



Investigating Mercury Transfer From Aquatic to Terrestrial Food Webs: The Influence of Distance from Pond Shorelines on Methylmercury concentrations in Arctic Wolf Spiders



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Introduction

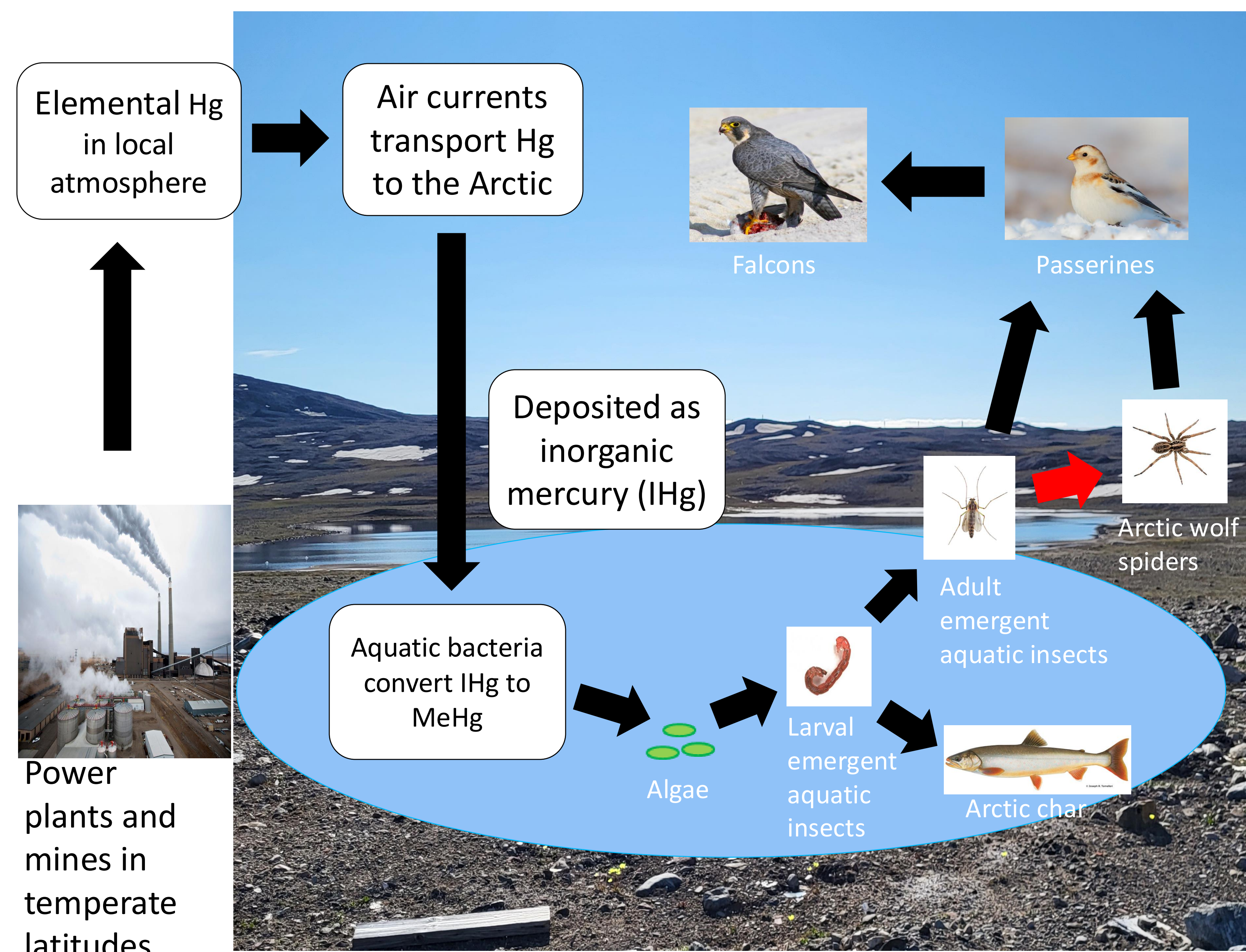


Figure 1: Arctic Freshwater Mercury Cycle

- Arctic aquatic ecosystems are contaminated with mercury (Hg) from human emissions originating at lower latitudes. Once deposited, mercury is converted to methylmercury (MeHg) by aquatic bacteria and it begins to bioaccumulate in food webs.
- Adult emergent aquatic insects transfer MeHg to terrestrial habitats, contaminating terrestrial predators such as spiders.
- In temperate regions, these insects typically disperse within 30 meters of their natal ponds, but it's unclear if distance from freshwater shorelines affects MeHg concentrations in Arctic wolf spiders (*Pardosa glacialis*).

Objectives

- 1) The effects of shoreline distance on the proportion of aquatic dietary resources in Arctic wolf spiders.
- 2) The role of shoreline distance on mercury concentrations in Arctic wolf spiders.

