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The Deep-sea Debris Database shows the extent of plastic pollution in the world's oceans and the possible threat it poses.

SOURCE: Marine Policy

By Adam Warren April 5, 2020

The deep sea is often perceived as a pristine, untouched environment less impacted by human activities than near surface ecosystems. However, new research highlights how this may not be the case. Plastic pollution is emerging as one of the most serious threats to ocean ecosystems to the point that world leaders, scientists, and the general population recognize the urgent need for management measures to protect the ocean from plastic pollution. Without these measures, detrimental environmental effects such as plastic entanglement and ingestion by marine animals and the release of toxic chemicals will continue.

A well-known and documented effect is entanglement, where an animal becomes trapped by large plastic debris such as nets and can perish if not freed, was documented by this study. Sixteen percent of all videos and images from this study contained at least one marine organism entangled with or settled on plastic debris. However, this is only based on direct observation as there may be many more animals getting caught in discarded items.

Another effect of plastic pollution on animals in the oceans is ingestion. The damage caused by plastic debris in animals through accidental ingestion of floating plastic, as well as the hazards posed by toxic chemicals released from the fragmented plastic on the biological function of marine organisms, have been well studied. Further, microplastic, any plastic item smaller than 5 millimeters, ingested by lower trophic level animals such as zooplankton can be transferred to higher level animals, including commercially important fish species, and can even reach the highest level of the food web with potential effects on human health.

The distribution and density of plastic pollution across the world is documented using data compiled from thousands of archived video and pictures from remotely operated vehicle (ROV) dives over the course of thirty years. Globally, plastic debris made up thirty three percent of all anthropogenic debris items found in the deep sea, the largest category of debris type. Of that percentage, eighty nine percent were large single use plastics like bags and bottles. Particularly in the individual oceans, single use plastic items accounted for one hundred percent of all plastic debris found.

Regarding horizontal distribution of plastic pollution, plastic debris reached over one thousand kilometers, or six hundred miles, off the coast into open ocean. The deepest known record of plastic was at the deepest point in the ocean, the bottom of the Mariana Trench at nearly eleven thousand meters, or thirty six thousand feet. Per ROV dive across the globe, there was an estimated density of 11-342 items per squared kilometer. Most of the documented plastic debris was observed in the 1,000-2,000 meter depth range, with plastic becoming the dominant debris type as depth increased, reaching more than fifty percent of all debris greater than six thousand meters.

The observed distribution of plastic debris indicates that human activities have impacted even the most remote locations in the ocean, previously thought untouched. It is possible that, because of their naturally high buoyancy, single use plastics can be transported vast distances by currents or other physical process before settling in the deep sea. This can lead to a high frequency of associations between deep sea organisms and plastic debris due to the low biomass of the deep sea, which is shown in this study.

The study aims to indicate the widespread distribution of plastic in the oceans, even reaching the deepest regions. Although authorities are well aware of the need for plastic waste regulation, with international initiatives such as the UN Environment Clean Seas campaign, there is still much work to be done to manage plastic pollution.

One of the challenges is the scarcity of plastic pollution assessments on all ocean ecosystems, especially in the deep sea. When such challenges are overcome, scientists must then provide ideas for effective management of plastic pollution. Possible starting points could be the monitoring of designated priority areas, like waters near highly industrialized regions across the world, and a global monitoring network with data sharing, leading to the establishment of international protocols. Ideally, the most successful way of managing plastic pollution is through international cooperative efforts using the soundest scientific knowledge.

Citation: Chiba, S., Saito, H., Fletcher, R., Yogi, T., Kayo, M., Miyagi, S., Ogido, M., Fujikura, K. (2018). Human footprint in the abyss: 30 year records of deep-sea plastic debris. *Marine Policy*, *96*, 204-212. doi:https://doi.org/10.1016/j.marpol.2018.03.022