



BALLAST *exchange*

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GREETINGS

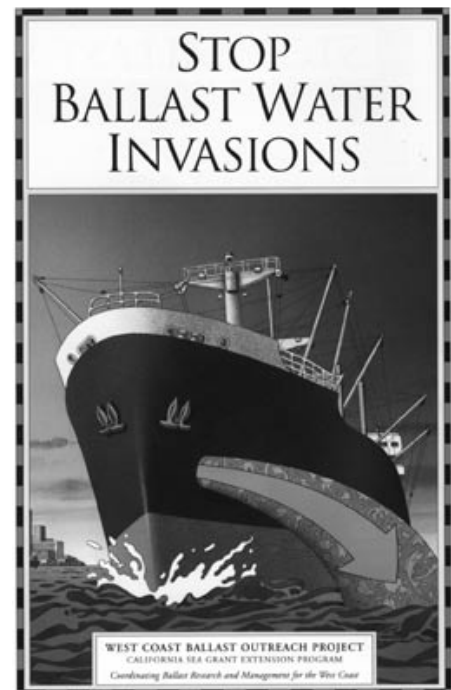
By Karen Hart McDowell, California Sea Grant Extension Program

Welcome to the third edition of the Ballast Exchange, the biannual newsletter of California Sea Grant Extension's West Coast Ballast Outreach Project. This issue is highlighted by a progress report on California's ballast water management program. We hope you enjoy reading this report along with the other articles in this edition. In addition to the newsletter, we have also continued work on several other outreach materials and events.

I am happy to announce that our educational poster and brochure on ballast water exchange are ready for distribution! These products are very attractive and informative, thanks to the efforts of writer/editor Joan Patton from the San Francisco Estuary Project and illustrator Ed Lindlof. I would like to thank the National Sea Grant College Program and the CalFed Bay-Delta Program for funding our project and the poster and brochure. With this funding we will be able to distribute these products free of charge. We would also like to thank the U.S. Coast Guard, the California State Lands Commission, and the Port of Long Beach for covering the printing costs of the posters and brochures that they will distribute. Their contributions have allowed us to increase the total number of posters and brochures that will be printed. Samples of our poster and brochure will be posted on our web site in the near future. To obtain copies of the poster and brochure, please contact me by e-mail (kdhart@ucdavis.edu) or by phone (510-622-2398).

We have also continued to organize and participate in various ballast water conferences and workshops. We cosponsored two events with the Pacific Ballast Water Group. The first was a workshop, "A Ballast Water Research Agenda for the 21st Century," that took place in July during the Coastal Society's 17th International Conference in Portland, Oregon. The second event was a teleconference with the

(continued on back page)



West Coast Ballast Outreach Project Brochure

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CALIFORNIA'S BALLAST WATER MANAGEMENT AND CONTROL PROGRAM

PROGRESS REPORT — SEPTEMBER 2000

By Maurya B. Falkner, Program Manager, California Ballast Water Management Program, California State Lands Commission, Marine Facilities Division

EXECUTIVE SUMMARY

The Ballast Water Management for Control of Nonindigenous Species Act of 1999 (Act) established a statewide, multi-agency program to prevent or reduce the introduction and spread of nonindigenous aquatic species (NAS) into California state waters.

Implementation began January 1, 2000, and is under the direction of the California State Lands Commission (CSLC) in consultation with other state and federal agencies. The total budget is \$6.67 million over four years and includes an inspection and monitoring program under the CSLC. The California Department of Fish and Game (CDFG) will conduct biological surveys to determine the extent of NAS introductions in state waters. The State Water Resources Control Board (SWRCB) will evaluate alternatives to mid-ocean exchange, and the Board of Equalization (BOE) will collect fees. The Program is funded through the assessment of a \$400 fee for each qualifying voyage. While the program had some initial problems with fee payment and reporting, compliance rates have improved dramatically.

BACKGROUND

On October 8, 1999, California's governor signed Assembly Bill 703, creating the Ballast Water Management for Control of Nonindigenous Species Act (Act), which became effective on January 1, 2000. The Act addresses a problem that has become all the more urgent as international commerce increases, resulting in a corresponding increase in the speed with which NAS are being introduced. The introduction of NAS has created ecological, operational, and engineering disasters in many areas of the United States and worldwide. Nonindigenous aquatic species are commonly reported in San Francisco, Los Angeles, San Diego and many smaller harbors and embayments throughout California.

The California Legislature recognized the significance of the problem and established, through passage of the Act, a state program that addresses the issue by making ballast water management mandatory. The law applies to all U.S. or foreign vessels that enter California waters after operating outside the U.S. Exclusive Economic Zone (EEZ). Vessels must either conduct a mid-ocean

exchange of ballast water or retain all ballast water on board the vessel. The program also assesses the current condition of the marine environment and evaluates alternative methodology for controlling NAS introductions.

The Act established a statewide multi-agency program with the intent to control the introduction and spread of NAS in state waters. Responsible agencies identified in the law include the CSLC, CDFG, SWRCB and the BOE. Each agency is required to work in cooperation with the others in developing reports and conducting research into the extent of current invasions, and potential long-term solutions to the problem of NAS introductions.

