

NATIONAL PARK SERVICE
CHANNEL ISLANDS NATIONAL PARK

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MARINE DEBRIS SURVEY
1990 ANNUAL REPORT

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ABSTRACT

Channel Islands National Park was one of eight National Park units participating in a five year marine debris survey for the National Marine Fisheries Service. Three quarterly surveys were conducted in 1990 on six beaches on Santa Rosa and San Miguel Islands. Breeding seabirds and marine mammals prevented beach surveys in the spring. A total of 18,779 pieces of debris were found on the three surveys. Sixty-six percent of the debris was found during the winter survey with almost 57% of that being foam fragments from Sandy Point beach. Plastics comprised 92% of the total number of pieces with foam fragments being the most numerous category in all seasons. Hard plastic fragments, plastic bottles, caps and lids, and straws were common categories. Wood pieces were the most abundant non-plastic items. Ingestible items were primarily foam fragments averaging 575 per km of beach. Small plastic bags, balloons, and small plastic sheets were other ingestible items of note. Rope was the most common entanglement item at a mean of 6.2 per km, followed by gaskets/rings (3/km) and six-pack rings (1/km). A total of nine fishing nets were found on the 18 transects. Cones from hagfish traps, a relatively young fishery, are being found in increasing numbers on the beaches. Most of the debris is suspected of coming from fishing boats and shipping. Many foreign labeled packaging items were found. The balloons, toys, and large number of straws seemed to indicate that there was some debris originating from mainland beaches.

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INTRODUCTION

The amount of litter found on beaches and at sea over the last few years has become a national concern. Debris washed ashore diminishes the scenic value of beaches and, while adrift, can endanger marine wildlife. Of particular concern is plastic debris, which may entangle and kill marine mammals, birds, fish, and sea turtles; disable ships; and aesthetically degrade beaches. According to results found in a 1975 United States National Academy of Sciences global survey, an estimated 6.4 million tons of litter is discarded in the world's ocean annually, mostly in the northern hemisphere.

In the United States, the National Marine Fisheries Service (NMFS), has conducted a long-term study in Alaska since 1972, predominantly monitoring derelict fishing gear and entangling debris (Merrell, 1984; Johnson and Merrell, 1988). For the remainder of the country, the problem of beach litter has been perceived as primarily an aesthetic and health problem. Data on the types and volumes of debris on beaches in the continental United States are collected primarily by volunteer beach cleanups (O'Hara and Younger, 1990). Frequent and consistent surveys at permanent beach sites are needed for detailed quantitative analysis of accumulation rates and seasonal trends.

In an effort to learn more about the amounts and types of debris littering our beaches and to evaluate the long-term trend in ocean pollution, the National Park Service (NPS) and the National Marine Fisheries Service are cooperating in the five year National Park Marine Debris Monitoring Program. Using the survey methods developed by the National Marine Fisheries Service, eight National Parks, selected by geographical coastal regions, are participating in this study.

Through quarterly surveys of established beach sites, the National Park Marine Debris Monitoring Program is gathering quantitative data to evaluate marine debris on continental U.S. beaches. The primary objectives of this program are to provide national and seasonal trends in marine debris abundance, composition, and accumulation. Information on marine debris will also provide insight on the types and debris that are hazardous to wildlife.

The eight National Parks participating in the program are Olympic National Park in Washington, Channel Islands National Park in California, Padre Island National Seashore in Texas, Gulf Islands National Seashore in Mississippi and Florida, Cape Canaveral National Seashore in Florida, Cape Hatteras

National Seashore in North Carolina, Cape Cod National Seashore in Massachusetts, and Assateague Island National Seashore in Maryland and Virginia.

Channel Islands National Park

Located in southern California, Channel Islands National Park encompasses five islands which lie 18 to 64 km off the coast of Ventura and Santa Barbara. The park is a Man in the Biosphere International Reserve, and overlaps the Channel Islands National Marine Sanctuary. Visitor access to the beaches is somewhat limited, however the park islands are popular with recreational and commercial fishermen and boaters. The Santa Barbara Channel has extensive oil and gas development and is a major shipping route for ships traveling between Los Angeles and ports to the north.