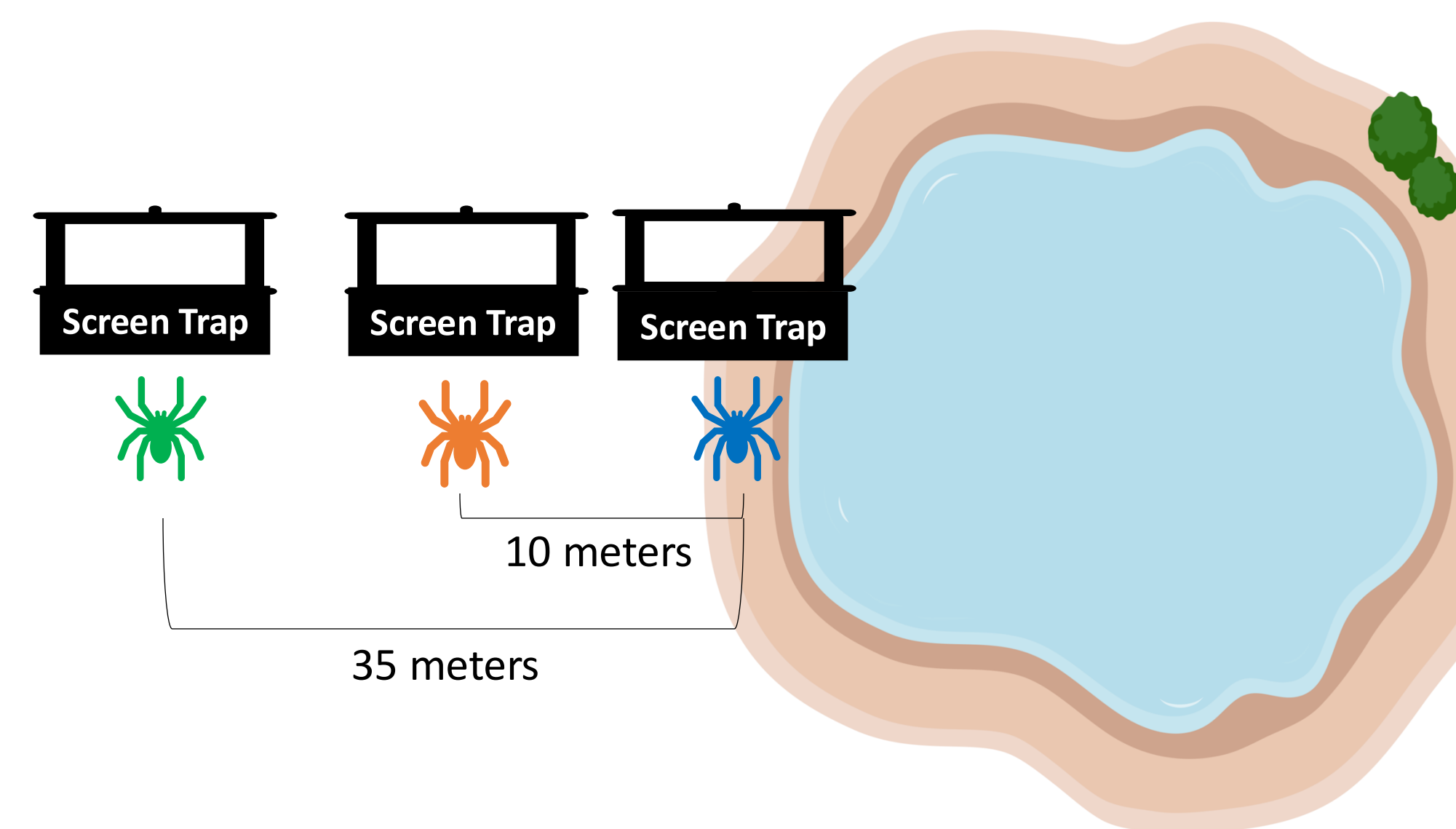
Methods



Figure 2: A) Screen trap for spider and terrestrial insect collection B) Study site in NW Greenland (Pituffik Peninsula) C) MA-3000 Total Mercury (THg) Analyzer used to test spiders for THg

Trapping Array:

- Traps set out 0 m, 10 m, and 35 m from the shoreline of six ponds
- Spiders and insects captured
- Identified and tested for THg in lab



Results

- 1) Spiders 35 m from the shoreline had lower THg contamination compared to those found at 0 m or 10 m.
- 2) No significant difference in THg contamination was observed between spiders collected at 0 m and 10 m from the shoreline.

Results Cont.