The CSLC is responsible for developing and implementing the ballast water inspection and monitoring program, and evaluating the effectiveness of the Act. The CSLC's program includes the establishment of a fee schedule for vessels operating in California waters, collection of vessel-specific ballast water management data, field inspection of ballast water and sediments from vessels, synthesis and analysis of monitoring and inspection information to evaluate the effectiveness of the program, and enforcement of the law, through the imposition of administrative civil penalties.

The CDFG, Office of Oil Spill Prevention and Response (OSPR), is responsible for conducting research to determine the location and extent of NAS populations in state coastal and estuarine waters. The SWRCB is responsible for conducting studies to evaluate alternatives for treating and otherwise managing ballast water to prevent the introduction and spread of NAS into state waters. Finally, the BOE is responsible for the collection and deposition of fees into the "Exotic Species Control Fund," which will pay for the statewide programs.

CURRENT STATUS

SHIPPING PATTERNS

From January 1 through August 31, 2000, 4,570 qualifying voyages, by 1,650 different vessels, entered California ports. Nearly 50% of these vessel calls were container vessels, 13% each were tank and bulk vessels, with general cargo, auto carriers and passenger vessels each constituting

Figure 1. VESSELS BY TYPE - STATEWIDE

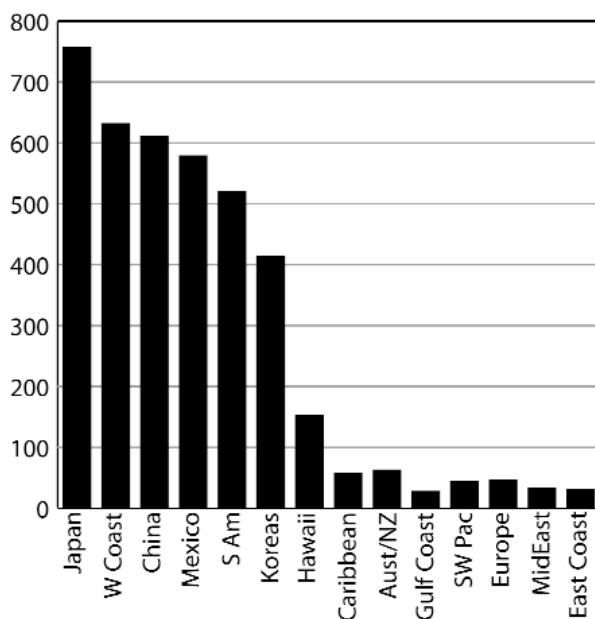
(through August 31, 2000)



approximately 10% of the vessel calls (Figure 1). Nearly 45% of the vessel calls identified a last port of call (LPOC) as a Far East port, such as Japan, China, and the Koreans. Twenty percent of the vessel calls originated from Pacific North American ports in Canada and Mexico, while 13% called at a South American port prior to arriving in California (Figure 2).

Nearly 4.6 million metric tons of ballast water was discharged into California ports between January 1 and August 31, 2000. Nearly 50% of those vessels discharging ballast in California originated from Far East ports, and more than 30% came from Mexican ports.

Figure 2. LAST PORT OF CALL (3971 vessel calls)



COMPLIANCE

Under Section 71205(a), ship agents, along with the master, owner, operator or person in charge, are responsible for submitting the ballast water reporting form for each voyage prior to the vessel leaving the first port of call in California. Letters were sent to nearly 80 ship agents in December 1999 explaining their responsibility under the new law. During the first three months of the program, the staff of the CSLC sent "Letters of Concern" to several of these agents. However, compliance with the reporting requirements during that time was less than 60% statewide and several large ship agents had compliance rates of less than 50%.

Despite the initial outreach letter to all agents and the focused letters of concern to "problem" agents, compliance during the second quarter of the year was still unsatisfactory. Beginning in May 2000, enforcement letters were sent to nine ship agents for violations of Section 71205(a). These agents all had significant numbers of non-compliant vessels and had received at least one "letter of concern" during the preceding quarter. Additionally, staff referred one case to the CDFG's Office of Spill Prevention and Response for further enforcement action. CSLC staff met with eight of the nine shipping companies between June and August 2000. Because of those meetings, all the ship agents initiated procedures designed to improve compliance and further enforcement action has been suspended at this time. The subsequent submission of outstanding forms has resulted in an overall compliance of 87% (Table 1).

INSPECTIONS

Representatives from the two CSLC Marine Facilities Division field offices have boarded and inspected approximately 25% of the qualifying voyages during the first eight months of the Program. Inspections have been conducted on over 650 different vessels. Each vessel is boarded, paperwork is evaluated, tanks are sampled for compliance and educational material is provided to the ship's crew. A report, summarizing the results of the inspection is provided to the crew. The majority (75%) of those vessels boarded comply with the law. Violations noted are primarily associated with administrative components of the law (incomplete ballast water management plans, no IMO guidelines on board, etc.). Less than five percent of the violations noted during inspections are associated with the required mid-ocean exchange of ballast water. Of these five percent, over 80% are passenger vessels coming from Mexican ports. The CSLC is working with these vessels to identify alternative exchange zones and or management techniques that will ensure compliance with the law in an environmentally sound manner.

