

# Mercury and molt: no strong Hg trend across songbird primaries

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## Mercury

- Mercury is distributed across landscapes from various point sources - can be natural and/or anthropogenic sources.
- Anaerobic organisms transform inorganic mercury into methylmercury; this occurs primarily in aquatic ecosystems.
- Organic methylmercury can be absorbed into tissues. For most organisms, MeHg is accumulated through diet.
- Biomagnification within the food web - concentration increases with trophic levels
- Bioaccumulation in individuals

## Hg in Songbirds

- Mercury is present in the food a songbird has eaten. It is incorporated into the bloodstream where it can be stored in fat deposits and body tissues or sequestered into egg shells and feathers.
- This project helps to examine the efficacy of using feathers as a MeHg indicator.
- Hg is excreted into feathers during their growth
  - Hg in bloodstream attaches to keratin and is sequestered into feather during growth. When growth stops, the feather contains a stable concentration of mercury which can be tested.

## Feathers - What is Known?

- Songbird primary feathers have a known molt order (1-10)
- Seabirds have the same chronological molt process for their primaries.
- Studies have shown a pattern of Hg deposits with primary feather number in seabirds; Primary feathers grown first have a higher Hg concentration than the feathers grown last in molt order.
- This has been understudied in other bird species. Is this same pattern evident in songbirds?

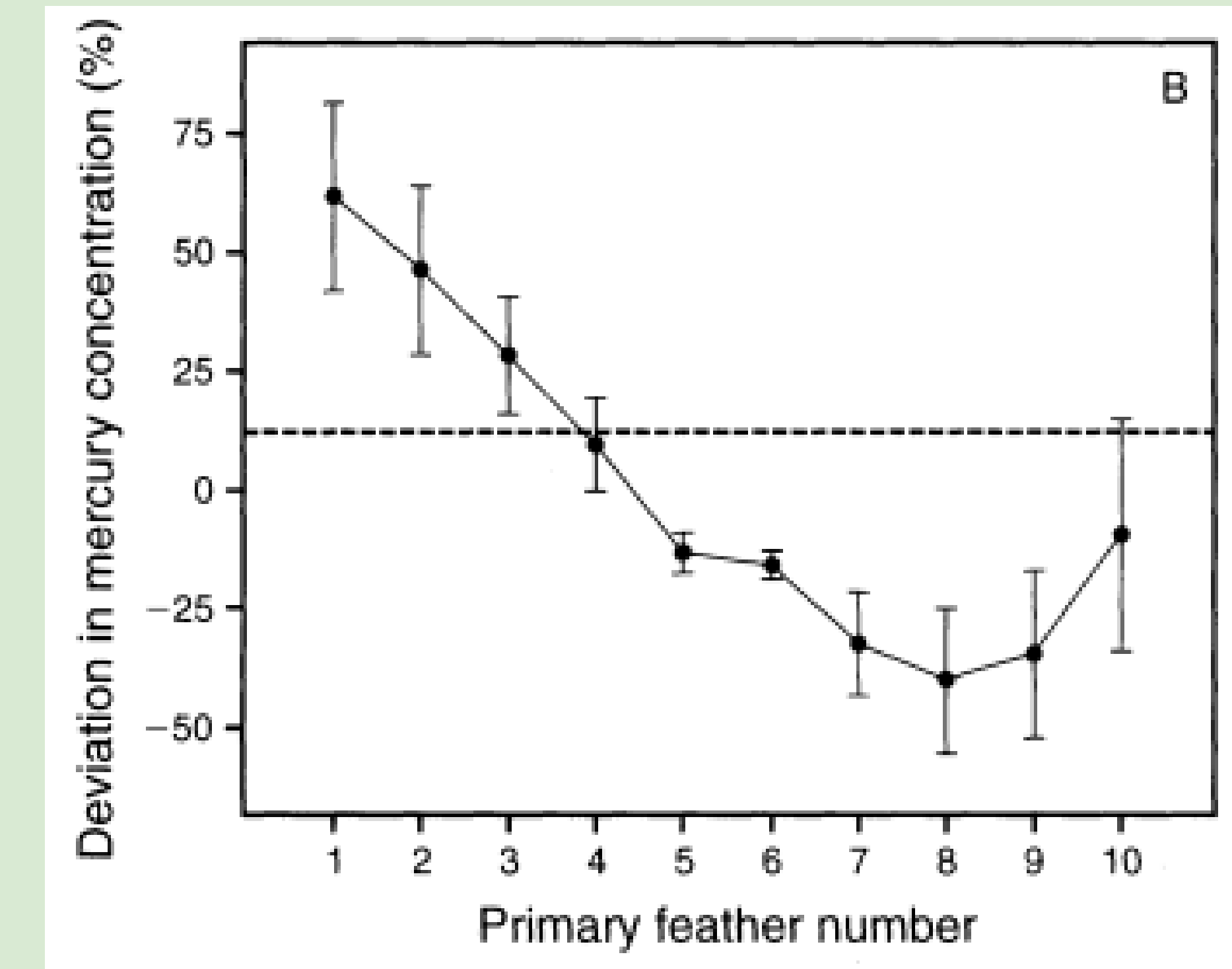


Figure 1: (Bortolotti 2010) Deviation in mercury concentration of primary feathers of Great Skuas.

