# Assessment of methlymercury availability to bats on the North Fork of the Holston River, Virginia - 2005

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# Why Bats????

- Insectivorous Species
- Typically Forage Over Water
- Previous Studies Have Shown Elevated Levels of Hg
- Long-Lived ~ 30 years
- Low Reproductive Output
- Continental Decline in Bat Populations

# Bats found in Virginia

| Scientific Name | Common Name | Species Status* | Foraging Type |
|---|---|---|---|
| *Myotis grisescens* | Gray Bat | FE,SE | Regularly over water |
| *Myotis lucifugus* | Little Brown Bat | -- | Regularly over water |
| *Eptesicus fuscus* | Big Brown Bat | -- | Occasional over water |
| *Lasionycteis noctivagans* | Silver-haired Bat | SC | Occasional over water |
| *Lasiurus borealis* | Eastern Red Bat | -- | Occasional over water |
| *Lasiurus cinereus* | Hoary Bat | -- | Occasional over water |
| *Myotis leibii* | Small-footed Bat | SC | Occasional over water |
| *Myotis septentrionalis* | N. Long Eared Bat | -- | Occasional over water |
| *Myotis sodalis* | Indiana Bat | FE,SE | Occasional over water |
| *Nycticeius humeralis* | Evening Bat | SC | Occasional over water |
| *Pipistrellus subflavus* | Eastern Pipistrelle | -- | Occasional over water |
| *Corynorhinus townsendii* | VA Big-eared Bat | FE,SE | Forests and ridges |

*FE= Federally Endangered Species; SE= State Endangered Species;

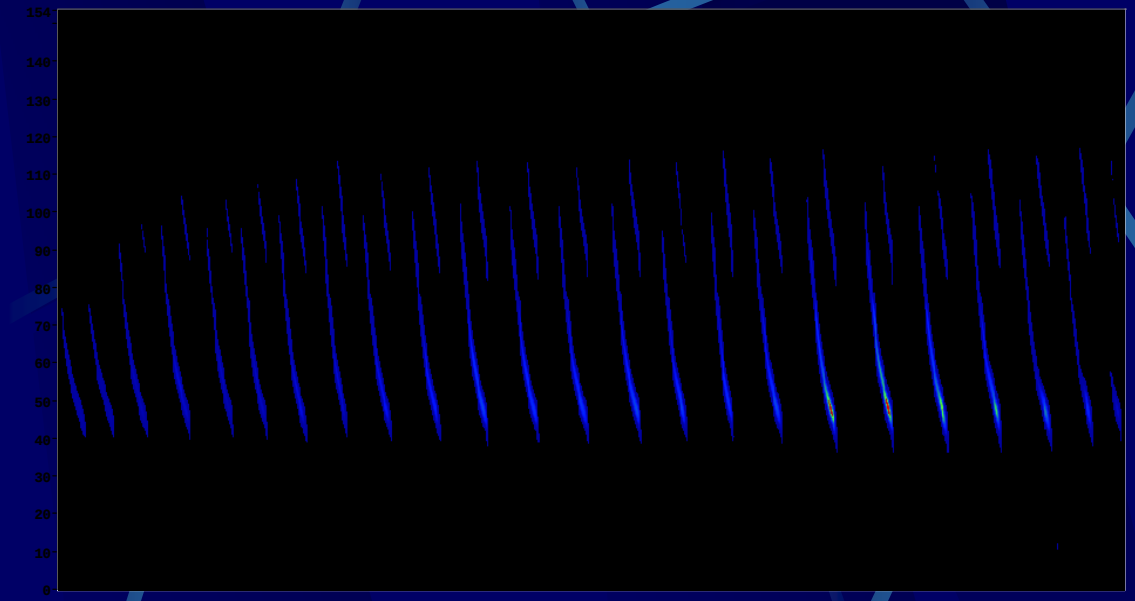
SC=Special Concern (Federal)

