

EDUCATION AND AWARENESS: KEYS TO SOLVING
THE MARINE DEBRIS PROBLEM

Patty Debenham
Center for Marine Conservation
1725 DeSales Street, N.W.
Washington, D.C. 20036, U.S.A.

ABSTRACT

The Center for Marine Conservation (CMC)--formerly known as the Center for Environmental Education--is a nonprofit conservation organization. The CMC currently conducts a national education campaign on the problems caused by plastic debris in the marine environment. The campaign includes the development and distribution of educational materials to the commercial fishing, merchant shipping, and plastics industries as well as to recreational fishermen, pleasure boaters, and the general public. This program is sponsored in part by the U.S. National Oceanic and Atmospheric Administration's (NOAA), Marine Entanglement Research Program and The Society of the Plastics Industry. Also, under contract to NOAA, CMC distributes information through its National Marine Debris Information Office. The CMC also administers the National Marine Debris Data Base. With support from NOAA, the U.S. Coast Guard, and the U.S. Environmental Protection Agency, the CMC distributed 43,000 data cards to volunteers in all 25 coastal states. Information obtained from volunteer data collection efforts will become part of CMC's national analysis of marine debris data.

INTRODUCTION

There is virtually unanimous agreement that education is necessary to motivate groups and individuals to dispose properly of wastes, especially plastic waste. Several international conferences have stressed the need for marine debris education programs, including the 1984 International Workshop on the Fate and Impact of Marine Debris, the North Pacific Rim Fishermen's Conference on Marine Debris, and the Oceans of Plastic Fishermen's Workshop. Federal legislation entitled the Marine Plastic Pollution Research and Control Act of 1987 mandates that the U.S. National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency (EPA) conduct a 3-year public education program. The 1989 Interagency Task Force on Marine Debris encourages marine debris education: "Concerned federal agencies should work with each other, state

and local governments, private industry, and environmental groups to develop comprehensive educational materials on problems caused by marine debris and on ways to solve those problems" (Interagency Task Force on Persistent Marine Debris 1988).

The Center for Marine Conservation (CMC)--formerly the Center for Environmental Education (CEE)--knows that education will be the most effective method to alter 4,000 years of ocean disposal behavior. When mariners realize and understand the effects that their age-old habits have on wildlife and human and vessel safety, they are willing to make a change. Since 1985, the CMC has developed an education campaign that encourages all members of industry, the general public, and the maritime community to get involved. It publishes documents, organizes beach cleanups, and responds to requests for information that encourages groups and individuals to take part in the solution to ocean pollution.

GETTING THE MESSAGE OUT

Early Efforts at Education

Prior to 1984 there were only a handful of programs working to teach people about the problem of marine debris. Judie Neilson's "Get the Drift and Bag It" campaign was not only the first marine debris education program, but also a highly successful coastal cleanup in Oregon (Neilson 1985). Also in 1984, the Workshop on the Fate and Impact of Marine Debris produced several recommendations discussing the need for marine debris education programs (Shomura and Yoshida 1985). The concept of marine debris education was so new that in the workshop proceedings these education recommendations were hidden under the general category of "Report of the Working Group on Management Needs." The subcategory entitled "Public information and education" recommended:

"Recognizing that greater benefits are likely to be realized as a result of positive rather than negative incentives, (Working) Group participants urged that significant emphasis be placed upon public information and education and that steps specifically be taken to:

- "a. Work with fisheries organizations and the fishery management councils to develop and carry out comprehensive information and education programs for foreign fishermen, working within the exclusive economic zone, and U.S. fishermen;
- "b. Work with appropriate national and international organizations to undertake cooperative comprehensive information and education programs; and
- "c. Work with relevant industries, such as has been done with elements of the plastics industry, on public education programs."