## Hypothesis and Methods

- Hg concentration will decrease with increasing primary feather number.**
  - Whole bird specimens needed to test primary feathers
    - Birds deceased due to natural causes or accidents donated by Chintimini Wildlife Center and local ornithologists.
  - Turdidae and Passeridae (*Catharus ustulatus*, *Ixoreus naevius*, *Turdus migratorius*, *Melospiza melodia*, *Zonotrichia atricapilla*, *Passerella iliaca*, *Pipilo maculatus*, *Junco hyemalis*) (N = 30)
  - Primary feather 10 was too small in the DMA to obtain a reliable result; not included in the graphs.



## Preliminary Results

- The trend visually is similar to seabirds, but lower variation in Thrushes and Sparrows indicates that these differences may not be biologically significant.
- No effect of primary feather number on ppm ( $p=0.2700$  in mixed effects repeated measures test with ppm as the fixed effect and bird i.d. as a random effect).

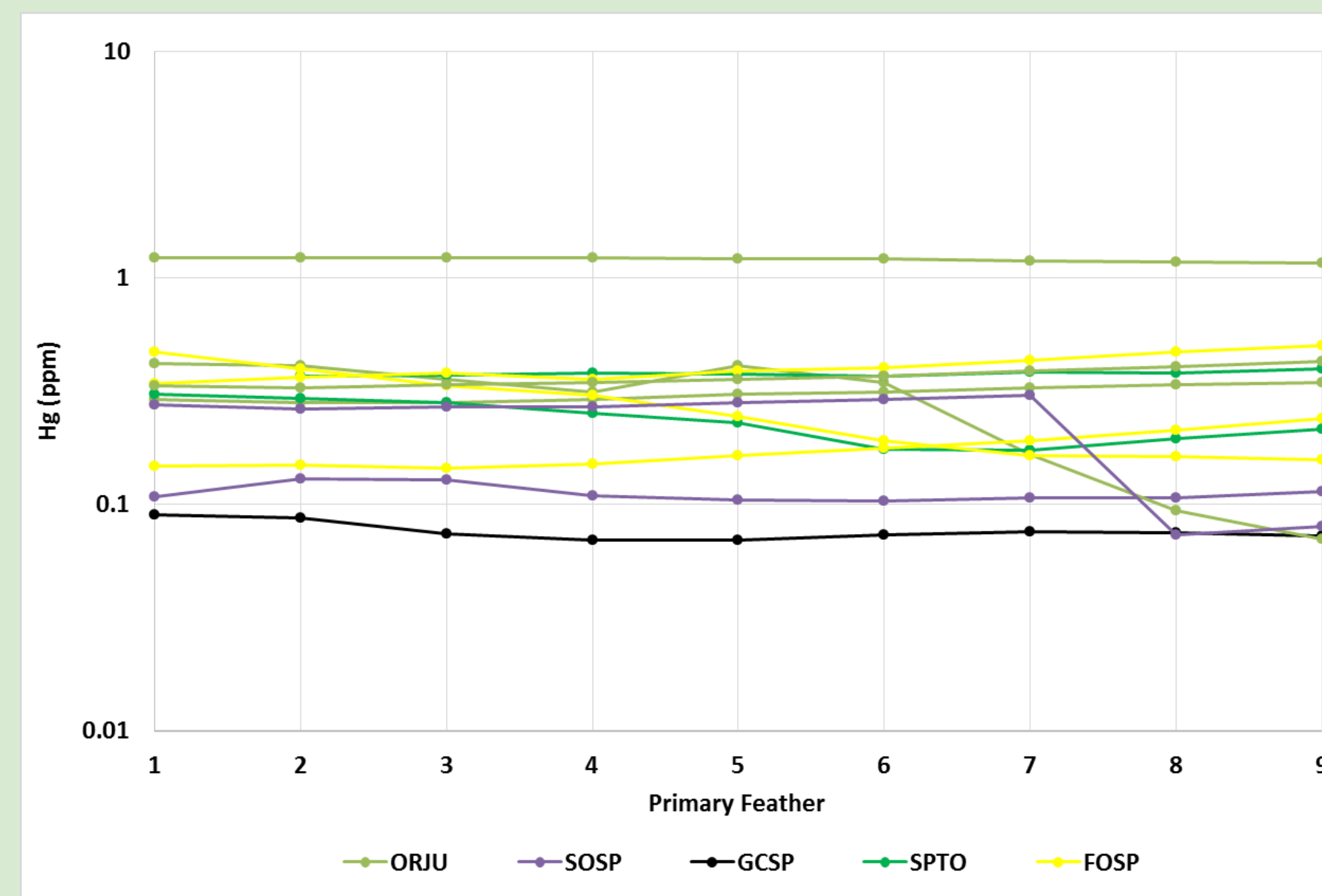


Figure 2: Hg(ppm on log scale) for primary feathers 1-9. Each line represents one individual; all 12 Sparrows are shown with colors delineating species.

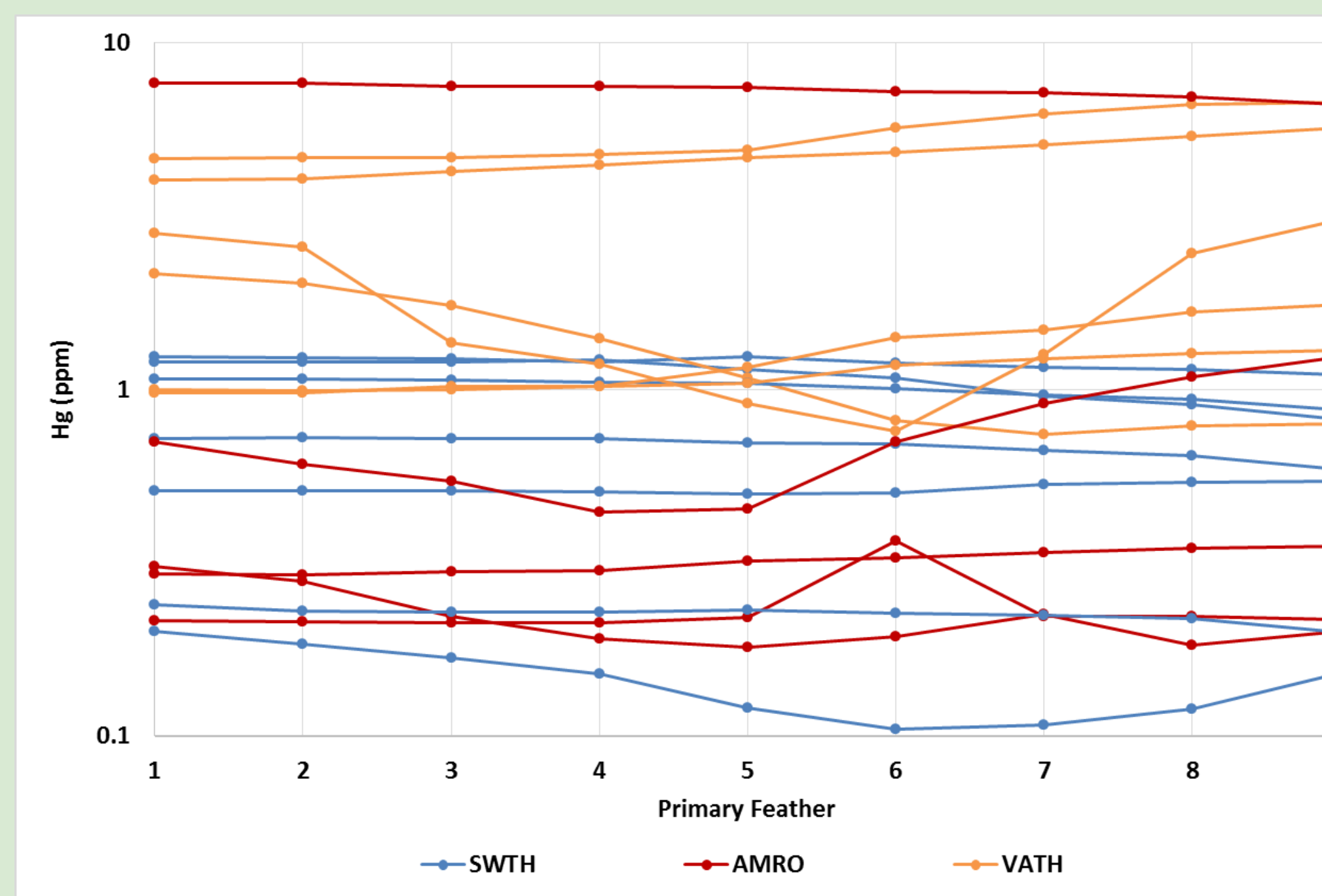


Figure 3: Hg(ppm on log scale) for primary feathers 1-9. Each line represents one individual; all 18 Thrushes are shown with colors delineating species.