# Bat Hg Samples by State

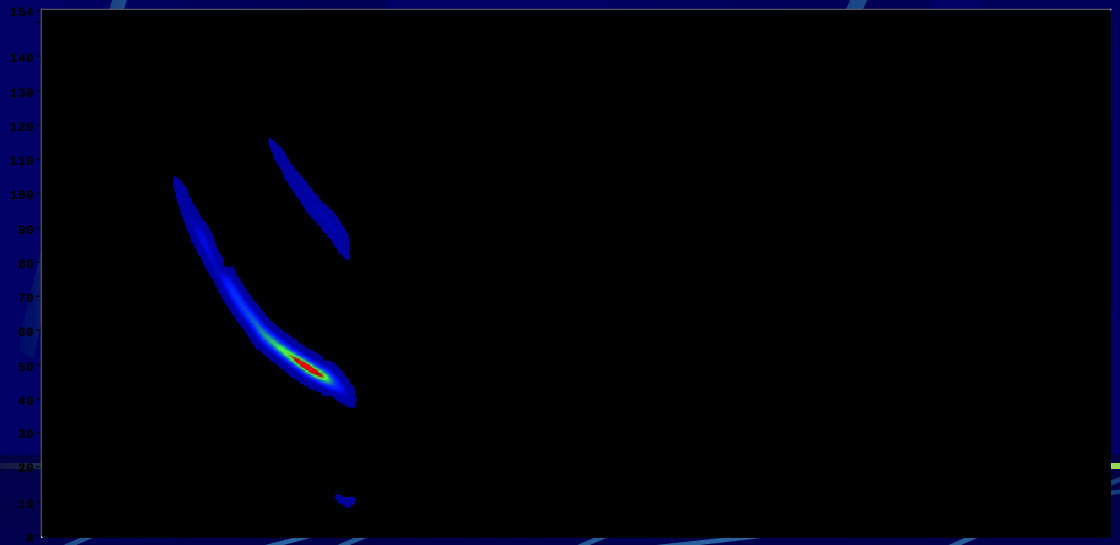
| State | Species | # of Samples |
|---|---|---|
| VA | 6 | 70 |
| NY | 8 | 100 |
| ME | 4 | 40 |
| MA | 3 | 15 |

