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1992 MARINE DEBRIS SURVEY REPORT

GULF ISLANDS NATIONAL SEASHORE



CONTENTS

Page

Abstract....2
Introduction....3
Study Area....5
Study Beaches....9
Methods....12
Results....14
Table 1. Comparison of Plastic Category by Year....14
Table 2. Comparison of Top Ten Plastics by Year....15
Discussion....18
Operational Support....21
References....23
Figure 1: National Park Marine Debris Monitoring Network..24
Figure 2: Regional Map....25
Figure 3: Survey Area....26
Figure 4: Cross Section of Barrier Islands....27
Figure 5: Percent of Total Debris by Category....28
Figure 6: Percent of plastic Debris by Category....29
Figure 7: Percent Plastics By Season--Year 4....30
Figure 8: 10 Most Abundant Plastic Items--Year 4....31
Figure 9: 10 Most Abundant Plastic Items by Season....32
Figure 10: Percent Plastic by Transect--Year 4....33
Table 3: Mean Quarterly Accumulation Rate--Year 4....34
Table 4: Comparison of Quantities of Marine Debris Harmful to Wildlife by Years....38
Table 5: Comparison of Items by Years....39

Appendix 1: Marine Debris Survey Sheet.....42
Appendix 2: Categories and Debris Definitions.....43

ABSTRACT

Results are presented from four quarterly marine debris surveys conducted at Gulf Islands National Seashore (GUIS) during FY 1992. Survey zones include five 1 km study beaches located on Santa Rosa Island (FL), Perdido Key (FL), Horn Island (MS) and West Ship Island (MS). In FY 1992 a total of 13,090 items, the second lowest number recorded since the survey began in 1989, was recorded, 83 percent consisting of plastics. The greatest amount of plastic debris was picked up during the summer survey. The 10 most abundant plastics in rank order were (1) foam fragments, (2) hard fragments, (3) caps and lids, (4) bottles less than one gallon, (5) bags less than one meter square, (6) plastic sheeting less than one meter square, (7) smoking accessories, (8) rope fragments less than one meter, (9) food containers , and (10) foam cups. By category 48% of the plastic debris was documented as miscellaneous, 34% packaging, 9% personal, and 8% fishing. Plastic debris was traceable to Venezuela and Mexico. Three dead animals were found in the Mississippi sites: a saltwater catfish in a plastic bag, a trigger fish in a plastic bottle, and a gull wrapped in plastic line. Medical debris was negligible. The most nonplastic debris was metal (7 %). Weather patterns including the storm surge of Hurricane Andrew, higher than normal rainfall on the mainland areas, and fewer commercial shrimping licenses, plus near shore current, shoreline growth and erosion, and offshore and onshore activities influenced the dispersion and amount of marine debris.

INTRODUCTION

In 1992, 145,000 volunteers from 35 states and U. S. territories, plus 12 foreign countries participated in the annual fall cleanup. Despite the December 31, 1989 implementation of MARPOL Annex V, an international treaty which prohibits dumping of plastic as sea, volunteers still removed mostly plastic debris from the beaches. Plastic material persists in the marine environment and poses serious threats to marine life which can be entangled or killed.

To provide a scientific assessment of national, regional, and seasonal trends in marine debris abundance, composition, and accumulation a five year cooperative National Park Service/ National Marine Fisheries monitoring program started in 1989. Initially, Gulf Islands National Seashore and seven other units of the National Park Service along the Atlantic, Pacific, and Gulf coasts were selected. Virgin Islands National Seashore and Dry Tortugas National Park (formerly Fort Jefferson National Monument) were added to the marine debris monitoring network in 1991, and 1992, respectively (Figure 1).

Located in the north-central area of the Gulf of Mexico, Gulf Islands National Seashore (GUIS) stretches 150 miles from West Ship Island, Mississippi, to Santa Rosa Island, Florida. Bishop (1989,1990, 1991) described the first three years result

of the monitoring program; this report summarizes results from GUIS's fourth year of study.

STUDY AREA

Natural Influences

GUIS, the largest national seashore, encompasses 38,489.38 hectares of land of which 87 percent are submerged. There are 77.4 kilometers of Gulf shoreline and 92.7 kilometers of Bay shoreline. GUIS is unique since it includes Horn and Petit Bois Islands, the only two federally designated national seashore wilderness islands in the Gulf of Mexico.

The weather in both the Florida and Mississippi Districts of GUIS is moderated by the Gulf of Mexico. The region has a humid, warm-temperate to sub-tropical climate, although occasional subfreezing temperatures occur. Normal rainfall ranges from 55 to 64 inches a year and is generally distributed throughout the year. Winter storms occur when large continental air masses move into the region; afternoon summer storms are frequent. Each year the possibility of tropical storms and hurricanes has been estimated at 13% and 6% respectively.

Prevailing winds are generally from the south most of the year and from the north from September to February. Winds and currents from the east transport sand from the eastern to the western islands. Erosion of the eastern ends of the islands and accretion on the western ends indicate significant occurrence of longshore drift (Figure 2).

Circulation patterns within the area are controlled by astronomical tides, winds, and freshwater discharges from river runoff. In the Mississippi Sound and adjacent Gulf waters, the

average tidal range is .46 m (1.5 feet) with a predominant diurnal period of 24.8 hours. The tidal wave progresses from south to north and enters Mississippi Sound first through Horn Island Pass and splits, traveling both eastward and westward, causing as much as a 6-hour phase shift within the Mississippi Sound. Water velocities range between 0 to 3 feet per second in the barrier island passes. In Florida, at the entrance of the Pensacola Bay, the average tidal range is .34 m (1.1 feet) and the tidal wave progresses from south to north entering the bay.

Wind driven currents are the primary non-tidal water motions. Although tidal currents are the most energetic currents seen in the area, non-tidal wind-induced circulation is the principal driving force of the low frequency circulation.

Human Influences.

Both GUIS districts are located near medium sized counties. The mainland population of the each Mississippi Coastal counties in 1990 was: Hancock--30,681, Harrison--161,991, and Jackson--113,221. In Florida the 1990 population of Escambia County was 280,000 and Santa Rosa County was 68,000.

The closest residential area to the survey sites in Mississippi is 11.27 k across the Mississippi Sound. In Florida, hotels and condominiums adjacent to the eastern boundary are 16 k from the Fort Pickens Area of Santa Rosa Island and 3.22 k from the western boundary of Perdido Key.

GUIS is within one day's driving distance from large metropolitan areas such as Atlanta and Memphis, and in 1992, over 5.5 million people, (an increase of 8% over 1991), visited GUIS

(Figure 3). Although GUIS is considered a year-round park, heaviest visitation occurs during the summer months.

Many seashore visitors use their own boats for transportation to the Mississippi barrier islands. For example, in 1992, 37,452 vessels were counted within the boundary of the Mississippi District. In Florida there 22,485 registered boaters in the Escambia and Santa Rosa counties adjacent to the Florida District in 1992. (Note: The number of registered boaters in 1991 was incorrectly reported as 19,362. The correct number is 22,163.)

In addition to recreational boats, commercial fishing vessels are, according to state regulations, allowed to trawl or fish within GUIS waters. In 1992, 2,423 licenses were issued to shrimp boat operators trawling for brown and white shrimp in the state of Mississippi. Brown shrimp, the primary commercial shrimp, is generally harvested from May to August, and offshore from June to November.

Other commercial operators are commercial licensed to harvest crabs, oyster, menhaden, croakers, and mullet in Mississippi waters. Menhaden landings made the Pascagoula-Moss Point, Mississippi, the second highest port in the United States for the volume of landings in 1989.

Because salt water licenses are not required for recreational fishing, it can be estimated that there are approximately 100,000 Mississippi saltwater anglers who sought a variety of fishes including flounder, cobia, red drum, sea trout, and Spanish mackerel.

In Escambia and Santa Rosa, Florida, a total of 724

commercial fishing and charter boats were registered in 1992. (Note: In 1991 it was reported that 153 commercial fishing and charter boats were registered in Escambia County, Florida. Corrections for 1991 are 417 registered commercial vessels in Escambia and 274 for Santa Rosa Counties.) Anglers in the Florida panhandle fish onshore for Spanish mackerel, speckled trout, stripped mullet and offshore for red snapper, trigger fish, and grouper. Billfishing is also a popular offshore recreational activity.

Other commercial activities within close proximity to GUIS include shipping, and oil and gas production. For example, in 1992 the Port of Gulfport, Mississippi, known as the "banana terminal" of United States, unloaded 335 ocean going vessels and barges including those registered from Europe, South America, Southeast Asia, Africa, and the Caribbean. The Port of Pensacola, Florida, served 182 vessels and 332 barges in 1992.

Both districts are close to active shipping lanes and the inter-coastal waterway. Construction of three U. S. Navy home ports located in Pensacola, Florida, Mobile, Alabama, and Pascagoula, Mississippi started in 1990. The Naval Air Station Pensacola, a major training base, used the aircraft carrier USS Forrestal and major support vessels for training navy pilots. Other military installations include Keesler Air Force Base on Biloxi Back Bay, and the Seabee Base located in Gulfport, Mississippi.

Although hundreds of oil and gas tracks are leased off the Seashore's Mississippi barrier islands there is only one well in

operation and that is located south of Petit Bois Island. In addition, gas and oil pipelines cross the Mississippi Sound from production areas in Louisiana to the Chevron Refinery located in Pascagoula, Mississippi. Within 30 miles of West Ship Island, Mississippi, there are an estimated 931 Louisiana wells in production; the closest active development lies offshore from Destin, Florida approximately 56.32 kilometers from the Florida District.

The largest oil refinery in the state of Mississippi and the second largest ship building company in the nation are located in Jackson County, the most eastern coastal county and located six to twelve miles north of Horn and Petit Bois Islands.

STUDY BEACHES

Marine Debris was monitored at five 1 km beaches which represents 3 percent of the GUIS shoreline (Figure 2).

1. **West Ship Island**: Facing the Gulf of Mexico this dynamic beach averages 58.6 m in width at west boundary and 30 m in width at east boundary. The beach, composed of well sorted fine to medium grained quartz sand with apparent concentrations of titanium and zirconium, slopes gently from the first natural dune line to the waters edge. The predominate vegetation on the landward boundary of the site is sea oats (Uniola paniculta). Offshore slope is very low and gradual; an offshore bar is approximately 24.32 to 30.40 m. The site is accessible by boat or by foot and is located approximately one kilometer from the

lifeguarded beach. (Note: West Ship Island which is 3.5 miles in length received 145,074 visitors in 1992. Except during the December survey, a few visitors were contacted in the survey area. Most of the visitors stayed on the western end of the island.)

