

DISPATCHES

A TIDE OF PLASTIC

RUTH NORRIS

THE SEA TURTLE, a hawksbill, died two days after it was found stranded on a Hawaiian beach. It was a young turtle, its shell only a foot long, and when found it was emaciated and unable to dive.

"This is what I found in its gut," says George Balazs, a National Marine

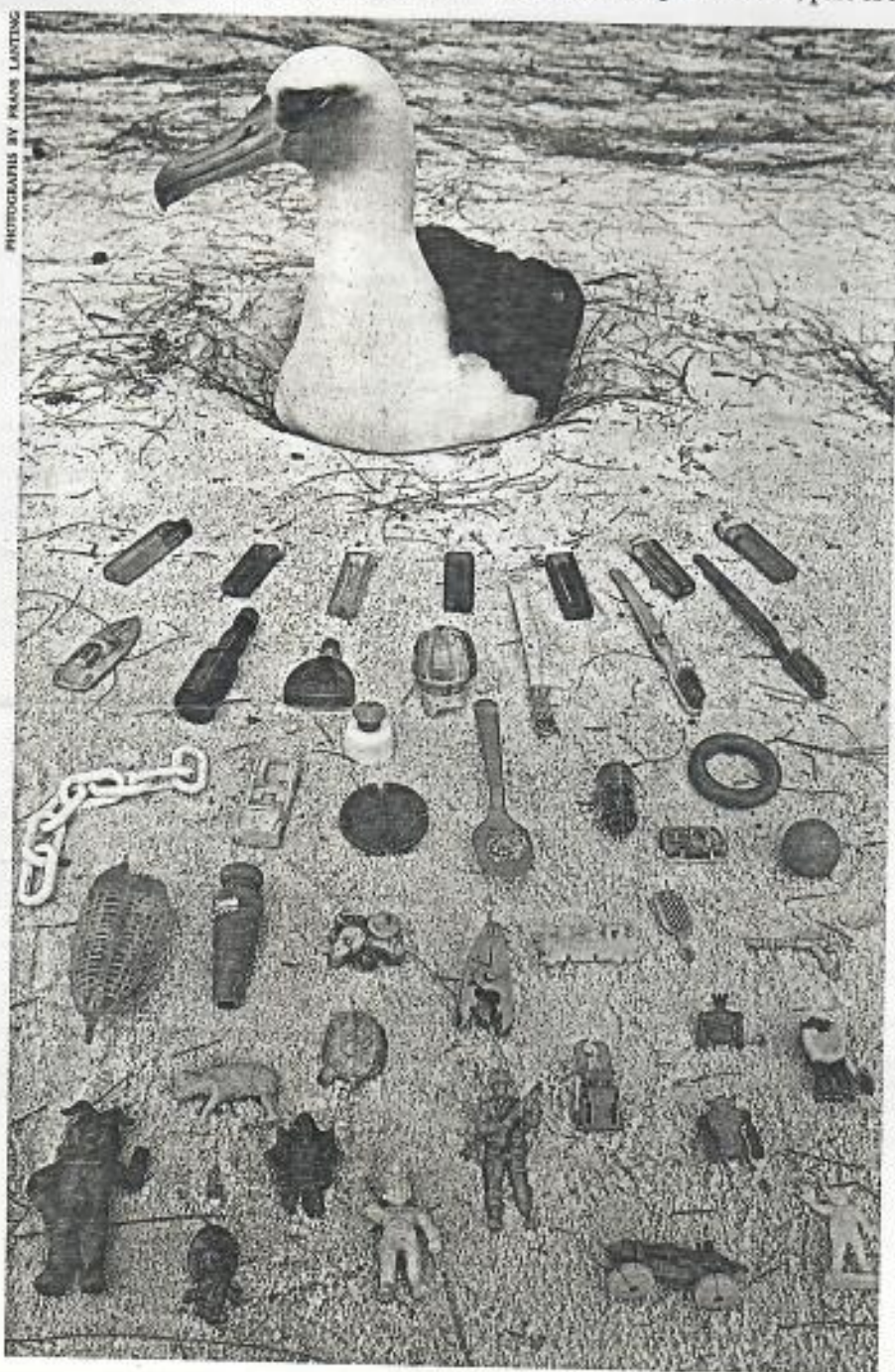
Fisheries Service sea turtle biologist, handing over a plastic Ziploc bag, about eight inches square. It contains a mass of garbage. There are a few pieces of pumice stone, but most of it is plastic—a golf tee, shreds of bags and sheeting, bits and pieces of monofilament line, a plastic flower, part of a

bottle cap, a comb, chips of Styrofoam and hard plastic, dozens of small round pieces. "The intestine was completely blocked with this stuff, all matted with fecal matter. That's eight-tenths of a kilogram of plastic. The animal weighed less than five and a half kilograms, so it's no wonder it couldn't dive."

