Temporal Analysis of Mercury Concentrations in Northwest Greenland Seabirds

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INTRODUCTION

Due to widespread anthropogenic emissions and a global atmospheric cycle, mercury (Hg) contaminates all aquatic ecosystems, including the Arctic, at concentrations above preindustrial baselines. Long lived, high trophic level predators, like seabirds, are at the highest risk for mercury toxicity.

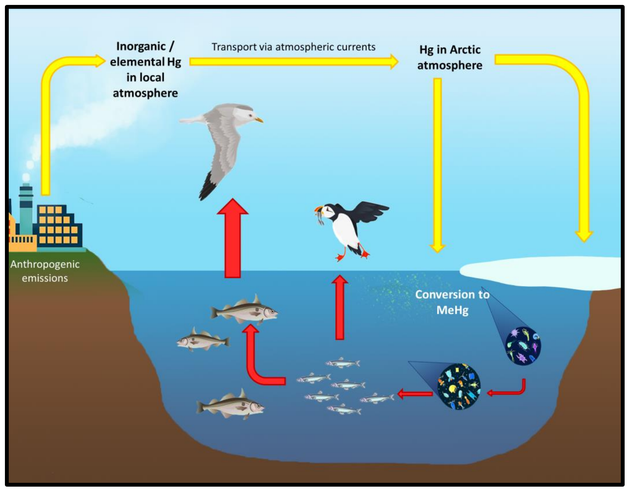

Figure 1. The mercury cycle

OBJECTIVES

1) Assess differences in Hg concentrations between five seabird species
2) Examine temporal trends in Hg concentrations for each species

METHODS

- Samples were collected between 2010 and 2023
- Whole blood samples were collected from breeding birds and frozen within 24 hours
- Samples were analyzed for total Hg as a proxy for methylmercury (MeHg) as well as carbon and nitrogen stable isotopes
- Temporal trends were analyzed with a mixed effect model

RESULTS

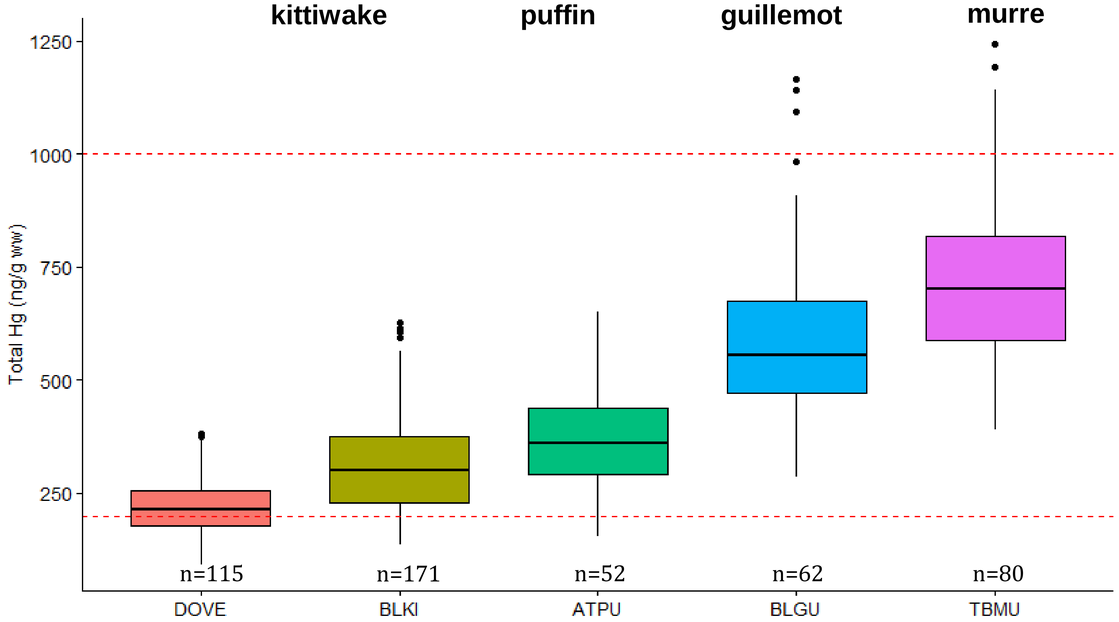

Figure 2. All species had significantly different blood Hg concentrations. Differences between species were analyzed with a Kruskal Wallis test ($\chi 2(4) = 303.64$; $p<0.0001$) with Wilcoxon post hoc tests (all: $p<0.001$). Red lines indicate no risk and low risk toxicity thresholds