2. Horn Island South: Facing the Gulf of Mexico, this dynamic beach site currently has the widest beach of all Mississippi survey sites, averaging approximately 78 m in width at the west boundary and 27 m in width at the east boundary. The beach is composed of well sorted fine to medium grained quartz sand is located in the center of the island approximately 500 meters east of the middle cross island trail. Pioneer plants such as sea rocket (Cakile constricta) and railroad vine (Ipomoea sp.) or the toe of the dune strand form the landward boundary. The site is accessible by boat or foot. Tracks of Red Wolves (Canus rufus) were frequently seen in this survey site. (Note: this endangered species was temporarily released on Horn Island in 1989 as part of a recovery project.)

3. Horn Island North: Facing the Mississippi Sound this site is the only one on the sound side and is located approximately 100 m west of the government dock and extends to the first western inlet. In width this beach site is approximately 7 meters from mean low water to the dune toe and is composed of well sorted fine to medium grained quartz sand. This beach is actively eroding and is accessible by boat or foot. Visitation to Horn Island in 1992 was 40,558.

4. Perdido Key: Fronting the Gulf of Mexico, this study site is located on the island of Perdido Key approximately 6.44 kilometers west of the Pensacola Pass inlet and Ship Channel. Beaches within the site are subject to moderate wave energy, exhibit low to moderate slopes, and are comprised of well sorted, fine to medium grained quartz sand. The study area is characterized as erosional, with annual shoreline retreat ranging between .61-1.83 meters (2-6 feet) per year over the last century. Prior to beach nourishment in 1989-90, the typical beach ranged from 15-30 meters; the western boundary in 1992 was 38.9 m and eastern boundary 37.6m. The flat post-nourishment beaches are backed by intermittent, moderately developed Uniola dominated dunes ranging in elevation from 2-4 meters above sea level. The study area is located approximately .5 kilometers from the terminus of public access road and receives moderate visitation from spring through fall.

5. Fort Pickens: The Fort Pickens study beach is located on the southern, Gulf of Mexico facing, shoreline of Santa Rosa Island, approximately 2.42 kilometers miles east of the Island's west tip at Pensacola Pass Inlet. Although Santa Rosa is characterized as generally stable, beaches within the study site are subject to highly variable short term cycles of both erosional and accretion. Typical beach widths range from 17.4 m on the western boundary to 16.3 me on the eastern boundary. The beach is subject to moderate wave energy, exhibits low to moderate slope, and is comprised of well sorted, predominantly fine grained quartz sand. Most of the study beach is backed by

moderately developed Uniola dominated dunes ranging in elevation from 1 to 5 meters about sea level, and which are occasionally eroded by overwash during storm events. This site, which is accessible by foot or by road, receives moderate visitation.

METHODS

Beach sites were surveyed over a four day period in December, 1991, a five day period in March, a seven and half week period in June/July*, and an eight day period in September, 1992. Between 2 and 14 fourteen people including GUIS staff, local volunteers, international volunteers, and National Marine Fisheries employees conducted the surveys.

This survey area included the intertidal zone from the water's edge to either the base of the erosion scarp (Horn Island North) or the primary vegetation in the dune field (Figure 4). (Note: When there was a lack of vegetation in the dune field, surveyors determined the boundary limits.) All unnatural

(*During the spring survey rough weather conditions and a delay in repairing the park boat prevented a timely survey.)

marine debris items except those smaller than 5 mm or those made of lumber or stone were removed and documented according to the survey sheets. (See Appendix 1 for debris definitions.) Items too heavy to be removed from the island or partially buried were tagged and dated.

All debris was recorded onsite in Mississippi. In Florida the debris with the potential to fragment was tallied as it was discovered and non-fragmentable debris was collected and enumerated offsite at a later date.

All items less than half their original size as well as netting with less than five complete meshes were documented as fragments. Lengths of rope or fishing line greater than one meter, and twine diameters of netting, rope, and fishing line were also measured and recorded. In addition, the measured distance between the two stretched adjacent knots of trawl web mesh and the diameter of stretched closed straps were measured. Small pieces of nets were weighed with hand scales.

Information from the documented survey forms was entered into a computerized data base at NOVA University in Dania, Florida to determine (1) the percentages of plastic, glass, metal, cloth, leather, stone, and paper debris, (2) the percentages based on fishing, personal, packaging, or miscellaneous categories, (3) the ten most abundant plastic items, and (4) per kilometer the mean number of potential ingestible plastics and items that could entangle wildlife.

RESULTS

Plastic Debris.

Of the 13,090 documented during the 20 beach surveys, plastics accounted for 83 percent (Figure 5). By category, 48% of the plastic debris was documented as miscellaneous, 34% packaging, 9% personal, and 8% fishing (Figure 6). Throughout 1992 ranking by category remained constant: (1) miscellaneous, (2) packaging, (3) personal, and (4) fishing (Figure).

Comparison of Plastic Category by Year

Category	1989	1990	1991	1992
Packaging	46	39	34	34
Miscellaneous	38	42	48	48
Personnel	7	10	8	9
Fishing	9	9	10	8

Table 1.

The ten most abundant plastic items in rank order for year four were: (1) foam fragments, (2) hard fragments, (3) caps and lids, (4) bottles less than one gallon, (5) bags < 1 m 2, (6) plastic sheeting < 1m 2, (7) smoking accessories, (8) rope < 1m 2 (9) food containers, and (10) foam cups. (Figure 7). These accounted for 83 percent of all observed plastics (Figure 6). By type, foam fragments, hard fragments, caps and lids accounted for 69 percent of the top ten plastic debris items or 56 percent of all marine debris in FY 1992. By season there was little difference in the ten abundant items (Figure 9).

Comparison of Top Ten Plastic Items by Year

Rank Order	1989	1990	1991	1992
1	foam frag.	foam frag.	foam frag.	foam frag.
2	hard frag.	hard frag.	hard frag.	hard frag.
3	caps/lids	caps/lid	caps/lid	caps/lid
4	bottles < 1 gal.	bottles < 1 gal.	bottles < 1 gal.	bottles < 1 gal.
5	bags <1m	bags <1m	smoking acc.	bags <1m
6	rope <1m	ropes <1m	bags <1m	plastic sheet <1m
7	plastic sheet <1m	plastic sheet <1m	plastic sheet <1m	smoking acc.
8	per. misc.	per. misc.	rope <1m	rope <1m
9	pkg. misc.	pkg. misc.	rope >1m	food cont.
10	smoking acc.	smoking acc.	misc. pkg.	foam cups

Table 2.

In addition, the mean numbers per kilometer of FY92 top items are: foam fragments--126.2, hard fragments-- 93.6, and caps and lids 81. Bottles < 1 gallon--33.9, bags < 1 meter square--28.3, and smoking accessories--24.2, Overall, the mean number of items by plastic category by survey were: miscellaneous 538.35, packaging 183.2, personal 49.85 and fishing 41.65 (Table 3).

Numerous foreign packaging containers were removed: *Mimosin*--toilet bowl cleaner, *Vita*--mineral water, *Quartett*--deodorant, *Mayonesa*--mayonnaise by Kraft, *Shelltox*--Mexican roach killer, and *Chin-Chin*--a basil seed drink. Except for the seed drink, which could be have been purchased locally at a Vietnamese grocery store, the other foreign products were either from Venezuela or Mexico. A high tide, possibly the result of Hurricane Andrew, brought hundreds of glass whiskey bottles and

plastic bottles onshore West Ship and Horn Islands. Many of these bottles were from Venezuela.
In fact 10% of the debris summer survey was made of glass.

An uncommon item, not documented in the three previous surveys, was a rubber turn table mat. Other unusual items were a diaper, contact lenses, plastic cup--"Ya'll Come to Union Hall", *Wall Street Journal* dated May 7, 1992, 14 Georgia Pacific paper cups, and over 30 fireworks. The "best" traceable item, a balloon, was from a Biloxi, Mississippi video store, "Spin-A-Dollar" was found on West Ship Island.

Large debris items included an industrial spool, a mattress, airplane wreckage pieces, a mysterious 1.83 m by 3.66 m fiberglass/ceramic fragment, and two 55 gallon drums. Items such as broken glass, toxic liquid such as Cop-r-tox, and containers with unidentified liquids presented handling problems for surveyors. However, only 5 medical related debris items were recorded in 1992.

Items that were selected as ones that could be ingested or could cause entanglement continue to pose serious problems for marine animals. For example, 29 percent of all FY 91 items including hard fragments, soft fragments, balloons, and plastic sheeting were considered as ingestible. Because of the abundance, ingestion of small plastic objects by wildlife presented a greater problem than entanglement. However, 4% of all FY 92 items such as rope loops, gaskets, 6-pack yokes, ropes 1 < meter, fishing line, and nets were considered threatening to wildlife (Table 4). Three dead animals were found in the

Mississippi survey sites: one saltwater catfish inside a plastic bag, a trigger fish inside a plastic bottle, and a gull wrapped in plastic line. Neither the bottle or plastic bag is considered as an "entanglement" item.

Over 50% of the items surveyed, such as balloons, hard fragments, soft fragments, plastic bags and plastic sheeting are classified as ingestible. The mean numbers of ingestible debris per kilometer decreased over the FY 91 survey. Per kilometer, only the mean numbers of balloons per kilometer and plastic sheeting greater than one meter square decreased (Table 4). By comparison, the mean numbers of rope loops, rings/gaskets,,and rope fragments which can entangle animals have decreased since the FY 91 survey. However, the mean numbers six pack yokes monofilament fishing line has remained the same since FY 91. (Table 4).

Metal was the second most abundant debris category recorded (7 percent); other materials such as cloth, paper, and leather combined contributed to 4 percent and glass was 6 percent. The abundance and relative proportion of plastic and non plastic objects varied according to seasonal surveys (Table 5). For example, the most number of metal beverage cans were found during the June survey.

DISCUSSION

Results from this fourth year of marine debris monitoring at GUIS are lower than those reported by Bishop in 1989 and 1991. Plastic continues to account over 83 percent of the debris with foam fragments, hard fragments, and caps and lids being the most abundant. Medical debris is negligible with only five items reported. However, broken glass, fishing lures, hard fragments, and containers with toxic material present problems for beach users. Marine animals also are threatened by debris that could entangle them or by potentially ingestible plastics.

Fishing related debris is more abundant in the fall and summer months. However, the percentage of fishing related marine debris is lowest in 1992 than in the previous three years. (Table 1.) Coincidentally the number of Mississippi shrimping licenses dropped from 3,431 in FY91 to 2,423 in FY92. The numbers of quart oil containers (69), and rope <1 m (244) are the lowest of the four years of the surveys. However, the number of light sticks (107) is the highest counted in four years.