# Capture Methods

# Sonobat®




Little Brown Bat Calls

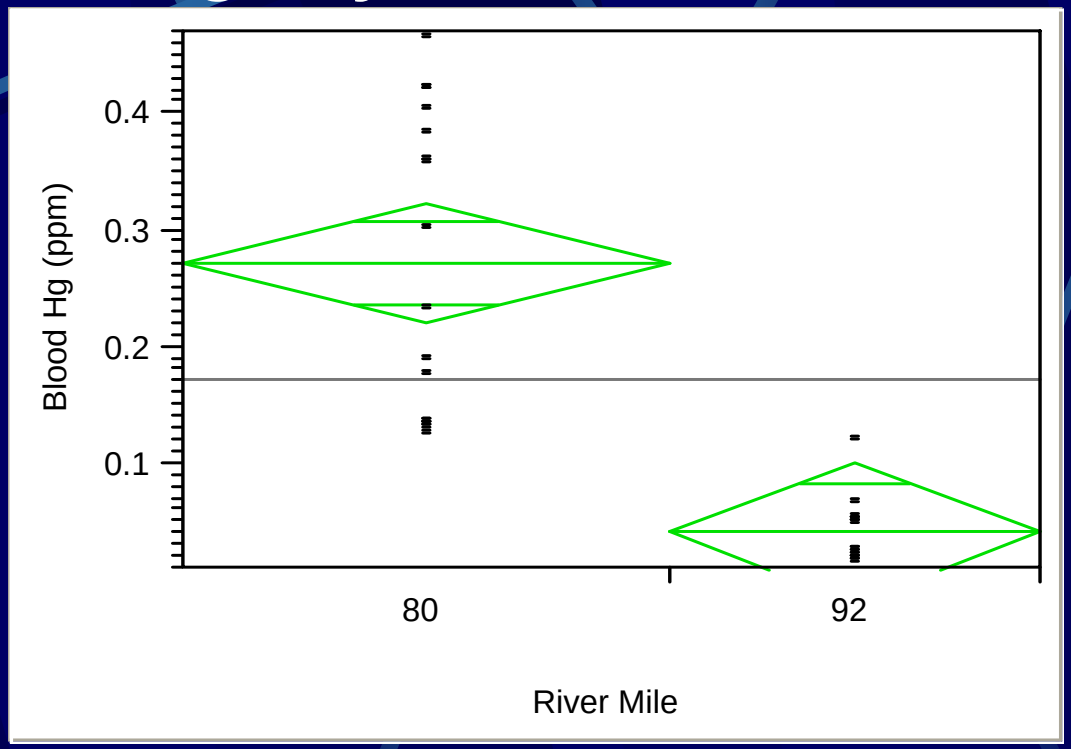



Little Brown Bat Call

# Blood Sample

# Fur Sample

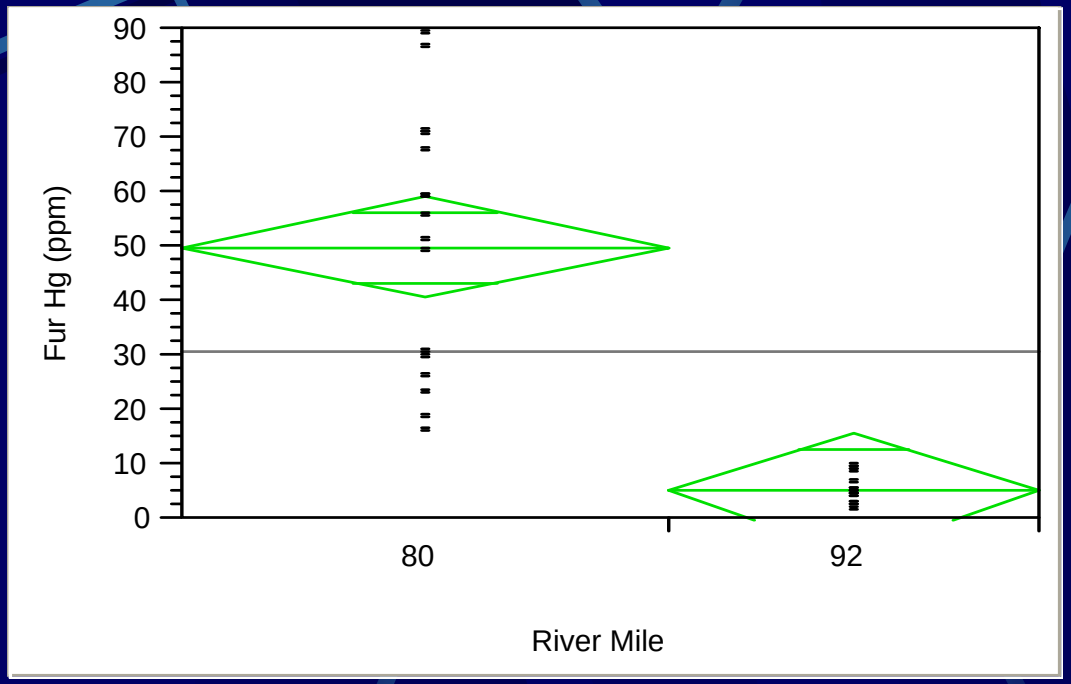
# One-way ANOVA of bat blood Hg by river mile




**Mean bat blood Hg concentrations and ranges by river mile.**

| River Mile | N | Mean Hg | SE +/- | Min. | Max. | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|---|
| 80 | 16 | 0.272 | 0.025 | 0.125 | 0.464 | 0.221 | 0.323 |
| 92 | 12 | 0.041 | 0.029 | 0.013 | 0.119 | -0.017 | 0.099 |

