2019 Fall Meeting of The Maritime Law Association of the U.S.

Panel Discussion Outline

Legal and Commercial Aspects of Marine Plastics Pollution

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In his May, 2016 address to a Senate Subcommittee on Fisheries, Water, and Wildlife, Jim Kurth, Deputy Director of the U.S. Fish and Wildlife Service, opened his remarks by stating, “Marine debris is one of the most pervasive and pernicious global threats to the health of the world’s coastal areas, oceans, and waterways. It is an issue of growing local, regional, national, and international concern. Marine debris can injure or kill marine and coastal wildlife; damage and degrade habitats; interfere with navigational safety; cause economic loss to fishing and maritime industries, degrade the quality of life in coastal communities; and threaten human health and safety.”[[1]](#footnote-1)

This outline and our presentation will focus on legal and commercial aspects of marine plastics pollution, and we’ll provide an overview of the ongoing efforts across the globe to combat the threat of marine plastics debris.

1. History of Plastic

Plastic is a relatively new product, with modern plastic as we now know it (fossil-fuel based) making its first appearance just over 100 years ago in 1907.[[2]](#footnote-2) Life has become unimaginable without it – think about all the plastic you touched to get here, or all the plastic you are touching right now.

Plastic became an invaluable material during World War II, during which it was used in multiple products from plane cockpits to parachutes to radar insulation. Fossil-fuel based plastics production ramped up four-fold during the war effort to support military uses. The industry growth and production capacity that was developed during the war was soon diverted to the manufacture of consumer products, although plastic’s integration into everyday consumer life evolved gradually at first. In order to promote the use of plastic and to create awareness amongst consumers about its versatility, an exhibition on all things plastic was held in New York in 1946.[[3]](#footnote-3) Due to its inexpensive nature and versatility, plastics use allowed for an increase in the standard of living and made products attainable for many more people.

Although having groceries bagged in plastic bags had become commonplace by the 1990’s, single-use plastic bags actually were not being used in grocery stores in the United States until 1979.[[4]](#footnote-4) At the end of 1985, supermarket consumers had the option to use plastic instead of paper bags in three-quarters of the stores, but only 25% of consumers were opting to use plastic bags. By about 1995, 80% of supermarket and convenience store customers were using plastic bags.[[5]](#footnote-5)

Public Perception Shifts

Consumers’ enthusiasm about plastics waned as citizens around the world began observing the effects of plastic waste on the environment. Slowly but surely various countries and communities began to limit the use of plastics.

As early as the 1960’s, concerns about plastic in oceans were raised, as awareness about environmental problems grew within the United States. By the 70’s and 80’s, the permanent nature of plastic was a cause of concern. In order to combat these concerns, consumers and the plastics industry began pushing for recycling systems to process discarded plastics.[[6]](#footnote-6) In 1980, Woodbury, New Jersey in the Philadelphia Metropolitan Area became the first city to provide its residents with a curbside recycling program.[[7]](#footnote-7)

While recycling programs expanded, research continued to explore new ways in which to utilize plastic in all of its different shapes and sizes. One new plastics application was the introduction of microbeads in skin products by the cosmetic industry in the 90’s.[[8]](#footnote-8) As we now know, these beads can be found in most water bodies around the world. A BPA scare arose in 2008 when it was discovered that the chemical Bisphenol A (“BPA”), which had been used in the manufacture of certain plastic water bottles and to line metal food cans, had leached into the water and into baby-formula.[[9]](#footnote-9) Studies and greater awareness of plastic’s potential harmful effects on consumers and the environment continued to grow, and by 2014 the Netherlands became the first country to ban the use of microplastics in cosmetics.[[10]](#footnote-10) Since 2014, other countries have followed suit and have banned their use, including the U.S., which enacted a ban on microbead use in rinse-off cosmetics, effective July 2017.[[11]](#footnote-11)

In 2002, Bangladesh became the first country to ban plastic bags.[[12]](#footnote-12) In 2007, San Francisco became the first U.S. city to impose a plastic bag ban.[[13]](#footnote-13) The product that a few decades prior had seemed to many to be the solution, gradually became viewed as a nuisance and danger that more and more cities and communities began working to address.