The western Hawaiian island where this turtle was found is one of the more remote places tracked by the biologists who study creatures of the sea—a tiny speck in a huge ocean, two thousand miles from the American mainland and from the nearest island group to the south. Visitors, however, don't escape constant reminders of those distant worlds. Their litter fills the sea and accumulates daily on the beaches. There are scraps of ropes and lines, strapping, containers, sometimes a whole fishing net weighing hundreds of pounds. Hawaiian monk seals as well as sea turtles have become entangled in plastic lines and nets, which sometimes snag on rocks or reefs and drown their captives. As the carcasses of dead albatrosses decompose on the beaches, the nondecomposing contents of their stomachs remain: plastic fragments, pellets, cigarette lighters, toy cars and soldiers. A recent U.S. Fish and Wildlife Service study of albatross chicks on Laysan Island found 90 percent with some quantity of plastics in their digestive systems.

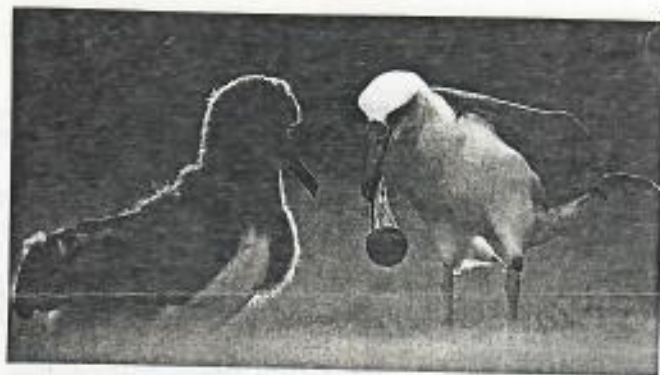
Almost anyone who treasures remote beaches can tell of discovering some isolated spot littered with fishing gear, plastic sandals, detergent bottles, bags, and assorted debris. Participants in a "coastwalk" cleanup of Oregon beaches two years ago picked up twenty-six tons of garbage in just three hours. Plastic pellets—the raw material

A Laysan albatross surrounded by plastic items collected on the beach of its nesting island in the Hawaiian chain. Five million containers are chucked overboard every day.



PHOTOGRAPHS BY PHAOS LANTING

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A Laysan albatross regurgitates a plastic bottle cap as food for its nestling, and remains of an albatross show plastic debris that had accumulated in its intestine. A study of albatross chicks on Laysan found 90 percent had plastics in their digestive systems.

of which all these utensils, containers, and toys are made—have washed up on New Zealand beaches in such quantities that the beaches seem coated with plastic sand. Some Alaskan beaches are so littered with lost and discarded monofilament fishing nets that any animal hauling ashore risks entanglement and death.

More than 50,000 ships sail the seas, with crews numbering one and a half million. Since very few ports provide adequate facilities for collecting ship-generated garbage, it's not surprising to find the oceans serving as a giant dump. More than five million plastic containers are chucked overboard every day. Plastic cargo nets, sheeting used to protect cargo, strapping bands, and utensils all get the same treatment. Garbage ships haul city refuse out into the ocean to be dumped. Commercial fishermen alone, the National Academy of Sciences estimates, dump more than fifty million pounds of plastic packaging into the sea each year and lose some 300 million pounds of plastic nets, lines, and buoys. Raw plastic particles—nibs, pellets, and beads—find their way into the oceans from the outfalls of manufacturing plants, by spilling as they are loaded for shipping, or by being clumped or holed off the decks of ships.