INDUSTRY PERSPECTIVE

By John Berge, Vice President, Pacific Merchant Shipping Association

The maritime industry has been attuned since 1995 to the issue of nonindigenous species residing in ship's ballast water and their introduction into the aquatic environment through the operational necessity of ballast discharge. Prior to then, vessels considered ballast water to be a benign discharge of "clean" water with the primary focus of mariners on other potential discharges with known environmental consequences, such as petroleum products, black and gray water and deck runoff. Mariners are now planning their ballast water exchanges with as much foresight to, and in conjunction with, cargo stowage, navigational routing and vessel stability.

Ocean-going vessels calling in California fall under the regulation of the Ballast Water Management for Control of Nonindigenous Species Act, which went into effect in January of 2000. The California State Lands Commission (CSLC) oversees this program. Prior to this California law, vessels calling in California ports abided by U.S. Coast Guard regulations for voluntary ballast reporting and exchange. Although the Coast Guard program is still in effect, with an overlap in reporting guidelines, the California program is mandatory and is funded through a per vessel fee. As with any new regulation, especially a state-specific regulation, several vessels were errant in both their reporting and fee payment compliance earlier this year. After an aggressive campaign of education by CSLC together with the assistance of ship operators and agents, the compliance level has improved dramatically.

California has taken a lead on the West Coast in the collection and analysis of ballast water data. The recent involvement of the State Water Quality Board in the program promises to provide valuable data on the effectiveness of available and potential methods of treatment. Through the sharing of this data between California agencies and other state agencies, port authorities, vessel owners and operators, the U.S. Coast Guard and international organizations such as the International Maritime Organization (IMO), it is the maritime industry's hope that a unified national or international approach can be developed. It is in this context that national or international standards for the level and type of ballast water treatment required need to be developed. The international scope of the ocean going maritime industry favors consistency in regulations of this kind. A ship travelling between ports in the three West Coast states and British Columbia must currently adhere to four different governing regulations with differing reporting requirements and even differences between what is an acceptable ballasting source. Although it is recognized that ecosystems will vary over geographical areas, this is an issue that ultimately needs to be addressed with a worldwide perspective. The Ballast Water Outreach program and the National Invasive Species Task Force have performed a valuable service in facilitating the sharing of information and data, which we hope will further this goal. The IMO, through the formation of the Global Program Task Force (GPTF), is providing a similar forum on an international basis. Locally, industry is working closely with the CSLC to ensure the success of the California program and its resulting data. The shipping community is anxious to assist these state, federal and international organizations in finding a solution to this problem.

OUTREACH/EDUCATION

Communication among the maritime industry, CSLC and other regulating entities is vital to the success of the California program. CSLC has initiated several outreach and educational programs in the past eight months to improve communication among the stakeholders. For example, an updated ballast water web page is found on the CSLC web page. Information on the law, new regulations, and synopsis of meetings, notification of upcoming meetings, and links to other related web pages can be accessed easily. CSLC, in conjunction with state and federal agencies and the maritime industry, has participated in or hosted more than 10 workshops/conferences on ballast water management in the past eight months.

Beginning in July 2000, the CSLC initiated a monthly e-mail procedure to notify the maritime industry of vessels that have not submitted the required ballast water report forms. This procedure has been well received by the industry and has resulted in a steady improvement in compliance. The compliance rate for the months of July and August were over 90%.

Finally, the formation of a Technical Advisory Group (TAG) made up of members of the maritime industry and state agencies has proved beneficial in determining an appropriate fee amount and in addressing issues related specifically to the implementation of the California law. The TAG meets quarterly to assess the effectiveness of the program and the status of the fund.

PARTNERSHIPS

CSLC is finalizing a Cooperative Agreement with the U.S. Coast Guard to streamline both programs, to reduce duplicative inspections, to share data at the regional and national levels, and to cooperate in research programs addressing new verification techniques and ballast water treatment technology. CSLC is an active member in several ballast water related groups, such as the Pacific Ballast Water Group, Ballast Outreach Advisory Team, and the Pacific Ballast Water Pilot Project (Table 2). Participants work toward consistent ballast water management regulations on a regional level while sharing data and evaluating alternative exchange zones off shore and feasible treatment technologies.

FUTURE PLANS

CSLC staff is working with passenger vessel companies, state agencies and the scientific community to identify potential alternative exchange zones within 200 nautical miles of land. Several companies have joined forces to develop a study plan that would evaluate the biological organisms and ocean current patterns in areas off the Baja California coast.