Plastics Use Today

Consumer perception as to plastics use is continuing to shift with increased public awareness of the negative impacts of marine plastics pollution on human health, tourism, fisheries, shipping, and marine life.[[14]](#footnote-14) Despite the shift in consumer perception, however, the expected reduction in plastics production has not occurred. Fifty percent of all plastic ever produced has been produced during the last 15 years. According to one source, more than 300 million tons of plastic is produced each year, half of which is for single-use purposes, and more than 8 million tons of plastic is dumped into the ocean every year.[[15]](#footnote-15)

1. Sources of Marine Plastics
2. Ocean Based Sources

Fishing gear may be lost from commercial fishing vessels as well as from recreational boats and from shore-fishing activities.[[16]](#footnote-16)

Offshore oil and gas platforms are surrounded by water, and all items lost from these structures become marine debris. Marine debris generated from these platforms includes items like plastic drill pipe thread protectors, hard hats, gloves, and 55-gallon storage drums.

Cargo lost overboard from freighters, or trash dumping from cargo, cruise ships and other vessels poses serious threats to marine navigation and the marine ecosystem.[[17]](#footnote-17) Container vessels caught in rough seas can lose the contents of their containers (sneakers, televisions, plastic toys, etc.), or perhaps even the entire container, a steel box 20 – 40 feet long, 8 feet wide and 8.5 feet high. Vessels carrying logs or lumber may lose large bundles or individual pieces of wood.

1. Land Based Sources

Intentional or unintentional disposal of domestic or industrial wastes on land or in rivers or streams can contribute to the marine debris problem if a subsequent action carries the debris to the ocean.[[18]](#footnote-18)

Storm water that flows along streets or along the ground as a result of rain or snow can carry street litter into storm drains. Storm drains carry this water and debris to a nearby river, stream, canal, or even directly to the ocean. Marine debris from storm water runoff includes street litter (e.g., cigarette butts and filters), medical items (e.g., syringes), food packaging, beverage containers, and other plastics material that might have washed down a storm drain.[[19]](#footnote-19)

Hurricanes, tornadoes, tsunamis, floods and mudslides have devastating effects on human life and property. The high winds, heavy rains, flooding, and tidal surges associated with extreme events are capable of carrying objects as light as a cigarette butt or as heavy as the roof of a two-story home far out to sea. During storms or other periods of strong winds or high waves, almost any kind of trash (including plastics, glass, metal, wood, and medical waste) can be expected to wash into storm drains and ultimately the oceans.

Since the 1960s the amount of plastic in the North Atlantic has tripled, with the biggest increase being from the 1990’s to the 2000’s.[[20]](#footnote-20)

1. The Potential Effects of Marine Plastics Debris

Research has also shown that plastic debris is a potential vector for the transfer of persistent, bioaccumulative, and toxic pollutants (PBTs) from the water to the food web, potentially creating a risk to marine species and human health.[[21]](#footnote-21) It has also been shown that plastic is not biodegradable and will continue to break down into ever smaller particles, ending up as micro plastics (particles smaller than 5 millimeters long).[[22]](#footnote-22) This and other unanswered questions about marine plastics and how they affect the health of our oceans are propelling new research.

NOAA’s Office of Response and Restoration’s Marine Debris Division describes the impacts of marine debris as follows[[23]](#footnote-23):

“Economic loss:
Marine debris is an eyesore along shorelines around the world. It degrades the beauty of the coastal environment and, in many cases, may cause economic loss if an area is a popular tourist destination.[[24]](#footnote-24) Would you want to swim at a beach littered in trash? Coastal communities may not have the resources to continually clean up debris.”

