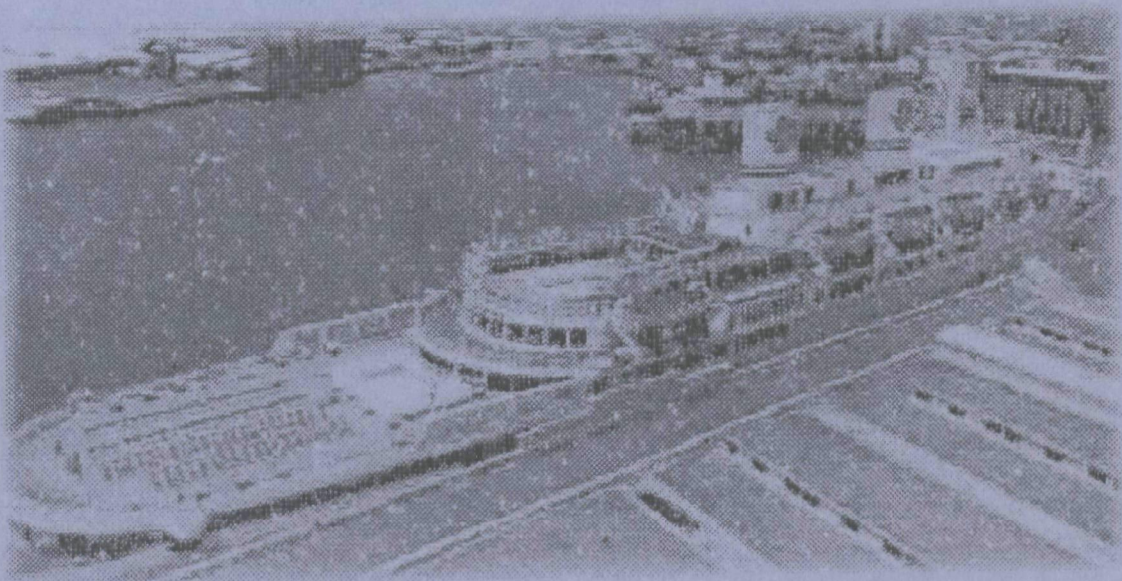


Recommendations for (a) the Reauthorization of the National Invasive Species Act of 1996, and (b) the National Ballast Management Program, to Address Issues of Concern for the Chesapeake Bay Region.

Prepared by
The Ballast Water Task Force,
Chesapeake Bay Program



As Requested by the
*Chesapeake 2000 Agreement and Approved and
Adopted on May 12, 2001*



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INTRODUCTION

The worldwide transfer and introduction of nonindigenous species (NIS) by human activities is having significant and unwanted ecological, economic, and human-health impacts. Although marine invasions have received relatively little attention compared to terrestrial and freshwater communities, the extent and consequences of these invasions are becoming increasingly clear. For example, approximately 400 NIS are known to be established in coastal marine waters of the U.S., and over 200 of these can occur in a single estuary. Some of these species have become numerically dominant and significantly alter key population, community, and ecosystem-level processes. In short, it is now clear that invasions by NIS are fundamentally altering the structure and function of our coastal ecosystems.

The rate of marine invasions appears to have increased exponentially over the past century, and most of the known invasions have been attributed to shipping. Although the introduction of NIS has resulted from many different mechanisms, many of which are still active today, the relative importance of shipping has increased over time.

Today, the global movement of ballast water appears to be single largest transfer mechanism for marine NIS. Since the 19th century, ships have used ballast water for stability, discharging water both at ports of call and en route. Ports can receive relatively large volumes of ballast water, originating from source regions throughout the world. For example, the United States receives annually >79 million metric tons of ballast water on ships arriving from foreign ports. A taxonomically diverse community of organisms is entrained and transported within ballast tanks, resulting in many successful invasions of NIS at ports throughout the world.

