

# 2020 Foreign Marine Debris Event—Bering Strait

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## Highlights

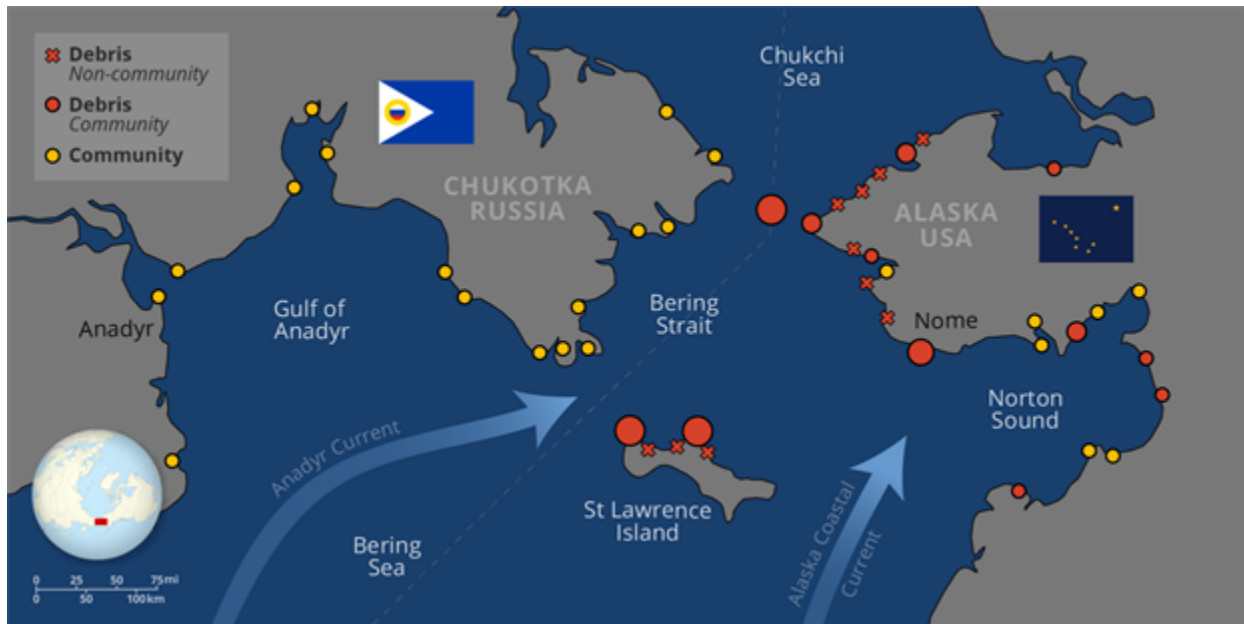
- During 2020, the Bering Strait region of Alaska experienced a marine debris event that brought garbage ashore that was different from the types and amount typically observed.
- Notification of, and response to, this event was undertaken by the regional public out of concern for their food security, marine wildlife health, human health, and conservation.
- Without significant collaborative transboundary communication and/or enforcement of existing international marine pollution rules, the Bering Strait region should expect similar or higher levels of marine garbage in the future as industrial maritime ship traffic increases.

## Introduction

The Bering Strait region of Eastern Chukotka (Russia) and western Alaska (USA) encompasses a narrow international waterway providing the sole transit corridor for a diverse assortment of federally-managed marine resources (e.g., marine mammals, seabirds, fish, and invertebrates), as well as all vessel traffic between the Pacific and Arctic Oceans. Two prominent northward flowing currents, the Anadyr and Alaska Coastal currents, produce a strong, typically one-way flow from the Bering Sea to the Chukchi Sea (Overland and Roach 1987) and are considered responsible for carrying anthropogenic debris northward (Mua et al. 2019; Kylin 2020).

The Alaskan Bering Strait region is extremely remote with an expansive coastline and little to no presence from the authorized federal agencies tasked with research, management, or response to the marine environment. Those personnel are typically located in the urban centers of Alaska and/or Washington state, far from western Alaska's coast.