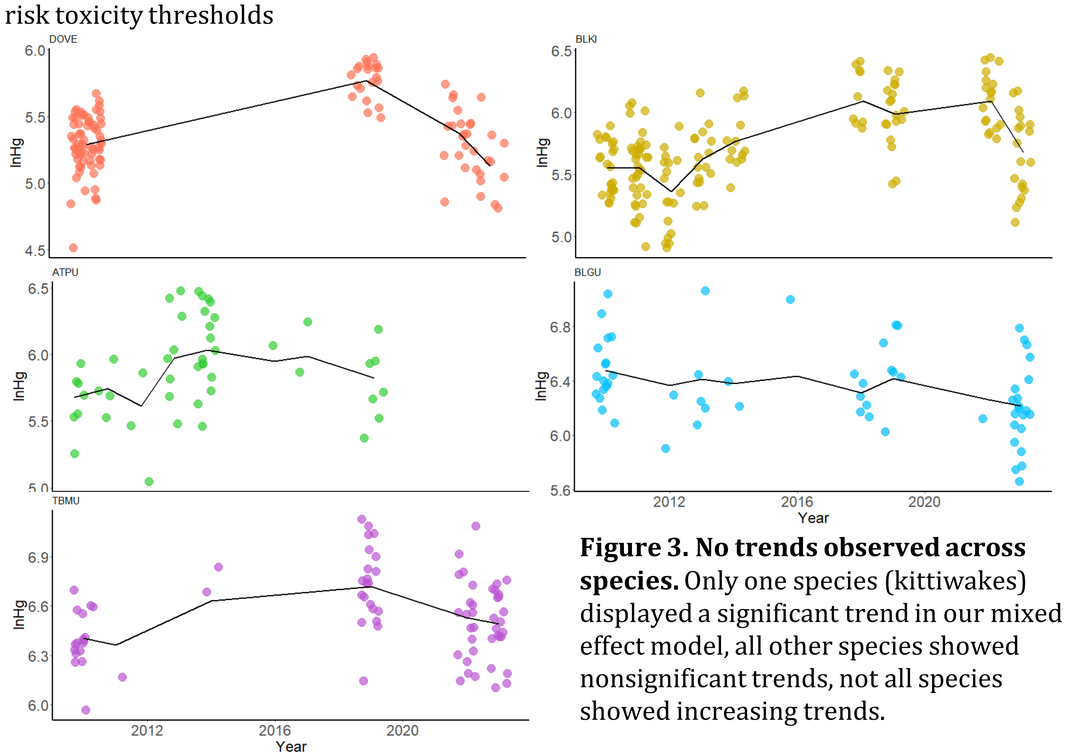

Figure 3. No trends observed across species. Only one species (kittiwakes) displayed a significant trend in our mixed effect model, all other species showed nonsignificant trends, not all species showed increasing trends.

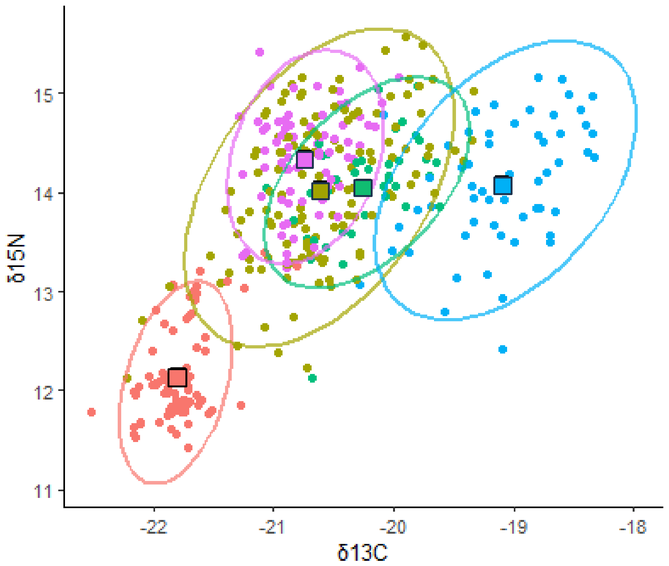

Figure 4. Distinct diets of each species. Increasing nitrogen indicates increasing trophic level. Decreasing carbon indicates a shift from pelagic to benthic prey

DISCUSSION

Dovekies exhibited the lowest Hg concentrations, likely due to their preference for filter-feeding copepods, while thick-billed murres showed the highest levels, attributed to their larger body size and consequent higher dietary intake (Figure 1, Figure 4). We did not observe overwhelming trends of Hg contamination across species (Figure 3). The variability in our data is influenced by factors such as diet, sex, colony location, and local biogeochemical conditions.

There is a need for continued and increased monitoring and research to grasp Hg contamination dynamics in Arctic wildlife, crucial for ecosystem health assessment and guiding regulatory actions. Based on our results future studies should account for various complexities inherent in such studies, including sex differences, species-specific variations, and environmental influences.

ACKNOWLEDGEMENTS

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