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Effects of Taxon and Body Size on Mercury Concentrations in Spiders from Two Rivers with Different Levels of Mercury Contamination: Implications for the Use of Riparian Spiders as Sentinels

Andrew C. Todd,[a] Matthew M. Chumchal,[a,*] Ray W. Drenner,[a] Chris W. Allender,[a] Benjamin D. Barst,[b,c] Morgan T. Capone,[a] Andrew P. Degges,[a] Madeline P. Hannappel,[d] Cale R. Perry,[a] Robert A. Peterson,[a] Tori L. Martinez,[a] Iris E. Schmeder,[a] Tyler T. Williams,[a] and Macyn G. Willingham[a]

[a]Biology Department, Texas Christian University, Fort Worth, Texas, USA
[b]Water and Environmental Research Center, University of Alaska Fairbanks, Fairbanks, Alaska, USA
[c]Department of Earth, Energy, and Environment, University of Calgary, Calgary, Alberta, Canada
[d]Department of Biological Sciences, University of North Texas, Denton, Texas, USA

Abstract: Due to widespread atmospheric deposition of mercury (Hg), all aquatic food webs are contaminated with toxic methyl mercury (MeHg). At high concentrations, MeHg poses a health hazard to wildlife and humans. Spiders feeding in riparian habitats (hereafter referred to as *riparian spiders*) have been proposed as sentinels of MeHg contamination of aquatic systems. Riparian spiders are exposed to MeHg through their diets, and the concentration of MeHg in spiders is positively related to the proportion of MeHg-contaminated emergent aquatic insects in their diets. The use of spiders as sentinels is complex because their MeHg concentrations can vary, not only among ecosystems but also between different spider taxa and as a function of spider body size. The objective of the present study was to examine how the level of ecosystem contamination, spider taxon, and spider body size interact to influence MeHg concentrations in four genera of riparian spiders from two rivers with different levels of Hg contamination. We collected four genera of riparian spiders (*Tetragnatha* sp., *Larinioides* sp., *Pardosa* sp., and *Rabidosa* sp.) from two sites along both the Clear Fork of the Trinity River and the West Fork of the Trinity River (Fort Worth, TX, USA). We analyzed concentrations of MeHg in different body sizes of spiders from each genus. We found that MeHg contamination of the river ecosystem, spider taxon, and spider body size were important determinants of MeHg concentration in riparian spiders. The results suggest that any of the four taxa of riparian spiders from the present study could be used as sentinels of aquatic MeHg contamination, but they should not be used interchangeably because of the interdependence between the effects of ecosystem contamination level, spider taxon, and body size. Future studies utilizing riparian spiders as sentinels of biomagnifying aquatic contaminants (e.g., MeHg, polychlorinated biphenyls) should consider the potentially complex interaction effects between ecosystem contamination level, spider taxon, and spider body size. *Environ Toxicol Chem* 2024;43:2169–2175. © 2024 The Author(s). *Environmental Toxicology and Chemistry* published by Wiley Periodicals LLC on behalf of SETAC.

Keywords: Methyl mercury; Riparian spiders; River; Sentinels

INTRODUCTION

Due to widespread atmospheric deposition of mercury (Hg) that largely originates from anthropogenic sources, all aquatic food webs are contaminated with Hg (Driscoll et al., 2013; Selin, 2009; Sonke et al., 2023). In aquatic ecosystems, sulfate-reducing bacteria can convert inorganic Hg to methyl mercury (MeHg; Driscoll et al., 2013), which is a persistent and bioavailable contaminant that concentrates in biota at the base of aquatic food webs (e.g., bacteria and phytoplankton; Miles et al., 2001). Methyl Hg biomagnifies through food webs, reaching elevated concentrations in predators feeding at high trophic positions (Lavoie et al., 2013). At high concentrations, MeHg can pose a threat to the health of wildlife and humans (Ackerman et al., 2024; Lepak et al., 2016; Mergler et al., 2007;

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* Address correspondence to m.m.chumchal@tcu.edu
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Scheuhammer et al., 2007), but the levels of MeHg contamination are highly variable among aquatic ecosystems as a result of landscape-level differences in Hg transport and methylation (Drenner, Chumchal, Adams, & Seymour, 2022).