The Channel Islands have the most pristine beaches and harbor the richest wildlife concentrations in southern California. Marine debris adversely affects both the aesthetics and wildlife of the park.

This report summarizes information collected at Channel Islands National Park during the second year of the five year monitoring effort.

METHODS

Survey methods were the same for all beaches. Criteria for beach selection were: one-kilometer sections of accessible shoreline that were not subject to cleaning, had minimal visitor impact, were representative of oceanic debris, and had uniform substrate and topography.

Three surveys of the beaches were made this year; fall (December, 1989), winter (March/April, 1990), and summer (September, 1990).

Marine debris surveys were conducted at four beaches on Santa Rosa Island and two beaches on San Miguel Island (Figure 1). Beaches are surveyed only on these two islands because other islands failed to meet the criteria established for debris monitoring by the National Marine Fisheries Service or had difficult access.

On Santa Rosa Island, debris was monitored on beaches representing different exposures at Cluster Point, Arlington Canyon, Skunk Point, and Sandy Point. Cluster Point is a broad, flat dune-backed beach with southwest exposure. The beach we sampled stretches westward of Cluster Point. The beach at the mouth of Arlington Canyon is a narrow relatively

steep dune-backed beach with a northern exposure. A perennial stream feeds a small lagoon at the west end of the beach. The beach at Skunk Point is a very broad, flat dune-backed beach with a northern exposure. At the east end of the survey area, the beach is over 50 m wide. The Sandy Point site is a shallow sloped beach, backed by a low bluff that faces northwest and is fully exposed to the prevailing northwest wind.

On San Miguel Island, sandy beaches at Cuyler Harbor and Simonton Cove were surveyed. The beach at Cuyler's Harbor faces northeast and is backed by short dunes at each end and by bluffs in the middle. At Simonton Cove, the long, wide beach backed by dunes, is exposed to the prevailing northwest winds.

All locations were surveyed in a similar manner. A team of two to six surveyors walked the beach collecting or counting all unnatural debris visible from a walking height. The debris that was collected was recorded on standard data forms (see Cole et al. 1990).

The survey area for each beach included the intertidal zone between the water's edge and the upper limit of normal high tide, usually at the seaward limit of terrestrial vegetation.

Debris was cleared from the surveyed area of all beaches. When possible, the debris was taken off the island. Pieces too large or heavy to carry were marked with paint and left in place, or placed in the dunes off the survey beach. Tar on the beach was noted as present or absent.

Arlington Canyon beach is only 600 m long. Therefore, values reported were extrapolated to 1 km. This beach was included in the surveys because it was the most accessible beach with this exposure.

Items less than one-half their original size were considered fragments. Ropes, netting, and buoys were measured and typed. Measurement data will be presented in a later report.

RESULTS

A total of 18,779 pieces of debris were collected from six beaches on three surveys in 1990. The total quantities of debris by season are presented in table 1. The spring surveys were not conducted because of nesting snowy plovers. Plastic made up 92% of the total number of debris pieces (Figure 2). Wood was the most numerous non-plastic debris category. Wood was not regularly removed from the beaches and was not counted on some surveys because of complications and the low priority

of non-plastic debris in this program.

The dominance of the miscellaneous plastic category (Figure 3) was due primarily to the large number of foam and hard plastic fragments. Over half (10,305) the total number of debris pieces were foam fragments with 7,013 coming from Sandy Point during the winter survey. The mean number of foam fragments was 575 per kilometer of beach for the year. Because of the high abundance of foam fragments at Sandy Point during the winter survey, three random 100 m segments were sub-sampled for foam fragments. All other categories were counted over the entire transect. Hard plastic fragments were the second most abundant category, with 1,869 pieces, and a mean of 104 per km.

The miscellaneous plastics category was the most abundant category in all seasons, but packaging reached a nearly equal percentage in the summer survey (Figure 4). Again foam fragments came into play, as fewer pieces were found on the summer survey. Fishing gear was most prevalent in the winter survey.

The top ten items (Figure 5) were nearly the same as last year's. Rope pieces less than 1 m and balloons were new to the list in 1990, while toys and floats dropped out. The numbers of foam fragments, hard plastic fragments, and straws were higher this year. The number of plastic bottles decreased. Seasonally, the list remained about the same, with some reordering and changes in abundance (Figures 6-8).

