Northwest and Alaska Fisheries Center

National Marine Fisheries Service

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Report on a Port-Based Project to Reduce Marine Debris

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NOTICE

REPORT ON A PORT-BASED PROJECT TO REDUCE MARINE DEBRIS

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REPORT ON A PORT BASED PROJECT TO REDUCE MARINE DEBRIS

This report is dedicated to the fishermen of Newport, Oregon and to port harbormaster Bud Shoemake and crew, who created a remarkable model.

The author wishes to acknowledge the help and support of the Port of Newport, the members of the Marine Refuse Disposal Project Advisory Group, the Oregon State University Extension/Sea Grant Program, the Marine Entanglement Research Program, the Oregon State University Marine Resources Management Program, and my friends.

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INTRODUCTION

New U.S. law requires operators of port or docking facilities to provide adequate refuse reception facilities for their vessels. Failure to do so by December 1988, as determined by Coast Guard inspections, may result in restriction or closure of port operations. The new law is entitled the Marine Plastic Pollution Research and Control Act (MPPRCA 1987) and implements the provisions of an international treaty called Annex V of MARPOL (The International Convention for the Prevention of Pollution from Ships).

This harsh sounding measure is designed to end a serious and pervasive ocean pollution problem-- plastic debris. The convenience of the ocean as a disposal site and the perception of the ocean as limitless have long made ocean disposal of wastes common place. Only recently have the extent and effects of this marine debris problem been recognized. In the early 1970's the National Academy of Science estimated that 6.4 million metric tons of garbage were being discarded into the ocean each year from vessels alone (1). Each year as much garbage enters the oceans of the world as there are fish caught in the United States!

A growing proportion of this garbage is plastic, virtually non-degradable in the ocean. Now even the ocean's vastness can't hide this persistent material. The remotest beaches in the Arctic and surface waters in the middle of the oceans are littered with plastic items from cargo, petroleum, and fishing industry operations, as well as crew generated packaging materials and the small plastic resin pellets from which all other plastic items are manufactured (2).

Economic losses are experienced by mariners and lives are threatened when propellers are fouled with ropes, sheeting and nets or when water intakes are blocked by plastic bags and sheeting. These problems are well known to mariners and seem quite common. Three studies of problems related to debris were conducted as part of the work of this project (see appendix pg.41). Of the 90 fishermen interviewed at a trade show held in Seattle, Washington in 1987, 64% had experienced vessel problems due to plastic debris and had incurred an average cost of $1910 for repairs and lost fishing time. Similarly, 58% of the 102 commercial fishermen interviewed in Newport, Oregon had debris related problems, with costs averaging $2725 per vessel. Almost one out of every five of the 280 sports fishermen surveyed in Newport also reported problems with plastic garbage. The average repair bills for these 52 boats were $100.

Other economic concerns are noted by coastal states such as New Jersey and Texas as a growing amount of debris litters their beaches, causing losses in tourism revenues and requiring many millions of dollars in clean-up efforts (3).

Millions of marine mammals, sea turtles, seabirds, and fish die each year from entanglement in or ingestion of plastic debris. Animals are entrapped in such common items as fish net, line, rope, cargo strapping bands, monofilament line, and six-pack loop connectors. Items ingested include plastic bags, sheeting, plastic resin pellets, packing materials, small plastic items such as cigarette lighters, and the pieces resulting from the disintegration of styrofoam and hard plastic items.

Some studies such as those done by Dr. Charles Fowler and others for the National Marine Fisheries Service (NMFS) in the Pribilof Islands of Alaska (4), indicate that entanglement may be a principle cause of mortality for the threatened northern fur seal population whose numbers may decline by as many as 50,000 animals a year. Other marine mammal populations may be similarly effected. Entanglement of the protected brown pelicans in monofilament line is considered a major problem by the U.S. Fish and Wildlife Service (5). In the North Pacific, entanglement of other sea birds such as auklets, puffins, murres, and shearwaters has been noted. Hundreds of sea birds at a time have been observed entangled in lost or abandoned pieces of high seas gill nets (6). The entrapment of sea-turtles in pieces of net and line has also been documented (7).

Plastic items are ingested by many marine organisms either non-selectively during normal feeding operations or by choice when plastic items are mistaken for their preferred food items. Large quantities of ingested plastic may cause intestinal blockage, may damage intestinal walls or may cause nutritional problems by creating a false feeling of satiation, or by reducing the absorption of nutrients (8,9). Studies conducted by Day and others show that at least 50 of the world's 280 seabird species are known to ingest plastics (10). The Smithsonian Institute reports nine species of whales and dolphins known to have ingested plastic bags (11). NMFS studies also show that five species of sea-turtles, all considered threatened or endangered, commonly ingest plastic bags and sheeting, apparently mistaking these items for their jellyfish prey (12).

Because of international concern over these impacts, Annex V of MARPOL was ratified by the United States in December, 1987. Having received the required ratification by 27 nations representing 50% of the world's shipping tonnage, Annex V of the treaty becomes binding in December, 1988. It prohibits vessels from signatory nations from disposing of

any plastic material into the ocean (as well as other materials, depending on distance from shore and location, see Appendix 9). It also requires that adequate refuse reception facilities be available in these nations' ports so that vessels can dispose of these retained materials.

Restriction of disposal of plastic at sea coupled with convenient means to get rid of this refuse upon return to port are basic to solving the marine debris problem. Education is also widely recognized as essential. Title II of the MPPRCA calls for an outreach program to educate boaters, fishermen, other users of the marine environment, and the general public about plastic pollution and its effects and remedies. This public education program is to be coordinated by the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, and the U.S. Coast Guard.

PROJECT BACKGROUND

The NMFS Marine Entanglement Research Program realized that the nation's ports would play a crucial role in ending the marine debris problem. In order to provide information and guidance to ports, they funded a pilot port program related to the development of refuse reception facilities and mariner awareness.

The goals and outline for such a pilot project were refined through the coordinated efforts of NMFS, West Coast trawl fishermen, the Oregon State University Extension/Sea Grant Program and the Port of Newport. This project was conducted at the Port of Newport, Newport, Oregon from January 1987 through March 1988. It was called "The Marine Refuse Disposal Project". NMFS granted a total of $97,000 and the Port of Newport pledged $28,780 in-kind support to the project.

DEMOGRAPHICS

Though the Port of Newport was relatively small in size, its diversity and activity were anticipated to be able to provide experiences applicable to ports both larger and smaller. Newport is a city of 8300 people located on the central Oregon coast. Commercial fishing is of prime importance to the area's economy and is supported by many marine industries and suppliers. This work brought $84 million dollars in income to the local area in 1987 (13). Forestry, recreational fishing, and tourism also contribute significantly to the area economy. The Port of Newport is important to all these industries. It supplies moorage and services to between 200 and 800 commercial fishing vessels, operates a launch ramp and a 600 berth recreational vessel marina which caters to about 1400 recreational fishermen

annually, and has a two-berth deep draft shipping terminal which loads 20 or more ships and barges with logs and lumber for domestic and foreign markets. The commercial vessel moorages, the recreational vessel marina, and the shipping terminals occupy physically distinct areas of the port property, and are managed separately.

Commercial fish landings in Newport are among the highest on the West Coast. Between 26 and 48 million pounds of shrimp, groundfish, salmon, crab, tuna, and scallops are delivered annually to the fish processing plants by trawlers, draggers, trollers, and pot fishermen. These fish are sold for an ex-vessel value of between $9 and $21 million dollars (14). Additionally, Newport is a major port for the vessels of the "Distant Water Fleet"- those trawl fishermen who fish in joint venture operations with foreign nations, principally off Alaska. In contrast to the commercial fleet, whose vessels are fished year round by community members, about 75% of the recreational fishermen live out of town, making use of their vessels predominantly during late spring through early fall weekends and vacation time.

OBJECTIVES

The objectives of the Marine Refuse Disposal Project were expressed in the grant proposal prepared in cooperation with Oregon State University Extension/Sea Grant Program, and submitted by the Port of Newport to the NMFS Marine Entanglement Research Program. The Port was to establish convenient refuse reception facilities and encourage the use of those facilities by educating port users and the community about the marine debris problem. The lessons learned while conducting the project were to be reported in a manner which would allow other ports to budget and plan according to our experiences.

The grant outlined these objectives as five tasks:

Task 1

Determine the extent and scheduling of the labor and equipment needed and arrange these services so each vessel returning to port has the opportunity to off-load its non-biodegradable refuse.

Develop an efficient system for vessels to communicate their needs to the waste management operators.

Undertake such advertising and annoucements as necessary to notify mariners and the public of the purpose for and the availability of the refuse reception services and to encourage their use.

Task 2

Maintain a complete record of all services rendered and expenses incurred in the set-up and operation of the prototype system.

Task 3

Devise, but not enact, schedules of charges, taxes, levees or other revenue generating mechanisms as may be suitable to pay for the refuse reception system.

Task 4

Solicit and record vessel owner and operator reactions to the system and its intent.

Task 5

Provide NMFS with a detailed report of the entire project such that other ports considering the development of similar systems may derive maximum benefit from this experience.

METHODS

The methods which were used to accomplish these multiple objectives were varied and are presented below according to task.

Task 1

(Provide refuse reception services, assure mariner/port communication, encourage awareness/use of services).

Annex V of MARPOL requires ports to provide adequate refuse reception facilities for their vessels. As some refuse reception facilities and services were already provided at the Port of Newport, an assessment of the existing system was needed. We defined "adequate" in terms of service and capacity: reception facilities should be located close to the vessels, be easy to find and use, and be able to accept the full volume and types of non-degradable refuse that vessels needed to dispose of. As we identified the needed improvements, we also kept in mind cost effectiveness.

The following methods were used to evaluate and improve our refuse system and solicit the input of mariners:

1. Discussed and analyzed refuse facility needs, problems, and improvement ideas with fishermen, port workers, and port management.

2. Identified refuse materials likely to be returned to port through discussions, observations or studies of refuse composition, refuse volume and vessel refuse handling/containment methods.

3. Surveyed refuse handling costs and investigated options by studying:
   a. past refuse disposal cost records to understand and assess refuse volume and cost patterns.
   b. costs for various types of containers and hauling schedules.
   c. costs for the services provided by different refuse companies and for different disposal options.
   d. laws and regulations applicable to refuse service and handling.
   e. port labor involvement required by different options.

4. Identified ways to improve service, maximize efficiency, minimize costs, and benefit community by:
   a. surveying on hand equipment, labor, and port services which could be used to improve refuse service.
   b. involving port personnel in efforts to plan improvements in services and facilities and keep records.
   c. identifying and investigating the need, markets, and services available for recycling and reusing waste resources.
   d. considering the efficiency of other handling/hauling options as the use of compactors, the use of the port's own garbage truck, or refuse sorting measures.

5. Investigated refuse handling services or potential at other places that serve mariners, e.g. fuel docks and fish processing plants or buying stations.

The following methods were used to inform and educate port users and the public about the marine debris problem and to motivate mariners to use the port refuse reception facilities:

1. Formed an advisory group whose members served to inform mariners and community members about the debris issue and generate peer pressure. Members were chosen to represent port users, port management, extension, fish and wildlife, enforcement, and boating safety groups, as well as refuse and recycling interests, the schools, and the community.

2. Encouraged the use of trash compactors and simple refuse containers on board the vessels.

3. Prepared and distributed written information such as press articles, signs, notices, letters, brochures, and resource lists.

4. Prepared and distributed visual and auditory information such as radio and tv public service annoucements, posters, and photographic displays, and granted interviews to radio and tv programs.

5. Prepared and distributed promotional items such as decals, stickers, clothing, and coloring books.

6. Encouraged dialogue and involvement through slide shows and presentations, survey taking, and discussions with port users.

7. Encouraged participation building/awareness generating activities such as distributing posters and brochures, speaking to peers, teaching classes, coordinating and participating in beach clean-up activities and debris studies, evaluating and improving refuse facilities, and participating in media and promotional events.

8. Promoted interagency cooperation in marine debris educational efforts by conducting presentations, providing ideas and resources to encourage agency action, and by supplying information for agency newsletters and activities.

9. Gave presentations, provided information and suggested activities to involve and educate school children and their teachers.

Task 2

(Keep complete records of the costs and services involved).

Marine Refuse Disposal Project Activities were recorded by keeping daily records of activities, maintaining copies of all work, bills, and correspondence, and by the preparation of periodic progress reports.

Task 3

(Determine the charges necessary to recover costs).

Under interpretation of the MPPRCA of 1987, ports will be allowed to recover the costs for setting up and operating refuse reception facilties. In order to assess what charges might be necessary, records of costs for the Port of Newport's refuse reception facilities and services were gathered and analyzed on the basis of estimates of port use.

Task 4

(Assess the reactions of mariners to refuse system/intent).

Vessel owners were surveyed through the mail and vessel owners and operators were surveyed on the docks, with oral and written surveys to obtain their initial ideas and suggestions and to solicit their responses as changes were made. Reactions to the system were also solicited more informally by initiating discussions with port users on the docks on a periodic basis.

At the end of the project a final opinion and comment survey was conducted to record vessel owners' and operators' reactions to the marine debris program and the refuse facilities.

Task 5

(Report experiences).

Periodic and detailed progress reports were submitted to the National Marine Fisheries Service. The appendix of each report contained copies of materials prepared or used during each reporting period. Additionally, as studies were completed, the results were reported to NMFS for their use. Copies of papers presented at conferences were also provided NMFS to update project progress. Finally, this summary report, another report entitled "Dealing with Annex V- Reference Guide for Ports" and a videotape called "The Marine Refuse Disposal Project"* will provide information that will assist other ports meet their refuse reception obligations.**

* This 9 minute videotape was produced by NMFS in conjunction with Barry Fisher, Yankee Fisheries, The Highliners Association, and the Oregon State University Extension/Sea Grant Program.

** See ordering information on page 22.

RESULTS

Pilot project results are reported below according to task.

TASK 1

(Provide refuse reception services, assure mariner/port communication, encourage awareness/use of services).

The surveys, discussions, and investigations conducted to evaluate refuse reception needs indicated some improvements were required in the refuse reception systems in each of the port areas-- the shipping terminals, the commercial fishing vessel moorages, and the recreational marina. The changes made at the recreational and commercial moorages are summarized in Tables 1 and 2 respectively and discussed below.

Changes required at the shipping terminals have not yet been accomplished. Sterilization or incineration facilities which conform to Department of Agriculture Animal and Plant Health Inspection Service (APHIS) requirements will need to be established. An investigation of these requirements was undertaken (see Appendix 8).

At the recreational vessel marina and at the moorages serving commercial fishing vessels changes were made to provide mariners with refuse reception facilities which are more convenient, ample, and comprehensive (see Diagrams 1 and 2). Refuse reception capacity for the commercial fishing vessels was increased by establishing areas for refuse adjacent to a dock where a hoist was available and on a barge (see Diagram 2 D,E). Additional refuse reception capacity also resulted from increases in the size or number of containers available to the recreational and commercial vessels on land-accessed docks (2B), at the head of each of the ramps providing access to floating docks (1A,2A), and on the boat launch ramp (1B). Windscreens and compounds were built around the refuse containers at the access and launch ramps (1A,B, 2A) to make the facilities less visible and less accessible so as to discourage the disposal of home generated refuse and maintain the aesthetic qualities of the waterfront. Refuse disposal facilities are completely accessible to mariners however, and are located as close to the vessels as possible while still allowing the access of the equipment needed to empty them.

