

SCIENTIFIC REPORTS

OPEN

Anthropogenic debris in seafood: Plastic debris and fibers from textiles in fish and bivalves sold for human consumption

Received: 01 April 2015

Accepted: 25 August 2015

Published: 24 September 2015

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The ubiquity of anthropogenic debris in hundreds of species of wildlife and the toxicity of chemicals associated with it has begun to raise concerns regarding the presence of anthropogenic debris in seafood. We assessed the presence of anthropogenic debris in fishes and shellfish on sale for human consumption. We sampled from markets in Makassar, Indonesia, and from California, USA. All fish and shellfish were identified to species where possible. Anthropogenic debris was extracted from the digestive tracts of fish and whole shellfish using a 10% KOH solution and quantified under a dissecting microscope. In Indonesia, anthropogenic debris was found in 28% of individual fish and in 55% of all species. Similarly, in the USA, anthropogenic debris was found in 25% of individual fish and in 67% of all species. Anthropogenic debris was also found in 33% of individual shellfish sampled. All of the anthropogenic debris recovered from fish in Indonesia was plastic, whereas anthropogenic debris recovered from fish in the USA was primarily fibers. Variations in debris types likely reflect different sources and waste management strategies between countries. We report some of the first findings of plastic debris in fishes directly sold for human consumption raising concerns regarding human health.

The ubiquity of anthropogenic marine debris and the toxicity of chemicals associated with the material have begun to raise concerns regarding how the ingestion of anthropogenic debris by marine animals may impact human health¹. These concerns have prompted a concerted effort from government and private organizations to assess the impacts of marine debris on human and environmental health, including organizations such as NCEAS (National Center for Ecological Analysis and Synthesis), UNEP (United Nations Environment Programme), US EPA (United States Environmental Protection Agency), GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) and NOAA (National Oceanic and Atmospheric Administration). Almost every report from these groups concluded further research is required to elucidate how marine debris may be affecting humans, and thus, whether inadequate waste management strategies are coming back to haunt us in our seafood.

Due to the large presence of anthropogenic marine debris in aquatic habitats^{2–5} and wildlife^{6–8}, we hypothesized that anthropogenic debris would be present in marine animals sold for human consumption. Anthropogenic marine debris is seemingly found across all habitats in the ocean, including coral reefs⁹, shallow bays^{10,11}, estuaries¹², the open ocean^{13,14} and the deep sea^{15,16}. Anthropogenic marine

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