“Habitat Damage:
Marine debris can scour, break, smother, and otherwise damage important marine habitat, such as coral reefs. Many of these habitats serve as the basis of marine ecosystems and are critical to the survival of many other species.”[[25]](#footnote-25)

“Wildlife Entanglement and Ghost fishing:

One of the most notable types of impacts from marine debris is wildlife entanglement. Derelict nets, ropes, line, or other fishing gear, packing bands, rubber bands, balloon string, six-pack rings, and a variety of marine debris can wrap around marine life.[[26]](#footnote-26) Entanglement can lead to injury, illness, suffocation, starvation, and even death.”[[27]](#footnote-27)

“Ingestion:
Many animals, such as sea turtles, seabirds, and marine mammals have been known to ingest marine debris.[[28]](#footnote-28) The debris item may be mistaken for food and ingested, an animal's natural food (e.g. fish eggs) may be attached to the debris, or the debris item may have been ingested accidentally with other food. Debris ingestion may lead to loss of nutrition, internal injury, intestinal blockage, starvation, and even death.”[[29]](#footnote-29)

“Vessel Damage and Navigation Hazards:
Marine debris can be quite large and difficult to see in the ocean, if it's floating below the water surface. Encounters with marine debris at sea can result in costly vessel damage, either to its structure or through a tangled propeller or clogged intake.”[[30]](#footnote-30)

“Alien Species Transport:
If a marine organism attaches to debris, it can travel hundreds of miles and land on a shoreline where it is non-native. Invasive species can have a devastating impact on fisheries and local ecosystems and can be costly to eradicate.”[[31]](#footnote-31)

Direct Impacts

Studies have conclusively shown that fish and other marine life do eat plastic, as they may mistake it for food[[32]](#footnote-32) or accidentally ingest it. Plastics could cause irritation or damage to the digestive system. If plastics are kept in the gut instead of passing through, the fish could feel full (of plastic, not food) and this could lead to malnutrition or starvation.[[33]](#footnote-33) Fish that have ingested plastics have shown to have a lower reproductivity, with this lower rate being passed down to the next generation that have not ingested plastics.[[34]](#footnote-34)

A study has shown that seabirds (a species where most animals are found to have ingested some plastic[[35]](#footnote-35)) have lower blood calcium levels, body mass, wing length and head and bill length due to their ingestion of plastic.[[36]](#footnote-36) The reason for this is said to be plastic’s impact on the birds’ kidneys function, reducing it and affecting their cholesterol and enzymes levels. *Id.* A noteworthy finding of this study was that the presence of *any* plastic in the birds’ systems was sufficient to cause these effects—no threshold quantity was required.[[37]](#footnote-37)

Indirect Impacts

Plastic debris accumulates pollutants such as PCBs (polychlorinated biphenyls) up to 100,000 to 1,000,000 times the levels found in seawater. PCBs, which were mainly used as coolant fluids, were banned in the U.S. in 1979 and internationally in 2001. It is still unclear whether these pollutants can seep from plastic debris into the organisms that happen to eat the debris, and very difficult to determine the exact source of these pollutants as they can come from sources other than plastic debris. More research is needed to help better understand these areas.[[38]](#footnote-38)

Derelict Fishing Gear

Ghost fishing occurs when lost or discarded fishing gear that is no longer under a fisherman’s control continues to trap and kill fish, crustaceans, marine mammals, sea turtles, and seabirds.[[39]](#footnote-39) Derelict fishing nets and traps can continue to ghost fish for years once they are lost under the water’s surface. *Id.*

Ghost fishing can impose a variety of harmful impacts, including: killing target and non-target organisms, including endangered and protected species; causing damage to underwater habitats, such as coral reefs and benthic fauna; economic losses from target species’ mortalities and replacement costs; and contributing to marine pollution.[[40]](#footnote-40)

Abandoned and Derelict Vessels

ADVs originate in a variety of ways, from natural disasters such as hurricanes to boat ownership neglect. These vessels may sink at moorings, becoming semi-submerged in the intertidal zone, or become stranded on shorelines, reefs, or in marshes. ADVs may persist for years, impacting protected harbors and bays and debris from disintegrating vessels can also become widespread. Assessing, removing, and disposing of these vessels requires significant financial and technical resources. Laws pertaining to ADVs vary within each state.