Table 1. BALLAST WATER REPORT FORM COMPLIANCE

CA Port/ Place	# of Qualifying Voyages	# of BW Reports in	Percent Compliance
Humboldt	20	11	55 %
Sacramento	40	31	76 %
Stockton	69	60	87 %
Carquinez Strait	141	111	79 %
Richmond	117	106	91 %
Oakland	415	326	78 %
San Francisco	65	56	86 %
Redwood City	18	12	67 %
Hueneme	177	166	94 %
LA/Long Beach	3306	2857	86 %
San Diego	202	188	93 %
TOTAL	4570	3924	87 %

Working with CDFG and the U.S. Coast Guard, CSLC will evaluate the study plan and final results to determine if the proposed area is an appropriate alternative exchange zone for vessels coming into California waters from Mexican ports.

CSLC staff is also working with the technology development sector to identify potential ballast water treatment systems. CSLC is facilitating the transfer of information among the technology development and maritime industries and the state and federal agencies. Recently CSLC was awarded a grant for a proposal titled "West Coast Regional Applied Ballast Management Research and Demonstration Project" from the U.S. Fish and Wildlife Service and National Sea Grant College Program. This project proposes to evaluate and install a shipboard ballast water treatment system on a qualified "volunteer" vessel. The vessel would then participate in Washington State's Ballast Water Pilot Program, where the real-time effectiveness of the treatment technology will be evaluated.

Table 2. CSLC-MFD PARTNERSHIPS

- **US COAST GUARD**
Coordination, Data Sharing & Research
- **WASHINGTON STATE**
Pacific Ballast Water Pilot Project
- **US FISH & WILDLIFE/SEA GRANT**
West Cost Demonstration Pilot Project
- **PACIFIC BALLAST WATER GROUP**
Regional Coordination of Management and Research
- **BALLAST OUTREACH ADVISORY TEAM**
- **BW TECHNICAL ADVISORY TEAM**
- **PORT OF OAKLAND/NMFS/SMITHSONIAN**
Ballast Water and Sediment Sampling

ENVIRONMENTAL PERSPECTIVE

By Linda Sheehan, Director, Pacific Region
Office, Center for Marine Conservation

The Center for Marine Conservation (CMC), a co-sponsor of AB 703, welcomes the efforts by the State Lands Commission and others to implement and enforce this precedent-setting law. CMC particularly applauds the relatively high (25%) boarding rate in the first eight months of the program. A high boarding rate is needed to inform the industry about the details of the program, recognize the efforts of vessel crews that do comply, and obtain the information needed for enforcement actions against those who choose not to comply.

CMC believes that any proposals to allow for alternative exchange zones within 200 nautical miles of shore should receive careful scrutiny to ensure that they maximize protection against harmful invasive species. These zones should be limited either to ships arriving from the same bioregion as the waters off California (as defined by thorough scientific and technical reviews) or ships that could not exchange or treat ballast due to legitimate safety issues.

AB 703 has prompted similar ballast control efforts around the country, including in Washington and Michigan. CMC is working to ensure that these states are not alone in their actions to protect the environment and economy from invasive species carried in ships' ballast. For example, EPA should respond in the next few weeks to a petition by CMC and other groups to regulate ballast water under the Clean Water Act. Nationwide, mandatory controls would level the playing field for vessels complying with AB 703 and make put them ahead of the curve on compliance.



TRACKING PATTERNS OF INVASION

By Jonathan B. Geller, Moss Landing Marine Laboratories

Nonindigenous species are dispersed around the globe by many different mechanisms. Recently, our attention has focused on ballast water as a mechanism of transport (Carlton and Geller 1993). However, other mechanisms of transport have existed over the entire history of human-mediated movement of marine and estuarine species. For example, the movement of adult oysters for culturing, which is uncommon today but was widespread in the 19th century, caused the spread of a diverse assemblage of organisms attached to oyster shells (Carlton 1989). Ships with wooden hulls have spread fouling organisms for centuries (Carlton and Hodder 1995). As populations of exotic species become established in new regions, these populations themselves become potential sources for new invasions mediated by the same or different mechanisms. Zebra mussels, for example, are thought to have come to North America in ballast water, but small craft and trailering of small craft may be responsible for moving



zebra mussels from one watershed to another (Johnson and Carlton 1996).

Determining the sources for invasions may help to identify measures that may prevent further invasions, but this task is not straight-

forward. First, as illustrated above, the region where a species is native is not necessarily the source for the invasion of other regions. Second, the area where a species is native may be quite broad, such that the source of invasion can only be crudely guessed (eg, "Asia" or "Europe"). Genetic markers can help to pinpoint sources of invasion more precisely, and this has been the focus of our work with one infamous invader of the Pacific coast of North America, the European Shore crab *Carcinus maenas* (also known as the "green crab"). This method depends on unique genetic markers, or combinations of genetic markers, that are distinct for particular geographic regions (Box 1). Thus, if these markers appear in a new invasion, we can reasonably infer the source of that invasion.

Carcinus has two source regions that have distinctive genetic markers, the Atlantic coast of Europe (Atlantic) and the Mediterranean Sea (Geller et al. 1997). Invasive populations are found in Eastern North America, Western North America, Australia (mainland), Tasmania, Japan, and South Africa. In our studies, we have focused on two types of DNA to determine the pattern of invasion between these populations.

