

**STATUS AND TRENDS OF BALLAST WATER MANAGEMENT
IN THE UNITED STATES**

**SECOND BIENNIAL REPORT OF THE NATIONAL BALLAST
INFORMATION CLEARINGHOUSE
(January 2002 to December 2003)**

Submitted to the United States Coast Guard

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A.W. Miller, G.M. Ruiz, and K. Lion

Smithsonian Environmental Research Center
P. O. Box 28
Edgewater, MD 21037 USA

U.S. Coast Guard Technical Advisor: R. A. Everett, United States Coast Guard (G-MSO-4),
2100 2nd Street, S.W., Washington D.C. 20593 USA

LIST OF ABBEVIATIONS

BOB	Ballast On Board
CFR	Code of Federal Regulations
COTPZ	Captain of the Port Zone
EEZ	Exclusive Economic Zone
KB	Kilobyte
MARAD	Maritime Administration
mt	metric ton
NABS	National Ballast Survey
NBIC	National Ballast Information Clearinghouse
NIS	Nonindigenous Species
NISA	National Invasive Species Act of 1996, P.L. 104-332
Nm	nautical mile
NOBOB	No Ballast On Board
OMB	Office of Management and Budget
SERC	Smithsonian Environmental Research Center
USCG	United States Coast Guard

EXECUTIVE SUMMARY

BACKGROUND

1. To simplify reporting and interpretation, the period of analysis has been shifted from a mid-year interval (i.e. July 1 to June 30) to one beginning January 1 and ending December 31. In so doing, data will be reported out on the calendar year for biennial and annual reports from now forward. Reports will focus primarily on data collected during the previous 1 or 2 year period, however, comprehensive time series graphs will always include data from the July 1, 1999 onwards to enable readers to discern longer term trends.

In this report analyses are concentrated on the time interval from January 1, 2002 to December 31, 2003. Data from July-December 2001 are plotted in time-series graphs, but not analyzed comprehensively. Coastal and national monthly reporting rates from July-December 2001 (Figs. 2 and 3) appear to follow the trend defined by results from the first and second biennial reporting periods, suggesting no marked difference in ballast water reporting for this intermediate time period.

2. Biological invasions by non-native, invasive species are having significant ecological and economic impacts on the waters of the United States. The rate of new invasions is increasing.
3. The discharge of ballast water from ships is a leading mechanism for the transfer of non-native species between coastal ecosystems. Organisms are entrained in ballast water taken up in one port and subsequently released in other ports.
4. The National Invasive Species Act of 1996 (NISA) directed the United States Coast Guard, in conjunction with the Smithsonian Environmental Research Center (SERC), to develop a National Ballast Information Clearinghouse (NBIC). The primary purpose of the NBIC is to collect, manage, and analyze nationwide data on ballast water discharge and management and on coastal invasions.
5. Pursuant to 33 CFR §151.2045, ships entering the United States from outside the Exclusive Economic Zone (EEZ) are required to submit a Ballast Water Reporting Form (OMB Control Number 1625-0069) to the NBIC. (This reporting requirement excludes ships arriving to the Great Lakes or those traveling north of the George Washington Bridge on the Hudson River, as these regions are addressed by separate regulations.)
6. NISA requests that the masters of commercial ships follow a set of voluntary ballast water management guidelines to reduce the risk of introducing non-native organisms to the waters of the United States in discharged ballast water. These guidelines include:
 - a. Exchanging ballast water obtained from harbors or other coastal areas outside the U.S. EEZ in the open ocean, at least 200 nautical miles from any coast and in at least 2,000 meter deep water.
 - b. Retention (i.e. no discharge) of unexchanged ballast water that is derived from overseas coastal areas;
 - c. Use of an alternative ballast management practice deemed by the U.S. Coast Guard to be at least as effective as open-ocean ballast water exchange.

7. A key element of NISA involves tracking the effectiveness of voluntary guidelines, as measured by analysis of the ballast water management reports submitted by ships. The Clearinghouse was created to provide these analyses on a national scale.
8. Since July 1999, the NBIC and the U.S. Coast Guard have managed a nationwide program, the National Ballast Survey (NABS), to measure ballast water management and delivery patterns for commercial vessels that arrive to U.S. ports from outside the nation's EEZ. These measurements include: (a) the level of compliance with mandatory ballast water reporting requirements, (b) the level of compliance with voluntary guidelines, (c) changes in the rate and patterns of ballast water delivery, and (d) reduction in the rate of ballast-mediated invasions.
9. To determine the rate of compliance with the mandatory ballast water reporting requirement, the NBIC compares the number of submitted ballast water reporting forms with the overall number of qualifying foreign arrivals, as indicated by the U.S. Foreign Waterborne Transportation Statistics maintained by the Maritime Administration (MARAD).
10. To determine the rate of compliance with voluntary ballast water management guidelines, the NBIC analyzes the submitted data and estimates the following: (a) the number of vessels reporting discharge of ballast water according to ballast management practices (i.e. no discharge, discharge with no exchange, discharge with some exchange, and discharge with unknown exchange) and (b) the volume and proportion of ballast water discharged according to the above management practices.
11. The biennial report is prepared to inform the United States Coast Guard, the Secretary of Homeland Security, and the U.S. Congress of the current status and trends for nationwide ballast water reporting, delivery, and management.

RESULTS

Compliance with Mandatory Reporting Requirement

1. Nationwide, compliance remained low (37.9%) during the 2002-2003 reporting period. This is an increase of 7.5% from the rate measured for the initial two-year period July 1999 to June 2001. At this slow rate of increase, the time required for the country to reach 100% reporting is projected to be over 25 years. Given the newly implemented federal regulations (published August 2004) which include substantial civil and monetary penalties for non-reporting, the NBIC expects compliance to rise more rapidly.
2. Compliance with the reporting requirement varied substantially among the geographic regions that comprise the United States. Compliance increased for all coastal regions during 2002-2003: Alaska (22.8%, +2.1% over 1999-2001), Caribbean (19.5%, +2.9%), East Coast (41.5%, +12.5%), Gulf of Mexico (24.1%, +7.0%), Hawaii (91.5%, +41.2%), West Coast (69.6%, +3.2%). Recently published federal regulations that include civil and monetary penalties for non-reporting and failure to manage ballast water are expected to increase compliance significantly.

3. Among Captain of the Port Zones (COPTZs), the average reporting rate was significantly higher in those that occur in states with legislation that contains monetary penalty provisions for non-reporting (i.e. CA, WA, OR, MD, VA) versus those in states without such laws.

Compliance with Voluntary Ballast Management Guidelines

4. Determining spatial and temporal patterns of voluntary compliance is challenging given the overall low national reporting rate of 37.9%. Despite this limitation, analyses of submitted forms was possible, both in terms of how many ships indicated some degree of compliance and with respect to the volumes and proportions of ballast water that were reported to have undergone management.
5. Of the 37,245 ballast water reports submitted during 2002-2003, 79.6% reported no intention to discharge, 9.5% indicated discharge with no exchange, and the remaining 10.9% indicated some or unknown exchange.
6. Nationwide, approximately 41.7 million metric tons of ballast water was reported discharged in 2002-2003, an increase of 11.8% over that reported in 1999-2001. Of this volume, 9.3 million mt was reported discharged without exchange and 32.0 million mt was reported discharged with some exchange.
7. As with mandatory reporting compliance, compliance with voluntary management guidelines varied considerably geographically.
8. Of the 37,245 ballast water reporting forms received by the NBIC in 2002-2003, 4,978 ships (13.4%) indicated no ballast on board (NOBOB) conditions. The frequency of NOBOB condition arrivals varied substantially over space. The Gulf of Mexico had the highest frequency of NOBOB arrivals (28.8%); nearly three times that of any other coast.
9. Spatial analysis of reported ballast water exchange locations showed that 28.4% (7,855 of 27,651 ballast water tanks) were within 200 nautical miles of a coast or were in water shallower than 2,000 meters depth, and thus not in compliance with the voluntary guidelines.

Data Accuracy and Representativeness

10. When individual ballast water reporting forms were compared for internal consistency (i.e. consistency among related ballast tank and ballast water volume fields), 33.8% of ships (3,821 of 11,412) either mistakenly indicated an intention to discharge or failed to report the volumes of their discharge. Such inconsistency likely results in a substantial underestimate of discharged ballast water.
11. The composition of ships arriving to coastal regions (i.e. proportion of various ship types as estimated with the MARAD database) was compared to the same compositions as estimated from ships that submitted ballast forms to NBIC. The analysis shows a strong deviation in most coastal regions, indicating that the 37.9% of

ship arrivals that do submit ballast water reporting forms is not a representative or reliable sample of the overall population, however, this varies geographically.

CONCLUSIONS

1. Nationwide compliance with mandatory reporting requirements remains low at 37.9%.
2. Rates of mandatory reporting vary geographically as does voluntary compliance with ballast water management guidelines.
3. The majority of BW Reporting forms indicated no discharge (79.6%) or as having undergone some exchange prior to discharge (10.9%). It should be noted that these values rely on vast under-reporting (i.e. 62.1% of ships did not report ballast water forms). Accurate measures of discharge and ballast water management volumes are difficult due continued under-reporting and inexact reporting.

INTRODUCTION

For more than 400 years ships have been bringing nonindigenous species from overseas to the North American continent and vice versa. During the last 120 years the commercial shipping industry has built ships that can carry water instead of solid (e.g. rock, sand, or brick) ballast. Ballast water is pumped or gravitated into specially designed tanks to help control a ship's stability, thrust, and steering. In general, ships undergo the majority of ballasting and deballasting while in coastal waters, in close proximity to where cargo is off and onloaded. Depending on weather conditions and other important safety and navigational concerns, a ship may actively shift, uptake, and discharge ballast water, as needed almost anywhere. Importantly, as ships take on ballast water, large quantities of marine organisms (e.g. zooplankton, phytoplankton, bacteria, and viruses) are entrained and enter ballast tanks. These organisms are then moved from one coastal ecosystem to another, both along coasts and across oceans. Today ballast water from ships is a leading transfer mechanism (i.e. vector) by which marine organisms are moved around the globe.

Nonindigenous species (NIS) can fundamentally change the structure and function of natural ecosystems. For the United States alone, estimated economic costs of biological invasions arguably exceed \$100 billion per year (Pimentel 2001). Moreover, aquatic NIS in coastal marine and freshwater systems have mounting ecological and economic impacts on the country's water bodies. If such invasions continue unabated, there is no reason to believe that ecological, economic, and public health threats will not increase substantively.