Movement

The name “Pacific Garbage Patch”, located between California and Hawaii with an area more than double that of Texas, has led many to believe that this area is a large and continuous patch of easily visible marine debris items such as bottles and other litter —akin to a literal island of trash that should be visible with satellite or aerial photographs. While higher concentrations of litter items can be found in this area, along with other debris such as derelict fishing nets, much of the debris is actually small pieces of floating plastic that are not immediately evident to the naked eye.[[41]](#footnote-41)

The debris is continuously mixed by wind and wave action and widely dispersed both over huge surface areas and throughout the top portion of the water column. It is possible to sail through the “garbage patch” area and see very little or no debris on the water’s surface. It is also difficult to estimate the size of these “patches,” because the borders and content constantly change with ocean currents and winds.[[42]](#footnote-42)

1. International Maritime Organization

According to the IMO, some scientists warn that the quantity of plastics in the oceans by 2050 will outweigh fish. In October of 2018, the IMO’s Marine Environment Protection Committee adopted an action plan to address marine plastics pollution from vessels.[[43]](#footnote-43)

Measures identified in the IMO Action Plan include:

1. A proposed study on marine plastic litter from ships;
2. Looking into the availability and adequacy of port reception facilities;
3. Consideration of making marking of fishing gear mandatory, in cooperation with the Food and Agriculture Organization (FAO);
4. Promoting reporting the loss of fishing gear;
5. Facilitating the delivery of retrieved fishing gear to shore facilities;
6. Reviewing provisions related to the training of fishing vessel personnel and familiarization of seafarers to ensure awareness of the impact of marine plastic litter;
7. Consideration of the establishment of a compulsory mechanism to declare loss of containers at sea and identify number of losses
8. Enhancing public awareness; and
9. Strengthening international cooperation, in particular FAO and UN Environment.[[44]](#footnote-44)

With respect to efforts to reduce marine plastic litter associated with fishing vessels, IMO Action Plan measures include the following:

1. Consider making the IMO ship identification number mandatory for fishing vessels over a certain size;
2. Consider making marking of fishing gear with the IMO Ship Identification Number mandatory, in cooperation with FAO;
3. Further investigate logging of the identification number for each item of fishing gear on board a fishing vessel;
4. Remind States to collect information on any discharge or accidental loss of fishing gear; and
5. Consider the development of best management practice to facilitate incentives for fishing vessels to retrieve derelict fishing gear and deliver it to port reception facilities, in collaboration with FAO.[[45]](#footnote-45)
6. Laws and Regulations
7. U.S.:
* 33 U.S.C. 1901-1914 (APPS)
* 33 C.F.R. Part 151 and Part 158
* 33 U.S.C. §2601 et seq. (Shore Protection Act)
* 16 USC § 1431 et seq. and 33 USC §1401 et seq. (Marine Protection, Research, and Sanctuaries Act, aka Ocean Dumping Act)
1. International:
* MARPOL Annex V
* Basel Convention
1. Enforcement
* In U.S., as with many APPS cases, it is false official records and false statements rather than the actual discharges
* The U.S., through State and NOAA, is working with other Nations to address the problem.
	+ World Bank financing programs
	+ Capacity building for waste management infrastructure
	+ Global partnerships on marine debris
* INTERPOL Pollution Crime Work Group
	+ 30-days at sea, October 2018.
	+ 30-days at sea 2.0, October 2019, expanding to ports and shore side pollution
* Lack of infrastructure can lead to discharges
1. Response
* Education and Outreach
* Legislation / Regulation / Policy
* Incentive Programs
* Cleanups

