Coastal birds carry toxic ocean metals inland

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Arctic terns have the longest yearly migration of any bird species, with some individuals covering 80,000 km annually. Metals and other contaminants accumulated over their long journeys are ultimately deposited near their nesting sites, in some instances to toxic concentrations. Credit: Mark Mallory

A collaborative research team led by Queen's University biologists has found that potent metals like mercury and lead, ingested by Arctic seabirds feeding in the ocean, end up in the sediment of polar ponds.

"Birds feeding on different diets will funnel different 'cocktails' of metal contaminants from the ocean back to terrestrial ecosystems, which can then affect other living organisms," says lead author Neal Michelutti, a research scientist at Queen's Paleoecological Environmental Assessment and Research Lab (PEARL).

The study will be published on-line the week of May 24 in the Proceedings of the National Academy of Sciences.

The team collected sediment cores from two ponds on a small island in the Canadian Arctic that is home to the nests of two kinds of seabirds: Arctic terns, which feed primarily on fish, and common eider ducks which feed mainly on mollusks. The researchers analyzed the pond sediment for metals and other indicators of the birds' activity.

They found significant differences between the samples that aligned with the birds' diets. There were higher concentrations of metals such as mercury and cadmium in the sites inhabited by terns, while the nearby eider site recorded higher amounts of lead, manganese, and aluminum. The patterns of metals in the sediment cores matched those recorded in the different bird species' tissues.

Queen's biology professor John Smol says the findings can be applied to other locations. "The High Arctic is an excellent 'natural laboratory' to undertake such studies, due to the lack of local industries," notes Dr. Smol, Canada Research Chair in Environmental Change, and winner of the 2004 NSERC Herzberg Gold Medal as Canada's top scientist. "However, the presence of seabirds on every continent suggests similar processes are operating along coastlines worldwide.

"Our concern is that these areas of elevated metals and other contaminants occur exactly where biological activity is greatest," he adds.

"The seabirds are obviously not directly to blame for the elevated metal concentrations in the ponds," says team member Jules Blais, a biology professor from the University of Ottawa. "They are simply carrying out their natural behaviours and lifecycles, but have become unwitting vectors of pollutants in an increasingly industrial age."

Provided by Queen's University