Spiders feeding in riparian habitats (hereafter referred to as *riparian spiders*) have been proposed as sentinels of MeHg contamination of nearby aquatic systems (Chumchal et al., 2022). Sentinels are species that accumulate and retain bioavailable contaminants, like MeHg, in their tissues without experiencing significant adverse effects, thereby indicating the bioavailable fraction of contaminants in an ecosystem (Beeby, 2001). Riparian spiders are exposed to MeHg through their diet, and the concentrations of MeHg in riparian spiders are positively correlated with the proportion of MeHg-contaminated emergent aquatic insects in their diets (Ortega-Rodriguez et al., 2019). The concentration of MeHg in riparian spiders reflects the level of Hg contamination in fish (Drenner, Chumchal, Gaul, et al., 2022) and emerging aquatic insects (Tweedy et al., 2013) in nearby aquatic ecosystems.

Although the concentrations of MeHg in riparian spiders reflect the level of MeHg contamination of aquatic systems (Chumchal et al., 2022; Drenner, Chumchal, Gaul, et al., 2022), the use of spiders as sentinels is complex because their MeHg concentrations can vary with spider taxon (Beaubien et al., 2020; Hannappel et al., 2021; Ortega-Rodriguez et al., 2019) and body size (Drenner, Chumchal, Gaul, et al., 2022; Hannappel et al., 2021). To effectively use riparian spiders as sentinels of MeHg contamination of aquatic systems, we need a better understanding of the interactions between the level of Hg contamination of an ecosystem, spider taxon, and spider body size. The objective of the present study was to examine how these three variables interact to influence MeHg concentrations in four genera of riparian spiders from two rivers with different levels of Hg contamination.

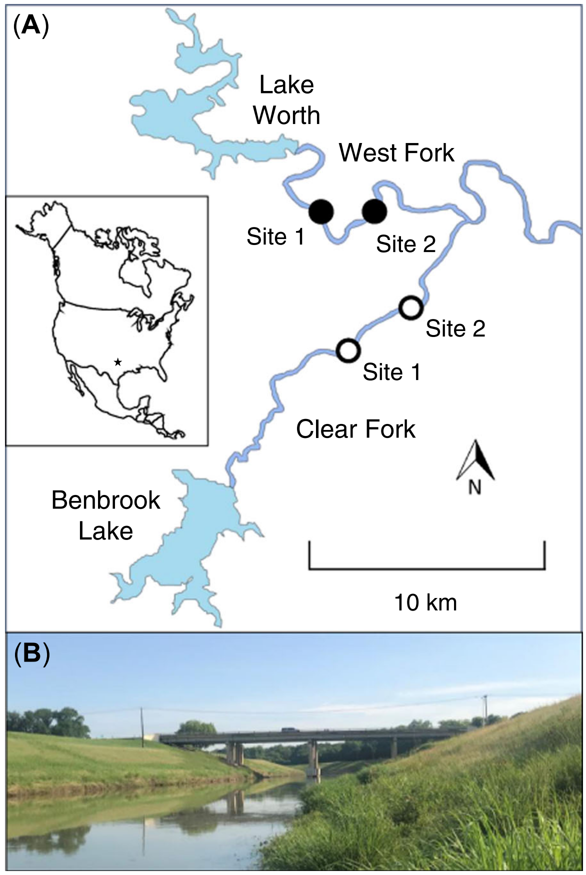

FIGURE 1: Map and representative image of sampling sites on the Clear Fork of the Trinity River and West Fork of the Trinity River, Fort Worth, Texas, USA. (**A**) The Clear Fork and West Fork sampling sites are downstream from Benbrook Lake and Lake Worth, respectively. (**B**) Example of bridge and shoreline habitats on the West Fork of the Trinity River that were sampled in the present study. Photo credit: Madeline Hannappel.

MATERIALS AND METHODS

Field collection of riparian spiders

We collected riparian spiders from two rivers in Fort Worth, Texas, USA, with different levels of Hg contamination: The Clear Fork of the Trinity River has relatively high Hg contamination, whereas the West Fork of the Trinity River has relatively low Hg contamination (Drenner, Chumchal, Gaul, et al., 2022; Figure 1A). A previous study found that spiders (*Tetragnatha* sp.) and fish (*Lepomis macrochirus*) from the Clear Fork had approximately 2.5 times higher Hg concentrations than those from the West Fork (Drenner, Chumchal, Gaul, et al., 2022). Both rivers are channelized with levees (Figure 1B), have a continual flow maintained by upstream reservoirs (Figure 1A), and have a fish and macroinvertebrate community similar to other lotic systems in the region (R. Drenner, personal communication, June 28, 2024).