Use of larger refuse containers at the recreational marina allowed the port to reduce the time required to handle refuse by about half and take better advantage of refuse company services. Changes in the refuse system at the commercial moorages also reduced the port labor required to handle refuse containers by half, allowing expansion of

worker duties into recycling tasks. Recycling bins or space for fishermen to put recyclables have been made available on a barge (2D), adjacent to the refuse containers (2A), and in the hoist dock area (2E) for use by the fishermen.

These recycling facilities accept items of net, line, cable, wood, metal, and cardboard. It is estimated that the port's capacity to receive plastic refuse has been increased by at least a third by having these large volume items diverted from the refuse containers. As mariners, recyclers, residents, and tourists find these collected materials desirable, they remove them from the port at no charge, resulting in decreased solid waste disposal costs. A small amount of revenue is even generated by the sale of the unwanted metal items. This recycling system has therefore allowed and encouraged vessels to conveniently dispose of a full range of waste materials (used-oil recycling has also been expanded).

On-board storage of refuse was facilitated by encouraging the development of convenient, inexpensive trash containers for vessels and the use of trash compactors. Compactor use was studied (Appendix 7) and proved to be a useful means of containing refuse on the larger vessels which spend long periods of time at sea. The SEARS corporation was encouraged to make trash compactors available to vessels at reduced rates. They have agreed to provide them to all ocean going vessels in the United States at near cost.

The involvement of the port refuse workers in the evaluation and planning of the refuse reception system, resulted in increased awareness and dedication of the workers to the refuse tasks. This dedication improves both efficiency and service. Port employees make sure full refuse containers are quickly emptied, misplaced recyclable materials are sorted, and refuse is efficiently distributed and compacted in the dumpsters.

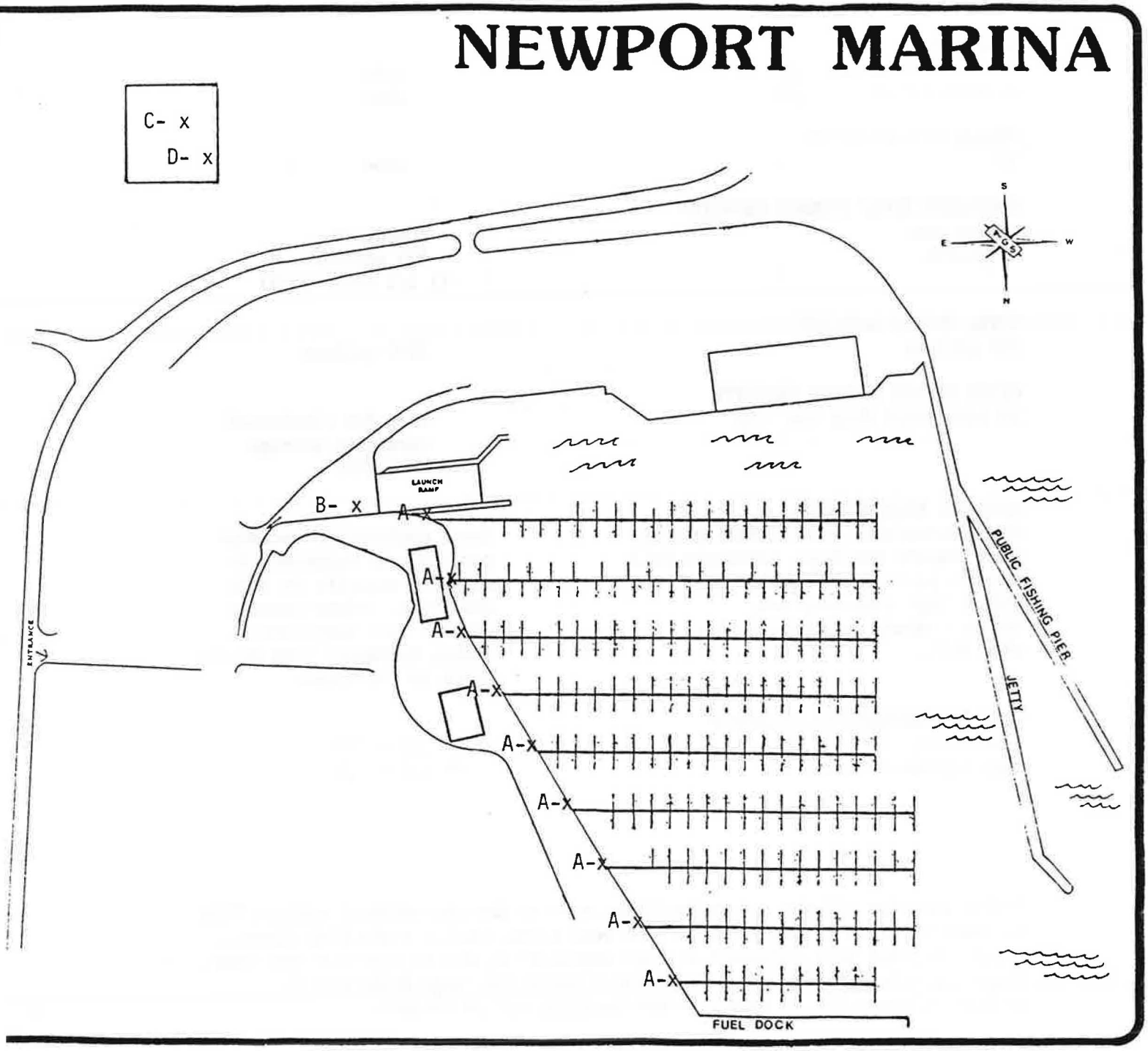
To generate awareness and promote the use of these facilities, much time was spent talking with port users to inform and motivate them. A wide variety of informative materials was also produced and used (see Appendix 1). Additionally many of the port's users and other community members helped promote awareness of the marine debris issue. Many served on the project's advisory group, helping to plan and coordinate activities, some distributed posters and brochures, arranged seminars and displays, talked with their peers, and spoke to school classes. Advisory group members and others also promoted the program by wearing project hats and sweatshirts, producing public service annoucements, helping with clean-up events, participating in a parade, and speaking with the media.

Table 1 - RECREATIONAL MARINA VESSEL REFUSE RECEPTION SYSTEM
(see Diagram 1)

AT START OF PROJECT	AT PRESENT
LOCATION	
on each access ramp (A)	same
on launch ramp (B)	same
NUMBER OF CONTAINERS	
10	same
CONTAINER TYPE/ STORAGE CAPACITY	
garage cans	dumpsters
50 gallon	324 gallon (1 1/2 cubic yard)
TOTAL REFUSE CAPACITY	
500 gallons	3240 gallons
OTHER REFUSE STORAGE CAPACITY	
20 cubic yard drop box (C)	drop box eliminated cardboard storage area (D).
HANDLING REQUIREMENTS	
Check containers, remove full plastic bags, insert new bags, transport full bags in pick-up to drop box (C), unload bags into drop box, refuse company empties drop box when full.	Check containers, exchange positions of dumpsters to maintain capacity in high use areas, refuse company empties full dumpsters at docks. Cardboard from marina store is collected.
TIME REQUIREMENTS (hours/day)*	
October-May: 0.5 - 1.5	.25 - .75
June-September: 3.0 - 4.0	** 1.0 - 2.0

* Time includes all the refuse handling tasks at the recreational marina. This includes the time to empty refuse from rest rooms, marina store,fish cleaning areas (emptied into different storage container), and to resupply restrooms. Since there were no changes made in these opertions, time differential reflects changes due to vessel refuse handling system changes.

** estimated time involvement for summer 1988.



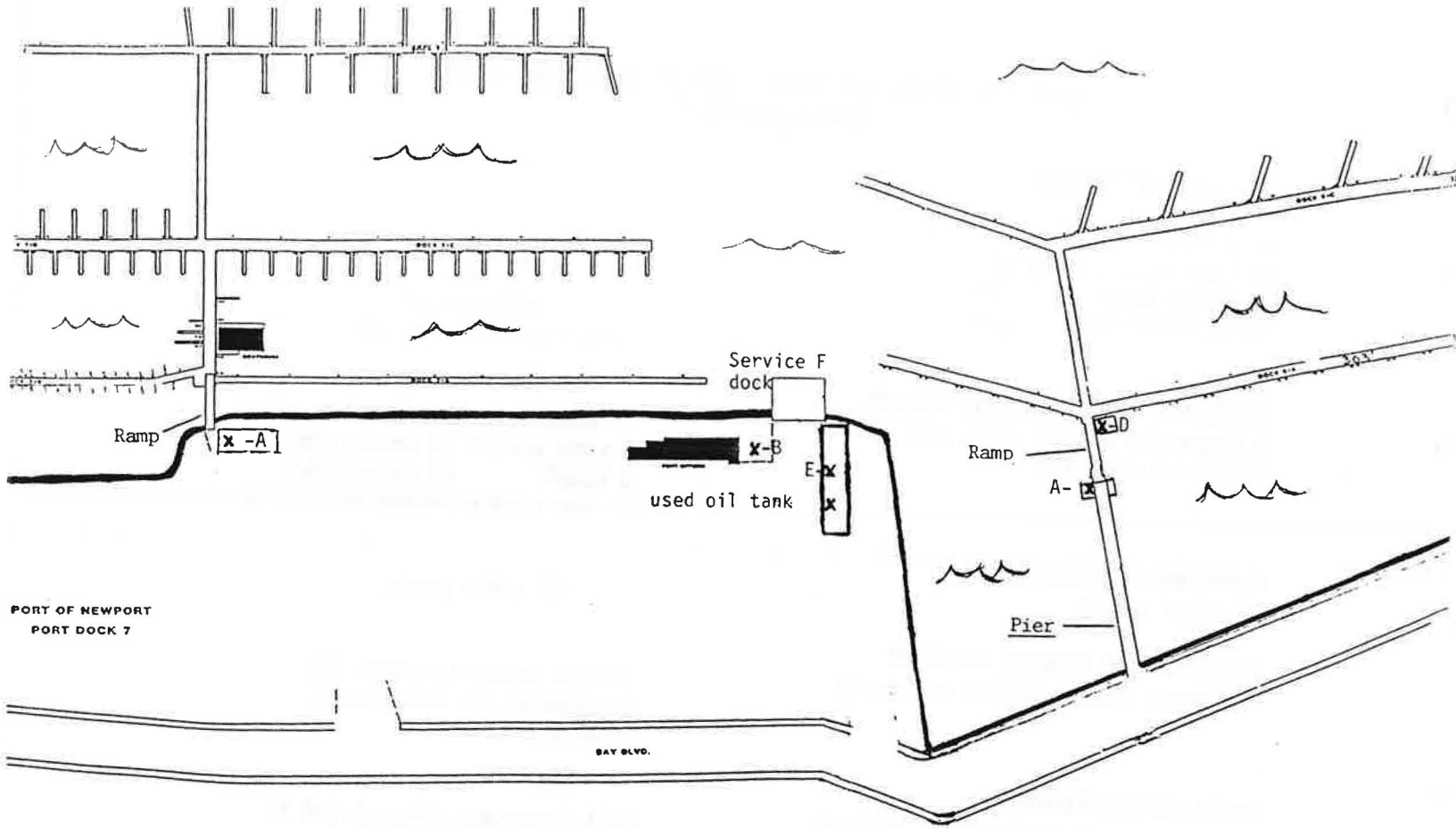
C- 20 cubic yard drop box
D- shed for cardboard

A,B- 50 gallon refuse cans replaced by 1½ cubic yard dumpsters

Diagram 1 - Recreational Marina Refuse Reception System

TABLE 2 - COMMERCIAL VESSEL REFUSE RECEPTION SYSTEM
(see Diagram 2)

AT START OF PROJECT	AT PRESENT
LOCATION	
on each access ramp (A)	same
on fixed dock (B)	same
near public road (C)	eliminated
	water level barge (D)
CONTAINER TYPE/CAPACITY/ NUMBER	
5 dumpsters (1 1/2 cubic yd)	13 dumpsters (1 1/2 cubic yd)
1 20 yard drop box	8 tote boxes* (2 cubic yds)
	2 bins* (5 cubic yds)
	(* for recyclable refuse material)
CONTAINER STORAGE CAPACITY	
30 cubic yards	47 cubic yards
OTHER REFUSE STORAGE CAPACITY	
old gear, nets accepted as needed	refuse reception area (E) designated for nets,cable, metal,wood,line.
HANDLING REQUIREMENTS	
Full dumpsters transported by fork lift to 20 yard container, another, larger fork lift used to empty dumpsters into container. Empty dumpsters transported back to dock area. Refuse company empties 20 yd container when full	Full dumpsters transported by fork lift to the central collection area (E) to be emptied by refuse company and empty dumpster from extra supply brought to dock areas. Containers of recyclables transported by fork lift to area (E) and emptied or barge towed to service dock (F) & unloaded using hoist. Containers, barge returned to place.
TIME REQUIREMENTS	
15–20 minutes/dumpster handled	5–10 minutes/dumpster handled. 8 hours/month for recycling tasks.
OTHER CHARACTERISTICS	
waste oil reception tank (G)	Tank (G) plus two additional waste oil recepticals at (A). Refuse containers hidden and sheltered by wind screens or compounds (H + I). Dock widened in refuse reception area (J).



A-- Refuse compound contains three dumpsters, cardboard, metal, wood recycling bin, used-oil recepticle

B-- One 1½ cubic yard dumpster

E-- Storage and recycling area contains extra empty dumpsters, receives full dumpsters, has trailer designated for wood, bins for cardboard,metal,line, has area designated for nets and cable

G-- Used oil tank

PORT OF NEWPORT
PORT DOCK 5

A--Three dumpsters, one cardboard recycling bin, one used-oil recepticle
Pier widened in recepticle are
Fork-lift moves recepticles

D- Water-level barge has space an bins to accept recyclable item nets, metal, and wood.

Diagram 2 - Commercial Moorages Refuse Reception System

A high degree of fishermen and community awareness and interest resulted from these outreach efforts as indicated by the participation in and responses to the project's final surveys (see Appendix 2). At least 20% of the fishermen filled out a survey form as did about 1% of the community. A total of 91% of the fishermen, and 98% of the community respondents indicated that they were aware of Marine Debris Project activities.

Thirty-four percent of the fishermen and 55% of the community members considered educational and awareness generating efforts to be of primary importance in solving the marine debris problem. Over half the fishermen (54%) and 86% of the community members thought the project had been effective in changing refuse disposal practices.

Signs, posters, and notices around the docks were mentioned by 31% of the fishermen as having created awareness of the marine debris problem or project. Newspaper articles, TV, and radio annoucements were also effective, as they were mentioned by 22% of the fishermen surveyed. Awareness of the program among the fishermen was also significantly fostered by word of mouth (15% mention) and by seeing the refuse and recycling containers on the docks (15% mention).

