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by

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Subject:
# International standards proposed by the International Maritime Organization (IMO) to manage ballast water, and its relationship to National Invasive Species Act Reauthorization

Mr. Chairman, Members of the Committee, it is a pleasure to be here today in response to your invitation to provide testimony on new international standards proposed by the International Maritime Organization (IMO) to manage ballast water, and its relationship to National Invasive Species Act Reauthorization.

My name is Roger Mann. I am a Professor of Marine Science and Acting Director for Research and Advisory Services at the School of Marine Science, Virginia Institute of Marine Science, College of William and Mary. I have been a researcher in the field of marine science for over thirty years. During that period I have maintained an active interest in the biology of non-native aquatic species, and actively participated in research and policy development related to non-native species at the state, regional, national and international levels. The arrival of non-native species into the United States through ballast water and other vectors are widely recognized as a significant threat to the integrity of native ecosystems, and hence to the nations economy as well as its recreational and aesthetic resources.

My testimony today will focus on three subjects. These are:

1) an explanation of what data is available to support the setting of specific standard(s);
2) what level of confidence do we have that a particular standard will have a meaningful impact on invasions; and
3) is it possible to determine with any level of specificity what the impact on invasions will be from setting a specific standard?

When setting the standard to keep out invaders the place to start is with a simple series of questions: what are the target organisms and given our current understanding of technology and biology, and who among the target organisms do we have a chance of eliminating from ballast water prior to discharge in US waters? Marine organisms of concern range all the way from the microscopic to the massive. At the microscopic end of the scale we encounter single cell bacteria that may be pathogenic to human and marine species, single cell phytoplankton that may change the nature of food chains in coastal environments, cyst forming organisms responsible for harmful algal blooms, and reproductive spores of plants that, in the final form may be large and imposing members of marine communities. Moving up the size ladder we encounter small invertebrates that compete directly with native species, often with undesirable outcomes, and the early life history forms (eggs and larvae) of the vast majority of marine organisms. Larger still and we encounter adult stages of a wide variety of organisms. Adult forms of larger organisms are probably of minor importance in this mix, the processes of filling tanks typically results in their death. However, the egg and larval stages of larger organisms are abundantly present in ballast water and represent a threat for eventual establishment of an invading species in US waters after discharge.

So we have identified the target organisms – predominantly microorganisms through early life history stages of larger organisms. We need to move quickly to control discharge of these organisms. The reauthorization of the National Invasive species Act of

1996 provides the opportunity for US legislation to regulate ballast water management in US waters. I have had the opportunity to comment on this reauthorization process before the U.S. House of Representatives, Committee on Resources, Subcommittee on Fisheries Conservation, Wildlife and Oceans in both November 2002 and April 2003. I urge the Congress to move forward on reauthorization. In my previous testimony **I proposed adoption of a standard requiring 100% kill of all organisms in excess of 50 microns (= 50 micometres in the terms of the IMO Convention) maximum dimension in discharged ballast. I maintain my support for this standard.** This standard that is both within reach of current technologies for very large volumes and that would be successful in retaining all the life history stages, including eggs, of the vast majority of aquatic vertebrates, invertebrates and macroalgae. These are groups of organisms that have a track record of causing significant ecological and economic impacts in regions where they have become invasive. While this standard will not insure removal of most phytoplankton and toxic dinoflagellates that cause red tide blooms – a group that may well represent a very serious challenge to any and all of the currently researched control technologies– it does represent a significant advancement of current options focused on ballast water exchange.

Ballast water exchange is a very limited management tool. It presents continual safety challenges for a ships masters, especially for bulk carriers in transoceanic passage. It is very expensive to effect. It will not produce uniform results because the starting ballast load will vary with season and location. "Variability in" will result in "variability out." We seek uniformity to a defensible standard. We will not achieve this using ballast water exchange as a final standard. It is only acceptable as an interim approach only until treatment technologies emerge to control ballast water associated organisms. Adoption of a rational standard will provide technology developers with tractable performance goals. We should not be handcuffed by the search for ultimate control tools while good, although perhaps not perfect technology is within grasp to address the ecological problem at hand. Incremental common sense dictates employment of the best available tools now, and better tools in due course. The reauthorization language will contain provision for continual review and improvement in standards as technology improves.