We collected four genera of riparian spiders (Tetragnathidae, *Tetragnatha* sp.; Araneidae, *Larinioides* sp.; Lycosidae, *Pardosa* sp.; and Lycosidae, *Rabidosa* sp.; Figure 2) which belong to the three spider families that have been most frequently used as sentinels in aquatic contamination studies (Chumchal et al., 2022). We collected 2363 spiders from May 25 to June 25, 2021, on 20 different dates from two sampling sites on each river ($n = 4$ total sampling sites; Figure 1A and Table 1). Each site included a bridge and approximately 200 m of shoreline for sampling spiders (Figure 1B). At each site, we collected *Larinioides* sp. from the bridge, while *Tetragnatha* sp., *Pardosa* sp., and *Rabidosa* sp. were collected from the shoreline. *Larinioides* sp. are web-builders and were typically collected at night from their webs on bridge handrails and guardrails. *Tetragnatha* sp. are web-builders and were typically collected from their webs on tall grass, shrubs, and trees. *Pardosa* sp. and *Rabidosa* sp. are active ground hunters and were typically collected from bare ground/rocks, shrubs, and grasses. *Tetragnatha* sp., *Pardosa* sp., and *Rabidosa* sp. were primarily collected within 2 m of the shoreline. However, some *Rabidosa* sp. were collected up to 20 m away from the shoreline due to low population densities. Spiders were collected by hand or with an insect net and preserved in 95% ethanol.

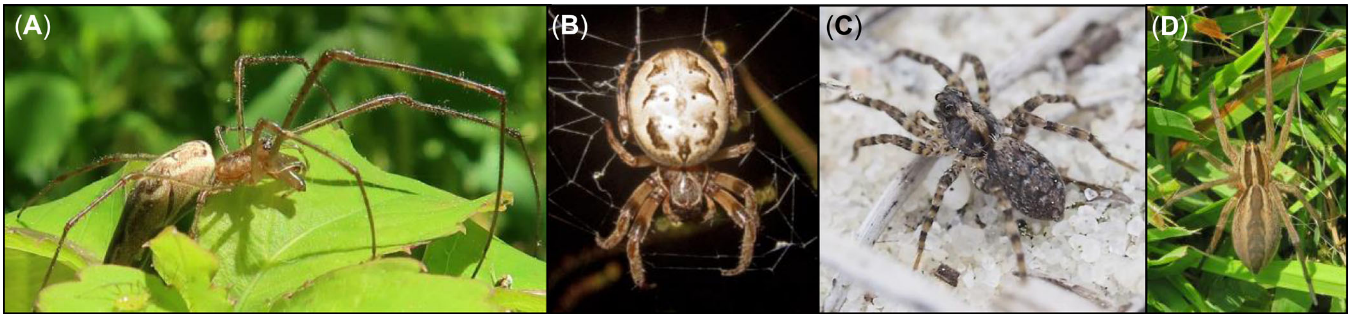

FIGURE 2: Representative photographs of the four spider taxa included in the present study: (**A**) Tetragnathidae, *Tetragnatha* sp.; (**B**) Araneidae, *Larinioides* sp.; (**C**) Lycosidae, *Pardosa* sp.; (**D**) Lycosidae, *Rabidosa* sp. Photographs depict the spider genera included in the present study but are not necessarily the species examined in the present study. Photo credits: (**A**, **B**, **D**) Seth Ausubel, (**C**) Jim Brighton, Maryland Biodiversity Project.