As authorized by the National Invasive Species Act of 1996, the U.S. Coast Guard has advanced a national program to minimize the rate of transfers and invasions in coastal ecosystems that result from ships, including especially ballast water. Since 1999, this program has required mandatory reports on ballast water management and discharge by all ships arriving to U.S. ports from outside the Exclusive Economic Zone. It has also promoted voluntary ballast water treatment, as a congressionally-directed initial step to reduce the transfer of species in ballast water. More recently, in August 2004, the U.S. Coast Guard has extended the reporting requirement to include coastwise traffic among U.S. regions (Captain of the Port Zones). In September 2004, the U.S. Coast Guard instituted regulations that require mandatory ballast water management (treatment) prior to discharge for all foreign arrivals.

Tracking and analysis of ballast water management and delivery patterns are critical for (a) understanding the forces that drive invasions and (b) developing effective management strategies to reduce the risk of future invasions. In particular, we need to know how ballast water delivery is changing in space and time, in response to our national policies. It is also critical to understand how changes in ships' behavior (ballast water management) affect the delivery and establishment of new organisms.

The National Ballast Information Clearinghouse (NBIC) was established, as called for by NISA, as a joint program between the U.S. Coast Guard and the Smithsonian Environmental Research Center (SERC) to provide analysis of ballast water management and invasion patterns on a national scale. The mandatory ballast water reports submitted by ships upon arrival (as above) are sent to the NBIC, for such analysis. NBIC provides

regular and ongoing analyses to the U.S. Coast Guard to measure the effects of changes in ships' reporting and ballast management practices across the Nation. As called for by NISA, a biennial report is provided to U.S. Coast Guard by NBIC, as a component of its biennial report to U.S. Congress. This is the second biennial report, and is based on data received from the period of January 2002 to December 2003.

ASSESSING COMPLIANCE

Compliance with the Mandatory Reporting Requirement

As in the First Biennial Report of NBIC (1999-2001) and pursuant to 33 CFR §151.2045, compliance with the mandatory ballast water reporting requirement was assessed by comparing the number of ballast water reporting forms received by NBIC with the number of "qualifying" arrivals as indicated by the U. S. Foreign Waterborne Transportation Statistics maintained by the Department of Transportation's Maritime Administration (MARAD). The MARAD database is composed of foreign and domestic arrivals to U.S. Ports. The NBIC uses the foreign arrivals data from MARAD and applies a series of standardized queries to characterize the population of qualifying foreign arrivals (e.g. arrivals to U.S. ports from Canada are considered by U.S. Coast Guard regulations, for this purpose, as domestic rather than foreign arrivals).

The principle goal of this comparison is to determine the extent to which qualifying arrivals have actually submitted ballast water forms, as required by the U.S. Coast Guard. Secondly, ballast water reporting forms were evaluated for completeness and accuracy of reporting (i.e. did the submitted forms contain the proper information types in all required data fields). At the present time, there is no independent national program in place to assess statistically the veracity of data reported to the NBIC. Thus, the current analyses simply provide summaries of information as provided.

Compliance with Voluntary Ballast Water Management Guidelines

Although qualifying vessels are required to submit reports to NBIC, management of ballast water at a national level has been voluntary, whereby ships are asked to follow particular guidelines. Compliance with these voluntary guidelines was assessed by examining all ballast water reporting forms submitted by commercial vessels during the reporting period. For each report, arrivals were classified into one of four categories, based upon ballast water discharge and management: a) no ballast water discharged, b) ballast water discharged with no exchange, c) ballast water discharged with some exchange or d) ballast water discharged with unknown exchange. We estimated the frequency of arrivals in each category as well as the ballast water discharge volumes reported by category. This assessment was carried out at both the national and coastal scales for the two-year reporting period.

Using only the BW Reporting form-based information, we also surveyed the quality of data reported by ships. We queried the data set (the National Ballast Survey) to look for internal consistency among tank and volume data fields within individual BW reporting forms. Internal inconsistencies suggest inaccurate reporting. For example, the number of tanks that a ship reports it intends to discharge should correspond closely with specific

tank and volume information reported elsewhere in the BW reporting form. Such internal inconsistency indicates diminished data quality.

To determine whether ships were following voluntary guidelines with regard to open ocean ballast water exchange, ballast water exchange locations were mapped in relation to 200 nautical mile zones surrounding all coasts and with respect to ocean depth.

Finally, we examined the proportion of ships reporting by vessel type. In the absence of full reporting compliance, or even reporting by the majority of qualifying vessel arrivals, it is difficult to know how representative the reported data are of the larger population. In the case of the National Ballast Survey, ships that report to the NBIC are also self-selecting, providing a situation whereby certain operators, or even sectors of the industry, may choose not to participate, a condition, which may result in strongly biased data. To begin to address this issue, the NBIC ballast water reporting records were compared with the MARAD records to determine whether the composition of reporting and arriving ships was similar (i.e. was the proportion of ship types reporting and arriving to coastal regions of the U.S. similar or different). Strong deviations from the MARAD arrival patterns would suggest that NBIC records are not representative and therefore should not be extrapolated to the larger population.

RESULTS

Under 33 CFR §151.2045, vessel masters are required to report specific information for discharged ballast water originating outside the United States' EEZ, including (a) whether or not ballast water was exchanged or otherwise treated, and (b) specific details of ballast water management on a per-tank basis, providing volume, management method, and calculated percent exchange if ballast water underwent mid-ocean exchange. In addition, ships are requested, per the direction of the Congress; to (c) voluntarily conduct ballast water exchange in the open ocean in at least 2,000 m depth and at least 200 nm from any coast.

Below, we evaluate compliance with mandatory reporting and voluntary ballast water management.

Compliance with Mandatory Ballast Water Reporting Requirement

1. Nationwide Vessel Traffic

The total number of qualifying foreign arrivals registered by MARAD for the period from January 1, 2002 to December 31, 2003 was 98,357 (45,994 in 2002 and 52,363 in 2003, see Table 1). Foreign arrivals were distributed across U.S. coastal regions in fairly similar proportions to the 1999-2001 reporting period (Fig. 1). The East Coast received the greatest number of foreign arrivals (35,881), followed by the Gulf of Mexico (33,982), the West Coast (14,808), the Caribbean (11,636), Alaska (845), and Hawaii (1,205).

2. *Nationwide Reporting Compliance*

The number of ballast water reporting forms submitted by foreign arrivals has steadily increased nationwide, but the resultant increase in overall reporting compliance has been marginal (Fig. 2). Ballast water reporting forms were submitted by 17,420 arrivals in 2002, followed by 19,824 in 2003. Nationwide compliance with the mandatory reporting requirement has remained low, 37.9% for the entire 2-year period, an increase of just 7.5% over the 1999-2001 reporting period (Table 1).

3. *Regional Reporting Compliance*

Changes in reporting compliance were shown to be quite variable among coastal regions, yet all showed increases (Figs. 3a and 3b, Table 1). The East Coast has shown a steady increase in compliance, rising from 29.0% in 1999-2001 to 41.5% during the 2002-2003 reporting period. The Gulf of Mexico showed a more modest change, increasing from 17.1% to 24.1%. The West Coast reached higher overall reporting rates than other coasts during 1999-2001 (66.5%) and remained high during the second reporting period (69.6%). Alaska's average reporting compliance increased from 20.5% to 22.8% between the two reporting periods, however monthly reporting rates in Alaska appear to vary more than in other coastal regions (Fig. 3b). The Caribbean showed a small increase in reporting compliance (16.6% to 19.5%). Hawaii posted the greatest increase in reporting compliance of any coastal zone in the United States (a rise from 50.3% to 91.5 %).

4. *COTPZ Reporting Compliance*

At the Captain of the Port Zone level, reporting compliance was again highly variable, ranging from 13.8% in Long Island Sound to 98.2% in San Francisco (Table 2). Valdez, AK was scored as 142% compliance (10 ballast water reporting forms compared with 7 MARAD arrivals), but this anomaly is thought due to under-reporting by MARAD in Alaska. The number of foreign arrivals reported by MARAD in the Alaskan coastal region displayed a high degree of variability, and is likely incomplete for some months during 2002-2003. The average change in reporting rate across all COTPZs was +7.5%. Of the 29 COTPZs for which MARAD data were available (MARAD does not collect data for vessel arrivals to Guam), ten had reporting compliances of greater than 50%, up from six in the 1999-2001 reporting period. Twenty-six COTPZs increased reporting compliance while three decreased (Table 1). When mean reporting compliance levels were compared among COTPZs from states that possess state legislation that impose monetary penalties for failure to report (CA, WA, OR, MD, mean \pm Variance = 64.9 \pm 4.4%) and non state legislated COTPZs (mean \pm S.E. = 42.0 \pm 8.4%), those with state legislation had significantly higher compliance rates ($t = 2.34$, $p = 0.015$, $df = 18$, $n = 29$, one-tailed t-test).

Compliance with the Voluntary Ballast Water Management Guidelines

A. Compliance with Voluntary Guidelines by Number of Ships Reporting

1. National Compliance

The majority of ships that submitted BW reporting forms to the NBIC reported no intention to discharge ballast water (79.6% of 37,245 BW reports). Among the 7,591 arrivals that indicated ballast water discharge, just over half reported exchange (3,969 specified some exchange, 70 specified an undetermined degree of exchange, see Table 2b and 3,552 discharged without exchange (9.5%, Tables 2a,b). On a percentage basis, non-discharging arrivals increased by 6% over the 1999-2001 reporting period, zero-exchange dischargers decreased by 3.4%, and dischargers with some or undetermined exchange decreased by 2.7%. During the 2002-2003 reporting period there were 8,257 more ballast water reports submitted than in 1999-2001. The overall number of ships reporting discharge, regardless of management, decreased slightly from 7,652 in 1999-2001 to 7,591 in 2002-2003, signifying that all new reports (or an equivalent number) could be accounted for as non-discharge arrivals.

It is important to note that given just 37.9% compliance with the mandatory reporting requirements, little can be said definitively about changes in compliance with voluntary guidelines across the two reporting periods.

