HCR 5

HOUSE COMMITTEE REPORT

(9)
Date Referred: January 13, 1989

FURTHER REFERRALS:

Date of Committee Action: 2-1-89

The RESOURCES Committee recommends that:

HOUSE CONCURRENT RESOLUTION NO. 5
[STATE BEACH CLEANUP/ANTI-DUMPING EFFORTS]
Encouraging citizen participation in state-wide beach cleanup and anti-dumping efforts.

[X] be replaced with CS HCR 5 (Res) — [X] the same title [ ] a new title

[ ] have attached amendment(s)

- [X] do pass
- [ ] do not pass
- [ ] no recommendation
- [ ] individual recommendations
- [ ] additional referral to the ____________ Committee

ADOPTS: ____________ letter of intent

ATTACHES NEW FISCAL NOTE(s):

- [ ] fiscal impact
- [X] zero fiscal note
- [ ] zero with analysis

APPROVES PREVIOUS:

- [ ] fiscal note(s) published: ____________
- [ ] zero fiscal notes(s) published: ____________

SIGNING DO PASS:

Cliff Davidson
[illegible signatures]

SIGNING OTHER THAN DO PASS:
(Do Not Pass, No Recommendation, Amend)

Cliff Davidson
Chairman's signature

STATE OF ALASKA
1989 LEGISLATIVE SESSION

BILL VERSION: CS HCR 5 (RES)
PUBLISH DATE: _____

FISCAL NOTE

REQUEST: _____

Revision Date: _____
Title: State Beach Clean up/Anti dumping efforts
Sponsor: Ulmer, Koponen, Ellis, Navarre
Requestor: _____

Agency Affected: None
BRU: _____
Components: _____

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0	0	0	0	0	0
CAPITAL	0	0	0	0	0	0
REVENUE	0	0	0	0	0	0

FUNDING: (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL	0	0	0	0	0	0

POSITIONS:

FULL-TIME	0					
PART-TIME	0					
TEMPORARY	0					

ANALYSIS: (Attach a separate page if necessary)

Representative Cliff Davidson
Co-Chair House Resources Committee

Prepared by: Cliff Davidson
Phone: 465-2487
Division: _____
Date: 2/1/89

Approved by Commissioner: _____
Date: _____
Agency: _____

Distribution (by preparer):
Legislative Finance
Legislative Sponsor
Requestor
Office of Management and Budget
Impacted Agency(ies)

6-0489E

Original sponsors: Ulmer, Koponen,
Ellis, and Navarre

IN THE HOUSE BY THE RESOURCES COMMITTEE

CS FOR HOUSE CONCURRENT RESOLUTION NO. 5 (Resources)

IN THE LEGISLATURE OF THE STATE OF ALASKA

SIXTEENTH LEGISLATURE - FIRST SESSION

Encouraging citizen participation in state-wide beach cleanup and anti-dumping efforts.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS lost and accidentally and purposely discarded plastic debris, including six-pack yokes, strapping bands, sheeting, packaging material, dunnage, bags, particles, pellets, fishing nets, fishing line, and related fishing gear, are annually killing at least an estimated 1,000,000 sea birds, 100,000 marine mammals, and untold numbers of sea turtles and fish by entanglement in the debris and ingestion of the debris; and

WHEREAS many of the fish and wildlife killed by the debris are resident wildlife of the state, and some of this wildlife are listed as depleted under the Marine Mammal Protection Act (16 U.S.C. 1361 - 1407), including the Steller's sea lion and the northern fur seal, or endangered under the Endangered Species Act (16 U.S.C. 1531 - 1543), including the humpback whale, bowhead whale, and Aleutian Canada goose; and

WHEREAS plastic debris is generally persistent, durable, and nondegradable, and may last for hundreds of years or longer; and

WHEREAS plastic debris deposited on the state's beaches by tidal action, wind, waves, storms, and similar occurrences may also entangle wildlife, and future storms and high tides may wash the plastic back into the sea where it will continue its lethal effect, possibly for hundreds of years; and

WHEREAS, in addition to the problems plastic debris causes to wildlife, garbage-strewn beaches are aesthetically unpleasing, discourage

tourism, and are costly to clean, and floating plastics also foul boat propellers, block cooling intake vents, snag fishing equipment, entangle submarines, and endanger divers; and

WHEREAS effective December 31, 1988, the Marine Plastic Pollution Research and Control Act of 1987 (33 U.S.C. 1901 - 1912) prohibits vessels from dumping plastics at sea and within the navigable waters of the state, although certain public vessels have five years in which to comply with this prohibition; and

WHEREAS enforcement by the United States Coast Guard of these anti-dumping provisions will be difficult, especially since the Coast Guard faces expanding responsibilities and a shrinking budget; and

WHEREAS the Marine Plastic Pollution Research and Control Act of 1987 contains a provision allowing an informant, in the discretion of the court, to receive up to one-half of the penalty assessed against a violator of the Act;

BE IT RESOLVED that the Alaska State Legislature strongly encourages all residents of the state to participate in Coastweeks '89, a national beach cleanup effort involving many public and private groups concerned about the environment, by taking part in a May 1989 beach cleanup along the 36,000 miles of the state's accessible shoreline; and be it

FURTHER RESOLVED that the Alaska State Legislature encourages those citizens who witness possible violations of the plastics anti-dumping law to contact the Port Operations Department of their local United States Coast Guard Marine Safety Office and, where possible, to provide the Coast Guard with as much of the following information as possible about the occurrence: date, time, location, witnesses' names, ship or vessel's name and number, photographs, and a sample of the discarded plastic.

Alaska State Legislature

Representative Fran Ulmer

P. O. Box V
Juneau, Alaska 99811
(907) 465-4947

HOUSE OF REPRESENTATIVES

M E M O R A N D U M

TO: Rep. Davidson & Rep. Menard, Co-Chairmen
Members, House Resources Committee

FROM: Rep. Fran Ulmer

DATE: February 1, 1989

RE: HCR 5

HCR 5 encourages citizen participation in state-wide beach cleanup and anti-dumping efforts.

In the past few years, the public has become increasingly aware of the damage done by discarded plastic trash. One of the major causes of plastic-related wildlife deaths is entanglement-the trapping, and often slow starvation or strangulation, of marine mammals, birds and sea turtles by lost or discarded fishing nets and other plastic debris. The Defenders of Wildlife, who asked that I sponsor this resolution, estimate that as many as a million sea birds and 100,000 marine mammals may be dying in the North Pacific alone each year after eating plastic or becoming entangled in it.

