Mercury in the Forest Spider *Micrathena gracilis*: Does the Mercury Burden Vary with Location?

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Introduction

Recent research has proposed that spiders could be a significant trophic link between rivers contaminated with mercury and adjacent terrestrial environments. The Spined Micrathena, *Micrathena gracilis,* is a common and widely distributed spider of deciduous forests in North America (Figure 1). *M. gracilis* is also commonly encountered in riparian forests, and therefore, could serve as an indicator of mercury transference. Our previous research has shown that *M. gracilis* accumulated significant amounts of total mercury (THg) and could be a link for transferring Hg from aquatic to terrestrial ecosystems. In this study we investigated the variation in the THg burden of *M. gracilis* in different locations along the Susquehanna River.

Objective

Our specific objectives were to a)determine if THg in *M. gracilis* varied significantly among sites, and b) delineate geographic patterns in detected differences.

Methods

•Spiders were collected from four forested areas along the Susquehanna River near Berwick, Pennsylvania (41.0845°N, -76.1317°W). Two areas were upland forests and two were riparian forests.

•Female specimens of *M. gracilis* (N=30) were collected from their webs and subsequently frozen in 1.5 mL Eppendorf vials.

•The mass of each spider was measured to the nearest 0.0001g and analyzed for total mercury using a direct mercury analyzer (DMA-80 Milestone, Inc). The DMA has a manufacturer's calculated detection limit of 0.005 ng.

•Data were analyzed by One-way ANOVA of the ranks with a Dunn's Method multiple comparison test.

•Alpha was set at P=0.05.

Photo credit Ryan McGrady

Figure 1. The Spined Micrathena, *Micrathena gracilis*, collected in a riparian forest along the Susquehanna River, Pennsylvania.

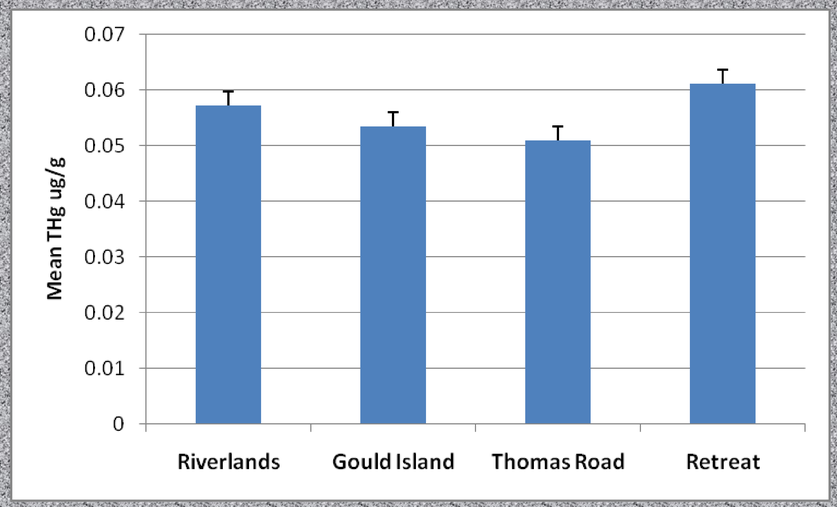

Figure 2. The median level of THg in M. gracilis was significantly higher at the Retreat site (N=46) than at the Thomas Road (N=39) and Gould Island (N=78) Sites (P<0.001,H=19.2). There were no significant differences among the remaining sites. Error bars indicate one standard error.

Results

•Average values of THg for *M. gracilis* at all four sites were ≥0.05 ug/g.

•Median THg concentrations at the Retreat site were significantly greater than those at Gould Island and Thomas Road sites (P<0.001, Figure 2).

•However, there were no differences detected among the remaining sites.

•The Gould Island site results were most variable (SD=0.034), followed by the Riverlands (SD=0.025), Thomas Road (SD=0.017), and Retreat (o.016).

Conclusions

•Spined Micrathena spiders accumulated THg at all sampling locations.

•However, the concentrations among some sites varied signficantly.

•One possible factor in this difference is that the Retreat location is closest among the sites to a former coal-fired power plant that was closed during the spring of 2010. This site was only 2.7 km from the power plant, while Gould Island, Thomas Road, and the Riverlands sites were 11.3 km, 12.5 km, and 12.8 km, respectively.

•if distance from the former coal plant is a primary determinant in these results, then future research should attempt to confirm a similar pattern in results, perhaps using common arthropods of the forest floor.

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