At the present time, ballast water exchange is the only effective management tool to reduce the risk of ballast-mediated invasion. It is a practice that can be implemented on many ships immediately, as it does not require any new technology or refitting. Ballast water exchange involves replacing coastal water with open-ocean water during a voyage. This process reduces the density of coastal organisms in ballast tanks that may be able to invade a recipient port, replacing them with oceanic organisms with a lower probability of survival in nearshore waters.

The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (P.L. 101-646) required that all vessels entering Great Lakes Ports from beyond the EEZ undergo ballast exchange or some comparably effective ballast treatment which conforms to discharge requirements of the Federal Water Pollution Control Act (33 U.S.C. 1251). These requirements were extended to vessels arriving in ports of the upper Hudson River, north of the George Washington Bridge on November 4, 1992.

The National Invasive Species Act (NISA) of 1996 (P.L. 104-332) reauthorized and amended the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, calling for a variety of measures to reduce the risk of exotic species invasions. NISA issued mandatory ballast management reporting and voluntary ballast exchange guidelines to all commercial vessels that enter U.S. waters from outside the EEZ, excluding crude oil tankers in coastwise trade and some passenger vessels. Military vessels are also excluded from these measures, but separate guidelines exist for ballast water discharge by military vessels that are considered under the Uniform National Discharge Standards (UNDS).

NISA is now being considered for reauthorization and amendment. Herein, we provide recommendations for the reauthorization of NISA to address key issues of concern for the Chesapeake Bay region.

Relevance to Chesapeake Bay

Chesapeake Bay and its tributaries are at risk from invasion. At least 150 nonindigenous species already are established in tidal waters of the Chesapeake, and the number of detected invasions has increased in recent decades. Most recent invasions are attributed to shipping, an industry that is expected to increase rapidly in the next decades. Conspicuous examples of invasive species include the whelk *Rapana venosa*

and the shorecrab *Hemigrapsus sanguineus*. As elsewhere, it is clear that some NIS are having significant impacts on ecosystem function and regional economies, including commercial fisheries.

The volume of ships' ballast water discharged into the Chesapeake Bay from overseas is greater than every other bay, except perhaps one, in the country. Furthermore, ships arriving from other domestic ports (i.e., coastwise traffic) also deliver relatively large quantities of ballast water to the Chesapeake, adding to the overall transfer of NIS into the Chesapeake via ballast water.

The Chesapeake Bay Program has formed the Ballast Water Task Force, as called for under the Chesapeake 2000 agreement, to help address the threat of NIS invasions. The two primary objectives of the Task Force are to provide recommendations on (a) the national ballast water management program, including the reauthorization of NISA, and (b) additional measures to prevent the spread of NIS into the Chesapeake Bay and its tributaries.

This document presents recommendations, developed and approved by the Ballast Water Task Force, for the reauthorization of NISA. The Task Force included representation of the signatory jurisdictions, ports, and the shipping industry.

RECOMMENDATIONS

We have divided recommendations among six major topic areas, listed below in order of priority. Under each major heading, we provide a short description of the desired objective(s) and identify recommendations to meet these objectives.

Although our focus is regional, nearly all of the key issues apply generally to other regions and the entire country. It is, therefore, most effective to address these issues in a national context. However, it is essential that Chesapeake Bay be considered explicitly in the reauthorization, to assure that the threat associated with NIS be addressed in this region. Chesapeake Bay also provides an important "model system" to test and develop approaches that can be applied more broadly, because it is one of the best studied systems in the country - especially with respect to invasions and ballast water.

In this document, we do not consider military vessels. At the present time, military vessels are excluded from NISA. The U.S. Navy currently has a procedure for ballast water exchange, and ballast water management practices for military vessels are under review in the UNDS process. We presume this will continue to be the case with reauthorization and have therefore restricted the scope of recommendations accordingly.

A. Regulations for Ballast Water Delivery & Management

Ships arriving to U.S. ports from overseas are required to report on the source, volume, and treatment of all ballast water released that derives from outside the EEZ. All reports are supposed to be sent to the National Ballast Water Information Clearinghouse, hereafter Clearinghouse, a joint program between U.S. Coast Guard and the Smithsonian Environmental Research Center (SERC).