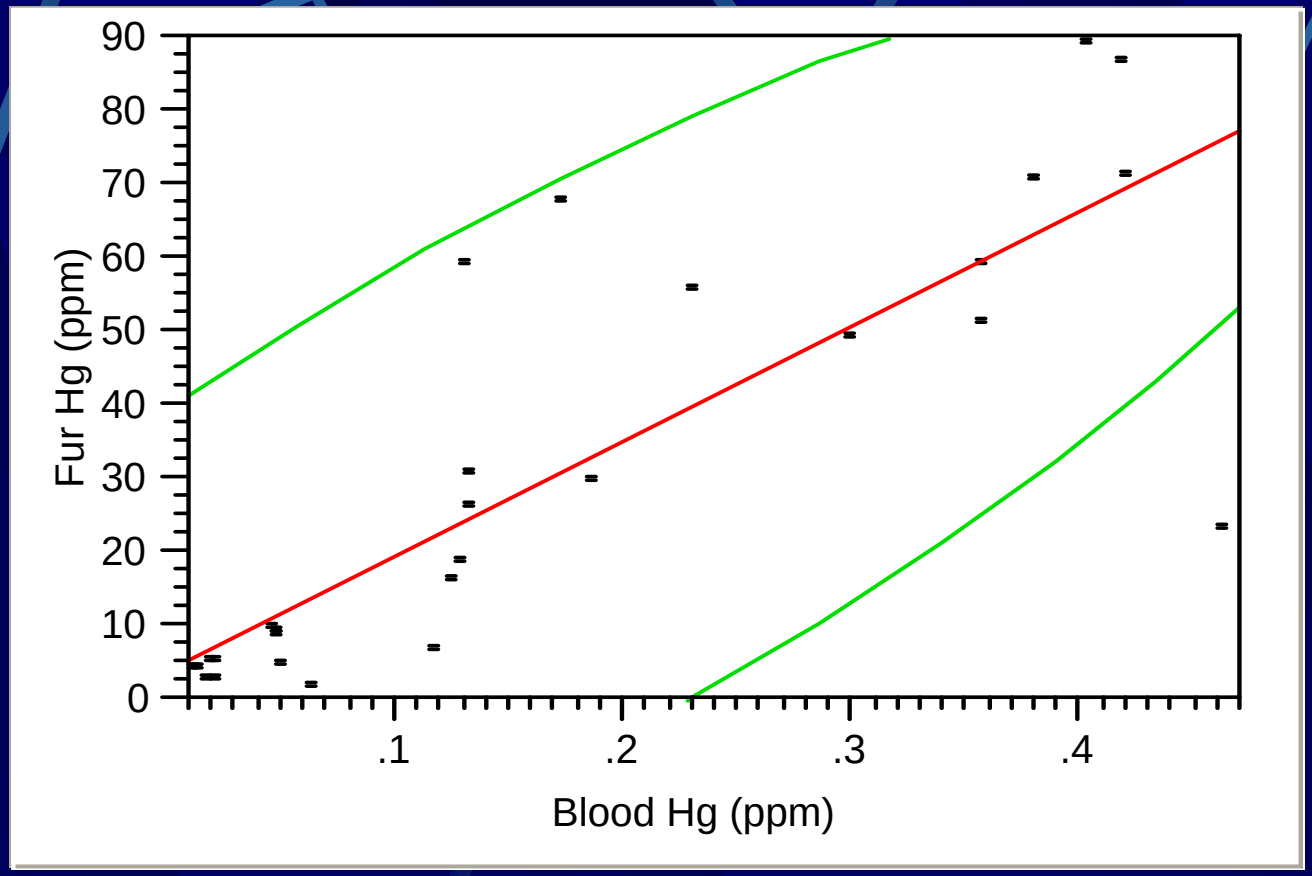
# One-way ANOVA of bat fur Hg by river mile.




**Mean fur Hg concentrations and ranges by river mile.**

| River Mile | N | Mean Hg | SE +/- | Min. | Max. | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|---|
| 80 | 16 | 49.88 | 4.54 | 15.8 | 89 | 40.56 | 59.20 |
| 92 | 12 | 5.02 | 5.24 | 1.08 | 9.43 | -5.75 | 15.78 |

# Blood and fur Hg relationships




Fur and blood Hg levels were significantly correlated ($r^2$=0.82, p<0.001, n=28). Blood and fur represent multiple species.

