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TITLE: Microplastic pollution in the Greenland Sea: Background levels and selective contamination of planktivorous diving seabirds

AUTHOR: ['Françoise Amélineau', 'Delphine Bonnet', 'Olivier Heitz', 'V. Mortreux', 'Ann M. A. Harding', 'Nina J. Karnovsky', 'Wojciech Walkusz', 'Jérôme Fort', 'David Grémillet']

ABSTRACT:

Microplastics have been reported everywhere around the globe. With very limited human activities, the Arctic is distant from major sources of microplastics. However, microplastic ingestions have been found in several Arctic marine predators, confirming their presence in this region. Nonetheless, existing information for this area remains scarce, thus there is an urgent need to quantify the contamination of Arctic marine waters. In this context, we studied microplastic abundance and composition within the zooplankton community off East Greenland. For the same area, we concurrently evaluated microplastic contamination of little auks (Alle alle), an Arctic seabird feeding on zooplankton while diving between 0 and 50 m. The study took place off East Greenland in July 2005 and 2014, under strongly contrasted sea-ice conditions. Among all samples, 97.2% of the debris found were filaments. Despite the remoteness of our study area, microplastic abundances were comparable to those of other oceans, with 0.99 ± 0.62 m-3 in the presence of sea-ice (2005), and 2.38 ± 1.11 m-3 in the nearby absence of sea-ice (2014). Microplastic rise between 2005 and 2014 might be linked to an increase in plastic production worldwide or to lower sea-ice extents in 2014, as sea-ice can represent a sink for microplastic particles, which are subsequently released to the water column upon melting. Crucially, all birds had eaten plastic filaments, and they collected high levels of microplastics compared to background levels with 9.99 and 8.99 pieces per chick meal in 2005 and 2014, respectively. Importantly, we also demonstrated that little auks took more often light colored microplastics, rather than darker ones, strongly suggesting an active contamination with birds mistaking microplastics for their natural prey. Overall, our study stresses the great vulnerability of Arctic marine species to microplastic pollution in a warming Arctic, where sea-ice melting is expected to release vast volumes of trapped debris.

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