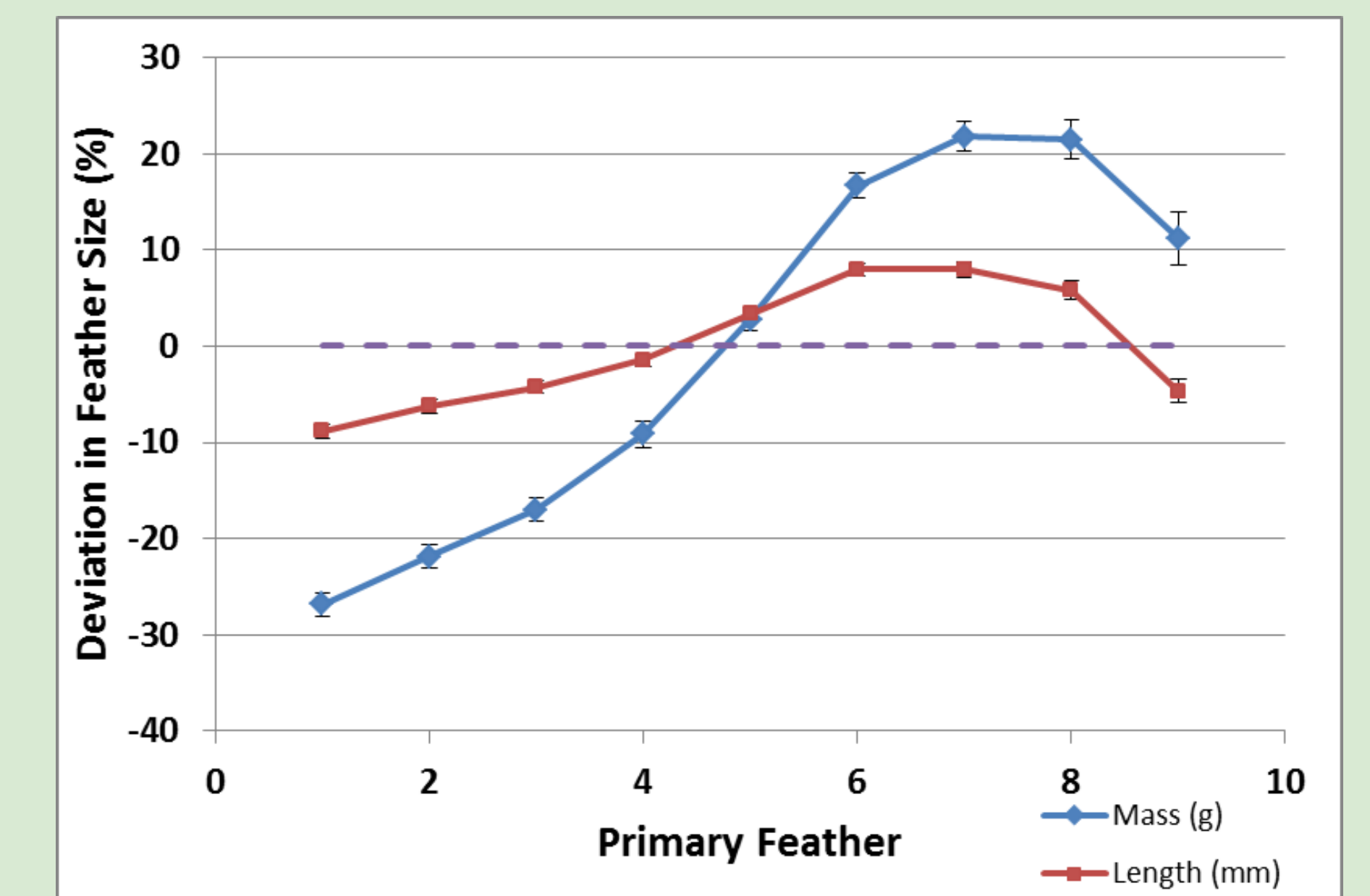


Figure 4: Deviation in feather size, mass (blue) and length (red), is shown for each primary feather.