A quarter (25%) of the community members mentioned newspapers as having created awareness of the marine debris problem or project, with TV and radio annoucements also raising awareness (21%). Signs and posters were mentioned by 13% of the respondents and presentations were mentioned by 12% of the respondents as having being sources of information about the problem.

TASK 2

(Keep records of costs,services).

About $20,000 was spent to develop the refuse reception facilities. These costs are outlined in Table 3. Costs for the materials used in the educational and promotional efforts were about $13,000 and are categorized in Table 4. The expenditures of the $97,000 worth of grant funds are categorized in Table 5.

Table 3 - COSTS OF REFUSE RECEPTION FACILITIES

CONTAINER COSTS- RENTAL		
The one and one half cubic yard refuse dumpsters initially in use in Newport were rented by the refuse disposal company. Rent is assessed at a price per pick-up of	$ 2/pick-up	
20 cubic yard container rental fee assessed at a rate of about $1.50 per day	$ 48/month	
CONTAINER COSTS- PURCHASE.		
20 galvanized dumpsters (1 1/2 cubic yard) were later purchased* from a metal fabricator. 20 dumpsters @ $375 =		$7500.
Refuse recycling bins for cardboard, wood, metal, and net materials were made from available, wooden boxes (used for the storage of fish and ice). These boxes (4' x 4' x 3) were painted, and lids put on those designated for cardboard. 6 bins donated, other 6 obtained for $15-$25 each =		$ 100.
Two storage drums (heavy galvinized steel drums with emptying spigot and lift -off metal lid) were acquired from state surplus and adapted to store used oil by rewelding and resealing them =		$ 100.
FACILITY DEVELOPMENT COSTS		
Area was cleared adjacent to a docking area where a hoist was available to create refuse reception capacity.** Pallets, bins, and a trailer were painted and designated by signs for the reception of various refuse items.		$ 1380.
Material- signs, paint, trailer railings	$300.	
Labor (90 hours)	$1080.	
Two refuse compounds were built at the commercial vessel moorages, windscreened areas built to house dumpsters at the recreational marina		$ 9696.
Material- windscreens, cement pads,	$1200.	
Material- refuse compounds, cement floor	$4008.	
Labor (75 hours)- wind screens, pads	$ 825.	
Labor (330 hours)-refuse compounds, floor	$3663.	
An old port barge was adapted to accept refuse materials by adding more flotation, railings, paint, and a sign		$ 500.
A heavy-duty metal "tote-picker" (an L-shaped piece of metal), was fabricated to be lowered by hoist to retrieve the totes of recyclable materials placed on the barge.		$ 50.
Rakes, brooms, small trash cans, chains and locks (for locking refuse containers to docks) were purchased		$ 100.
TOTAL COSTS		$19426

* (Dumpsters were purchased by the port when they planned to operate their own garbage truck, a plan made impossible by an exclusive franchise agreement (monopoly) arrangement the city has with the local refuse company which prohibits all other entities from hauling refuse. The Project rented the dumpsters from the Port for 8 months @ $600/month = $4800.

** Additional costs (about 50 hours labor ($350), and $130 forklift rental) were incurred to clean up a compound area for refuse storage at the marina. This area was not used except for cardboard storage.

Table 4 - COSTS OF EDUCATIONAL AND PROMOTIONAL MATERIALS

The approximate costs of the educational materials used in the local education campaign are as follows:

	Quantity	Cost
Brochures	10,000	$ 2100
Posters:	5,000	$ 500
Decals :	6,000	$ 900
Coloring Books	3,000	$ 1000
Stickers	20,000	$ 450
Signs (wood)	20	$ 800
Litter bags	8,000	$ 1400
Litter bags (beach clean up)	2,000	$ free
Slide shows	5	$ 250
Photo-displays	9	$ 1000
Sweatshirts	288	$ 2200
Hats	432	$ 1100
Notices	40	$ 25
Video-taped programs (copies)	4	$ 200
Radio PSAs (copies, 7 annoucements)	25	$ 250
TV PSAs (copies)	6	$ 200
Advertisements, newspaper	2	$ 350
Advertisements, tv	2 weeks	$ 200
		$ 12,925

Note: Additional costs (about $2500) were involved in the development of the tv and radio public service annoucements and brochures and for the acquisition of the rights to some art and photographic materials. Additional brochures, posters, and decals were produced for distribution elsewhere in state and country.

Table 5- EXPENDITURES OF GRANT FUNDS

Expenditures are listed in the categories in which they were incurred:

Wages and Fringe:	$ 43727
Transportation:	$ 2850
Photography/Video:	$ 7108
Equipment:	$ 8265
Advertisement/Promotion:	$ 14618
Education:	$ 3408
Consultation:	$ 602
On-Board Waste Control	$ 2096
Dumpster Rental & Services	$ 13320
Office:	$ 802
TOTAL	**$ 96796**

TASK 3

(Determing the charges necessary to recover costs).

The Port of Newport moorage rate charges for recreational and commercial vessels includes a utility fee which covers water, electrical, and garbage services. The utility fee is assessed at the rate of $1.00 per day, $15.00 per month ($0.50 cents/day), $42.00 for six months ($0.23 /day), and $84.00 per year ($0.23/day). The costs to dispose of refuse (see refuse records in Appendix 4) are covered by this fee as noted below.

Fees to cover refuse disposal costs

Port area	Vessel moorages & launch days 1987	Refuse Disposal Costs, 1987	Fees necessary Per Vessel
Recreational Marina	29,000	$8400	$0.29
Commercial Moorages	58,000	$7500	$0.13

The Port of Newport charges ships that call at the shipping terminals a fee of $75/docking to cover the costs of garbage services.

Refuse costs of $2450 were incurred by the shipping terminal operations in 1987. Since 20 ships and barges used the terminals that year, each ship would actually need to pay about $123 to cover the full refuse service costs, though fishing vessels which used the terminal docks when ships weren't present would defray part of these charges through the utility fees charged them. Refuse generated at the shipping terminals comes from operations and domestic barge traffic, since no APHIS certified sterilization facilities are yet available to receive refuse from foreign ships. Refuse fees will need to be increased to cover this additional refuse load and treatment step.

Because of the NMFS grant, the Port of Newport did not need to recover the costs of the refuse reception facility improvements or its educational program. The amount of revenues which would have been needed to cover the costs of purchase for these items are outlined below. Operation, maintenance, and depreciation costs should be considered additionally.

Recovering the purchase costs of refuse reception facilities, education

Service	Costs	Payback period (8% interest)	Funds required per month	Funds required per day
Facilities (see Table 3)	$20,000	7 years	$311.72	$10.22
Education program (see Table 4)	$13,000	3 years	$407.37	$13.36
APHIS facilities (see Appendix 8)	$20,000 (estimated)	10 years	$242.66	$ 7.96

TASK 4
(Assessing the reactions of mariners to refuse system/intent).

Fishermen and community members were asked to comment on the Marine Refuse Disposal Project (Project) in January and February 1988, just over a year after its inception. Results of these evaluations are presented in full in Appendix 2 and summarized below:

Ninety-one percent of the 117 fishermen and 98% of the 87 community members providing written responses to the final opinion and comment survey were aware of the Project activities.

- 96% of the fishermen and 86% of the community members were convinced that the Project had been at least somewhat effective in changing ocean disposal of plastics.

- 79% of the fishermen felt that refuse service at the Port of Newport met their needs, with better used-oil disposal and more dumpster capacity being requested by those that wanted further improvements.

- 93% of the fishermen thought that this project had had a positive effect on the fishing community.

- 35% of the fishermen surveyed felt that other ports and communities should run projects similar to the Newport Project.

TASK 5
(Report results)

In order to provide guidance to other ports and assist in our own refuse planning efforts, studies were conducted to determine the amount of refuse generated on board fishing vessels, the composition of the refuse returned to port, the usefulness of trash compactors in reducing vessel refuse storage problems, and the refuse volumes generated by vessels. These studies are included in the appendices of this report and are summarized below. Additional information and guidelines resulting from this pilot project are reported in a publication called "Dealing with Annex V-- Reference Guide for Ports"* and are presented in a nine minute videotape called "The Marine Refuse Disposal Project" **.

Fishermen's reports reveal that their vessels generate on average 11.6 gallons of refuse per vessel per day with each person aboard generating about 4.4 gallons of refuse per day (see Appendix 5). Between 45% and 60% of this refuse (by volume) is likely to be non-degradable materials (see Appendix 6). Additional refuse is generated when repair work is done or vessels are provisioned.

Other calculations of the amount of refuse generated on vessels reveal that commercial fishing vessels generate between 12 and 16.5 gallons of refuse for each day registered in port, and that recreational vessels will generate between 4 and 9 gallons of refuse per day of vessel use. Crew generated plastic refuse might be expected to accumulate at about 0.4 gallons per person per day (see Appendix 5).

Trash compactors allow vessels a method for reducing (by 5 to 7 times) the storage space required to contain refuse. Kitchen sized compactors have proved practical on vessels which are at least 60 feet in length and which spend long periods of time at sea (see Appendix 8).

* These guidelines are available by writing to the National Marine Fisheries Service, Marine Entanglement Research Program, 7600 Sand Point Way NE, Seattle, WA 98119. Specify you want the publication called "Dealing with Annex V--Reference Guide for Ports".

** To obtain a VHS copy of this videotape send a check or money order for $8.00 (includes postage and handling) to Westcom Productions, Attention Customer Service Department, 1925 Bailey Hill Road, Eugene, Oregon 97405. Specify that you want the Port of Newport Marine Refuse Disposal Project tape.

DISCUSSION

Annex V of MARPOL requires only that ports provide adequate refuse reception facilities for plastics and other materials regulated under this law. However, the experiences of the Port of Newport's project indicate that much is to be gained if ports take a broader approach to solving the marine debris problem. By conducting an awareness program and providing comprehensive refuse reception service, ports can encourage mariners' compliance with the new restrictions and gain the support and assistance of their users and the community in accomplishing these goals.

In Newport, the greatest majority of port users now return their refuse to port and find refuse facilites available to handle the full range of refuse materials needing disposal. Despite large increases in refuse being returned, increased efficiency has allowed the port to keep refuse disposal costs low. The marine debris project has improved the relationship between the port and the fishing industry as service and responsiveness to suggestion were demonstrated. Improved public relations for the Port also resulted from the involvement of community members in Marine Refuse Disposal Project (Project) activities and the continuous and positive media attention the Project received.

The most critical determinants of the Project's success have been the port's genuine interest in trying to end the marine debris problem by addressing the refuse disposal needs of their users, the involvement of port users in efforts to educate their peers, and widespread community support.

Refuse reception facilities and services

While some of the refuse system changes made may have been specific to this port's situation, many ideas are general and may be directly applicable to other ports. Recycling to reduce port solid waste disposal costs, color coding of refuse receptacles, clearly designating refuse areas, displaying notices on the docks and in user frequented stores, water-level refuse reception barges, and positioning refuse areas near hoists and other refuse handling equipment, are actions that can be helpful to any port.

Though plastics are the material of concern to Annex V regulations, the issue of refuse disposal is a more integrated one from the user's perspective. The need for a place to dispose of used oil or cable, for example, is not a separate issue from the need for a place to dispose of plastic packaging or net materials. It seems clear then that the handling of plastics should be only a part of the larger and more comprehensive port waste management picture.

Expansion of refuse services and reception capacity

The Port expanded refuse services in response to the need demonstrated and the suggestions resulting from surveys, analyses, and discussions with fishermen and port personnel. Refuse reception capacity was increased in five different ways:

1. Larger sized containers were used.
2. Refuse reception areas and containers were designated.
3. Recycling was instigated.
4. Containers were emptied with increased frequency.
5. Port workers increased system efficiency.

The use of additional or larger sized containers alone expanded the refuse handling capacity by about seven times. This reduced the frequency and effort required by port labor to keep the containers emptied and reduced the overflow problms during high-use times. Additionally, a large amount of reception capacity was provided at low cost by designating refuse areas adjacent to the vessel service dock and on a floating barge. These changes provided sufficient facilities to handle all the refuse the fishing vessels wanted to deliver.

These additional or larger containers and clearly designated refuse areas also served to emphasize that the port expected and was able to handle more refuse and was trying to make refuse disposal as convenient as possible. If mariners had to expend effort to stuff bags of refuse into already full containers, or go far to dispose of large items, the ease of at-sea disposal might become more attractive again.

The bright and uniform coloration of the recycling bins and signs also drew attention to the port's efforts to provide increased levels of service to the users. Fishermen we found, will cooperate with the recycling efforts not only because recycling bins are convenient, but also because they often find useful matrials in them. The recycling bins for net, line, metal, and wood make readily available some materials for vessel and gear repairs and invention-- without having to go to the store.

From the port's perspective this recycling not only allowed comprehensive service, but kept the refuse containers available for plastic refuse. This increased refuse system efficiency and decreased refuse disposal costs. Port labor involvement in recycling tasks was minimized by collaboration with recyclers to allow for the automated hauling of cardboard and metal materials, and by making recyclable materials available to others. Wood materials were either burned or provided to service agencies helping elderly and handicapped citizens meet their heating needs. Many people

came to the port recycling areas to take nets, barrels, line, wood, cable, and other useful items. Nets and net pieces were used to fish or to repair other nets, to construct playground equipment, baseball and golf backstops, erosion control structures, horticultural supports, or for decoration.

These recycling efforts have also brought the port praise and recognition not only from those fishermen, residents, and tourists who used the material directly, but from resource agencies, environmental groups, and individuals.

Increases in refuse service efficiency

The changes made in the refuse handling system increased the efficiency of port operations and reduced port labor handling. Port workers had been carrying out much of the work that the refuse company would do at no additional cost. However, since refuse service was not provided on the weekends, it was necessary, if we were to rely on this service, to increase either the capacity or the number of refuse containers. With these changes made, port worker time has been freed up to provide recycling services or to be devoted to other tasks.

Role of management support

Support by the port management was critical for the successful workings of the marine debris project. Where management was committed to the port role in solving the marine debris problem, facilities were planned with service to the port users in mind, facilities were put in place quickly, and refuse handling tasks were integrated into the other duties of the port workers.

Given this management support, worker understanding of the marine debris problem and involvement in the workings of the marine debris program led to increased attention to refuse handling operations. This resulted in more frequent refuse container emptying, the willingness to participate and aid in the recycling efforts, accurate record keeping, attention paid to efficient utilization of refuse container space, and efforts to keep refuse areas clean. Workers took pride in the high level of service provided. They voluntarily informed the fishermen about the refuse program and relayed suggestions, comments, and critiques related to progress and problems.

In contrast, where management support and supervison were lacking, refuse facility projects were often put off or delayed, and it was difficult to foster employee initiative and involvement in the marine debris program. As a result, worker participation in project related actions was sporadic and undependable, record keeping inaccurate, and public

outreach non-existant.

