice to know” and longer-term studies. The STAC recommendations build on the NRC recommendations, but are much more specific and consider the necessary timeframes and sequencing of component studies.

Interestingly, although many uncertainties were identified, the STAC workshop agreed that enough information existed to reach conclusions on three important points:

1. an introduction of Suminoe oysters, if it takes hold, is likely to be irreversible;
2. the spread of Suminoe oysters beyond the borders of the Chesapeake Bay is inevitable if self-sustaining populations are established here; and
3. the so-called Oregon strain has very narrow genetic diversity and is, therefore, less than ideal for a managed introduction.

² Breitburg, D., M. Luckenbach, and J. Kramer. 2004. Identifying and Prioritizing Research Required to Evaluate Risks and Benefits of Introducing Diploid *Crassostrea ariakensis* to Restore Oysters to Chesapeake Bay. Scientific and Technical Advisory Committee, Edgewater, Maryland.

Three Federal agencies³ have considered the NRC and STAC recommendations in the context of both the states' desire to accelerate the EIS process and the federally sponsored research that has been launched. They proposed a research plan that would provide the information needed for a defensible EIS by the end of 2007, almost three years later than the states' ambitious schedule, but more compressed than either NRC or STAC recommended.

Status of Research

To support the EIS process, the Maryland Department of Natural Resources has engaged researchers within University System of Maryland (USM) institutions, Virginia academic research institutions (particularly the Virginia Institute of Marine Science) and private institutions to address questions important to deciding whether to introduce Suminoe oysters. The table in this testimony lists the research projects being undertaken in USM institutions, including those that have been supported by Maryland Sea Grant, DNR, and National Oceanic and Atmospheric Administration. They include a wide range of research on the ecology, behavior and dispersal of Suminoe oysters (UMCES), diseases (UMBI), economic and cultural studies and risk assessment (UMCP). These studies are being undertaken under the utmost care to minimize the risk of accidental introduction of Suminoe oysters while the research is going on. The studies being supported by DNR began only in March 2004, or later, and are concluding now, one year later. Meanwhile additional and follow-on studies have started under grants recently awarded from a FY 2004 Congressional appropriation to NOAA. Additional appropriations for continuation and expansion of this research are included in the FY 2005 Federal budget.

**Ongoing research within the University System of Maryland
 on the nonnative, Suminoe oyster**

Subject	Performing Institution	Sponsor	Period
Characterizing performance of Suminoe oyster in Maryland	UMCES (Paynter)	Sea Grant	2004-2006
Potential for natural predators to control spread of Suminoe oyster	UMCES (Newell/Kennedy)	Sea Grant	2003-2005
Ecological Risk Assessment to evaluate alternative approaches to increasing oyster populations	UMCP (Christman) and Versar	Maryland DNR	2004-2005
Economic component for proposed introduction of Suminoe oysters	UMCP (Lipton) and VIMS*	Maryland DNR	2004-2005
Virulence of pathogens to Suminoe oysters	UMBI (Zohar/Vasta)	Maryland DNR	2004-2005
Modeling dispersal of Suminoe oyster larvae in Chesapeake Bay	UMCES (North et al.)	Maryland DNR	2004-2005
Behavioral responses of Suminoe and Eastern oyster larvae	UMCES (Newell et al) and VIMS	Maryland DNR	2004-2005
Evaluation of gametogenesis and spawning cues for Suminoe oysters	UMCES (Meritt) and VIMS	Maryland DNR	2004-2005

³ EPA, FWS, and NOAA. 2004. Summary of Research Needs for A Defensible EIS on the Non-Native Oyster.