Despite the current requirement for mandatory reporting, only approximately 22% of vessels were in compliance in the first year of this program. No penalty exists for lack of reporting in the national program.

In contrast, state laws have been passed in California, Washington, and Maryland that require reporting under civil penalty. California was the first to enact such a law, and compliance with reporting exceeded 80% in the first year of the national program, exhibiting a large jump in reporting compliance coincident with this regulation.

The current national program does not provide any information on ballast water delivery patterns associated with coastwise domestic traffic, or the movement of ballast water associated with either U.S. flag vessels or foreign flag vessels that travel among domestic ports. It is evident that such coastwise traffic can contribute strongly to the overall transfer of non-native species among ports and poses a significant risk of accelerating the rate of invasions.

There are multiple advantages to requiring mandatory reporting for BOTH foreign and coastwise arrivals. First, both traffic types contribute to the spread of non-native species, and the relative strength of each component is not well understood. Second, some confusion exists about which vessel traffic should report.

Although it is not clear exactly what should be done to prevent spread in the ballast materials of coastwise traffic, because voyage duration and distance from shore often does not permit recommended ballast water exchange, this should not prevent the collection of information on ballast water delivery patterns. Furthermore, it is exactly this type of information that is needed to inform decisions about the scope of this transfer mechanism and potential management options.

In contrast, ballast water exchange or an approved alternative treatment should be required for all vessels entering the U.S. from outside the EEZ. Recognizing ballast water exchange can be performed in many circumstances and does reduce the concentration of organisms transferred among coastal regions, this practice should be required when it is safe to do so. The management programs in California, Australia, and New Zealand have demonstrated that many vessels can perform exchange under such a regulatory regime.

Recommended Actions: To further reduce the risk of invasions, as well as track compliance and patterns of ballast water delivery:

- *Require reporting of ballast water discharge and management by ALL vessel arrivals, including foreign arrivals and coastwise traffic;*
- *Impose penalty for lack of reporting immediately (within 3 months);*
- *Require ballast water exchange or alternative treatment (approved by U.S. Coast Guard) for all ballast water that originates outside the EEZ, when safety allows. (See section B for the need to rapidly advance standards.);*
- *Develop and phase-in additional ballast water treatment requirements for coastwise and overseas traffic, as alternate treatments are approved and available;*
- *Provide U.S. Coast Guard with the specific and necessary authority to impose penalties for enforcement of reporting and discharge requirements (as above), and these penalties should be commensurate with those for meeting other reporting requirements and discharge standards.*
- *Measure spatial and temporal patterns of ballast water delivery to U.S. Ports, to track and evaluate (a) compliance and (b) total discharge volume by source port, ballast treatment, and vessel type.*

B. Ballast Water & Sediment Treatment

To reduce the risk of invasions by non-native species associated with shipping, various countries and international organizations are calling for management of ballast water and associated sediments. At the present time, ballast water exchange is recommended as one method, now available, that can reduce the transfer of alien species. However, there are some significant constraints associated with this practice.

including concerns about safety for some ships and routes. In addition, ballast water exchange still leaves a residual of organisms. For this reason, ballast water exchange is viewed as a stop-gap measure that will be replaced over time by other treatments, using one or more technologies.

A major component of current efforts (to reduce invasions) should focus on promoting the development, evaluation, verification, and goals for treatment of ballasted materials --- including both water and sediments. Thus, this effort should address both vessels that discharge water and those that arrive with No-Ballast-On-Board (NOBOB), as both may pose significant risks of invasion, since the latter may conduct ballast operations and discharge resident organisms in the process.

The evaluation, verification, and goals for treatment apply equally to ballast water exchange and any alternative treatment. Despite popular opinion, we actually know very little about the performance of ballast water exchange, as measures exist for very few vessels and organism types. Importantly, to evaluate technology in comparison with ballast water exchange, as NISA calls for, requires measures for each.