2. Regional Compliance

Among U.S. coastal regions, the degree to which ships reported no discharge varied widely, ranging from 22.4% of BW reports in Alaska to 93.6% in Hawaii. Of ship arrivals that reported some kind of discharge, there was high variability among coasts with respect to the number and percent of zero-exchange discharges. The East coast had 2,192 zero-exchange discharge reports (73.4% of discharging vessels), followed by the Gulf of Mexico with 816 (41.6%), the West coast with 218 (10.3%), the Caribbean with 163 (64.2%), Alaska with 70 (49.0%), and Hawaii with 67 (63.8%) (Fig. 4). Conversely, the West coast, Gulf coast, and Alaska each reported some kind of exchange prior to discharge in more than 50% of cases.

3. COTPZ Compliance

Between January 2002 and December 2003 more than 50% of all ballast water reporting forms were received from ships arriving to just five Captain of the Port Zones (Tables 2a,b). The Miami COTPZ received the greatest percentage of ballast water reporting forms in the United State (5,656 forms, 15.2% of total). Los Angeles received 5,572 BW forms (15.0%), followed by New Orleans with 2,901 forms (7.8%), Houston (2,750, 7.4%), and New York (2,373, 6.4%). Among these COTPZs, the percentage of zero-exchange dischargers have decreased, however in the Miami and New Orleans COTPZs 26.6% and 10.0% of arrivals, respectively, did not undergo mid-ocean exchange.

B. Compliance with Voluntary Guidelines Based on Percent Exchange by Volume

Because ships are composed of multiple ballast water tanks and holds, the degree of ballast water management can be variable across tanks/holds for a single arrival. Therefore, volumetric analyses are performed at the tank level and scaled up to coastal region and national scales. As noted in the Biennial Report for 1999-2001, there still

appears to be widespread confusion as to how percent ballast water exchange is calculated. Since tank/hold volume capacity is necessary in the calculation of percent ballast water exchange, at least for flow-through method, but is not a required field on the current Ballast Water Reporting Form (OMB control number 1625-0069), there is no method for crosschecking reported values. For this reason, ballast water management was categorized as “Discharge with No Exchange”, “Discharge with Some Exchange”, and “Discharge with Unknown Exchange”. Additionally a “No Discharge” category is included which captures ships that hold their ballast.

1. *National Compliance*

During 2002-2003, approximately 41.7 million metric tons (mt) of ballast water were reported through the National Ballast Survey as discharged into waters of the United States (Fig. 5). Nationally, this is an increase of 4.4 million metric tons or 11.8% volumetrically from the 1999-2001 reporting period. Of this discharge, approximately 9.3 million mt (22.2% of all reported discharge) was reported as “Discharge with No Exchange”. This represents a decrease of approximately 1.8 million mt (-7.5% volumetrically) from 1999-2001. The volume of ballast water reported as “Discharge with Some Exchange” equaled 32.0 million mt (76.8% of all reported discharge). This was a 6.4 million mt increase (+8.1%) in exchanged discharge over 1999-2001. Finally, approximately 416,500 mt (1% of all reported discharge) was categorized as “Discharge with Unknown Exchange”, a decrease from 594,500 mt (-0.6%) during the first reporting period.

When national monthly discharge volumes are considered, there was a cyclical increase in average discharge volume during the periods from September through March of each year (approximately 450,000 mt more per month) compared with April through August time periods (see Fig. 5). This apparent seasonality may coincide with changing weather conditions whereby ships carry more ballast water during fall, winter, and early spring to ensure greater stability when weather is more extreme or variable. Cyclical ballast water discharge through time was not obvious during 1999-2001.

To determine the relative amounts of variation in monthly reporting across the discharge categories, the coefficient of variation was calculated for the two-year reporting period. The coefficient of variation is reported as a percentage, where $CV = (\text{standard deviation}/\text{mean}) \times 100$. When all discharge categories were combined, $CV = 16.6\%$ for 2002-2003. Coefficients of variation equaled 14.1% for “Discharge with No Exchange”, 18.6% for “Discharge with Some Exchange”, and 73.1% for “Discharge with Unknown Exchange” categories. These results indicate that relative variation in monthly discharge is fairly similar among non-exchanging vessels versus exchanging vessels, even when Some Exchange and Unknown Exchange dischargers are combined ($CV = 18.5\%$). Comparing monthly discharge volumes for these categories across months suggests that these categories also track one another (i.e. volumes vary in same direction) through time (Fig. 5). High CV value for “Discharge with Unknown” is thought idiosyncratic, attributable to random variation in the degree to which ships supplied this information, and not associated with any seasonal cycle.

Of the 37,245 overseas arrivals that reported to NBIC in 2002-2003, the total ballast on board indicated was 152.3 million metric tons. Of this water, only 41.7 million mt (27.4% of total) was discharged, with or without any exchange across the nation.

2. *Regional Compliance*

Among coastal regions, the voluntary compliance with ballast water exchange and discharge guidelines varied substantially. The reported discharge volumes among these coastal regions are vastly different. For example, the reported discharge volumes to the West Coast were anywhere from 1.6 to 41 times greater than other coasts (Fig. 6). Additionally, the volume of water that underwent exchange prior to discharge along the West Coast outstripped all other coasts by a large margin (17.9 million mt, 94.1% of discharge). The Gulf of Mexico and East Coast reported 9.1 million mt of exchanged discharge (76.6% of discharge) and 3.0 million mt of exchanged discharge (59.7% of discharge) respectively. The other coastal regions reported lower volumes as well as lower percentages of exchanged discharge by volume.

The differences between the West Coast and other coasts may be due to the significantly higher rate of compliance associated with state legislated mandatory reporting requirements there. West Coast = 69.4% versus 24.1% for the Gulf Coast and 41.5% East Coast) (Table 1). As stated above, the greater West Coast rates of reporting likely stem from state legislation in CA, OR, WA that include monetary penalties. The completeness of reporting reduces the uncertainty surrounding estimates of discharge magnitude and is thus integral to a fuller understanding of the patterns of discharge at the regional level. Despite these shortfalls in mandatory compliance with federal regulation, the Gulf of Mexico, Alaska, and the East Coast reported 2.5, 2.0, and 1.9 times more volume of unexchanged discharge than was reported on the West Coast (Fig. 6). It is interesting to note that in Hawaii, which registered the highest compliance with the mandatory reporting requirement (91.5% compliance, Table 1), nearly half (49.8%, 228,584 mt) of discharged ballast water was reported as “Discharge with No Exchange”. Given Hawaii’s distance from all other landmasses, time is not likely the limiting factor.

Compliance with Voluntary Ballast Water Exchange Location Guidelines

Vessel masters are required to report the latitude and longitude of the end points of ballast water exchange operations. When location data were plotted on a global map containing bathymetric data describing locations less than 2,000 m depth and coastal boundary data (≤ 200 nm from any coast), a substantial number of exchange activities are shown not to meet the requested voluntary guidelines set out in the federal regulations (Fig. 7). Ships reported some kind of information on 45,441 ballast water tanks in 2002-2003. Of these, there was exchange location information for 27,651 tanks of which 7,855 (28.4%) provided latitude/longitude coordinates that fell either inside 200 nautical miles of a coast or in waters shallower than 2,000 m. As in the 1999-2001 reporting period, numerous vessels exchanged their ballast water within 200 nm of the North American coasts as well as other continental and island coasts. In particular, the Gulf of Mexico and the Pacific Coasts of the United States, Mexico, and Central America showed high densities of ballast water exchange activities within 200 nm of shore.

Accuracy and Representativeness of BW Form Data

1. Internal Consistency of Reporting Ballast Water Forms

In the absence of independent measures to gauge reporting accuracy (i.e. a ship boarding verification survey), the NBIC database was analyzed to look for internal consistency among data fields within ballast water reporting forms. For example, in the Ballast Water Reporting Form (see Table 3), results from the "Total Number of Ballast Water Tanks to be Discharged" field in Section 4 (Ballast Water Management), were compared with the information about discharged ballast water in Section 5 (Ballast Water History). The number of arrivals that reported volumes greater than zero in Section 5 was 7,591 or 20.4% of all arrivals. An additional 3,821 ships reported their intention to discharge ballast in Section 4 but did not include any volumetric information in the Ballast Water Discharge column of Section 5. Therefore, at least 33.8% of ships (3,821 of 11,412) either mistakenly indicated an intention to discharge or failed to report the volumes of their discharge. Either way, a large percentage of ships submitted forms in 2002-2003 that contained internal inconsistencies, which could result in significant underestimates of ballast water discharge volume.

A second internal data field consistency check compared the "Total Ballast Water On Board" and "Total Ballast Water Capacity" fields in Section 3 (Ballast Water Usage and Capacity). This comparison showed that only 294 of the total number of forms submitted (0.8%) reported ballast water onboard volumes that exceeded the reported capacity of the ship, suggesting greater reporting consistency of this information.

2. Composition of Arrivals by Ship Type and Region

As discussed above, with low national rates of reporting compliance (37.9%), it is difficult to know how representative the sample (i.e. the ships that report) is of the entire shipping population. To address this issue, results from the MARAD and NBIC databases were compared by coastal region. The proportion of each of six ship types (bulker, container, tanker, passenger, general cargo, and other) was calculated independently for each coastal region using both the MARAD and NBIC data sets. The MARAD proportions (i.e. proportion of actual arrivals) were then subtracted from the NBIC proportions (i.e. proportion of reporting vessels) and plotted (Fig. 8). This analysis indicates 1) the proportional magnitude of difference by ship type and coast and 2) whether there were reporting biases associated with ship types across these regions.

The West Coast showed the least proportional deviation between the two data sets, suggesting that ships reporting with NBIC were likely a representative sample of the whole population as estimated by the MARAD data. Conversely, Alaska showed the strongest deviations between the two data sets, indicating that ships reporting from Alaska were not very representative of the ships that actually arrived. When individual ship types were compared across coasts, in five of six locations passenger vessels were proportionally over-represented in NBIC data, general cargo vessels were under-represented on five of six coasts, and ships in the "other" category were shown to be under-represented on all coasts. These results suggest that there are strong differences in reporting patterns among coasts and that in most locations, the ships that report to NBIC are not truly representative of the ships that arrive.

Given the strong degree of reporting inaccuracy as measured by internal reporting inconsistencies coupled with a non-representative sample of reporting ships, statistical inference from the NBIC data to the entire population of arrivals is not yet justifiable.