In FY 91 regardless of season, miscellaneous debris is the most abundant (Figure 7). In fact, except for 1989 Miscellaneous has been the highest category throughout the surveys. (Table 1.) Except for 1991, fragments of plastic sheeting, hard plastic, and foam are higher in 1992 than in 1989, and 1990. However, the numbers of tires (5) and medical related debris (5) are lower than the three previous years.

In 1992 the variations among beaches are the result primarily of higher numbers of caps, lids, foam fragments, hard

fragments, or nonplastic items. For example, Beach site #4 (Perdido Key, FL) is documented with the most foam fragments (491) during the winter and with aluminum pieces (166) during the fall survey. Beach site #5 (Fort Pickens) has the most debris during the spring survey, and #1 (West Ship Island) during the summer survey.

Variation among seasons is caused primarily from weather patterns. Over 12 inches of rain was recorded during the months of January and June. The storm surge of Hurricane Andrew on August 25, 1992 is believed to have been a contributing factor in the record amounts of debris collected during the summer survey at beach sites #1 (West Ship) and #2 (Horn Island South). Also associated with the storm surge was the appearance of sargasum weed which carried caps, lids, and plastic fragments onshore. Rainfall on Horn Island for 1992 was 62.80 which is average, but at Keesler Air Force Base in Biloxi, Mississippi, the yearly rainfall was 75.90 inches or 13 inches above normal. The yearly rainfall recorded at the Pensacola Naval Air Station was 76.59 inches or 15 inches above normal.

Land based debris has the potential for entering the marine environment via the Pearl, the Pascagoula, and the Biloxi Rivers flowing into the Mississippi Sound which forms the northern boundary of the barrier islands. The Escambia, the Perdido, and the Yellow Rivers, and Blackwater Creek flow into the Perdido and Pensacola Bays.

Residual debris from the 1989-1990 beach nourishment project continues to contribute to the debris loadings at the Perdido Key

study site. Two items in particular, metal cans and cloth fragments (burlap), are seen as a direct result of nourishment activities. On site #4, for example, 12 pieces of metal were found in 1989, whereas 365 were reported in 1992 ; 1 piece of cloth fragment was found in 1989 whereas 301 were reported in 1992. Consequently site #4 had less percent of plastic than the other five areas (Figure 10). (Note: Burlap was used to seal dredge pipe sections and the metal pieces are believed to have been shredded by the dredge cuttherhead and deposited within the new beach.)

In the Florida District marine debris was land generated since the city of Pensacola which abuts Pensacola Bay does not have an effective stormwater and retention or treatment system. The Bay, which separates Perdido Key and the Fort Pickens areas of GUIS, empties into the Gulf discharging land generated debris.

One week after the Fourth of July over 30 spent fireworks were documented in the swash zone of #3 (Horn Island North) on July 11, 1992. This record number of entertainment combustibles is documented only as a result in the delayed spring survey.

However, most of the debris is probably released into the coastal waters surrounding the GUIS. Although 8% of plastics were directly related to the fishing industry, additional debris such as gloves, boots, and salt bags which fall in personal and packaging categories, are attributed to the shrimping industry. Some of the plastic packaging debris such as bulk liquid containers, milk jugs, syrup bottles, shampoos bottles, or toilet cleaners are most likely galley waste from recreational or

commercial vessels. Plastic bottles, which is the fourth most abundant item, account for 7% of all plastic debris.

Problems occurred during the winter, spring, and summer surveys: (1) the east boundary marker of site #1 (West Ship Island) disappeared and was replaced only after the volunteer beach cleanup; (2) the park boat which was scheduled for routine maintenance was inoperable during a six week period from June to July which delayed the Horn Island surveys; (3) the marine debris coordinator in the Florida District transferred to Assateague Island and the Florida fall survey was directed by different park personnel and international volunteers who were unfamiliar with survey item definitions. The previous problems demonstrate that even though controls in a study are preferred, conditions are forever changing in a seashore environment. Regardless of this dynamic situation at GUIS, marine debris accumlations in a four year period show the following trends: (1) plastic accounts for over 75 percent of debris removed, (2) the top four plastic items are foam fragments, hard fragments, caps, and bottles, (3) the higher than normal yearly rainfalls correlate with higher marine debris accumulations, and (4) the percentage of fishing related debris is on a decline.

OPERATIONAL SUPPORT

Sixty percent of the total time required to complete the FY 92 survey at GUIS can be attributed to volunteers who contributed approximately 365 hours. International volunteers from the

former Czechoslovakia, France, Germany, Great Britain, GUIS volunteers, and employees from the National Marine Fisheries Service assisted in collecting debris. In addition to the funding provided by the National Marine Debris Monitor Program, approximately $3,200 GUIS NPS operating funds were used to subsidize the FY 92 survey. This represented 44 percent of the total amount.

Other marine debris related programs were continued. In 1992 approximately 50,000 visitors to the Mississippi District's William M. Colmer Visitor Center and 83,000 visitors to the Florida District's Fort Pickens Museum viewed exhibits on marine debris.

Participation in the two districts beach adoption programs increased. Approximately 200 volunteers Mississippi volunteers took part in the spring "Beach Reach Cleanup" and 700 in the fall "Coastal Mississippi Take Pride Gulf Wide Cleanup"; 350 Florida volunteers cleaned Fort Pickens beaches in April, 1992, and in the "Florida Take Pride Gulf Wide Cleanup." Both the Mississippi District's 1992 Adopt-A-Beach program and the Florida District's 1992 Adopt-A-Shore program were selected for each state's Take Pride America federal government category .
Beach Cleanup media coverage FL and MS

Media coverage for the two state cleanup events and the marine monitoring program was well covered especially on television. The Biloxi, Mississippi, news director for WLOX, Dave Vincent, not only volunteered to help survey #1 (West Ship Island) in March 1992 but also video taped other volunteers

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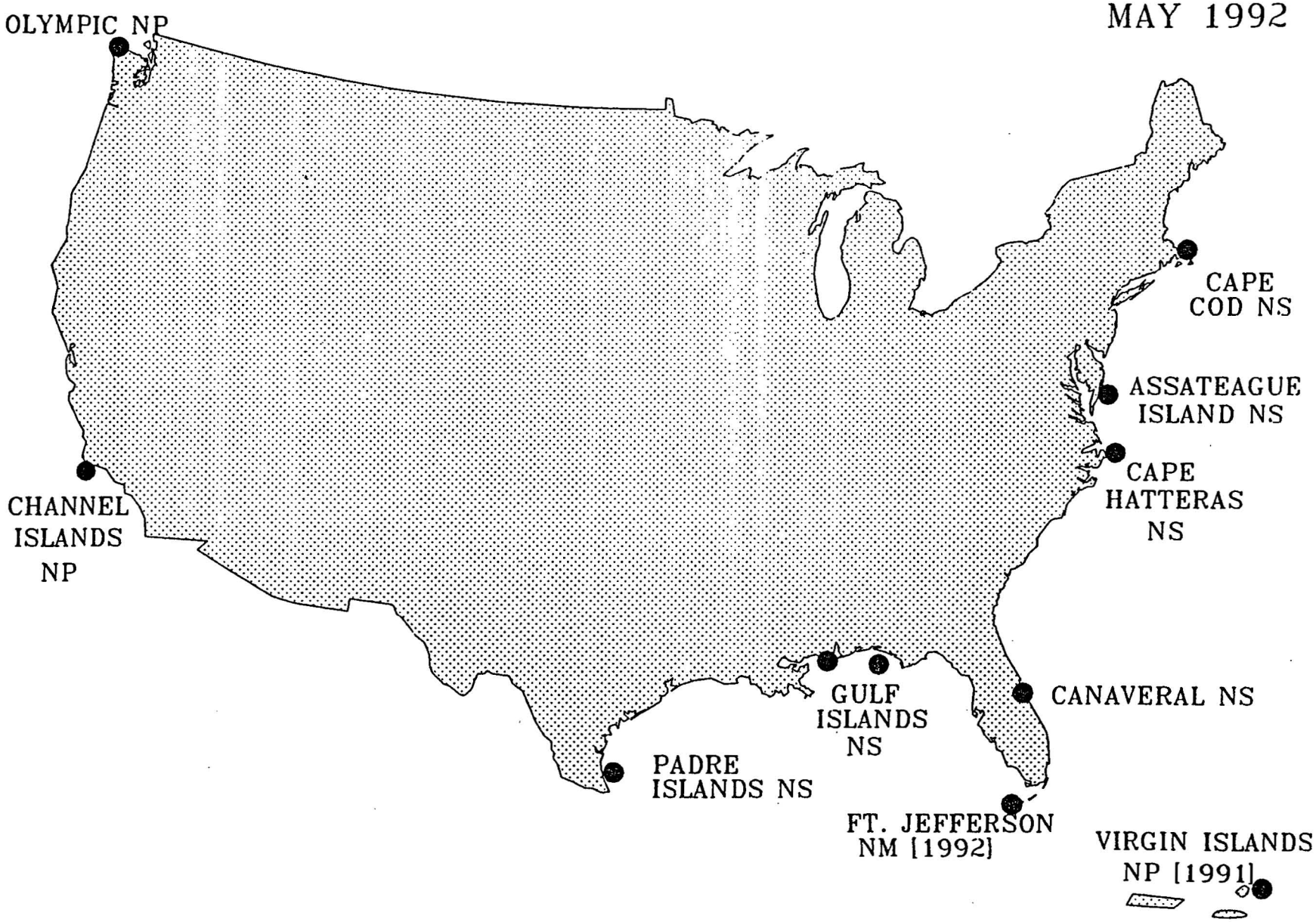
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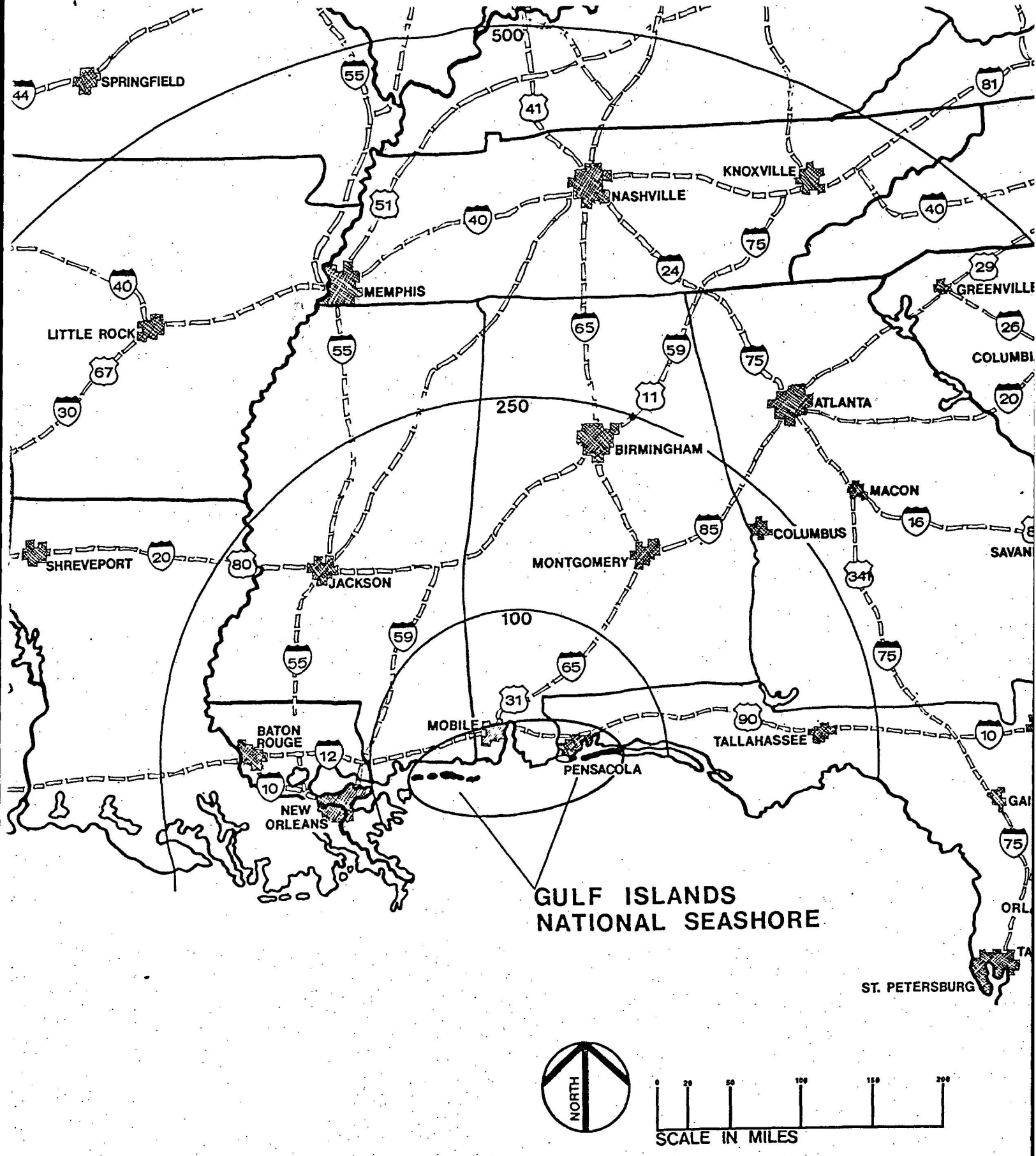
NATIONAL PARK MARINE DEBRIS MONITORING NETWORK