# What do these results mean?

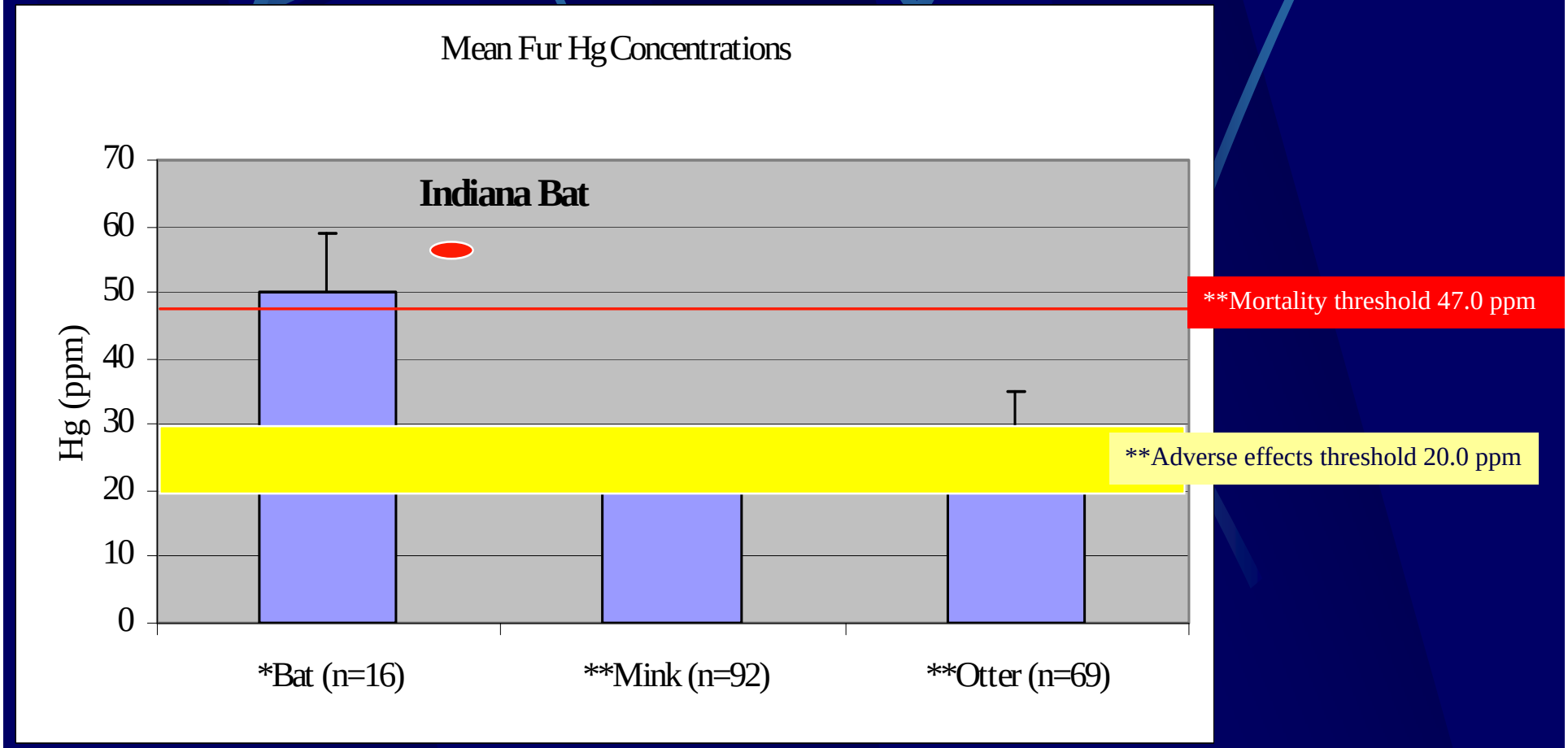
- Higher Hg levels than comparison bat studies
- Higher Hg levels than other small mammals
- Higher Hg levels than larger aquatic mammals

# Discussion

- Researchers in Japan examined various species of Chiroptera from areas sprayed with mercury fungicides. They measured total fur Hg in 1965 and 1966 and found 33.0 ppm (+/-6.3) and 33.7 ppm (+/-4.2), respectively. The fur Hg concentrations found in Chiroptera from the contaminated area of North Fork of the Holston (mean Hg 49.9 +/- 10.3ppm) exceeded these values from Japan.

- In Arkansas, researchers examined various Chiroptera species from rivers in Arkansas that were under fish consumption advisories and found Hg concentrations ranging from 1 to 30 ppm in fur. They concluded that Hg accumulation had exceeded the hazard criteria set by USFWS and that Hg accumulation in the bats is a serious problem that warranted further investigation.
- In eastern Ontario and Quebec, researchers in 1997 pooled samples from 5 sites and found Hg concentrations ranging from 2.0 to 7.6 ppm in fur. In 1998, they sampled the same sites and found fur Hg concentrations that approached or exceeded 10 ppm.

# Comparison of fur Hg levels in bats and mustelids



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3. U.S. Fish and Wildlife Service, Southwest Virginia Field Office, Abingdon, VA,

4. Texas A&M Trace Element Research Lab

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