

Marine Debris on NPS Beaches: A Plastic, Glass, Metal Nightmare

By C. Andrew Cole

The problem of marine debris has been around as long as humans have been discarding their solid wastes into the oceans. Lately, debris has become globally ubiquitous. Recent disclosure of medical wastes found on eastern beaches has heightened concerns about marine debris for both the general public and the scientific community.

Many environmental groups have shown concern. Each year the Center for Marine Conservation (CMC) sponsors a nationwide "Beach Sweep." This coordinated effort rallies volunteers for a few hours to pick up and catalog beach debris. Although the data from these efforts have been useful and have provided some important insights into the nature and variety of the problem, they are largely anecdotal (CMC 1990), and results from year to year are not necessarily comparable. Also, the sweeps being about a year apart, they leave considerable doubt as to what goes on between sweeps.

On the federal level, the National Marine Fisheries Service (NMFS) began systematic studies of derelict marine fishing debris in the early 1970s (Merrill 1984, Johnson and Merrill 1988). In an effort to expand on that information and generate a broader data base, NMFS and NPS have joined forces since 1988 to conduct a 5-year pilot program to monitor debris at 8 park units. Both agencies figured the NPS could provide relatively unaltered beaches for assessing types and accumulation rates of marine debris. The National Park Marine Debris Monitoring Program (NPMDDMP) has been under way since fall 1988. This article describes some of the information realized to date.

Study Sites

Eight park units have been involved in the monitoring program. Olympic NP (OLYM) and Channel Islands NP (CHIS) represent the Pacific coast. Padre Island National Seashore (PAIS) and Gulf Islands National Seashore (GUIS) exemplify the Gulf of Mexico region. Canaveral National Seashore (CANA) and Cape Hatteras National Seashore (CAHA) illustrate the southeast Atlantic coast, while Assateague Island National Seashore (ASIS) and Cape Cod National Seashore (CACO) portray the northeast Atlantic coast. For the fourth year, the program has added Virgin Islands NP (VIIS), and is considering addition of Fort Jefferson (FOJE) in the Dry Tortugas, pending funding.

Methods

By using standardized survey methods and forms developed by NMFS and modified by the NPS, each park has been collecting data on debris since December 1988 (except for PAIS, as explained below). Although NMFS is primarily interested in plastic debris, the NPS is interested in all kinds, and so measured debris types include plastic, glass, metal, cloth, paper, and leather (the last 3 categories are typically lumped as "other"). In any one sample, therefore, 61 plastic, 5 glass, and 9 metal variables can be measured (along with cloth, paper, and leather).

At each park (again, except for PAIS), a minimum of 5 one kilometer beachers are surveyed. Selection of survey beaches considered accessibility, representation of regional conditions, distance from significant public access, and a uniform substrate and topography.