No Ballast On Board (NOBOB)

As discussed above, of 37,245 foreign arrivals 29,654 (79.6%) indicated no discharge (Table 2b). Of the non-discharging vessels, 4,978 (13.4% total reports) indicated no ballast on board (NOBOB) conditions, as designated by a “0” or blank in the “Total Ballast Water On Board” data field in Section 3 (Ballast Water Usage and Capacity) of the BW Reporting Form. The percentage of NOBOBs reported in 2002-2003 was similar to that reported in 1999-2001 (12.8% of total reports). Because ships that report as NOBOB still maintain biota in sediments and residual ballast water, especially if tanks have not undergone any sort of ballast water management, the arrival and subsequent ballasting practices of such ship are of interest. The arrival frequency of NOBOBs was greatest on the Gulf of Mexico coast (28.8%) but varied considerably across coast and COTPZs (Table 4). Other coasts reported from 5.2% (AK) to 10.4% (East Coast) NOBOB conditions. Given the continued overall low rate of mandatory reporting compliance, it difficult to fully assess the implications of this pattern, however, differences in shipping and trade patterns among coasts likely contribute to NOBOB frequency patterns.

Next Port of Call (Domestic versus Foreign)

A large number of ships that arrive to the United States visit multiple ports. When next ports of call were examined, 18,001 reports (48.4% of total) listed domestic ports that would not require the ship to pass outside the U.S. EEZ prior to arrival. Again, as during 1999-2001 reporting period, the vast majority of these ships did not report any sort of ballast water activity beyond their first port of call (even though such “follow-on” reports are included under the mandatory ballast water reporting requirement). This result further suggests that incomplete/inaccurate reporting was widespread.

CONCLUSIONS

Ballast Water Reporting

The compliance with the federal mandatory ballast water reporting requirements remained very low for the nation during 2002-2003 (37.9%), an overall increase of only 7.5% from the 1999-2001 reporting period. All coastal regions experienced increased reporting rates, however three of 29 COTPZs showed decreased reporting rates. Reporting rates by individual COTPZs increased by an average of $7.5 \pm 3.4\%$ (mean \pm standard error) from 1999-2001.

Ships reported greater overall discharge to the nation in 2002-2003 than in 1999-2001 (41.7 million mt versus 37.3 million mt). Of this, the volumes and percentages of unexchanged ballast water decreased (9.3 million mt/ 22.2% of discharge versus 11.1 million mt /29.7% of discharge in 1999-2001) while volumes and percentages of exchanged ballast water increased (32.4 million mt/ 77.8% versus 25.6 million mt/ 68.7% in 1999-2001).

Given the continued low rate of ballast water reporting (63.9% of qualified arrivals did not report), inadequate reporting accuracy, low representativeness of ballast water reporters, it is still not possible to fully characterize the true magnitude and spatial distribution of ballast water discharges, or the extent to which these ships have undergone treatment (ballast water exchange), in the United States. This is likely to undergo rapid change, due to a series of new regulations issued by U.S. Coast Guard in response to the compliance results documented in the First NBIC Biennial Report. The Secretary of Transportation indicated the United States Coast Guard's intention for proposed rule making to: 1) expand ballast water reporting requirements 2) establish penalties for non-reporting, and 3) make the voluntary ballast water management guidelines mandatory (see Report to Congress which can be found in the USGC 2002-13147 at <http://dms.dot.gov>). Final rules were published in the Federal Register on June 14, 2004 (Volume 69, Number 113, pages 32864-32871) and July 28, 2004 (Volume 69, Number 144, pages 44952-44961) and are expected to increase the extent with which ships report and undertake ballast management.

The National Ballast Information Clearinghouse anticipates a significant increase in reporting rate by foreign arrivals due to these new regulations. Additionally, by expanding reporting requirements to include foreign arrivals as well as most domestic arrivals, NBIC anticipates less confusion on the part of the shipping industry with respect to where and when ballast reporting is required. Although outside the time period covered by this Second Biennial Report, NBIC has experienced a substantial increase in reporting during the latter half 2004. We anticipate dramatic changes in both the extent of reporting and the quality of ballast water information in the next biennial report, thus permitting a more comprehensive treatment of shipping and ballast water patterns in the nation.

Electronic Reporting

As ballast water reporting rates rise significantly, the NBIC foresees the increased need for ships to submit their ballast water reporting forms electronically (i.e. as an e-mail attachment or direct online submission using an approved ballast water reporting form). During the past 12 months, the NBIC has extended and refined the available electronic reporting forms. These now include a .pdf form with embedded submission buttons that allows the user to work offline and submit either as an e-mail attachment or directly over the Internet. Online submission results in an instantaneous, automated response to the ship, which indicates when and what was reported by a ship. E-mailed .pdf submissions receive similar receipts from the NBIC, generally within two business days. Transmission time (i.e. satellite uplink time) is short. On average, ships that submit information in these ways will transmit between 10 and 20 kilobytes of data, thus requiring only a few seconds of transmission time. The NBIC also offers a Microsoft Word™ form that may be filled out offline and submitted via e-mail. This method also triggers a receipt within two business days and generally requires the transmission of 250 KB (uncompressed file) or 25KB (compressed file). Finally, there is also a web-based ballast water reporting form that allows users to fill out their forms online and receive instantaneous reporting receipts.

The National Ballast Information Clearinghouse sees advantages of electronic reporting for both itself and for ships. The NBIC benefits from increased data fidelity, decreased

data entry time/effort, as well as faster processing, analysis, and posting of data. Ships benefit from fast transmission times, proof of receipt of ballast water reporting forms, and embedded data validation rules that prevent the entry of the wrong data type in a data field (e.g. text entered into a numerical field), and the ability to use forms as templates whereby only dynamic information must be updated with subsequent arrivals.

Ballast Water Management

The degree of compliance with the voluntary ballast water management guidelines was mixed. Among ships that reported to the NBIC, 79.5% reported no intention to discharge ballast water. Among the discharging vessels, approximately one-half indicated discharge with no exchange (9.5% of overall arrivals). In total, of the 152 million metric tons of ballast water that was reported carried to the United States on ships, 41.7 million mt were actually released following some or no open ocean ballast water exchange. When reported ballast water exchange locations were mapped, 28.4% of exchange events occurred within 200 nautical miles of a coast or in less than 2,000 m of water.

Improved Data Quality of Ballast Water Reporting Forms

If increased mandatory reporting by foreign and domestic arrivals is in fact realized with the imposition of monetary and civil penalties, the expectation is that the NBIC will receive in excess of 100,000 ballast water reporting forms per year, an increase of approximately 4 to 5-fold above 2002-2003 reporting rates. In order to reap full benefit from increased participation by ships in the National Ballast Survey, education, outreach and other approaches should be advanced to improve the overall quality (both completeness and veracity) of reports. It is clear that a significant number of forms are currently submitted with internal inconsistencies and key information omitted. Moreover, no program now exists to ground-truth the data accuracy. These issues become increasingly important as reporting compliance increases across the country.

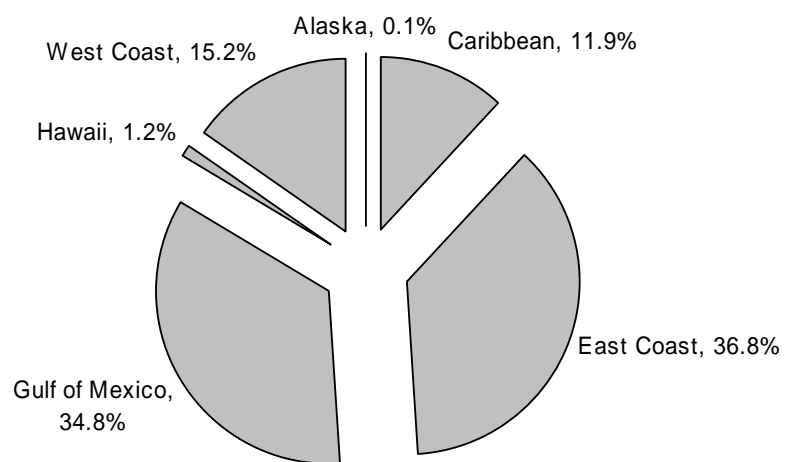


Figure 1. Percent foreign arrivals traffic by coast over two-year reporting period from January 2002 to December 2003 (n = 97,578 arrivals). Data are from MARAD arrival database.

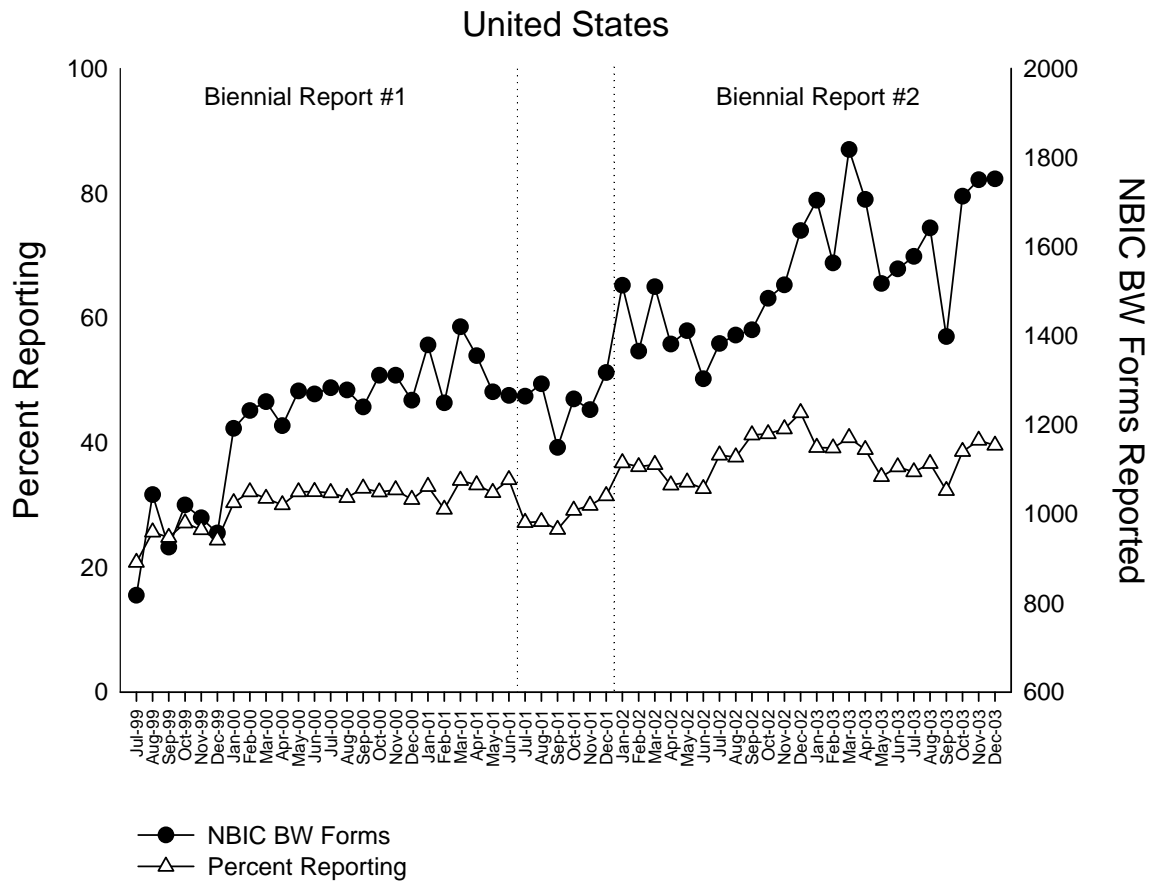


Figure 2. Monthly BW reporting rates (rate = #NBIC BW Forms/#MARAD Arrivals) for the nation by foreign arrivals (July 1999 to December 2003). Data are from National Ballast Survey and MARAD databases. Vertical lines indicate the six-month period between biennial reports for which data were collected but not comprehensively analyzed (see text for further details).