Identification of spider genera, body size determination, and sample processing

In the laboratory, all spiders were examined using a Zeiss Stemi 305 microscope. Spiders were identified to genus using spider identification keys (Levi, 2002; Ubick et al., 2017) and measured using the Zeiss Labscope measurement application (Ver. 2.8.0, 2018). We used leg length (tibia + patella of the first leg; Supporting Information, Figure S1) as a proxy for body size in spiders because (1) within a spider taxon, leg length is correlated with other body size measurements (e.g., carapace length and carapace width; Hannappel et al., 2021), (2) leg length does not change with feeding or reproductive status like mass or abdomen size (Danielson-François et al., 2002), and (3) total Hg and MeHg concentrations in some spider taxa are positively correlated with leg length (Drenner, Chumchal, Gaul, et al., 2022; Hannappel et al., 2021). Within each genus, spiders were grouped based on leg length into 0.5 to 1-mm size classes, depending on biomass. Composite samples of similarly-sized spiders were then dried in an oven at 60 °C for at least 48 h before being homogenized using a ball mill.

Total Hg analysis

Two hundred and twelve composite spider samples were analyzed for total Hg (inorganic Hg + MeHg) using a Milestone DMA-80 Direct Hg Analyzer, which uses thermal decomposition, gold amalgamation, and atomic-absorption spectroscopy (US Environmental Protection Agency [USEPA], 1998a). Quality assurance included reference standards (National Research Council of Canada Institute for National Measurement Standards), method blanks (empty quartz sample boats), and duplicate samples. Reference standards (DORM-4) were analyzed every 10 samples, and the mean recovery percentage for DORM-4 was 98.4 ± 0.6% (mean ± standard error [SE]; range 88.9%–106%; $n = 30$). Duplicate samples were analyzed every 20 samples, and the mean relative percent difference was 2.0% (range 0.4–5.3%; $n = 14$). All samples were above the method limit of detection of 0.26 ng total Hg calculated by adding the limit of blank to 1.645 times the standard deviation of low-concentration samples (Ambruster & Pry, 2008). Prior to statistical analysis and data visualization, total Hg concentrations of composite samples from each genera and river within the same 0.5 to 1-mm size class were averaged (Supporting Information, Table S1).

TABLE 1: Number of spiders collected from two sampling sites on the Clear Fork of the Trinity River and two sampling sites on the West Fork of the Trinity River

	Clear Fork			West Fork		
Genus	Site 1	Site 2	Total	Site 1	Site 2	Total
Tetragnatha sp.	320	282	602	262	201	463
Larinioides sp.	171	133	304	106	238	344
Pardosa sp.	187	72	259	56	73	129
Rabidosa sp.	19	81	100	103	59	162
Grand total			1265			1098

MeHg analysis

A subset of the composite samples that were analyzed for total Hg (*Tetragnatha* sp., $n = 12$; *Larinioides* sp., $n = 14$; *Pardosa* sp., $n = 12$; *Rabidosa* sp., $n = 14$; Supporting Information, Table S2) were analyzed for MeHg concentrations at the Marine Ecotoxicology and Trophic Assessment Laboratory at the University of Alaska Fairbanks, USA according to previously published methods (Hannappel et al., 2021). Briefly, samples were analyzed for MeHg using a Brooks Rand MERX®-M Automated MeHg Analytical System, which uses purge and trap, gas chromatography, and cold vapor atomic fluorescence spectroscopy (USEPA, 1998b). Dried and homogenized samples (~8 mg) were digested with 30% HNO_3 for 20 h in a water bath at 65 to 70 °C. Cooled digests were diluted with ultrapure water and stored in the dark at room temperature until analysis within 48 h. To quantify MeHg, 100- to 200-µL aliquots of the sample digests were added to individual glass vials containing ultrapure water and acetate buffer. A 1% solution of sodium tetraethylborate in KOH was added to each vial, and the total volumes were adjusted to 40 mL with ultrapure water. Reference samples (DORM-4 and International Atomic Energy Agency [IAEA]-86, human hair) were digested and analyzed with the samples. Additional quality assurance included the analysis of check standards (10 pg MeHg), blank spikes

(10 pg MeHg), matrix spikes (10 pg MeHg), duplicate samples, and reagent blanks. Reagent blanks consisted of 30% HNO_3 without the addition of a sample. All sample digests were analyzed in triplicate. Any samples with a coefficient of variation among triplicates >15% were reanalyzed until <15% was achieved. The mean value of triplicates was used for statistical comparisons. Mean recovery percentages for DORM-4 and IAEA-86 were 98.3% (range 91.9%–109.4%; $n = 6$) and 98.3% (range 83.9%–106.1%; $n = 6$), respectively. The mean recovery percentages of MeHg from check standards, blank spikes, and matrix spikes were 110.5% (range 90.1%–120.4%; $n = 38$), 108.8% (range 103.4%–112.6%; $n = 4$), and 107.0% (range 106.7%–107.3%; $n = 2$), respectively. The mean relative difference percentage between duplicates was 4.9% (range 0%–5.3%). The mean mass of MeHg in digestion blanks was 0.19 pg (range 0.17–0.22; $n = 2$). All samples were above the method detection limit of 0.25 pg MeHg, calculated by adding the mean of reagent blanks to 3 times the standard deviation of the same blanks.