TABLE 1. Frequencies of microsatellite alleles at microsatellite locus CM9 for green crabs in Atlantic Europe (Netherlands, Spain), Mediterranean Europe (France, Italy) and six invaded regions. Green crabs from Atlantic Europe and most invaded regions possess all that are predominantly 272 base pairs or smaller. Green crabs in Mediterranean Europe and Japan possess alleles that are predominantly 300 base pairs in size or larger. Two alleles identified in Japan were intermediate in size to alleles observed in native crabs.

Locale	Allele Size Range (base pairs)		
	198-272	276-280	300-360
Netherlands	0.99		0.01
Western Spain	1.00		
Southern France	0.06		0.94
Italy	0.07		0.93
Australia	1.000		
Tasmania	1.000		
Eastern North America	1.000		
Western North America	1.000		

TABLE 2. SUMMARY OF RESULTS

	SOURCE REGIONS		INVADED REGIONS	
	ATLANTIC COAST OF EUROPE (Atlantic)	MEDITERRANEAN SEA	AUSTRALIA (Mainland)	TASMANIA
mtDNA Analysis	1 marker characteristic of region (Referred to as Atlantic mtDNA marker)	1 marker characteristic of region (Referred to as Mediterranean mtDNA marker)	Atlantic mtDNA marker	Atlantic mtDNA marker
Microsatellite DNA (Analysis at locus CM9)	Small Sized Alleles (between 198-272 base pairs)	Large Sized Alleles (between 300-360 base pairs)	Small Alleles	Small Alleles
Genetic Variation within Population	High	High	Low	Low , and only possess a subset of the alleles that are found in Australia.
Source of Invasive Population	N/A	N/A	Atlantic coast of Europe	Mainland of Australia (which was invaded from the Atlantic coast of Europe)

The first is mitochondrial DNA (mtDNA) (Box 2). *Carcinus* populations in Eastern North America, Western North America, and Australia only possessed the Atlantic mtDNA marker, identifying the Atlantic coast of Europe as the population source. In contrast, populations from Japan and South Africa possessed both the Mediterranean and Atlantic mtDNA markers. In South Africa, available evidence points to invasions by both Atlantic and Mediterranean crabs. For Japan, other evidence discussed below suggests that it was invaded by a single population source, with the genetic mixing occurring prior to the invasion.

The second type of genetic marker we used was microsatellite DNA (Box 3). We assessed the presence and number of each allele in populations in Europe and in introduced populations (Bagley and Geller 2000). Between the two source populations, Atlantic and Mediterranean, nearly fixed differences in the sizes of microsatellite alleles were observed at one locus, CM9 (Table 1) (Bagley and Geller 2000). The Atlantic source population had small alleles at this locus and the Mediterranean population had large alleles at this locus. Introduced populations in Australia, Tasmania, Eastern North America, and Western North America had small alleles at this locus that were characteristic of the Atlantic form of green crab. These results are consistent with the results from the first test. Green crabs in Japan did not possess any of the small alleles characteristic of the Atlantic populations at the highly diagnostic locus CM9, but rather appeared to be derived from Mediterranean populations. This suggests that the crabs in Japan came from a single population in the Mediterranean. In contrast, the South African population possessed large and small alleles, suggesting that green crabs have invaded South Africa more than once.

A key pattern that has emerged is the severe loss of genetic variation that occurs with invasion. Thus, *Carcinus* populations in Eastern North America possess only a subset of the alleles that were present in Europe. Each independent invasion possesses a different subset of alleles. We found that alleles in Tasmania were a subset of alleles found in mainland Australia, and that alleles found in Western North America were a subset of those found in Eastern North America. Thus, natural or anthropogenic dispersal has spread the Australian invasion to Tasmania after a 100 year delay. In North America, it is likely that ballast water transport, or

the movement of adult crabs in bait or by hand, resulted in the leap frog-like movement of crabs across the continent. A summary of all of the results can be viewed in Table 2. These results demonstrate the power of microsatellite DNA analysis for studying marine bioinvasions. Our data indicate that green crabs were able to successfully invade several regions despite losing large amounts of genetic variation and suggest that a new trend is emerging in which prior introductions have become stepping stones for new invasions. Genetic characterization of native and introduced populations of additional marine bioinvading species is like-

Box 1. The use of genetic markers takes advantage of the evolutionary process in which mutations to DNA produce novel DNA sequences (“alleles,” in genetic parlance, or “markers,” more colloquially). If two populations are isolated (limited exchange of breeding organisms between populations), then a new marker may become common in one population but not in the other. In this way, sets of markers become characteristic of one population but are rare elsewhere. If markers from a native population are also found in an exotic population, it is statistically most probable that the native population is the source.

