

Sea Waste Disposal: Cause For Concern

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Summary

Plastic waste in the oceans is a threat to the health of marine species^{1,2,3}. There are numerous factors at various scales that contribute to the accumulation of plastic debris in the ocean. In order to most effectively reduce the input of waste, there needs to be appropriate policy at these different scales. Currently, MARPOL Annex V regulates sea-based waste disposal for vessels over 400 t, however those ships that are under this weight class lack regulation of their at sea disposal^{1,2,4}. In order to effectively control input of plastic to the marine environment, this loop-hole in regulation needs to be addressed².



Image: Chris Jordan

Species Impacts: Albatross

The island of Midway, at the West end of the Hawaiian Island chain in the North Pacific Ocean, is the breeding ground of Laysan albatross. These albatross contain a larger volume of plastic and have greater incidence of plastic ingestion that any other seabirds¹⁰. Ingested plastic is not broken down in the intestinal tract of albatrosses, which causes it to accumulate, and may lead to reduced food intake, intestinal blockages, decreased fat deposition, starvation, and increased exposure to organic pollutants^{3,6,10,11}. Mistaking plastic for food is not only an issue for the adults, but also the chicks who are being fed the plastic. A study by Auman et al found that 97.5% of chicks examined contained plastic. Chicks lack the ability to regurgitate so large quantities of plastic accumulate in their bodies which can lead to starvation, dehydration, and death¹⁰.

Recommendation

Develop a national policy to be implemented regarding the disposal of waste at sea for those vessels to which Annex V regulations do not apply.

Introduction

Plastic debris negatively impacts marine ecosystems, wildlife, biodiversity, and the economic benefits of fisheries^{2,4}. Although there is some regulation for large vessels via Annex V, it is lacking for smaller vessels². Policy at different scales is necessary to control dumping of plastic at sea. Regulation of plastic waste is fundamental to decreasing the risk it poses to marine life. Ingestion of plastic is the most common issue, with species such as seabirds, fish, whales, and turtles, having been found to ingest plastic debris^{1,5}. Ingestion can not only rupture internal organs, lead to starvation and choking, but plastics often absorb harmful organic pollutants which can then be assimilated into the tissues of the individual^{3,6}. There are also high levels of entanglement of marine animals in discarded or lost fishing gear^{1,2}.

Issue

Large amounts of plastic debris enters the marine environment due to a lack of strict enforcement and policies regarding the disposal of plastic materials at sea³. The majority of the global fishing vessels are under 400 t, which exempts them from MARPOL Annex V regulation meaning they are free to discharge their garbage at sea with no consequences². Although waste generated by individual vessels may be

¹ Ryan, P. G., Moore, C. J., van Franeker, J. A., & Moloney, C. L. (2009). Monitoring the abundance of plastic debris in the marine environment RID B-4363-2009. *Philosophical Transactions of the Royal Society B-Biological Sciences*, 346(1526).

² Chen, C., Liu, T. (2013). Fill the gap: Developing management strategies to control garbage pollution from fishing vessels. *Marine Policy*, 40, 34-40.

³ Derraik, J. G. B. (2002). The pollution of the marine environment by plastic debris: A review. *Marine Pollution Bulletin*, 44(9), 842-852.

⁴ Gold, M., et al. (2013). Stemming the tide of plastic marine litter: A global action agenda. UCL: School of Law. Retrieved from <http://newsroom.ucla.edu/portal/ucla/ucla-report-identifies-legal-shortcomings-249108.aspx>

⁵ Canadian Council of Ministers of the Environment. 1999. Canadian water quality guidelines for the protection of aquatic life: Debris (Marine).

⁶ Azzarello, M. Y. & Van Vleet, E. S. (1987). Marine birds and plastic pollution. *Marine Ecology Progress Series* 37: 295-303

⁷ Vancouver Aquarium. (2013). Entangled Sea Lions Rescued. Retrieved from <http://www.aquablog.ca/2013/10/entangled-sea-lions-rescued-by-vancouver-aquarium/>

small, the number of boats in operation around the world is huge, so this sums to a potentially large amount of unregulated plastic disposal. Even with international protocols such as MARPOL in place, it's estimated that 6.4 million tons of plastic is still dumped in the oceans every year³. It is important that this issue be addressed for all types of sea vessels to reduce plastic waste and minimize the threat to marine species.

Dispersion of Plastic

There are numerous means by which plastic enters the marine ecosystem. The two primary pathways are land-based sources and sea-based sources via accidental or purposeful dumping of materials^{1,2,6}. Plastic makes up 60-80% of the total biomass of marine debris worldwide^{3,8}, and is easily distributed throughout the oceans by currents. This results in large concentrations of garbage throughout the oceans in such places as the North Pacific Gyre².

Impact

Plastic debris poses a serious threat to numerous marine species through consumption and entanglement, and is an additional threat to species that may already be struggling with other anthropogenic pressures such as overfishing, by-catch and climate change^{1,3}. Even after Annex V was put in place, there seemed to be no reduction in entanglement of some species, such as the Hawaiian Monk Seals and Antarctic Fur seals¹. Local species in British Columbia are also impacted by marine debris. Over the last six years, there have been 408 instances of reported sea lion entanglement in Clayoquot and Barkley Sounds alone⁷. Plastic products do not fully degrade in the environment. Instead the polymers become brittle due to photodegradation and oxidation, which cause them to breakdown into smaller fragments^{6,9}. These small fragments are then able to be consumed by a variety of species.

Species Impacts: Sea Lions⁷

In October 2013, Dr. Haulena of the Vancouver Aquarium travelled to Vancouver Island as part of an initiative to free entangled animals in the region. They were successful in being the first to dart and disentangle a wild sea lion in Canada, removing plastic debris from the necks of two male California sea lions that were slowly being choked to death. The Aquarium has aided seals in the past who have ingested man-made debris. Most notably, a sea lion in 2011 was rescued after ingesting four feet of fishing gear, which was fortunately able to be removed. After some recover time, the animals was released back to the wild.

Policy Options & Implications

It is proposed that a policy be implemented to monitor and track the waste of vessels exempt from MARPOL Annex V. The regulations could adopt practices from the protocol such as garbage record books, tracking of types and amount of garbage, and inspection of vessels suspected of violating the regulations². It is also recommended that there be adequate recycling facilities at ports which are conveniently located, to encourage fishers to bring waste materials back with them².

The implications of this policy would be a reduced input of sea-based plastic debris into the marine environment. It's recognized that since land-based waste is a large contributor to marine debris, this policy would not mitigate all sources. However, it addresses the issue at a scale that is currently unregulated, which should aid in reducing the dumping of waste and exposure of marine species to potentially life threatening plastic.



Image: The Telegraph, UK

⁸ Rios, L. M., More, C., & Jones, P. R. (2007) Persistent organic pollutants carried by synthetic polymers in the ocean environment. *Marine Pollution Bulletin*, 54(8), 1230-1237.

⁹ Titmus, A. J. & Hyrenbach, K. D. (2011). Habitat associations of floating debris and marine birds in the north east pacific ocean at coast and meso spatial scales. *Marine Pollution Bulletin*, 62(11), 2496-2506.

¹⁰ Auman, H. J., Ludwig, J. P., Giesy, J. P., Colborn, T. (1997). Plastic ingestion by Laysan Albatross chicks on Sand Island, Midway Atoll in 1994 and 1995. *Albatross Biology and Conservation*, 239-44.

¹¹ McDermid, K. J., & McMullen, T. L. (2004). Quantitative analysis of small-plastic debris on beaches in the Hawaiian archipelago. *Marine Pollution Bulletin*, 48(7-8), 790-794.