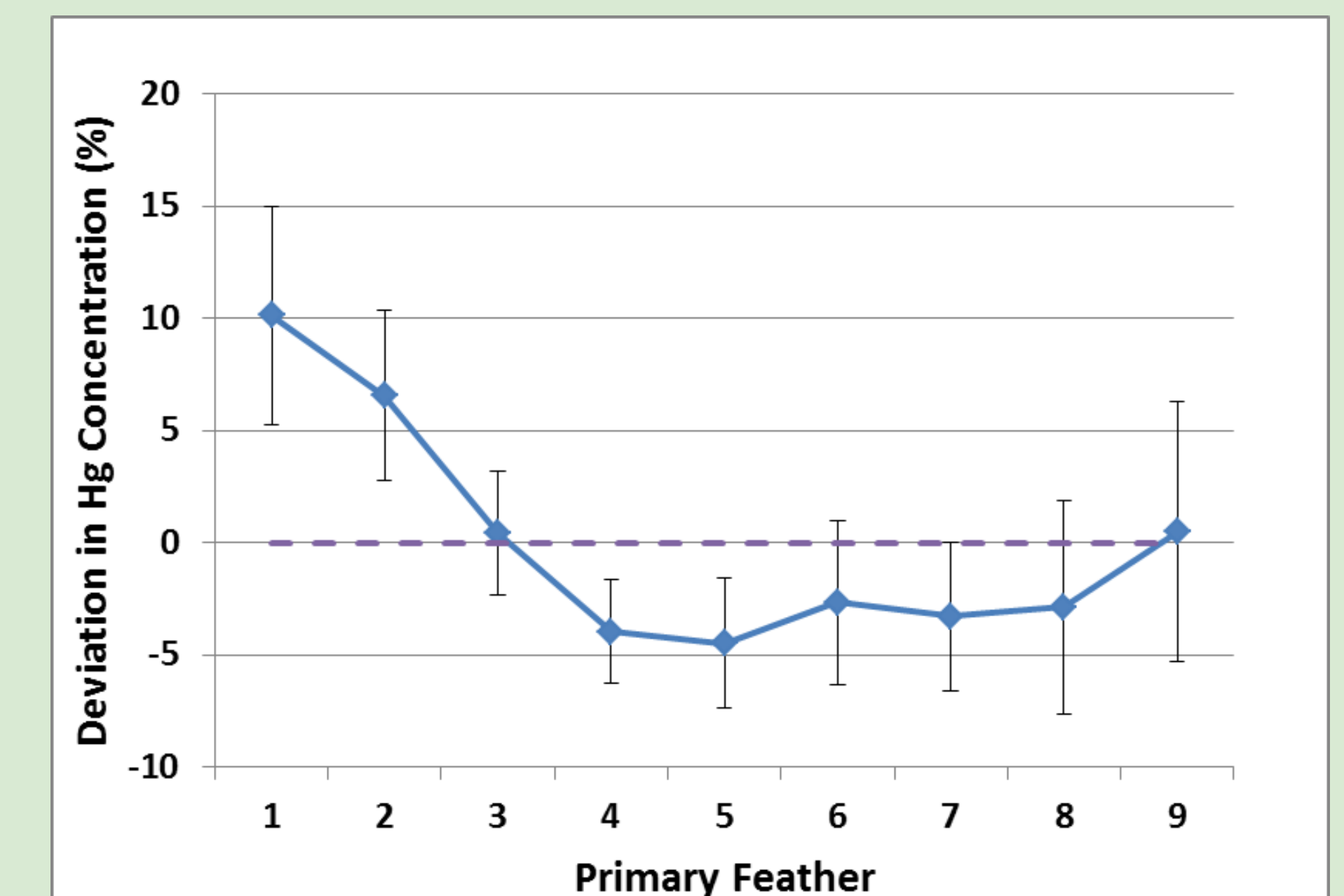


Figure 5: Deviation (percent) in feather Hg concentration is shown for each primary feather. This is the average deviation for the sample size.

## Challenges with Feathers

- Factors influencing Hg deposition to feathers:
  - Diet shifts
  - Deposition into other body tissues and feather tracts may be occurring at the same time as primary feather growth.

## Path Forward

- Analyze tissue samples for mercury in the same specimens to compare with feather Hg concentrations.

## Acknowledgements:

USGS Contaminant Ecology Research Program: John Pierce, Lora Tennant, Erica Johnson, Jim Randolph

OSU - Fisheries and Wildlife Science Department

Chintimini Wildlife Center, especially Mary Estes

Bird Specimen Donors: Molly Monroe, Sean Murphy, Randy Moore, Nancy Allen, Jess Castillo, Jenna Curtis, Ben Frable, Evan Jackson, Scott Jennings, Megan Zarzycki, K. Starley