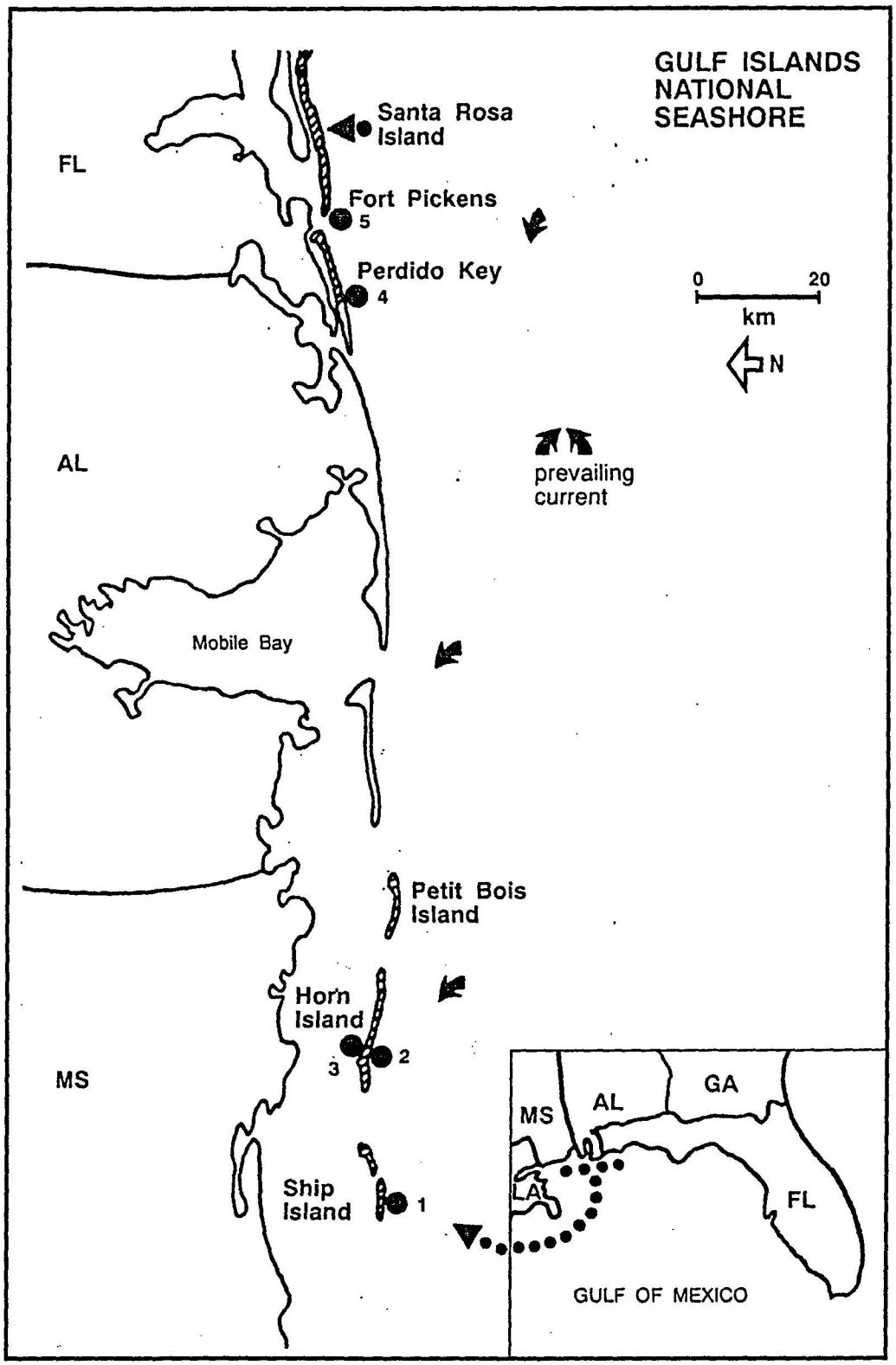
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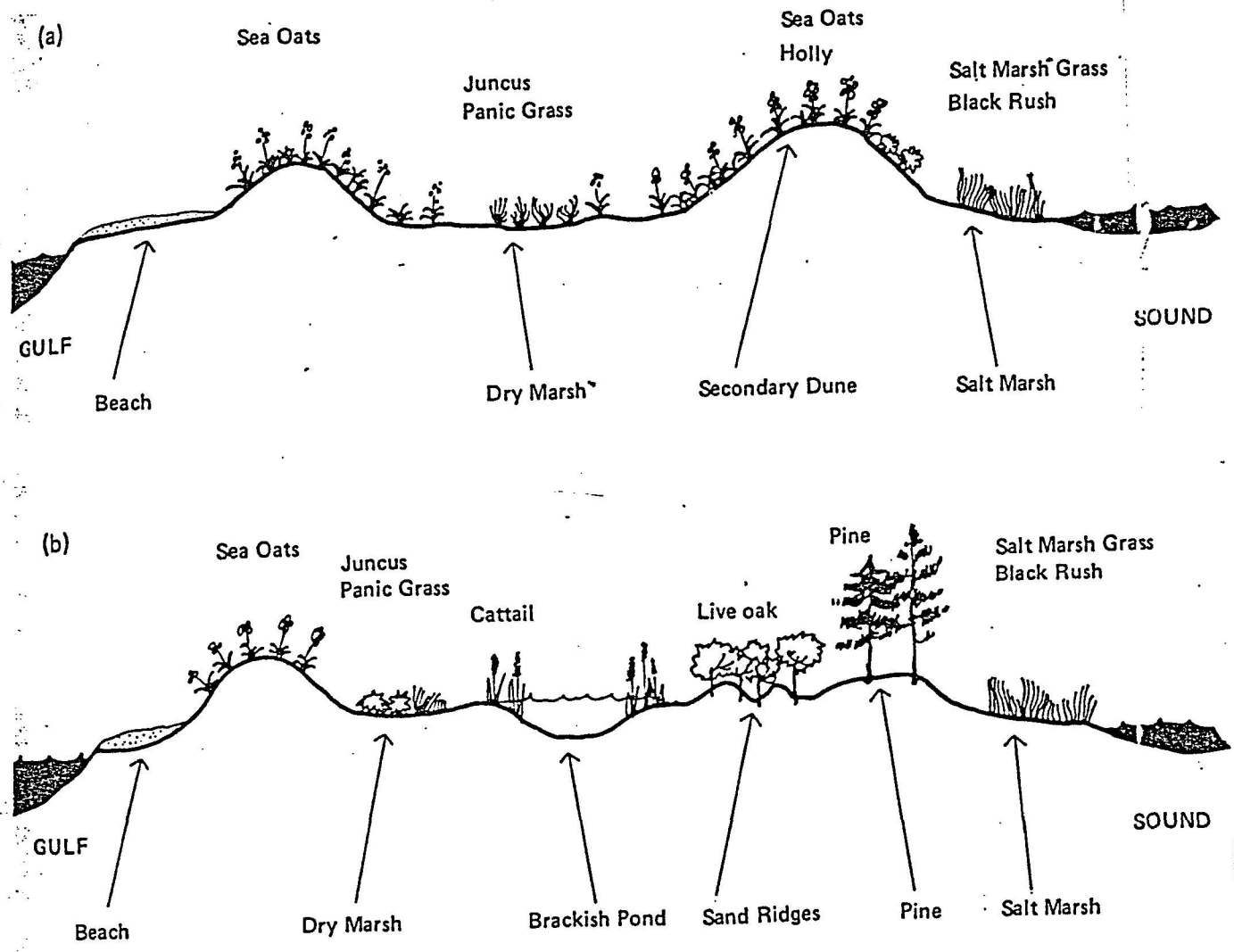


