

UNDS *tidings*

Uniform National Discharge Standards



a bi-monthly bulletin published by the U.S. Navy

volume 1 number 4

July/August 1997

Ballast Water Management: Defending Our Waters from Invasive Species

*As part of the UNDS development process, the Navy and EPA are reviewing ballast water, an incidental discharge, and evaluating the effectiveness of current ballast water management practices and technologies to control the risk of introducing invasive species. Although the contribution of Armed Forces' vessels to total ballast water discharged in US ports is small compared to commercial vessels, the potential for environmental impact from nonindigenous aquatic species is sufficient to warrant evaluation. The efforts will help achieve the UNDS goal of enhancing environmental protection. This edition of UNDS *tidings* features ballast water and related issues.*

According to the Great Lakes Commission, since the 1800s, at least 136 nonindigenous aquatic species of all types — including plants, fish, algae, and mollusks — have become established in the Great Lakes region alone. Approximately one-third of the organisms have been introduced in the past 30 years, a surge coinciding with the opening of the St. Lawrence Seaway. Scientists speculate that as world trade grows and ship travel time decreases, organisms in ballast water are more likely to survive the voyage, and the number of nonindigenous aquatic introductions will increase.

Over the centuries, mariners have unintentionally transplanted various species to new areas through the use of all types of ballast. Today, worldwide shipping and the resulting transfer of ballast water between ports represents the single largest source of invasive, nonindigenous aquatic species. Nonindigenous aquatic species refers to a member of a species introduced to a body of water or aquatic ecosystem outside its historic or native range. Ballast water taken on by ships may contain living microorganisms, plants, and animals native to the water pumped aboard. The discharge of this ballast water into a different aquatic ecosystem can introduce a species outside its original habitat, resulting in nonindigenous species rapidly dispersing and displacing native species.

article is termed “clean ballast water” by the Armed Forces, and stores only seawater in specially-designated tanks.

Armed Forces' Ballast Water Management

To reduce the risk of introducing nonindigenous species to a port, the Navy instituted a “double exchange” policy. This policy requires all surface vessels to purge tanks containing ballast water taken on within 3nm (or in an area densely populated with potentially invasive species) twice with clean seawater while outside of 12 nm. Exceptions to the policy consider a vessel's proximity to the original point of ballast operation. The International Maritime Organization (IMO) has developed guidelines outlining ballast water management practices. One management option is a ballast water exchange while in open waters 2,000 meters or more in depth. The IMO

Ballast Water: What and Why

Vessels use ballast water to improve stability and maneuverability under various transit conditions. Ballast water may be supplied and discharged by various means such as gravity, pressurized air, pumps, and eductors (i.e., via suction) depending on the location of the ballast tank in relation to the waterline. The ballast system discussed in this

CONTENTS

Ballast Water Management: Defending Our Waters from Invasive Species	1
UNDS Fast Fact	3
Recent Progress	4



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Ballast Water Management con't...

U.S. ports receive at least 21 billion gallons of ballast water annually (mostly from commercial vessels). The direct and indirect effects of nonindigenous species are best illustrated by the following reports from across the country:

Throughout the Great Lakes and Mississippi River drainage basins, the European zebra mussel continues to have significant impacts on the ecosystem and local economies. For example, one small powerplant on the Illinois River spent \$1 million installing a zebra mussel control system.

In San Francisco Bay, researchers have found a total of 212 nonindigenous organisms. In recent years, one new organism is introduced every 12 weeks.

Over the past 20 years, more than 150 recorded species of marine invertebrates and plants have invaded Hawaii and other Pacific Islands. Toxic "red tides," caused by dinoflagellates carried in ballast water, have been moving through the tropical Pacific resulting in a rising number of paralytic shellfish poisoning cases.

The Chesapeake Bay ports of Norfolk and Baltimore receive 3 billion combined gallons of ballast water annually. More than 100 nonindigenous species have been introduced to these coastal areas.

In 1991, a strain of cholera bacteria found in fish populations in Mobile, Alabama was transferred from plankton-sized crustaceans in ballast water from vessels inbound from South America.

guidelines are followed by the US Coast Guard and commercial vessels. Many Military Sealift Command (MSC) vessels also currently abide by IMO ballast water guidelines.

Ballast water exchange has the advantages of not requiring capital investment and generally not impacting a vessel's transit schedule. However, the most significant advantage is that ballast water exchange is extremely effective in preventing the transportation of nonindigenous species, especially between intercoastal, saltwater ports. Species that thrive in near-coastal, low-salinity environments generally cannot survive in the high-salinity waters of the open ocean; the reverse is true for open-ocean species.

As part of an ongoing study of nonindigenous aquatic species in the Chesapeake Bay, the Smithsonian Environmental Research Center (SERC) recently sampled ballast water from Navy vessels in 10-day transits from Rota, Spain to Norfolk, Virginia. The study involved a double-exchange of ballast water containing a known number and concentration of microbials. Preliminary results of the research indicate a high level of effectiveness of double-exchange in preventing nonindigenous species.