Ingestible plastic item types and quantities are presented in table 2. Foam fragments dominated the list. Small plastic bags, balloons, and small plastic bags were other categories of note.

Entangling debris types and quantities are presented in table 3. Entangling debris was less common than ingestible items, with a mean of 11.5 entangling items per km. Rope was the most common entangling debris type with a mean of 6.2 per km. A total of 677 m of rope was collected giving an average of 6 m per rope. An additional 578 m of rope was attached to floats and not counted as rope. The winter survey had the greatest amount of entangling debris. Simonton Cove had the most entangling debris for any beach.

Among the noteworthy items found on Channel Islands National Park beaches were the end pieces of hagfish traps. These pieces are plastic cones, 13 cm in diameter, with plastic fingers reaching back to a point. They are generally used on plastic cylinder traps or on 5 gallon plastic buckets, attached through the lid. Complete traps of both kinds have

been found, but generally only the cone is found. The trap cones were included in the fishing gear fragment category. A total of 89 trap cones and two complete traps were collected from five beaches, with Cuyler Harbor being the only beach not having any. Simonton Cove had the most, and many trap cones were seen on neighboring beaches. Only 13 trap cones were found in 1989-90. This fishery is new to California in just the last few years.

Beach notes

Simonton Cove: This beach usually had the most debris, with quantities of foam fragments and plastic bottles normally leading the counts. Many balloons and a few net fragments were also found. A syringe was found in the fall sample, a Norwegian tobacco can and Korean fishing lure were found in the winter, a television set, food bags and plastic bottles with foreign writing (mostly Asian), and many hagfish trap cones were found in the summer survey.

Cuyler Harbor: This beach was generally pretty clean. Quart oil containers and food related items were most common. A bottle of Phenobarbital tablets were found here in the summer.

Sandy Point: This beach received more foam fragments than any other. It also had quite a few hagfish trap cones and traps. Wood was also common. In the summer survey, two wine bottles were found with the same business card in each, milk cartons from Brazil and Panama, a washing machine agitator, current meter buoy antenna, two LP tanks, a director's chair, and a garbage bag full of oil were found.

Arlington Beach: Metal cans, lobster traps, and fragments seem to be more predominant on this beach. Pieces of dive gear, (ie. snorkels) were not unusual on this beach. A note from a local high school oceanography class was found. The note was several years old, and no reply was received when sent to the school. Hagfish trap cones were found in low numbers.

Cluster Point: While typically being relatively clean, this beach seemed to collect an unusual variety of debris. In the summer, items included a television set, food bags with Korean labels, a tire, a Holland Cruise Line shampoo bottle, a chest freezer, fire extinguisher, Coleman stove gas tank, a syringe, and a glass pipette. A hand blown glass fishing float was found in the dune. Hagfish trap cones are found in low numbers.

Skunk Point: Amounts of debris were quite variable seasonally on this beach. Several U.S. Navy buoys and equipment parts

were found. Lobster traps, and a few hagfish trap cones were part of the debris, as well as a syringe collected in the fall. Drinking straws were quite common on this beach; 126 were collected in the summer sample.

At least some oil or tar was present on every beach during every sample, except in fall at Cluster Point. No effort was made to quantify the amounts.

Table 1. Total quantities of marine debris by season at Channel Islands National Park in 1989-90 (Year 2 of marine debris study).

