

Microplastic pollution in marine sediments surrounding Iceland

Loughlin, C.¹, Morley, A.¹

¹ School of Geography and Archaeology, National University of Ireland, Galway
University Road, Galway, Ireland

Microplastic pollution is widespread throughout the marine environment and is increasingly recorded in the marine sediment¹⁻². Depositional trends and distribution of microplastics in the benthos is important to understand in order to determine the end fate for microplastics³. Here, we present the first distribution analysis of presence, depth and distribution of microplastics in marine sediments from the Iceland continental shelf and surrounding areas. We also present an analysis of the potential role oceanic surface and bottom water currents, organic content, and sediment type has on the distribution, deposition and burial of microplastics in marine sediments.

Study sites were specifically chosen to reflect the complex oceanography surrounding Iceland and the unique depositional environments present on the Icelandic Shelf. The top 0-5 cm of nine box cores (1cm intervals) were examined for microplastics using a dry-sieving method. Sediment size distribution for each sample was determined using a Mastersizer 2000. To reconstruct a history of microplastic deposition for each site, we calculated sedimentation rates using AMS radiocarbon dating (AMS ¹⁴C).

Microplastics were recovered from all nine sediment cores. The microplastic depositional trends showed a relationship between organic matter and a sheltered environment from fast currents similar to Strand et al's (2013) findings⁴. 7 of the 8 sites had a non-linear relationship of microplastic abundance by depth, indicating mixing or disturbance of the top 5 cm. Age models created by radiocarbon dating prove that microplastic contamination was not limited to the depth intervals that correspond to plastic production due to sediment disturbance. Potential sources were unable to be confirmed without the use of a Fourier Transform Infrared spectrometer; however, there was a significant relationship between microplastic abundance and the main fishing grounds in Iceland. It was concluded that microplastic pollution hotspots can be hypothesized only with consideration for the depositional environment. Further research is needed for the confirmation of polymers on the microplastics.

References

1. Van Cauwenberghe, L., Devriese, L., Galgani, F., Robbins, J. and Janssen, C. R. (2015) Microplastics in sediments: A review of techniques, occurrence and effects, *Marine Environmental Research*, 111, pp. 5–17. doi: 10.1016/j.marenvres.2015.06.007.
2. Woodall, L.C., Sanchez-Vidal, A., Canals, M., Paterson, G.L., Coppock, R., Sleight, V., Calafat, A., Rogers, A.D., Narayanaswamy, B.E. and Thompson,

R.C. (2014) The deep sea is a major sink for microplastic debris, *Royal Society Open Science*, 1(4), pp.140317–140317. doi: 10.1098/rsos.140317.

3. Lusher, A. L. (2015) 'Microplastics in the Marine Environment: Distribution, Interactions and Effects', in Bergmann *et al.* (eds.) *Marine anthropogenic litter*. Springer International Publishing, pp 245- 307.
4. Strand, J., Lassen, P., Shashoua, Y. and Andersen, J.H. (2013) Microplastic particles in sediments from Danish waters, In *Poster at the ICES Annual Conference Reykjavik, Iceland*.