In 1985, after marine scientists found that plastic net fragments and other plastics were killing large numbers of fur seals in the Pribilof Islands, the National Marine Fisheries Services established an entanglement office within their organization. The Entanglement Network has also been formed. This is a group of over 40 conservation, wildlife and animal welfare organizations which serve as a unified voice of the environmental community on entanglement, incidental take, and plastic debris ingestion. In Oregon, which has a much smaller coastline than Alaska, over 14 tons of litter was collected in a statewide beach cleanup conducted there last year. This resolution asks Alaskans to participate in the cleanup of our beaches in

cleanup of our beaches in hopes of saving many of our mammals and sea birds from death in these plastic snares.

HCR 5 also encourages people who witness a violation of the anti-dumping laws, to contact the proper authorities. By doing so, they may be able to collect up to one-half of any fine assessed against the violator. This provision of federal law became effective in December of 1988, and we need to make Alaskans aware of this incentive.

One small change has been made in this resolution, which is why you have a CS before you. My staff received a call from one of the persons involved in the beach cleanup effort, to alert us to the fact that it will actually take place in May this year in conjunction with a variety of other related activities. On page 2 line 19, June has been changed to May.

TRASHY The Sea Around Us

A disgraceful plastic tide is fouling the oceans—and killing marine animals. The cleanup has barely begun.

by William H. MacKenzie

THE BROAD, sandy beaches of the Oregon coast are a magnet for visitors from all over the country. There you can feel the soft sea foam gently wash your feet in the sand, observe delicate marine life in the haven of a tidal pool, dig for clams, watch graceful pelicans glide near the surface of a bay and luxuriate in the solitude.

And you can watch as each incoming tide brings in a new crop of plastic debris.

Last September, a beach cleanup in Oregon attracted hundreds of volunteers who picked up more than 14 tons of litter that had found its way to shore. Included were chunks of styrofoam larger than baseballs, bands used for strapping boxes, plastic bottles and other containers, six-pack yokes, pieces of synthetic fishing gear, plastic bags and sheets and plastic eating utensils.

Similar artifacts of 20th century civilization wash up onto beaches around the world every day of the year. But much more floats far from shore on the sea's surface or suspended and unseen in the ocean depths, or sinks to the ocean floor.

Some people pay no attention, accepting the plastic tide as part of the landscape. Others get annoyed, but see it mainly as an esthetic irritant. Then there's Jim Coe. He gets angry. "Sometimes I get so intense about it I feel like I ought to go out and get a black hat and a skinny tie and act like I'm on a mission from God," he says. "The whole thing has turned into a crusade of sorts, to try to make people more aware of the consequences of all this persistent debris for the marine environment."

Coe is in a better position than most people to carry out his crusade. Since 1985 he's been manager of the Marine Entanglement Research Program of the National Marine Fisheries Service (NMFS). I talked with him in his office overlooking Lake Washington on the east side of Seattle. The building is right in the middle of a wildlife preserve, and the view from his window of geese, ducks, pheasants and even an occasional coyote helps ease the tensions of his job. Coe is no stranger to environmental controversies. In 1971, when he went to work for NMFS in La Jolla, California, he found himself in the midst of a furor over the killing of tens of thousands of porpoises in tuna nets in the Pacific. He first ran an observer program to monitor the tuna fishing operations and later headed the team that designed net modifications and procedures to reduce the toll.

In 1985, after marine scientists established that net fragments and other plastics were killing large numbers of fur seals in Alaska's Pribilof Islands, NMFS set up an entanglement office and asked Coe to head it. He says the dedicated efforts of John Twiss, ex-

George Antonelis/NMFS

Beached trash and a dead dolphin in the Canary Islands. A six-pack yoke, later removed, on a California sea lion on an island off Santa Barbara.

José L. González/Bruce Coleman, Inc.

ecutive director of the Marine Mammal Commission, were crucial to getting an appropriation from Congress. "The other person who deserves an enormous amount of credit," Coe says, "is Nancy Wallace, who mobilized the environmental community and organized the Entanglement Network. The energy she generated helped focus the public—and congressional—eye on what scientists were learning about harm to wildlife."

With a budget of less than $1 million annually, Coe is overseeing a two-pronged program. One focus is research on the sources, types, distribution and impacts of marine debris, particularly plastics and other long-lasting materials. This part of the program also involves looking at what to do about the problem, including examining technologies to deal with waste generated on vessels at sea and identifying ways to reduce the hazard of persistent waste materials before they enter the marine environment, such as developing plastics that break down in a controlled period or encouraging the use of alternative materials that are less persistent or hazardous.

The second component of Coe's program is public education—making people aware of the extent of the problem and what they can do about it. This is being carried out both at home and in international forums. The international effort already has

resulted in seminars in Japan, Taiwan and South Korea.

Coe has no delusions about the scope of the task ahead of him. Researchers have reported bottles, plastic sheeting and styrofoam cups even on the remote beaches of the Beaufort Sea off arctic Alaska. A plastic Godzilla toy recently was found on a beach on the small island of Laysan 1,000 miles northwest of Honolulu—along with disposable lighters and plastic pellets, the raw material for manufactured products.

The world's merchant fleets alone dump an estimated 450,000 plastic, 4.8 million metal and 300,000 glass containers into the sea every day, along with many thousands of plastic eating utensils, ropes and cargo-strapping bands. Carmen Blondin, a deputy assistant administrator of the National Oceanic and Atmospheric Administration (NOAA), told members of the House Subcommittee on Coast Guard and Navigation at a 1986 hearing that the world's commercial fishing vessels lose or discard up to 135,000 tons of plastic fishing gear each year. Fishing boats have been estimated to be the source of another 340,000 tons of waste annually, including more than 23,000 tons of plastic packaging materials.

Recreational boaters and beach vacationers add their share. The U.S. Coast Guard has estimated that they jettison a pound and a half of trash per person per day into the nation's coastal waters. Los Angeles beachgoers alone are reported to leave behind 75 tons of trash every week. Some of it is collected by cleanup crews, but much is claimed by the tides.

The sheer volume of plastic waste defies any accurate reckoning, but unquestionably it is overwhelming. Ironically, it includes some trash we believe we have disposed of safely. An estimated 9 million tons a year of solid waste generated in the United States end up being dumped at sea, and about 700,000 tons of this are plastic. More is discharged from sewage treatment plants, and combined storm and sanitary sewer systems carry trash to the sea during heavy rainstorms. More is swept seaward from land-based disposal sites along coastal waterways.

Whatever the grand total, it surely is rising steeply. Al Pruter, a specialist in plastics at Natural Resources Consultants of Seattle, says, "With the constant increase in production and use of plastics, it wouldn't surprise me if our annual crop of plastic waste has tripled over the last ten years."