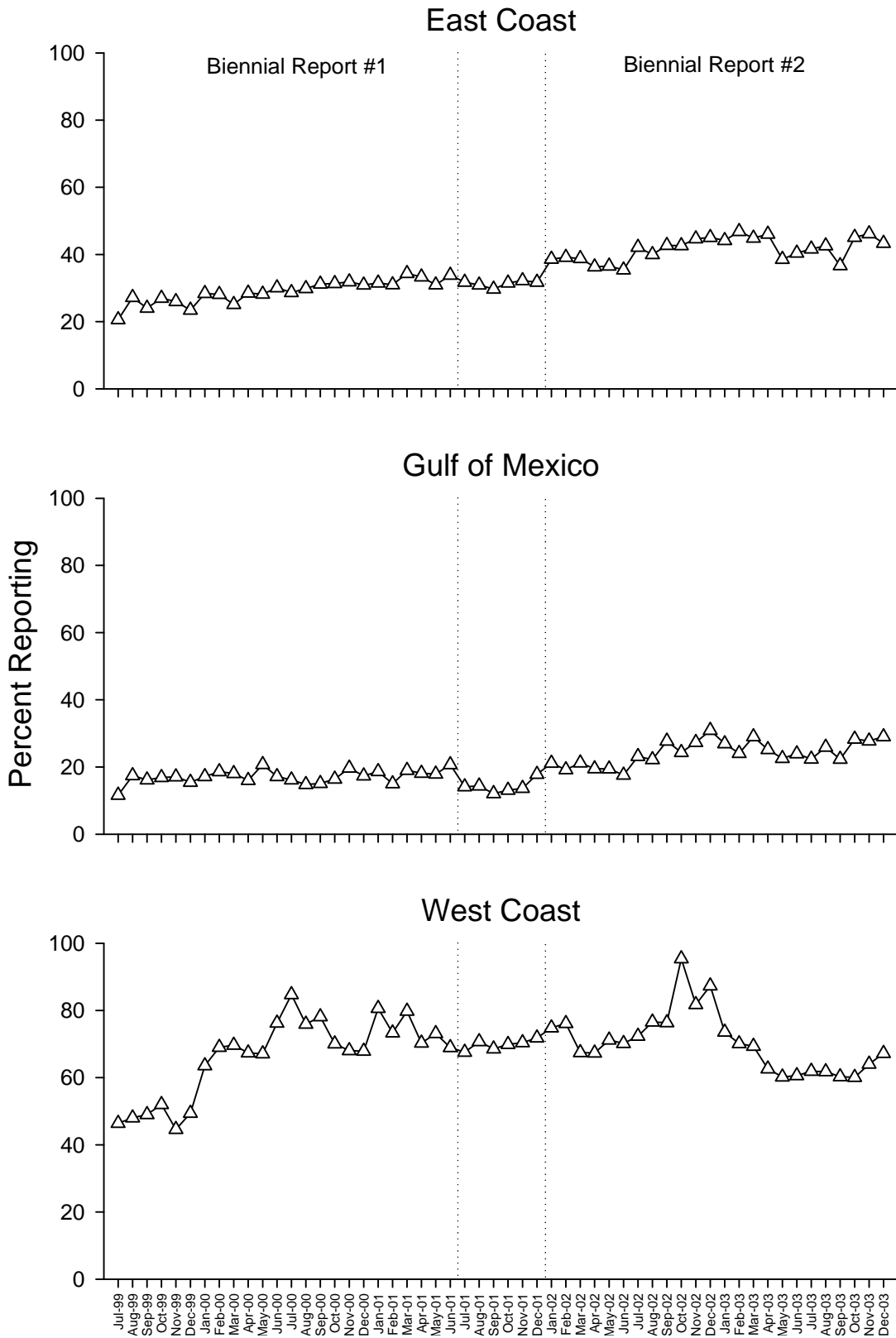


Figure 3a. Monthly BW reporting rates (rate = #NBIC BW Forms/#MARAD Arrivals) for East, Gulf of Mexico, and West coasts by foreign arrivals from July 1999 to December 2003. Data are from National Ballast Survey and MARAD databases.

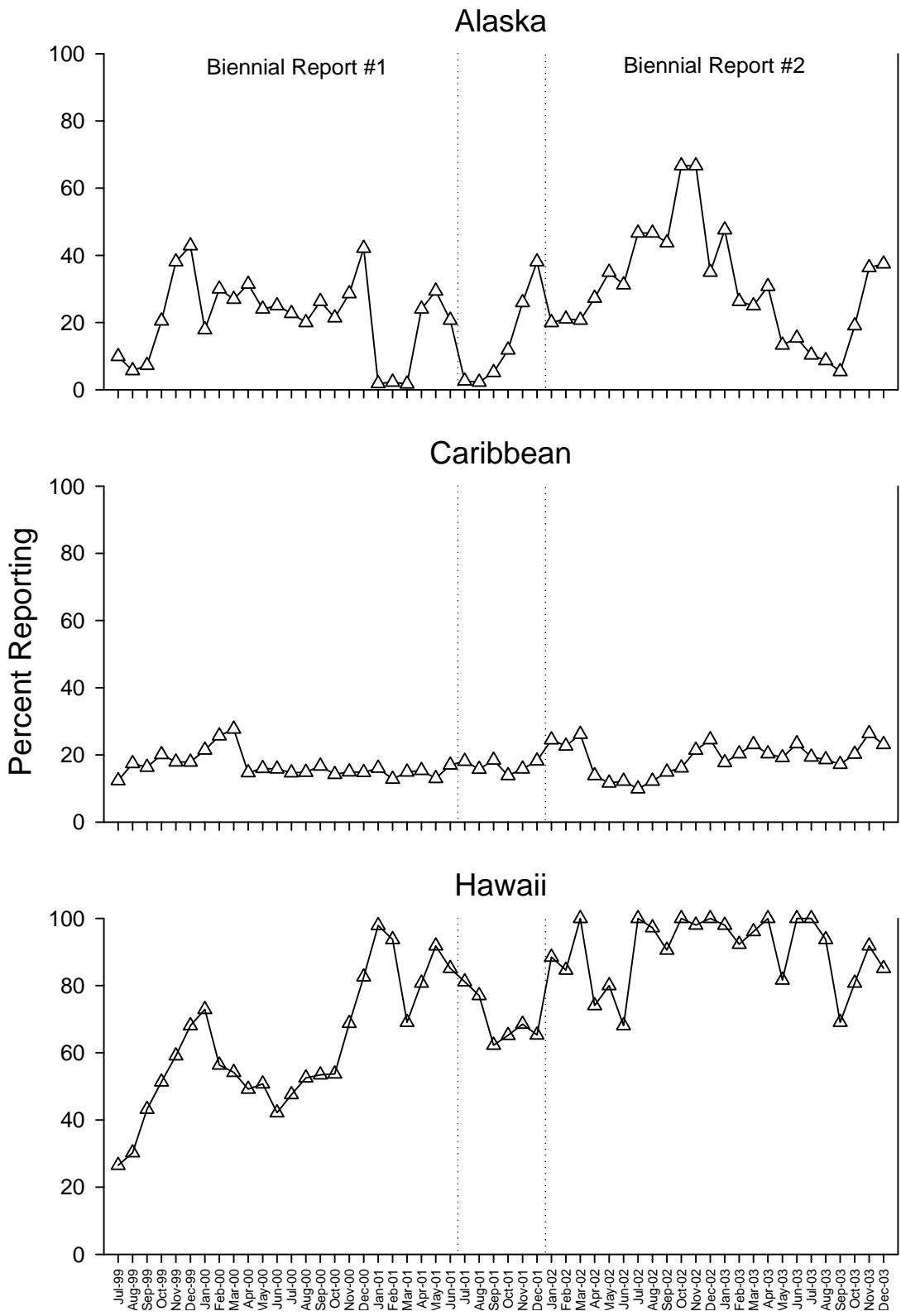


Figure 3b. Monthly BW reporting rates (rate = #NBIC BW Forms/#MARAD Arrivals) for Alaskan, Caribbean, and Hawaiian coasts by foreign arrivals from July 1999 to December 2003. Data are from National Ballast Survey and MARAD databases.