The subcategory entitled "Debris cleanup" recommended:

". . . immediate steps to remove existing debris from the environment are clearly needed and concentrated efforts should be directed to reducing the rate at which new debris is deposited. The management steps recommended are:

- "a. To undertake cleanup programs to remove existing debris from shore areas and the water column;
- "b. To assign priority to areas where the density of debris is such that it affects endangered, threatened, or commercially valuable species;
- "c. To require that all potentially harmful debris be retained onboard vessels until proper disposal is possible;
- "d. To encourage the removal of debris from the environment and prevent the discarding of additional debris, positive incentives such as financial rewards for the return of discarded netting material should be considered as should possible negative incentives; and
- "e. To take such actions as may be necessary to assure the proper disposal of unwanted materials in a nonharmful manner."

These recommendations identified a need for marine debris education and provided the baseline for all future education programs.

Plastics Debris Problem

In 1986, the EPA commissioned CMC to prepare a report on the plastics debris problem in the marine and Great Lakes waters of the United States. As the first comprehensive review of available information on marine debris, this document showed that plastics debris is a nationwide problem for marine wildlife. The report identified the major ocean- and land-based sources of plastics debris, and indicated that the total amount of debris generated by these sources is unknown. The report noted the absence of appropriate laws to address the plastic debris problem (CEE 1987a). Finally, the study helped to redirect attention from general marine debris to those problems caused specifically by plastic items.

Upon completion of the document, CMC presented the report to members of The Society of the Plastics Industry (SPI), explaining that plastics debris was threatening wildlife and vessel safety in addition to being unsightly. The plastics industry accepted CMC's invitation to become part of the solution. The result has been the development of numerous brochures, books, and posters geared to promoting proper disposal of plastics at sea.

PUBLIC AWARENESS AND RESPONSE

Beach Cleanups

The CMC's most successful efforts have been its citizen beach cleanups in Texas and Florida. From 1986 to 1988, it organized the largest beach cleanups in American history, accounting for one-third of the nation's total participation. Diverse groups worked toward a common goal: industry provided financial and in-kind support; government and environmental organizations acted as regional coordinators; and the general public together with all these groups removed trash from the beaches.

Since 1984 there has been a steady growth in beach cleanup participation (Fig. 1). In 1984, Judie Neilson encouraged 2,100 Oregonians to clean the beaches. Nationwide during Coastweeks '88, more than 47,000 people participated in coastal cleanups. In 1989, we expect the participation to increase to 60,000, and our goal is to work with the states to encourage 100,000 citizens to clean the beaches by Coastweeks '92.

A beach cleanup is not just a 1-day event, but rather an ongoing education campaign. The CMC's volunteer data collection system is one mechanism that ensures continuing education. Beach cleanup data help identify possible sources and quantify the amounts of debris found by volunteers. Each cleanup volunteer receives a data card and a "Guide to Good Data Collection." The data card lists items volunteers will likely collect during a beach cleanup. The guide explains the importance of data collection and describes items that are found on most beaches yet are difficult to identify.

In Texas and Florida, volunteers work in pairs to share the tasks of debris collection and data recording. From volunteer data, the CMC published two reports on the Texas debris problem (CEE 1987b, 1988b). These reports document the sources of debris and include recommendations to reduce the marine debris problem. In some cases it is possible to attribute certain types of beach debris to a specific source. For example, volunteers found 4,170 plastic light sticks on Texas beaches in 1987. Fishermen commonly use light sticks to attract fish to their hooks. Although it is counterproductive to point accusatory fingers, CMC uses indicative data to encourage possible debris contributors to become active contributors to the solution.

Press generated from a cleanup also helps maintain the long-term education effects. Media coverage reaches people who may not donate their Saturday mornings to clean the beach, but may unconsciously discard their boat or beach trash. The CMC uses the media to remind the public that their plastic trash can have disastrous effects on marine wildlife. The 1986 Texas Coastal Cleanup campaign not only increased awareness among the general public, but also helped the Texas General Land Office initiate a statewide "Adopt-A-Beach" program.



Figure 1.--Volunteer participation during beach cleanups from 1984 to 1990.