With so much plastic in the marine environment, as in our daily lives, it can be hard to remember how short a time these synthetic materials have been with us. Only in the 1940s did use of long-lasting plastic products become cost-effective and widespread. It didn't take long for manufacturers to warm up to plastic's light weight, adaptability, durability and low cost. But the qualities that made plastic attractive to manufacturers and consumers, particularly its durability and low cost, have made it a menace at sea. Plastic debris kills marine mammals, seabirds, turtles and nontarget fish by the millions each year, and causes untold harm to countless others.

Seabirds and marine mammals all too readily become entangled in debris, particularly abandoned fishing nets known as ghost nets. Because the victims are mostly out of sight of human census-takers, reckonings of the toll are necessarily very rough, but at least 100,000 marine mammals are believed to die annually in nets and debris, either by drowning or from exhaustion and starvation. Young seals play with plastic packing-bands, net fragments and other floating objects that then get caught around their necks and strangle them as they grow. Young Hawaiian monk seals—an endangered species—have become entangled in netting and then snagged on coral reefs.

Great whales are victims, too. In the last six years, 79 whale deaths from entanglement have been reported off the coasts of North America. The true death toll is probably considerably higher. Whales also have been seen ingesting plastic.

Plastic trash is one of the reasons almost all the world's sea turtles are on the endangered list. Ingestion of plastics by leatherback turtles has been documented in New York, New Jersey, French Guiana, South Africa and France. The same is happening to green turtles in the coastal waters of Japan, Central America and Australia, olive ridley turtles off the western coast of Mexico and hawksbills near Costa Rica. The turtles appar-

Michigan Department of Natural Resources

Six-pack holders head the list of plastic packaging products that kill many marine animals, like this gull.

ently mistake floating plastic bags for jellyfish, one of their favorite foods. Sea turtles also become entangled in monofilament fishing line and are unable to feed, swim or surface to breathe.

Seabirds such as shearwaters become trapped in fishing nets at the surface when they see the fish but not the net and dive into the webbing. Murres are trapped when they dive several meters down into a net. Fifty of the 280 species of seabirds in the North and South Atlantic, North and South Pacific and sub-Antarctic are known to have eaten plastics. They suffer blocked passages, ulcerations, toxic accumulations, decreased appetite and strangulation, often fatally. Almost three-fourths of Laysan Island albatross carcasses examined by researchers in a 1966 study were found to have plastic in their stomachs or gizzards. The young birds apparently had been fed plastic pellets their parents picked up at sea.

Efforts to combat the plastic tide are not yet keeping pace with its growth. At the international level, efforts are under way to win U.S. ratification of Annex V to the 1973 Marine Pollution (MARPOL) Convention, which would ban at-sea dumping of all persistent plastics and synthetics. The annex also would require that ports provide facilities for receiving refuse generated by merchant ships. But before it can go into effect, the annex must be ratified by nations representing 50 percent of the gross tonnage of the world's shipping fleet. That goal is proving difficult to achieve. Ratification by the United States, long awaited, would bring the total to about 45 percent, and action by other countries that could be expected to follow suit would probably bring the annex over the top. Observers believe this may come about within the next six months, after which Congress will need to pass legislation enabling the United States to comply.

Jim Coe sees Annex V as a useful step toward cleaning up the seas. "The general freedom of the seas for disposal of trash seems to persist in the minds of many," he says. "It's just a matter of 'out of sight, out of mind.' There's never going to be an enforcement regime that's going to be able to bust everybody who throws stuff overboard. But that doesn't detract from the importance of Annex V and national legislation aimed at the same problem. All the pressures together create greater awareness of the problem and increase people's inclination to behave differently. So Annex V is part of an education effort, because in the end people aren't going to do something about the problem unless they want to."

More economically feasible technologies are available for large vessels such as tankers and cruise liners than for fishing boats and other small vessels, according to Coe. But systems on larger vessels are only as good as the people who operate them. "They're just not all sailor-proof," he says, "so if some dummy walks up and starts punching buttons, the system falls apart or disconnects or blows apart." As for the smaller vessels whose owners can't afford compaction equipment, Coe sees just plain sorting and storage as the likely method of dealing with most refuse. "We're not talking about a really difficult solution here—they can either keep it or they can throw it over the side," he says.

But stowing trash on board will accomplish little unless it is properly handled when the vessels reach port. It will not do, obviously, to repeat an incident reported in the October, 1986, issue of the *Alaska Fisherman's Journal*. In that case a fisherman saved all his plastic garbage for several weeks, deposited it in a dumpster at a cannery in False Pass, Alaska, then that night watched with chagrin as a cannery worker picked up the dumpster with a forklift, drove it out to the end of the dock and dumped the contents into the outgoing tide.

Awaiting action in Congress are seven bills to ban the use of certain nondegradable plastics, assess the impacts of discarded plastics on the environment and particularly on fish and wildlife, develop recommendations on actions to alleviate the problem, and deal with problems caused by driftnets. There is high interest in these measures on Capitol Hill, and hearings are likely this summer.

Volunteer efforts are growing at the state level, witness the spread of Oregon's citizen beach cleanup. Last September there were similar campaigns in 14 other states. But as helpful as these activities are in focusing attention on the problem, new rafts of trash are disgorged on the cleaned-up beaches by the next tides. Al Pruter of Natural Resources Consultants says: "The problem will continue unless steps are taken to reduce the amounts of plastics entering the oceans or to alter the persistent character of plastics."

In Newport, Oregon, the former option is being addressed by people like Fran Recht. She is the director of a one-year NMFS-funded pilot program to limit vessel-generated debris. Jim Coe calls her "a five-foot-tall ball of fire." She approaches her present job with the same dedication that motivated her recent stint as a Peace Corps volunteer in Latin America.

Most of Recht's work is educating people on the consequences of dumping at sea and encouraging all vessels to bring waste back to port, where it can be collected at adequate and convenient facilities. In a ten-foot by 20-foot nondescript building on the waterfront, she drafts plans, designs posters, makes phone calls and figures out ways to draw attention to the problem. Then she walks along the docks greeting fishermen and cajoling them into putting warning signs in their boats about damage done by plastics at sea.

Under Recht's guidance the port of Newport already has done a study of garbage-handling facilities. "That's helped us find out what's in the waste stream, some of which we've found can be sold for recycling," she says. "That could be a potential source of money for other ports to run programs like mine without government grants."