Box 2. Mitochondria are cellular organelles that contain their own DNA. MtDNA is inherited only from mother to offspring, without paternal influence, in most organisms. It also tends to accumulate mutations faster than the DNA found in the cell’s nucleus. These properties have made mtDNA a favorite for the analysis of geographic patterns of genetic differentiation (Avice 2000).

Box 3. Microsatellite DNA refers to regions of each organism’s genome that consist of repeated simple patterns of two to six nucleotide base pairs. For example, a dinucleotide microsatellite might be CA repeated 40 times. This can be written as (CA)40. Microsatellites have the tendency to mutate rapidly by the addition or deletion of repeat units. Thus, another individual of the same species might contain the sequence (CA)41. Within a population, many such variants may exist, allowing ample opportunities for isolated populations to drift genetically so that different sets of alleles are common and rare.

SEE PAGE 9 FOR LITERATURE REFERENCES

ly to be a fruitful research approach and will allow assessment of the generality of our results.

INVADED REGIONS-CONT.			
EASTERN NORTH AMERICA	WESTERN NORTH AMERICA	SOUTH AFRICA	JAPAN
Atlantic mtDNA marker	Atlantic mtDNA marker	Atlantic mtDNA marker and Mediterranean mtDNA marker	Atlantic mtDNA marker and Mediterranean mtDNA marker
Small Alleles	Small Alleles	Large Alleles	Large Alleles
Low	Low, and only possess a subset of the alleles that are found in Eastern North America	Relatively large genetic variability for an invasive population	Low
Atlantic coast of Europe	Eastern North America (which was invaded from the Atlantic coast of Europe)	Atlantic coast of Europe and the Mediterranean Sea (multiple invasions)	Mediterranean Sea (genetic mixing of mtDNA markers probably happened in the source population prior to the invasion to Japan)

PRINCESS CRUISES TESTS THE OPTIMAR BALLAST WATER TREATMENT SYSTEM ON THE REGAL PRINCESS

By Karen Hart McDowell, California Sea Grant Extension Program

Open ocean exchange is not a practical management option for most cruise ships, since many cruise ships never venture far from the coastline. Currently this is a major issue in California, where cruise ships that travel from Southern California to Mexico are required by state law to conduct an open ocean exchange (at least 200 nautical miles offshore) before discharging ballast water in California state waters. Many of the cruise lines (including Princess Cruises) have been working with the California State Lands Commission to possibly set up temporary alternate exchange zones located closer to shore and additional ballast management practices, until a better solution is found.

Princess Cruises has gone a step further and has taken the initiative to test the Optimar Ballast Water Treatment System on one of their cruise ships, the Regal Princess. It is an ideal platform for testing this system since cruise ships only have to process a very low volume of ballast water. The Optimar system is designed and manufactured by OptiMarin Marketing of Stavanger, Norway and distributed by Hyde Marine, Inc. It contains the patented MicroKill cyclonic separator and the MicroKill ultraviolet (UV) light treatment system. While the ship is ballasting, the water passes through the cyclonic separator, which removes the heavier particles/organisms; then it passes through the UV system, where the remaining organisms are irradiated (theoretically killing or inactivating the remaining organisms). While deballasting, the water is again passed through the UV system.

The Optimar Ballast Water Treatment System was installed aboard the Regal Princess in late March 2000, with no interruptions to the ship's normal operations. The system is located in the ship's pump room. This system is very easy to operate and allows the crew to treat the ballast water without affecting normal operations (i.e. time spent at the dock, or distance traveled from shore). Princess Cruises is very pleased with operational aspects of this system and hopes to install the system on all of its ships, if it is proven to be effective for treating ballast water. Efficacy testing, conducted by Allegra Cangelosi

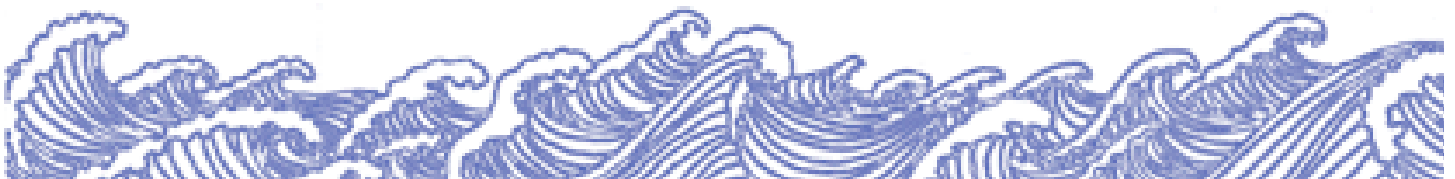
from the Northeast-Midwest Institute, began in May during a short four-day cruise from Vancouver, BC to Alaska. The testing is still in progress, but preliminary results are promising.

Princess Cruises is one of the first companies to test a ballast water system on one of their ships. If approved, this system could be used on other

cruise ships. Hyde and OptiMarin plan to install test systems on other merchant ships that process larger volumes of ballast water. The results from the "small" system installed on the Regal Princess will speed up development of larger scale systems. Princess Cruises and Hyde/OptiMarin have been working closely with the various regulatory agencies to test this system. Collaborative efforts like these will speed up the approval process for ballast water treatment systems, giving companies a choice between open ocean exchange and treatment.