Certain circumstances, such as weather conditions or ship design, may prevent a vessel from conducting ballast water exchange. In adverse weather conditions, safety concerns may prevent a ship from conducting ballast exchange. Some vessel designs are not conducive to ballast water exchange. Larger (mostly commercial) vessels may sag, and in the extreme, break apart from the stresses to the hull if ballast water is pumped into or out of tanks in the wrong sequence.

Other Promising Technology

Over the past ten years, there has been heightened awareness of ballast water management as demonstrated by the many regulatory and voluntary initiatives to control nonindigenous species (see Table 1). One such initiative, the Great Lakes Ballast Technology Demonstration Project — a cooperative effort of the US and Canadian Coast Guards; US Fish and Wildlife Service; USEPA; National Oceanic and Atmospheric Administration; and the Great Lakes Commission — is testing the effectiveness of an onboard filtration system for ballast water. Although filtration is a possible technology, no one technology will likely serve the needs of all the types of vessels and missions. A combination of technologies or practices may be needed to address all the distinct

Ballast Water Management con't...

organisms present in the ballast water of a given vessel. Therefore, scientists are evaluating other technologies such as heat and ultraviolet light treatments to control nonindigenous species transportation in ballast water.

Ballast Water: The UNDS Connection

UNDS intends to achieve an enhanced level of environmental protection compatible with the design, operational, habitability, and cost constraints of Armed Forces' vessels. The Navy and EPA analyzed the discharge process, frequency, volume, and constituents of ballast water during a nature of discharge (NOD) analysis as part of UNDS Phase I activities. Clean ballast water is already controlled on Navy vessels by a marine pollution control device (MPCD) — the double-exchange policy — and therefore is a likely candidate to require control in the future. Under UNDS, an MPCD may be a piece of equipment or a management practice.

During Phase II of the UNDS rulemaking process, the Navy and EPA will continue to research potential technologies, study the effectiveness of ballast water exchange practices, and provide insight into the development of any new policies or practices considered to reduce the introduction of nonindigenous species between and among coastal areas.

The use of ballast exchange promises to reduce the rate of nonindigenous species introductions. Although current Armed Forces' contribution to total volume of ballast water released to US waters is small compared to commercial vessels, UNDS-driven research may contribute significantly to the universe of solutions used to control the invasion of nonindigenous aquatic species in domestic and international waters.

Table 1. Ballast Water Management in the Last Decade:

- 1990 - Nonindigenous Aquatic Nuisance Species Prevention and Control Act passed, aimed primarily to prevent and control the spread of the zebra mussel through U.S. coastal inland waters
- 1991 - Joint U.S./Canadian guidelines establish a voluntary ballast water exchange practice prior to St. Lawrence Seaway entry
- 1993 - Lake Carriers' Association initiates voluntary ballast water management program in Lake Superior to stem the introduction of ruffe (*Gymnocephalus cernuus*)
 - Ballast water exchange in high salinity ocean waters becomes mandatory before entering the St. Lawrence Seaway (U.S. Coast Guard enforced)
- 1996 - National Invasive Species Act is signed requiring ballast water exchange and other measures for all vessels calling on U.S. waters
 - National Defense Authorization Act passed, authorizing the establishment of UNDS to regulate incidental Armed Forces' vessel discharges such as ballast water

UNDS Fast Fact

In March 1996, Ohio Senator John Glenn introduced S. 1660, the National Invasive Species Act (NISA). This Act requires ballast water exchange or other measures for all vessels calling on U.S. waters to curb the introduction and transportation of invasive species. The Act reauthorizes the Great Lakes ballast water management program and applies to vessels operating beyond the exclusive economic zone (3-200 nm offshore). NISA establishes guidelines regarding ballast water exchange in the open ocean. However, the Act allows the master of the vessel discretion to determine if ballast exchange threatens the safety or stability of the vessel, crew, or passengers.

Section 1103 of the Act outlines an Armed Services Ballast Water Program. This section requires the Secretary of Defense (for DoD) and the Secretary of Transportation (for the Coast Guard's seagoing vessels) to implement a ballast water management program. As discussed in the feature article, the Navy's double-exchange practice is intended to limit the introduction of invasive species and is part of the Navy's ballast water management activities.

Recent Progress



The Technical Working Group is preparing Nature of Discharge (NODs) reports. These reports will be available to the States. State representatives will be contacted soon to schedule the second round of consultation meetings and will have the opportunity to review EPA/Navy progress in determining which discharges require control. For more information, please contact Melissa French at (703) 917-2556 or email UNDS@bah.com.



On 27 June, the UNDS Executive Steering Committee met to review progress and upcoming activities, including the Nature of Discharge reports and upcoming state consultation meetings. ESC members are looking forward to consulting with state representatives on the discharge analyses.

What do you want to know about UNDS? Please submit questions to the UNDS newsletter editor at UNDS@bah.com or through <http://www.n4.hq.navy.mil/n45b/doc/unds/unds.html>

next issue of UNDS ^{tidings} ...

**State Consultation
Meetings**

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