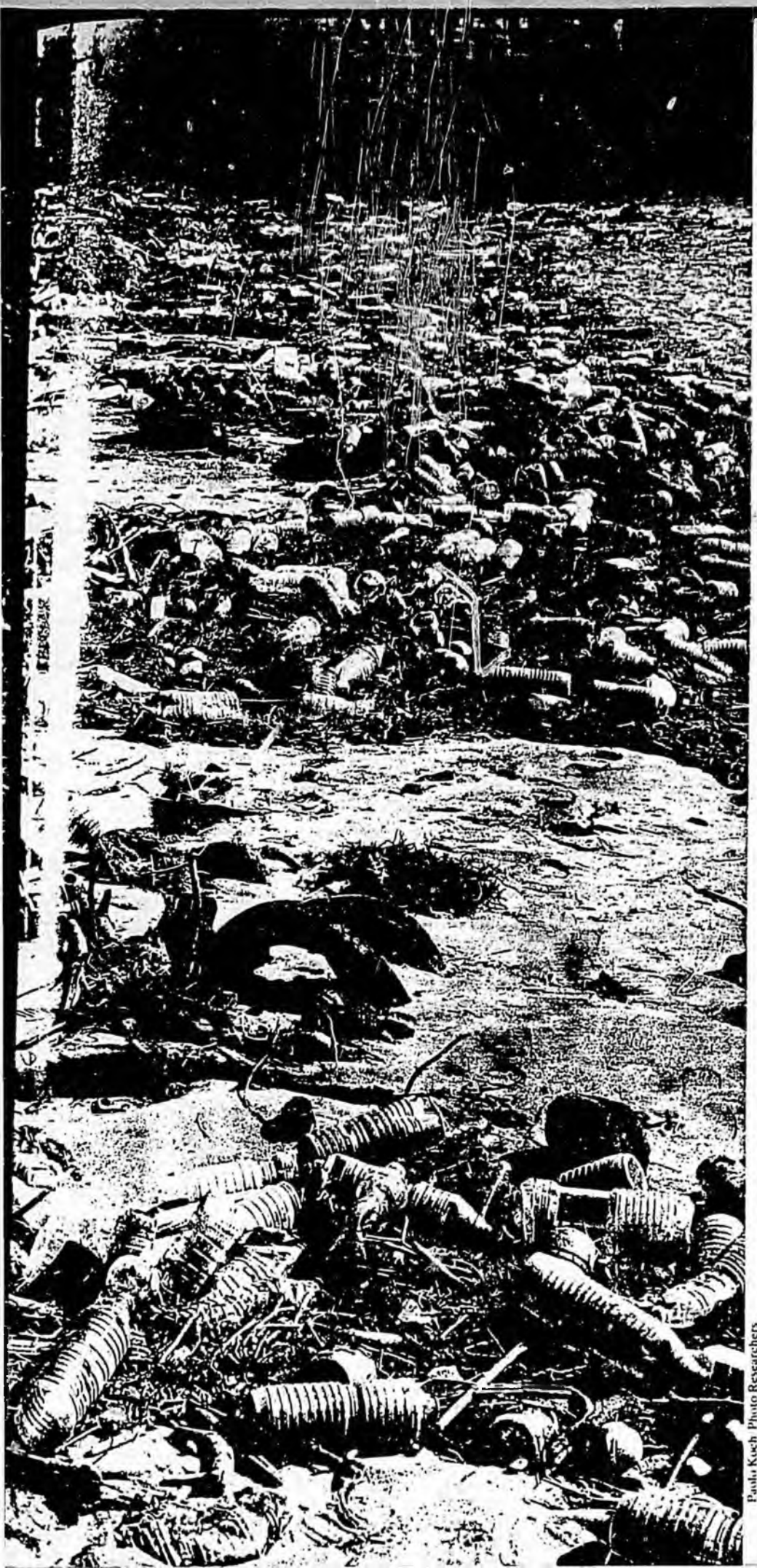
Recht also has worked with shoreside fish processors on several projects, among them supplying more trash receptacles at dockside and attaching messages about the plastics problem to their payment checks to fishermen. She has persuaded the Coast Guard Auxiliary, a volunteer group that teaches boating safety, to put more emphasis on the importance of keeping plastic debris out of the waters, and at her urging the sheriff's department decided to include references to the hazards of marine debris in its talks to school children about law enforcement. Through her efforts, posters and newspaper articles about the problem adorn the walls of a restaurant frequented by high school students. "We really have to get into the education system to effect long-term change if we want this to be more than a one-shot government-funded program," Recht says.

But plastics are proliferating faster than ways are being found to deal with them. A famous scene from the 1967 satirical film "The Graduate" captured the wave of the future nicely. A businessman told Dustin Hoffman at a suburban party, "I just want to say one word to you, one word. Plastics." Hoffman stood for a moment bewildered. Then the man added, "There's a great future in plastics."

He was right. Witness plastic soda bottles, plastic microwaveable frozen food trays, plastic fast-food packaging. Campbell's Soup is testing plastic and cardboard boxes and microwave-ready plastic bowls. Even Army field rations now come in camouflaged, heat-sealed plastic wrappers. In a strange twist, the more short-lived the manufactured goods we buy, the more we are packaging them in indestructible containers. Production has doubled in the last ten years, with the plastics industry now synthesizing and using about 22 million tons of resin annually.

Plastic products are multiplying because manufacturers find they enhance their position in the marketplace, and the consumer is responding. Much of the reason, however, is because disposal and the impact of all these products on the environment are not reflected in the price of the packaged product. "If the environmental costs were factored in and passed on to consumers," says Al Manville, Defenders of Wildlife biologist and chairman of the Entanglement Network, "we'd be generating a lot less trash."

So far, state efforts to create economic incentives against dumping trash are limited to litter taxes and deposits on containers. Washington has a litter tax on the gross proceeds of businesses that make and sell containers. The $2.5 million it yields annually pays for public education and youth programs to clean up litter. California is just beginning a recycling incentive system based on payment by manufacturers of one cent per container. Recycling centers run as private businesses accept the used containers and refund the one cent to consumers out of money paid by processors of the recyclable product, who are reimbursed from the state fund. Deposits will go up annually for the next several years unless at least 65 percent of all containers of each type sold are not redeemed by consumers.



Paula Koch Photo Researchers

Neal Maxon/Oregon Dept. of Fish and Wildlife

Plastic bottles and other junk off the Bay of Biscay in Spain after a storm. Above, a mallard in northern Oregon that was lucky—it was saved by a beach cleanup volunteer.