Emergency response to severe marine debris events

* Enforcement
* Research and Technology Development
* Regional coordination
1. Selected Prosecutions Involving Discharge of Plastics from a Vessel
2. July 11, 2019 – Fukuichi Gyogyo Kabushiki Kaisha, a Japanese fishing company, pled guilty in District Court in Guam to two APPS violations and one count of obstruction of justice. Charges arose from discharges of waste oil and oily bilge water from the F/V Fukuichi Maru No. 112 into international waters in the Pacific Ocean and included failing to properly document the discharge of fishing gear and plastics from the vessel. U.S. Coast Guard Port State Control inspectors examined the vessel's Garbage Record Book (“GRB”) and interviewed crew members and determined that animal carcasses and fishing gear, which included plastic, had been discharged from the vessel and not recorded in the GRB. The company was ordered to pay a $1.5M criminal fine and serve a five-year term of probation, during which time the company must implement and comply with an Environmental Compliance Plan (ECP) that includes vessel audits. Vessels owned and/or operated by the company are banned from entering the Exclusive Economic Zone, Territorial Sea, or a port or terminal belonging to the United States without prior approval of the nearest U.S. Coast Guard Captain of the Port, to whom the company must transmit the ECP and associated audits prior to entering U.S. waters or a U.S. port.[[46]](#footnote-46)
3. June 3, 2019 – Princess Cruise Lines and its parent company, Carnival, admitted to probation violations which included the deliberate discharge of plastic in Bahamian waters from the Carnival Elation and failing to accurately record the illegal discharges. The DOJ press release states, “Prosecutors advised the Court that this particular instance was an example of a more widespread problem, identified by the external audits, in failing to segregate plastic and non-food garbage from waste thrown overboard from numerous cruise ships.” [[47]](#footnote-47) Among other penalties imposed under the terms of the settlement, Carnival was required to pay a $20M criminal penalty, and to “make major changes in how the company uses and disposes of plastic and other non-food waste to urgently address a problem on multiple vessels concerning illegal discharges of plastic mixed with other garbage.”[[48]](#footnote-48)
4. February 26, 2018 – Sea World Management & Trading, Inc., operator of the Tank Vessel SEA FAITH, and the vessel’s Master pled guilty in the So. District of Texas to two APPS violations stemming from illegal discharges of oily waste and the bypassing of the required pollution prevention equipment, as well as the illegal dumping of plastics, empty steel drums, oily rags, batteries, and empty paint cans directly overboard into the ocean. None of the garbage discharges were recorded as required in the vessel’s Garbage Record Book. The company agreed to pay a total fine of $2.25M and to serve a 3-year term of probation, during which all vessels operated by the company and calling on U.S. ports will be required to implement an Environmental Compliance Plan. The Master was sentenced to six months incarceration to be followed by two years of supervised release and a $2,000 fine.[[49]](#footnote-49)
5. June 20, 2017 – Egyptian Tanker Company and Thome Ship Management, owner and operator of the M/T ETC MENA, pled guilty to a violation of APPS and obstruction of justice arising from a whistleblower complaint alleging that the crew bypassed the ship’s OWS and discharged bilge water directly into the ocean. The USCG’s investigation revealed also that the crew threw plastic garbage bags filled with metal and incinerator ash overboard in March of 2016. The discharges of untreated bilge water and of plastic garbage into the ocean were not entered into the ship’s ORB and GRB, in violation of APPS. The obstruction of justice charge stemmed from the presentation of false record books to the USCG at Port Arthur, Texas. The plea agreement requires the companies to pay a fine of $1.9M and to complete a four-year term of probation that includes a comprehensive environmental compliance plan to ensure, among other things, that all of ships operated by Thome Ship Management that come to the United States fully comply with all applicable marine environmental protection requirements.[[50]](#footnote-50)