REGIONAL MAP

GULF ISLANDS NATIONAL SEASHORE



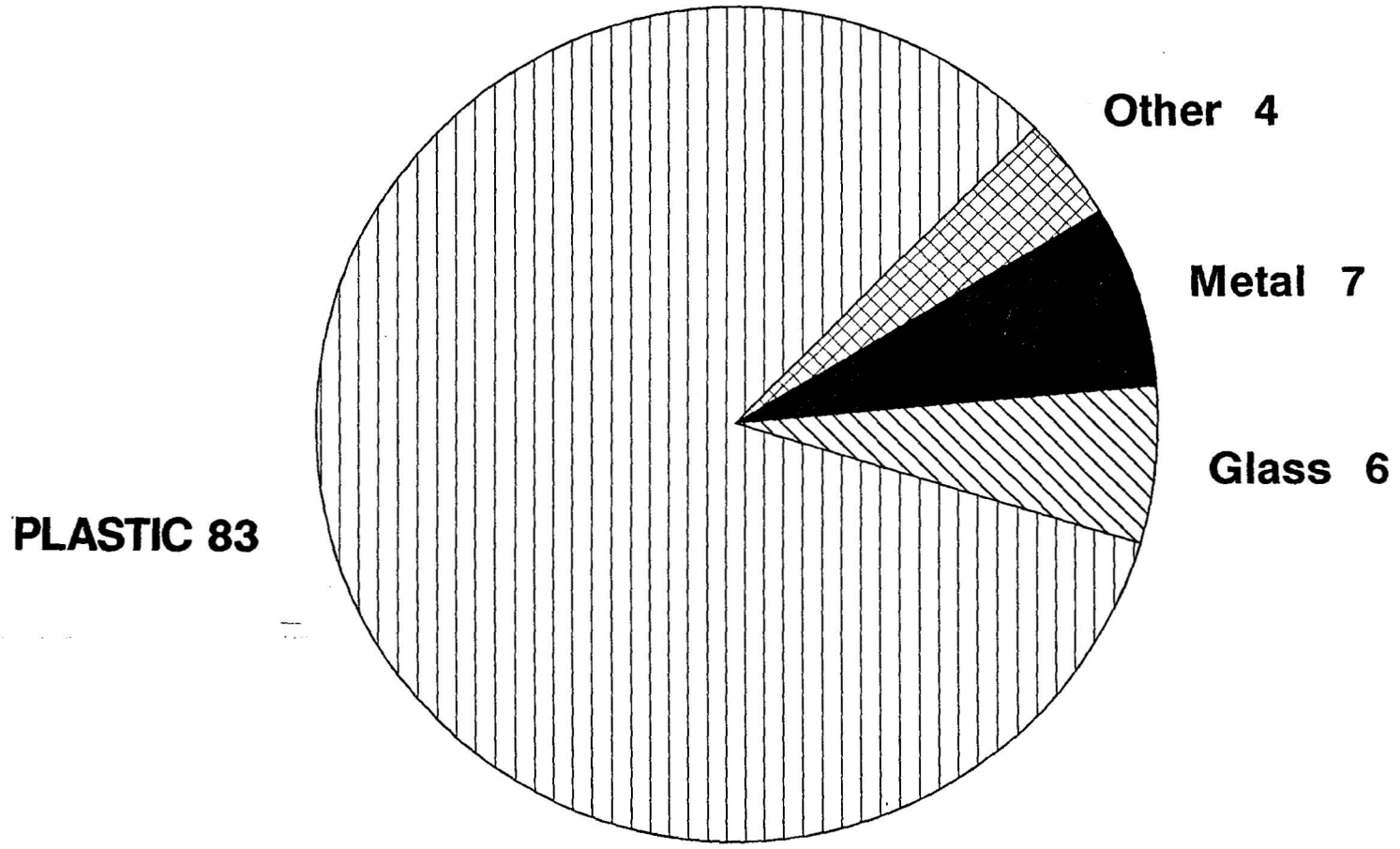

GULF ISLANDS
NATIONAL
SEASHORE
Santa Rosa
Island
FL
Fort Pickens
5
Perdido Key
4
0
20
km
N
AL
prevailing
current
Mobile Bay
Petit Bois
Island
Horn
Island
3
2
MS
Ship
Island
1
MS
AL
GA
LA
FL
GULF OF MEXICO



Typical cross sections of Florida and Mississippi barrier islands. Actual elevations and vegetation may vary with specific sites. (a) Well developed secondary dunes--Santa Rosa Development Unit, eastern Fort Pickens, Perdido Key, West Ship Island, (b) forested barrier islands--central Fort Pickens, West Ship Island, Horn Island, Petit Bois Island.

