
Microplastics and other anthropogenic particles in Antarctica: Using penguins as biological samplers

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Abstract

Microplastics (< 5mm size) are known to be widespread in the marine environment but are still poorly studied in Polar Regions, particularly in the Antarctic. As penguins have a wide distribution around Antarctica, three congeneric species: Adélie (*Pygoscelis adeliae*), chinstrap (*Pygoscelis antarcticus*) and gentoo penguins (*Pygoscelis papua*) were selected to evaluate the occurrence of microplastics across the Antarctic Peninsula and Scotia Sea. Scat samples (used as a proxy of ingestion), were collected from breeding colonies over seven seasons between 2006 and 2016. Antarctic krill (*Euphausia superba*), present in scat samples, contributed 85%, 66% and 54% of the diet in terms of frequency of occurrence to the diet of Adélie, gentoo and chinstrap penguins, respectively. Microplastics were found in 15%, 28% and 29% scats of Adélie, chinstrap and gentoo penguin respectively. A total of 92 particles were extracted from the scats (n = 317) and 32% (n = 29) were chemically identified via micro-Fourier Transform Infrared Spectroscopy (μ -FTIR). From all the particles extracted, 35% were identified as microplastics, particularly polyethylene (80%) and polyester (10%). It was not possible to ascertain the identification of the remaining 10% of samples. Other anthropogenic particles were identified in 55% of samples, identified as cellulose fibres. The results show a similar frequency of occurrence of particles across all colonies, suggesting there is no particular point source for microplastic pollution in the Scotia Sea. Additionally, no clear temporal variation in the number of microplastics in penguins was observed. Overall, this study reveals the presence of microplastics across Antarctica, in three penguin species and offers evidence of other anthropogenic particles in high numbers. Further research is needed to better understand the spatio-temporal dynamics, fate and effect of microplastics on these ecosystems, and improve plastic pollution policies in Antarctica.

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