The communities of the Alaskan Bering Strait region are diverse and include Iñupiaq, St. Lawrence Island/Siberian Yupik, Yup'ik, as well as non-Native peoples. All reside along the coast, reflecting the importance of the marine ecosystem (see Fig. 1.). Reliance on marine resources for subsistence purposes is essential to each community's nutritional, cultural, and economic well-being. Though there is often a lack of science data from western Alaska, there is no lack of regional knowledge regarding the marine environment. Coastal communities with active and comprehensive maritime subsistence activities typically are the first to discover anomalous events, alert regional partner institutions, and subsequently conduct the event response. The regional impetus to respond is out of food security, wildlife health, human health, and/or conservation concerns.



**Fig. 1.** A map of the Bering Strait region. Coastal communities are indicated by yellow circles. Alaskan communities reporting foreign debris are indicated by red dots with the circle size corresponding to the numbers of reports. Areas with debris reported with assistance from the US Coast Guard and/or traveling community members are indicated by red "X"s. The reporting Chukchi Sea communities of Kivalina and Wainwright are not shown. The primary northbound ocean currents, Anadyr Current (Chukotka) and the Alaska Coastal Current (Alaska), are indicated by the two arrows.

In the last decade, the peoples of the region have responded to anomalous events affecting marine species, including petroleum oil-fouling (Stimmelmayer et al. 2018), biogenic oil-fouling (Smith 2020), and novel disease and/or mortality events (Stimmelmayer et al. 2013; Bodenstern et al. 2015; Van Hemert et al. 2021). Additionally, the Bering Strait region experiences industrial fisheries debris washing ashore. Since 2006, the Norton Sound Economic Development Corporation (NSEDC) has conducted community environmental clean-up efforts (e.g., historic industrial, military materials, etc.). Over 1.1 million pounds (approximately 500 metric tons) have been collected from 15 member communities, with much of that as commercial fisheries equipment typically in the form of nets, floats, and other equipment (Fred Jay Ivanoff, Senior Crew Leader, NSEDC, 2021, personal communication). With large international commercial fisheries in the southern Bering Sea and strong northward flowing ocean currents, St. Lawrence Island consistently receives fisheries equipment ashore. Overall, the rest of the Bering Strait region receives a much lesser amount of fisheries-related materials ashore.

As a result of less and thinner seasonal sea ice, more open water, and rapidly reorganizing marine ecosystems (Stevenson and Lauth 2019; Eisner et al. 2020; Thoman et al. 2020), industrial maritime vessel traffic (e.g., Pollock and Pacific cod commercial fishing, Northern Sea Route large vessel traffic, etc.), which mostly originates far from the Bering Strait region, has significantly increased in frequency and duration in the northern Bering Sea (USCMTS 2019). These intensified activities increase the likelihood of future anomalous marine events that will require community vigilance and response throughout the Bering Strait region.

## Marine debris event in 2020

Starting during late July 2020, tribal leadership at St. Lawrence Island voiced serious concerns regarding the amounts and types of debris washing ashore and provided qualitative reports (Table 1) to Kawerak, Inc. and the University of Alaska-Alaska Sea Grant (UAF-ASG) office in Nome. Kawerak and UAF-ASG responded initially by contacting the federal authorities. They used the existing regional communication network to gather and provide information as the event unfolded. Additionally, Kawerak and UAF-ASG created a regionally relevant public awareness poster with contact information for regional distribution, coordinated with regional media to provide information, and worked with the urban-based federal response agencies to provide the opportunity to speak (remotely) to the public about the emerging event. Through mid-November, individuals from 14 coastal communities (Fig. 1) discovered and documented over 350 individual items ashore, most with Russian, Korean, and/or other Asian lettering or branding (Table 2, Fig. 2). This number should be considered a minimum, with qualitative reports of mostly uncounted debris extending for miles. Reporting communities included locations in Norton Sound (Elim, Kotlik, Shaktoolik, Unalakleet), Bering Strait (Gambell, Savoonga, Diomed, Brevig Mission, Wales, Nome), and the Chukchi Sea region (Shishmaref, Deering, Kivalina, Wainwright). Additional reports of debris ashore (e.g., deck boots) were also received from the US Coast Guard during their aerial missions in the Bering Strait region, and these were incorporated with all reports received.

