Title: Talking Trash: Marine Debris in Connecticut

Authors: Katharine A. Owens and the students of the POL390 and HON390 Spring 2016 Marine Debris Course at the University of Hartford
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Marine debris Marine debris is not a new problem, but our reliance on disposable and single-use plastic items means that the debris accumulates in global waterways at an astonishing rate. While in the 1950s only about 5 million tons of plastic were produced each year, now we produce over 280 million tons annually, most to create items that are not in use within twelve months (Thompson et al, 2009). Plastics production uses 8% of global oil resources each year, what many would consider a misuse of this critically important resource (Thompson, 2015). About 20 million tons of plastic reach the ocean annually– the five oceanic gyres contain approximately 100 million tons of marine debris (U.S. EPA, 2011; Vannela, 2012). Our project sought to understand this global problem in the Connecticut context.

Why is marine debris a problem?

Plastics do not break down quickly. Plastics comprise about 10% of discarded rubbish but a higher proportion of marine debris. Plastics are estimated to take from hundreds to thousands of years to break down, but this may vary widely depending on circumstances (exposure to wind, air, sunlight, etc.) (Barnes et al, 2009).

Plastic debris harms wildlife. The instances of entanglement (animals becoming trapped in plastic) and ingestion (animals eating and choking on plastic) have increased dramatically since 1997 from impacting 267 to 557 species globally. 100% of turtle species are now affected, as well as 66% of marine mammal species (or 81 species), and 50% of seabirds (203 species). There are also increases for fish and invertebrates groups, which were previously overlooked (Kühn et al, 2015).

Plastic debris can worsen issues of invasive species. Marine debris can serve as rafts for all manner of creatures, which use the material to travel to new ecosystems. 387 taxa (including microorganisms, seaweed, and invertebrates) have been recorded rafting or floating on litter in all major global oceans. Invasive species in the United States cost an estimated $120 billion in annual damages (Kiessling et al, 2015; USFWS, 2012).

Plastic debris creates a toxic soup in our oceans. Marine debris produces a toxic cocktail including the chemicals from plastics manufacturing and those it absorbs from marine environments. Plastic marine debris is both a physical and a chemical hazard, as animals ingest plastic pieces laden with chemicals. Chemicals are transported through these animals to various environments, impacting more than the species originally in contact with the product. The influx of decomposing plastics and the subsequent leaching of toxic chemicals poses a danger to water quality, wildlife, and human health (Barnes et al, 2009, Engler, 2012, Rochman, 2015).

Marine debris negatively influences industries including tourism and recreation, shipping and yachting, fisheries, aquaculture, and agriculture

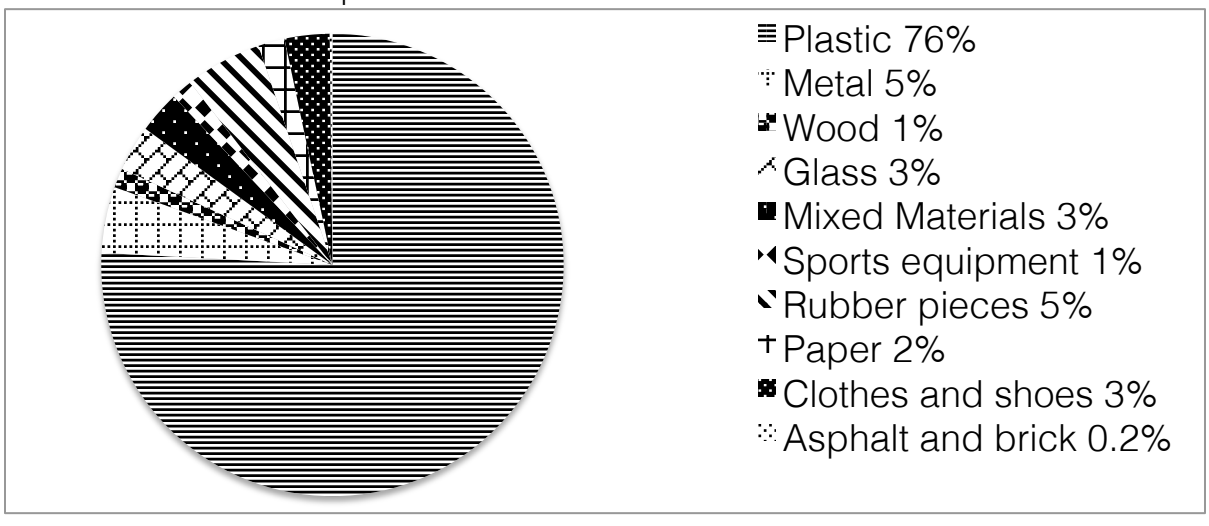
- A study of 31 California beaches found that reducing marine debris by 50 percent at beaches in Orange County could generate $67 million in benefits to Orange County residents over a 3-month period (Leggett et al, 2014).
- Removing marine litter costs United Kingdom ports and harbors the equivalent of 2.7 million dollars per year (Newman et al, 2015).
- A 1990 study demonstrated that on the American east coast, 45% of commercial fishers dealt with caught propellers, 30% suffered from fouled gear, and 40% experienced cooling systems inhibited by debris (Wallace, 1990).
- Marine litter is estimated to cost finfish and shellfish producers of Scotland the equivalent of $176,000 per year (Newman et al, 2015).
- A recent study of oysters exposed to polystyrene microparticles (Styrofoam) showed this "interfere[d] with energy uptake and allocation, reproduction, and offspring performance" (Sussarellu et al, 2015, p. 1).
- In some coastal areas, debris can be carried by wind onto farmland, damaging property and putting livestock at risk (Newman et al, 2015).

