

THE CENTER FOR
**ENVIRONMENTAL
LEADERSHIP**
IN BUSINESS

TRAVEL & LEISURE

INTERIM SUMMARY REPORT

A SHIFTING TIDE

ENVIRONMENTAL CHALLENGES &
CRUISE INDUSTRY RESPONSES



■ JAMES E.N. SWEETING ■ SCOTT L. WAYNE

ACKNOWLEDGMENTS

Many people have contributed their time and expertise to the creation of this document and the overall Cruise Industry Initiative of The Center for Environmental Leadership in Business. While the views expressed in this paper are strictly those of the authors, we are grateful to the following people for their time, comments and advice.

At Conservation International, we would like to thank Glenn Prickett, Sarah Raposa, Bambi Semroc, and Amy Skoczlas of The Center for Environmental Leadership in Business and Dr. Jamie Bechtel of the Field Support Division. We would like to extend a special thank you to Laury Saligman and Frank Stewart for their work on the design and production of this document.

We are grateful to the following individuals for their comments and suggestions on various versions of this report: Michael Crye and Captain Ted Thompson of the International Council of Cruise Lines; Captain William Wright and Hans Molver of Royal Caribbean Cruises Ltd.; Elaine Heldewier of Carnival Cruise Lines; Carolyn Cresswell of P&O Princess Cruises plc; Daniel Paro and Fred Danska of Wärtsilä; Graham Lockyer of Hamworthy; Nazeli Seferian of ZENON and Jackie Savitz of Oceana. In addition, we received valuable technical input from Kathy Hurd at the U.S. Environmental Protection Agency's Oceans and Coastal Protection Division.

We would also like to thank Tracy Guerin and Thomas Lorimer of Royal Caribbean Cruises Ltd.; Mark Conroy of Radisson Seven Seas Cruises; George Wright of Princess Cruises; Lieutenant Commander David Beck of the U.S. Coast Guard; Maurya Falkner and Terri Ely of the California State Lands Commission; Christophe Tulouc of the Pew Oceans Commission; Dr. Allegra Cangelosi of The Northeast-Midwest Institute; Jon Maidens and Lauretta Burke of the World Resources Institute; and Dr. Joth Singh of the Caribbean Conservation Association for their support of our research efforts.

Finally, we would like to thank Carly Reiter for her research and contributions to the earliest stages of this Initiative and Amy Sweeting for her editorial assistance on this document.

PHOTOGRAPHY

COVER Radisson Seven Seas Cruises courtesy of CLIA. **CONTENTS** Royal Caribbean Cruises Ltd. **PAGE 1** Digital Vision. **PAGE 6** Royal Caribbean Cruises Ltd. **PAGE 17** Conservation International. **PAGE 19** Royal Caribbean Cruises Ltd. **PAGE 20** Digital Vision.

CONTENTS

| | |
|----|--|
| | Foreword |
| 1 | Introduction |
| 3 | The State of the Cruise Industry |
| | Environmental impact and regulations |
| | Industry response |
| 7 | Key Environmental Challenges and Cruise Industry Responses |
| | Air emissions |
| | Ballast water and non-native species |
| | Wastewater |
| | Hazardous waste |
| | Solid waste |
| | Oily bilge water |
| | Coral reefs |
| 20 | Conclusion |
| 21 | Endnotes |





FOREWORD

Over the past decade, the cruise industry and its environmental practices have generated headlines and controversy. While some non-governmental organizations and the media have portrayed the industry as a major polluter, the cruise industry promotes its environmental programs and compliance with international and national laws and regulations. It was this seemingly irresolvable conflict and confrontation that led Conservation International's Center for Environmental Leadership in Business (CELB) to look beyond the headlines and examine the facts. We talked with the cruise industry and environmental organizations to gain a clear picture of what environmental practices are currently in use by the major cruise lines. We are pleased to share with you our interim findings.

This document is part of the larger, ongoing Cruise Industry Initiative developed by CELB in 2002, which seeks to understand the reality of the cruise industry's impact on the environment and to work with the industry to promote positive actions and activities. What we have found so far is that the cruise industry's environmental programs and specific actions are more extensive than might be expected given the headlines of the past few years. Many of the major cruise lines have instituted environmental programs and policies that, in some cases, go beyond prevailing regulations and shipping practices.

At the same time, we know that the unique places upon which the cruise industry depends are at risk. Conservation International has performed a global assessment to determine those regions on Earth that harbor the highest levels of biological diversity and are under the most severe threat. The Caribbean and Mediterranean Basin are both high on that list of "biodiversity hotspots".

There is still much to be done to protect these and other tourism destinations that feature the natural world as their main attraction. We offer this report as a starting point for effective collaboration between the cruise industry and others interested in helping the industry further reduce its environmental footprint and contribute to the conservation of the ecologically important areas that cruise ships visit. As a next step, CELB will be working with both the industry and the conservation community to promote best practices within cruise ship operations, examining ways in which cruise lines might positively influence the environmental impacts of their suppliers, and creating innovative ways for the cruise industry to be a positive and proactive force for conservation. We invite you to join us.

Glenn Prickett
Executive Director
The Center for Environmental Leadership in Business

INTRODUCTION

The cruise ship industry is one of the fastest growing and most visible sectors of the travel industry. For many years, the cruise industry has had a negative image in people's minds regarding environmental issues – one of a polluter, spilling oil and dumping garbage at sea. Cruise ships do have an environmental impact and the industry's high growth rates may mean even more impact. However, a number of the leading cruise lines have responded by implementing practices and procedures to address their environmental impacts.

Any level of environmental impact can be a problem for the cruise industry, because the very nature of its product depends on a healthy natural environment. Clean oceans are essential to the cruise experience – passengers do not want to sail on polluted waters or visit contaminated beaches. Furthermore, good environmental practices allow the industry to expand its market and tap into the growing international demand of informed and concerned tourists seeking environmentally and socially responsible travel choices.

This interim report focuses on the three major cruise line companies that represent nearly two thirds of the cruise market: Carnival Corporation, P&O Princess Cruises plc and Royal Caribbean Cruises Ltd., each of which includes two or more subsidiaries. The report has also benefited from input and support from Radisson Seven Seas Cruises and the International Council of Cruise Lines. The majority

*Clean oceans are essential
to the cruise experience
– passengers do not want
to sail on polluted waters or
visit contaminated beaches.*



of these companies' business is based in the Caribbean and Alaska, two areas considered priorities for many conservation organizations. Because of this focus, much of the data and examples in this document come from these companies and destinations. In addition, this document centers principally on ship operations, and not on the impact of cruise passengers when shore-side or issues related to port development. These are both vital topics for further research and action.