National Marine Debris Data Base

In 1988, the CMC expanded its Texas data collection efforts to establish a National Marine Debris Data Base. With support from the EPA, NOAA, and the U.S. Coast Guard, CMC distributed 43,000 data cards to cleanup volunteers in all 25 coastal states. In addition, Spanish data cards were sent to cleanups in Puerto Rico, Costa Rica, and the Dominican Republic. The resulting data base is providing essential information for understanding specific debris problems in each part of the country. O'Hara's paper entitled "National Marine Debris Data Base" gives a detailed analysis of the preliminary results from the first nationwide assessment of coastal debris (O'Hara 1990). The CMC's final report will be out in June 1989.

The CMC's data base relies on volunteer cooperation, and CMC realizes that it is not the same as a rigorous scientific survey. Nonetheless, their data give consistent perspectives of the problem and indicate some

common trends. For example, in all states plastics account for between 55 and 65% of all debris types collected. In 1988, the fact that Florida volunteers collected 489.1 km (304 mi) of monofilament fishing line indicates a large (although not exclusive) contribution from the recreational fishing community. The data from Florida were used by Governor Bob Martinez and his staff to prepare an executive order to provide state enforcement of MARPOL Annex V and to research the use of degradable fishing line. Finally, data collected in 1988, prior to implementation of Annex V, will provide a baseline of information to measure loosely the effectiveness of international and national legislation to reduce ocean pollution.

Marine Debris Information Offices

Under contract to NOAA, CMC coordinates two marine debris information offices (MDIO). The first is in Washington, D.C., to serve the Atlantic coast and Gulf of Mexico. The second, in San Francisco, responds to Pacific coast inquiries. The CMC and NOAA created these offices in response to a growing number of requests for information on the marine debris problem. The MDIO functions to disseminate educational materials and other information on marine debris to government agencies, industry groups, educators, the press, and the general public. In most cases, requests for information fall into specific categories. To respond efficiently to these requests, 16 standardized educational packets were developed :

- General public.
- Teachers and educators.
- Elementary (kindergarten to fifth grade),
- Middle school, high school (6th to 12th grade) and college students.
- Beach cleanup information.
- Recreational fishermen and boaters.
- Press and media personnel.
- Plastics recycling and degradable plastics information.
- Cruise ship passengers.
- Fishermen and fish processors.
- Cargo vessel operators and crews.
- Offshore oil and gas (companies).
- Offshore oil and gas (workers).
- Plastics manufacturers and resin pellet producers.
- Port and terminal operators.
- Charter vessel operators.

All packets contain general information about the marine debris problem, with additional information specific to the requester's interest. From the establishment of the MDIO in October 1988 until 1 April 1989, CMC responded to 842 requests for information. Also available from the MDIO are numerous education materials developed by NOAA, SPI, and CMC as part of a national campaign to promote the proper disposal of plastics.

Chronologically, the first element of the joint educational campaign consisted of print public service advertisements developed for each of the



This discarded net is done fishing. But it's not done killing.

When worn fishing nets or other plastic gear is dumped or lost in the water, something else happens: animals die.

Seabirds get caught in nets when diving for food, and drown. Other marine animals become entangled in them and slowly strangle.

Discarded nets and traps even compete with you, by needlessly catching and killing millions of pounds of potentially valuable fish and shellfish.

In addition, plastic wastes can foul propellers and block cooling intakes, causing costly vessel disablement.

Over 100,000 tons of plastic fishing gear are dumped into our oceans every year. This critical issue is destined to attract increasing public and government scrutiny if we fail to take action to solve it.

So please, alert your dock operators that you'll need trash facilities, because you're saving your plastic trash and worn out gear for proper disposal on land. That's not all you'll be saving.

To learn how you can help, write: Center for Environmental Education, 1725 DeSales Street, N.W., Suite 500, Washington, D.C. 20036.