Recommended Actions: To advance prevention through treatment:

- *Encourage development of new treatments;*
- *Evaluate the biological efficacy of treatments -- exchange and technology;*
- *Create a process by which new technologies are given interim approval for use & experimental evaluation;*
- *Create a process to assess the operational merits, limitations, and feasibility of potential treatments -- exchange and technology -- to include both efficacy of treatment and environmental effects of discharge;*
- *Develop reliable methods for verification of treatments -- exchange and technology;*
- *Provide standards for the performance of treatment -- exchange and technology.*

C. Assessment of National Program & Invasion Risk

The success or effectiveness of the national program can be measured in both a proximate and ultimate sense. To date, emphasis has been placed upon measuring the proximate success --- or the frequency of compliance with guidelines among ships arriving from outside the EEZ. Although this type of tracking is important as a short-term proxy for program effectiveness, this simply indicates the change in behavior of ships and does not demonstrate the program's effect in reducing the rate of invasions (or ultimate success).

NISA recognizes the importance of measuring the impact of the national program on invasion patterns, as the ultimate measure of success. In fact, it calls for the Clearinghouse to provide synthesis and analysis of the country's invasion patterns, using information gleaned from "ecological surveys" and other available sources. Unfortunately, the nature and format of these ecological surveys were never defined. In addition, such surveys, and Clearinghouse analyses, have received little funding and have not been advanced.

To date, the Clearinghouse has developed the National Database of Marine Invasions, including all NIS known to be established in North America. Through low-level funding, this database now contains some information on approximately 400 non-native species. Although this provides useful information, and will soon be made available through the Clearinghouse website, it cannot be used as baseline information to measure the rate of invasions. The data quality is rather uneven and biased, since it results from literature reports rather than standard surveys (which provide confidence in the data and allow comparisons in space or time).

To truly assess the ultimate success of the national program to reduce invasions, we must implement a program of standardized surveys across multiple coastal sites. These must be conducted over time, providing statistical measures of invasion rate. Importantly, such a national program should not be “boot-legged” on some existing program, as there is no current program designed to adequately assess invasion patterns. To take this ad-hoc approach would compromise the quality of resulting data and not meet the needs identified here. This is exactly the conclusion of a forum, convened by U.S. Fish & Wildlife Service, in which 15 scientists participated in 1998.

Collection and analysis of well-designed national surveys should be used to assess the effect of national management actions on invasion patterns, and it can be used to identify additional gaps in the program. More specifically, collection of contemporary invasion data can identify where and how new invasions are occurring, by incorporating these data into the national database and conducting an analysis of vector strength. This approach provides a basis to identify additional management actions that may be necessary to fine-tune the program.

Recommended Actions: To assess the performance of the national program in reducing the risk of future invasions:

- *Measure proximate success of program, using compliance of ships (as outlined under A. above);*
- *Establish a national program of standardized, field-based surveys to measure the ultimate success of program in reducing the rate of invasions;*
- *Expand the national database of marine invasions to track invasion patterns and to assess vector strength on local, regional, and national scales*

D. Information Access, Coordination, and Outreach

A critical component of the national program must include efficient and effective methods for (a) providing access to key information to interested parties, (b) developing a coordinated approach across national, regional, state, and local groups, and (c) explaining the program’s rationale, goals, and results to all involved.

Although there are many on-going activities to address education and outreach, and these could be expanded in some topic areas, many limitations remain in the area of information access and coordination. While the Clearinghouse has been building national databases on ballast water delivery and management, as well as coastal invasions, these are not yet fully accessible to support the current needs of research, management, and policy. In addition, there are many parallel efforts underway at state, national, and international levels that could be coordinated, expanding the scope of available information and increasing cost-efficiency of these efforts.