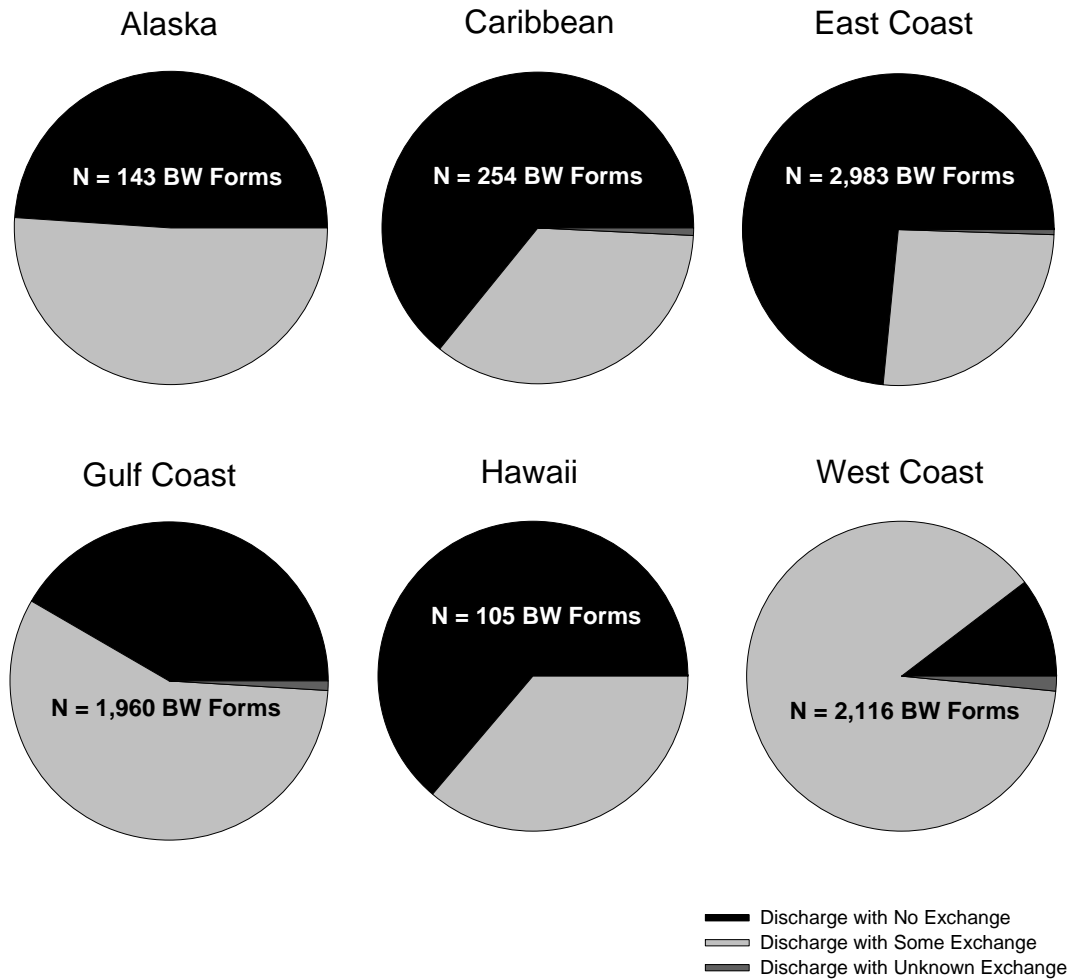


Figure 4. Proportion of foreign arrivals that reported ballast water discharge by coastal regions and management strategy. Data are from the National Ballast Survey database (January 2002 to December 2003).

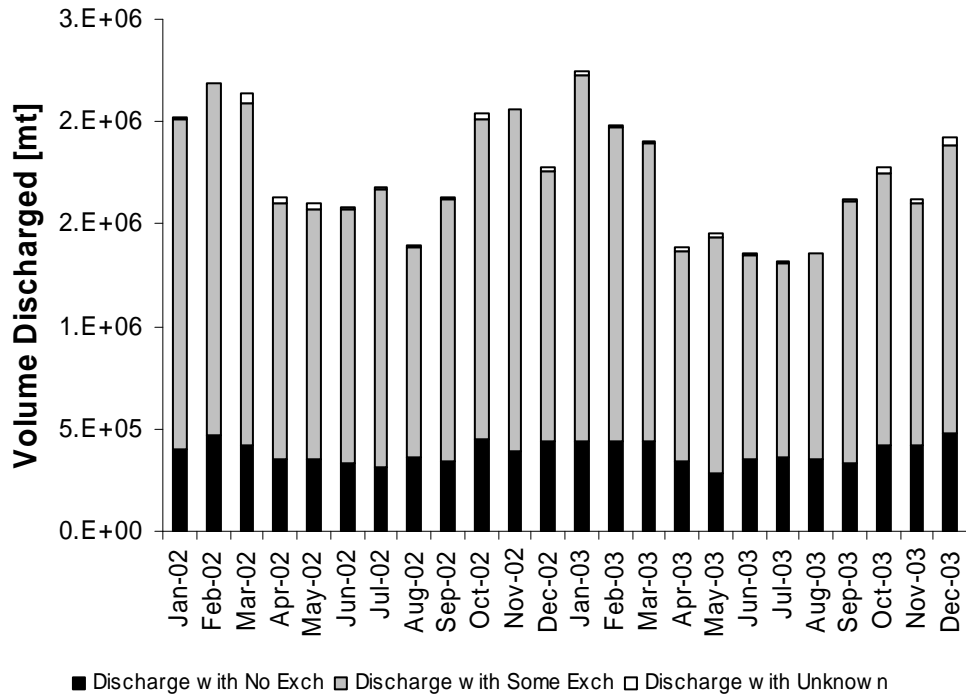


Figure 5. National monthly reporting rates by foreign arrivals from January 2002 to December 2003. Mean monthly discharge = $1,737,497 \pm 12,009$ mt (± 1 S.E.). Total reported discharge over two-year period = 41,699,917 mt. Data are from the National Ballast Survey and MARAD databases.

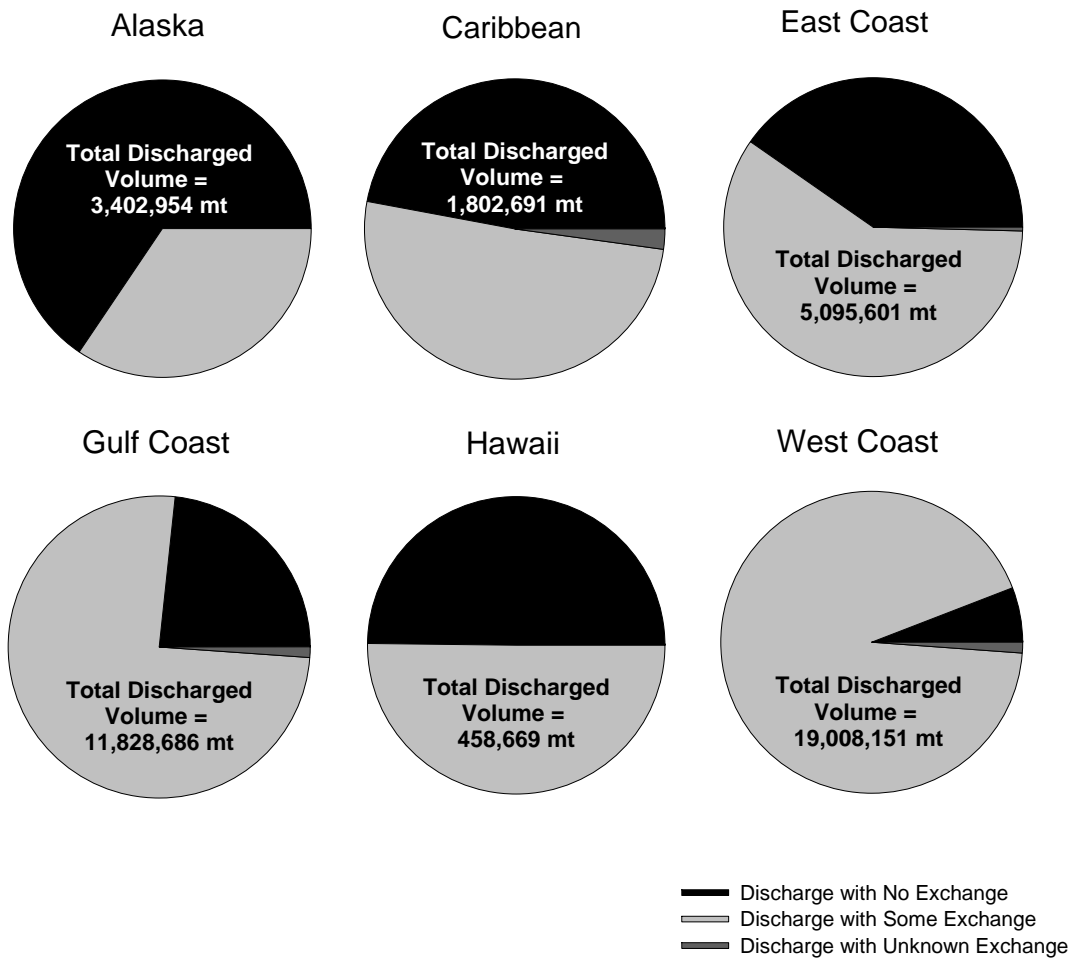


Figure 6. Proportion of ballast water discharged by coastal region and management strategy. Data are from the National Ballast Survey database (January 2002 to December 2003).

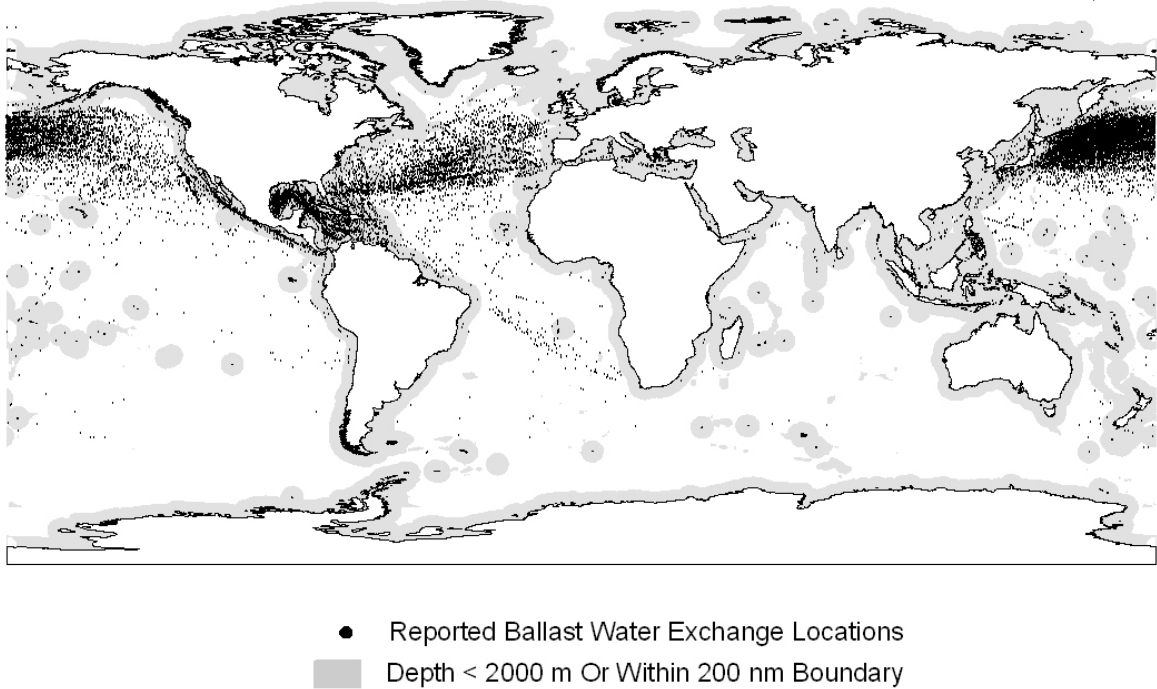


Figure 7. Reported ballast water exchange locations (i.e. end-points of exchange) for individual ballast water tanks on vessels that reported their exchange activities to the NBIC between January 2002 and December 2003. Gray shading indicates zones within 200 nautical miles of coastlines and depths of less than 2,000 meters.