Eleven states—Alaska, California, Connecticut, Delaware, Maine, Massachusetts, New Jersey, New York, Oregon, Rhode Island and Vermont—have banned nonbiodegradable six-pack holders and other can-connecting devices. But not all these bans are effective. A recent study by the Oregon liquor control board found a high degree of compliance with the law, but not all the rings were found to decompose within the required 120-day time limit and under all circumstances. In fact, rings placed in water for up to five months simply did not decompose, and they are expected to remain indefinitely in the marine environment.

Yet a recently completed research project of the Research Triangle Institute in North Carolina concluded that technology now available can make plastics that break down on exposure to light and biological organisms. If widely used, this could make some of the plastic debris much less hazardous to marine life. It is effective with polypropylene and polyethylene products such as containers, ropes and the packaging bands frequently implicated in maiming and strangling young seals and sea lions.

For fishing gear, the picture is more complicated. While gear can be made that will degrade within a given time period, there are special problems with

some types of gear. And Defenders' Manville says it would be a mistake to depend on degradability as a total solution to the plastics problem. "For one thing, even if it works, it still takes time," he says. "And some degradable plastics shred up into sharp-edged spikes while they are breaking down, and thus are even more dangerous to wildlife. And there's a big unknown here: we just don't know what the byproducts of plastic degradation are going to do to the environment."

In Oregon, Sara Vickerman of Defenders has persuaded legislators to introduce a bill—one of many legislative proposals in the state aimed at limiting plastic debris—to generate revenue by assessing a fee on the plastic products that harm wildlife in the marine environment, and to educate the public by requiring a warning label on these products. Such a proposal seems more promising than banning a particular product or type of packaging, a suggestion that has generally met with stiff industry opposition as undue interference with the free market. Proposals to ban the use of plastic containers have failed in New Jersey and New York.

Several states are taking a different tack by promoting research on plastics recycling. Michigan awarded $600,000 to a company to develop a system to convert mixed waste plastics into other products, and New Jersey is contributing funds to the Center for Plastics Recycling Research at Rutgers University. Established by the Society of the Plastics Industry, the center receives the bulk of its funds from industry.

There are some hopeful developments in plastics recycling. Some plastics, for example, can be recycled and used as insulation material in buildings. But recycling-research programs are complicated by the thousands of varieties of plastics in use and the fact that some cannot be remelted and formed into new products. Moreover, types of plastic that look alike may require a chemical or burn test to tell them apart. Without being able to separate out large amounts of specific types of plastics, recycling is not likely to be profitable. Federal regulations bar the reuse and recycling of plastics for some food packaging. All this means that recycling is a complicated alternative. Similarly, degradable plastics may lose the very qualities that have made plastics attractive—durability and adaptability.

All of these avenues—degradability, recycling, improvements in laws and enforcement on dumping, and cutting down on waste—must be taken to effect any real improvement, according to Defenders' Manville. Waste reduction is the surest and most environmentally sound, he believes, and he thinks the way to achieve it is to pass costs of disposal and cleanup on to consumers. "If every plastic bag cost a dollar or two, we'd be a lot more interested in reusing them," he says. Americans may seem wedded to a throwaway lifestyle, but Manville

Neal Maine/Oregon Dept. of Fish and Wildlife

Gillnetting constricts the head of a luckless California sea lion on one of the Farallon Islands. A bird skeleton gripped by fishnet lies on an Oregon beach. A trout in Michigan grew up in the unyielding embrace of the pull tab from a beverage can.

believes we are capable of change. "Look at how many of us gave up cigarettes," he points out. "I don't think plastic's as addictive as tobacco."

Like Jim Coe, Manville believes most people vastly underestimate the danger of plastics in the marine environment. He also points out that there have been recent reports of humans entangled in plastic: propellers fouled and divers caught in net fragments. "When we realize we're one of the species that suffer from plastic trash," he says, "maybe we'll sit up and take notice." □

William H. MacKenzie is a Portland, Oregon, journalist who formerly served as counsel to the House Subcommittee on Fisheries and Wildlife Conservation and the Environment.

Michigan Department of Natural Resources

Jack D. Swenson

Jack D. Swenson

TRACKING PLASTIC IN THE PACIFIC

A visit to the westernmost Aleutians proves that a growing scourge is reaching our remotest beaches

Article and photographs by Albert M. Manville II

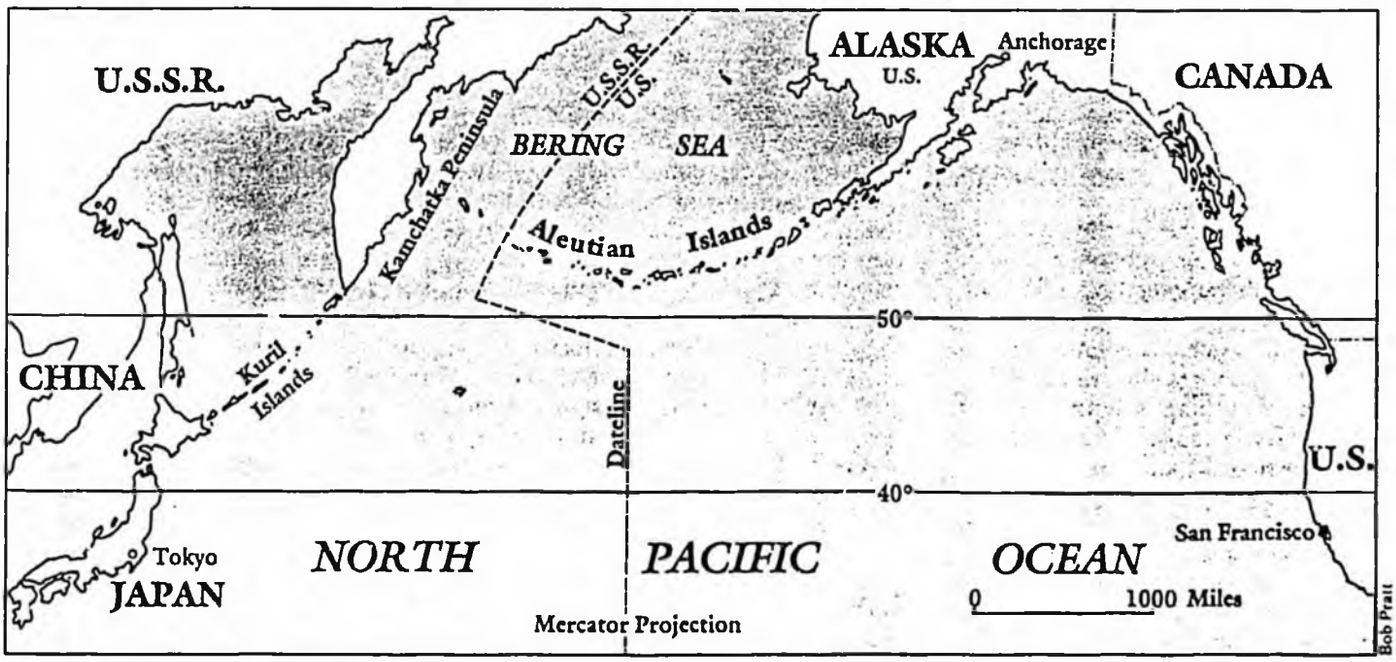
AS THE PUBLIC is beginning to realize, discarded plastic trash is increasingly causing suffering, disfigurement and death among marine animals around the world. One of the chief causes of plastic-related wildlife deaths is entanglement—the trapping, and often slow starvation or strangulation, of seabirds, marine mammals and sea turtles by lost or discarded fishing nets and other plastic debris.