Our project

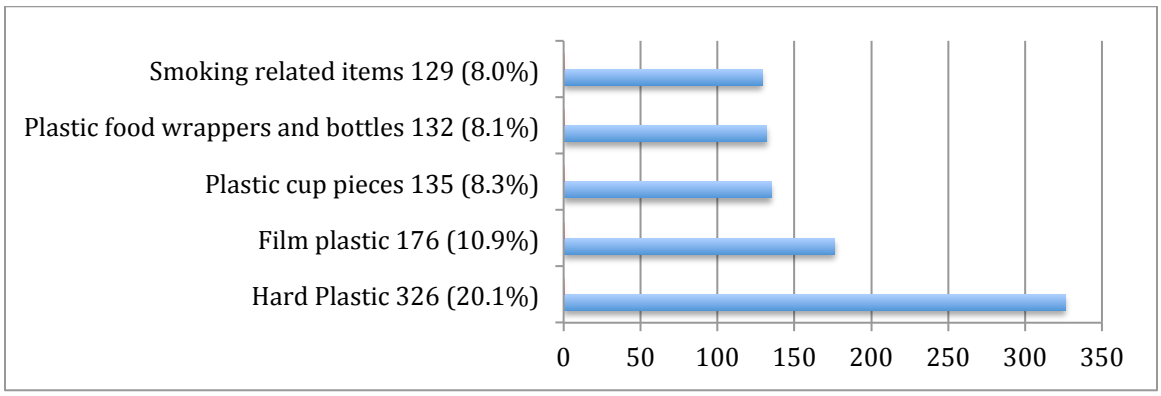
A group of thirty-five undergraduate students collected marine debris from three areas in Connecticut in the spring of 2016 including Bluff Point State Park and Coastal Reserve (February 6), Hammonasset Beach (February 7), and Meig's Point, Hammonasset (February 7 and April 2).

What we found

We spent fewer than 8 hours collecting and found over 1600 individual pieces (42 pounds) of debris of which 76% was plastic.



The five most frequently found types of items



What does this tell us?

The global problem of marine debris is an issue in Connecticut. The pattern of marine debris being composed of a high proportion of plastic debris holds true in our state, which results in risks to health, wildlife, water resources, and the economy.

What policies have other communities adopted to address marine debris?

- Bottle bills (updated in CT in 2009) significantly impact recycling rates of glass, aluminum, and plastic drink bottles and cans.
- Plastic bag bans reduce the number of these single use items in communities[1]
- Plastic bag fees charge users for taking plastic bags at retail outlets, for example D.C.'s Anacostia River Clean up and Protection Act of 2009[2]
- Micro bead legislation passed nationally as the Microbead-Free Waters Act of 2015[3]
- Polystyrene food container bans for example the Sustainable DC Omnibus Amendment Act of 2014[4]

What economic instruments might address marine debris?

In The Economics of Marine Litter, Newman et al (2015) found that a range of economic instruments can counteract the accumulation of marine litter, including:

- incentivizing industries to use less packaging
- targeting waste accumulation (i.e., charging for landfill use)
- aiming policies at specific types of waste, such as plastic bags
- targeting in-ocean sources of waste, such as that related to shipping
- reducing litter that leads to ghost fishing
- paying for litter collection
- charging for litter according to how toxic it is
- discouraging polluting behavior (p. 388)

[1] A list of communities across the country with bag bans can be found here: http://www.cawrecycles.org/list-of-national-bans . Additional information on bag bans can be found here http://plasticbaglaws.org/legislation/state-laws/

[2] http://doee.dc.gov/publication/anacostia-river-clean-and-protection-act-2009

[3] https://www.congress.gov/bill/114th-congress/house-bill/1321

[4] http://lims.dccouncil.us/Legislation/B20-0573

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