Marine plastics pollution as a vector for contaminants in Arctic Canada

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THE RESEARCH CHALLENGE: Marine plastic pollution is now a common problem in many regions of the world, including Arctic Canada. While negative effects from ingested plastics have been documented, the effects from the contaminants associated with plastics is still being explored. We examine the plastics ingested by seabirds, and contaminants in the plastics and the seabirds.

The Global Context:

Seabirds and plastics in northern Canada:









The vast volume of plastic pollution in the world's oceans is of increasing concern for marine life and ecosystems. Seabirds are conspicuous top predators in the marine environment, and possess attributes that reflect changes to marine ecosystems. The first observations of plastic ingestion by seabirds were reported more than 50 years ago and have increased exponentially since this time (Fig 1A). While the majority of publications on plastic ingestion examining this phenomenon on seabirds focus on reporting ingestion metrics, our understanding of how plastic pollution affects seabirds and other wildlife is still in its infancy (Fig 1B).



Step 1. Seabirds are collected by local hunters in northern Canada breeding near colonies.







Ingestion of marine plastics by seabirds was first reported in Canada in the 1960s (in Leach's stormpetrels and great black-backed gulls in Atlantic Canada), and in the Canadian Arctic in the 1970s in black-legged kittiwakes.

While no formal program of sampling exists, we currently take advantage of hunted and collected birds for other programs to compare plastics ingestion by seabirds across Canada. Northern fulmars are collected from all three of Canada's oceans and ingested plastics are compared across regions.

In Canada, and throughout the globe, we find lower levels of marine plastics pollution as we move towards the poles.



Polymer types:

Since marine plastics research started systematically quantifying ingested plastics in seabirds in the 1980s, a visual categorization system has been used. This includes reporting industrial plastics (nurdles or pellets) and user items (fragments, fibers, sheet and form).

Visual sorting of plastics – standard practice from 1980s onwards



Chemical movement from plastics to tissues:

Eggs from and other tissues other northern fulmars (and seabirds) are collected at some colonies in Nunavut for annual chemical contaminants monitoring. We will analyze eggs, liver, and preening oil collected by programs under the NCP and ECCC, and held in the National currently Bank in Ottawa for Specimen plastics associated contaminants like phthalates.









New FTIR techniques allow us to determine polymer type





New methods now allow us to determine what polymer type different debris pieces are made from. Since different polymers contain different contaminants this, is helping us to determine what chemical contaminants wildlife that ingest plastics may be exposed to.