Recommended Actions: To improve public awareness and effective information exchange:

- *Expand on-line access to the National Database of Marine Invasions through the clearinghouse;*
- *Improve access and use of the Nationwide Database of Ballast Water Delivery & Management for State and Regional Programs, creating opportunities for improved coordination of efforts;*
- *Expand the existing on-line directory (i.e., Aquatic Invasion Research Directory) of invasion research and management to enhance information exchange and coordination;*

- *Develop database networks, linking our national databases for invasions and shipping (e.g., those of the clearinghouse and the U.S. Geological Survey) to counterparts overseas, creating an expanded information resource that is international in scope.*

E. Rapid Response & Control

Although prevention has been the major emphasis of NISA, as well as other management activities for marine invasions, opportunities may also exist to limit impacts of established invasions. For example, it may be possible and economically feasible to eradicate some newly established populations, especially when the population size and distribution are very limited. In addition, for well-established invaders, control measures may also be worthwhile to reduce their impacts, when they are deemed severe and undesirable (e.g., impacts on fishery resources, critical habitats, or endangered species).

At the present time, there is no system established to consider or implement such rapid response and control options. Specifically, we lack: (1) a mechanism to detect new invasions in the nation's estuaries and bays; (2) a source of information and guidelines on various response / control options; and (3) a group that is tasked to evaluate and initiate potential actions for eradication or control.

Implementing a national survey to measure the effect of management actions on invasion rates (as discussed in C, above) could establish an "early-warning" system, providing a mechanism to detect new invasions at an early stage.

The National Database of Marine Invasions (as discussed above) is designed to include key biological and ecological data on each species, which is an integral component to exploring response options. Further, with links to similar databases overseas, access to information would greatly expand to include a broader range of potential and future invaders (known from outside the U.S.), saving valuable time in obtaining information needed for informed and timely decisions.

An advisory group could be established to develop "action plans" for various types of invasions. In essence, this group would draw on scientific expertise to establish criteria to consider for various types of actions, applying this to a few invasions as model systems. The group should also identify responsible agencies / groups to take the lead in implementing an action, when appropriate.

Finally, it would be very informative to have some demonstration projects, which test the feasibility of management actions for eradication and control. These demonstrations would essentially ground-truth the action plans, providing key insights into what does and does not work.

Recommended Actions: To develop a rapid response and control capability:

- *Create a national program of surveys, with an "early-warning" system for newly established invaders;*
- *Expand the National Database of Marine Invasions, including its linkage to a network of overseas databases;*
- *Create an advisory group tasked to develop action plans and criteria for response to invasions;*
- *Develop demonstrations projects to test the feasibility of implementing such action plans.*

F. Ship Hulls

Most marine invasions in the U.S. are associated with shipping and many of these are attributed to ballast water. However, for a large number of species invasions that result from shipping, it is often difficult to discern the relative contribution of ballast water versus hull fouling. Many organisms have different life stages, allowing them to occur in ballast water and on hulls, making either mechanism of transfer possible.

In general, the role of hull fouling in invasions is thought to have declined over time. However, the number of ships and the size of hulls have probably increased in the past 50 years. In addition, the use of TBT is being phased out which likely will reduce the effectiveness of hull coatings in the near, and possibly long-term, future. As a result, the relative contribution of hull fouling versus ballast water is unresolved in many cases, and some believe hull fouling may contribute to many or most invasions in particular regions.

Recommended Actions: To address the relative contribution of ships' hulls to invasions:

- *Assess the Potential for Invasions associated with Ships' Hulls --- Measuring the number, diversity, and condition of organisms associated with hulls*
- *Conduct Vector Analysis to Estimate the proportion of contemporary invasions that may be attributed to hull fouling (as noted under C, above).*

CONCLUDING REMARKS

We wish to note the strong support for a national-level program in each of these six areas. The same issues addressed here are highlighted as priorities in many regions and states throughout the country. The risks and concerns associated with ship-mediated invasions are fundamentally the same along all shores: the Atlantic, Pacific, and Gulf coasts as well as the Great Lakes. The need for similar actions also exists among these different regions.

There are clear advantages to addressing these needs directly through reauthorization of NISA. First, invasions and ballast water are truly national-scale issues that warrant a nationwide response. Second, the degree of coordination, management decisions, evaluation and information management and access will be strengthened by this approach. Third, a national response would also benefit from an economy of scale, limiting the total resources required to address these issues independently in different states and regions. Finally, there is a strong desire on the part of the shipping industry and ports to implement a uniform national approach.