Unknown numbers of seabirds, mammals and fish also die after eating plastic particles, either from broken-down finished plastic products or from raw materials used in plastics manufacturing. Still another threat to wildlife is posed by the ingestion of floating plastic bags by hungry sea turtles, which often mistake them for jellyfish. Once swallowed, the bags often lodge in the turtles' stomachs, where they block the digestive tract and produce ulcers and starvation.

The exact extent of wildlife mortality caused by plastics pollution is hard to gauge, since most marine animal deaths occur out of sight of human beings. However, a slightly different but related problem, the incidental taking of non-targeted animals in active salmon driftnets, is easier to measure. This kills an estimated 750,000 seabirds each year in the North Pacific alone. Researchers believe that in addition, 125,000 North Pacific marine mammals die in active driftnets annually. And it is believed that as many as a million seabirds and 100,000 marine mammals may be dying in this region each year after eating plastic or becoming entangled in it.

The United States, with six percent of the world's population, is the source of perhaps a third of the plastic waste found in the oceans of the Northern Hemisphere. In 1985 alone we used some 48 billion pounds of plastics, of which we discarded 1.4 billion pounds into the oceans. In 1987 our national plastics use grew to 53 billion pounds, and a recent report by the Society of the Plastics Industry projects that it will reach 76 billion pounds by the year 2000. Plastics use by other nations also is growing. What will this mean for marine wildlife?

As chair of the Washington, D.C.-based Entanglement Network Coalition, I recently traveled to Alaska to see what discarded plastics may be



doing to the waters surrounding the Aleutian Islands, a region rich in marine life. At the invitation of the U.S. Fish and Wildlife Service, I joined Captain Alvin Bayer and the crew of the new research vessel *Tiglax* on a tour of the westernmost islands in the Aleutian chain, in order to look for plastic trash on 25 of North America's most remote beaches.

Plastic entanglement, especially in trawl net fragments and packing bands, has been well documented as a leading cause of deaths of northern fur seals in the North Pacific, where the seals are declining by four to eight percent annually. Entanglement is blamed for killing perhaps 30,000 to 50,000 a year.

Just outside our 200-mile limit, in this isolated area far from where most Americans live, fishing boats from a number of nations create a special entanglement threat by setting out tens of thousands of miles of driftnet every night during the five-month fishing season. Driftnets get their name from the fact that commercial fishermen do not anchor them but let them drift in the ocean catching fish automatically. This practice virtually guarantees regular losses of plastic netting to the ocean, as well as the deaths of seabirds and marine mammals. Some 700 boats from Japan, Taiwan and South Korea put out an estimated 20,500 miles of driftnet each night in international waters in the North Pacific. The National Marine Fisheries Service estimates that the Japanese alone lose about 12 miles of net per night, or about 639 miles every season. In addition, plastic debris is dumped into the North Pacific by naval and fishing vessels from the bordering nations.

The Aleutians, totaling some 3.9 million acres, extend more than 1,100 miles from Unimak Island west to Attu Island. Of more than 200 named islands, islets and rocks in the chain, most of them treeless, I visited seven of the westernmost, three of them situated in the Near Island group named for its proximity to the Soviet Union. These islands were unlike anything I'd ever imagined. Volcanic in origin, they boast mountains over 4,000 feet in altitude, shorelines that are frequently indented with fjords, and several-thousand-foot cliffs that drop abruptly to the ocean.

Because these islands are a barrier between the Pacific Ocean and the Bering Sea, the waters around them are roiled by ocean upwellings, tidal surges and ever-present tidal rips—places where two currents come together, rich nutrients are brought up and plankton are concentrated, in turn attracting fish and seabirds. Unfortunately, such areas also tend to collect plastic trash that has been discarded elsewhere and carried along by the currents.

Even in July, most of the outer Aleutians were still covered with a patchwork of snowfields, especially in their upper elevations. Frequent fogs and low-lying clouds provided a nearly continuous dampening of the lush vegetation, which consists of tall, herbaceous meadows as well as li-

Some of 28 rope coils and pieces, 13 trawl net sections and other plastic debris at Etienne Cove, Attu Island.

The Tiglax *waits off Little Kiska Island. On North Bight Beach on Buldir Island, expedition members Nancy Norvell, Mike Boylan and Vern Byrd inspect a dead glaucous-winged gull on a piece of trawl net.*

chens, mosses and low alpine plants. This rich environment provides nesting habitats for several million seabirds of 25 different species. It also supports the endangered Aleutian Canada goose, three common raptors and other waterfowl. Arctic foxes and Norway rats were introduced here, the former for fur, the latter by mistake. The foxes especially have had a significant impact on native birds.

Along with sperm, minke, killer and Steineger's beaked whales, the world's largest sea lions are found in the Aleutians. Adult bull Steller's sea lions can weigh nearly a ton. I also saw sea otters, harbor seals, northern fur seals and Dall's porpoises.

My plan for surveying beaches for plastic was simple. First I selected sample sites 100 yards long. Then I counted plastic items found at these sites from the water's edge up through high storm-tide level. I also photographed all the beaches and collected representative plastic samples.

As I soon discovered, there were good reasons why surveys had probably never been done before on many of these beaches. Not only are they remote, but the seas around them are unpredictable and storms come up quickly. Access was mostly by inflatable Zodiak, and the swell of the waves was a formidable hazard. Massive kelp beds around the islands also made Zodiak landings difficult. Then there was the fog: we were in the clear one moment, enshrouded the next. Because of the danger of capsizing in the icy water, we all wore bulky Mustang survival suits and carried two-way radios and other survival equipment as we rode the Zodiaks in to the beaches.