The major cruise lines have done much to respond to the challenge of preserving the environment on which their business depends. Royal Caribbean, Carnival, P&O Princess and several other cruise lines are implementing leadership practices, testing and refining new technologies and developing management programs to address environmental impacts. In some cases, cruise ship companies have taken actions that go beyond existing regulations and common shipping practices. Nevertheless, key challenges remain for the cruise industry to minimize its environmental footprint. Many of these challenges and industry responses are detailed in this report.

New practices and technologies are continually being developed to address the most pressing environmental impacts of shipping, with the cruise industry playing an important role in developing and testing new equipment. Furthermore, many cruise lines are using new technologies and practices on some, but not all of their ships. Companies should develop and

communicate management plans to phase in these leading practices across their entire fleets. The cruise ship industry has the opportunity to become a model for the shipping and tourism industries if it continues to show leadership in piloting and implementing leading practices.

Finally, a key conclusion of this study is that there is a pressing need for further study of the impacts of cruise ship activity on the environment. Although much is known in general about the effects of air pollution, oily water and untreated waste, there is little data on the specific impacts of cruise ships. There is a dearth of information on impacts in the Caribbean, which is home to more than half of the cruise industry's activities. Non-governmental, academic and scientific organizations, in cooperation with the cruise industry, all play an important role in conducting research to better understand the potential and actual impacts of cruising and to determine the most effective and sustainable responses.

THE STATE OF THE CRUISE INDUSTRY

We're in such an embryonic stage that it's silly. I can't see the end. I can't even see the end of the beginning.

– Bob Dickinson, President,
Carnival Cruise Lines

Since it began in the 1960s, the modern cruising industry has rapidly evolved from mainly exclusive journeys for the rich to popular vacations for everyone. Today, the cruise industry is one of the world's fastest growing tourism segments. The number of cruise ship passengers has grown nearly twice as fast as world international tourist arrivals over the last decade,¹ and is expected to grow at 8.5 percent per year over the next decade. (See Table 1)

Table 1: Growth of the Cruise Industry

| Year | Number of passengers worldwide |
|------|--------------------------------------|
| 1970 | 500,000 |
| 1998 | 9.5 million ³ |
| 2010 | 14.2 million ⁴ (estimate) |

Table 2: The Largest Cruise Ship Companies⁵

| Company | Approximate number of ships | Global market share (%) |
|------------------------------|-----------------------------|-------------------------|
| Royal Caribbean Cruises Ltd. | 23 | 22 |
| Carnival Corporation* | 43 | 27 |
| P&O Princess Cruises plc* | 18 | 13 |

*As of early 2003, P&O Princess had begun the process of merging with Carnival Corporation.

Nearly two-thirds of the cruise industry is concentrated in just three corporations: Royal Caribbean Cruises Ltd., Carnival Corporation and P&O Princess Cruises plc. (See Table 2) In response to the growing demand for cruises, these and other cruise line companies are expected to add as many as 49 new ships to their fleets between 2002 and 2005, at a cost of approximately \$12 billion.²

Much of this growth in the cruise industry is occurring in destinations that are located in biodiversity hotspots, which are among the most diverse and threatened environments on Earth. (See Figure 1) About 70 percent of cruise destinations are in the hotspots, including the Caribbean, the Mediterranean, Western Mexico, the Panama Canal Zone and the South Pacific.

Of this total, a full half of the world's cruise passengers depart from United States ports for the Caribbean. In 2001, the North American cruise industry alone contributed \$20 billion to the U.S. economy, a \$2-billion increase over 2000.⁶ Because of the significance of the North American cruise industry, this report focuses on U.S. federal and state laws for its legal and policy analysis.

FIGURE 1: BIODIVERSITY HOTSPOTS

The biodiversity hotspots concept is a prioritization system, adopted and refined by Conservation International, which allows conservationists to focus their efforts on the regions where the threat is the greatest to the largest number of species. Hotspots are designated as such because they harbor a great diversity of endemic species (those found nowhere else in the world) and, at the same time, have been significantly altered and impacted by human activities. The 25 terrestrial biodiversity hotspots (see map) contain 44 percent of all plant species and 35 percent of all terrestrial vertebrate species in only 1.4 percent of the planet's land area. For more information on biodiversity hotspots, see www.biodiversityhotspots.org.



ENVIRONMENTAL IMPACT AND REGULATIONS

With the cruise industry's predictions of continued rapid growth over the next few decades, it will be increasingly important to understand and address the potential environmental impacts of cruising. While the cruise industry is growing at a rapid pace, it still represents only a tiny fraction of the world shipping industry. In January 2001, passenger ships, which include cruise ships and ferries, made up only about 6 percent of the world shipping fleet.⁷ The 100 plus ships of the International Council of Cruise Lines (ICCL)⁸ members, which account for about two-thirds of the world's cruise ships, comprise less than 5 percent of all passenger ships and only 0.2 percent of the world's trading fleet. Thus, it is important to look at the cruise industry in a broader context. While cruising may have a relatively minor environmental impact relative to the full shipping industry, it is an impact nonetheless. And in certain ports, for example in the Caribbean or Alaska, where cruise ships may represent a major portion of activity, the local environmental impacts can be significant.

Because a cruise ship will likely be in a number of national and state jurisdictions, as well as international waters during a typical cruise, the cruising industry is regulated by a series of international treaties, national and state laws that control discharges and emissions and specify waste management procedures. The International Maritime Organization develops and oversees conventions and treaties that apply to cruise vessels and other types of ships in

all international waters. The principal treaty governing cruise ship activity is the 1973 International Convention for the Prevention of Pollution from Ships (MARPOL), which was modified in 1978 and has subsequently been updated by various amendments. MARPOL Annexes and amendments cover pollution from oil, chemicals, harmful substances in packaged form, sewage and garbage, but each Annex must be ratified by member State Governments whose fleets represent over 50 percent of world shipping tonnage.

Over the past decade there have been a number of examples of cruise lines not abiding by these laws and regulations. According to a 2000 GAO report on marine pollution, cruise ships were responsible for 87 confirmed incidents of illegal discharge of oily bilge water, garbage and other waste between 1993 and 1997. In Juneau, Alaska, between 2001 and 2002, four major cruise lines were cited for illegal discharge of wastewater, while another six lines were cited for violations of air opacity regulations. For instance, in April 2002, Carnival Corporation was fined \$18 million for the deliberate falsification of oily bilge record-books, related to the discharge from a few ships of oily bilge water through separators with disabled oil content meters. In July 2002, Norwegian Cruise Line was fined \$1 million for falsification of oily bilge water records by the previous owner aboard one of its ships. In 1998 and 1999, Royal Caribbean Cruises Ltd. was fined \$9 million and \$18 million respectively for discharging oil-contaminated bilge waste.⁹ While many of these incidents are attributed to accidents caused by human error or mechanical

failure,¹⁰ it is essential for the cruise industry to demonstrate a commitment to compliance with international, national and state regulations. This commitment is also important in order to maintain credibility regarding the cruise industry's environmental performance.