6. April 8, 2016 – DSD Shipping, a Norwegian shipping company which operated the M/T STAVENGER BLOSSOM, was convicted for obstructing justice, violating the Act to Prevent Pollution from Ships, tampering with witnesses, and conspiring to commit those offenses after an investigation revealed that DSD and its crew used a bypass pipe to circumvent pollution prevention equipment and discharge waste oil and oil-contaminated waste water directly overboard. DSD also filled plastic bags with waste oil from a sludge tank and dumped the oil-filled plastic bags into the sea. DSD’s sentence included the payment of a $2.5M penalty, and DSD was placed on a three-year term of probation and ordered to implement an environmental compliance plan.[[51]](#footnote-51)
7. August 15, 2012 – Following an obstruction of justice conviction by a jury in the So. District of Alabama, Prastana Taohim, a former captain of the M/V GAURAV PREM, was sentenced to one year and one day of incarceration, followed by three years of probation if not immediately repatriated to Thailand after his custodial sentence. The investigation into the bypass of pollution control equipment aboard the vessel revealed also that Taohim had ordered the discharge of hundreds of plastic pipes into the ocean, and that those discharges were not recorded in the vessel’s garbage record book as required. The jury found Taohim guilty of obstruction of justice related to the attempted concealment of the discharge of plastic pipes, which had previously contained insecticide and had been used to fumigate a grain shipment, in that he created a false and fictitious GRB.[[52]](#footnote-52)
8. Commercial Responses / Efforts to Address Marine Plastics Pollution
9. Carnival
	1. As referenced above, Carnival admitted to probation violations relating in part to marine plastics disposal. The problems identified during the audit of Carnival vessels included a finding that Carnival allowed plastic to be discharged along with food into water. DOJ noted Carnival’s inability to detail how it handles the estimated 50 million plastic bottles used on its vessels each year. Carnival has indicated that the plastic bottles are recycled at some of its 700 destinations, but DOJ is seeking evidence substantiating Carnival’s representations in that regard.
	2. Carnival has outlined a number of steps it is taking to significantly reduce single-use plastics on its ships by the end of 2021.
10. MSC Cruises is phasing out the use of all single-use plastic items across its fleet by 2019.
11. Norwegian Cruise Line in 2018 banned the use of plastic straws on all ships in its fleet and at its private islands, and is eliminating plastic shopping bags, spoons, glasses, stirrers, and other single-use items. Norwegian has pledged to ban single-use plastic bottles on its ships by 2020 and to replace them with paper cartons.[[53]](#footnote-53)
12. Royal Caribbean and other cruise lines are following suit. Royal Caribbean eliminated the use of plastic straws, stirrers, and toothpicks at the end of 2018.
13. Disney Cruise Line eliminated single-use plastic straws this year, as well as plastics stirrers, refillable plastic cabin items, shopping bags, and other disposable plastic items.
14. Virgin Voyages is among the cruise lines to completely ban single-use plastics, including straws, water bottles, shopping bags, food packaging, stirrers, and takeaway cups. In addition to substituting single-use plastics with reusable items, Virgin’s disposable paper products such as tissues, paper towels, napkins, and cups will be primarily made not from trees, but from a by-product of agricultural crops that are typically burned or wasted.
15. National / Municipal Bans on Single-Use Plastics
	1. India – October 16, 2019 – Noting that a 2018 United Nations Environment Programme (“UNEP”) report entitled, “Single-use plastics – A Roadmap for Sustainability”[[54]](#footnote-54) highlighted the ubiquitous nature of plastic and that it “transform[s] some marine areas into a plastic soup,” the Indian Directorate General of Shipping, Mumbai (“DGS”) issued an order memorializing in part a decision that “all possible efforts will be made by … Indian shipping to contribute towards achieving the goal of making India and Indian waters free from Single use plastic.” [[55]](#footnote-55)