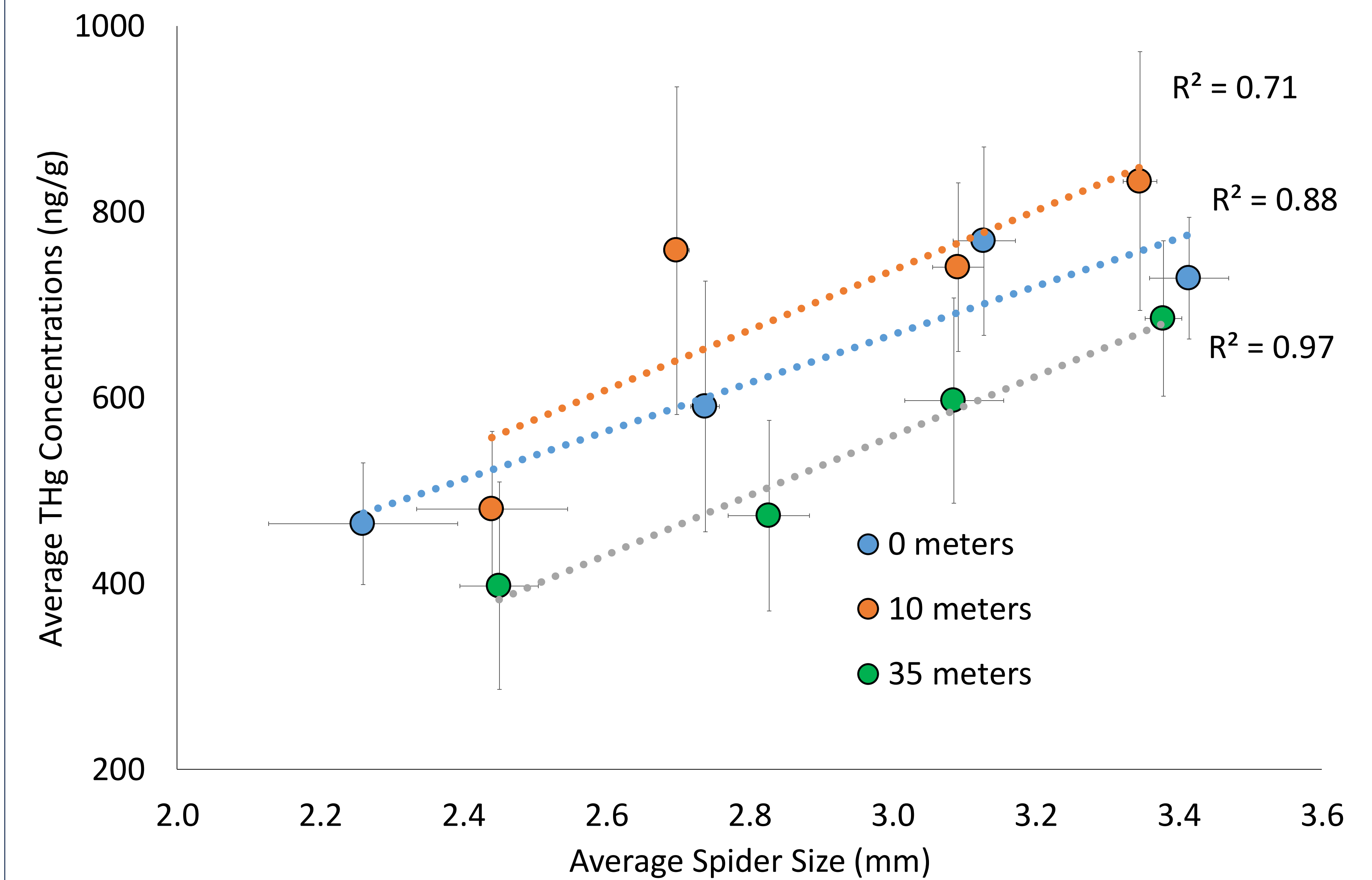


Figure 3. The relationship between average spider size (mm) and average THg concentrations (ng/g) at varying distances (0 m, 10 m, 35 m) away from the shoreline of six ponds in northwest Greenland. The spiders collected at 0m and 10m showed no significant difference in their mercury values, while spiders collected at 35m had significantly lower mercury values ($p = 0.049$) than spiders collected at 0m or 10m.

Discussion

- Spiders 35 m from pond shorelines have lower MeHg contamination than those closer to shorelines, suggesting that shoreline distance affects Hg levels in *P. glacialis*.
- Aquatic emergent insects may be transferring MeHg further across Greenland's terrain in comparison to temperate regions due to reduced barriers in Greenland.
- Passerines that feed on arachnids in areas where insects disperse may face a higher risk of MeHg toxicity compared to farther upland birds.
- Rising Hg contamination in the future may impact both aquatic and terrestrial food webs in Greenland.

References: Burnham and Maddox 1984, Chumchal and Drenner 2015, Chumchal and Drenner 2020, Dastoor et. al 2022, Gratton and Zanden 2009, Green and Greenwood 1974, Ortega-Rodriguez et al. 2019, Pacyna 2020.