Subject	Performing Institution	Sponsor	Period
Behavior and substrate selection of Suminoe oyster larvae	UMCES (Tamburri), VIMS, Smithsonian Inst.	Maryland DNR	2004-2005
Competitive interactions between Eastern and Suminoe oysters and reef development	UMCES (Newell), VIMS, Smithsonian Inst.	Maryland DNR	2004-2005
Investigation of Suminoe oyster reef in Laizhou Bay, China	UMCES (Paynter) and VIMS	Maryland DNR	2004-2005
Cultural analysis for oyster restoration alternatives	UMCP (Paolisso)	Maryland DNR	2004-2005
Environmental tolerance studies on Suminoe oysters	UMBI (Zohar/Stubblefield)	Maryland DNR	2004-2005
Long-term mesocosm studies of competitive interactions between Suminoe and Eastern oysters	UMCES (Newell), VIMS, Smithsonian Inst.	NOAA	2005-2006
Behavior, substrate selection and survival of Suminoe oyster larvae in response to variations in environmental conditions	UMCES (Tamburri)	NOAA	2005-2006
Response of different strains of Suminoe oyster larvae to environmental change	UMCES (Newell)	NOAA	2005-2006
Predation by polyhaline invertebrates on young Suminoe oysters	UMCES (Kennedy)	NOAA	2005-2006

First, let me say that interactions and cooperation between the research community and DNR and within the research community have been excellent. Scientists, like most people, come to this issue with different perspectives, some feel deeply that more oysters are needed in the Bay and that the Suminoe oyster may offer some benefits, while others are more skeptical, fearing the unintended consequences we have come to expect from nonnative, invasive species or feeling that native oysters have been mismanaged and more effort should be spent on restoring their populations. To its credit, DNR has reached out and engaged these skeptics in the research it has supported. DNR has also provided significant and critically needed support for the new native oyster culture facilities at our Horn Point Laboratory, consolidating resources from its own less-advanced, shellfish aquaculture facilities.

The scientific community has pursued the Suminoe oyster research and risk assessment with a sense of urgency, openness to collaboration, and serious commitment to objectivity that I have not seen in the 30-year period on which I have worked in Chesapeake Bay science. Given the independence of the NRC recommendations, how rapidly all this has spun up, and the practical and biological limits on the pace of research, my colleagues and I believe assertions that scientists, motivated by self interest, want to “study this to death” simply have no merit. Until a year ago, research on Suminoe oysters focused mainly on its performance and suitability for triploid aquaculture, not on assessing the risks and benefits of introduction of reproductive, self-sustaining populations. It was just last year that we secured necessary permits to possess and experiment with the animal here in Maryland and our research has been slowed because it has been difficult to secure significant specimens of the Oregon strain to develop a broodstock and produce larvae for experimentation. Then again, even Suminoe

oysters grow only so fast and it takes time to experiment on changes in predation or competition with native oysters as adults. It takes at least two years to produce adults used in these experiments. We simply cannot turn this clock faster.

It has been widely reported in the press that many research scientists are uncomfortable with the notion that knowledge will have been advanced sufficiently to support an EIS decision on introduction in 2005. Indeed, I have asked repeatedly and I have yet to find a scientist outside of a state agency who feels otherwise. We have made sure that scientists have been able to communicate their progress, challenges and concerns about the inadequacy of knowledge directly with the DNR leadership. And, again, Secretary Franks has been more than willing to engage in direct discussions with a wide range of leading scientists. These scientists believe that the DNR-supported studies are incomplete or inconclusive a year or less after their initiation and that other important questions are not yet being adequately addressed.

Having said that, my colleagues in the scientific community are depending on two very important steps in the DNR assessment process for sound science and good judgment to prevail. First, a risk assessment model is being developed with input from the various investigators. This model will not, I am told, present a single conclusion or outcome, but will incorporate uncertainty embodied in the current status of knowledge such that a range, quite possibly a very wide range, of potential outcomes is revealed. Second, the states have established an Independent Oyster Advisory Panel to review the scientific data to ensure that there is adequate information on which to make a decision for the oyster restoration alternatives under consideration. If the answer is no, the Panel will help the state agencies determine what additional research is necessary and an appropriate timeline for it. While scientists believe that the NRC, STAC and Federal agencies reports provide very good guidance in this regard, the members of the Panel are widely respected in the scientific community and trusted to provide these additional scientific interpretations and sage advice. The Independent Panel begins its deliberations shortly and I understand will release a public report in May.

Madame Chairwoman, thank you once again for the opportunity to provide these perspectives.