Due to high analytical costs, MeHg could not be measured directly in all composite samples. To estimate MeHg concentrations in our samples, we determined the mean percentage of total Hg that was MeHg for each spider taxon using the subset of composite samples analyzed for MeHg ($n = 52$; Supporting Information, Table S2). The mean percentage MeHg for each respective spider taxon was then used to estimate MeHg concentrations from each sample's total Hg concentration.

Statistical analysis

We used analysis of covariance (ANCOVA) models to determine the effect of genus and river (categorical independent variables or factors) and leg length (covariate) on MeHg concentrations in spiders. We first ran a model that included factor and covariate main effects and the genus × river and genus × leg length interactions. We detected a significant main effect of genus, so we conducted pairwise comparisons of MeHg concentrations in genera using Bonferroni's method. We also detected significant genus × river and genus × leg length interactions (indicating that the effects of river, genus, and leg length on spider MeHg concentrations were not independent), so we assessed the effects of river and leg length on each genus using additional ANCOVA models. Specifically, we assessed the effect of river, leg length, and the river × leg length interaction on MeHg concentration for each genus. The river × leg length interaction term was not significant in any of the genera-specific models and so was removed from these models prior to assessing the main effects of river and leg length on MeHg concentration. All analyses were performed using SPSS (Ver. 26), and statistical significance was determined at $p \leq 0.05$.

RESULTS

We detected significant main effects of river, genus, and leg length on MeHg concentrations in spiders (Table 2 and Figure 3). Methyl Hg concentrations were higher in the Clear Fork relative to the West Fork (Figure 3A). *Tetragnatha* sp., *Larinioides* sp., and *Pardosa* sp. had significantly higher concentrations than *Rabidosa* sp. (Figure 3B; $p \leq 0.05$). Leg length was positively correlated with spider MeHg concentrations (Figure 3C). However, we also detected significant genus × river and genus × leg length interaction effects (Table 2), indicating that the effects of river, genus, and leg length on MeHg concentrations in spiders were not independent.

TABLE 2: Model parameters from analysis of covariance models assessing interaction and main effects of river, genus, and leg length on methyl mercury concentrations of riparian spiders

Factor	*df*	*F*	*p*
Genus × river	3, 114	10.2	<0.001
Genus × leg length	3, 114	6.7	<0.001
River	1, 114	73.6	<0.001
Genus	3, 114	22.5	<0.001
Leg length	1, 114	8.4	0.005

Because we detected significant genus × river and genus × leg length interactions in our omnibus model, we explored the effects of river and leg length on MeHg concentrations within each genus (Table 3 and Figure 4). The river × leg length interaction was not significant for any genus (Table 3), indicating that the slope of the relationship between MeHg concentration and leg length between rivers was homogenous (i.e., parallel) for each genus (Table 3). We detected significant main effects of river in all four spider genera (Table 3), such that spiders from the Clear Fork had higher concentrations of MeHg than those from the West Fork regardless of leg length (Figure 4). Finally, we detected a significant main effect of leg length on MeHg concentrations in *Larinioides* sp., *Pardosa* sp., and *Rabidosa* sp. (Table 3), indicating that spiders from both rivers had MeHg concentrations that were positively correlated with leg length (Figure 4).