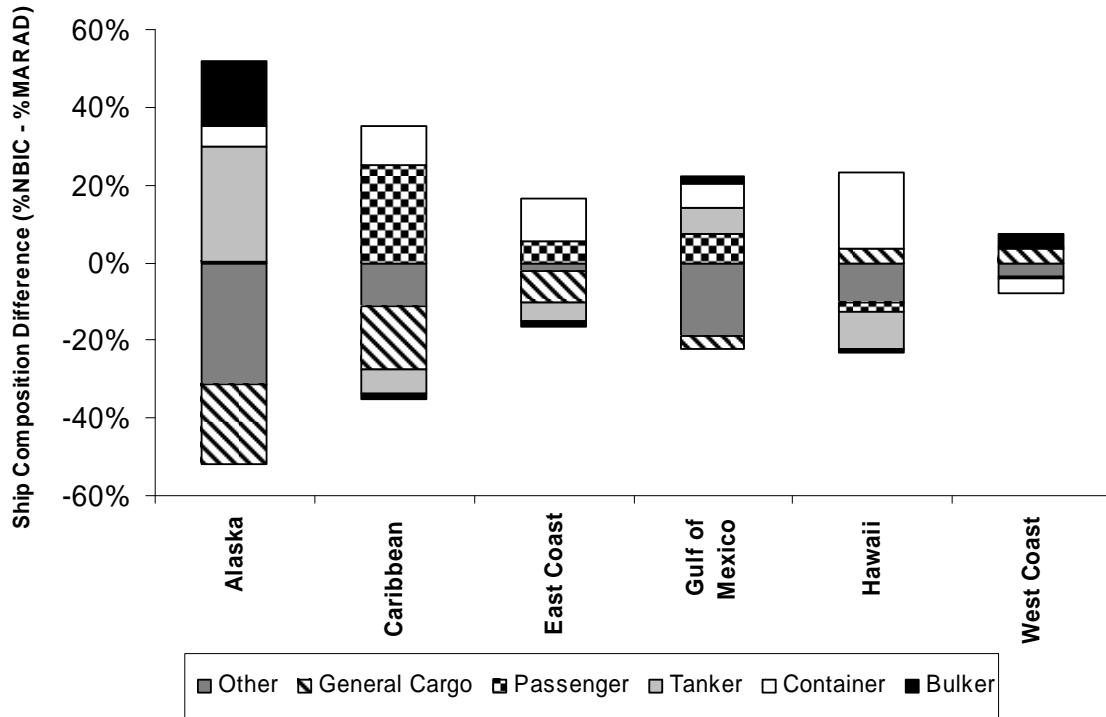


Figure 8. Differences in ship type composition by coastal region (% NBIC - % MARAD). Stacked bars indicate the magnitude of difference for each ship type (i.e. width of bar) and whether NBIC proportions were greater than (+ values) or less than (-values) expected arrival proportions based on MARAD data.

Table 1. Compliance with mandatory ballast reporting requirements by coast and COTPZ. Data are from National Ballast Survey and MARAD databases (January 2002 to December 2003).

U. S. Coast	COTPZ	BWR Forms [#] 2002	MARAD Arrivals 2002	2002-Percent Reporting Rate	BWR Forms [#] 2003	MARAD Arrivals 2003	2003-Percent Reporting Rate	Total BWR Forms	Total MARAD Arrivals	Total (2002-2003) Percent Reporting Rate	Reporting Rate Change (2002-03)-(1999-2001)
Alaska	ANCMS	91	265	34.3%	68	514	13.2%	159	779	20.4%	+1.5%
Alaska	JUNMS	11	23	47.8%	13	36	36.1%	24	59	40.7%	+14.3%
Alaska	VALMS	6	4	150.0%	4	3	133.3%	10	7	142.9%	+92.9%
Alaska	Subtotal	108	292	37.0%	85	553	15.4%	193	845	22.8%	+2.1%
Carib	SJPMS	876	4,942	17.7%	1,393	6,694	20.8%	2,269	11,636	19.5%	+2.9%
East	BALMS	416	625	66.6%	432	635	68.0%	848	1,260	67.3%	+36.9%
East	BOSMS	141	311	45.3%	174	384	45.3%	315	695	45.3%	+22.8%
East	CHAMS	393	739	53.2%	374	740	50.5%	767	1,479	51.9%	+16.7%
East	HMRMS	147	396	37.1%	142	465	30.5%	289	861	33.6%	+10.9%
East	JACMS	936	1,738	53.9%	1,015	1,958	51.8%	1,951	3,696	52.8%	+23.5%
East	LISCP	19	181	10.5%	38	233	16.3%	57	414	13.8%	-7.8%
East	MIAMS	2,593	7,690	33.7%	3,063	8,059	38.0%	5,656	15,749	35.9%	+10.4%
East	NYCCP	1,044	2,429	43.0%	1,329	2,761	48.1%	2,373	5,190	45.7%	+13.3%
East	PHIMS	683	1,802	37.9%	707	1,675	42.2%	1,390	3,477	40.0%	+3.4%
East	POMMS	150	318	47.2%	180	330	54.5%	330	648	50.9%	+8.9%
East	PROMS	55	130	42.3%	87	239	36.4%	142	369	38.5%	+28.3%
East	SAVMS	313	744	42.1%	395	872	45.3%	708	1,616	43.8%	+12.6%
East	WNCMS	32	202	15.8%	42	225	18.7%	74	427	17.3%	-1.2%
East	Subtotal	6,922	17,305	40.0%	7,978	18,576	42.9%	14,900	35,881	41.5%	+12.5%
G of M	CORMS	258	1,042	24.8%	318	1,135	28.0%	576	2,177	26.5%	+7.9%
G of M	HOUCP	1,217	5,251	23.2%	1,533	5,916	25.9%	2,750	11,167	24.6%	+8.0%
G of M	MOBMS	220	1,678	13.1%	382	1,786	21.4%	602	3,464	17.4%	+3.0%
G of M	NEWMS	1,266	5,691	22.2%	1,635	6,865	23.8%	2,901	12,556	23.1%	+7.6%
G of M	PATMS	222	1,186	18.7%	345	1,267	27.2%	567	2,453	23.1%	+9.7%
G of M	TAMMS	383	1,049	36.5%	406	1,116	36.4%	789	2,165	36.4%	+2.9%
G of M	Subtotal	3,566	15,897	22.4%	4,619	18,085	25.5%	8,185	33,982	24.1%	+7.0%
Hawaii	HONMS	542	588	92.2%	560	617	90.8%	1,102	1,205	91.5%	+41.2%
Other	GUAD	112	N/A	N/A	145	N/A	N/A	257	N/A	N/A	N/A
Other	OTHER	15	N/A	N/A	16	N/A	N/A	30	N/A	N/A	N/A
West	LOSMS	2,727	3,895	70.0%	2,845	4,262	66.8%	5,572	8,157	68.3%	-2.8%
West	PORMS	727	942	77.2%	656	1,090	60.2%	1,383	2,032	68.1%	+11.8%
West	SDCMS	219	602	36.4%	247	678	36.4%	466	1,280	36.4%	+7.9%
West	SEAMS	892	846	105.4%	575	1,047	54.9%	1,467	1,893	77.5%	+13.0%
West	SFCMS	715	685	104.4%	705	761	92.6%	1,420	1,446	98.2%	+10.3%
West	Subtotal	5,280	6,970	75.8%	5,028	7,838	64.1%	10,308	14,808	69.6%	+3.2%
Total		17,421	45,994	37.9%	19,824	52,363	37.9%	37,244	98,357	37.9%	+7.5%

Table 2a. Year 1 compliance with voluntary ballast water management guidelines, by coastal region and COTPZ. Data are from National Ballast Survey database (January 2002 to December 2002).

