

Introduction

Microplastic (< 5 mm) debris in the North Pacific has increased by two orders of magnitude since 1972, and Tobias Kukulka cautions that these surface measurements underestimate true plastic marine debris abundance by a factor of 27.

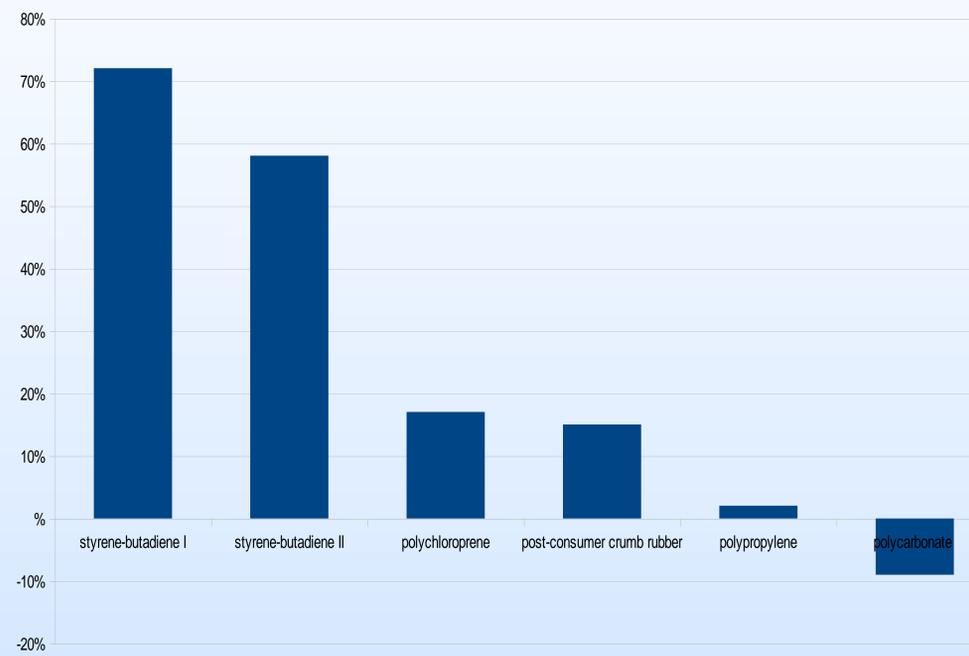
The literature shows that several types of plastic debris concentrate lipophilic persistent organic pollutants. My hypothesis is that methyl mercury may be concentrating in plastic marine debris as well, due to the intentional incorporation of mercaptans in the plastic.

Methods

Brooks Rand Labs (BRL) staff dosed 50-mL seawater samples with 1.0 g of plastic resin pellets. Experimental samples were spiked with 5 ng (100 ng/L) of meHg. The vials were agitated on an orbital shaker at room temperature for 72 hours. All samples were analyzed for total mercury (THg) by EPA Method 1631. The difference in the THg concentrations between the control and the experimental samples represents the amount of meHg that absorbed to the plastic resin pellets.

Results of a Pilot Study

Percent of meHg Adsorbed by Plastic Type



Pre-consumer styrene-butadiene pellets adsorb significant amounts of methyl mercury. Post-consumer crumb rubber and polychloroprene pellets adsorbed mercury as well, but less efficiently. *Polycarbonate added mercury to the sea water sample, suggesting that it may be a source, rather than a sink.*

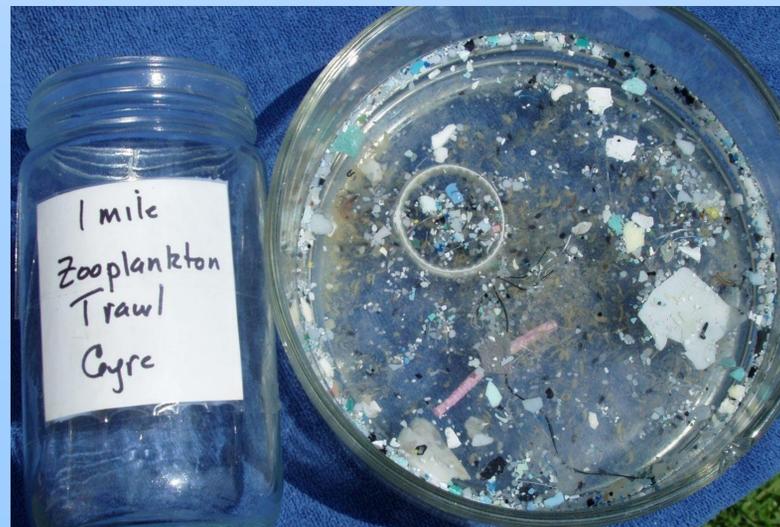


Photo credit: Algalita Marine Research Foundation

Implications

It is well documented that hundreds of marine species ingest plastic marine debris; however, the toxicokinetics of desorption remain to be elucidated. If plastic marine debris is concentrating mercury in the marine food web, then the risk assessments based on bio-concentration factors may be underestimating the public health impact of atmospheric mercury deposition.

I propose that we consider modifying our risk assessments to account for plastic-mediated magnification, and that we treat source reduction as a public health imperative.

References

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