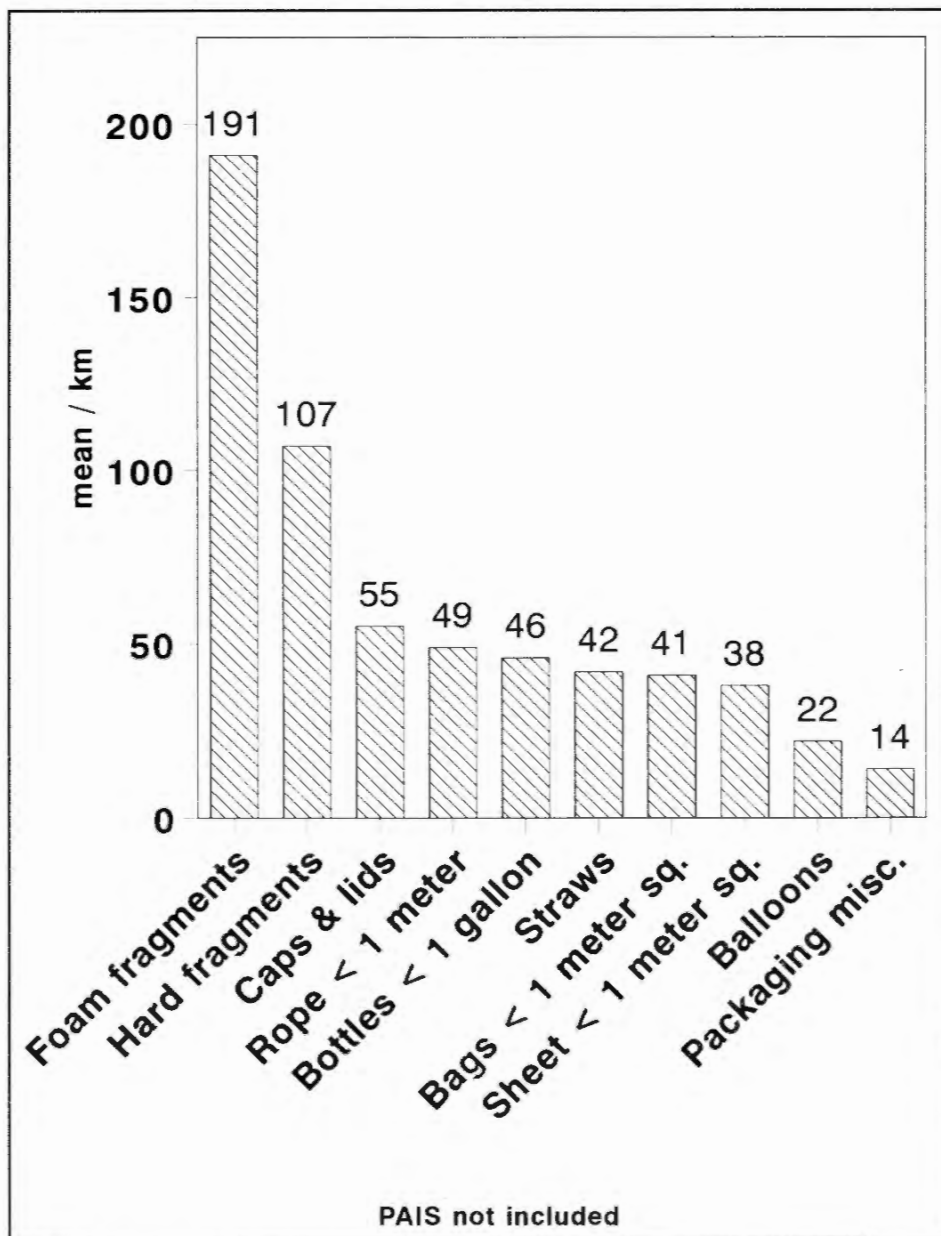


Figure 1. Ten most abundant plastic items of marine debris on the seven NPS sample sites.

On a quarterly basis, beaches are surveyed from the water's edge to the seaward limit of terrestrial vegetation, or to the base of a dune or a cliff. All debris visible from a walking height, and greater than 5 mm in length, is collected and recorded. Any item less than 1/2 its original size is considered a fragment. Hard plastic fragments, therefore, can be very large, unlike foam fragments, which typically are fairly small. This results in not including hard fragments as ingestible plastics, although quite clearly some are.

Ingestible items are those we feel are small enough to be readily eaten by by marine wildlife. Entanglement items are those large enough to entangle marine wildlife. In certain cases (e.g. rope < 1 meter in length) a judgment call was made not to include the item as

entangling. If possible, all debris is removed from the beaches, thereby allowing for calculation of accumulation rates between samples. If articles cannot feasibly be removed (e.g. a large buried net), they are marked with paint for identification and non-inclusion in future surveys.

The most egregious local conditions are found at Padre Island; so much debris is found there that entire sets of surveys for consecutive quarters had to be canceled. Until recently the park simply did not have the time, money, or personnel to handle the mess. This (and other problems) resulted in the non-comparability of data for PAIS for the first 2 1/2 years of the project. However, a revised sampling protocol specifically designed for PAIS, plus additional outside funds from

EPA, have allowed the seashore to return to the sampling program.

Results to Date

As expected, most recorded debris at all beaches has been plastic. Values range from 97 percent at OLYM to about 67 percent at CAHA. Of those plastics, most common are foam fragments, hard fragments, caps and lids, rope < 1 meter, and bottles < 1 gallon (Fig. 1). By far the most common entangling item has been pieces of rope, while foam fragments clearly are the most frequent ingestible item found (Fig. 2).

Due to the variability we have encountered, definitive statements as to trends are impossible; still, some trends seem evident. Packaging appears to be declining in abundance, whereas the miscellaneous category is growing. Plastic, as a whole, also seems to be increasing as a percentage of total debris, though for individual parks there does not appear to be much of an increase in total debris (except for OLYM).

Average number of debris items per km varies widely among parks. Although not included here (due to problems already discussed), PAIS clearly has the most debris per km. In those parks where we have comparable, multi-year data, mean numbers of debris items per km range from 1392 (CACO 1990-91) to 223 (CAHA 1990-91).

Future Directions

It is clear that deposition of marine debris on the 8 parks is a highly variable phenomenon. The information to date, however, does provide useful documentation. For example, few parks seem to have much aesthetic degradation from debris. Even though there may be much of it, generally items are small and relatively inconspicuous.

Levels of medical debris are extremely low. Exceedingly few items have been found and they constitute much less than 1 percent of the total catalogued to date. This is an important finding, as medical debris, when found on beaches, is a public relations nightmare.

Although entangled wildlife catches much of the popular press (photographs of seals caught in nets, fish tangled in 6-pack rings), potentially entangling debris is not that common. Ingestible items, however, are extremely abundant and pose a serious potential threat to wildlife. Apparently much of what becomes fragments is the wide variety of foam products common in coastal settings (coolers and the like). Foam is easily broken apart by wind and waves, generating a profusion of fragments.

Cape Cod has found significant numbers of tampon applicators ("beach whistles") and q-tip straws, apparently arriving by way of sewage disposal from Boston. If efforts to curtail pollution in Boston Harbor continue, such debris on CACO should decline. Few other parks showed much evidence of sewer-related wastes.