The DGC Order bans “single-use plastic on Indian ships and foreign ships while in Indian waters.” The ban applies immediately as to certain items, such as garbage bags and plastic water bottles up to 10 liters in size. January 1, 2020 is the implementation date for the ban on other plastic items, such as trays, food packaging film, shampoo bottles, potato chip bags, and containers for cleaning fluids, ice cream, etc. During Port State inspections of foreign-flagged vessels, administration surveyors shall ensure that single-use plastics are not in use and are kept locked in a store while in Indian waters and ports.

* 1. In July of 2019, Panama became the latest country to ban single-use plastic bags. The above-referenced 2018 UNEP report on single-use plastics includes figures and a discussion regarding those countries and municipalities who have enacted bans or imposed levies on the use of single-use plastic bags.[[56]](#footnote-56)
1. Marine Debris Projects
	1. NOAA – $2.7M in grants for marine debris removal and research[[57]](#footnote-57)
		1. On August 15, 2019, the National Oceanic and Atmospheric Administration announced $2.7 million in grants “supporting 14 projects to address the harmful effects of marine debris on wildlife, navigation safety, economic activity, and ecosystem health. With the addition of non-federal matching contributions, the total investment in these marine debris projects is more than $5.2 million.” Additional information pertaining to each of the funded projects is available via this link: <https://marinedebris.noaa.gov/funding/funding-opportunities>[[58]](#footnote-58)
	2. Pacific Ocean cleanup efforts - <https://komonews.com/news/local/40-tons-of-fishing-nets-retrieved-in-pacific-ocean-cleanup>
2. Possible Questions for Discussion
* Are there ongoing efforts to improve enforcement?
* What can be done to better regulate plastics in the ocean?
* Is shipbreaking an issue in the U.S.?
* Will the United States join the Basel convention?
* Are there any new legislative changes coming:
	+ In the U.S.?
	+ Internationally?
1. <https://www.doi.gov/ocl/marine-debris> [↑](#footnote-ref-1)
2. <https://www.ecowatch.com/plastics-history-ecological-crisis-2560978473.html> [↑](#footnote-ref-2)
3. <https://www.scientificamerican.com/article/a-brief-history-of-plastic-world-conquest/> [↑](#footnote-ref-3)
4. <https://www.theatlantic.com/technology/archive/2014/10/how-the-plastic-bag-became-so-popular/381065/> [↑](#footnote-ref-4)
5. *Id.; See also* <https://www.nationalgeographic.com/environment/2003/09/news-plastic-grocery-bags-waste-recycling/> [↑](#footnote-ref-5)
6. <https://www.smithsonianmag.com/smart-news/how-1970s-created-recycling-we-know-it-180967179/> [↑](#footnote-ref-6)
7. *Id.* [↑](#footnote-ref-7)
8. <https://www.ijc.org/en/history-and-evolution-microbead> [↑](#footnote-ref-8)
9. <https://www.ewg.org/research/timeline-bpa-invention-phase-out#.WtZDcOjwbrc> [↑](#footnote-ref-9)
10. <https://www.wired.co.uk/article/microbeads-international-ban-damage-marine-life-plastic> [↑](#footnote-ref-10)
11. *Id.* [↑](#footnote-ref-11)
12. <https://www.bbc.com/news/uk-24090603> [↑](#footnote-ref-12)
13. <https://www.npr.org/templates/story/story.php?storyId=89135360> [↑](#footnote-ref-13)
14. *See, e.g.*, <https://www.independent.co.uk/environment/blue-planet-2-save-oceans-what-to-do-how-pollution-climate-change-bbc-finale-a8100076.html>; [↑](#footnote-ref-14)
15. <https://plasticoceans.org/the-facts/> [↑](#footnote-ref-15)
16. <http://www.fao.org/in-action/globefish/fishery-information/resource-detail/en/c/388082/> [↑](#footnote-ref-16)
17. <https://www.businessinsider.com/plastic-pollution-ocean-comes-from-ships-trash-2019-10> [↑](#footnote-ref-17)
18. <https://www.plasticethics.com/home/2019/5/19/estimate-of-plastic-waste-from-rivers-into-the-worlds-oceans> [↑](#footnote-ref-18)