Unlike old-time fishing nets of hemp or flax, unlike tin cans and cardboard containers, which sink and eventually disintegrate, plastic garbage is buoyant and nearly indestructible. It collects in huge masses wherever wind and currents take it. It snags and kills wildlife. Plastic banana bags thrown from docks in Costa Rica wind up in the digestive tracts of sea turtles, perhaps because the turtles mistake them for a favorite food, jellyfish. Lost fishing nets continue to capture fish, even though their owners will never return to claim them. They also capture seabirds that dive to catch the fish, unable to see the transparent netting until it is too late. In the North Pacific, netting has been recovered with one hundred dead seabirds and two hundred dead salmon entangled in a single piece.

This tide of plastic garbage began to surge just after World War II, when disposable, durable, inexpensive polymer materials came into wide use. The 1960s brought a tremendous increase in commercial fishing, with an attendant loss and abandonment of more and more gear. Each year brings new and stronger plastics and yet more uses: oxygen-barrier bottles that can keep the fizz in soft drinks, plastic containers tough enough to be reheated after packing perishable foods. Unfortunately, products made more durable for supermarket shelves are also more durable after disposal. But "up-scale convenience products" continue to replace bottles and cans. Plastic packages can go from microwave to table, and plastic containers are light-

er and take less energy than metals to manufacture. "Almost everything that's in other packaging now is apt to find itself in plastic eventually," declares a spokesman for the Society of the Plastics Industry.

Something similar could be said for the creatures of the sea. They find themselves in plastics, and plastics in themselves, accidentally. Seabirds may mistake plastic pellets for the tiny crustaceans they normally feed on. One part of the problem, notes George Balsas, is that "tides and currents tend to concentrate plastics in the same way they normally concentrate food items. If it's where food is supposed to be, it gets eaten."

Seals and sea lions are in particular danger because they tend to cozy up to nets, strapping bands, and lines. At the National Marine Fisheries Service lab in Honolulu there are pictures of Hawaiian monk seals—among the most endangered marine mammals occurring in U.S. waters—entangled in nets, encircled by packing bands, muzzled by container rings. One seal is easily recognizable by a scar around its neck left by a strapping band. For years the seal carried the band, which became tighter and tighter as the seal grew around it.

Anecdotal evidence from other areas is even more gruesome. "I observed a sea lion with a net fragment so deep in its tissues that the net had cut through skin, blubber, and muscle and had actually cut open the trachea," Rich Tinney of the Center for Environmental Education told a congressional committee two years ago. "The animal was incapable of diving for food because water would enter its throat through the opening cut by the net."

THE BEST EVIDENCE of the plastics pollution problem, and perhaps the most devastating effect on a single species, can be found in the North Pacific. There, each night, Japanese, Taiwanese, and Korean fishermen set out their eight-mile-long, twenty-six-foot-deep nets, with weights at the bottom and floats at the top. In all, the night's work stretches 20,000 miles of invisible curtains of net. Because their gills catch on the nets, fish too large to make it all the way through the mesh become caught when they attempt to back out. Each morning, when the nets are retrieved, an average of ten miles of netting escapes detection. And thousands of miles of deteriorated nets are abandoned or dumped overboard each year. These

"ghost nets" continue to fish until they wash ashore or sink from the weight of their catch.

This fishery has been controversial since its inception. Native Alaskans have objected to the Asians' interception of anadromous salmon that otherwise would return to Alaskan waters. Although an agreement with Japan has recently been signed, it will have little effect beyond moving the fishery to inshore waters, and it postpones a planned phaseout for five years.

A few of these nets, and a great many more from the bottomfish trawlers that ply the Bering Sea, are a major threat to northern fur seals. Fur seals have themselves been a subject of con-

siderable controversy: Their population has declined dramatically, and reauthorization of the treaty that protects them was held up because of protests by animal-rights groups against the hunting of seals by Pribilof Islanders. But, according to National Marine Fisheries Service researchers, ten times as many seals are killed each year when they become caught in plastic fishing nets as are killed in the hunt. On at least four separate occasions, floating balls of netting and debris containing eight to twelve dead fur seal pups have been sighted. Since the area inhabited by fur seals is vast, these few sightings undoubtedly represent only a tiny fraction of actual occurrences.

WHAT IS TO BE DONE about a problem whose dimensions can only be guessed at, whose consequences appear only as its victims happen to be washed up by winds and currents, whose sources encompass the whole of factories on land and ships at sea? Although there are laws and treaties prohibiting the disposal of persistent plastics at sea, they are not binding on all ships, and detection and enforcement have not been high on any country's priority list. The unintentional loss of fishing gear is not criminal. In the United States, the National Oceanic and Atmospheric Administration is responsible for preparing five-year plans for the control of oceanic pollution. But the agency has barely begun to address the plastics problem. Until 1985, notes Michael Bean of the Environmental Defense Fund, it was possible to read the national marine pollution plan from start to finish without even finding mention of entanglement.