Some Accomplishments

In the middle of this project, it has become obvious that we are a long way from a complete understanding or delineation of the marine debris problem. We can, however, claim several accomplishments.

We have documented, for the first time, the continuous accumulation of marine debris on NPS beaches in all major regions of the United States. We know that plastics overwhelmingly dominate the debris loads deposited on beaches. We have recorded the wide variability in debris deposition and have begun to identify certain common items potentially useful as debris indicators. We have begun to sort out some of the sources of marine debris, though our conclusions still

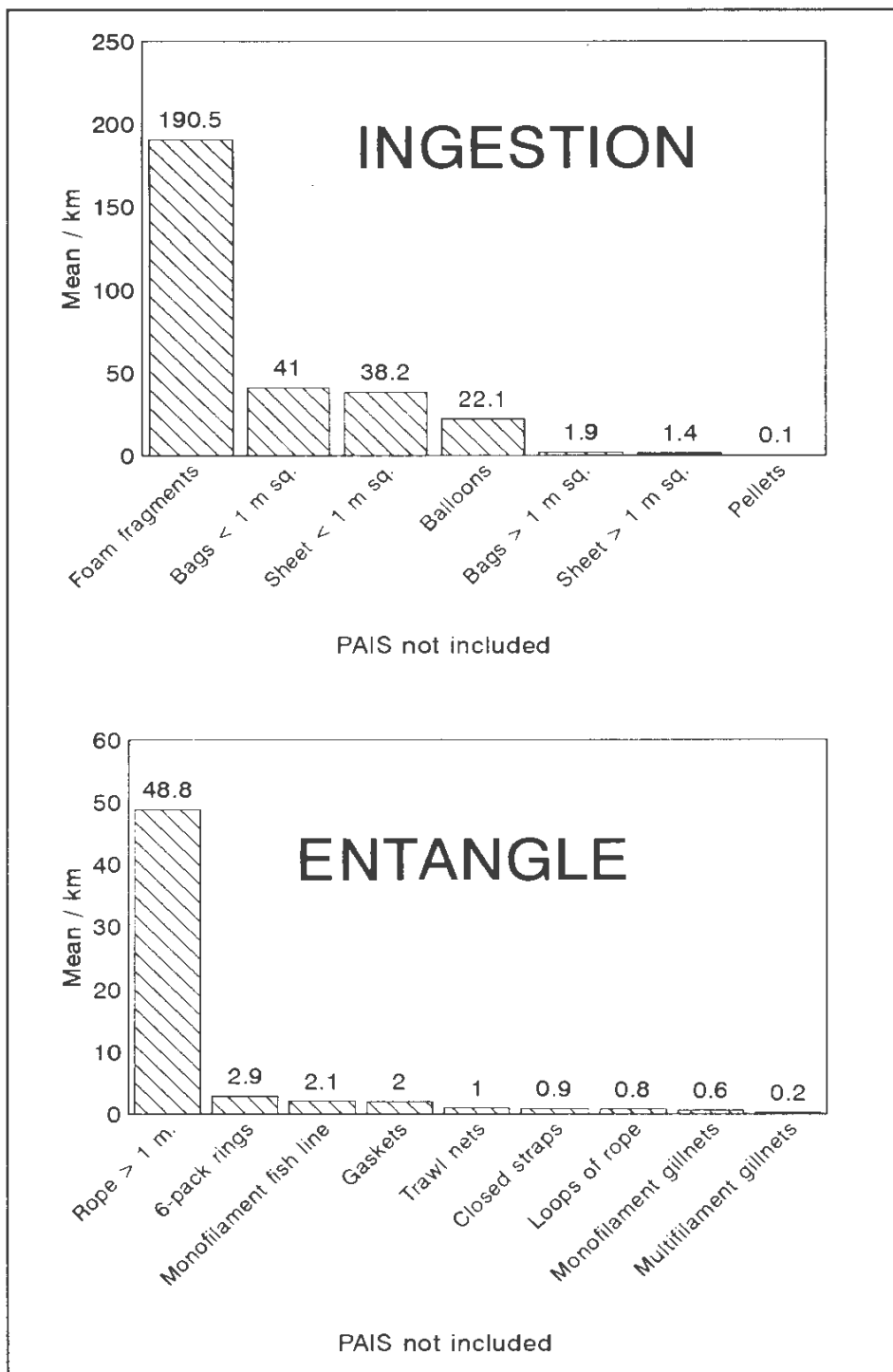


Figure 2. Mean number/km of ingestion and entanglement related plastic debris items found at the seven NPS marine debris sample sites.

are very broad. We have successfully involved NPS employees from several sources and a wide variety of volunteers in a long-term effort, and we have shown the value of using NPS units as educational centers for the marine debris issue.

Dr. Cole is Data Management Coordinator for the joint NPS-NMFS program and an assistant professor at Nova Univ. Oceanographic Center in Dania, FL.

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