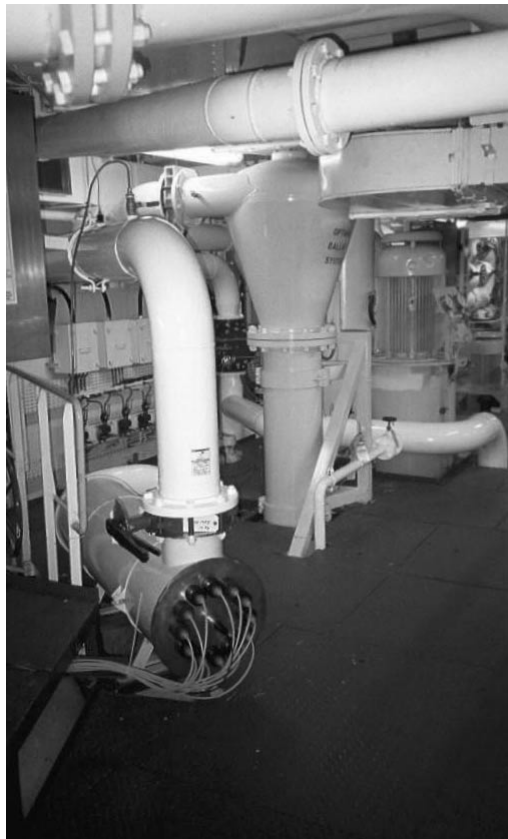
Regal Princess Cruise Ship



INDUSTRY ON THE



Installing Optimar Ballast Treatment System



Optimar Ballast Treatment System

ON LINE

(Note: Many addresses have changed recently)

ANS Task Force

<http://www.anstaskforce.gov/>

California State Lands Commission

<http://www.slc.ca.gov/>

Great Lakes Panel on Aquatic Nuisance Species

<http://www/glc.org/ans/anspanel.html>

International Maritime Organization

<http://www.imo.org/>

National Ballast Water Information Clearinghouse - SERC

<http://invasions.si.edu/>

Northeast-Midwest Institute - Aquatic Invasive Species Site

<http://nemw.org/biopollute.htm>

USGS Nonindigenous Aquatic Species Site

<http://nas.er.usgs.gov/>

Sea Grant Nonindigenous Species Site

<http://www.sgnis.org/>

U.S. Coast Guard Ballast Water Program

<http://www.uscg.mil/hq/g-m/mso/mso4/>

West Coast Ballast Outreach Project

<http://ballast-outreach-ucsgp.ucdavis.edu/>

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M O V E

H O T T O P I C S

U.S. PORTS ENDORSE BALLAST WATER MANAGEMENT LEGISLATION

(Excerpted from AAPA News Release, October 16, 2000)

Veracruz, Mexico - In response to the growing trend of state laws regulating ballast water discharges from ships, U.S. ports plan to develop a legislative proposal that would: 1) establish a strong federal ballast water management program; and, 2) preempt state legislation in this area. Port executives gathered in Veracruz, Mexico, in October for the 89th Annual American Association of Port Authorities (AAPA) Annual Convention.

During the October 16 meeting of AAPA's U.S. Legislative Policy Council (USLPC) representing the Association's 84 U.S. port members, Chairman of the Board J. Robert Bray, PPM®, Executive Director of the Virginia Port Authority, led the discussion of concepts for legislation in the area of ballast water and introduction of nonindigenous species. The USLPC voted unanimously to adopt the position that reflects Association members' growing concern over the development of new ballast regulations.

"The port industry recognizes the serious environmental and human health risks posed by invasive species, and we will work with the Congress, the Coast Guard and others to promote responsible laws, policies, and regulations related to ballast water management," said Mr. Bray. "AAPA supports solutions to the transportation and introduction of nonindigenous aquatic species that are international in scope, flexible in application, and targeted at the source," he added.

AAPA's ballast water legislation will include an amendment to the National Invasive Species Act (NISA) to direct the Coast Guard to make mandatory, with a safety exemption, the current voluntary ballast water exchange provision. Under existing law, the Coast Guard cannot make ballast exchange mandatory until January 2002 at the earliest, and only then if compliance with the voluntary program is determined to be "inadequate."

To view the entire News Release, please visit AAPA's Web site at www.aapa-ports.org

FIRST ANNUAL REPORT ON THE NATIONAL BALLAST WATER SURVEY

The first report on the National Ballast Water Survey has been completed by the Smithsonian Environmental Research Center and the U.S. Coast Guard.

The Interim Report, dated October 2000, is titled "Results of the First Year of Data Management and Analysis: Shipping Industry Compliance with Mandatory Ballast Water Reporting Requirements, Shipping Industry Compliance with Voluntary Ballast Water Management Guidelines." It is written by G.M Ruiz, A.W. Miller, R.A. Everett, B. Steve, K. Lion, C. Whitcraft, A. Arnwine, E. Colinetti, M. Sigala, and D Lipski.