DEBRIS ITEM	FALL	WINTER	SUMMER	TOTAL NUMBER OF DEBRIS ITEMS FOUND
<u>FISHING GEAR</u>				
TOTAL	169	492	335	996
Trawl Net	0	3	0	3
Monofilament Gillnet	1	2	0	3
Multifilament Gillnet	0	1	0	1
Rope >=1m	19	61	32	112
Rope < 1m	42	152	68	262
Mono Fishing Line	1	3	1	5
Rope Loops	0	0	5	5
Open Straps	5	16	13	34
Closed Straps	0	3	2	5
Trawl Float	0	0	5	5
Gillnet Float	7	24	17	48
Crustacean Float	12	35	32	79
Buoy Bag	0	2	3	5
Other Float	15	25	15	55
Quart Oil Cont.	29	68	48	145
5 Gallon Oil Cont.	1	14	0	15
Fish Basket	1	3	0	4
Bait	4	15	11	30
Lures	0	6	4	10
Chemical Ampules	0	0	0	0
Light Stick	0	2	3	5
Fragments	20	44	68	132
Miscellaneous	12	13	8	33
<u>PERSONAL EFFECTS (PLASTIC)</u>				
TOTAL	189	318	143	650
Hats/Helmets	5	7	5	17
Footwear	23	33	16	72
Gloves	3	2	0	5
Smoking Accessory	19	47	31	97
Toys	31	67	28	126
Balloons	95	118	49	262
Comb/Brush/Eyeglass	3	14	4	21
Tampon Applicators	3	8	4	15

Miscellaneous

7

22

6

35

Table 1. (Continued)

	TOTAL NUMBER			
DEBRIS ITEM	FALL	WINTER	SUMMER	OF DEBRIS ITEMS FOUND
PLASTIC PACKAGING				
TOTAL	611	1558	925	3094
Bottles <= 1 Gal.	246	492	336	1074
Caps/Lids	132	550	162	844
Bags < 1m	79	85	143	307
Bags >= 1m	0	0	0	0
Cups	5	12	8	25
Styrofoam Cups	13	17	7	37
Styrofoam Food Container	3	1	4	8
Container/Bowl/Utensil	37	78	54	169
Drinking Straws	73	282	180	535
Pails/Buckets	5	10	9	24
Six-Pack Yokes	7	7	4	18
Beverage Crates	0	0	0	0
Bulk Liquid Container	1	6	4	11
Styrofoam Packaging	5	3	4	12
Miscellaneous	5	15	10	30
MISCELLANEOUS PLASTICS				
TOTAL	1931	9523	1068	12522
Sheet < 1m	36	47	40	123
Sheet >= 1m	2	0	0	2
Shotgun Wads	5	12	7	24
Pipe/Tubing	6	26	17	49
Brushes/Brooms	0	11	7	18
Garbage Cans	0	1	3	4
Tires/Innertubes	2	6	4	12
Hard Fragments	170	1277	422	1869
Foam Fragments	1681	8091	533	10305
Pellets	0	0	0	0
Gaskets/Rings	12	32	8	52
Miscellaneous	15	18	24	57
Medical	2	2	3	7

Table 1. (Continued)

DEBRIS ITEM	FALL	WINTER	SUMMER	TOTAL NUMBER OF DEBRIS ITEMS FOUND
<u>NON PLASTICS</u>				
TOTAL	400	474	643	1517
Glass Bottles	66	114	95	275
Light Bulbs	20	17	20	57
Medical (glass)	1	0	0	1
Glass Pieces	1	7	9	17
Misc. (glass)	0	0	2	2
Wood	154	104*	278	536
Stone	0	0	0	0
Paper	71	123	116	310
Bottle Caps	0	1	0	1
Propane Canisters	4	5	0	9
55-Gallon Drums	0	1	1	2
Beverage Cans	26	14	42	82
Other Cans	33	34	28	95
Wire/Cable	1	0	2	3
Crab/Fish Traps	1	10	0	11
Metal Pieces	18	19	5	42
Misc. (metal)	2	8	7	17
Cloth	1	15	38	54
Leather	1	2	0	3
	3300	12365	3114	18779

* wood was not counted on all beaches in winter survey

Table 2. Types and quantities of ingestible plastic items per km at Channel Islands National Park, 1989-90 (Year 2 of marine debris study).

Debris Item	Mean #/km	Min-Max	Total
Foam fragments	575.0	6-7013	10,305
Bags < 1 m ²	17.1	2-54	307
Balloons	14.6	1-46	263
Sheet < 1 m ²	6.8	0-22	123
Sheet > 1 m ²	0.1	0-1	2
Bags > 1 m ²	0	0	0

Table 3. Types and quantities of plastic entanglement debris at Channel Islands National Park, 1989-90 (Year 2 of marine debris study).