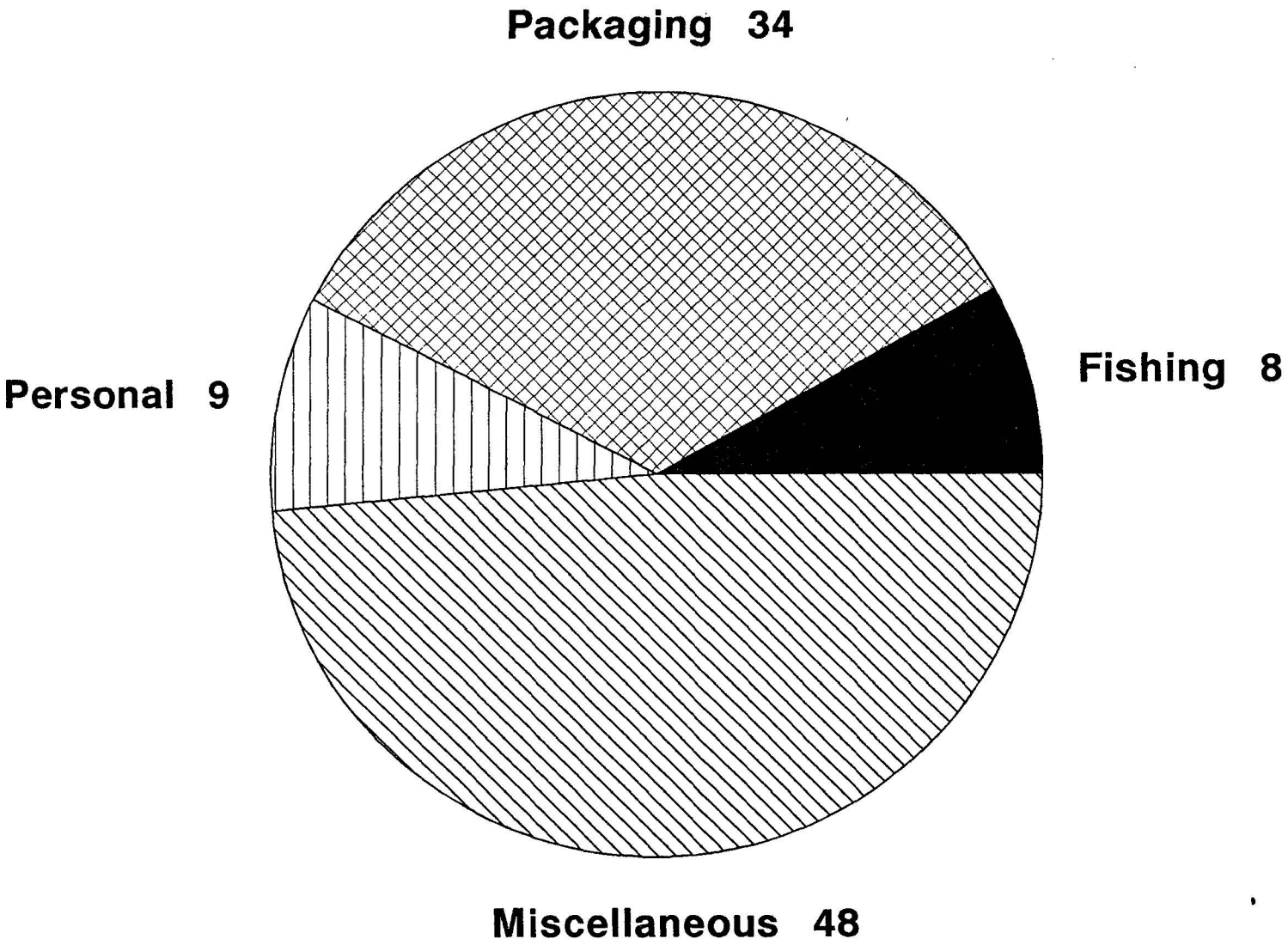
GULF ISLANDS NATIONAL SEASHORE

% of Total Debris by Category- Year 4



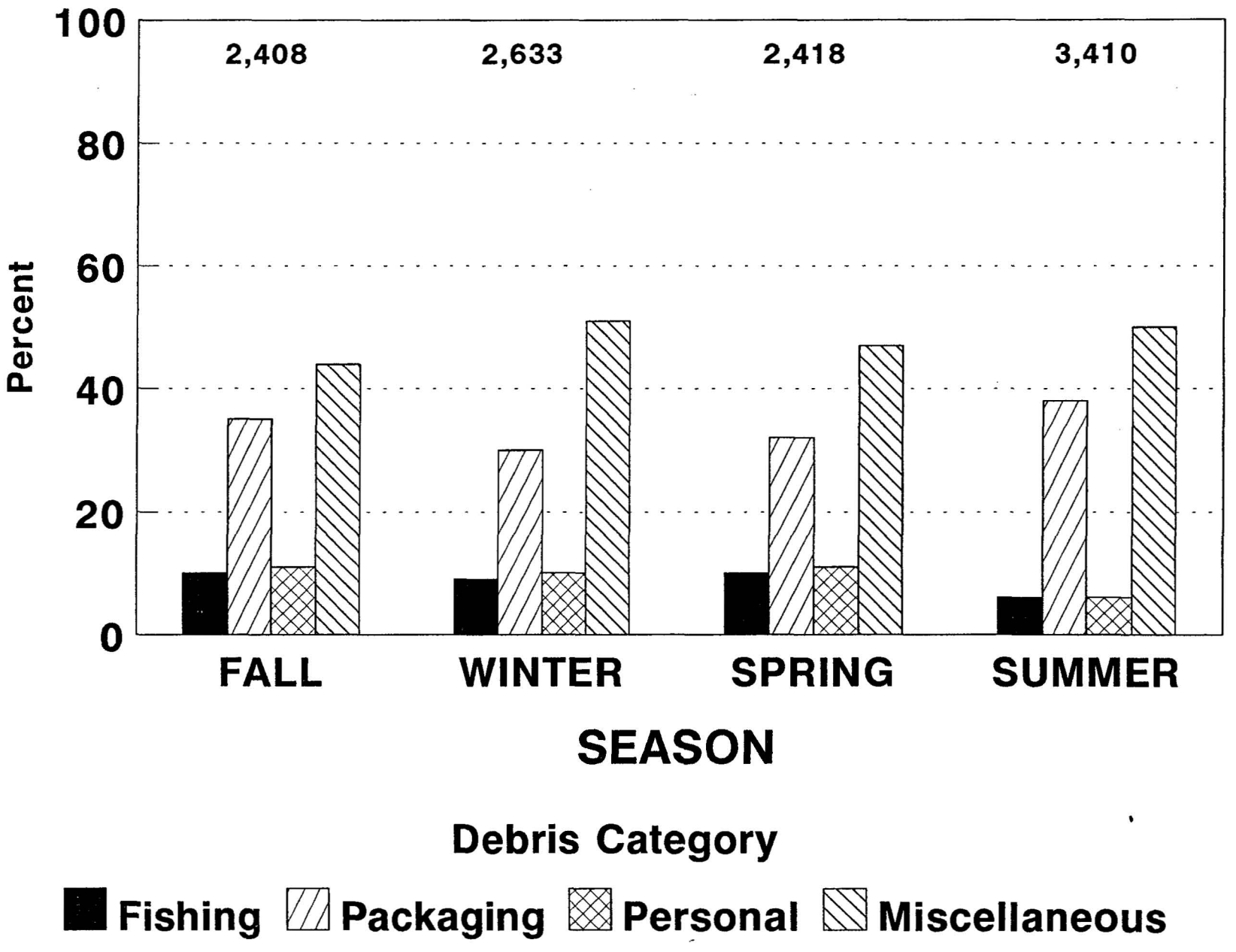
GULF ISLANDS NATIONAL SEASHORE

% of Plastic Debris by Category- Year 4



GULF ISLANDS NATIONAL SEASHORE

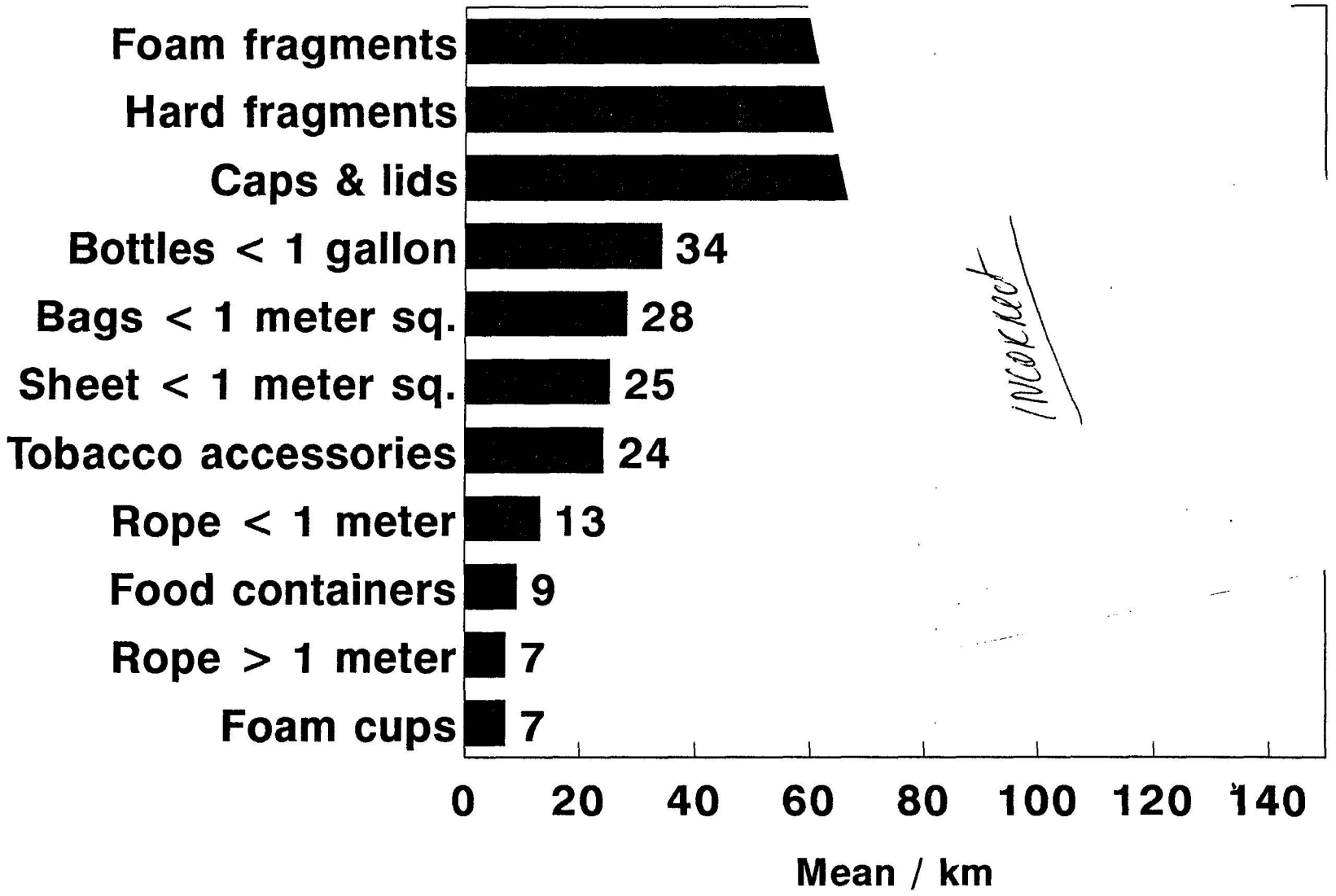
% Plastics by Season- Year 4



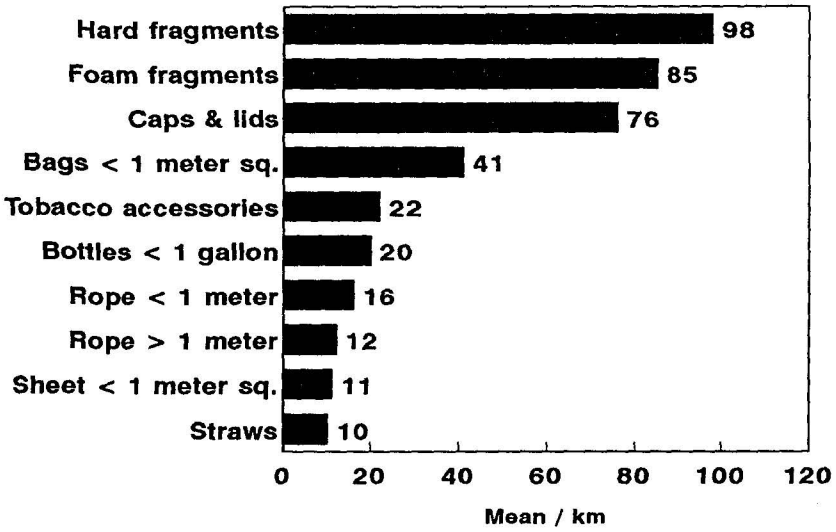
GULF ISLANDS NATIONAL SEASHORE

10 Most Abundant Plastic Items- Year 4

PLASTIC DEBRIS

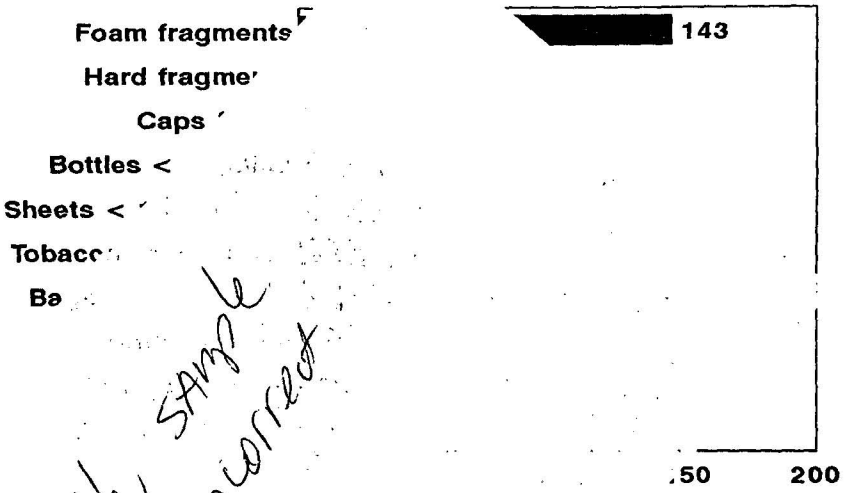


PLASTIC DEBRIS



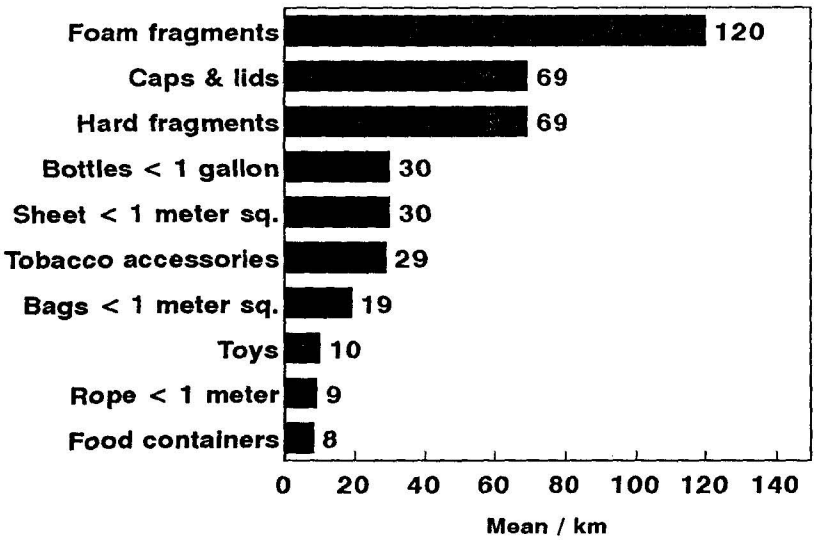
Fall sample period

PLASTIC DEBRIS

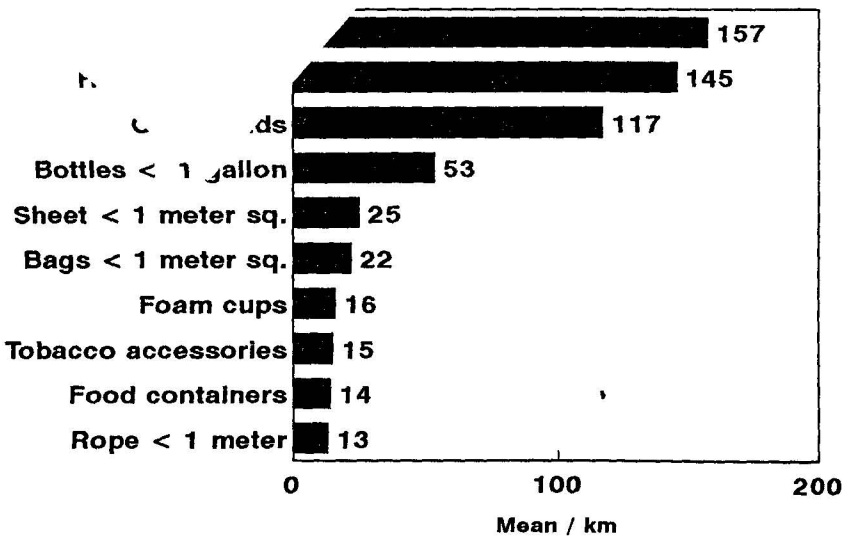


winter sample incorrect

PLASTIC DEBRIS



Spring sample period



Summer sample period

GULF ISLANDS NATIONAL SEASHORE

% Plastic by Transect- Year 4

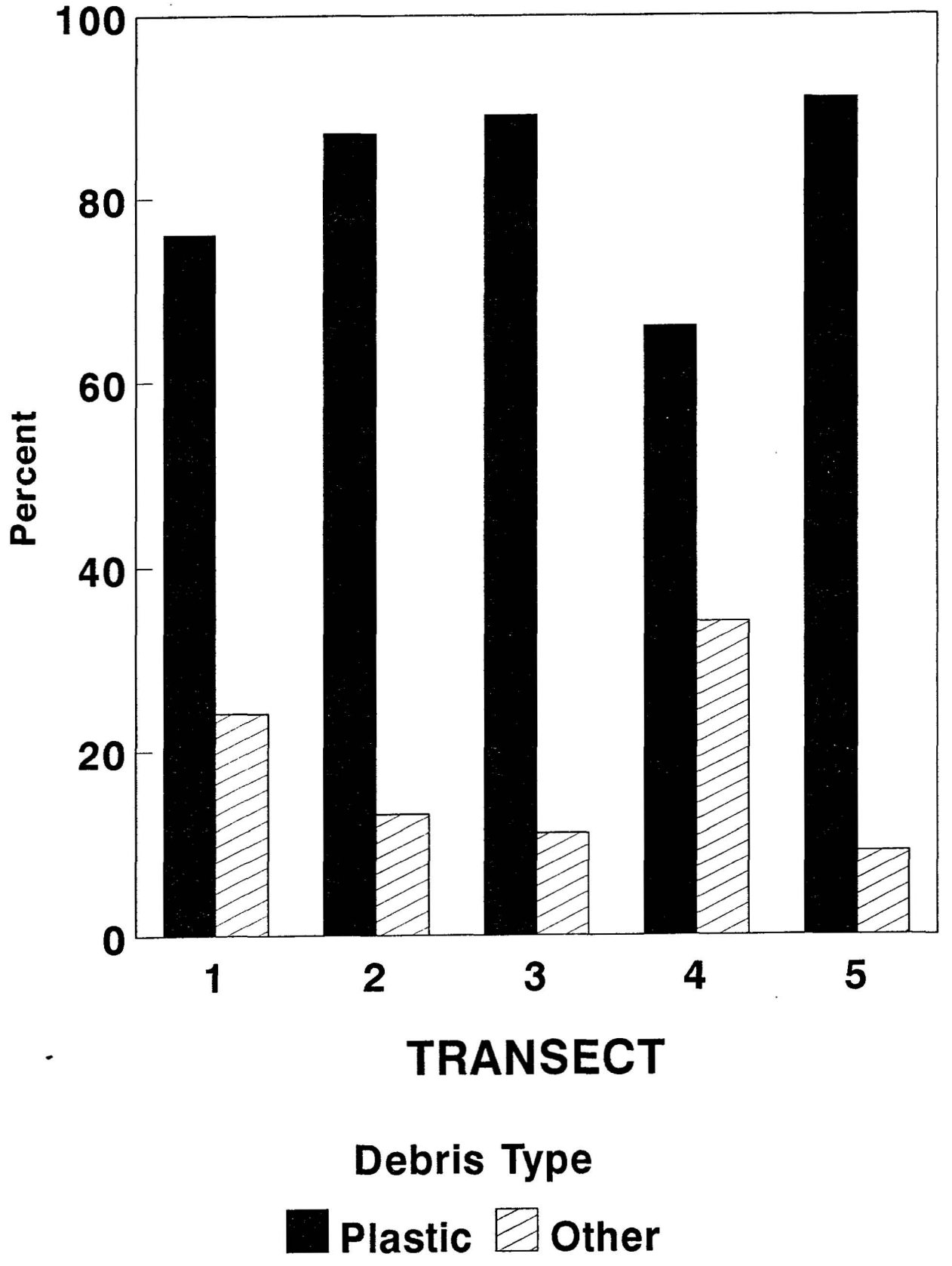


Table 1. Mean quarterly accumulation rate for all marine debris items, Year 4, at Gulf Islands National Seashore (GUIS).

	Variable	Mean accumulation rate (#/km beach)
PLASTIC		
FISHING	Trawlnet	0.6
	Monofilament gill net	0.1
	Multifilament gill net	0.2
	Rope > 1 meter	7.2
	Rope < 1 meter	12.5
	Monofilament fish line	1.8
	Loops of rope	1.1
	Open straps	2.4
	Closed straps	0.6
	Trawl floats	0.8
	Gill net floats	0.3
	Crustacean pot floats	1.0
	Buoy bags	0.1
	Other floats	1.6
	Oil containers	3.8
	Fish baskets	0
	Bait containers	0.1
	Lures	1.2
	Chemical ampules	1.0
	Lightsticks	5.4
	Fishing gear fragments	0.4
	Fishing gear misc.	0.7

Table 1. Continued.

PLASTIC PERSONAL	Hats	0.3
	Footwear	4.6
	Gloves	3.0
	Tobacco accessories	24.2
	Toys	6.1
	Balloons	5.4
	Combs\brushes\eyeglasses	3.0
	Tampon applicators	1.1
	Cotton swabs	0
	Condoms	0
	Syringes and parts	0
	Crack vials	0
	Personal misc.	2.4
PLASTIC PACKAGING	Bottles < 1 gallon	33.9
	Caps and lids	81.0
	Bags < 1 meter^2	28.3
	Bags > 1 meter^2	0.3
	Plastic cups	6.9
	Foam cups	7.2
	Foam food containers	1.9
	Food containers	9.0
	Straws	6.5
	Pails and buckets	0.4

Table 1. Continued.

	Six-pack yokes	4.8
	Beverage crates	0.1
	Bulk liquid containers	2.5
	Foam packaging	0.8
	Packaging misc.	2.0
PLASTIC MISCELLANEOUS	Sheet < 1 meter^2	24.5
	Sheet > 1 meter^2	1.1
	Shotgun accessories	2.6
	Pipes and tubing	0.8
	Pipe thread protectors	0
	Brushes and brooms	0.9
	Garbage cans	4.3
	Tire and inner tubes	2.1