INDUSTRY RESPONSE

In June 2001, the International Council of Cruise Lines (ICCL) and its members adopted a set of practices and procedures entitled *Cruise Industry Waste Management Practices and Procedures*. These practices primarily build on the regulations of the International Maritime Organization and the United States Environmental Protection Agency.

The three major cruise companies (Carnival Corporation, Royal Caribbean Cruises Ltd. and P&O Princess Cruises plc) and some smaller companies, such as Radisson Seven Seas Cruises, have corporate programs for implementing the ICCL practices and procedures, and, in some cases, exceeding these standards. All three major lines have programs that include environmental awareness training for their crews, screening of vendors who handle shore-side off-loading of wastes and testing of technologies to minimize or eliminate waste. Each of these programs is continually evolving to integrate the latest technologies and management practices.

Although the U.S. Coast Guard conducts regular inspections of cruise ships for

safety and environmental compliance, many groups are critical about the lack of monitoring, evaluation or enforcement of the ICCL practices and procedures. A systematic approach to reporting on the implementation of the ICCL practices and procedures would help demonstrate the good practices many of the cruise lines are implementing. While the companies are making progress, there is still more to be done. The next section discusses seven individual environmental challenges and specific industry responses to those issues.





KEY ENVIRONMENTAL CHALLENGES AND CRUISE INDUSTRY RESPONSES

The cruise industry faces a number of key environmental challenges related to its activities and operations in the world's oceans, particularly in and around priority conservation areas. There is significant potential for wide-ranging negative environmental impacts from mishandled waste and pollutants or poorly planned and implemented management processes. Although the major cruise lines have made progress in addressing and mitigating these impacts, there is still work to be done to fully minimize the effect of cruising on the natural environment. Furthermore, due to a serious lack of data related to the specific impacts of cruise ships in sensitive environments, there is a real need for more study on these issues.

This section looks at the challenges raised by seven key issues – air emissions, ballast water and non-native species, wastewater, hazardous waste, solid waste, oily bilge water and the potential impact of the cruising industry on coral reefs. Under each issue, both the potential impacts and implications for the industry, as well as current industry responses are discussed.

AIR EMISSIONS

Challenge

Cruise ships are primarily powered by diesel fuel, which generates a variety of air emissions, including carbon dioxide (CO₂), nitrogen oxides (NO_x), sulfur dioxide (SO₂), ozone, volatile organic compounds (VOCs), carbon monoxide (CO), and particulate matter. These emissions can cause human health problems and damage the natural environment. For instance, CO₂ emissions are the principal cause of human-induced climate change while NO_x and SO₂ are the main ingredients of acid rain, which can damage trees and freshwater bodies.

On a global scale, cruise ships generate a relatively small amount of air pollution. While the international shipping industry accounts for about 2 percent of CO₂ emissions, 5 percent of SO₂ and 14 percent of NO_x worldwide,¹¹ cruise ships make up only a small fraction of the world fleet. However, because cruise ships tend to concentrate their activities in specific coastal areas, and visit the same ports repeatedly, their cumulative impact on a local scale could be significant.

The majority of cruise ship air emissions-related data concerns “air opacity,” or haze. Particulate emissions are the main source of haze that reduce visibility, while ozone, NO_x, and SO₂ also contribute to the problem. Haze and reduced visibility have been reported as problems in Alaskan ports, particularly Juneau, but the current data does not indicate to what extent the cruise

industry is the cause of the problem. In fact, the volatile organic compounds emitted by oil tanker ships when loading and unloading also need to be considered.

Air emission studies have been conducted in Alaska, including a cruise industry-sponsored Environmental Protection Agency study, which is a part of the Alaska Cruise Ship Initiative. The air emissions testing was “not designed to determine exactly which sources were contributing to the monitored air pollution concentrations, [however], the highest recorded pollutant levels were far below the state and federal health based standards as listed in 18 AAC 50.010.”¹² Nevertheless, as with other environmental issues, there is a need for more study on whether cruise ship air emissions are having an impact, particularly on coastal-marine habitats.

Response

Major cruise companies and engine manufacturers, such as GE Marine Engines and the Wärtsilä Corporation, are working together to develop engines that can drastically reduce air emissions from ships. For example, Celebrity Cruises was the first cruise line to use smokeless gas turbine engines, manufactured by General Electric, that lower nitrogen oxide emissions by 80 percent and sulfur dioxide by 98 percent. In recognition of their use of this engine, the U.S. Coast Guard awarded Celebrity Cruises their “William M. Benkert Award for Environmental Excellence” in 2002. P&O Princess Cruises and Crystal

Major cruise companies and engine manufacturers are working together to develop engines that can drastically reduce air emissions.

Cruises are using Wärtsilä Corporation “enviroengines,” which consume less fuel, lower emissions, and do not emit any visible smoke.¹³ In fact, the majority of the P&O Princess ships under construction are being fitted with these engines and the company is working with Wärtsilä to retrofit older vessels. Carnival Cruise Lines is pursuing additional research on these engines with Wärtsilä.

In addition to making changes in the engines used to run the ships, the cruise industry is taking other steps to reduce air pollution in Alaska. For instance, in Juneau, six P&O Princess cruise ships shut down their engines and connect to the local electricity grid whenever possible while they are in port. This system works in Juneau because the local grid can support (through surplus hydroelectric power) the additional energy demands of the ships and the facilities exist on the dock for the necessary connections. These facilities required a multi-million dollar investment by P&O Princess. The ICCL has also reported that all ships now have air opacity meters for monitoring haze.

BALLAST WATER AND NON-NATIVE SPECIES

Challenge

Ballast water is used to maintain stability, especially when there are substantial shifts in the total weight of a ship. Ships take on ballast water as they consume fuel, discharge wastewater or unload cargo, and discharge it when they take on fuel or cargo. Ships may also take on or discharge ballast water to pass under certain bridges or sail into particular ports. Given that cruise ships do not experience the type of major in-port weight shifts experienced by cargo and tanker ships, most of their ballast water discharges occur outside ports.

When ships discharge ballast water in port, it can contain non-native plant and animal species, especially if that water was taken on in a different environment. Non-native species of plants, animals, pathogens and bacteria have been introduced and spread in coastal waters around the world, threatening and at times destroying native species. While many of these non-native species are harmless, even a small number of invasive species can quickly establish themselves and over-run or even eliminate local native species. Invasive, non-native species can cause significant loss of biodiversity in marine ecosystems. For example, the San Francisco Bay region is now home to at least 212 non-native species, which “have had a profound impact on the ecology of this region... (with) no shallow water habitat now remain[ing] uninvaded by exotic species.”¹⁴

Although cruise ships make up only a small percentage of the world’s shipping fleet, they visit the same ports frequently and thus could be a source of invasive non-native species in certain areas. At the same time, many cruise ships travel within the same environmental region, thus reducing the potential for their ballast water to introduce invasive non-native species. As with air emissions, there is little cruise-industry specific data on this issue and further study is needed to determine the scope of impact of the industry.

