Information and Common Questions on Marine Debris

Compiled by the NOAA Marine Debris Program

The information contained in this document will be updated as new information becomes available.

The use of the term "marine debris" herein is defined as, any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes.

Plastic debris

- It is becoming clear that there is a fair amount of small plastic distributed in the oceans and on beaches worldwide, not surprising given its durability and floatability.
- Marine debris is often ingested by animals such as sea turtles, marine mammals, and seabirds. Items such as lighters and small plastic pieces may look like food to an animal, or have an animal's natural food attached to it. Debris may also be ingested accidentally with actual food items. Exactly how many of them die each year due to marine debris ingestion is not known.
- The detrimental effects of plastic marine debris on Laysan albatross have been an object of research interest for many years but like most ecological questions it is not straightforward. It is known that Laysan albatross do ingest marine debris, which can cause mechanical damage or harm in the form of entrapment and entanglement, blockage of the digestive tract, perforation of the gut, impairment of nutrition by displacement of food or false satiety. Studies have found that ingested plastic debris is not a significant direct cause of death in these seabirds, but may be a likely cause for physiological stress (Auman et al., 1997; Sievert and Sileo, 1993). More research is needed to see if these results have changed.
    - Auman, H.J., Ludwig, J.P., Giesy, J.P., and Colborn, T. 1997. Plastic ingestion by Laysan Albatross chicks on Sand Island, Midway Atoll, in 1994 and 1995. Albatross Biology and Conservation, pp 239-44.
    - Sievert, P.R., and Sileo, L. 1993. The effects of ingested plastic on growth and survival of albatross chicks. *In*: The status, ecology, and conservation of marine birds of the North Pacific. Can. Wildl. Serv. Spec. Publ, Ottawa. pg 212-217.
- The results of a recent study conducted by Ryan in 2008 show the number of ingested plastic particles in five species of seabirds in the Atlantic and southwestern Indian Ocean have not changed significantly. He found that the proportion of nurdles (pre-production plastic pellets) decreased 44-79% in all five species. *"More data are needed on the relationship between plastic loads in seabirds and the density of plastic at sea in their foraging areas, but the consistent decrease in pellets in birds suggests there has been a global change in the composition of small plastic debris at sea over the last two decades."*
    - Ryan, P.G. 2008. Seabirds indicate changes in the composition of plastic litter in the Atlantic and south-western Indian Oceans. Mar. Poll. Bull. 56: 1406-1409
- Research on other effects of plastic debris in the ocean is still needed. For example, the impacts of contaminants that adsorb to the plastic.
- To help address this need for additional research on plastics and toxins, the NOAA Marine Debris Program is coordinating a research workshop, to be held in September 2008, to provide an opportunity for research scientists to convene and discuss some of the many pressing issues regarding mircoplastics and marine pollution.

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North Pacific marine debris "hot spot": The Convergence Zone

- This North Pacific marine debris "hot spot" or Subtropical Convergence Zone (STCZ) is a known area of marine debris accumulation in the North Pacific. This area moves seasonally between 23° and 37° N latitude. The STCZ shifts further southward during periods of El Niño.
- The term "garbage patch" may have originated from a study done in 2001 by James Ingraham (with NOAA) and Curtis Ebbesmeyer wherein a computer model, called OSCURS, was used to predict where debris would move in the Pacific - their results showed what they termed "eastern and western garbage patches."
    - Ingraham Jr., W.J., Ebbesmeyer, C.C., 2001. Surface current concentration of floating marine debris in the North Pacific Ocean: 12-year OSCURS model experiments. In: Proceedings of the International Conference on Derelict Fishing Gear and the Ocean Environment. Available online at <http://hawaiihumpbackwhale.noaa.gov/>.

How long do various marine debris items take to degrade in the marine environment?

- Bottom line: Most debris items take a long time to degrade in the marine environment.
- Figures on the amount of time it takes for durable debris items to break down in the environment are variable and rampant. It is unknown where the numbers listed in degradation timelines for these durable items originated or how they were figured.
- Degradation time depends upon numerous factors including material type, size, thickness, and environmental conditions (amount exposed to sunlight; location (e.g. on the beach, in the surf, floating at sea, etc).

Is it true that plastics in the marine environment do not degrade?

- Plastic polymers are extremely stable, and do not readily enter into the degradation cycles of the biosphere.
- Plastic photodegrades, breaking down into what we call "microplastics." Their effect on our oceans and marine life is being looked into, particularly the rates of photo degradation when submerged in water.

Is it true that 100,000 marine mammals and/or sea turtles die each year due to marine debris/plastics/plastic bags?

- Origin of statement: PROCEEDNGS OF THE WORKSHOP ON THE FATE AND IMPACT OF MARINE DEBRIS 27-29 November 1984, Honolulu, Hawaii, July 1985 -- NOAA-TM-NMFS-SWFC-54
    - "Debris entanglement is estimated to cause 50,000 to 90,000 deaths per year in the northern fur seal. The population in 1983 was dropping on the main rookery in Alaska at about 8% per year. At least 50,000 deaths are thought to be due to entanglement; the other 40,000 deaths possible entanglement or possibly some unknown factor such as disease (Fowler 1983)."