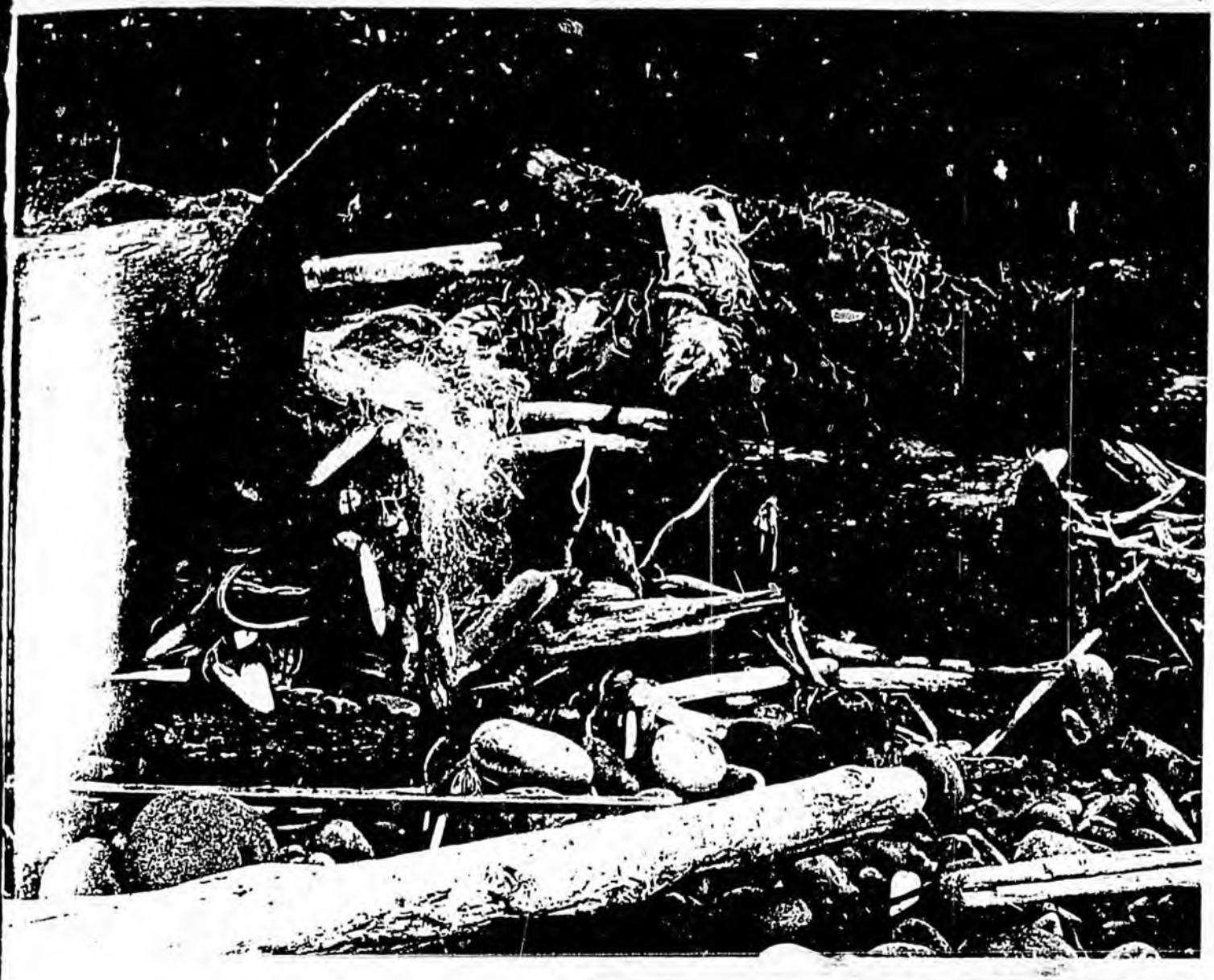
Shielded by their protective harbors from storms and strong currents, the first few beaches I visited on Shemya and Attu islands had only small amounts of plastic. But even the most protected beaches had some debris; at least 15 items were deposited on the cleanest of them.

Then, as the *Tiglax* rounded Wrangell Point on Attu, site of the westernmost beach in North America (it is so far west it is located in the Eastern Hemisphere), I saw in the distance a myriad of colored dots on the shore. They turned out to be plastic floats for trawl nets and crab pots, and the beach was littered with them. After dropping anchor and fighting the usual battle to get the Zodiak through the kelp, we carefully approached the beach without disturbing 13 sleeping bull Steller's sea lions. One had his head on a plastic buoy. Another lay on a plastic trawl net. The sea lions soon awoke and lumbered toward the water, all the while bellowing, growling and barking at us.

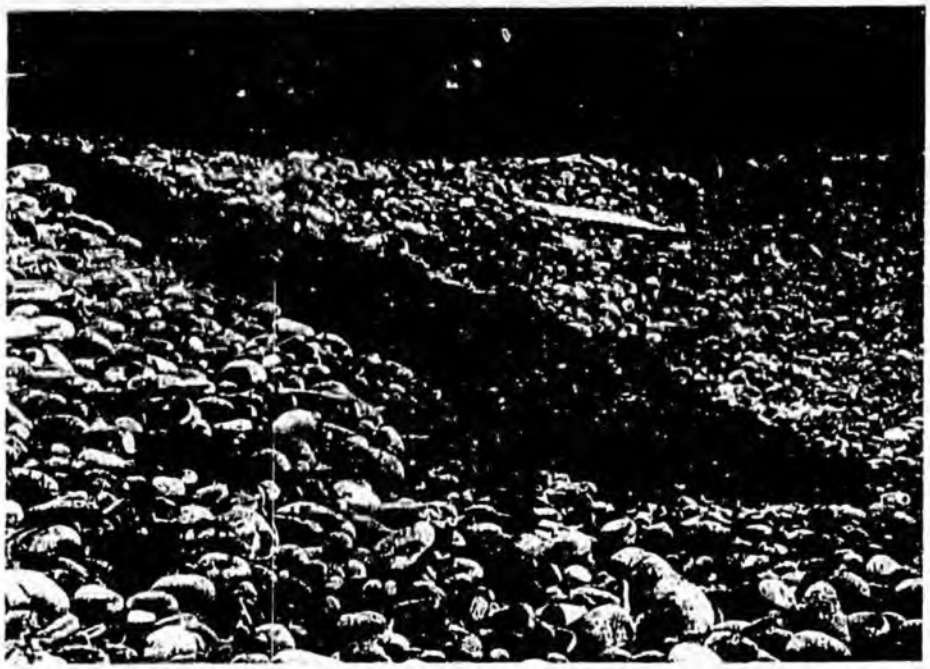
My survey of this beach recorded the following array of plastic items: 34 bottles, seven bottle caps and lids, nine fish-sorting baskets, a beer crate, three plates, two hard hats and two beverage coolers. In addition, I found nine strapping bands, nine pieces of polystyrene foam, 47 hard plastic buoys and 80 foam plastic buoys. On the same beach were 110 nets, most of them trawl nets, but also including a few gillnets; and 179 pieces or complete coils of plastic rope. There were even three orange drift cards from a National Marine Fisheries Service study of the forces causing oil to move along the ocean surface. On this one beach I counted 511 items representing 27 varieties of plastic.