Fee assessment

It is important that vessels are not penalized by their efforts to comply with Annex V. Fees charged to offload debris would deter the return of refuse and the retrieval of the debris many trawl fishermen and other mariners may drag up or encounter at sea. Collection of revenues through the use of a moorage charge system, through the port operating funds, vessel licensing fees, taxes on debris items, etc. might be better methods. Ports could even consider means of encouraging the return of retrieved refuse, such as waiving fees for the use of hoists and fork lifts.

Involvement and awareness

In approaching the users directly, asking to hear their ideas, and paying attention to their suggestions and comments, the port gained valuable insight and was able to instigate popular changes to make refuse disposal convenient and easy. Additionally this input created support for the program and resulted in the continued involvement of the fishing community. This interaction fostered a genuine feeling of pride and ownership by the fishermen in the changes made and accomplishments realized. The involvement of the port workers was also important for generating ideas, troubleshooting, and problem solving. Worker involvement generated support and commitment to the project and resulted in efficient and conscientious service.

When pursuing educational activities, it was important to speak about the magnitude of the plastic debris problem (on the regional or local level where possible), to avoid pointing fingers or targeting any one user group, and to point out how this marine debris problem effected mariners directly. The studies conducted about the amount of debris on local beaches and about the vessel problems plastic debris had caused local commercial fishermen and recreationalists generated considerable mariner attention.

Peer pressure and the competitive spirit also seemed to play a role in influencing support and cooperation. The involvement of captains who brought back their refuse and insisted on their crew's compliance was important in generating support as were the conversations fishermen initiated with others about refuse containment. Peer motivation was fostered by those port users who participated in the Project's advisory group, helped to post posters, joined promotional and educational activities, and appeared in media articles.

The advisory group, made up of influential port user group and community members, also played a key role in generating awareness. This group originated and executed ideas related to effectively influencing user, port, and community support. By involving themselves in educational and promotional activities, port users as well as community members became aware of the marine debris problem and the effects of this program were extended into the future. Involvement and commitment of fishermen and the fishermen's wives group, the area's schools, the U.S. Coast Guard, the Coast Guard Auxiliary, the Chamber of Commerce, the state fish and wildlife agency, and the sheriffs and state police, were fostered through the actions of advisory group members.

The media too played an influential role in generating awareness and maintaining and increasing support. Frequent reports were made not only about the marine debris problem, but also about the positive actions being taken by individuals and groups and the progress being made.

Other Benefits

The good will fostered within the community by the Project may allow the port to gain support more quickly in future, unrelated endeavors. The name recognition fostered by regional and national attention to this Project may also help in future port marketing efforts.

SUMMARY

The Marine Refuse Disposal Project had two main goals, to encourage the return of refuse to port through education of port users and to make facilities available to receive this refuse. The focus of Project activities was not to impose a structure from the outside, but to involve the port's users, port workers, and management, in the development of the refuse reception system and in efforts to heighten awareness of the marine debris problem.

The refuse system that was developed through this process not only met user needs for refuse disposal convenience and port needs for economic efficiency, it also generated commitments to action and involvement. Indications are that 80% of the fishermen are now voluntarily returning their plastics to port and encouraging similar actions among their peers. Port employees are diligently trying to provide a complete and accomodating service to help them. A sense of pride and ownership and even enjoyment of the Project has been apparent. Both the fishermen and the Port have received much positive attention from the community and from the media for their on-going efforts.

Refuse reception facilities are now able to handle the comprehensive waste disposal needs of the port's users. They are conveniently located, readily apparent, and have ample capacity. Refuse facility costs and refuse disposal costs have been minimized by encouraging recycling, increasing efficiency of the refuse containers used, utilizing low cost and readily available materials, and choosing facilities which allowed for the use of on-hand port equipment and labor.

The educational and promotional activities of the Project were furthered substantially by the participation of a broad spectrum of community members in the Project's advisory group. These members provided not only advice on how best to influence user and community awareness and support, but initiated and supported activities of the Project and generated interest within their own organizations. The assistance of these community members and agency groups has not only greatly expanded the reach and effect of the Project, but has served to strenthen the ties and cooperation between the port and these groups.

Ports will play a crucial role in solving the marine debris problem by the provision of adequate garbage reception facilities as required by Annex V of MARPOL. Ports can also serve as catalysts of public awareness by fostering user involvement and community education. Experiences at the Port of Newport show that these efforts will be widely recognized and pay off in high level reduction in the disposal of persistent wastes into ocean and coastal environments.

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APPENDIX 1 - MATERIALS USED IN THE EDUCATION AND AWARENESS PROGRAM

Information Source	Number of kinds	Where appeared	Content
Press articles	75	local,regional,trade newspapers, newsletters magazines.	debris problem- animal/ vessel effects, pilot project, actions taken by groups,individuals.
Public service annoucements	7	local and state radio stations.	ranged in nature from serious to humerous, targeted different audiences, ages.
Public service annoucements	4	local and state television stations.	targeted at general public, recreational/ commercial fishermen.
Advertisements	9	7 on local tv station. 2 in newspaper	tv carried debris facts. notified about beach cleanup event, newspaper notified about contest, thanked community.
Letters/surveys	2	sent to all 500 vessel owners.	inform about pilot project, solicit comments.
Letter	1	sent to 250 commercial fishermen by marine extension agent.	inform about pilot project, encourage retention of plastics.
Brochure* (4-color)	1	10,000 to marine businessess, fish license outlets, inserted in newsletters, handed out on docks, port office, at presentations, meetings, trade shows, in new vessel owner information packets.	general marine debris information, provides suggestions.
Notices	2	40 placed on bulletin boards on docks, port offices, 500 sent to vessel owners with billing.	facilities available to mariners, encourages return of plastics, communication if assistance needed.

Signs	6	outside of port offices buildings, launch ramp area, end of pier closest to harbor channel, high school playing field.	project logo **, encourages mariners to keep waters clean.
Sign	1	on litter bag dispenser. on vessel launch ramp	shows pictures of entangled wildlife. Encourages mariners to keep plastics on board.
Posters	1	2500 posted locally on buildings, windows around waterfront, in city. 2500 distributed elsewhere in state and country.	project logo**, encourages mariners to keep refuse on board.
Surveys	6	surveyed mariners on docks, at trade show	vessel, animal impacts of debris, refuse facility and refuse containment ideas.
Slide Presentations	12	given to fisheries group representatives, port managers & harbormasters, educators, students, environmental groups, coastal managers, tourists, legislators, scouting groups.	marine debris problem, port project, suggestions for activities, involvement.
Photographic Displays	9	appeared in marine education center, post office, library, schools, regional exhibits, educator workshop, debris conference, fish and wildlife exhibit at county fair, used by Extension Service.	effects of debris.
School Curriculum Information	10	given to educators	ideas for surveys, beach clean-ups, learning activities.

Promotional items	5	6000 decals, 20,000 stickers, 3000 coloring books, 432 hats, and 288 sweatshirts, distributed at port, marine businesses, by Ext./Sea Grant program, at community offices,in schools (some number of sweatshirts/hats sold at cost, other items for free)	project logo **, debris messages
Litter bags* **	2	8000 bags (5 gallon) handed to boaters by port, boating safety group(Coast Guard Auxiliary), and enforcement agents, available from dispenser on launch ramp and in port offices. 2000 large (35 gallon) beach cleanup bags given to individuals, groups, school classes.	project logo**, debris, boating messages on vessel size bag.

* Brochure was made available for reprinting to other groups and organizations across the United States. State agencies, Sea Grant Programs, organizations, and legislators in Alaska, California, Florida, Mississippi, Oregon, South Carolina, Texas, and Washington have received copies of the brochure as have Defenders of Wildlife, National Oceanic and Atmospheric Administration/NMFS, the U.S. Fish and Wildlife Service, and the U.S. Navy.
To date 100,000 brochures have been produced for others.

** Project logo is a fish entrapped in a six pack ring, caption reads "Don't Teach Your Trash to Swim !"

*** Litter bags were designed by Oregon Department of Fish and Wildlife, and Oregon State Marine Board with Project assistance.
These agencies ordered a total of 40,000 bags, our 8000 bags were ordered additionally. Beach clean-up bags were made available for free from a group working under the State Department of Transportation, called Stop Oregon Litter and Vandalism (SOLV).

APPENDIX 2 - FINAL PROJECT EVALUATIONS

SUMMARY OF OPINION AND COMMENT SURVEY OF NEWPORT'S COMMERCIAL FISHERMEN

Procedure: Between January 18th and January 31, 1988 a final evaluation of the Marine Refuse Disposal Project was conducted by providing written forms for comments by fishermen. Survey forms and collection boxes for these forms were left unattended in different places frequented by fishermen: in resturants (for two weeks), or on the docks (for three days, coffee and donuts provided). The survey forms were collected periodically during this time. Ninety four surveys were collected in this way (this is estimated to represent 10% or more of the fishermen in Newport this time of year). Additionally a survey form was sent to about 500 vessel owners with their December billing statement. Twenty four completed surveys were returned (5% return).

Results: One hundred and eighteen completed opinion and comment forms were received by the Marine Refuse Disposal Project, and are summarized below. Questions receiving more than one response are noted with an asterik. The total number of applicable responses to each question is noted in parantheses above the question. Comments receiving less than 3% mention are grouped together as "other".

Note: The survey form sent with the monthly billing statement differed somewhat from that left on the docks and in the resturant. Only the questions that overlap are included in this summary statement.

SURVEY RESULTS SUMMARIZED— REPORTED AS PERCENTAGE

(117)
1. I _91% __am aware of the Marine Refuse Disposal Project related
__9%___am not to the ocean plastics problem

(103)
*How did you know about it ? (Be specific if possible):

31% signs, posters, notices around docks
22% publicity, advertising, newspaper, TV, radio
15% word of mouth
15% bins on docks
8% talk to project personnel
4% magazines and periodicals
4% other

(103)
2. Do you have a trash receptacle on your boat? __95%___yes __5%___no

*It is a __31%__trash can __45%__bag __19%__bucket __3%__ compactor
__4%__other (explain— cardboard box)

(115)
3. What percent of our non-degradable trash do you return to port?

__77%__ 100% _11%__ 75% __2%__ 50% __4%__ 25% __2%__ 0%
_4%___ other (__3%__ 95-100%, __1%__ 80-90%)

(123)
*4. Where do you dispose of the non-degradable trash you return to port ?

_76%__ dumpsters on port docks 26%___containers at fish plant (which plant? _3%__ home ___other

(106)
5. The project has been _17%_ extremely effective in changing ocean disposal
_37%_ very effective of plastics.
_42%_ somewhat effective
_4%_ not very effective
_1%_ not effective at all

(115)
6. Garbage service at the Port of Newport _79%_ fully meet(s) my needs.
_17%_ partially
_3%_ doesn't

Service could be improved by

29% better oil dump
21% more dumpsters
13% more regular emptying of dumpsters
8% keep floating barge emptied and in place
8% consolidate disposal sites
4% larger cardboard container
4% furnish plastic bags
4% dumpsters at fish buyers, gas docks
4% small cans on docks
4% finding solution to trash storage on small vessels

(79)
7. Of the fishermen I know, _15%_ 100% keep plastics on board.
_43%_ 75%
_25%_ 50%
_8%_ 25%
_1%_ 0%
_8%_ other (1.6% 10-20%)
(1.6% 30-40%)
(1.6% 50-66%)
(1.6% at least 75%)
(1.6% most)

(73)
8. What do you think would be the best ways to encourage vessels to keep plastics on board?

34% continued education and awareness campaign, education emphasizing effects of plastics on ocean, vessels etc.
23% laws, fines, penalties
7% money or tax incentives, buy back trash, recyclables
5% person to person education, peer pressure
5% provide containers on docks
5% buy everyone a compactor, make compactors available
4% eliminate plastic containers, use glass, paper, metal
16% other

(89)
9. This Project has had __93%__ a positive effect on the fishing community.
__2%___ a negative effect
__4%___ no effect

(48)
10. What suggestions or comments do you think should be made to other ports and communities related to refuse services and education about the marine debris problem?

35% run similar project to Newport's
25% continuous education, awareness, publicity
17% have containers on docks, convenient access to containers
6% other
4% NMFS should develop standard educational kit for other ports
4% get charter boats involved, get rid of styrofoam from charter boats
8% use shock films, photos

(115)
11. Lacking a grant like ours, how should expanded garbage service at other ports be financed?
_29%__ lottery funds
_19%__ moorage/launching/docking fees
_19%__ plastic industry tax
_10%__ sales tax on plastic products
__8%__ vessel licensing fees
__7%__ fishing license fees
__2%__ gross cargo tonnage/poundage fees
_ 0%__ property tax base
__7%_ other

Marine Refuse Disposal Project

OPINION SURVEY and COMMENT FORM

Newport's one year pilot project related to marine debris is drawing to a close. The project's purpose has been to encourage vessels to keep refuse on board voluntarily and provide convenient garbage service in port.

We need your help to evaluate the project. Your comments and ideas will be used to improve your service here in Newport and in the the preparation of a report which will be sent to ports and communities nationwide. Thanks for your assistance.

Fran Recht
Project Manager

Please check your choice of answer and use the back , if you want more space for your comments.

1. I _____am _____am not aware of the Marine Refuse Disposal Project related to the ocean plastics problem

How did you know about it ? (Be specific if possible):

_____

2. Do you have a trash receptacle on your boat? _____yes _____no
It is a ___trash can ___bag ___bucket ___ compactor ___other (explain

3. What percent of our non-degradable trash do you return to port?
____100% ____75% ____50% ____25% ____0% ____ other (____ %)

4.Where do you dispose of the non-degradable trash you return to port ?
___ dumpsters on port docks ___containers at fish plant (which plant?
___ home ___other (explain)

5. The project has been ____ extremely effective in changing ocean disposal
____ very effective of plastics.
____ somewhat effective
____ not very effective
____ not effective at all

6. Garbage service at the Port of Newport ____ fully meet(s) my needs.
____ partially
____ doesn't
Service could be improved by

_____

7. Of the fishermen I know, ____ 100% keep plastics on board.
____ 75%
____ 50%
____ 25%
____ 0%
____ other (____ %)

8. What do you think would be the best ways to encourage vessels to keep plastics on board?

_____

9. This Project has had _____a positive effect on the fishing community.
_____a negative effect
_____no effect

10. What suggestions or comments do you think should be made to other ports and communities related to refuse services and education about the marine debris problem?

_____

11. Lacking a grant like ours, how should expanded garbage service at other ports be financed?
___ moorage/launching/docking fees ___ gross cargo tonnage/poundage fees
___vessel licensing fees ___fishing license fees ____plastic industry tax
___sales tax on plastic products ___property tax base ___lottery funds
___ other (explain please:_____

SUMMARY OF OPINION AND COMMENT SURVEY OF NEWPORT COMMUNITY MEMBERS

Procedure: Between January 15 and February 10, 1988 a final evaluation of the Marine Refuse Disposal Project was conducted by providing written forms for comments by community members. Survey forms and collection boxes for these forms were left unattended in the Newport Public Library and at the Newport City Hall. Additionally survey forms were distributed for comment at a Rotary Club meeting and were given to teachers at the two grade schools, the middle school, and the high school. The survey forms were collected at the end of the Rotary Club meeting and on February 10th.