**Table 1.** Examples of the qualitative reporting of items from the 2020 marine debris event.

Month	Location	Report
July	Gambell	"5-10 miles of litter"
July	Savoonga	"There is trash and debris for miles along the shoreline"
July	Nome	"From Sinuk River to Nome (~25 miles) there were 174 items noted"
August	Gambell	"In 3 miles of shoreline we picked up trash that filled 19 (40 gal.) trash bags that each weighed ~50 lbs/apiece"
August	Savoonga	"Lots of trash washed in with lots of dead seabirds (murre, fulmars)" and "seen quite a bit of [deck boots] to the East and to the West"
August	Unalakleet	"Lots of Russian plastic [water] jugs"
September	Gambell	"Seeing lots of debris and even vegetables [washed in] of late"
September	Brevig Mission	"Quite a bit of debris of different varieties"
September	Wales	"In 4 miles there were a handful of milk bottles, > dozen beer/alcohol bottles, several aerosol cans, and one can of aerosol foam"
September	Shishmaref	"During the flight from Wales to Shishmaref (~50 miles), recently washed in trash (plastic bags, pallets, plastic bottles, small plastic containers, deck boots, and even a large black ship's fender) was consistently observed on the beach."

**Table 2.** Examples of the quantitative reporting of items from the 2020 marine debris event.

Type	# of Items	Examples
Water	117 bottles	Russian brands (6), Korean brands (3), Chinese brand (1), and 43 undetermined bottles with no label but similar in shape and size to labelled water/beverage containers.
Beverages	46 bottles	Juice: aloe vera, pineapple, peach, tomato, and "cocktail"; Dairy/yogurt beverages; soda; milk; kvass; and one undetermined beverage
Deck Boots	47 boots	Several styles and colors, primarily orange.
Equipment	~46 items	Russian "pike" bamboo pole with welded hooks for retrieving longline buoys, 55 gallon oil drums (empty), long line buoy with a fishing company's (Vladivostok, Russia) Pacific Cod permit tag number, a case of packing bands in a cardboard(!) box from Busan, S. Korea, two trawl net floats, packet of crystalline polypropylene, life jackets, chemical bottle, lighter, various plastic containers, and plastic bags, etc.
Food packaging	32 items	Cheese, chips, jam, candy, chocolate/peanut butter paste, cookies, pickles, dessert topping, garlic, ginger, peppers, instant pasta/soup, mayonnaise, ketchup, sour cream, tomatoes, soy sauce, yogurt, soybean oil, and undetermined condiment bottles
Aerosol cans	26 cans	Roach insecticide, lubricating oil, spray paint, butane, polyurethane foam, air freshener, and muscular pain relief spray
Bathroom cleaner	14 bottles	Toilet bowl cleaners, drain clog remover, dishwashing liquid
Hygienic products	8 items	Shampoo, stick deodorant, body wash (Men's)
Alcohol	5 bottles	Beer, vodka
Foods	9 items	Biscuits (in a repurposed Russian food container), apple, lemon, green pepper, pumpkins, orange
Clothing (adult)	4 items	Russian Navy sailor cap, patent leather shoe, plastic slipper with liner, slip-on shoe
Water bottle	(1) six liter bottle containing 78 items	Plastic food packaging wrappers: meat, vegetables, pasta, rice, candy/gum, spice packets, baking powder, yogurt; disposable gloves, sponge, etc.



**Fig. 2.** Items from 2020 foreign marine debris event: (a) plastics scattered along the shoreline; photo by L. Apatiki, (b) shampoo bottle; photo by T. Pelowook, (c) miscellaneous aerosol cans of butane, paint, and lubricating oil, foods, and bottles of bathroom cleaners, water bottles, etc; photo by G. Sheffield, (d) 1L carton of milk; photo by A. Ahmasuk, (e) deck boot; photo by G. Sheffield, (f) longline anchor buoy from a Vladivostok-based fishing company with the Pacific cod permit attached; photo by R. Tokeinna.