While the IMO has voluntary guidelines¹⁵, the State of California has enacted a Ballast Water Management Act (based on the IMO guidelines)¹⁶ and the U.S. Coast Guard has also developed voluntary guidelines¹⁷, it appears that the problem is still being defined. Experts remain unclear about when ballast water is clean enough to be discharged.¹⁸ These guidelines encourage ships to exchange ballast water collected in coastal waters with mid-ocean water, which contains fewer organisms that can survive in coastal environments. However, full exchanges such as these are only feasible for transoceanic cruise voyages and are not really applicable to cruise ships that travel principally in coastal waters.¹⁹

Response

The cruise industry and environmental regulators are testing a number of technologies for ballast water management and the elimination of non-native species. These technologies include ozone, ultraviolet, filtration, heat, chemical biocides and

deoxygenation. No technology is currently being widely implemented, as further shipboard testing is needed to determine the most effective technology. The U.S. Environmental Protection Agency is studying 22 different approaches, but has not yet made any definitive recommendations.

In the meantime, the cruise industry has taken steps to decrease the impact of ballast water discharges. For instance, P&O Princess Cruises plc is one of the first companies to test experimental two-phase cyclonic separation/UV systems on their ships. Carnival Cruise Lines is testing a gas injection system for killing non-native species. Royal Caribbean Cruises Ltd. maintains a policy of no ballast water discharges in port unless the water is from a similar ecological area, or from an area at least 200 miles (322 km) offshore. In addition, cruise ships hold ballast water in multiple tanks, which can allow them to exchange ballast water from the same ecological areas. Ballast water management plans depend, however, on a cruise ship's itinerary and water and fuel consumption schedules. Ballast water can also be treated onshore in individual ports, but, according to a recent report by the U.S. Environmental Protection Agency²⁰, such treatment would require major new infrastructure and operational modifications.

According to the February 2003 *Report on the California Ballast Water Management Program*, which was prepared for the California State Legislature, nearly 90% of ships in California waters reported compliance with the Ballast Water Management Program's mandatory requirements.²¹

WASTEWATER

Challenge

Cruise ships generate two kinds of wastewater: graywater and blackwater. Graywater is wastewater from the sinks, showers, galleys, and cleaning activities aboard a ship. It can contain a variety of substances including detergents, oil and grease, and food waste. More than 1 million gallons (3.785 million liters) of graywater are typically produced on a 7-10 day cruise, which makes it the largest source of liquid waste generated by cruise ships.²² While the standards for discharging graywater vary at the international, national and local levels, this waste can legally be pumped overboard almost anywhere the ship sails.

Blackwater is sewage – wastewater from toilets, urinals and infirmaries. A cruise ship generates an estimated 8,000 to 21,000 gallons (30,280 to 79,5000 liters or 30 to 80 metric tons) of blackwater per day.²³

According to the International Maritime Organization (IMO) Annex IV of MARPOL (which comes into force in September 2003):

"It is generally considered that on the high seas, the oceans are capable of assimilating and dealing with raw sewage through natural bacterial action and therefore the regulations in Annex IV of MARPOL 73/78 prohibit ships from discharging sewage within four miles of the nearest land, unless they have in operation an approved treatment plant. Between 4 and 12 miles from land, sewage must be comminuted and disinfected before discharge."²⁴

A key impact of wastewater discharges is the introduction of excessive nutrients into a marine environment. Excessive nutrients can over-stimulate the growth of aquatic plants and algae, a process known as eutrophication. When eutrophication is prolonged in tropical waters, corals can be smothered and die beneath a thick cover of algal growth. This, in turn, affects fish and other organisms that depend on the reef ecosystem, leading to a decrease in animal and plant diversity and affecting use of the water for fishing and swimming.²⁵ Wastewater also can contain bacteria, including fecal coliform, which can cause serious human health problems.

In 2000, the Bluewater Network, a non-profit environmental organization, petitioned the U.S. Environmental Protection Agency (EPA) on behalf of 53 organizations, asking for “an in-depth assessment...of waste streams from cruise ships.” Subsequent studies by the EPA, the International Council of Cruise Lines (ICCL) and the Science Advisory Panel of the State of Alaska have looked at the composition, dispersion and impact of graywater and blackwater discharged from cruise ships. The studies concluded that the current practices of the major cruise lines were resulting in high dispersion levels with minimal negative impacts on the environment. The faster a ship sails, the more extensive the dispersion of graywater. In fact, high bacteria counts were found when graywater was not discharged and instead held in tanks near warm engine compartments, which helped accelerate bacterial growth. In July 2001, Alaska

established a program that regulates cruise ship wastewater discharges.²⁶

Response

Cruise lines that are members of the ICCL have agreed to discharge graywater and treated blackwater only while the ship is underway, proceeding at a speed of not less than six knots. The companies have also agreed that wastewater will not be discharged in port or less than four nautical miles (7.4 kms) off shore, or the distance dictated by local laws.

Although graywater can legally be discharged almost anywhere, some cruise lines have adopted more restrictive policies. For example, Royal Caribbean, in keeping with its company environmental commitment to act “above and beyond compliance” has a policy that prohibits discharge of graywater less than 12 nautical miles (22.22 kms) from land.²⁷ Carnival Cruise Lines has a similar internal management policy. Holland America and other lines also adhere to a “zero discharge” policy in harbors, special areas and protected pristine environments, such as Glacier Bay National Park.

The U.S. Clean Water Act mandates the use of a Marine Sanitation Device (MSD) on all vessels that are equipped with installed toilets, to prevent the discharge of untreated or inadequately treated blackwater. An MSD uses physical, chemical and/or biological processes to allow effluent to be discharged with characteristics that are similar to effluents from wastewater treatment plants on land.

In addition to the standard MSDs, many cruise ships are also using or experimenting with other advanced water treatment technologies to break down and separate contaminants in the wastewater. For example, Celebrity Cruises uses a reverse osmosis process by Rochem (similar to that used to make bottled water) to clean wastewater so effectively that it meets the most stringent discharge standards, including those in Alaska.²⁸ The MSDs on Royal Caribbean International ships use physical and chemical processes to break down the wastewater. Carnival Cruise Lines is testing a Rochem ultrafiltration system on one of their ships for wastewater; MSDs that use biological treatment processes are installed throughout their fleet. Radisson Seven Seas and Princess Cruises are using Hamworthy systems that utilize membrane bioreactors to break down and screen the wastewater. Holland America is using ZENON membrane bioreactors on six of their ships.