A public service message from
The Center for Environmental Education
The National Oceanic and Atmospheric Administration
The Society of the Plastics Industry

Figure 2.--Commercial fishing public service advertisement.

following groups: commercial fisheries (Fig. 2), merchant shippers (Fig. 3), the plastics industry (Fig. 4), recreational boaters (Fig. 5), and recreational fishermen (Fig. 6). To date these ads have appeared in 30 magazines and major trade journals in addition to several regional and local publications including National Fisherman, Marine Log, Modern Plastics, Outdoor Life, and Saltwater Sportsman. Each advertisement directs interested persons to the MDIO for more information about marine debris. The MDIO in turn responds to each request by sending the appropriate information packet and relevant materials.

Each public service advertisement has a corresponding eight-panel brochure with more information on how marine debris affects that particular group. For example, commercial fishermen may be more interested in the fact that discarded gillnets will foul their propellers rather than in the effects the nets may have on seals, which in some cases are viewed as competitors. Groups often request large quantities of brochures for their own distribution. To date, the MDIO has distributed over 60,000 brochures to educators, individuals, and the government, including 15,000 National Safe Boating Week press packets, 8,000 for National Fishing Week, and 3,000 to Coast Guard port captains.

A Citizen's Guide to Plastics in the Ocean: More Than a Litter Problem is another product of the cooperative NOAA, SPI, and CMC campaign that is now available through the MDIO (CEE 1988a). The book informs citizens of the growing problem of plastics in the ocean and gives suggestions on how individuals can become involved in solving this problem. The MDIO has distributed 19,000 copies of this guide since September 1988, including 5,000 copies to the U.S. Navy as part of their educational package on marine debris. Due to the popularity of the book, it is now ready for a second printing that will contain more current information on Annex V and new initiatives to stop plastic pollution at sea.

The MDIO also distributes materials produced by other groups. Recht's (1988) Reference Guide for Ports is a valuable source of information on how ports can comply with the requirements of MARPOL Annex V and the U.S. Marine Plastic Pollution Research and Control Act of 1987. Figure 7 shows the most current version of the MDIO order form with the most frequently requested educational materials.

The CMC staff believe that each person requesting information is a potential grassroots organizer able to educate others about the problems of plastic debris. The staff cultivates each request and acts to network people and information. The elementary school information packet uses a "Playa Pen Pal" program to network even the youngest requests ("playa" means beach in Spanish). All children who ask for information receive the names and addresses of the last three children who wrote in, and are encouraged to exchange information about marine debris in their part of the country with their playa pen pal.



When it's done holding your ship's garbage, it could hold death for some marine animals.

This plastic trash bag may not look like a jellyfish to you. But to a hungry sea turtle, it might. And when the turtle swallows an empty bag, the mistake becomes fatal.

The problem is more than bags. Plastic six-pack holders sometimes become lodged around the necks and bills of pelicans and other seabirds, ultimately strangling or starving them. Other plastic refuse, either through ingestion or entanglement, causes the deaths of thousands of seals, whales, dolphins and other marine mammals every year.

Plastic debris also causes

costly and potentially hazardous delays to shipping when it fouls propellers or clogs intake ports.

