THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

February 21, 2003

Mr. William A. Pruitt, Commissioner
Virginia Marine Resources Commission
2600 Washington Avenue, Third Floor
Newport News, VA 23607

Dear Mr. Pruitt:

On behalf of the National Research Council's Committee on Non-Native Oysters in the Chesapeake Bay, we are writing to express this committee's views about the pending 2003 proposal from the Virginia Seafood Council (VSC) to use *Crassostrea ariakensis* in a field trial. The National Research Council was asked by several state and federal agencies (see attachment B for the study's statement of task and list of sponsoring organizations) to undertake a review of the potential benefits and impacts of introducing this oyster into the Chesapeake Bay. Although the committee's final report will discuss many different aspects of risk assessment for using a non-native species, it will not be completed until June of this year. The committee decided to send this letter because of the importance and time sensitive nature of the pending decision before the Commission. This letter represents the consensus views of the committee and has been formally reviewed and approved by the National Research Council.

The Virginia Seafood Council has submitted a proposal "Economic analysis and pilot-scale field trials of triploid *C. ariakensis* aquaculture" to Virginia's Marine Resources Commission for the 2003 growing season. This proposal is designed as an industry trial with 10 participants and approximately 100,000 animals per site. Four different growing methods would be employed: bags in clam cages, bags on bottom, rack and bag, and floating raft. The animals would be harvested when they reach market size, estimated at 9-18 months. This proposal was originally submitted for 2002 and then revised in response to comments from the Virginia Institute of Marine Science and the Chesapeake Bay Program Living Resources Subcommittee - *C. ariakensis* Ad Hoc Review Panel. The major changes in the new proposal are as follows:

- Genetic (mated tetraploid by diploid) triploids will be used instead of "induced" (chemical) ones,
- The number of field trial participants has been reduced to 10, each with a larger number of animals,
- An economic feasibility analysis is stated as the principal goal, and
- A project manager will be hired specifically to oversee all aspects of the trial.

The purpose of this letter is to identify, based on this committee's work to date, important risks associated with the field trial as proposed. Major sources of risk or concern that are specific to the current Virginia Seafood Council proposal include:

- The process of generating mated triploids is not 100% effective, hence a small number of reproductive diploid oysters will be deployed with the triploids. In the 2000 year class of mated triploids, 3 out 3396 oysters examined were diploid (S. K. Allen, Jr., Virginia Institute of Marine Science; Response to Questions by *C. ariakensis* Ad Hoc Panel 2/3/03). If this frequency of occurrence (about 0.09%) were characteristic of populations of triploids produced by mating tetraploids and diploids, each field site under the 2003 VSC proposal would contain approximately 90 diploids per 100,000 oysters. If these diploids are allowed to become sexually mature and if they are in sufficient proximity to each other, there is a risk that a diploid population of non-native oysters could become established in the Chesapeake Bay. The probability that the reproductive diploids may be in close enough proximity to fertilize successfully has not been quantified, but should be determined for each grow out method.
- Reversion of triploids to diploids increases as the oysters get older, requiring more clearly defined accountability for the inventory to ensure that all oysters are removed by eighteen months. The triploid oysters may undergo gonadal maturation during the proposed trial. Currently, there are no provisions in the proposal for assessing maturation during the length of the trial. The risk of introducing a reproductive population of oysters could be lowered by harvesting animals before they have a chance to produce gametes. In the 2000 year class mentioned above, 25 mosaic animals (partial reversion of triploids to diploids) have been identified to date. In 6 of these mosaics, a small fraction of diploid cells were found in gonadal tissue, but none contained haploid gametes (S. K. Allen, Jr., Virginia Institute of Marine Science; Response to Questions by *C. ariakensis* Ad Hoc Panel 2/3/03). With the large number of oysters proposed for use in this trial a larger number of oysters will be expected to revert to diploid over time, increasing the risk that reproductive non-native oysters could be released into the Chesapeake Bay;
- If diploid *C. ariakensis* are found in the wild in the future, it will not be possible to determine whether or not they originated from this field trial. Genotyping of the broodstock would make it possible to determine whether or not the oysters from this field trial were responsible for introducing diploid *C. ariakensis* into the Chesapeake Bay or neighboring state waters;
- The causes of a significant mortality event may not be identified because regular monitoring for disease is not required. The proposal does not identify resources or responsibility for follow up investigation of a disease event. Furthermore, the position of project manager is contingent on outside funding, posing a risk that the trial will proceed without a responsible party to ensure implementation and coordination of monitoring, data collection, and data management. Both the stated goals of the field trial and safeguards meant to reduce the risk of accidental release of *C. ariakensis* would be compromised without a program manager to ensure enforcement.