Results: Eighty-eight completed opinion and comment forms were received by the Marine Refuse Disposal Project, and are summarized below. Thirty-three responses (38%) were received from the Rotary Club, 27 responses (31%) received from the public library, 22 responses (25%) from the schools and 6 responses (7%) from City Hall. Some questions received more than one response and are noted with an asterik. (The total number of responses pertaining to a question are noted in paranthesis above the quesion). Those comments receiving less than 3% mention are grouped together as "other".

SURVEY RESULTS SUMMARIZED— REPORTED AS PERCENTAGE

(87)
1. I _98% __am aware of the Marine Refuse Disposal Project related
__2%___am not to the ocean plastics problem

* How did you know about it ? (Be specific if possible):
(178)
25% newspapers
21% TV, radio
13% signs, posters
12% public meetings
8% word of mouth
6% public photo-displays
11% other

(63)
2. The project has changed 86% refuse disposal behavior.
not changed 14%
* Why do you think this?
(67)
50% increased awareness
15% know fishermen/more trash seen coming back to docks
11% beaches/water cleaner
9% media reports of change
8% beaches/water still littered
5% beach clean-ups done on spontaneous basis
4% other

(87)

3. Ocean clean-up projects such as this are	92%	very important
	8%	important
	0%	somewhat important
	0%	not very important
	0%	not important at all

(128)

* 4. What do you think are the best ways to keep our oceans and beaches clean?

55% awareness/education
12% beach clean-up projects/paid litter patrols
9% more/convenient refuse containers/signs
7% heavy fines/enforcement/ public service retribution
19% other

(106)

*5. What role should the government play in keeping our oceans and beaches clean?

25% education/awareness programs/vessel educational programs
22% finance litter patrols,clean-ups /clean-up,disposal incentives
22% enforcement
13% active,lead /coordination role
5% no role/minimal role
4% laws/legislation/policy
10% other

(43)

*6. What suggestions or comments would you like made to other ports and commmunities related to the marine debris problem?

33% increase public awareness-public help, awareness, monitoring
30% run similar program to Newport's
17% should be widespread effort/everyone work together
9% beach litter patrols, pick-ups
9% enforce existing laws/fines
7% get more refuse facilities, trash cans/litter bags for boats

Marine Refuse Disposal Project
The Port of Newport
600 S.E. Bay Boulevard
Newport, Oregon 97365
(503) 265-7758

OPINION SURVEY and COMMENT FORM-- MARINE DEBRIS PROJECT

Newport's one year pilot project related to marine debris is drawing to a close. The project's purpose has been to encourage vessel crews and beach users to properly dispose of plastic refuse.

We need your help to evaluate the project. Your comments and ideas will be used in Newport and in the preparation of a report which will be sent to ports and communities nationwide. Thanks for your assistance.

Fran Recht
Project Manager

Please check your choice of answer and use the back , if you want more space for your comments.

1. I _____ am _____ am not aware of the Marine Refuse Disposal Project related to the ocean plastics problem.

How did you know about it ? (Be specific if possible):

---

2. The project has _____ changed _____ not changed refuse disposal behavior.

Why do you think this? (Be specific if you can):

---

3. Ocean clean-up projects such as this are
_____ very important
_____ important
_____ somewhat important
_____ not very important
_____ not important at all

4. What do you think are the best ways to keep our oceans and beaches clean ? _____

---

5. What role should the government play in keeping our oceans and beaches clean ?_____

---

6. What suggestions or comments would you like made to other port and communities related to the marine debris problem?

APPENDIX 3 - DEBRIS IMPACT STUDIES

SUMMARY REPORT—MARINE DEBRIS IMPACTS VESSELS OF THE WESTERN UNITED STATES FROM FISH EXPO '87 SURVEYS

Ninety fishermen from the West Coast of the United States were surveyed at the Seattle Fish EXPO October, 1987 by Virginia Tardaewether and Fran Recht of the Port of Newport's Marine Refuse Disposal Project.

Fifty eight vessels (64%) reported accounts with synthetic debris. Total cost of these encounters was estimated to be $110,780. A summary of the type of impacts and costs for these 58 vessels is reported. A summary of impacts organized by home port state is also presented. Survey results of a few U.S. east coast and foreign vessels are also presented.

Type of Problem	Number of Encounters	Type of Debris	Cost of Repairs	Estimated Value of Fishing Time Lost	Total Cost
Propellor	14	net	$960	$10100	$11060
Fouled	8	sheet/tarp	$160	$18510	$18670
	5	polyline	$2050	$3000	$5050
	3	bags	$60	$2000	$2060
	3	6pack/strap		$55200	$55200
	1	mono. fil. line		$600	$600
total	34		$3230	$89,410	$92,640
Lines	5	bags	$400		$400
Fouled	1	sheet			
	1	6-pack			
	1	monoline		$1000	$1000
	1	polyline			
totals	9		$400	$1000	$1400
Intake	6	bags		$40	$40
Fouled	1	sheet		$1000	$1000
totals	7			$1040	$1040
Grand Total	58		**$3630**	**$107,150**	**$110,780**

MARINE DEBRIS IMPACTS REPORTED BY VESSEL HOME PORT

Explanation: 90 fishermen were surveyed from Alaska (58), Washington (18), Oregon (10), and California (4). 58 of these fishermen (64%) had had problems with synthetic debris. U.S. East coast and foreign vessel impacts are also summarized. The following summary is organized on the basis of home port.

Debris Impact	Number of Encounters	Cost of Repairs	Estimated Cost Lost Fishing Time	Total
ALASKA				
In propellor:	22	$2360	$80600	$82960
In net:	6		$15500	$15500
On lines:	4		$1000	$1000
In intake:	4		$1000	$1000
TOTAL	36	$2360	$98,100	$100,460
WASHINGTON				
In propellor:	5	$620	$8000	$8620
On lines:	3			
In net:	2		$200	$200
In intake:	1			
TOTAL	11	$620	$8200	$8820
OREGON				
In propellor:	5	$250	$610	$860
On lines:	1			
In intake:	1			
TOTAL	7	$250	$610	$860
CALIFORNIA				
In propellor:	2		$200	$200
On lines:	1	$400		$400
In intake:	1		$40	$40
TOTAL	4	$400	$240	$640
NORTHEAST COAST OF UNITED STATES				
In propellor:	2	$300		$300
In net:	1			
In intake:	1	$2000	$2000	$4000
TOTAL	4	$2300	$2000	$4300
FOREIGN VESSELS				
In propellor:	3	$159,900	$128,624	$288,524
CANADA				
In propellor:	1			
In net:	2			
TOTAL	3	no costs involved		

FISH EXPO 1987, Seattle, Washington Date:

—PORT FACILITY AND MARINE DEBRIS SURVEY—

"The Port of Newport, Oregon is running a project to assess port facilities for handling vessel garbage and unwanted fishing gear. Can I ask you a few questions?"

1. What kind of fishing do you usually do?
salmon___crab___ bottom_____ tuna___shrimp___jv_____ other_____

2. Have you heard that there is concern about plastic in the oceans? yes_____ no_____
3. What have you heard?
animals_____ aesthetics_____ vessel_____ other_____
(Haven't heard but have seen or experienced _____)

4. Have you ever seen animals entangled in or eating garbage? yes_____ no_____
bird_____ fish_____ crab_____ mammal_____ other_____

5. Have you ever been in danger or had vessel or gear problems due to debris?
yes_____ no_____

6. What kind of debris caused the problem ? polyline_____net____
monoline___plastic bag_____ plastic sheeting_____other_____

7. What happened? prop fouled_____ engine burned_____ intake fouled_____ net fouled_____line fouled_____ other_____

8. Where did this happen ?: AK____ WA____OR___ CA___other___

9. Did you have to be towed? no_____ diver_____ removed_____ yes_____
by C.G. _____ miles _____ hours_____?

10. Did you have to pay for repairs, new gear or for the diver?
no_____ how much ?_____

11. Did you loose fishing time because of this? yes____no_____
How much time?_____

12. About how much did this time cost you ?_____

13. What port do you use most often?_____

14. Where do you get rid of your trash now?
fish plant_____ fuel dock_____port dock _____ other_____

15. What refuse facilities are available there?
dumpsters _____ trash cans_____totes_____other_____

16. Are they adequate? yes_____ no_____
(for trawlers: Have you ever tried to dispose of nets in port? yes_____
no____. Were they accepted ? yes_____no_____)

17. Do you think that your port would be responsive if you asked for expanded refuse facilities?
yes_____ no_____

ENCOUNTERS WITH DEBRIS BY COMMERCIAL FISHING VESSELS
(From studies done in Newport, Oregon)

SUMMARY:
A sampling of about 25% of the commercial fleet at the Port of Newport was conducted between January and November of 1987. 73 of the 125 commercial vessels surveyed in writing or orally, following a survey format, reported encounters with debris (58%). Actual costs incurred and lost fishing time cost estimates total to $173,449 (average cost $2725/vessel). This figure is considered minimal, since 35 reports of lost fishing time included no dollar estimate of this down time.

The largest number of impacts reported in any one category (31) were due to propellers fouling with net pieces. The most expensive encounters however were due to propellers fouling with pieces of rope or line. The largest single-encounter cost reported was $13,000 (figure does not include lost fishing time). Overall fouled propellers account for 56% of all the debris related problems. The largest impact reported overall was by a longline fisherman who reports that over a 10 year period various encounters with debris have cost him about $40,000.

Attached is a summary of impacts categorized by type of vessel problem and type of debris listed in descending order of frequency of reports.

BACKGROUND:
Surveys were conducted by mail, in the Project's office, or on Port of Newport docks 5 & 7 by Fran Recht during the period January 7 - November 30, 1987. Additionally 12 fishermen related encounters orally to the Project during this period. Some boats reported multiple encounters.

SAMPLE SIZE:
125 vessels is 25% of the approximately 500 commercial vessels at the Port of Newport.

NOTE: The actual losses due to debris is much greater than the dollar figure reported above. Lost income and lost volume of fish has serious economic impacts on the larger community. It has been calculated that 80% of the money made by the boat owners and 90% of the money made by crew members stays in the Newport area. Additionally, for every $1.00 of fish sold here, about $2.25 of additional income is generated in the community.

ENCOUNTERS WITH DEBRIS BY COMMERCIAL FISHING VESSELS
(Summary Of Impacts By Type Of Vessel Problem And Debris)

A summary of the impacts reported is classified by both the type of vessel problem and by the type of debris and listed in descending order of frequency of reports. The written surveys were filled out with varying levels of detail, so associated costs were not always reported. The estimated costs of lost fishing time reported by the fishermen are noted in parenthesis.

TYPE OF PROBLEM: Propeller fouled by nets
NUMBER OF REPORTS: 31
ASSOCIATED COSTS (as reported):
towed in, lost fishing time ($9000).
$7000 repair, Coast Guard tow-hazardous, week's time ($5000-$7000)
$1800 repair, 2 fishing trips lost ($5000-$10,000)
12 1/2 hour tow, 3 days lost fishing time ($5000).
$250 repair, replacement of torn off salmon pole, $50 for diver, hour tow, 4 days fishing time ($1000-$5000).
$430 repair, tow by Coast Guard, 4 days fishing time ($2000).
one and a half days fishing time ($1000)
one day lost ($700-$800)
4 days fishing time lost ($300)
$50 and lost fishing time ($200)
2 1/2 hours lost time ($200)
5 mile tow, one fishing day lost ($150)
tow to port, 4 days fishing time lost
tow by Coast Guard, two days lost fishing time
30 mile tow, fishing time lost
few hours labor
1 hour to cut out net, shut off boat
1/2 hour work
10 minutes, no costs but danger
3 reports, no details, Coast Guard tows + lost fishing time
4 reports, no details, lost fishing time
towed to another boat with a diver
tow to port

TYPE OF PROBLEM: Plastic pieces, netting entangled in trolling/long lines.
NUMBER OF REPORTS : 15
ASSOCIATED COSTS AS REPORTED:
$40,000 over 10 year period (result of nets, cables, shrimp and crab pots fouling long line gear many times, includes one encounter with net in propeller).
$150
$100 gear, 3 days decreased fishing potential
1 Hour, $100 in time, new longline gear
$64-$80/trolling day

$50
1-2 hours of fishing time
few hours time
trolling pole replaced
new line, lost time
few hooks replaced
hassle and time to remove from wires (two reports)
big net pieces snagged in gears (no details given)

TYPE OF PROBLEM : Propeller fouled by rope:
NUMBER OF REPORTS: 13
ASSOCIATED COSTS (as reported):
$13,000 repair, lost fishing time
$12,000 repair, lost fishing time
$700 repair, lost fishing time ($2000), haul out
$80 repair, 3 days fishing time ($3500-$5000)
30 minute dive, lost fishing time ($3000)
$25 repair, day of fishing time ($800-1000)
$25
$20, 1 day fishing time
fishing time
2 hours time, had to jump into the water to cut out
30 minutes fishing time

TYPE OF PROBLEM: Plastic bags in engine intakes
NUMBER OF REPORTS: 12
ASSOCIATED COSTS (as reported):
$1400 repair, 9 days lost abalone diving ($2700)
$1000-$2000/year
$1000 repair, lost fishing time
couple hours time ($500-$1000)
$6000 cost for lost time, tow , and repair
1 1/2 days lost fishing time ($1500)
lost fishing time, dive at sea
half day lost fishing time
3 reports , no details, lost fishing time
1 report, highly dangerous repair at sea

TYPE OF PROBLEM: Propeller fouled by unspecified plastics
NUMBER OF REPORTS: 8
ASSOCIATED COSTS (as reported):
20 minute dive
15-20 minute dangerous dive
10 minute dive
$1100, lost fishing time ($2000)
$1500, lost fishing time ($2000)
4 hours to fix
work during haulouts to remove
few minutes shut down time

TYPE OF PROBLEM: Line fouled in gear
NUMBER OF REPORTS: 4
ASSOCIATED COSTS (as reported):
$9000
$500
$50 a number of times

TYPE OF PROBLEM : Trawl net snagged/damaged by man-made object
NUMBER OF REPORTS: 4
ASSOCIATED COSTS (as reported):
$3500 for new net, $1500 expenses, one day time ($2000)
Lost trawl net
hours of time ($1000)
Sorting garbage out of net

TYPE OF PROBLEM: Plastic bag or other plastic in crab water pump
NUMBER OF REPORTS: 2
ASSOCIATED COSTS (as reported):
Could have lost several thousand dollars of crabs and vessel stability
Could have lost load of crabs

TYPE OF PROBLEM: Line snags on something underwater
NUMBER OF REPORTS: 2
ASSOCIATED COSTS (as reported):
$194, half hour-hour fishing time
$2000 total cost for 4 gear conflicts ($234 for new lead weight, hydraulic motor repair $180, diving costs, lost gear, broken wires, lost fishing time ($500 per day)).