U. S. Coast	COTPZ	2002 - BWR Forms [#]	Zero Discharge [#]	% Zero Discharge	Zero Exchange [#]	% Zero Exchange	Some Exchange [#]	% Some Exchange	Unknown Exchange [#]	% Unknown Exchange
Alaska	ANCMS	91	30	33.0%	34	37.4%	27	29.7%	0	0.0%
Alaska	JUNMS	11	1	9.1%	0	0.0%	10	90.9%	0	0.0%
Alaska	VALMS	6	0	0.0%	1	16.7%	5	83.3%	0	0.0%
Alaska	Subtotal	108	31	28.7%	35	32.4%	42	38.9%	0	0.0%
Carib	SJPMS	876	772	88.1%	73	8.3%	31	3.5%	0	0.0%
East	BALMS	416	374	89.9%	7	1.7%	35	8.4%	0	0.0%
East	BOSMS	141	134	95.0%	7	5.0%	0	0.0%	0	0.0%
East	CHAMS	393	350	89.1%	10	2.5%	33	8.4%	0	0.0%
East	HMRMS	147	117	79.6%	2	1.4%	27	18.4%	1	0.7%
East	JACMS	936	719	76.8%	188	20.1%	29	3.1%	0	0.0%
East	LISCP	19	19	100.0%	0	0.0%	0	0.0%	0	0.0%
East	MIAMS	2,593	1,866	72.0%	620	23.9%	105	4.0%	2	0.1%
East	NYCCP	1,044	946	90.6%	58	5.6%	39	3.7%	1	0.1%
East	PHIMS	683	639	93.6%	12	1.8%	32	4.7%	0	0.0%
East	POMMS	150	145	96.7%	0	0.0%	5	3.3%	0	0.0%
East	PROMS	55	52	94.5%	1	1.8%	2	3.6%	0	0.0%
East	SAVMS	313	268	85.6%	8	2.6%	37	11.8%	0	0.0%
East	WNCMS	32	32	100.0%	0	0.0%	0	0.0%	0	0.0%
East	Subtotal	6,922	5,661	81.8%	913	13.2%	344	5.0%	4	0.1%
G of M	CORMS	258	209	81.0%	38	14.7%	11	4.3%	0	0.0%
G of M	HOUCP	1,217	933	76.7%	106	8.7%	176	14.5%	2	0.2%
G of M	MOBMS	220	191	86.8%	11	5.0%	17	7.7%	1	0.5%
G of M	NEWMS	1,266	884	69.8%	135	10.7%	244	19.3%	3	0.2%
G of M	PATMS	222	205	92.3%	7	3.2%	9	4.1%	1	0.5%
G of M	TAMMS	383	278	72.6%	72	18.8%	33	8.6%	0	0.0%
G of M	Subtotal	3,566	2,700	75.7%	369	10.3%	490	13.7%	7	0.2%
Hawaii	HONMS	542	473	87.3%	46	8.5%	23	4.2%	0	0.0%
Other	GUAD	112	98	87.5%	12	10.7%	2	1.8%	0	0.0%
Other	OTHER	15	14	93.3%	1	6.7%	0	0.0%	0	0.0%
West	LOSMS	2,727	2,311	84.7%	83	3.0%	324	11.9%	9	0.3%
West	PORMS	727	356	49.0%	4	0.6%	366	50.3%	1	0.1%
West	SDCMS	219	208	95.0%	7	3.2%	4	1.8%	0	0.0%
West	SEAMS	892	680	76.2%	7	0.8%	202	22.6%	3	0.3%
West	SFCMS	715	586	82.0%	25	3.5%	101	14.1%	3	0.4%
West	Subtotal	5,280	4,141	78.4%	126	2.4%	997	18.9%	16	0.3%
Yr 2002	Total	17,421	13,890	79.7%	1,575	9.0%	1,929	11.1%	27	0.2%

Table 2b. Year 2 compliance with voluntary ballast water management guidelines, by coastal region and COTPZ. Data are from National Ballast Survey database (January 2003 to December 2003).

U. S. Coast	COTPZ	2003 - BWR Forms [#]	Zero Discharge [#]	% Zero Discharge	Zero Exchange [#]	% Zero Exchange	Some Exchange [#]	% Some Exchange	Unknown Exchange [#]	% Unknown Exchange
Alaska	ANCMS	68	15	22.1%	35	51.5%	18	26.5%	0	0.0%
Alaska	JUNMS	13	3	23.1%	0	0.0%	10	76.9%	0	0.0%
Alaska	VALMS	4	1	25.0%	0	0.0%	3	75.0%	0	0.0%
Alaska	Subtotal	85	19	22.4%	35	41.2%	31	36.5%	0	0.0%
Carib	SJPMS	1,393	1,243	89.2%	90	6.5%	58	4.2%	2	0.1%
East	BALMS	432	399	92.4%	17	3.9%	16	3.7%	0	0.0%
East	BOSMS	174	146	83.9%	26	14.9%	2	1.1%	0	0.0%
East	CHAMS	374	342	91.4%	11	2.9%	19	5.1%	2	0.5%
East	HMRMS	142	116	81.7%	5	3.5%	21	14.8%	0	0.0%
East	JACMS	1,015	754	74.3%	224	22.1%	35	3.4%	2	0.2%
East	LISCP	38	34	89.5%	0	0.0%	4	10.5%	0	0.0%
East	MIAMS	3,063	2,017	65.9%	882	28.8%	162	5.3%	2	0.1%
East	NYCCP	1,329	1,163	87.5%	92	6.9%	71	5.3%	3	0.2%
East	PHIMS	707	633	89.5%	9	1.3%	65	9.2%	0	0.0%
East	POMMS	180	171	95.0%	5	2.8%	3	1.7%	1	0.6%
East	PROMS	87	86	98.9%	0	0.0%	1	1.1%	0	0.0%
East	SAVMS	395	356	90.1%	8	2.0%	29	7.3%	2	0.5%
East	WNCMS	42	39	92.9%	0	0.0%	3	7.1%	0	0.0%
East	Subtotal	7,978	6,256	78.4%	1,279	16.0%	431	5.4%	12	0.2%
G of M	CORMS	318	239	75.2%	48	15.1%	31	9.7%	0	0.0%
G of M	HOUCP	1,533	1,225	79.9%	102	6.7%	201	13.1%	5	0.3%
G of M	MOBMS	382	323	84.6%	27	7.1%	32	8.4%	0	0.0%
G of M	NEWMS	1,635	1,161	71.0%	156	9.5%	311	19.0%	7	0.4%
G of M	PATMS	345	318	92.2%	8	2.3%	19	5.5%	0	0.0%
G of M	TAMMS	406	259	63.8%	106	26.1%	41	10.1%	0	0.0%
G of M	Subtotal	4,619	3,525	76.3%	447	9.7%	635	13.7%	12	0.3%
Hawaii	HONMS	560	524	93.6%	21	3.8%	15	2.7%	0	0.0%
Other	GUAD	145	130	89.7%	12	8.3%	3	2.1%	0	0.0%
Other	OTHER	16	16	100.0%	0	0.0%	0	0.0%	0	0.0%
West	LOSMS	2,845	2,464	86.6%	55	1.9%	321	11.3%	5	0.2%
West	PORMS	656	325	49.5%	9	1.4%	318	48.5%	4	0.6%
West	SDCMS	247	241	97.6%	4	1.6%	2	0.8%	0	0.0%
West	SEAMS	575	428	74.4%	8	1.4%	135	23.5%	4	0.7%
West	SFCMS	705	593	84.1%	17	2.4%	91	12.9%	4	0.6%
West	Subtotal	5,028	4,051	80.6%	93	1.8%	867	17.2%	17	0.3%
Yr 2003	Total	19,824	15,764	79.5%	1,977	10.0%	2,040	10.3%	43	0.2%
Grand Total		37,245	29,654	79.6%	3,552	9.5%	3,969	10.7%	70	0.2%

Table 3. Ballast Water Reporting Form indicating data fields required for reporting.

OMB Control Number 1625-0069

BALLAST WATER REPORTING FORM

IS THIS AN AMENDED BALLAST REPORTING FORM? YES NO

1. VESSEL INFORMATION

2. VOYAGE INFORMATION

3. BALLAST WATER USAGE AND CAPACITY

Vessel Name:	Arrival Port:	<i>Specify Units Below (m³, MT, LT, ST)</i>		
IMO Number:	Arrival Date:	Total Ballast Water on Board:		
Owner:	Agent:	Volume	Units	No. of Tanks in Ballast
Type:	Last Port:	Country of Last Port:		
GT:		Total Ballast Water Capacity:		
Call Sign:	Next Port:	Volume	Units	Total No. of Tanks on Ship
Flag:		Country of Next Port:		

4. BALLAST WATER MANAGEMENT

Total No. Ballast Water Tanks to be discharged:

Of tanks to be discharged, how many: Underwent Exchange: Underwent Alternative Management:

Please specify alternative method(s) used, if any: _____

If no ballast treatment conducted, state reason why not: _____

Ballast management plan on board? YES NO Management plan implemented? YES NO

IMO ballast water guidelines on board [res. A.868(20)]? YES NO

5. BALLAST WATER HISTORY: Record all tanks to be deballasted in port state of arrival: IF NONE, GO TO #6 (Use additional sheets as needed)

Tanks/ Holds List multiple sources/tanks separately	BW SOURCE				BW MANAGEMENT PRACTICES						BW DISCHARGE			
	DATE D/M/YYYY	PORT or LAT. LONG.	VOLUME (units)	TEMP (units)	DATE D/M/YYYY	ENDPOINT LAT. LONG.	VOLUME (units)	% Exch	METHOD (ER/FT/ ALT)	SEA HT. (m)	DATE D/M/YYYY	PORT or LAT. LONG.	VOLUME (units)	SALINITY (units)
				C										sg
				C										sg
				C										sg
				C										sg
				C										sg
				C										sg
				C										sg
				C										sg

Ballast Water Tank Codes: Forepeak = FP, Aftpeak = AP, Double Bottom = DB, Wing = WT, Topside = TS, Cargo Hold = CH, Other = O

6. RESPONSIBLE OFFICER'S NAME AND TITLE, PRINTED AND SIGNATURE: _____

Table 4. Reported Ballast condition on arrival to United States ports. NOBOB and BOB frequency across Captain of the Port Zones and coasts. Data are from National Ballast Survey database (January 2002 to December 2003).

U. S. Coast	COTPZ	BOB BW Forms (2002-2003)	NOBOB BW Forms (2002-2003)	Percent NOBOB (2002-2003)
Alaska	ANCMS	150	9	5.7
Alaska	JUNMS	23	1	4.2
Alaska	VALMS	10	0	0.0
Alaska	Subtotal	183	10	5.2
Carib	SJPMS	2,084	185	8.2
East	BALMS	647	201	23.7
East	BOSMS	241	74	23.5
East	CHAMS	709	58	7.6
East	HMRMS	252	37	12.8
East	JACMS	1,850	101	5.2
East	LISCP	39	18	31.6
East	MIAMS	5,463	193	3.4
East	NYCCP	2,121	252	10.6
East	PHIMS	1,033	357	25.7
East	POMMS	165	165	50.0
East	PROMS	132	10	7.0
East	SAVMS	643	65	9.2
East	WNCMS	57	17	23.0
East	Subtotal	13,352	1,548	10.4
G of M	CORMS	408	168	29.2
G of M	HOUCP	2,016	734	26.7
G of M	MOBMS	448	154	25.6
G of M	NEWMS	2,073	828	28.5
G of M	PATMS	236	331	58.4
G of M	TAMMS	697	92	11.7
G of M	Subtotal	5,878	2,307	28.2
Hawaii	HONMS	1,024	78	7.1
Other	GUAD	253	4	1.6
Other	OTHER	30	0	0.0
West	LOSMS	5,131	441	7.9
West	PORMS	1,290	93	6.7
West	SDCMS	453	13	2.8
West	SEAMS	1,387	80	5.5
West	SFCMS	1,201	219	15.4
West	Subtotal	9,462	846	8.2
Total		32,266	4,978	13.4