
Temporal change in plastic pollution in the critical habitat of an endangered cetacean on the continental slope, Nova Scotia, Canada

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Abstract

"The Gully", situated off Nova Scotia, Canada, is the largest submarine canyon in the western North Atlantic. This unique oceanographic feature, which became a Marine Protected Area (MPA) in 2004, is rich in marine biodiversity and the critical habitat of endangered northern bottlenose whales (*Hyperoodon ampullatus*). To understand the potential impact of plastic pollution in the MPA, and on this endangered cetacean, we evaluated trends in the density and composition of plastics between the 1990s and 2010s and compared these to the stomach contents of two recently stranded northern bottlenose whales. From the 1990s to 2010s, the mean density of small plastic debris (100 μm – 25 mm) increased significantly (up to ~129,000 per km²), while the mean density of large plastic debris (> 5 cm) has significantly decreased, from 31.5 to 14.0 items per km². Estimates from the 2010s are lower than nearshore coastal areas, but much higher than surrounding offshore areas. Despite being far from centres of human population, FTIR spectroscopy identified a wide diversity of plastic polymers in The Gully, including polyethylene, polypropylene, PET, nylon, paint containing alkyds, and anthropogenic and semi-synthetic cellulose fibers, from consumer products, vessels, industrial activities, fishing and recreational activities. Whale stomach contents contained fragments of fishing nets, ropes, bottle caps, cups, food wrappers, smaller plastic fragments, fibers, and paint flakes. These debris items ranged from 150 μm to 1.13 m, consistent with the composition and character of items collected from their critical habitat. The unique oceanographic features of The Gully (i.e., currents and bathymetric complexity) may act to trap plastic pollution in this important area. Long-term impacts of plastic ingestion on the recovery of northern bottlenose whales in this region remains to be determined.

Keywords: floating plastic debris, polymer characterization, neuston tow, visual survey, microplastics, mesoplastics, macroplastics, fibers, fragments

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