DISCUSSION

Similar to the results from a previous study (Drenner, Chumchal, Gaul, et al., 2022), riparian spiders on the Clear Fork had higher MeHg concentrations than spiders on the West Fork. Fish from the Clear Fork had higher concentrations of MeHg than fish from the West Fork (Drenner, Chumchal, Gaul, et al., 2022). The difference in MeHg contamination levels of the two rivers is reflected in the riparian spider taxa examined in the present study, suggesting that all four taxa can be used as sentinels of aquatic MeHg contamination. The difference in Hg contamination of the two rivers may be due in part to the design and operation of reservoir dams and associated water-level fluctuations in the reservoirs immediately above our sampling sites (Drenner, Chumchal, Gaul, et al., 2022). Between-year fluctuations in maximum water storage of reservoirs are positively correlated with total Hg concentrations in fish (Drenner, Chumchal, Gaul, et al., 2022; Willacker et al., 2016). Drenner, Chumchal, Gaul, et al. (2022) hypothesized that greater between-year fluctuations in water surface elevation of Benbrook Lake on the Clear Fork compared to Lake Worth on the West Fork led to increased

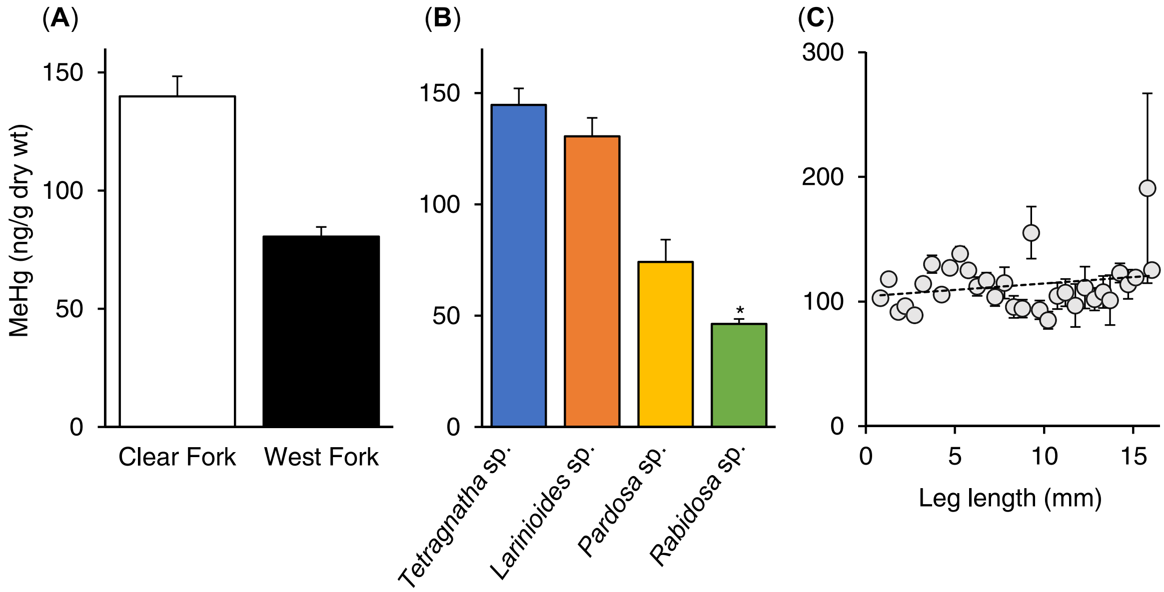

FIGURE 3: (**A**) Mean (±standard error [SE]) methyl mercury (MeHg) concentration of all spider genera from the Clear Fork of the Trinity River and West Fork of the Trinity River, (**B**) mean (±SE) MeHg concentration by spider genera, and (**C**) relationship between mean (±SE) MeHg concentration and mean (±SE) leg length for all spider genera. *Significant difference ($p < 0.05$) measured by the Bonferroni method.

MeHg production and discharge into the Clear Fork, increasing MeHg contamination in the Clear Fork relative to that in the West Fork.

In the present study, *Tetragnatha* sp., *Larinioides* sp., and *Pardosa* sp. had higher concentrations of MeHg than *Rabidosa* sp.; and we hypothesize the MeHg concentrations of these riparian spiders reflect the degree to which they rely on emergent aquatic insects (Ortega-Rodriguez et al., 2019). Other studies have found elevated concentrations of MeHg in spiders from the families Tetragnathidae and Araneidae because of the high proportion of emergent aquatic insects in their diet (Hannappel et al., 2021; Ortega-Rodriguez et al., 2019). Some species of *Pardosa* are found exclusively on shoreline habitats, which likely increases the probability that they will encounter and consume emergent aquatic insect prey (Muehlbauer et al., 2014; Paetzold et al., 2005). The low concentrations of MeHg observed in *Rabidosa* sp. could reflect their tendency to feed in terrestrial areas away from shorelines where MeHg-contaminated emergent aquatic insect prey may be less available (Hannappel et al., 2021; Ortega-Rodriguez et al., 2019).