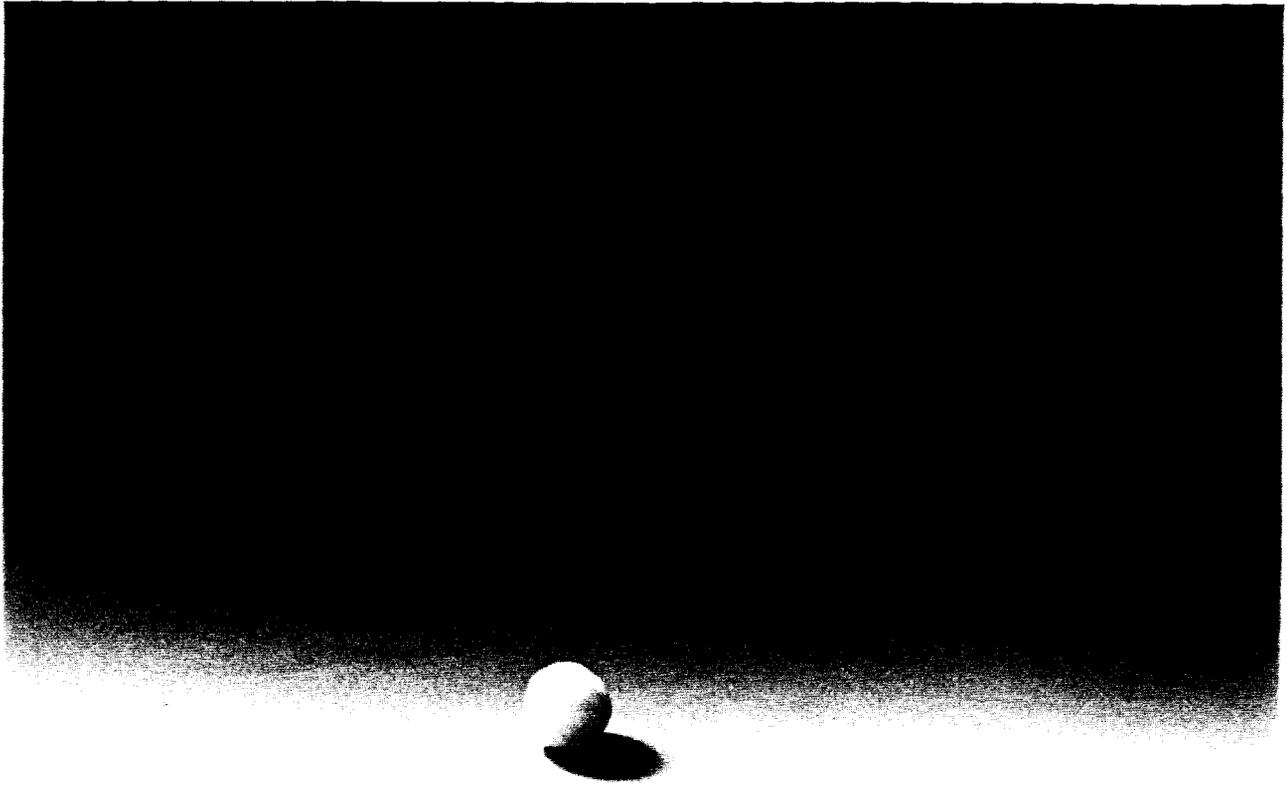
It's a critical issue, destined to attract public and government scrutiny if we fail to take action to solve it.

So please, stow your trash, and alert your shipping terminals that you will need proper disposal on land. A sea turtle may not know any better. But now, you do!

To learn how you can help, write: Center for Environmental Education, 1725 DeSales Street, N.W., Suite 500, Washington, D.C. 20036.

A public service message from
The Center for Environmental Education
The National Oceanic and Atmospheric Administration
The Society of the Plastics Industry

Figure 3.--Commercial shipping public service advertisement.



A seabird could mistake this resin pellet for a fish egg. And die.

One little pellet may be insignificant to your plastics processing operation. But to thousands of seabirds, it could lead to a fatal error.

These pellets, in many shapes and sizes, can be washed down drains as waste or reject material, or spilled in the course of normal handling. But ultimately, they may find their way to bodies of water, where the real trouble begins.

When eaten in sufficient quantity by a seabird, they can block digestion or sometimes fool the bird into thinking it is not hungry, causing eventual starvation. Fish and sea turtles

can suffer the same fate.

The growing problem of plastic trash in our oceans threatens more than wildlife. This critical issue is destined to invite increasing public and government scrutiny unless we take action to solve it.

So please: see that resin pellets are reclaimed or disposed of properly. If we ignore the problem, we—like the unfortunate seabird—will be making a serious mistake.

To learn how you can help, write: The Society of the Plastics Industry, 1275 K Street, N.W., Suite 400, Washington, D.C. 20005.

A public service message from:
The Center for Environmental Education
The National Oceanic and Atmospheric Administration
The Society of the Plastics Industry

Figure 4.--Plastics industry public service advertisement.