The equipment washed ashore was commercial fisheries related, including a case of packing bands still in a cardboard box from Busan, South Korea, several life jackets, two 55-gallon drums with Russian branding, dozens of deck boots, countless blue plastic "bucket liner" or packaging bags, and even a longline buoy with permit tag (for Pacific cod) belonging to a Vladivostok-based commercial fishing company. The predominant debris washed ashore were empty single serving beverages, bottled water, and/or packaging associated with foods and snacks. Most plastic items were un-weathered, in pristine condition, indicating they had entered the water recently. The most recent date of manufacturing noted on any item was April 2020. Hazardous materials included cans and other containers that had and/or still contained roach insecticides, toilet cleaners, drain clog remover, lubricating oils, butane gas, and spray paints. Of note, one large plastic water bottle recovered near the community of Shishmaref contained 78 plastic and/or foil items associated with cooking meats, vegetables, starches, as well as cooking for a large number of people (e.g., disposable gloves, etc.). This one bottle containing multiple items was a reminder that the items documented were an absolute minimum, and highlighted the potential for more plastics to be released in the future. There was no clothing or hygienic debris typically associated with women or children, which supports attributing this mass debris event to commercial fisheries, which mostly employ male crew members.

Community members remained vigilant and voluntarily reported, documented, and even shipped debris to Nome in hopes of identifying the responsible party for these violations of the existing international pollution convention, and to get them to stop polluting regional waters. The largest number of villages' simultaneously reporting trash ashore occurred during September 2020, with the last foreign debris reported from Little Diomedes in mid-November at the start of seasonal sea ice formation. Regional residents continued to note that the 2020 event was more widespread, of longer duration, and included

more internationally manufactured or branded everyday garbage (e.g., water/beverage bottles, snack packaging, aerosol cans, and foods) ashore than previous years. Of note, there were two items of clothing (a Russian Navy cap and a patent leather shoe, both in pristine condition) that washed ashore on St. Lawrence Island during September that were potentially associated with a large Russian military exercise near St. Lawrence Island during late August (Isachenkov 2020; Sutton 2020).

During 2020 it was not just commercial fishing equipment coming ashore; debris also included everyday garbage such as plastics, food items, and hazardous materials. Each item documented ashore is in violation of international regulations to prevent garbage pollution from ships as outlined in Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL) (International Maritime Organization 2021). The documented plastic debris, fishing equipment, and hazardous materials not only negatively impact regional marine resources, but also the peoples and communities that directly rely on them for nutritional, cultural, and economic well-being.

Possible reasons for the increase of marine debris in the Bering Strait region during 2020 include:

- An increase in marine traffic to the region: Unfortunately, however, we have not found accessible quantitative information on the change in ship traffic in the northern Bering Sea during 2020.
- Different people are now using the Bering Strait region: During 2020, industrial fishing vessels and/or commerce vessels, originating far from the Bering Strait region, arrived to exploit novel volumes of commercially-viable marine resources (e.g., Pacific cod and pollock) (Spies et al. 2020; Stevenson and Lauth 2019) and/or unprecedented maritime northern transit conditions (Humbert 2021; Smith 2021).
- A foreign vessel sunk: Based on authors' consultation with the US Coast Guard, such information may not be currently available at the international level for the Bering and Chukchi Seas.

## Conclusions

The 2020 debris event and response demonstrated that, during a maritime environmental or food security-related event in the Bering Strait region, the federally-authorized responding agencies located far from the coast of western Alaska are reliant on regional peoples—not only for awareness of the event but also for detailed information and response. Regional residents, tribal leadership, and communities documented, reported, conducted clean-up activities, and investigated the source of debris on a voluntary basis using personal resources, little to no training, and limited response capacity.

Without regular and relevant collaborative transboundary communications and/or enforcement of existing international marine pollution rules, the Bering Strait region should expect similar or higher levels of marine garbage in the future as industrial ship traffic increases. The Arctic Council's working group Protection of the Arctic Marine Environment (PAME) seems an appropriate forum for collaboration on addressing this issue. Identifying a primary point of contact within the Russian Federation would be ideal for collaborative time-sensitive communications to address the immediate and shared environmental, ecological, and industrial concerns regarding marine debris that face both Alaska and Chukotka in the unique Bering Strait region.

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