In the present study, the concentrations of MeHg in *Larinioides* sp., *Pardosa* sp., and *Rabidosa* sp., but not *Tetragnatha* sp., were positively related to leg length, perhaps reflecting age-related bioaccumulation. Only four studies

TABLE 3: Model parameters from analysis of covariance models assessing interaction and main effects of river and leg length on methyl mercury concentrations in four genera of riparian spiders

Genus	Factor	*df*	*F*	*p*
Tetragnatha sp.	River × leg length	1, 52	0.99	0.32
	River	1, 53	68.9	<0.001
	Leg length	1, 53	2.90	0.09
Larinioides sp.	River × leg length	1, 21	0.12	0.73
	River	1, 22	30.2	<0.001
	Leg length	1, 22	12.1	0.002
Pardosa sp.	River × leg length	1, 8	1.3	0.29
	River	1, 9	44.3	<0.001
	Leg length	1, 9	18.2	0.002
Rabidosa sp.	River × leg length	1, 29	0.04	0.84
	River	1, 30	13.3	0.001
	Leg length	1, 30	13.5	0.001

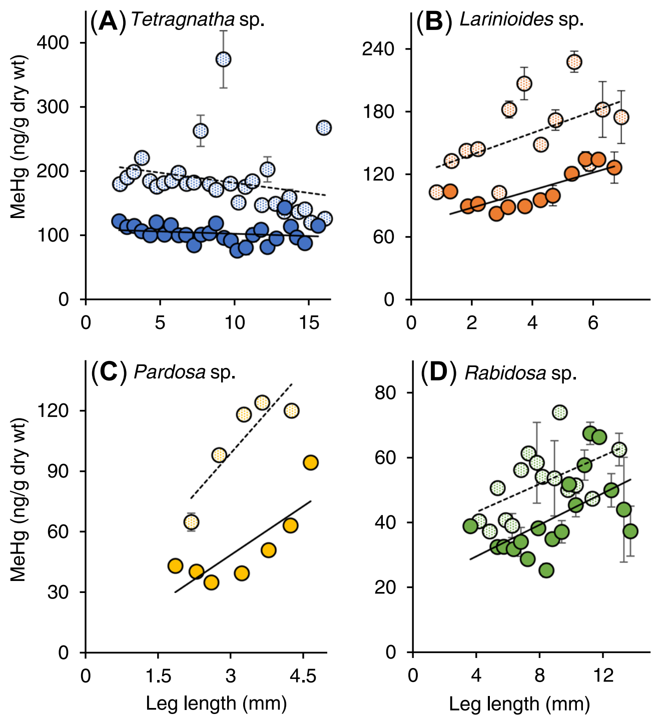

FIGURE 4: Relationships between mean (±standard error [SE]) leg length and mean (±SE) methyl mercury (MeHg) concentrations in *Tetragnatha* sp., *Larinioides* sp., *Pardosa* sp., and *Rabidosa* sp. spiders on the Clear Fork (open circles) of the Trinity River and West Fork (closed circles) of the Trinity River.

TABLE 4: Citation, study site, spider taxon, Hg species, proxy for spider body size, and direction of the effect of spider body size on Hg concentrations in spiders