TYPE OF PROBLEM: Plastic sheeting in engine intake
NUMBER OF REPORTS: 1
ASSOCIATED COSTS (as reported):
lost morning of fishing

TYPE OF PROBLEM: Unspecified plastic in engine intake
NUMBER OF REPORTS: 1
ASSOCIATED COSTS (as reported):
lost fishing time

COMMERCIAL FISHERMEN MARINE DEBRIS SURVEY

Date: Vessel Name:

I'm working with the Newport Marine Debris Project , do you mind me asking you a few questions?

1. Where's your home port?: Newport____Other_____

2. What kind of fishing are you doing now?_____

3. How do you presently keep your trash on board- in a trash can , a bag , a bucket , other_____ ?

4. How long are your average trips ? _____days

5. How do you usually dispose of your trash ?
overboard_____ processors_____ dock_____ other____

6. How much trash do you generally have each trip ?

7. Where do you store your trash on board?

8 Have you heard about the marine litter problem
yes__ no___ ? Where?

9. Have you ever seen animals entangled in or eating garbage ?

10. Have you ever been in danger or had vessel or gear problems due to debris ? yes_____ no_____
if yes- where did this happen?
What happened?

Did you have to be towed or how did you fix it?

How much time was involved?_____
How much money did this cost?

11. Is refuse disposal easy for you now? How could it be made more convenient?

12. Have you seen ideas for garbage disposal in other ports that could be adopted?

ENCOUNTERS WITH DEBRIS BY SPORTS FISHING VESSELS
(From Studies Done in Newport, Oregon)

SUMMARY:
A random sampling of about 19% of the recreational fishing boats at the Port of Newport's Newport Marina at South Beach was conducted between May 10 and August 28 1987.

52 of the 280 recreational vessels surveyed reported encounters with synthetic debris (19%). Actual and estimated costs incurred totaled to $4772.

The impacts reported were summarized and categorized by type of problem and type of debris. The largest numbers of reports by category were associated with either rope (17 reports) or monofilament line (16 reports) fouling in propellers. The third most numerous category, were problems due to plastic bags in engine intakes (15). The largest cost reported from a single encounter with debris was $700 and was due to plastic sheeting which was sucked up into the engine intake, causing the engine to overheat.

BACKGROUND:
Surveys were conducted orally by Virginia Tardaewether of the Marine Refuse Disposal Project, following a written survey format on a random schedule.

SAMPLE SIZE:
280 vessels represent 19% of the approximately 1400 recreational boating vessels at the Port of Newport.

SUMMARY OF ENCOUNTERS WITH DEBRIS BY SPORTS FISHING VESSELS
(Summary Of Impacts By Type Of Vessel Problem And Debris)

The impacts are classified by both the type of vessel problem and by the type of debris. The categories are listed in decending order of the frequency of reports. Some of the boaters were able to remove the debris by backing the engine or pulling the engine up and do not report an associated cost.

TYPE OF IMPACT: Polyrope fouls propeller
NUMBER OF REPORTS:
ASSOCIATED COSTS (as reported):
$500 lower unit repair
$200 to replace
$100, haul out, lost two days fishing time
$100 for one hour dive
$80 for new cannon-ball, lost fishing time
$20 to repair bent propeller prop damage, stalled/raced motor to get in took 1 hour burned out seal, water in lower unit
20 min, stopped dead in water, jumped in to untangle
Tow by Coast Guard
half hour fishing time
two hours time-on water
half hour time-on water
half hour (lost anchor line)
15 min to unwind
two times had to back up to remove

TYPE OF IMPACT: Monofilament lie fouls propeller
NUMBER OF REPORTS: 14
ASSOCIATED COSTS (as reported):
$300+ for repair of ruined gears, water pump, outdrive, lost whole summer in repair work
$300 repair for overheated engine
$300 in repairs, lost time
$17 for parts, 1/2 hour fix it time on water
burned out seals
lost shear pin, shut off on water
2 hours shut off on water to untangle
2 hours to fix
2 times, 15 min stopped on water to remove
20 min stopped dead to remove
1/2 hour to cut it out, turned off engine
irritation
lost time
reports of having to back up on the water to untangle

TYPE OF IMPACT: Plastic bag in engine intake
NUMBER OF REPORTS: 13
ASSOCIATED COSTS (as reported):
$1200 repair of intake, 2 months downtime, tow by Coast Guard
$200 repair for overheated engine
$100 for impeller replacement
hard time returning to port
12 reports overheated engine (resulting in two dives overboard, and a few minutes to an hour of repair time).

TYPE OF IMACT: Plastic sheeting in engine intake
NUMBER OF REPORTS: 2
ASSOCIATED COSTS (as reported):
$700 to replace rings on overheated engine, dive, three days time.
stopped boat, had to tip up motor to remove

TYPE OF IMPACT: Unknown
NUMBER OF REPORTS: 2
ASSOCIATED COSTS (as reported):
$200 to repair burned engine

TYPE OF IMPACT: Net piece in propeller
NUMBER OF REPORTS: 1
ASSOCIATED COSTS (as reported):
$200-$300 for repair of outdrive and U joint.

TYPE OF IMPACT: six pack yoke
NUMBER OF REPORTS: 1
ASSOCIATED COSTS (as reported):
$75

MARINE DEBRIS SURVEY

Vessel Name_____
Date_____

_____sportsfisherman
_____crabbing
_____clamming
_____commercial
_____other

1. What location did you come from to fish in Newport?
   _____Newport (local) _____Portland
   _____Salem _____Astoria
   _____Eugene _____Medford
   _____Corvallis _____Other City:_____
   State:_____

2. What is your perception of the marine debris problem while on Oregon coastal waters? Severe____, Serious____,Not a bad problem____,Other_____
   While on the beach?_____.

3. The debris problem is_____increasing, _____decreasing, _____staying the same, _____.

4. What trash do you generate on board? (check all that apply)
   _____plastic bait bags/trays _____cans _____paper
   _____six-pack rings _____ food packaging _____styrofoam
   _____oil or gas containers _____other_____

5. How do you PRESENTLY dispose of your trash while fishing?
   ____plastic bag,____bucket,_____other_____
   _____
   _____

6. Have you ever had vessel or engine damage due to plastics or rope entanglement while fishing? ____YES ____NO If so, give details (amount, damage, when, where, etc.)_____
   _____
   _____
   _____

7. Have you ever seen marine mammals, birds or fish entangled or ingesting marine debris?_____YES_____NO Were they dead?_____
   What debris caused the problem?_____
   What animal?_____

8. Would you use a dockside trash disposal system:
   A. If it were free? _____YES ____NO
   B. If you had to pay a nominal fee? _____YES _____NO
   C. What is a reasonable fee to you?_____.
   D. How should a refuse disposal system be financed?____
   _____

9. Do you have any ideas or solutions to solving the plastic debris problem?_____
   _____

   Other comments_____

APPENDIX 4 - REFUSE RECORDS

COMMERCIAL MOORAGES — 1987 REFUSE RECORDS & VESSEL LANDLING RECORDS

1987	Cubic Yards Refuse	Gallons Refuse	Vessel Landing Records	Gallons of Refuse Per Landing Record
January	100	21600	298	73
February	40	8640	314	28
March	60	12960	232	56
April	60	12960	331	39
May	40	8640	863	10
June	60	12960	731	18
July	80	17280	2503	7
August	80	17280	1185	15
September	64	13824	970	14
October	85	18360	572	32
November*	95	18360	39	470
December	84	18144	392	46
	(848)	(183168)	(8430)	(22)
Year Totals (November omitted)	**753**	**162648** (216 gallons per cubic yard)	**8391**	**19**** **mean 31****

* November figures have been omitted from calculations because of the extremely low vessel landing records and resulting high refuse figure. (The refuse generated is presumed due to vessel repair and provisioning work, refuse generated by live-aboards, and storage yard clean-up).

** According to the final project survey, about 71% of the commercial fishermen dispose of their vessel refuse in the containers at the port docks, about 26% of the vessels dispose of their refuse at the fish plants, and about 3% deposit their vessel refuse at home.

If 19 gallons of refuse per vessel landing record represents only 71% of the vessel refuse returned to port, the amount of trash expected to be generated per vessel landing record is 27 gallons of refuse/vessel landing record.

COMMERCIAL MOORAGES--REFUSE AND MOORAGE RECORDS COMPARED FOR 1986 & 1987

Month	Cubic Yards Refuse		Vessel Days in Port		Refuse Costs	
	1986	1987	1986	1987	1986	1987
January	60	100	1613	2535	$521	$842
February	60	40	1159	2089	$515	$368
March	80	60	1112	2116	$710	$548
April	120	60	1020	1862	$978	$536
May	100	40	1815	2760	$827	$360
June	60	60	2607	3965	$519	$540
July	80	80	5552	5151	$694	$686
August	80	80	6090	9969	$684	$686
September	60	64	5980	7466	$528	$364
October	60	85	5945	6604	$530	$828
November	80	95	6550	6713	$682	$909
December	80	84	5907	6343	$688	$822
Total	**920**	**848**	**45,350**	**57,573**	**$7876**	**$7489**
'87:'86	9% decrease		27% increase		5% decrease	

1986	1987	Percent change ('87:'86)
Gallons refuse per vessel per day in port**	4.4 gallons	3.2 gallons	38% decrease
Average Refuse Costs per vessel per day in port	$0.17	$0.13	34% decrease

** 1 cubic yard of refuse = 216 gallons of refuse

MARINA REFUSE VOLUME AND VESSEL USE RECORDS COMPARED FOR 1986 AND 1987

Month	Cubic Yards Refuse 1986	1987	Vessel Useage** 1986	1987	Refuse Costs 1986	1987
January	23	20	(?)	880	$179	$218
February	23	20	739	936	$179	$212
March	23	40	1082	1242	$179	$374
April	30	40	981	1115	$229	$374
May	30	60	1600	1546	$279	$530
June	130	120 (80)*	4063	3818	$825	$996
July	86	180 (120)*	7173	5938	$694	$1466
August	86	180 (120)*	4797	5055	$688	$1466
September	106	122	4249	4322	$840	$988
October	86	75	3875	3602	$686	$750
November	86	49	972	880	$682	$470
December	46	56	866	651	$374	$537
TOTAL	**732**	**782***	**30397**	**29985**	**$5834**	**$8381**
	(Feb–Dec only)		(Feb–Dec only)		(Feb–Dec only)	
'87:'86	7% increase		1.5% decrease		44% increase	

	1986	1987	Percent change ('87:'86)
Gallons* Refuse per Vessel Use Day.**	5.2 gallons	5.6 gallons	8% increase
Average Refuse Costs per Vessel Use Day	$0.19	$0.29	53% increase

* Refuse volume reported here is calculated from containers hauled by garbage company. Port is charged each time container is emptied whether or not it is full, making both accurate volume and cost comparisons difficult. Scheduled refuse pick-ups instigated in summer 1987 result in apparent increases in refuse volume. Real volumes were observed to be between half to two thirds of the apparent volume. Calculations take real volumes to be two thirds of apparent volume.

** Vessel use days calculated from records of vessel launch tickets sold and estimates of the amount of use of the vessels holding moorages.

*** A cubic yard of refuse is equal to 216 gallons of refuse. These figures should be considered minimum figures. Though we estimate that a high percentage of Port of Newport recreation vessels users return their refuse to port, it is unknown what this percentage is.

SHIPPING TERMINALS REFUSE RECORDS COMPARED FOR 1986 and 1987

Month	Cubic Yards Refuse 1986	1987	Vessel Useage 1986	1987	Refuse Costs 1986	1987
January	8	40			75	380
February	8	20			75	212
March	8	20			75	124
April	8	40			75	372
May	9	12			82	124
June	8	20			75	188
July	8	8			86	125
August	48	11			302	166
September (demolition)	40	11			216	162
October	8	11			88	162
November (demolition)	40	8			256	130
December (demolition)	20	27 (yd clean-up)			106	273
TOTAL	213	228	6 (Ships and barges only)*	20	$1511	$2418

*Fishing vessels also tie to terminal docks when ships are not in.

COMPARISON OF THE COSTS OF REFUSE DISPOSAL FOR 1986 and 1987

Total refuse disposal costs at the Port of Newport commercial vessel moorages, recreational marina, and shipping terminals were $15,221 in 1986 and $18,288 in 1987 (the year of our pilot program). Clearer understanding of these costs is had by looking at each of the docking areas separately.

At The Commercial Vessel Docks:

Refuse disposal costs were $7876 in 1986 and $7489 in 1987. This decrease is apparent even though great increases in refuse volume return have been noted, with 80% of the commercial fishermen now returning their non-degradable refuse to port. The use of recycling, worker attention to efficiency, changes in collection container type and service, and change in port use* have accounted for a 5% ($387) decrease in refuse disposal costs during the year of the pilot program.

At The Recreational Vessel Marina:

Refuse service at the marina cost $5834 in 1986 and $8381 in 1987. Between 50% and 60% of this $2547 increase is due to an inefficient refuse hauling schedule (resulting in the hauling of refuse containers which weren't full), with the other 40% or 50% change due to increased refuse volumes (no recycling system in place). Marina use stayed about constant between the two years.

At The Shipping Terminals:

Refuse costs at the shipping terminals were $1511 in 1986 and $2418 in 1987. Refuse costs therefore increased 60% ($907) in 1987 as compared to 1986. Use of the shipping terminals more than tripled, with fourteen more ships and barges calling in 1987 as compared to 1986, providing an explanation of the cost increase.

* There has been a 27% increase in vessel days registered in port in 1987 as compared to 1986. Since the number of fish landing records (the number of vessels delivering fish to the processing plants) have remained about constant between the years, increased days in port may indicate more bad weather days (during which vessels were forced into port or stayed tied up in port). If vessels in port were home ported vessels, more days in port might indicate less refuse, since vessels would be unoccupied, or more refuse if repair and provisioning work were being done. If vessels were from other ports, additional refuse would be expected from those fishermen staying aboard, and from any repair or provisioning work being done.

SUMMARY — TIME INVOLVEMENT FOR RECYCLABLE HANDLING

Recyclable materials handled by Port personnel April 6 through August 31, 1987.

TYPE OF MATERIAL	NUMBER OF CONTAINERS HANDLED	LABOR HOURS INVOLVED
Cardboard	40	10.0 hours
Wood	15	3.75 hours
Metal	7	1.75 hours
Recycling Barge	5	22.0 hours
Total Hours To Handle Containers		**36.5 hours**
Extra Time To Remove Cardboard From Dumpsters (10 minutes/dumpster handling day x 105 days dumpsters were handled)		**17.5** hours
Extra Time To Load And Move Cable (3 hours), **Move Wood To Burn Area** (3 hours), and to **Clean Recycling Compound Area** (6 hours)		**12.0** hours
Extra Time Required For Recyclable Material Handling		**66.0** hours
Time Savings-Result Of Cleaner Docks Due To Centralized Disposal Area For Wood & Other Recyclables (Frequency of dock clean-ups decreased due to disposal areas: Before disposal areas in place it required 8 person hours (two people,4 hours of labor each) every three weeks to clean wood, other unwanted materials off docks; after disposal areas in place it dock cleaning requires 8 person hours every five weeks). (In five months 3 dock clean-ups avoided x 8 hours/clean-up)		**24.0** hours
TOTAL-Extra Personnel Time Resulting From Recycling During The 5 Month Period		**42.0 hours**
	TIME INVOVLEMENT PER MONTH	**8.4 HOURS/MONTH**

SUMMARY — TIME INVOLVEMENT FOR RECYCLABLE HANDLING

Recyclable material containers handled by Port personnel September through December 1987.