Let me now address the utility of the recently adopted IMO Convention on ballast water management as adopted at the February 2004 conference at IMO's London Headquarters. The Convention will go into force 12 months after ratification by 30 member states. This represents 35% of the worlds shipping tonnage. I wish to quote from the Convention (text in quotations) and offer comment on sections of its content (text in italics)

> "**Annex - Section A General Provisions:** Except where expressly provided otherwise, the discharge of Ballast Water shall only be conducted through Ballast Water Management, in accordance with the provisions of this Annex."
> *I applaud this move to universal compliance.*
>
> **"Annex - Section B Management and Control Requirements for Ships**
> Ships are required to have on board and implement a Ballast Water Management Plan approved by the Administration (Regulation B-1). The

Ballast Water Management Plan is specific to each ship and includes a detailed description of the actions to be taken to implement the Ballast Water Management requirements and supplemental Ballast Water Management practices. Ships must have a Ballast Water Record Book (Regulation B-2) to record when ballast water is taken on board; circulated or treated for Ballast Water Management purposes; and discharged into the sea. It should also record when Ballast Water is discharged to a reception facility and accidental or other exceptional discharges of Ballast Water."

*Again, I applaud this move to uniform and comprehensive record management, but a weak link emerges where each ship has a unique management plan. Any regulation that has to be custom fit to each ship is already too complicated.*

"Other methods of ballast water management may also be accepted as alternatives to the ballast water exchange standard and ballast water performance standard, provided that such methods ensure at least the same level of protection to the environment, human health, property or resources, and are approved in principle by IMO's Marine Environment Protection Committee (MEPC). Under Regulation B-4 Ballast Water Exchange, all ships using ballast water exchange should:

- whenever possible, conduct ballast water exchange at least 200 nautical miles from the nearest land and in water at least 200 metres in depth, taking into account Guidelines developed by IMO;
- in cases where the ship is unable to conduct ballast water exchange as above, this should be as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 metres in depth.

  When these requirements cannot be met areas may be designated where ships can conduct ballast water exchange. All ships shall remove and dispose of sediments from spaces designated to carry ballast water in accordance with the provisions of the ships' ballast water management plan (Regulation B-4)."

*While I applaud the recognition of alternatives my comments on the limited value of ballast water exchange have been expressed earlier.*

**"Annex - Section D Standards for Ballast Water Management**

There is a ballast water exchange standard and a ballast water performance standard. Ballast water exchange could be used to meet the performance standard:

**Regulation D-1 Ballast Water Exchange Standard** - Ships performing Ballast Water exchange shall do so with an efficiency of 95 per cent volumetric exchange of Ballast Water. For ships exchanging ballast water by the pumping-through method, pumping through three times the volume of each ballast water tank shall be considered to meet the standard described. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95 percent volumetric exchange is met."

*I reiterate my comments on the limited utility of ballast exchange.*

**"Regulation D-2 Ballast Water Performance Standard** - Ships conducting ballast water management shall discharge less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension and less than 10 viable organisms per milliliter less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations. The indicator microbes, as a human health standard, include, but are not be limited to:

a. Toxicogenic Vibrio cholerae (O1 and O139) with less than 1 colony forming unit (cfu) per100 milliliters or less than 1 cfu per 1 gram (wet weight) zooplankton samples;

b. Escherichia coli less than 250 cfu per 100 milliliters;

c. Intestinal Enterococci less than 100 cfu per 100 milliliters."