A few quotes from the executive summary are as follows:

- "Over the first 12 months (1 July 1999 – 30 June 2000) that the rule was in effect, only 20.8% of the vessels that entered U.S. waters from outside the EEZ filed mandatory reports with the Clearinghouse, as required by the U.S. Coast Guard."
- "For the entire U.S., compliance with reporting improved only slightly over the 12-month period, remaining between 23% and 29% from October 1999 through June 2000."
- "Due to the poor nationwide reporting rate (20.8%), it remains difficult to estimate reliably (a) the patterns of ballast water delivery and (b) the compliance with voluntary guidelines for ballast water management."
- "Of the 12,170 vessels that submitted reports: 70.7% indicated no intention to discharge ballast water within U.S. territory; 14.1% declared non-exchange of ballast water prior to discharge; and 8.9% and 6.3% of the reporting vessels declared partial and complete exchange, respectively, of ballast water prior to discharge."

For complete analysis, please review the full report at the National Ballast Water Clearinghouse on the web at <http://invasions.si.edu/>

THE GLOBAL BALLAST WATER MANAGEMENT PROGRAMME

*By Karen Hart McDowell, West Coast Ballast Outreach Project
and Steven Raaymakers, Marine Environment Division,
International Maritime Organization*

The International Maritime Organization (IMO) recently joined forces with the Global Environment Facility (GEF), the United Nations Development Programme (UNDP), member governments, and the shipping industry to assist less-industrialized countries in tackling the ballast water problem.

The full title of this new project is Removal of Barriers to the Effective Implementation of Ballast Water Control and Management Measures in Developing Countries. It is more simply referred to as the Global Ballast Water Management Programme, or GloBallast. This three-year program runs from May 2000 to May 2003 and is funded by the GEF and the six participating countries. This program will assist developing countries in implementing effective measures to control the introduction of foreign marine species, initially through six demonstration sites. These sites are intended to represent the six main developing regions of the world:

- Dalian/China - East Asia
- Mumbai/India - South Asia
- Kharg Island/Iran - Middle East
- Saldanha/South Africa - Africa
- Odessa/Ukraine - Eastern Europe
- Sepitiba/Brazil - South America

As these sites progress, they will be replicated throughout each region in the future. Lessons learned from the initial demonstration sites will be valuable in improving ballast water management and reducing the translocation of harmful marine species in each region.

GloBallast has a number of immediate objectives linked to specific outputs and activities. These include education and awareness, ballast water risk assessments, port baseline studies, ballast water sampling, training of port and shipping personnel, assistance with laws and regulations, and self-financing mechanisms. The education and awareness portion of GloBallast includes producing a newsletter, Ballast Water News. This newsletter will focus on providing ballast water news from an international perspective. The first issue provides an introductory overview of GloBallast. Future issues will provide updates on the program's progress, as well as articles on the latest developments in science, engineering, shipping, law and other responses to the problem of introduced marine species. For more information about GloBallast, visit the web site (<http://globallast.imo.org>). To receive future issues of Ballast Water News, send an e-mail to mbaker@imo.org.

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WELCOME (CONT)

Pacific Ballast Water Group on coastal traffic along the West Coast of the U.S. and Canada, in which we had over 30 participants. In August, I was invited to give a presentation at the Prevention First 2000 meeting in Long Beach, hosted by the California State Lands Commission. They put together a wonderful two-day conference that was highlighted by a session on ballast water that was well attended by key members from the maritime industry and government agencies.

We continue to enjoy working with our many partners. We look forward to continuing our partnerships and creating new ones. Once again, we would like to encourage your active participation and feedback on the West Coast Ballast Outreach Project. We are just a fax, phone call, or e-mail away and always appreciate any comments or suggestions.

Karen Hart McDowell, Project Coordinator,
West Coast Ballast Outreach Project

Jodi Cassell, Marine Advisor,
California Sea Grant Extension Program



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COMING EVENTS

Second International Conference on Marine Bioinvasions
New Orleans, Louisiana
April 9-11, 2001

The Massachusetts Institute of Technology (MIT) Sea Grant College Program and the Louisiana Sea Grant College Program invite you to participate in this Conference. The focus is on the incidence, effects and management of exotic species in coastal, estuarine, and marine ecosystems. Conference topics will include:

- Research on ecological and genetic consequences of bioinvasions
- Patterns of invasions in time and space
Intentional and unintentional transport vectors (including ballast water)
- Environmental management and assessment possibilities
- Economic impacts

For more information see:
<http://massbay.mit.edu/exoticspecies/conf2/>

The U.S. Army Corps of Engineers is the host sponsor of this Conference. This annual four-day conference is widely considered the most comprehensive forum for:

- The review of accumulated scientific knowledge
- Presentation of the latest field research
- Introduction of new technological developments for prevention, monitoring, control and mitigation
- Discussion of policy, legislation, public education and outreach initiatives related to aquatic invasive species

For more information see
<http://www.aquatic-invasive-species-conference.org>
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