TYPE OF MATERIAL	NUMBER OF TIMES HANDLED	LABOR HOURS INVOLVED
Cardboard	28	7.0 hours
Oil	12	4.0 hours
Wood	7	8.0 hours
Metal	6	1.8 hours
Recycling barge	3	8.0 hours
Nets, Line	1	1.5 hours
Total Hours To Handle Containers		**29.3** hours
Extra Time To Remove Cardboard From Dumpsters- (10 minutes/dumpster handling day x 90 days dumpsters were handled by Port personnel during the 122 day period between September and December 1987.		**15.0** hours
Extra Time To Clean Recycling Compound, Move Wood		**4.0** hours
Extra Time Required For Recyclable Material Handling		49.3 hours
Time Savings- Result Of Cleaner Docks Due To Centralized Disposal Area For Wood And Other Recyclables (In 4 months, 2 dock clean-ups avoided @ 8 hours ea)=		**16.0** hours
TOTAL- Extra Time Resulting From Recycling Tasks During 4 Month Period-September 1-December 31, 1987.		33.3 hours
	TIME INVOLVEMENT PER MONTH	**8.33 hours**

APPENDIX 5 - AMOUNT OF REFUSE GENERATED BY VESSEL TYPE

The quantity of refuse generated (by volume) by recreational and commercial fishing vessels and a research vessel at the Port of Newport were studied and are presented below. A calculation of refuse generated (by weight) taken from studies on Naval vessels is also presented (F). These figures should be considered minimum figures.

Different means of estimating port useage and refuse volumes were used in the following table. Calculations used to prepare the table follow.

The following assumptions are made: 100% return of refuse to port, refuse is mixed in composition (except for G), and no recycling is used.

Port/Vessel Use Calculation	Type of Vessel	Refuse Volume
A. Number of days vessels registered in port, taken from nightly inventory record.	commercial fishing	12-16.5 gallons per vessel/day
B. Fish landing records (number of vessels making fish deliveries to processing plant).	commercial fishing	71 gallons per fish landing record
C. Refuse generated by vessels from fishermen reports	commercial fishing	11.6 gallons per vessel/day 4.4 gallons per person/day
D. Estimate of average number of vessels served each day	recreational- fall/spring summer	3.75-6.5 5.0- 8.8 gallons per vessel/ day
E. Vessel launch records and estimates of use of moored vessels	recreational	5.2-5.6 gallons per vessel/day
F. Based on vessel complement	Navy*	3.0 pounds per person/day
G. Vessel complement 30 persons	research	0.4 gallons per person/day only plastic refuse

* From a study commissioned by the NOAA/National Marine Fisheries Service Seattle, WA. under contract number 85-ABC-00203.

CALCULATIONS FOR TABLE - THE AMOUNT OF REFUSE GENERATED BY VESSEL TYPE

The volume of refuse disposed of in Newport was used for calculations A-E in the above table. Since this table represents 100% return rate of refuse, a correction factor of 1.25 has been applied to calculations A, B, D, and E, adjusting for the 80% rate of refuse return achieved in Newport over the course of the pilot project. An additional correction factor has been applied to calculations A and B to adjust for the estimated volume of refuse expected if recycling had not been used. In Newport recycling of cardboard, wood, metal has been used, reducing apparent refuse volumes by an estimated third. Nets have also been recycled further reducing apparent refuse disposal volumes. Calculations A & B have used refuse figures adjusted upward by a factor of three.

An additional amount of vessel refuse (perhaps 26% of the refuse volume disposed of by the port) is disposed of at the local fish processing plants. This factor has not been considered in calculations A and B.

Calculations C and F do not account for provisioning and repair refuse, so additional capacity will be needed for refuse resulting from these operations.

A. Calculation based on records of commercial fishing vessels:

a. refuse volume: total volume disposed of per year (920 cubic yards (1986), 848 cubic yards (1987)). 1 cubic yard = 216 gallons
b. port use: vessel days registered in port during the year (taken from nightly vessel inventory record).(45,350 (1986),57573(1987))
c. gallons of refuse per vessel day in port = 3.2-4.4 gallons
d. correction factor = 3.75
(1.25 (assuming an 80% return rate in Newport, figure is corrected to a 100% return of refuse) + 3.0 (volume of recyclables not included, refuse capacity needs would be at least three times greater without recycling).
e. Corrected volume: 12.0-16.5 gallons per vessel/day registered in port.

B. Calculation based on commercial fishing vessel records:

a. refuse volume : total refuse disposed of in a year at port (753 cubic yards, 1987, November not included).
b. port use: the number of fish landing records (8391) recorded at the fish processing plants in 1987, November not included).
c. gallons of refuse per fish landing record = 19
d. correction factor = 3.75 (see A.d. above).
e. Corrected volume = 71 gallons per fish landing record.

C. Calculation based on commercial fishing vessel records (see p.63):

a. refuse volume: amount of refuse per vessel as reported by fishermen in a survey.
b. vessel use: vessel complement between 1 and 4 persons.
c. gallons of refuse per vessel per day = 11.6
gallons of refuse per person per day = 4.4
d. correction factor = none, but note that this figure does not account for provisioning and repair refuse, so additional capacity will needed to handle refuse generated in these operations.

D. Calculation based on recreational vessel records:

a. refuse volume: from records kept of refuse containers emptied during weekend use periods.

b. port use: rough estimation of the average number of recreational vessels served (115 vessels during fall,spring weekends, 250 vessels during summer weekends.)

c.

Containers Emptied/Day (50 gallon refuse cans)	Volume/Day gallons	Volume/Vessel/Day gallons
7-12 (fall,spring)	350-600	3.0-5.2
20-35 (summer)	1000-1750	4.0-7.0

d. correction factor = 1.25 (assuming an 80% return of refuse in Newport, figure is corrected to 100% return).

e. Corrected volume = 3.8-6.5 gallons per vessel/day during fall/spring.
5.0-8.8 gallons per vessel/day during summer.

E. Calculation based on recreation vessel records:

a. refuse volume: total volume disposed of in a year (755 cubic yards (1986), 802 cubic yards (1987)). 1 cubic yard = 216 gallons of refuse.

b. port use: number of vessel use days (30387 (1986), 29095 (1987)), calculated on basis of launch ramp records and estimates of use of moored vessels.

c. gallons of refuse per vessel use day = 5.2-5.6.

d. correction factor = 1.25 (see D.d. above)

e. Corrected volume = 6.5-7.0 gallons of refuse per vessel use day.

F. Calculation based on naval vessels:

a. refuse weight: calculated on the basis of the weight of the materials used for packaging of the vessel stores.

b. vessel use calculated on basis of vessel complement.

c. weight of refuse per person per day = 3.0 pounds.

d. correction factor = none, but note that this figure does not account for provisioning and repair refuse, so additional capacity will needed to handle refuse generated in these operations.

G. Calculation based on oceanographic research vessel which saved only plastic refuse:

a. refuse volume: records kept of volume of plastics put into trash compactor (651 gallons in 60 days).

b. vessel use: complement of 30 persons.

c. Gallons of plastics per person per day = 0.4

d. correction factor = none, but note that this figure does not account for provisioning and repair refuse, so additional capacity will needed to handle refuse generated in these operations.

REFUSE GENERATED ON BOARD FISHING VESSELS
(Information provided by Newport fishermen)

Note: Fishermen provided all information presented below except for that listed in "estimated volume" column. This volume is calculated as follows from the information given:

Unless other-wise understood or specified, "bag" or "sack" is taken to mean the standard size large plastic sacks commonly available in stores. These sacks are usually dark green, brown, or black in color and can hold 33 gallons of trash. Other trash containers commmonly in use are tall kitchen garbage cans which hold 13 gallons, buckets which are taken to hold 5 gallons, and paper sacks which are taken to hold 8 gallons.

For the following calculations: minimum trip length was taken to be one day the lower number of days in the range is taken to be the trip length, and the higher volume of refuse estimated if a range is given, is taken to be the volume of refuse generated.

FISHERY	TRIP LENGTH (days)	HOW MUCH TRASH	ESTIMATED VOLUME * gallons	WHERE STORED	WHAT KEPT
salmon	1/2	bucket	5		
salmon	1	grocery bag full	8	box	
salmon	1	1/4 bucket	1	galley	
salmon	1	8 gallons	8	cabin	
salmon	1	bag	13		
salmon	1	1/2- 1/3 bag	7		
salmon	1	1/2 paper sack	4	head	
salmon	1	2 grocery bags	16	storage room	everything
salmon	1	bucket	5		
salmon	1-2	bucket	5		
salmon	2	1/2 garbage can	7	bow	
salmon	2-3	gunny sack (coffee)	30	behind wheel house	everything
salmon	3	1-1 1/2 sacks	21	in box on back deck	
salmon	3	8-15 gallons	15	hang bag on wall in wheel house	
salmon/bottom	3-4	1/2 lg sack	17	head	plastics,cans
salmon/bottom	3-4	20 gallon			
salmon	3-5	couple of small bags that fit into one large sack	33		
salmon	3-5	15 gallons	15	on corner of deck	
salmon	3-5	2 small bags	26		
salmon	3-5	1 bag	33	deck	
salmon	3-6	5 gallons	5	wheel house,focsle, 55 gallon drum on deck behind wheelhouse	

salmon	3–12	1g sack	33	backdeck,g.can	everything
				in house	but foodstuffs
salmon	4	2 bags	66		
salmon	4	1 trash sack	33		
salmon	4	1 paper sack	8		
salmon	4	30 gallons	30	deck behind wheelhouse	
salmon/tuna/crab	4–5	5 gallon	5	outside door on back deck	
salmon	4–5	30 gallon(stomped)	30	back deck	
salmon/non-bait	4–5	2- 5 gal.buckets	10		
salmon	4–5	5 gal. bucket	5		plastics
salmon	4–5	trash sack full	33	outside of wheel house on deck	everything
salmon	4–7	2 1g trash bags	66		plastics,cans
salmon	5	1 sack full	33	head	plastics
				(cans kept separately)	
salmon	5	1 sack full	13	garbage can with sack inside	
salmon	5	bag	33		
salmon	5	boxful	33	wheelhouse	
salmon	5	2–3 bags	99		bait packaging
salmon	5	bag full	13	under sink	plastics
salmon	5–6	bunch of bread	13		sacks, milk jugs
salmon/tuna	6	2 bags	66		
salmon/tuna	6–7	2 paper bags	16	under sink	plastics
salmon	6–7	3–20 gallon sacks per 10 days	60		everything
salmon	7	3 bag s	99		
salmon	7	full 1g garbage sack	33	kitchen, flying bridge	
salmon	7–8	1–1 1/2 30 gallon bags	45	alongside vessel between wheel house and rail behind dingy	
salmon	10	1/2 tote garbage	267		

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168 days 1416 gallons:
Average 8.4 gallons refuse/day salmon fishing
Average crew size 1.5 persons= 5.6 gallons refuse/person/day

tuna	4–5	1 1/2 steel sacks	50	wheel house,flying bridge	
tuna	5	bag full	13	under sink	plastics
tuna/salmon	5	30 gallons	30	barrel on deck	
tuna	5–6	boxful	33	on table which is not in use	
tuna	14–21	1–2 sacks	66		
tuna	15	2 40 gallon bags	80		everything
tuna	20	13 gallon bags	91	under skiff on deck	

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68 days 363 gallons:
Average 5.34 gallons refuse/day tuna fishing
Average crew size 2.5 persons= 2.7 gallons refuse/person/day

blackcod	3-4	4 white bags (bag/day)	52		everything
blackcod(line)	5	2- 2 1/2 big bags	83		
longline/crab	5	2-3 bags	99	outside	
halibut	6	33 gallons	33		75% plastics
longline(cod/halibut)	7	2 gallons	2	stores in milk jugs in galley	
halibut/swordfish	8	3 bags	99	above wheel house	
halibut/albcore	7-14	1g sack	33	kitchen, flying bridge	
blackcod (line)	15	tote/black cod pot full (64cubic ft)	533		plastics
blackcod	20-30	1 bag/week(3-4 bag 5 bags at most)	165	back deck	
blackcod (30)		300 lbs	(?)	freezer inside 1g bag	

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76 days 1099 gallons
Average 14.5 gallons refuse/day blackcod/halibut fishing
Average crew size 3.5 persons= 4.1 gallons/person/day

crab	1/8	picnic lunch amount	8	in bow	
crab	1-2	23 gallons	23		
crab	2	13 gallons	13		plastics
crab	2	bag	33	back deck	
crab	2	bag	33	galley deck	
crab	2	1 bag	33	galley,deck	
crab	2	55 gallons	55	barrel on deck	
crab	2-3	1 bag	33	deck	
crab	5	1 bag	33		

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19 days 264 gallons
Average 13.9 gallons refuse/day crab fishing
Average crew size 3 persons = 4.6 gallons/person/day

shrimp	4-5	few lawn size bags	117		plastics
shrimp	4-5	33 gallon	33	head	
shrimp	5	30 gallons	30		plastics
shrimp	5	full bag	33	tool room	
shrimp	5	2 1g bags	66		plastics
shrimp	5	4 1g bags	132		

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28 days 411 gallons
Average 14.7 gallons refuse/day shrimp fishing
Average crew size 3 persons= 4.9 gallons/person/day

bottom	2-3	2-3 1g sacks	99		
bottom	2-3	2-3 1g sacks	99		
mid-water trawl	3	1/2 bag	17		plastics
bottomfish/midwater	3	2 bags	66		
drag	3-4	4 white bags (sack/day)	52		everything
drag	5	bag	33	galley	
JV-Alaska	5	4 bags	132		
JV	10	3-5 bags	165		everything
JV	14	3-4 sacks	132	fish hold	
JV	14	3-4 bags	132		
JV	14-21	4 sacks	132		
JV	14-21	1 sack	33	outside wheel house	plastics
JV/mid-water	14-16	10 bags/16 days	330	deck and/or hold	
JV	15	4-5 big bags	165	fish hold	
JV	22	8 bags(not full)	264	hold	everything except cans
JV drag	30	bag every three days	330	in box on deck close to cabin after bulkhead, compact and give to Soviets.	
JV	30	4-5 compactor sacks	660	hold	
JV	30	20 bags	660		
JV	30	3 bags every 10 days	297	back deck, side of winch (transferred to Soviets)	
JV	70	1 1/2 dumpsters(30 bags)	330		everything

330 days 4128 gallons
Average 12.5 gallons refuse/day trawl fishing
Average crew size 3 persons = 4.2 gallons refuse/person/day

AVERAGING ALL FISHERIES ABOVE : 11.6 gallons of refuse/fishing day might be expected , and 4.4 gallons of refuse/person/day aboard a fishing boat might be expected.