Study	Site	Taxon	Hg species	Proxy for spider body size	Effect of spider body size on Hg
Pennuto and Smith (2015)	Buffalo River, New York, USA	*Larinioides sclopetarius*	Total Hg	Body weight	–
Hannappel et al. (2021)	Ponds, Texas, USA	Araneidae	MeHg	Leg length	+
	Ponds, Texas, USA	*Pardosa* sp.	MeHg	Leg length	+
	Ponds, Texas, USA	*Rabidosa* sp.	MeHg	Leg length	NS
	Ponds, Texas, USA	*Schizocosa* sp.	MeHg	Leg length	NS
	Ponds, Texas, USA	Salticidae	MeHg	Leg length	+
	Ponds, Texas, USA	*Tetragnatha* sp.	MeHg	Leg length	+
Drenner, Chumchal, Gaul, et al. (2022)	Clear Fork, Texas, USA	*Tetragnatha* sp.	Total Hg	Leg length	+
	West Fork, Texas, USA	*Tetragnatha* sp.	Total Hg	Leg length	NS
Wang et al. (2023)	Forests near reservoirs, China	*Nephila clavata*	Total Hg	Body weight	–
	Paddies near reservoirs, China	*Argiope bruennichi*	Total Hg	Body weight	–
Present study	Clear Fork, Texas, USA	*Tetragnatha* sp.	MeHg	Leg length	NS
	West Fork, Texas, USA	*Tetragnatha* sp.	MeHg	Leg length	NS
	Clear Fork, Texas, USA	*Larinioides* sp.	MeHg	Leg length	+
	West Fork, Texas, USA	*Larinioides* sp.	MeHg	Leg length	+
	Clear Fork, Texas, USA	*Pardosa* sp.	MeHg	Leg length	+
	West Fork, Texas, USA	*Pardosa* sp.	MeHg	Leg length	+
	Clear Fork, Texas, USA	*Rabidosa* sp.	MeHg	Leg length	+
	West Fork, Texas, USA	*Rabidosa* sp.	MeHg	Leg length	+

MeHg = methyl mercury; NS = not significant.

have examined the effects of body size (measured as body weight or leg length) on concentrations of MeHg or total Hg in riparian spiders, and these studies found inconsistent relationships between body size and Hg concentrations among or within taxa (Table 4). For example, in contrast to the present study, Pennuto and Smith (2015) found that concentrations of total Hg in *Larinioides* sp. were negatively correlated with body size. Similar to the present study, Hannappel et al. (2021) found that concentrations of MeHg in *Pardosa* sp. were positively correlated with body size, but the MeHg–body size relationships observed in Hannappel et al. (2021) for *Tetragnatha* sp. and *Rabidosa* sp. were different from the relationships observed in the present study. Similarly, the positive correlation between total Hg and body size in *Tetragnatha* sp. from the Clear Fork and the West Fork observed by Drenner, Chumchal, Gaul, et al. (2022) also differed from the present study. Variability in Hg–body size relationships between studies could be caused by methodological variability (e.g., low sample size, limited range of body size, analytical variability), season of collection, or variability in the Hg concentrations of diet over time. Until the reasons for the variability in Hg–body size relationships are better understood, future studies should collect data on body size given that Hg and body size can be strongly correlated.

In a recent review, Chumchal et al. (2022) suggested that riparian spiders have great potential as sentinels of aquatic contamination but that more insight was needed into the factors that influence contaminant concentrations within spiders. In the present study, we found that the level of MeHg contamination of the aquatic ecosystem, spider taxon, and spider body size are all important determinants of MeHg contamination in riparian spiders; but the effects of these variables on MeHg contamination of spiders are not independent. Although any of the four taxa of riparian spiders examined in the present study could be used as sentinels, they should not be used interchangeably because of the interdependence between the effects of ecosystem contamination level, genera, and body size. Future studies utilizing riparian spiders as sentinels of aquatic biomagnifying contaminants (e.g., MeHg, polychlorinated biphenyls) should consider the potentially complex interaction effects between ecosystem contamination level, spider taxon, and spider body size.

Supporting Information—The Supporting Information is available on the Wiley Online Library at https://doi.org/10.1002/etc.5968.

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Author Contribution Statement—**Andrew C. Todd**: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Validation; Visualization; Writing–original draft; Writing–review & editing. **Matthew M. Chumchal**: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Validation; Visualization; Writing–original draft; Writing–review & editing. **Ray W. Drenner**: Conceptualization; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Writing–original draft; Writing–review & editing. **Chris W. Allender, Morgan T. Capone, Andrew P. Degges, Cale R. Perry, Robert A. Peterson, Tori L. Martinez, Tyler T. Williams, Macyn G. Willingham**: Investigation. **Benjamin D. Barst**: Investigation; Methodology; Resources; Writing–review & editing. **Madeline P. Hannappel**: Investigation; Methodology; Writing–original draft; Writing–review & editing. **Iris E. Schmeder**: Investigation; Writing–review & editing.

Data Availability Statement—Data are freely available in the online-only Supporting Information.

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