*The regulation for organisms greater than 50 micometeres (=microns) recognizes this size in accordance with my proposed standard, but does not require 100% mortality. A 100% mortality standard is tractable with current technology and is not cost prohibitive. The standard for organisms between 10 and 50 microns is very commendable, although probably not achievable in the same time frame as the regulation for organisms in excess of 50 microns. Consider here that the US Coast Guard STEP program (Shipboard Technology Evaluation Program: Experimental Ballast water Treatments) requires only 98% removal of organisms over 50 microns and simple reporting of organisms smaller than 50 microns. I suggest adoption of an interim standard that will immediately address the greater than 50 micron standard with current technologies while working towards technologies capable of addressing both size standards as suggested by IMO. The human health standard for toxigenic Vibrio cholera are such that compliance would require sterilization of the water. Vibrio are difficult to kill. A standard of 1 cfu per 100 milliliters is at the detection limit of current methods, and therefore cannot be guaranteed in practical application. Vibrio would be problematic in certain geographical regions (e.g., the coastline of the Indian subcontinent) but not elsewhere. We have no compendium of knowledge describing water quality at ports of loading, yet the ability to enforce proposed IMO regulations at receiving ports are incompatible with vessel loading schedules. Items b. and c. address Escherichia coli and Enterococcus. Both of these have very short survival times in sea water and, with rare exceptions, present no significant risk in practical terms. The E. coli standard is twice that used by EPA to close bathing beaches. In truth, the value of the standards addressing toxigenic and/or pathogenic bacteria are for setting performance standards for treatment technologies to be examined in test systems.*

"Ballast Water Management systems must be approved by the Administration in accordance with IMO Guidelines (Regulation D-3 Approval requirements for Ballast Water Management systems). These include systems which make use of chemicals or biocides; make use of organisms or biological mechanisms; or which alter the chemical or physical characteristics of the Ballast Water."

*Testing and approval of technologies by formal procedures is appropriate.*

**"Prototype technologies**
Regulation D-4 covers Prototype Ballast Water Treatment Technologies. It allows for ships participating in a programme approved by the Administration to test and evaluate promising Ballast Water treatment technologies to have a leeway of five years before having to comply with the requirements."
*I applaud this measure to encourage the shipping industry to partner in the development of new technologies*

**"Review of standards**
Under regulation D-5 Review of Standards by the Organization, IMO is required to review the Ballast Water Performance Standard, taking into account a number of criteria including safety considerations; environmental acceptability, i.e., not causing more or greater environmental impacts than it solves; practicability, i.e., compatibility with ship design and operations; cost effectiveness; and biological effectiveness in terms of removing, or otherwise rendering inactive harmful aquatic organisms and pathogens in ballast water. The review should include a determination of whether appropriate technologies are available to achieve the standard, an assessment of the above mentioned criteria, and an assessment of the socio-economic effect(s) specifically in relation to the developmental needs of developing countries, particularly small island developing States."
*Periodic review of standards is sound*

To return to my three original questions:
Question #1. An explanation of what data is available to support the setting of specific standard(s);
Question #2. What level of confidence do we have that a particular standard will have a meaningful impact on invasions; and
Question #3. Is it possible to determine with any level of specificity what the impact on invasions will be from setting a specific standard?

The target organisms can be categorized based on size. The 50 micron standard would be successful in retaining all the life history stages, including eggs, of the vast majority of aquatic vertebrates, invertebrates and macroalgae. 100% mortality within this size range is a technically and economically attainable goal, is practically enforceable, and would effectively eliminate these invaders. The 10-50 micron standard would include some, but not all phytoplankton and toxic dinoflagellate of the type that cause harmful algal blooms. Even 100% mortality here will not eliminate invasions, and is probably not attainable. A listing of toxigenic or pathogenic bacteria can be as long as deemed necessary, but its use is in defining performance standards of technologies, not in practical application.

In conclusion I again thank the Committee for the opportunity to provide testimony. This completes my testimony.