OTHER INFORMATION:

shark	10-14	full garbage can every other day	165		food,packaging

charter (9 people)	1/3 day	1- 1 1/2 bags	50	outside,cabin,roof	everything

Refuse per person aboard= 5.6 gallons/person/charter trip

NOTES RELATED TO NEWPORT FLEET AND FISHERY

Type of fishery	vessel complement	vessel size	packaged bait used
salmon	1-2 persons	20-50	yes, no*
longline	2-5 persons	40-90	yes
tuna	2-3 persons	40-60	no
black cod (pot)	3-4 persons	40-100	yes
crab	3 persons	30-90	yes
shrimp	3 persons	60-90	no
JV/mid-water/bottom	3 person	50-90	no

Vessels in Newport are more often than not used to fish in more than one fishery. The vessel's gear is adapted or changed over to allow for participation in the various fisheries. What type of fish a vessel will pursue is determined by multiple factors some of them being : fish quotas, seasons, fish stock, fish prices, vessel design, and personal experience and preference.

* Salmon fishery is both a lure and a bait fishery, with bait use especially prevalent during the summer and fall. Bait used for salmon fishing is often packaged in a styrofoam tray covered with a plastic wrapper.

Long-line type fishing is used to catch either black cod or halibut Black-cod fishery—can be fished either longline or by pot. Bait is used in both. Bait such as squid,hake, and herring are used and comes packaged in 25 or 50 lb packages, with the bait fish being placed in clear plastic bags within cardboard boxes and frozen.

In the long line fishery for black cod and halibut- crew size dependent on the size of the vessel. In Newport vessels fishing black cod or halibut range from 40 to 100 feet. (As one goes further north from Oregon, black cod vessel sizes tend to increase). A 40 ft vessel usually would fish with 3 persons on board while a large (98 ft) vessel might fish with up to 15 persons on board.

A 43 ft vessel fishing using packaged bait to fish for black cod can easily go through 150-200 lbs of bait/day. Between 5 and 8 large sized bags are generated from bait packaging alone each day— this quantity of bait packaging plus the clippings from the gear would fill a garbage bag each day.

A 98 ft vessel fishing for black cod uses 25 boxes/day of squid bait (in 25 lb. boxes) and 35 boxes/ day of hake bait that's at least 60 plastic bags/day. In a 15 day trip —get a whole black cod pot stuffed full of plastics or fill a tote (64 cubic ft) with it.

Tuna fishery is a lure and line fishery predominantly, if bait is used, it is caught fresh at sea (e.g. anchovy).

Tuna vessels especially in areas south of here (e.g. those fishing out of southern California ports) area can be much larger than those used here— up to 85 feet.

Crab fishery is a pot fishery, packaged bait is used and is often supplemented by fish carcasses used for hanging bait. Squid and clams are often used for bait. The bait comes packaged in 25 lb packages. 500 or more pounds of bait are used in a two day trip by a average size boat (i.e. at least 20 large size plastic bags from bait packaging alone).

Shrimp, JV, bottom, midwater, and shark fisheries are net fisheries— no bait used.

Jig and long-bar gear is used by some vessels to fish bottom fish in near-shore areas. Bait is sometimes used.

Information related to cubic feet/yd to gallon conversion:

8.33 gallons are taken to fit into a cubic ft of space
216 gallons are taken to fit into a cubic yd of space

However, since most persons do not fill their refuse bags or cans to capacity, a figure that a refuse company worker gives, is that a cubic yard dumpster holds between 8 and 10 32 gallon cans of refuse (i.e. between 256 and 320 apparent gallons of trash).

Similarly a cubic yard and a half container can be filled with between 12 and 14 cans (32 gallon cans) of refuse (i.e. between 384 and 448 apparent gallons of trash).

APPENDIX 6 - REFUSE COMPOSITION STUDY

These figures represent the composition of refuse found in the Port of Newport trash containers. Half of each dumpster's contents were surveyed. Refuse was sorted by its material type. Cardboard, metal and glass deposit containers were recorded by number of items and removed from the sample. The remaining refuse quantities were reported by volume. The samples were done between August 16 and November 30, 1987 in Newport, Oregon.

	Recreational Marina	Commercial moorage A*	B*	total	Total
Percentage by volume:					
NON-DEGRADEABLE (household)	49 %	35 %	35 %	35 %	42 %
NON-DEGRADEABLE (gear/work materials)*	8 %	11 %	22 %	16 %	12 %
DEGRADEABLE	43 %	54 %	43 %	48 %	46 %
Additional items (not included in above volumes)					
METAL, GLASS containers	306	128	100	228	534
CARDBOARD BOXES	50	10	21	31	81
DUMPSTERS IN SAMPLE	15	6	4	10	25

A* Small commercial vessels (to 45 feet): many day-use and some vessels that stay a week at sea.

B* Large commercial vessels: many shrimp, trawl, tuna, and salmon vessels. These vessels may remain at sea for periods of one week to a month.

Recycling bins are available at the commercial docks for the placement of cardboard, metal, deposit beverage containers, nets and wood, affecting compositions found in dumpsters.

* Gear and work materials includes synthetic materials such as fishing line, net and rope pieces, hoses, gloves, bait packaging, packing band straps, lures, etc.

APPENDIX 7 - TRASH COMPACTOR USE

Trash Compactor Use Aboard Fishing and Research Vessels

Background:

Refuse storage space on vessels is often limited, potentially making compliance with Annex V difficult especially for those vessels which spend long times at sea.

Compactors have been in use for some years now, on at least five fishing vessels on the West coast, whose sizes range between 60 and 87 feet in length. Three to five persons work on these space limited vessels which spend between 15 and 45 days at sea between port calls. In June 1987, three additional vessels in Newport, Oregon (two fishing vessels and a research vessel) experimented with the use of trash compactors as a means of containing their refuse on board. Written surveys were filled out by the operators of these vessels and interviews were conducted to evaluate compactor effectiveness. The compactors used were small, kitchen sized SEARS Kenmore trash compactors which measure (in inches) 34h x 15w x 25d, and weigh 170 pounds.

Results:

The longest period of time between port calls for one fishing vessel (Pacific Future, length 75 feet) is two weeks. With a crew of four, 4 compactor bags are filled during this time. The other fishing vessel (Marathon, 87 feet), has a three person crew. This vessel spends between twenty and thirty days at sea between port calls and generates 4 compactor bags of refuse. The refuse placed into the compactor was mixed in composition.

Fishing vessel operators estimated that between five and seven standard kitchen sized bags (13 gallons) were compacted into one compactor bag. The Pacific Future stores compacted refuse by the side of the wheel house, while the Marathon stores its compacted trash in the fish hold. The compacted bag of refuse on both these vessels is placed in a large plastic bag which is then sealed before storage, to eliminate smell and sanitary problems and prevent any fluid leakage.

By separating and compacting only the plastic wastes, the Research Vessel WECOMA with a crew of 30 persons, generated a compacted bag of plastic refuse every 3 to 6 days. The compacted bag held 50 gallons of uncompacted plastic refuse on the average (range 30 to 88 gallons). The separation of the plastic wastes from the degradable wastes was accomplished at the point of disposal, by placing an additional refuse container along-side each existing container and clearly labeling it for "plastics only". About 99% of the plastics generated on board is estimated to stay on board, using this method. The longest continuous time at sea between port calls during the survey period was 23 days, during which time 6 compacted bags were generated and stored on board.

Thirty minutes of work is required each day on the WECOMA to collect the refuse containers containing plastics, load the compactor, and compact the refuse. (The plastic refuse is loaded into the compactor a small amount at a time and several compaction cycles started). Additionally, whenever a bag is removed from the compactor, the compactor is cleaned and disinfected. This operation takes an additional 30 minutes. During the two month research cruise, 13 compactor bags were filled and emptied. Thus, the additional time for cleaning amounted to 6.5 hours over the 60 day period.

Comments by the captains or crew members responsible for the refuse handling tasks on these three vessels reveal that compaction is a method which will minimize the time and work required to handle refuse on board and one which will facilitate refuse storage and compliance with regulations preventing disposal of refuse at sea. Though it may take some initial adjustments to find a place to install a compactor and the compacted refuse, these are not difficult problems to resolve.

Summary:

Trash compactor use may allow persons on space limited vessels to more easily handle and store refuse on board.

APPENDIX 8 - APHIS REQUIREMENTS

HANDLING OF REFUSE FROM VESSELS WITH FOREIGN PORT CALLS

Any garbage offloaded from a vessel (foreign and domestic) which has been in any ports outside of the continental United States or Canada is a potential source of plant and livestock pests and diseases. The introduction and spread of these pests could spell disaster for United States food production and the economy.

Handling of such refuse is regulated by the United States Department of Agriculture, Animal and Plant Health Inspection Service (APHIS).

Special Requirements

"Garbage" regulated under these USDA AHPIS rules means all waste materials acquired from outside the continental United States and Canada which are derived in whole or part from all types of produce and meat materials, and any other refuse of any type that has been associated with such materials on the vessels. This includes not only the food scraps, table refuse, and galley refuse, but the food wrappers and packaging materials too. (This also includes any other food and food packaging material from stores, food preparation areas, passengers or crews' quarters, and dining rooms).

While on board the vessel, APHIS regulations require that all of this garbage be contained in tight, leak-proof, covered receptacles within the guard rails of the vessel. This garbage cannot be unloaded in port unless it is removed in these containers under direction of an APHIS inspector. The garbage must go into an APHIS approved facility for sterilization, incineration, or grinding into an APHIS approved sewage system (or for other handling specifically allowed by APHIS). Sterilization is accomplished by cooking the refuse at 212° F for 30 minutes, incineration involves reducing the refuse to ash, and an approved sewage system is one which keeps discharge off land, lagoons or stationary waters (e.g. one that goes into a sewage treatment plant).

APHIS inspectors have been authorized to coordinate their regulatory efforts with activities of representatives of the Environmental Protection Agency, and other Federal, State, and local agencies which also have jurisdiction over such garbage.

Ports Must Apply For Facility Approval From APHIS

Port officials or the owners of the facilities where such refuse will be accepted need to apply for the approval of their facilities. Write to the Administrator, Animal and Plant Health Inspection Service, U.S. Department of Agriculture, WA, D.C. 20250. More information is also available from this address.

Disposal Of Refuse After APHIS Treatment

The refuse which results from the sterilizer (volume is reduced by about 25%) can then be disposed of in regular refuse disposal containers.

The ash that results from operation of an incinerator can then also be disposed of in a regular disposal container (unless its composition requires that it be disposed of in a landfill designated for hazardous wastes).

Considerations For Choosing APHIS Reception Facilities

The capacity of the APHIS approved equipment or facility will be important for port consideration. The number of operating cycles possible per day and the volume of refuse accepted each operating cycle will determine the system's capacity.

While vessels are, under MARPOL ANNEX V, only required to keep certain types of materials on board (see Appendix 9), refuse returned to port will be mixed. The amount of refuse expected should be calculated with this in mind. If studies in Newport regarding the volume of refuse generated on commercial and recreational fishing vessels are any indication of refuse generation on other types of vessels, one might approximate a volume of refuse of between 4 and 6 gallons per person per day on a vessel. (See Appendix 5).

Notes Regarding Sterilization Facilities

All airports which receive planes from airports outside the continental United States and Canada are similarly regulated. In these airports refuse from flights is usually handled by an autoclave machine.

The Port of Seattle airport, for example now uses a sterilizer machine which is 5' in diameter and 10'long, which they fill up to 3/4 full of refuse one to three times per day. A sterilization cycle runs about 1.5-2 hours and is accomplished at 250° F and 15 pounds per square inch of pressure. Fuel costs for each load run about $1.00 per load. About 30 minutes of labor is involved each load for cleaning out sterilized refuse and loading an unsterilized batch. Maintanence is minimal and costs less than $100 per year. Maintenance involves cleaning the steam trap and the steamer regularly and the door seal about once every 3 years. This type of machine costs about $20,000, not including installation costs.

One needs to have a source of steam to run such a sterilizer. The airport uses steam from the boiler room which is used to heat the airport terminal, but must reduce the pressure of the line from 125 psi to 20 psi through a pressure reducing coupling valve. A ship's boilers could provide that source of steam. If no such source of steam exists a small boiler would need to be purchased (boilers may cost $20,000 as well).

Operators have found that to efficiently sterilize refuse, plastic bags containing refuse must be punctured before being sterilized to allow the escapement of any liquids while the refuse is being cooked, or all the refuse will not reach the required temperature. The fewer liquids in the refuse the easier it is for the refuse to heat up.

Notes Regarding Incineration Facilities

Incinerators are commercially available for use both on land and on vessels, though their use is controversial. Concern centers around the pollutants (particulates, heavy metals, and complex organic molecules) which may emit from incinerators. The Environmental Protection Agency is presently reviewing regulations applying to incinerator facilities.

A small commercial sized incinerator which may prove feasible for a small port operation might be similar to the one in use on some U.S. Corps of Engineer dredging vessels.

The dredging vessel, Yaquina, uses an incinerator to burn all standard refuse (no hazardous wastes). Having had trouble incinerating wet refuse, they try to divert all organic "wet" refuse from that which will be burned, by having separate recepticles in the galley. The incinerator unit measures about 3' in diameter and 5' in length, and can handle about 7 cubic feet of refuse (about 58 gallons) in each two hour cycle (a cool down period is also necessary). Diesel fuel is burned to run the incinerator. Incinerators such as these may cost about $16,000 (not including installation) with larger capacity incinerators costing up to $50,000.

An incinerator was in operation at the Port of Seattle airport, before their conversion to a sterilization system, in 1977. The incinerator was expensive to operate, with the fuel costs of each load of $25.00 (1977 prices). Maintanence costs were also reported to be much higher. Another disadvantage of incinerator operation was seen to be the desire of other governmental agencies to use the incinerator for disposal of drugs and materials contaminated with animal or plant diseases.

Recovering Costs

To cover the purchase costs of a $20,000 facility in a 10 year period (given a 8% interest rate) the port should recover a total of $242.66 a month. Operational, maintenance, and depreciation costs are additional.

APPENDIX 9 – MARPOL ANNEX V DISCHARGE LIMITATIONS

MARPOL ANNEX V

Summary of Refuse Discharge Limitations

Refuse Type	All Vessels	
	Outside Special Areas	In Special Areas***
Plastics* – includes synthetic netting material and rope	Dumping Prohibited	Dumping Prohibited
Floating packing and lining material	> 25 miles offshore	Dumping Prohibited
Paper, rags, glass, metal, bottles, crockery	> 12 miles	Dumping Prohibited
Ground paper, rags,** glass, etc.	> 3 miles	Dumping Prohibited
Food	> 12 miles	> 12 miles
Food comminuted or** ground	> 3 miles	> 12 miles

* Not apply to accidental loss of synthetic fishing nets, provided all reasonable precautions have been taken.

** Ground refuse must be able to pass through a screen with mesh size no larger than 25 mm. (1 inch)

*** The Gulf of Mexico is being considered for designation as a special area.