	Write protection rings	0
	Hardhats	0
	Hard fragments	93.6
	Foam fragments	126.2
	Pellets	0
	Gaskets	4.0
	Miscellaneous	2.0
	Medical	0.3
	Oil & gas industry	0.2

Table 1. Continued.

GLASS ITEMS	Bottles	22.1
	Bulbs	4.6
	Medical	0.1
	Pieces	6.3
	Miscellaneous	9.9
PAPER ITEMS		13.3
METAL ITEMS	Caps	2.4
	Propane canisters	0.3
	55 gallon drums	0.1
	Beverage cans	19.5
	Other cans	2.5
	Wire	0.8
	Crustacean pots	0.2
	Pieces	20.3
	Miscellaneous	1.6
CLOTH ITEMS		12.7
LEATHER ITEMS		0.2

QUANITITIES OF MARINE DEBRIS HARMFUL TO WILDLIFE

INGESTION

Mean Number per Kilometer

Item	FY 89	FY 90	FY 91	FY 92
Balloons	9.25	7.35	6.65	5.4
Bags < 1 m sq.	21.25	20.75	28.15	28.3
Bags > 1 m sq.	2.0	3.45	3.35	0.3
Plastic Sheeting < 1 m sq.	11.75	16.80	27.70	24.5
Plastic Sheeting > 1 m sq.	4.10	.85	.45	1.1
Foam Fragments	67.35	115.20	156.80	126.2
Pellets	0	7.50	.1	0
Hard Fragments	96.55	84.90	123.40	93.6

Entanglement

Mean Number per Kilometer

Item	FY 89	FY 90	FY 91	FY 92
Trawl Net/Seine	.30	.05	.2	0.6
Monofilament Gill Net	.50	0	.05	0.1
Multifilament Gill Net	0	0	.85	0.2
Rope Fragment > 1 m	10.40	6.10	11.75	7.2
Monofilament Fishing Line	2.80	2.90	1.60	1.8
Loop Rope	.45	1.20	2.0	1.1
Closed Strap	.20	.15	.20	0.6
Six Pack Yoke	5.0	6.25	4.70	4.8
Rings, Gaskets	.90	3.35	5.15	4.0

Marine Debris Survey Comparison

Fishing Gear (Plastic)

Item	1989	1990	1991	1992	1993
Trawl/Seing web	9	0	4	11	
Monofilament gillnet	1	0	1	1	
Multifilament gillnet	0	0	17	3	
Rope/line >1m	195	97	225	143	
Rope/line <1m	274	355	551	244	
Monofil. fish line	55	42	32	36	
Loops (rope)	9	19	40	22	
Open straps	36	53	73	46	
Closed straps	4	4	11	11	
Trawl floats	19	5	7	16	
Gillnet floats	10	4	10	6	
Crustacean pot floats	24	28	47	19	
Buoy bags	0	0	11	2	
Other floats	8	5	13	32	
Quart oil containers	154	99	114	69	
Fish baskets	5	1	0	0	
Bait container	2	17	0	2	
Lures	6	28	49	23	
Chemical ampules	0	9	2	19	
Light sticks	57	58	60	107	
Fragments	13	10	10	7	
Miscellaneous	20	24	24	14	
Total	901	858	1301	833	

Personal Effects (Plastic)

Hats/helments	14	25	13	5	
Footwear	51	51	59	91	
Gloves	83	74	57	59	
Smoking Accessories	253	273	593	483	
Toys	30	70	85	120	
Balloons	178	164	133	108	
Combs/brushes/etc	35	36	78	61	
Tampon applicators	15	32	34	22	
Miscellaneous	15	303	98	48	
Total	674	1028	1150	997	

Packaging (Plastic)