Other practices can be used to reduce the overall volume of wastewater, thus lowering treatment costs and potential discharge amounts. For example, Royal Caribbean and P&O Princess ships use low-flush toilets and other water-saving devices, which greatly reduce the amount of blackwater generated on board. Use of biodegradable, environmentally friendly cleaning products can also help to reduce the volume of and contaminants within graywater.

HAZARDOUS WASTE

Challenge

In their waste management systems, cruise ships maintain separate processes for hazardous and non-hazardous materials. Hazardous waste is any solid or liquid waste that can or does pose a serious present or potential threat to human health or the environment.²⁹

According to both International Council of Cruise Lines (ICCL) and International Maritime Organization (IMO) definitions, hazardous waste from cruise ships includes:

- Waste from photo processing, including x-ray development fluid;
- Dry-cleaning waste fluids and contaminated materials;
- Print shop waste fluids;
- Fluorescent and mercury vapor lamp bulbs; and
- Certain batteries.

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (LDC) of 1972 was amended in 1996 to “prohibit the dumping of any wastes or other matter with the exception of those listed in Annex 1.

These are:

1. Dredged material
2. Sewage sludge
3. Fish waste, or material resulting from industrial fish processing operations
4. Vessels and platforms or other man-made structures at sea
5. Inert, inorganic geological material
6. Organic material of natural origin³⁰

Only 16 countries, representing less than 11 percent of the world's gross shipping tonnage, have ratified this Convention. Nevertheless, the members of the International Council of Cruise Lines have agreed to not discharge any hazardous substances at all, even outside territorial waters.

If mishandled, any of the above-mentioned hazardous materials can cause serious damage to plant and animal species, as well as threaten human health. For example, the silver in waste from photo processing can cause death or reproductive failure in fish, shellfish, and other marine organisms. Dry cleaning sludge and print shop wastes contain chemicals that can be toxic to aquatic mammals. Also the anti-foulant paint that has been painted on ship hulls to kill any form of marine life that comes in contact with them, contains the chemical compound tributyltin, which is extremely toxic to lobster and mollusks such as mussels, clams and oysters. Through the IMO, the shipping industry and governments have recently agreed to phase out the use of these paints.

Response

As the potential for serious harm to biodiversity and human health is so great from hazardous materials, the cruise lines indicate that they are exercising extra caution to comply with and exceed current regulations. It is standard industry practice to off-load hazardous wastes in port for either recycling or disposal, in much the same way as land-based generation of the same wastes. For example, in the

Caribbean, hazardous wastes are off-loaded to one of 15 ports with approved facilities and hazardous materials contractors. Waste management firms are inspected and audited by the cruise companies to ensure compliance with applicable laws and requirements. Carnival's review, for example, includes insurance, licenses and procedures of each vendor to ensure full compliance with environmental regulations.

The International Council of Cruise Lines' "Waste Management Practices and Procedures" are very specific as to the management and handling of hazardous substances. Most substances must be landed ashore for processing and recycling in accordance with U.S. federal laws. The three major cruise lines also have individual corporate programs to review and revise operational procedures, to reduce hazardous chemical use and substitute with more benign substances. In 2000, Royal Caribbean eliminated the use of 99 different chemicals. Carnival Cruise Lines maintains a list of prohibited chemicals for their fleet.

Waste is carefully processed to separate out hazardous materials. On Royal Caribbean ships, for example, batteries, electronic parts and butane lighters found in trash bins are removed for separate processing and disposal. On Carnival ships, aerosol cans are segregated from the solid waste, de-pressurized and drained. Any remaining propellant is collected in a sealed container and landed ashore as a hazardous waste.

The cruise lines have also adopted a number of specific practices for different types of hazardous wastes:

- Carnival Cruise Lines, Royal Caribbean and P&O Princess all off-load photo processing waste on shore and are experimenting with complete digitalization.
- For dry-cleaning operations, Celebrity Cruises has installed a filtration system that removes the most toxic chemicals from the process.
- ICCL members are beginning to use alternative printing inks, such as soy-based and non-chlorinated hydrocarbon-based inks in their print shops. Royal Caribbean ships now use water-based instead of chemical-based printing plates.
- Photocopier and laser printer toner cartridges are off-loaded for recycling by all Royal Caribbean, Carnival Cruise Lines and P&O Princess ships.
- Excess or expired over-the-counter medicines are off-loaded for disposal in an environmentally responsible manner. Carnival Cruise Lines donates some older pharmaceuticals to animal shelters, aquariums and animal rehabilitation facilities.
- Batteries, fluorescent bulbs and mercury lamps are separated from waste and recycled or off-loaded as a hazardous waste. Carnival Cruise Lines ships, for example, annually recycle nearly 7,200 pounds (3,273 kg) of batteries and 18,000 fluorescent lamp bulbs.³¹ P&O Princess collects old batteries from passengers at on-board photo shops.

SOLID WASTE

Challenge

Solid waste generated on a ship can include glass, paper, cardboard, aluminum and steel cans, incinerator ash, plastics and kitchen grease. On average, each cruise ship passenger generates at least two pounds (about 1 kg) of solid waste per day and disposes of two bottles and two cans. With some ships carrying more than 3,000 passengers, the amount of waste generated in a day can be massive.

Much of this non-hazardous waste is not easily biodegradable or does not biodegrade at all (see Table 3). Marine mammals, fish, sea turtles and birds can be injured or killed from entanglement with plastics and other solid waste. Animals may also get sick or die from ingesting these objects.

Table 3: Time required for waste to biodegrade or dissolve at sea.

| | |
|-------------------------|----------------------|
| Paper bus ticket | 2-4 weeks |
| Cotton cloth | 1-5 months |
| Rope | 3-14 months |
| Woollen cloth | 1 year |
| Painted wood | 13 years |
| Tin can | 100 years |
| Aluminum can | 200-500 years |
| Plastic bottle | 450 years |

Source: Hellenic Marine Environment Protection Association (HELMEPA)³²

Through the International Maritime Organization (IMO), most of the world's

shipping countries have agreed to a complete ban on dumping all plastics into the sea, at any distance from land. Other types of garbage, such as paper products, rags, glass, metal, bottles, crockery, lining and packing materials can be legally discharged 25 miles (40.23 kms) from shore. No discharging of any type of garbage is permitted in “Special Areas,” which are bodies of water deemed to require additional protections beyond the normal discharge requirements.³³

The entire Caribbean is considered a “Special Area,” but an exception is made for food waste, which can be discharged 12 or more nautical miles (22.22 kms) from shore.³⁴ And any food waste that has passed through a grinder can be discharged three miles (4.8 kms) from shore.

