

Additives in plastic litter and their potential impacts

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Plastic litter suspended in the water column and on beaches and beds of oceans and lakes are potentially harmful to wildlife through entanglement, maiming and ingestion. As well as reducing feeding drive and posing a significant risk of obstruction or damage to the linings of digestive tracts, ingestion also has the potential to transfer toxins associated with polymers into the aquatic foodchain. The majority of studies in this area have focussed on persistent organic micropollutants, including polycyclic aromatic hydrocarbons and polychlorinated biphenyls that are sorbed to the plastic surface. However, more recent attention has been paid to the occurrence and potential impacts of metals, metalloids and halogens that are either adsorbed to the plastic or incorporated into the polymer itself. While recent empirical evidence and modeling calculations suggest that the exposure to and accumulation of adsorbed compounds or elements may have been overstated in the literature, inorganic and organic additives of the plastic matrix, that include catalytic residues, halogenated flame retardants and heavy metal-based pigments, appear to represent a more significant source of contaminants to the foodchain. In order to improve our understanding of the impacts of potentially toxic additives in environmental plastics, we have determined elemental concentrations as proxies in litter collected from ocean beaches, lakes and soils. Results indicate the ubiquity of restricted hazardous chemicals, including brominated flame retardants, often in association with antimony-based synergists, and cadmium- and lead-based pigments and stabilizers, among primary and secondary thermoplastics and fragments of foam.