Debris Item	Mean #/km	Min-Max	Total
Rope > 1 m	6.2	0-20	112
Gaskets/rings	2.9	0-15	52
6-pack rings	1.0	0-3	18
Mono. fish. line	0.3	0-2	5
Rope loops	0.3	0-4	5
Closed straps	0.3	0-3	5
Trawl net	0.2	0-1	3
Mono. gill net	0.2	0-1	3
Multi. gill net	0.1	0-1	1

DISCUSSION

On a per kilometer basis, 1.6 times more debris was collected in the three 1989-90 surveys than last year. Foam fragments per km increased nearly five times. Balloons were nearly twice as common. The amount of fishing gear collected increased in all sample periods. The amounts in all general categories increased in the summer sample (Richards and Dugan, 1990).

Foam fragments were the most troublesome item, slowing many of the counts and leading to subsampling on Sandy Point in the winter survey. The foam fragments in that sample represent 68% of the total foam fragments for the year, and 37% of the total number of all debris pieces. Foam fragments were still important ingestible items. Eliminating the Sandy Point winter survey would leave a mean of nearly 200 foam fragments per km, which is still far greater than other categories.

Animal carcasses were noted during the surveys. In most cases the cause of death was unknown. No animals were found entangled in debris on the survey beaches. Numbers of sealions on Santa Barbara and San Miguel Islands have been observed with net fragments or rubber bands around their necks. This year many animals were treated and released.

Simonton Cove and Sandy Point which face into the prevailing northwest wind and swell, accumulated the greatest amounts of debris. Cuyler Harbor, which is the most protected of the sample beaches, accumulated the least debris.

It appeared that nearly all of the debris found on the rarely visited beaches of San Miguel and Santa Rosa Islands originated from offshore sources. The sources of the debris appeared to be primarily litter from fishing and diving vessels, offshore oil rigs, and commercial shipping. Mainland sources are also suspected because of the abundance of toys for example. Balloons certainly originate on the mainland.

Since the size of individual pieces of debris varied greatly, the volume of debris was not correlated to the number of pieces. Approximately 600 kilograms of debris was removed from the islands. The amount of debris removed filled approximately 50-60 garbage bags. Other debris was cached behind the dunes on some beaches.

Styrofoam and plastic fragments were a particular problem in the surveys because of their abundance and size. Pieces ranged in size from approximately one centimeter to over one meter. Plastic fragments were usually small pieces of broken plastic or parts of something that did not fit in any other

category. Styrofoam pieces were usually packing ("peanuts") material or fragments from styrofoam cups or floatation.

A monitoring handbook was written to establish guidelines for expanding the monitoring effort to other beaches and islands.

There has been some interest to do monitoring on Santa Cruz Island by a Maine Sanctuary intern and by the island ranger.

OPERATIONAL SUPPORT

The debris monitoring trips were planned to overlap with other the rocky intertidal monitoring trips whenever possible to make the best use of available personnel and minimize transportation costs. Three of the participants on the debris monitoring this year were volunteers. The other participants were NPS staff from Resource Management, Research, Protection, and Maintenance divisions.

Costs beyond normal time for employees included overtime and transportation. Without overlapping trips and making use of available transportation, the costs would have exceeded NMFS support funding. Project time for the park marine debris coordinator (Richards) probably exceeds 160 hours, and is supported through base funding.

Currently there are no formal marine debris interpretation programs at the park, however awareness of the issues among the staff has expanded greatly. A display is in the planning stages. The Channel Islands National Marine Sanctuary through the Sea Center, is offering a Marine Debris Lesson as part of its Environmental Education Program to grade school students.

RECOMMENDATIONS

The monitoring program would be more efficient and cost effective if the sampling responsibility were transferred to the island rangers. There should be continued coordination with other resource management monitoring trips.

Increased efforts are needed to share the results of this project with the general public. The Park should take a more active role in the Coast Cleanup, especially to survey and clean beaches on Anacapa and Santa Cruz Islands or to remove accumulated debris in the dune areas. Interpretive displays or programs should be initiated to foster public awareness of the problem. Increased use of volunteers would serve as another means of "getting the word out".

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