A more comprehensive discussion of risks associated with the introduction of a non-native oyster will be provided in the committee's final report, including the potential ecological and economic risks and benefits. These types of risks and benefits have been raised in previous reports (e.g. Chesapeake Bay Program (2002). *Report of the Ad-hoc Panel On the Industry Trials of Triploid Non-Indigenous Oyster Species in Waters of the Chesapeake Bay Basin*, Annapolis, Maryland; Thompson, Julie A. (2001) *Introduction of Crassostrea ariakensis to Chesapeake Bay: The solution to Restoring an Oyster Fishery and Water Quality in the Bay?* U.S. Fish and Wildlife

Service, Chesapeake Bay Field Office, Annapolis MD; and Hallerman, E., Leffler, M., Mills, S., and Allen, S. (2001). *Aquaculture of Triploid Crassotrea ariakensis in Chesapeake Bay: A Symposium Report*. Maryland and Virginia Sea Grant, College Park, MD).

The committee is also concerned that the proposed field trial might be considered "a first time introduction" of *C. ariakensis* as stipulated in the 1993 Chesapeake Bay Program Policy for the Introduction of Non-Indigenous Aquatic Species. The committee firmly supports the Chesapeake Bay Program policy on non-native species introduction and the review process implemented by the ad hoc panel. This process enables participation by the major parties likely to be affected by this important decision. Unless this issue is clarified, the 2003 VSC field trial could preclude the Chesapeake Bay Program's review of future proposals to introduce this species, either as non-reproductive triploids in aquaculture or as reproductive diploids in the wild.

At present, there is insufficient scientific information available to thoroughly quantify and evaluate the risks and benefits of introducing this species into Virginia waters. Even less information is available for assessing the potential spread of *C. ariakensis* in the Chesapeake Bay and into the coastal waters of states along the Atlantic seaboard. If the Commission decides to approve a 2003 field trial, the committee strongly recommends amending the proposal to include measures to reduce the risks described above and to require collection of scientific data necessary for assessing the risk of introducing this non-native oyster. For example, more information is needed on the reproductive cycle of *C. ariakensis* in the field, the causes of mortality events, the fidelity and stability of triploid induction, and the growth rates at different locations under various deployment methods. This information would also be valuable for assessing the economic viability of using *C. ariakensis* in aquaculture.

Sincerely,

Jim Anderson, Ph.D.
Dennis Hedgecock, Ph.D.
Co-Chairs
Committee on Non-Native Oysters in the Chesapeake Bay

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ATTACHMENT A

Committee on Non-native Oysters in the Chesapeake Bay
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ATTACHMENT B

Non-native Oysters in the Chesapeake Bay
Statement of Task

This study will examine the ecological and socio-economic risks and benefits of open water aquaculture or direct introduction of the non-native oyster, *Crassostrea ariakensis,* in the Chesapeake Bay. The committee will address how *C. ariakensis* might affect the ecology of the Bay, including effects on native species, water quality, habitat, and the spread of human and oyster diseases. Possible effects on recovery of the native oyster, *Crassostrea virginica,* will be considered. The potential range and effects of the introduced oyster will be explored, both within the Bay and in neighboring coastal areas. The study will investigate the adequacy of existing regulatory and institutional frameworks to monitor and oversee these activities.

The committee will assess whether the breadth and quality of existing research, on oysters and on other introduced species, is sufficient to support risk assessments of three management options: 1) no use of non-native oysters, 2) open water aquaculture of triploid oysters, and 3) introduction of reproductive diploid oysters. Where current knowledge is inadequate, the committee will recommend additional research priorities.

Study Sponsors

The study is sponsored by the U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, Maryland Department of Natural Resources, Virginia Department of Environmental Quality, Virginia Sea Grant, Maryland Sea Grant, Connecticut Sea Grant, and National Fish and Wildlife Foundation.

Acknowledgments

This letter report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's (NRC) Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their participation in the review of this report:

Daniel S. Simberloff, University of Tennesee, Knoxville
Preston Pate, North Carolina Division of Fisheries, Morehead City
Chris Langdon, Oregon State University, Corvallis
James T. Carlton, Williams College, Mystic Seaport, Mystic, Connecticut

Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this letter report was overseen by John E. Dowling, Harvard University, Cambridge, Massachusetts. Appointed by the NRC, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.