Snake fungal disease distribution in the Driftless Area, Wisconsin, USA

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Introduction:

Reported cases of snake fungal disease (SFD) have been increasing substantially as it spreads throughout the U.S. and into Canada. We are monitoring snake populations in Southwest Wisconsin for SFD which is a skin infection caused by the fungus *Ophidiomyces ophiodiicola.* This infection negatively impacts snake populations by restricting feeding and drinking capacities and increasing susceptibility to predation. Our observational study of SFD was conducted at Eagle Valley Nature Preserve in Glen Haven, Wisconsin, and in Memorial Park on the campus of the University of Wisconsin-Platteville.

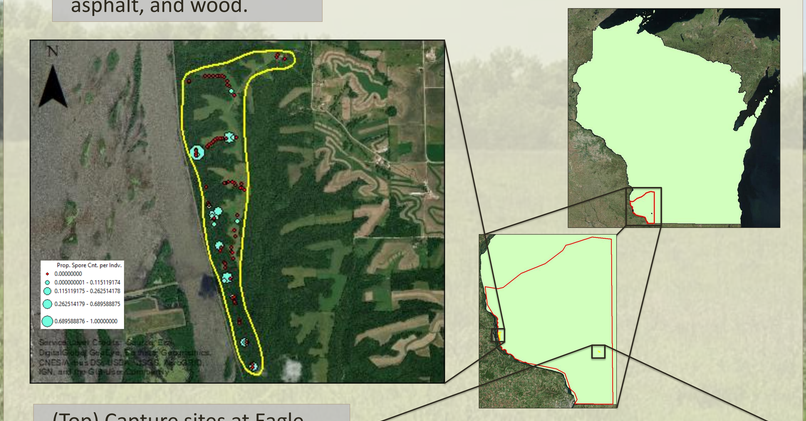
(Above) Seven species of snake were identified between both sites. (Top left and going clockwise) prairie ring-necked snake (*Diadophis punctatus arnyi*), common watersnake (*Nerodia sipedon*), eastern milk snake (*Lampropeltis triangulum*), gray ratsnake (*Pantherophis spiloides*), western wormsnake (*Carphophis vermis*), DeKay's brownsnake (*Storeria dekayi*), and plains garter snake (*Thamnophis radix*).

Methods:

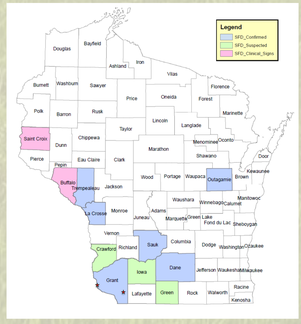
- Capture sites were haphazardly placed in both study areas in order to increase likelihood of snake presence
- Surveys were conducted over the course of seven months for sites located at Memorial Park and four months at Eagle Valley
- At each capture we recorded species identification, weight, length, temperature under cover board, environmental condition, capture location, cover type, visible signs of SFD infection, and each captured snake was swabbed and tested for SFD
- Shannon Wiener Diversity Index ($H = -\sum [(pi)*\ln(pi)]$), Pielou's Species Evenness Index ($E = H/H_{max}$), and species abundance were calculated for captures at both Eagle Valley and Memorial Park

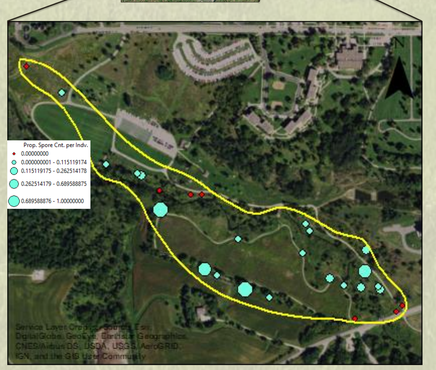
(Above) Each capture site at both study areas consisted of three cover board material types: tin, asphalt, and wood.

(Above) Four captured snakes exhibiting symptoms of SFD indicated in red
(Below) study sites in the state of Wisconsin



(Top) Capture sites at Eagle Valley Nature Preserve
(Below) SFD status by county

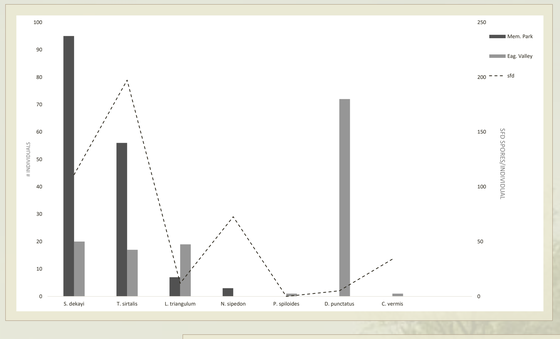




(Above) Capture sites at Memorial Park

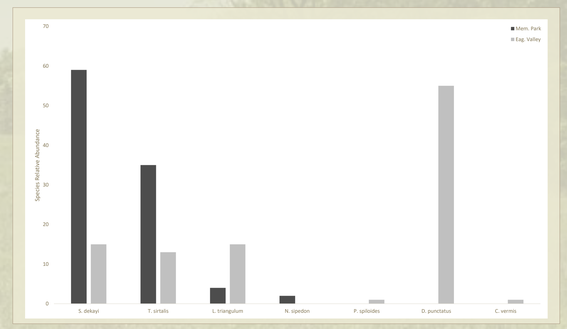
Results:

- *O. ophiodiicola* spores per individual (SPI) was calculated for each species: *S. dekayi* (111 SPI) , *T. sirtalis* (197 SPI) , *L. triangulum* (12 SPI), *N. sipedon* (73 SPI) , *D. punctatus* (5 SPI), and *C. vermis* (34 SPI). No captured *P. spiloides* individuals exhibited signs of SFD.
- Eagle Valley had a species richness of 6, Shannon Wiener Diversity Index of 1.24, and Pielou's Evenness Index of 0.69
- Memorial Park had a species richness of 4, Shannon Wiener Diversity Index of 0.89, and Pielou's Evenness Index of 0.64



Number of individuals by species for both study sites with spores per individual (SPI) overlayed

Relative abundance of each captured species for both study sites



Discussion:

- Known as the rarest snake in Wisconsin, 3 *C. vermis* individuals were captured on the Eagle Valley site where they historically have not been found, thus expanding the range of this species
- *D. punctatus* was only present at the Eagle Valley site which may be due to habitat bias towards relatively undisturbed and/or more xeric locations; the opposite may help explain abundances of *S. dekayi* and *T. sirtalis* at the Memorial Park site, which is more riparian and mesic
- Highest occurrence of SFD was found with *S. dekayi* and *T. sirtalis*, which also had the highest rate of capture at Memorial Park

Conclusions and Future Research:

- Snake fungal disease was confirmed to be affecting *S. dekayi*, *T. sirtalis*, *L. triangulum*, *N. sipedon*, *D. punctatus*, and *C. vermis* at our sites
- Four species of conservation concern were found on the Eagle Valley site, including prairie ring-necked Snake, western wormsnake, timber rattlesnake (not captured), and gray ratsnake
- More studies need to be conducted to accurately address how environmental variables such as temperature influence the intensity of *O. ophiodiicola* on host snakes
- Future studies can help identify locations and species that may be more susceptible to this pathogen