

Risk of microplastic in the global ocean

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Despite the undeniable presence of microplastic in marine ecosystems, knowledge of its possible harmful ecological effects is low. We examined the risk of floating marine microplastic (1µm – 5mm) by comparing ambient concentrations with available ecotoxicity data. Integration of twenty-three species-specific effect data in a species sensitivity distribution yield a median safe concentration of $1.21 * 10^5$ microplastic particles per m^{-3} (95%CI: $7.99 * 10^3$ – $1.49 * 10^6$ particles m^{-3}). The probabilistic risk assessment indicated that the more plastic is present in the marine environment, the higher the chance that species are negatively impacted, and the larger the area where impacts are expected. We found that in 2010 0.17% of the surface layer (0 - 5m) of the global ocean was at risk. By 2050 and 2100, this fraction increases to 0.52% and 1.62%, respectively. Our results reveal substantial spatial differences of the environmental risk of microplastic, i.e. especially the Mediterranean Sea and the Yellow Sea are currently at risk.

Keywords: Microplastic concentrations; Ecotoxicity data; Risk quantification; Modelling; Global ocean surface