This discarded line is done fishing. But it's not done killing.

Carelessly discarded plastic fishing line can keep working long after you're done with it—entangling birds, seals, sea turtles, and other animals.

And because plastic line is strong and durable, it's nearly impossible for these animals to break free. They strangle, drown, or starve. That's not sporting.

Some birds even use old fishing line in their nests, creating death traps for their young.

Other plastic debris can be dangerous, too. Fish, birds, and seals become entangled in six-pack rings. Sea turtles eat plastic bags—which they mistake for jellyfish—and suffer internal

injury, intestinal blockage, or death by starvation. Birds are known to ingest everything from small plastic pieces to plastic cigarette lighters and bottle caps.

Plastic debris also can foul boat propellers and block cooling intakes, causing annoying—sometimes dangerous—delays and causing costly repairs.

So please, save your old fishing line and other plastic trash for proper disposal.

That's not all you'll be saving. *To learn more about how you can help, write: Center for Environmental Education, 1725 DeSales Street, N.W., Suite 500, Washington, D.C. 20036.*

A public service message from
The Center for Environmental Education
The National Oceanic and Atmospheric Administration
The Society of the Plastics Industry

Figure 5.--Recreational fishing public service advertisement.



Tossing this trash overboard could leave death in your wake.

Throwing a few plastic items off a boat may seem harmless enough. What's one more six-pack ring, plastic bag, or tangled fishing line?

Actually, it's one more way a fish, bird, seal, or other animal could die.

Fish, birds, and seals are known to strangle in carelessly discarded six-pack rings. Sea turtles eat plastic bags – which they mistake for jellyfish – and suffer internal injury, intestinal blockage, or death by starvation.

Other plastic trash can be dangerous, too. Birds are known to ingest everything from small plastic pieces to plastic cigarette lighters

and bottle caps.

Birds, seals, sea turtles, and whales die when they become trapped in old fishing line, rope, and nets.

Plastic debris also can foul boat propellers and block cooling intakes, causing annoying – sometimes dangerous – delays and causing costly repairs.

So please, save your trash for proper disposal on land.

That's not all you'll be saving.

To learn more about how you can help, write: Center for Environmental Education, 1725 DeSales Street, N.W., Suite 500, Washington, D.C. 20036.

A public service message from
The Center for Environmental Education
The National Oceanic and Atmospheric Administration
The Society of the Plastics Industry

Figure 6.--Recreational boating public service advertisement.

NOAA'S MARINE DEBRIS INFORMATION OFFICE
OPERATED BY THE CENTER FOR MARINE CONSERVATION
EDUCATION MATERIALS LIST AND ORDER FORM

Name _____

Organization _____

Address _____

Phone _____

The National Oceanic and Atmospheric Administration's (NOAA) Marine Debris Information Office distributes educational materials about the effects of plastic in the ocean and about MARPOL Annex V. The materials are free to the public unless otherwise stated. Please order only what you will honestly use because we do have limited quantities.

INFORMATIONAL PACKETS - Choose 4 types (limit 2 packets each)
 We have developed a number of informational packets to meet the needs of different interest groups, however the packets do contain the same basic information.

	Qty.
<u>Elementary School Student</u>	_____
<u>Middle, High and College Students</u>	_____
<u>Teachers or Other Educator</u>	_____
<u>General Public</u>	_____
<u>Beach Cleanup</u>	_____
<u>Plastics Recycling and Degradability</u>	_____
<u>Offshore Oil and Gas Industry</u>	_____
<u>Recreational Boating/Fishing</u>	_____
<u>Commercial Shipping</u>	_____
<u>Port and Terminal Operator</u>	_____
<u>Press and Media Personnel</u>	_____
<u>Plastics Manufacturers/Resin Pellet Producer</u>	_____
<u>Cruise Ship Passenger</u>	_____
<u>Commercial Shipping</u>	_____

BROCHURES - Up to 200 free
 These are 8-panel brochures discussing the problems caused by plastic as related to the interest group mentioned in the title.