Those who study the problem have several items on their action agenda. Existing legal authorities could be used to pursue research. Current laws could be enforced and aid programs administered in such a way as to minimize dumping. Development of more biodegradable plastics could be encouraged, and additional international treaties could be brought into force.

It was by congressional directive—a million-dollar appropriation specifically designated for work on marine debris—that a NOAA agency, the National Marine Fisheries Service, came up with a plan. The overwhelming majority of the funds have been put into research and education, however. Less than fifteen percent are for measures actually aimed at reducing the amount of garbage in the sea, and even here, the emphasis is on encouraging the shipping fleet not to litter and on studying potential alternatives. Only five thousand of the million dollars are earmarked for developing strategies to enforce existing prohibitions on disposal of plastics at sea.

Two treaties currently regulate the dumping of plastics at sea: the London Dumping Convention (implemented in the United States by the Ocean Dumping Act) and MARPOL, diplomatic shorthand for the 1973 Marine Pollution Convention. The former regulates trash-hauling ships, the latter other vessels. MARPOL's prohibition against dumping persistent plastics, though, is contained in an "optional" section known as Annex V. It has been

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signed by twenty-four countries but will not be put into effect until it has been signed by countries representing half the gross tonnage of the world shipping fleet. If the United States and Britain, each with about five percent of the world tonnage, were to sign, Annex V would acquire force of law.

"There are a number of laws enacted for other purposes that might be brought to bear, assuming a creative and aggressive desire on the part of agencies to address the entanglement problem," adds Michael Bean. For example, the Endangered Species Act, Migratory Bird Treaty Act, and Marine Mammal Protection Act prohibit the killing of marine birds, turtles, and mammals. Negotiations with fishermen might produce agreements on precautionary measures to be taken in return for immunity from prosecution for accidental kills. Then there are programs that compensate fishermen for lost gear. Fishermen who wished to participate in those programs could be required to mark their gear, dispose of it safely, report inventories and disposition of all gear, and notify authorities when they spotted concentrations of debris. (Presently, foreign fishermen operating in U.S. waters are required to mark gear with their radio call signals, and they have U.S. observers on board who at least theoretically could enforce the Fishery Conservation and Management Act's prohibition on discarding gear into the ocean. But there are no such requirements on U.S. ships.)

Some states have made attempts to attack the problem at its source, enacting laws and creating incentives for the use of biodegradable plastics. Although it is too soon to rely on these products as a solution, their hazards at least are shorter-lived than those of what's out there now.

Eight states now require the plastic yokes that bind six-packs to be made of biodegradable materials, and similar legislation has been proposed in two dozen other states. These plastics remain strong while kept inside stores and homes but become brittle and decompose into tiny flakes when exposed to sunlight. Since the ultraviolet rays that do the job don't penetrate seawater, a different tack would have to be taken for plastics used by ships—perhaps disintegration when exposed to saltwater.

Firms that have specialized in biodegradable plastics (Good 'n Tuff garbage bags, for example) have found their products to be price-competitive

with standard-issue plastics, but the real question is whether consumer demand will lead to an expanded array of degradable products. One of plastics' prime selling points has been their durability, and many firms fear that degradables will hurt plastics' overall reputation for reliability.

And so the masses accumulate. The same currents and tides that shift and deposit sands on shorelines also bring their daily loads of oceanic litter. In the northwestern Hawaiian Islands, observers have begun gathering the trash, hauling it off or burning it, and they have seen a decrease in the number of

monk seals entangled. But the fur seals, whales, sea otters, manatees, turtles, and all the birds—murrets, puffins, shearwaters, auklets, albatrosses—are not so closely concentrated or so carefully tended. Each species has its band of dedicated researchers. All of these monitors have ideas about the extent to which their charges are being harmed by plastic debris, and about the strategies that might bring the problem into focus and under control. What is missing is that creative and aggressive desire, fuel to turn agencies that *could* be doing something into partners in pollution control.

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The cover: Alaskan caribou, photographed by Mark Newman.