Response

As with hazardous waste, the International Council of Cruise Lines members’ waste management practices are very specific as to the management of solid waste. The practices are based on IMO regulations and U.S. laws, such as the Federal Water Pollution Control Act. ICCL member cruise lines have “zero-discharge” policies in effect, meaning that they have committed to not discharging certain types of wastes and discharging others only after they have been treated properly.

Wastes such as glass, cardboard, aluminum and steel cans are processed onboard through crushing, reuse and/or recycling and incineration. Incineration is used primarily for food waste, contaminated

cardboard, some plastics, trash and wood. Incinerator ash is periodically tested for toxicity and, if it is determined to be non-hazardous, can be disposed at sea in accordance with international regulations. Hazardous ash must be disposed of onshore. Royal Caribbean Cruises Ltd. and Carnival Cruise Lines land all ash ashore and test the ash regularly to ensure that hazardous substances are not present; as their policies are to not incinerate hazardous materials.

Most of the major cruise lines have begun to implement shipboard recycling programs, to reduce the generation of solid waste. Carnival’s recycling program achieves a recycling rate of nearly 65 percent, which is much higher than most land-based communities. An average of 170,000 pounds (77,111 kgs) of cardboard, aluminum cans, plastics, glass and steel are recycled each month from Carnival’s fleet.³⁵ Prior to sending waste to a facility, each vendor is checked to ensure that they are in full compliance with local, state and federal environmental regulations. Royal Caribbean’s Vision-class ships sort, crush and off-load about 450 pounds (204 kgs) of aluminum cans for recycling per weeklong trip.

The major cruise lines also minimize and prevent waste generation through product purchasing practices that emphasize products with recycled content and less packaging. Holland America uses recycled paper for all onboard printed materials. In some cases, disposable packaging is eliminated before products are even brought on board, or replaced with reusable

packaging materials. Some of the cruise lines have eliminated plastic cups, straws, stirrers, and packaging and introduced bulk dispensers in place of individually packaged condiments.

To minimize the use of plastics, P&O Princess has worked closely with suppliers to replace plastic with other biodegradable materials or eliminate or reduce packaging materials. The company has been able to reduce plastic waste by approximately a third, or seven million pieces of plastic, each year over the last few years. Royal Caribbean has begun cleaning and reusing plastic pails, for holding items such as laundry soap, using as tote buckets for tools or for collecting spent batteries for recycling.

A relatively new approach to treating solid waste is the use of plasma energy, pioneered by a Canadian company called PyroGenesis Inc. Through their Plasma Arc Waste Destruction System, waste is pulverized, converted to a gas consisting of carbon monoxide and hydrogen and then combusted in a secondary chamber and fully treated before being released. Although the company is expanding the system so that it can treat concentrated sludge from used oil, blackwater and graywater, as well as bilge water, it has not yet been extensively tested by cruise ships.

OILY BILGE WATER

Challenge

The discharge of untreated oily bilge water into the ocean can contribute to marine pollution. On a ship, oil often leaks from engine and machinery spaces or from fittings and engine maintenance activities and mixes with water in the bilge, the lowest part of the hull of the ship. A typical large cruise ship will generate an average of 8 metric tons (2,228 gallons or 8,434 liters) of oily bilge water for each 24 hours of operation.³⁶

To maintain ship stability and eliminate potentially hazardous conditions from oil vapors in these areas, the bilge spaces need to be flushed and periodically pumped dry. However, before a bilge can be cleared out and the water discharged, the oil that has accumulated needs to be extracted from the bilge water. This process involves pumping the oily water out of the bilge and, in accordance with international and national laws, passing it through an oily water separator (OWS) before further processing. Any oil that is extracted from the bilge water can then be reused, incinerated and/or off-loaded in port, although most ports lack adequate facilities to receive the extracted oil.³⁷

An oily water separator can usually treat from 1-10 tons (.9 to 9 metric tons/up to 2,600 gallons or 9,842 liters) of bilge water each hour. IMO regulations require that the oil content of any discharged water be less than 15 parts per million and that it

not leave a visible sheen on the surface of the water. A single pint of oil can leave a sheen of oil across as much as one acre of ocean surface.³⁸ If a separator is faulty or deliberately by-passed, untreated oily bilge water could be discharged directly into the ocean. Some discharge incidents over the past few years have been due mainly to human error or malfunctioning equipment. As mentioned above, a number of cruise lines have been charged in relation to this issue in recent years. For example, in 2002, Carnival Corporation was fined \$18 million for deliberate falsification of oily bilge record-books, related to the discharge from a few ships of oily bilge water through separators with disabled oil content meters. And in 1998 and 1999, Royal Caribbean Cruises Ltd. was fined \$9 million and \$18 million, respectively for discharging oil-contaminated bilge waste.

Discharging oil or oily water into the ocean can hurt or kill marine life and severely damage coral reefs. Diesel fuel is acutely toxic to fish, invertebrates and seaweed, although in open water it dilutes quite rapidly. Spills can be particularly toxic to crabs and shellfish in shallow, confined near-shore areas because these organisms bio-accumulate the oil, often over a period of several weeks after exposure. Oily contaminants may also concentrate on the sea surface, which is an important area for the early development of the eggs and larvae of many fish and other marine species. Because there is only a limited understanding of the risks caused by long-term chronic oil discharges, such as from oily bilge water, into coastal

marine environments in the Caribbean and elsewhere, there is a pressing need for further study of these issues.

Response

Despite the recent incidents of illegal by-pass pipes and falsified logbooks, the International Council of Cruise Lines and the major cruise companies do seem to be taking the issue of oil bilge water seriously. For example, Royal Caribbean's current discharges of oily bilge water contain less than 5 parts per million of oil, an amount that goes beyond the international standards.³⁹ In addition, the company's use of gas turbine engines on its Celebrity ships reduces oily bilge water as the engines are based on a combined gas turbine and steam turbine system, rather than diesel fuel.

All cruise ships are required under U.S. law to use some form of oily water separator or to store the oily water for off-loading in a port. Most cruise ships separate the oil from the water to create a sludge, which is then either incinerated or off-loaded. Holland America and several other cruise lines now often use two oily water separators to prevent accidental discharges from equipment malfunction.



CORAL REEFS

Challenge

Coral reefs are a popular attraction with tourists, especially cruise passengers. However, an increasing number of visitors could put the reefs at risk if these visits are not properly managed.

Although coral reefs cover only 0.2 percent of the ocean's area, they are an essential part of marine ecosystems, especially in the Caribbean and the South Pacific. By some estimates, coral reefs are home to as much as one-third of all marine fish species and thousands of other species. To humans, coral reefs represent crucial sources of income and natural resources through their role in tourism, fisheries, and as an important source of pharmaceutical compounds. As a vital source of fisheries, reefs yield as much as 6 million metric tons of fish annually. Approximately a quarter of the total worldwide fish production in developing countries comes from coral reefs. Reefs also provide critical protection to coastlines from storm damage, erosion and flooding by reducing wave action.