<u>Recreational Boating - "Tossing this..."</u>	_____
<u>Recreational Fishing - "This discarded..."</u>	_____
<u>Commercial Shipping - "When it's done..."</u>	_____
<u>General Public - "Our Planet is..."</u>	_____

PACIFIC COAST OFFICE: 312 Sutter St., Suite 606, San Francisco, CA 94108 (415) 391-6204 FAX (415) 956-7441
 ATLANTIC GULF COAST OFFICE: 1725 DeSales St., NW, Washington, DC 20036 (202) 429-5609 FAX (202) 872-0619

Figure 7.--Current version of NOAA's Marine Debris Information Office order form.

**ASSESSING THE IMPACT OF THE CENTER FOR MARINE
CONSERVATION'S EDUCATIONAL PROGRAMS**

Although empirical evidence shows us that hands-on programs are the best form of education, the CMC's 1989 Saltonstall-Kennedy (SK) grant will demonstrate the actual effects of its education programs. Prior to conducting any education events, CMC distributed surveys to a random sample of commercial and recreational fishermen in four designated test areas: Hampton, Virginia; Martin County, Florida; Bayou La Batre, Alabama; and Taylor County, Florida (as a control group). Wallace (1990) of Kearney-Centaur Associates discusses the results of this first SK survey in the paper entitled: "How Much Do Commercial and Recreational Fishermen Know About Marine Debris and Entanglement? Phase 1."

From March to July 1989, the CMC will conduct concentrated educational activities within three of the test areas, excluding the control area of Taylor County, Florida. It will adapt educational activities to accommodate regional differences, style, and events. For example, a large percentage of Martin County, Florida's, recreational fishing community will participate in or attend Arthur Smith Kingfish, Dolphin, Wahoo Fishing Tournament. In addition to providing educational materials to tournament participants, CMC will involve spectators by conducting "Stow It, Don't Throw It" raffle contests for such prizes as boat coolers and fishing reels.

The CMC will distribute a revised version of the survey upon the conclusion of these educational programs. The second survey developed by Kearney-Centaur Associates will assess the impacts of CMC's educational activities. It believes the survey results will statistically demonstrate increased public awareness.

The CMC makes one primary assumption in its approach to solving the marine debris problem. It believes that education will motivate people to alter any harmful disposal behavior. Enforcement of international and national legislation will be very difficult. Marine debris research is both expensive and difficult to conduct in the ocean environment. The CMC feels that education in the form of publicity, books, and if possible hands-on educational events such as beach cleanups will encourage people to keep harmful trash out of the water.

REFERENCES

Center for Environmental Education.

1987a. Plastics in the ocean: More than a litter problem. Center for Environmental Education, Wash., D.C., 128 p.

1987b. 1986 Texas coastal cleanup report. Center for Environmental Education, Wash., D.C., 52 p.

1988a. A citizen's guide to plastics in the ocean: More than a litter problem. Center for Environmental Education, Wash., D.C., 131 p.

1988b. 1987 Texas coastal cleanup report. Center for Environmental Education, Wash., D.C., 105 p.

Interagency Task Force on Persistent Marine Debris.

1988. Report of the Interagency Task Force on persistent marine debris. May 1988, Wash., D.C., 168 p.

Neilson, J.

1985. Get the drift and bag it: A nuts and bolts guide to organizing a beach cleanup campaign the easy way, June 1985; Portland, Oregon, 12 p.

O'Hara, K. J.

1990. National marine debris data base: Findings on beach debris report by citizens. In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. [See this document.]

Recht, F.

1988. Dealing with Annex V. A reference guide for ports. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-F/NWR-23, 132 p.

Shomura, R. S., and H. O. Yoshida (editors).

1985. Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54, 580 p.

Wallace, B.

1990. How much do commercial and recreational fishermen know about marine debris and entanglement? Phase 1. In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. [See this document.]