Items	1989	1990	1991	1992	1993
Bottles < = 1 gal	1055	605	838	677	
Caps/lids	1417	1350	1951	1619	
Bags <1m2	425	365	562	526	
Bags >1m2	40	69	67	5	
Plastic Cups	65	69	67	136	
Styro cups	260	170	119	144	
Styro food cont.	122	77	91	40	
Food cont/bowl/ut	196	207	199	180	
Straws	164	162	191	129	
Pails	5	11	19	7	
Six-pack	100	114	94	95	
Beverage crate	2	3	1	1	
Bulk liquid cont.	243	122	177	50	
Styrofoam pack.	220	81	105	17	
Miscellaneous	320	220	233	38	
Total	4,634	3,625	4,714	3,664	

Miscellaneous (Plastic)

Items	1989	1990	1991	1992	1993
Plastic sheet					
<1m2	235	298	554	490	
=>1m2	80	16	9	21	
Shotgun wads/ shellcase	39	44	85	52	
Pipe/tubing	18	28	25	16	
Brushes/brooms	10	22	22	17	
Garbage cans	4	4	1	0	
Tires/innertubes	10	18	9	5	
Hard plastic fragments	1852	1448	2058	1957	
Foam fragments	1365	1917	3129	2556	
Pellets	0	2	2	0	
Gaskets/rings, etc	18	62	103	82	
Miscellaneous	99	73	88	39	
Medical industry	12	8	8	5	
Offshore industry	1	2	0	4	
Petroleum (tar balls)				29	
Total	3,743	3,942	6,543	5,273	

Subtotal Plastics	9,952	9,453	6,543	10,767

Item	1989	1990	1991	1992	1993
Glass					
Bottles/jars	669	349	357	432	
Light bulbs	248	118	112	91	
Medical	7	16	4	1	
Pieces	46	137	121	126	
Miscellaneous	21	87	56	198	
Total	991	707	650	848	
Wood					
(Not counted)					
Stone	1	2	10	0	
Paper	1428	251	48	266	
Metal					
Bottle caps	89	90	91	48	
Propane canister	27	10	35	5	
55-gallon drum	0	0	2	2	
Beverage cans	626	250	415	390	
Other cans	119	119	123	50	
Wire/cable	2	10	28	15	
Crab/fish traps	11	2	6	3	
Pieces	39	182	364	408	
Miscellaneous	8	62	86	32	
Total	921	725	1153	953	
Cloth	26	30	6	253	
Leather	0	2	0	3	
Subtotal Nonplastics	3367	1707	1864	2,323	
GRAND TOTAL	13,319	11,170	15,572	13,090	

APPENDIX 1

Surveyor_____ Location_____ Location 2___ Location 3___
Length_____ Transect___ Substrate___ Slope___ Month___ Day___ Year___ Cleared___

Fishing Gear

	T
*Trawl/Seine web	
*Monofilament gillnet	
*Multifilament gillnet	
*Rope/line =>1m	
Rope/line <1m	
*Monofil. fish line	
Loops (rope)	
Open straps	
*Closed straps	
*Trawl floats	
*Gillnet floats	
*Crustacean pot floats	
*Buoy bags	
*Other floats	
Quart oil containers	
5-gal. oil container	
Fish basket	
Bait container	
Lures	
Chemical ampules	
Light stick	
Fragments	
Miscellaneous	

Personal Effects (Plastic)

Hats/helmets	
Footwear	
Gloves	
Smoking accessories	
Toys	
Balloons	
Combs/brushes/eyeglas	
Tampon applicators	
Miscellaneous	

Plastic Packaging

	T
Bottles <= 1 gal.	
Caps/lids	
Bags <1m^2	
Bags =>1m^2	
Plastic cups	
Styrofoam cups	
Styro food container	
Food contain/bowl/utsl	
Straws	
Pails/buckets	
Six-pack/beverage yoke	
Beverage crate	
Bulk liquid container	
Styrofoam packaging	
Miscellaneous	

Miscellaneous Plastics

Plastic sheet	
<1m^2	
=>1m^2	
Shotgun wads/shellcase	
Pipe/tubing	
Brushes/brooms	
Garbage cans	
Tires/innertubes	
Hard plastic fragments	
Foam fragments	
Pellets	
Gaskets/rings/etc.	
Miscellaneous	
Medical industry	
Offshore oil industry	
Petroleum: Slick/pancake/tar balls/asphalt (presence=1, absence=2)	

Glass

	T
Bottles/jars	
Light bulbs	
Medical	
Pieces	
Miscellaneous	

Metal

	T
Bottle caps	
Propane canister	
55-gallon drum	
Beverage cans	
Other cans	
Wire/cable	
Crab/fish traps	
Pieces	
Miscellaneous	

Wood

Cloth

Stone

Leather

Paper

APPENDIX 2: Categories and Debris Recorded

Plastic Fishing Gear

Trawl/Seine Web	Twisted or braided netting with 5 or more meshes intact. Measure knot to knot on one representative mesh stretched tight. Netting comprised of less than 5 meshes are tallied under fishing fragments and not recorded on the Plastic Measurement Form.
Monofilament Gillnet	Lightweight, single filament netting. Record in same manner as above.
Multifilament Gillnet	Lightweight, multistrand filament netting. Record in same manner as above.
Rope/Line	Twisted or braided. ≥ 1 meter length - tallied and measured on both forms. < 1 meter length - tallied on survey form only.
Monofilament Fishing Line	Record on both forms if 1 or more meters in length. Fishing lines < 1 meter are tallied under fragments only.
Loops	Rope spliced or tied together to form a loop. If article has a tail, consider it a rope and record as such.
Open Straps	Flat material used to band crates, boxes, bundles, etc. Tally on Survey Form only.
Closed Straps	Record on both forms. Measure stretch diameter.
Trawl Floats	Hard surface, hollow, usually with 2 or more eyes. Record on both forms.
Gillnet Floats	Small, elongated, rigid foam, grooved with 4 holes. Record on both forms.
Crustacean Pot Floats	Variable but usually rigid foam, tapered cylinder, minimum 6" diameter and 12" long; often marked with license number; consider large liquid containers with line attached to handle as this category. Record on both forms.
Buoy Bags	Spherical, inflatable, usually orange or red with one eye. Record on both forms.

Other Floats	Fishing bobbers, seine floats, boat bumpers, etc. Record on both forms.
Quart Oil Container	Two stroke, single weight or multi-weight engine oil.
5-Gallon Lubricant Container	Can or a pail with a lid and sometimes a spout or identifiable by label, residues, etc. If lid, residue and/or labels are absent, record as pail/bucket.
Fish Baskets	Similar to an over-sized laundry basket.
Bait Containers	Usually quart-sized container with perforations or mesh.
Lures	Both rubber and plastic.
Chemical Ampules	About 500 cc, cubical, translucent, usually embossed with oriental characters. Usually found cut or torn open.
Light Sticks	Tubular, approximately 1 x 8", sealed at both ends.
Fragments	Net - all pieces with < 5 meshes intact. Fishing line - mono and multi filament pieces < 1 meter in length. Parts - any piece (< 1/2 size of original) of fishing gear that is identifiable as such.
Miscellaneous	Fishing articles that do not fit the above categories.

Plastic Packaging Material

Bottles	All shapes, ≥ 1 gallon. Do not count caps or lids separately if on container.
Caps/Lids	Tally only those not on containers. Included in this category are broken beverage seals (such as from gallon water or milk jugs).
Bags	Count as a bag only if corner or seam is present (otherwise tally as a "plastic sheet").
Styrofoam Food Containers	
Food Containers/Bowls/utensils	All non-foam articles.
Straws	Drinking straws or hollow coffee stirs
Pails/Buckets	With or without bails.

Six-Pack/Beverage Yokes	Any device designed to hold beverage containers together.
Beverage Crates	Hard plastic boxes, usually with mesh and containing 12 bottles or cartons.
Bulk Liquid Containers	All containers > 1 gallon.
Styrofoam Packaging	Molded packaging material recognizable as such and at least 1/2 of original size. "Peanuts/popcorn" are to be tallied as "foam fragments" under the Miscellaneous Plastics heading. The same holds true for any foam fragments that cannot be identified as to their function.
Miscellaneous	Candy bar wrappers, bottle labels, shrink wrap, etc.

Personal Effects

Hats/Helmets	Hard hats, assorted helmets and headgear. Includes hats that have plastic webbing or fabric and plastic sun visors.
Footwear	Any footwear where at least half of the construction is of a plastic/rubber base. Tongs, sandals, boots and shoes are included. An all-leather dress shoe with a rubber heel would not be included (it would be tallied under the "Leather" heading).
Gloves	Plastic and rubber base handwear including rubber-coated or impregnated materials. The exception is surgical gloves. These normally latex gloves are used for a variety of activities including the fishing industry, but because of the potential contamination by body fluids, they will be recorded as "medical" under the Miscellaneous Plastics heading.
Smoking Accessories	Items associated with tobacco use. Includes lighters, snuff cans, pouches, pipe stems, cigar tips, etc.
Toys	Plastic and rubber.
Balloons	Plastic and rubber; colored ribbon was recorded under this category because our experience indicated that they were originally associated with balloons.
Combs/Brushes/Eyeglasses	Hair picks, barrettes, personal use brushes, including tooth, hair, shower, eyelash, etc. Eye glassware includes all types of glasses.

Miscellaneous	Writing supplies, plastic papers, plants, ornaments, lifesaving rings, Q-tips, belts, diapers, etc.

Miscellaneous Plastics

Plastic Sheet	≥ 1 m2 - plastic sheets without seams or corners (wrapping, tarps, covers, visqueen). > 1 m2 - same as above.
Shotgun Wads/Shell Cases	With or without brass base.
Pipe/Tubing	Rubber and plastic irrigation hose, PVC, etc.
Brushes/Brooms	Cleaning or maintenance type.
Trash Cans	
Tires/Inner Tubes	
Solid Fragments	Rigid, non-foam, non-porous pieces of unknown items or less than one-half of the original size, except for known fragments from the fishing or oil/gas industries.
Foam Fragments	Styrofoam, spongy, stiff or porous foam of unknown origin or items less than 1/2 their original size.
Pellets	Solid, generally small and circular plastic pellets used as manufacturing material in the plastics industry.
Gaskets/Rings/Bands/Seals	All small closed rings, rubber bands, gaskets, safety seals, etc. Exceptions are for rubber bands used to enclose lobster claws; these items should be recorded as "miscellaneous" under the Fishing heading.
Medical Industry	Medical/health related items which may have come into contact with body fluids. Condoms, syringes, saline bags, plastic based needles, etc.
Miscellaneous	Any item not fitting any of the above categories.