Coral reefs are threatened throughout the world's oceans. A recent analysis by the World Resources Institute (WRI), in collaboration with the International Center for Living Aquatic Resources Management (ICLARM) and the World Conservation Monitoring Centre (WCMC) estimated that 58 percent of the world's reefs are highly or moderately threatened by human activity. More than 60 percent of the coral reefs in the Caribbean region are under threat.⁴⁰

Threats to these reefs include marine resource extraction, such as fishing and coral collection and harvesting; water quality degradation; both land-based and ship-based pollution; over-exploitation; coastal development; ship anchors and unmanaged tourist activity.

Cruise ships can pose a direct threat to coral reefs by damaging them with their anchors or even accidentally hitting the reef with the ship's hull. A single cruise ship's anchor and chain can weigh as much as five tons (4.5 metric tons) and can damage up to 2,100 square feet (195 square meters) of ocean bottom at a single anchorage site on a calm day with no swell or current.⁴¹

Many cruise ship shore excursions from Caribbean ports include at least one visit to a coral reef. Small tour boats anchoring on or near the reefs can cause damage, while cruise passengers may harm the reefs by touching, walking and standing on the coral or breaking off pieces for souvenirs.

Response

Along with the invaluable biodiversity contained within and protected by coral reefs, they are also a chief attraction for cruise passengers. A diseased or damaged reef reduces the quality of a destination and thus the quality of the cruise line's product. As shore excursions, particularly to marine parks, become increasingly popular, cruise lines are realizing the value of maintaining and protecting coral reefs. For cruise ship companies, the response to this issue is two-pronged: how to prevent damage to

the coral reefs and how to contribute to conserving and restoring the reefs.

According to ICCL, wastewater discharges should occur at no less than four miles (6.4 kms) from a coral reef. Cruise ships are now given specific instructions as to where anchoring can avoid damaging a coral reef. In short, ICCL states that anchoring by cruise ships is not done indiscriminately.

In order to protect the Great Barrier Reef in Australia, Royal Caribbean planned the itinerary of its Legend of the Seas ship so that all wastewater was held aboard the ship while in this area. Any wastewater that needed to be discharged was released at least 12 nautical miles (22.22 kms) to seaward from the reef, or landed in the port city of Cairns for treatment and disposal.⁴² In Bermuda, where some reefs extend as far as eight miles (13 kms) from the island, Royal Caribbean has adopted an additional restriction on its ship operations, prohibiting discharges within 20 miles (32 kms) of Bermuda.

In February 2003, Royal Caribbean also provided a grant to the Bermuda Biological Station for Research to study the impact of pollutants on coral health and to develop an early-warning diagnostic system for corals in Bermuda and other island nations.

Prior to shoreside excursions to coral reefs and other environmentally sensitive areas, Carnival Cruise Line onboard staff brief their guests on minimizing their impacts.

Another opportunity for cruise lines to contribute to the conservation of coral reefs is through partnering with local and international conservation organizations on projects and communications efforts to engage cruise lines and passengers in supporting coral reef protection. For example, in early January 2002, the United Nations Environment Programme (UNEP) and the International Coral Reef Initiative (ICRI) responded to the growing threats to Caribbean coral reefs by unveiling an awareness-raising initiative based on five new communication tools designed to help the tourist industry explain to their customers the importance of protecting coral reefs during their holidays.



CONCLUSION

The practices and procedures detailed in this report demonstrate that the major cruise lines have begun to respond effectively to the environmental challenges of the past decades. Nevertheless, much remains to be done to ensure that the rapidly growing demand for cruising does not overwhelm the very assets of a pristine environment that attract people to cruises and cruise destinations. Cruise lines should continue to pilot and implement leading practices for addressing their environmental impact, seek partnerships with non-governmental and scientific organizations to better understand their impact and seek ways to make the industry a sustainable model for the future of tourism and shipping.



ENDNOTES

- ¹ Initial Report on the Cruise Industry (Madrid: World Tourism Organization, 2001)
- ² Cruiserver Web site <http://www.cruiserver.net>
- ³ “Marine Pollution – Progress made to reduce marine pollution by cruise ships, but important issues remain,” GAO Report to Congressional Requesters (GAO/RCED-00-48) February 2000 <http://www.gao.gov/new.items/rc00048.pdf> (January 2003)
- ⁴ Ann Toh, “Plan for Second Cruise Center Needs Scrutiny: PSA chief” Shipping Times April 6, 2000
- ⁵ Compiled from information of the International Council of Cruise Lines, Cruise Lines International Association and the web site <http://www.cruiserver.net>
- ⁶ Press release from the International Council of Cruise Lines, Oct. 11, 2002
- ⁷ Lloyd’s Maritime Information Services (LMIS) via the Web site of the Maritime International Secretariat Services <http://www.marisec.org/shippingfacts/keyfactsnoofships.htm> (February 2003)
- ⁸ Conversation with Captain Ted Thompson, Senior Vice President, International Council of Cruise Lines (January 2003)
- ⁹ “Marine Pollution – Progress made to reduce marine pollution by cruise ships, but important issues remain,” GAO Report to Congressional Requesters (GAO/RCED-00-48) February 2000 <http://www.gao.gov/new.items/rc00048.pdf> (January 2003)
- ¹⁰ Cruising Toward Sustainability: An Environmental Performance Report for the International Cruise Industry, (Arlington, Virginia: International Council of Cruise Lines, 2002), p. 14
- ¹¹ Dr. James Corbett, An Assessment of Air Pollution and Environmental Impacts from International Maritime Transportation including Engineering Controls and Policy Alternatives (Washington, DC: Environmental Protection Agency, April 2000)
- ¹² Alaska Cruise Ship Initiative: Part 2 Report, Alaska Department of Environmental Conservation, July 2001, p 8-9. 18 AAC 50.010 refers to the Alaska Administrative Code, Title 18. Environmental Conservation, Chapter 50. Air Quality Control, Section 10. Ambient Air Quality Standards.
- ¹³ Excerpt from the Wärtsilä Web site http://www.Wärtsilä.com/english/index.jsp?cid=en_envi_common&hid=09.07.04.05 (January 2003)
- ¹⁴ Andrew N. Cohen and James T. Carlton, Nonindigenous Aquatic Species in a United States Estuary: A Case Study of the Biological Invasions of the San Francisco Bay and Delta (Washington, DC: United States fish and Wildlife Service and the National Sea Grant College Program, 1995), p. 2
- ¹⁵ IMO Guidelines can be found at <http://globallast.imo.org>
- ¹⁶ AB 703 established the California Ballast Water Management for Control of Nonindigenous Species Act during the 1999 legislative session to address the introduction of nonindigenous aquatic species.
- ¹⁷ US Coast Guard guidelines can be found at <http://www.uscg.mil/hq/g-m/mso/mso4/>
- ¹⁸ Joint Hearing on the Implementation of the National Invasive Species Act, Subcommittee on Water Resources and the Environment, Subcommittee on Coast Guard and Marine Transportation, Committee on Transportation and Infrastructure Testimony of Allegra A. Cangelosi, Senior Policy Analyst, Northeast-Midwest Institute, May 15, 2002
- ¹⁹ *ibid*
- ²⁰ URS/Dames & Moore, Feasibility of Onshore Ballast Water Treatment at California Ports (San Francisco: A Study Conducted on behalf of the California Association of Port Authorities (CAPA) Pursuant to a Small Grant Assistance Agreement with the U.S. Environmental Protection Agency, September 2000)