As four of us from the *Tiglax* surveyed the beaches on northern Attu for sea lions, another disturbing trend became evident. An FWS count of sea lions here in 1979 turned up 5,705 animals; we sighted only 811. Could plastic trash be one reason for the decline? I found no dead sea lions entangled in plastic, but for unknown reasons the Steller's sea lion population worldwide has dropped 50 percent in the last decade. In the eastern Aleutians, a 50-percent fall-off in the Steller's sea lion population has been observed since 1957. More research is definitely needed to determine whether this decline is linked to plastic entanglement. On Buldir Island I did photograph a bull sea lion with a massive entanglement scar on its neck. It looked as if the plastic were still imbedded in the bull's flesh, but I couldn't get close enough to be sure. I received reports of other sea lions with entanglement scars on Kiska Island.

On the 2.3 miles of beach on seven islands that I covered during the trip, I tallied 3,159 plastic items in 67 different product categories. On the average, each beach yielded 126 different pieces of plastic. But this total



Top, trawl net, monofilament driftnet and other plastic on Buldir Island. Left, Tiglax *first mate Kevin Bell holds a plastic naval ordnance container on Kiska. On Buldir, a Steller's sea lion's neck bears a massive entanglement scar.*



accounts only for what was visible, not for what doubtless lay hidden under debris, sand and rocks. Since Alaska boasts some 36,000 miles of coastline, my survey results undoubtedly represent only a tiny fraction of the state's beach debris problem. The next storm could easily wash this plastic back into the ocean to continue its lethal journey through the marine environment. Or a storm could just as easily reveal additional plastic that has floated in on the water, or plastic nets that have temporarily disappeared beneath the water's surface

This section of trawl net on Buldir Island probably came from a Soviet or Japanese fishing boat. The pink inflatable plastic buoy in the Buldir Steller's sea lion rookery below is from the Alaskan king crab fishery.

because of entangled debris and dead wildlife.

The most prevalent of the 67 different kinds of items I found was plastic rope. Pieces of it, and sometimes complete coils, accounted for 706 of the 3,159 plastic articles I tallied. The next most common type of debris consisted of 535 foam plastic buoys from gillnets. The discarded plastic appeared to come from ships, oil-drilling platforms or land sources and included products from Japan, South Korea, China, Taiwan, the Soviet Union, Norway and the United States.

Most of the plastic lacked convenient identification markings. Previous reports indicated that most beach litter found on Amchitka Island was from Japanese and Soviet fishing vessels. My findings in the outer Aleutians are consistent with earlier researchers' discoveries of enormous quantities of trawl web nets on Amchitka. Trawl nets, large webs dragged along the ocean bottom, are used to harvest salmon, walleye pollock, cod and other fish in this region.

The outer Aleutians appear to be a paradise for birds. Troubling, though, is the possibility that plastics may be taking a heavy toll on their populations. I found hundreds of dead seabirds on the beaches, some wrapped in plastic. Given the decomposition of the carcasses, it usually was impossible to determine the cause of their deaths. But my initial analysis suggests that more research on seabird mortality definitely needs to be conducted in the outer Aleutians. The birds that seem most abundant here are least auklets, estimated to number 1.3 million on Buldir and Kiska islands. In flight, least auklets and crested auklets resembled a large cloud of smoke as we sighted them from a distance while steaming toward their Buldir rookery. Among the common birds in the islands are tufted and horned puffins, thick-billed and common murres, black-legged kittiwakes, red-faced and pelagic cormorants, forked-tailed and Leach's storm petrels and glaucous winged gulls.

What is astounding about many of these birds is their diving prowess. Murres, for example, have been found diving to depths of more than 600 feet, and crested auklets to depths below 120 feet. The tufted puffin can dive at least 450 feet below the ocean's surface in search of fish, squid or other prey. It's worth asking whether this increases the birds' chances of drowning in plastic "ghost nets" and other debris lurking below the surface.

Potential victims of the Pacific's spreading burden of plastic are this mother Pacific harbor seal guarding a concealed pup and the black-legged kittiwakes thronging an oceanside cliff, in both cases on Buldir Island.

What does the future hold for these birds? What entanglement threats may lie ahead of the huge bull Steller's sea lion that I accidentally surprised on one island while changing my film behind a boulder where he was sleeping? Fortunately, 35 nations have now ratified Annex V of the MARPOL (International Marine Pollution) Treaty which bans the disposal of plastic wastes from commercial and other private vessels. The United States ratified the MARPOL Protocol late last year after an extensive public-education campaign by environmentalists, and last December President Reagan signed legislation implementing the treaty and prohibiting plastic dumping by any vessel within our 200-mile Exclusive Economic Zone. The U.S. Navy last June accepted and began implementing recommendations to phase out its plastics dumping over the next five years.

The campaign to make our increasingly plastics-dependent world safe for marine wildlife, however, still has much to accomplish. As we disembarked from the *Tiglax* at the end of our ten-day research voyage, I observed that our trash had been carefully stored on board for proper disposal later. The plastic debris floating in the harbor at Adak Naval Air Station, however, had not been handled so carefully. Perhaps it had been pitched overboard by deckhands on some non-naval vessel still out at sea.

To reduce the plastics threat, conservationists need to work for strict enforcement of the 1987 Marine Plastic Pollution Research and Control Act after it takes effect this December. We must also ensure that the federal government carries out its mandate under the Driftnet Impact Monitoring, Assessment and Control Act to negotiate with foreign nations over reducing and ultimately eliminating the killing of marine life by driftnets and related equipment.

Congress should require use of degradable nets and marking and registration of driftnets, trawl nets and purse seines, as proposed in testimony supported by a majority of the Entanglement Network Coalition in 1987. Finally, it seems clear that significantly larger appropriations are needed to support research on seabird and marine mammal deaths in the outer Aleutians and elsewhere. What we found last July on those 2.3 miles of beaches is surely only a hint of a much larger problem. Many questions remain about entanglement, other impacts of plastic on marine organisms and the decline of wildlife populations in the region. But with the federal government facing a deficit problem and a host of competing claims on its financial resources, conservationists may have to expend some effort to make sure that those questions are answered. □

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