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20. <https://www.nationalgeographic.com/environment/2019/04/atlantic-ocean-plastic-increased-since-1960/> [↑](#footnote-ref-20)
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22. <https://www.nytimes.com/2019/04/18/science/what-are-microplastics.html> [↑](#footnote-ref-22)
23. See https://marinedebris.noaa.gov/discover-issue/impacts [↑](#footnote-ref-23)
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27. <https://www.telegraph.co.uk/science/2018/10/16/ghost-fishing-kills-650000-animals-year-researchers-think-have/>; https://marinedebris.noaa.gov/discover-issue/impacts [↑](#footnote-ref-27)
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31. <https://serc.si.edu/research/projects/invasive-species-rafting-ocean-plastics>; https://marinedebris.noaa.gov/discover-issue/impacts [↑](#footnote-ref-31)
32. <https://www.mindbodygreen.com/articles/microplastics-101-how-they-impact-our-health-and-the-environment> [↑](#footnote-ref-32)
33. <https://www.dropbox.com/s/nxvyl3v5s9d0a1v/PLASTIC%20INGESTION%20Web%20spreads.pdf?dl=0> [↑](#footnote-ref-33)
34. <https://www.nationalgeographic.com/magazine/2018/06/plastic-planet-health-pollution-waste-microplastics/> [↑](#footnote-ref-34)
35. It is estimated that 90% of the world’s seabird’s have pieces of plastic in their stomachs compared to the estimated 5% in the 1960s. [↑](#footnote-ref-35)
36. <https://www.salon.com/2019/08/12/plastic-debris-is-altering-the-blood-composition-of-seabirds/> [↑](#footnote-ref-36)
37. *Id.* [↑](#footnote-ref-37)
38. <https://marinedebris.noaa.gov/can-plastic-marine-debris-harm-animals> [↑](#footnote-ref-38)
39. <https://oceanservice.noaa.gov/facts/ghostfishing.html>; http://www.fao.org/news/story/en/item/19353/icode/ [↑](#footnote-ref-39)
40. <https://marinedebris.noaa.gov/sites/default/files/publications-files/Ghostfishing_DFG.pdf> [↑](#footnote-ref-40)
41. It is estimated to contain 79,000 tons of plastic, of which a large amount are fishing nets. [↑](#footnote-ref-41)
42. <https://response.restoration.noaa.gov/about/media/how-big-great-pacific-garbage-patch-science-vs-myth.html> [↑](#footnote-ref-42)
43. A copy of the IMO Action Plan is available here: <http://www.imo.org/en/MediaCentre/HotTopics/marinelitter/Documents/IMO%20marine%20litter%20action%20plan%20MEPC%2073-19-Add-1.pdf> [↑](#footnote-ref-43)
44. <http://www.imo.org/en/MediaCentre/HotTopics/marinelitter/Pages/default.aspx> [↑](#footnote-ref-44)
45. <http://www.imo.org/en/MediaCentre/PressBriefings/Pages/20-marinelitteractionmecp73.aspx> [↑](#footnote-ref-45)
46. <https://www.justice.gov/opa/pr/japanese-fishing-company-convicted-obstruction-justice-and-falsifying-records-cover-illegal>; DOJ 19-752 (D.O.J.), 2019 WL 3027635 [↑](#footnote-ref-46)
47. <https://www.justice.gov/opa/pr/princess-cruise-lines-and-its-parent-company-plead-guilty-environmental-probation-violations>; DOJ 19-611 (D.O.J.), 2019 WL 2339908 [↑](#footnote-ref-47)
48. *Id.* [↑](#footnote-ref-48)
49. <https://www.justice.gov/opa/pr/tank-vessel-operator-and-master-convicted-oil-and-garbage-offenses>; DOJ 18-237 (D.O.J.), 2018 WL 1053781 [↑](#footnote-ref-49)
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55. <https://dgshipping.gov.in/writereaddata/News/201910170533471492393DGS_Order_05of2019.pdf> [↑](#footnote-ref-55)
56. <https://reloopplatform.eu/wp-content/uploads/2018/06/UNEP-report-on-single-use-plastic.pdf>; *See also* <https://www.economist.com/graphic-detail/2019/07/24/ever-more-countries-are-banning-plastic-bags> [↑](#footnote-ref-56)
57. <https://www.noaa.gov/media-release/noaa-awards-27-million-in-grants-for-marine-debris-removal-and-research> [↑](#footnote-ref-57)
58. <https://marinedebris.noaa.gov/funding/funding-opportunities> [↑](#footnote-ref-58)