  - In Conclusions: "*Up to one hundred thousand marine mammals and possibly more die each year.* Half or more of the individuals of certain marine reptile species are affected by the plastic litter, and beachcombing land mammals become snarled in nets and die. ..."
  - Fowler, 1983 is a background paper for the 26th Annual Meeting of the Standing Scientific Committee of the North Pacific Fur Seal Commission.
- Also mentioned in Wallace, N. 1985. Debris entanglement in the marine environment. A review. Pp 259-277 in: R. S. Shomura, H. O. Yoshida (eds.) Proceedings of the Workshop on the Fate and Impact of Marine Debris. NOAA Technical Memorandum. NMFS, NOAA-TM-NMFS-SWFC-54.
- Plastic Bags: no scientific literature or studies have been found to support this statement.

Is it true that millions of seabirds die due to marine debris each year?

- No information was found to support this exact statement/figure.
- The closest referenced figure published was “214,500-763,000 seabirds are killed annually incidental to driftnet fishing by Japanese fishermen in the North Pacific Ocean (US Department of Commerce, 1981)” from Laist, 1987. This may refer to active fishing gear bycatch vs. marine debris.
  - Laist, D. W. 1987. Overview of the Biological Effects of Lost and Discarded Plastic Debris in the Marine Environment. Marine Pollution Bulletin, Vol. 18, No. 6B, pp. 319-326

Marine mammal entanglements – Are both active and derelict fishing gear considered marine debris?

- NO. NOAA does not consider active fishing gear marine debris, even though the animal may break it loose after the entanglement. It is typically difficult to tell if entangling gear was active or derelict gear at the time of entanglement. In the past the level of fouling and presence of numerous other types of gear were used as factors to determine if entangling gear was indeed marine debris.
- NOAA, across the nation, is involved in, and in many areas, leads, marine mammal disentanglement or response teams that take action in a situation of entanglement.

How much debris enters the ocean?

- There is a study by the National Academy of Sciences that gives an estimate of approximately 1.4 billion pounds of trash per year enters the ocean. This study was published in 1975, before MARPOL Annex V, and thus is quite dated.
  - This study only took into account debris from vessels. Data were collected from vessels’ Garbage Record Books.
  - Today, with the implementation of MARPOL Annex V, Garbage Record Books are only required by vessels over 400 tons.

- In accordance with MARPOL Annex V, "all ships of 400 gross tonnage and above and every ship certified to carry 15 persons or more, and every fixed or floating platform engaged in exploration and exploitation of the seabed, must provide a Garbage Record Book, to record all disposal and incineration operations." (http://www.imo.org/Environment/mainframe.asp?topic_id=297#review)
  - MARPOL = International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL)
  - Annex V = Annex V: Prevention of pollution by garbage from ships
    Entry into force: 31 December 1988
- NOAA is working with other agencies and groups to investigate the best available information to work towards a more current estimate.

What happens to marine debris once it is removed from the marine environment?

- Depending on the type of debris, methods of disposal may include recycling, reusing, or even using debris to create electricity.
  - Nets to Energy Program and Partnership in Hawaii -- Instead of adding these nets to already congested landfills, Hawaii's multi-partner marine debris group devised a unique program to recycle this marine debris into usable electricity. Today, all NOAA-funded marine debris removal projects in Hawai'i incorporate this recycling as a component for success. 100 tons of net create enough electricity to power 43 homes for a year each.
  - Fishing for Energy Program in Massachusetts -- The Fishing for Energy project aims to reduce the amount of unused fishing gear in the community and marine environment. The project provides a place for the fishing community to dispose of old or derelict fishing gear they recover while at sea at no cost. The Scituate Harbor site is the fourth site in the effort which is proposed to span the East Coast. 1 ton of derelict marine debris = fuel for a home for 25 days.

What is being done to address marine debris?

- Marine debris is a global problem. It can be found on shorelines and beaches around the world. Much is being done on an international level to raise awareness and address this pervasive problem
  - International Coastal Cleanup – The largest marine debris and litter cleanup event in the world. This event is held on the 3rd Saturday of every September and is coordinated by the Ocean Conservancy.
- While this is a global problem, efforts are ongoing locally to solve it. Together, through partnerships, work is being done nationwide to research, prevent, and reduce marine debris, as well as educate the public to be better stewards of our ocean.
  - Since 2005, the NOAA Marine Debris Program has funded and helped support over 110 projects working with partners and addressing marine debris across the nation. Examples include:

- Temporal and Spatial Distribution of Marine Debris on Selected Beaches in the Gulf of Alaska
- Assessing change in Derelict Fishing Gear and Other Marine Debris in Deepwater Benthic Habitats Within the Monterey Bay National Marine Sanctuary
- Marine Debris Survey and Removal from the Northwestern Hawaiian Islands (NWHI) Marine National Monument: Maintenance Mode
- Planning for Removal of Derelict Vessels and Vessel Debris in American Samoa
- Gulf of Mexico Marine Debris Project
- Marine Debris Characterization in Salt Marsh and Submerged Habitats in Coastal North Carolina
- Impact Assessment, Recovery, and Prevention of Derelict Fishing Gear (crab traps) in Chesapeake Bay
- Marine Debris Removal in Right Whale Habitat
- Marine Debris Education Campaign for Guam
- *More can be found at http://marinedebris.noaa.gov/projects/welcome.html*

- Everyone, no matter how close to or far from the ocean, can contribute to the solution. It's simple: Reduce, Reuse, and Recycle -- (1) Try to **Reduce** the amount of disposable items you use on a daily bases; (2) When you head to the beach this summer or have picnics in the park, make use of items that are **Reusable** rather then disposable; and (3) when you do use disposable items, try to remember to **recycle**!