ENDNOTES (CONTINUED)

- ²¹ Maurya B. Falkner, Report on the California Ballast Water Management Program (California State Legislature, California State Lands Commission, Marine Facilities Division, February 2003), p. 1.
- ²² Cruise Control: A Report on How Cruise Ships Affect the Marine Environment (Washington DC: The Ocean Conservancy, May 2002), p. 15-16
- ²³ Royal Caribbean estimate
- ²⁴ Annex IV to the International Convention for the Prevention of Marine Pollution from Ships (MARPOL 73/78) (London: The International Maritime Organization)
- ²⁵ EPA Vessel Sewage Discharge Program web site http://www.epa.gov/owow/oceans/vessel_sewage/ (February 2003)
- ²⁶ Alaska Department of Environmental Conservation, Cruise Ship Waste Disposal and Management web site <http://www.state.ak.us/local/akpages/ENV.CONSERV/press/cruise/cruise.htm> (February 2003)
- ²⁷ Royal Caribbean Environmental Report 2001, p. 2 http://www.royalcaribbean.com/asp/rc/nw/rcnw_aboutusintro.asp?s=F8050E44F3 (February 2003)
- ²⁸ June 20th 2002 press release, Celebrity Cruises, <http://www.celebritycruises.com/pressrelease.asp?s=9C928E4A35&xref=17094>
- ²⁹ U.S. Resource Conservation and Recovery Act. Section 1004 (5)
- ³⁰ Article 4, The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, as amended in 1996
- ³¹ Undated Carnival Corporation press release “Seakeepers, Eco-friendly dry cleaning are the latest Carnival Cruise Lines’ fleetwide environmental programs.”
- ³² Cited on the International Maritime Organization web site concerning the “Prevention of Pollution by Garbage from Ships”: http://www.imo.org/Environment/mainframe.asp?topic_id=297 (February 2003)
- ³³ Federal Register, IMO Special Areas, August 21, 1995 (Volume 60, Number 161) [Rules and Regulations][Page 43374-43378] <http://www.epa.gov/docs/fedrgstr/EPA-GENERAL/1995/August/Day-21/pr-551.html> (February 2003)
- ³⁴ *ibid*
- ³⁵ Undated Carnival Corporation press release “Seakeepers, Eco-friendly dry cleaning are the latest Carnival Cruise Lines’ fleetwide environmental programs.”
- ³⁶ Alaska Cruise Ship Initiative: Report of the Work Groups -- Wastewater and Solid Waste Handling, Air Emissions, Oil Spills Environmental Leadership, May 10, 2000, p. 18.
- ³⁷ Green Ports: Environmental Management and Technology at U.S. Ports (Alexandria, Virginia: American Association of Port Authorities, 2001), p. 44 <http://www.aapa-ports.org/govrelations/resources/index.html> (February 2003)
- ³⁸ *ibid*
- ³⁹ Email message to Scott Wayne from Captain William Wright, Senior Vice President, Royal Caribbean Cruise Lines, March 26, 2002
- ⁴⁰ Mark D. Spalding, Corinna Ravilious, and Edmund P. Green, World Atlas of Coral Reefs (Berkeley: University of California Press, 2001)
- ⁴¹ William Allen, “Increased dangers to Caribbean marine ecosystems: Cruise ship anchors and intensified tourism threaten reefs” *BioScience* Vol. 42, No. 5 May 1992
- ⁴² Royal Caribbean Cruise Line web site, press area http://www.royalcaribbean.com/asp/rc/nw/nf/rcnwnf_main.asp (February 2003)

ABOUT THE CENTER FOR ENVIRONMENTAL LEADERSHIP IN BUSINESS

The Center for Environmental Leadership in Business provides a new forum for collaboration between the private sector and the environmental community. Created in a partnership between Conservation International (CI) and Ford Motor Company, the Center operates as a division of CI and is governed by a distinct executive board of leaders from the business and environmental communities. The Center engages the private sector worldwide in creating solutions to critical global environmental problems in which industry plays a defining role. The Center's Travel & Leisure program works with leading tourism companies to integrate conservation principles into their day-to-day operations and to influence the planning and management of key tourist destinations. More information is available at www.celb.org.



ABOUT CONSERVATION INTERNATIONAL

CI believes that the Earth's natural heritage must be maintained if future generations are to thrive spiritually, culturally and economically. Our mission is to conserve the Earth's living natural heritage, our global biodiversity, and to demonstrate that human societies are able to live harmoniously with nature. Founded in 1987, CI is a global nonprofit organization, working in more than 30 countries on four continents. Practical and people-centered, we draw upon a unique array of scientific, economic, awareness-building and policy tools to help inhabitants of the Earth's biologically richest ecosystems improve the quality of their lives without depleting natural resources. More information is available at www.conservation.org.



ABOUT FORD MOTOR COMPANY

Ford Motor Company (NYSE: F) is a global leader in the automotive industry, selling more than seven million vehicles annually with approximately 335,000 employees in 200 markets on six continents. Its automotive brands include Aston Martin, Ford, Jaguar, Land Rover, Lincoln, Mazda, Mercury and Volvo. It has 110 wholly owned, equity-owned and joint venture manufacturing plants in 30 countries on six continents. Ford Motor Company also is committed to being a responsible corporate citizen, especially as it relates to environmental and safety matters. With world headquarters in Dearborn, Michigan, Ford Motor Company will officially observe its 100th anniversary on June 16, 2003. Additional information can be found on the company's web site at www.ford.com.

Ford Motor Company

Travel & Leisure Program
The Center for Environmental Leadership in Business

Conservation International
Suite 600
1919 M Street NW
Washington, DC 20036

www.celb.org
202.912.1000
info@celb.org



This paper was processed chlorine free