Unnatural Occurrences at the Missouri / Kansas Border!

Or

Why We Should Be Working With Other States to Understand Species Distributions In Missouri

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Herpetology Halloween!
Introduction

- General Observations
- Missouri Herpetology
- Ecoregions
- Missouri / Kansas Species Maps
- Other States
- Summary
General Observations

- Uncommon species or common species at the edge of their range tend to be over-represented in state collections.
- Collectors often exhibit an affinity to their own state and an aversion to regular collecting in nearby states.
- Areas of higher diversity are often collected more often than areas of lower diversity.
General Observations

- The result is often a “shadow effect” on one or more borders, often in the eastern, southern, or southeastern border of a state. Why?
- One would expect species distributions to more closely follow ecoregions rather than state boundaries.
- For many reasons, recent records are more reliable than older records. Why?
Missouri Herpetology

- Missouri has not been thoroughly explored herpetologically, even now.
- Missouri collecting has been concentrated around hotspots:
  - Ozarks
  - Urban centers
  - Favorite field trip locations (Mingo, Hercules)
- Prairie areas have mostly been ignored.
Missouri Herpetology

- Each state, including Missouri, has a unique biologist history and “culture” and this affects collecting activity and collections management.

History

- Classic Period (1890 – 1965)
- Modern Period (1987 – present)
Classic Period

- Classic Period (1890 – 1965)
  - Starts with earliest collections in the 1800s but these are rare
  - Julius Hurter (1842 – 1916)
  - Paul Anderson (1914 – 1962)
  - Ends with Anderson’s *Reptiles of Missouri* (1965)
Research Period

  - Many universities involved in active field research around the state but there is little interest in species distributions
  - Universities are building collections at this time but not necessarily for distribution records
Modern Period

Modern Period (1987 – present)

- Starts with Johnson’s *Amphibians and Reptiles of Missouri* (1987) (although several collections are not represented)
- There is a renewed interest in distribution and a push to fill in “county records”
- Most collections are single specimens, salvaged roadkill or photographs
- A focus on distribution continues today with annual updates to the *Atlas*
Ecoregions

- Level I and II are very broad
- Level III Ecoregions (general)
- Level IV Ecoregions (specific)
- Source: EPA
  (http://www.epa.gov/wed/pages/ecoregions.htm)
Missouri / Kansas Maps

- Shadow effects
- Great Plains “toads”
- Unnatural occurrences!
- Northern prairie relicts
Shadow effect

**Pseudacris crucifer**
(Spring Peeper)

- 1890 – 1965 (Classic Period)
- 1966 – 1986 (Research Period)
- 1987 – 2006 (Modern Period)
Shadow effect

*Pseudacris crucifer* (Spring Peeper)

1890 – 1965 (Classic Period)

1966 – 1986 (Research Period)

1987 – 2006 (Modern Period)
Extremely shadow effect!

*Eurycea longicauda, Eurycea lucifuga, Eurycea spelaea, Eurycea tynerensis*
Extreme shadow effect!

Eurycea longicauda, Eurycea lucifuga, Eurycea spelaea, Eurycea tynerensis
Extreme shadow effect!

Eurycea longicauda, Eurycea lucifuga, Eurycea spelaea, Eurycea tynerensis
Great Plains “toads”

Bufo cognatus, Bufo woodhousii, Gastrophyne olivacea, Spea bombifrons
Great Plains “toads”

Bufo cognatus, Bufo woodhousii, Gastrophryne olivacea, Spea bombifrons
Unnatural occurrences!

Rana blairi
(Plains Leopard Frog)

Eumeces obsoletus
(Great Plains Skink)
Unnatural occurrences!

Rana blairi
(Plains Leopard Frog)

Eumeces obsoletus
(Great Plains Skink)
Another anomaly

Sceloporus consobrinus
(Fence Lizard)
Another anomaly

Sceloporus consobrinus
(Fence Lizard)
Northern prairie relicts

Eumeces septentrionalis
(Northern Prairie Skink)

Sistrurus catentus
(Massasauga)

Thamnophis radix
(Plains Garter Snake)

Liochlorophis vernalis
(Smooth Green Snake)
Northern prairie relicts

- *Eumeces septentrionalis* (Northern Prairie Skink)
- *Sistrurus catentus* (Massasauga)
- *Thamnophis radix* (Plains Garter Snake)
- *Liochlorophis vernalis* (Smooth Green Snake)
Other States

- Sharing atlas data with neighboring states can reveal interesting distribution patterns.
- Some states do not have active atlas programs—KS, IL, (IA), (AR), (TN).
- States with “artificial” boundaries are more likely to reveal interesting patterns.
Missouri Possibilities

- Scarlet snake records in the NE AR Ozarks are in the same ecoregion as the SE MO Ozarks, a poorly explored area.

- Northern leopard frogs (*Rana pipiens*) and Plains garter snakes (*Thamnophis radix*) occur in several southern Iowa counties without corresponding Missouri populations.

- Extant populations of smooth green snakes (*Liochlorophis vernalis*) are known within a few miles of the MO – NE border.
Summary

- Distribution anomalies exist at state borders (e.g., Missouri / Kansas) but many (not all) can be explained by collecting history in each state.

- We need to:
  - Spend more time exploring the western and northern prairie regions of Missouri.
  - Work with other states and know what’s going on there—particularly Kansas, Iowa, Arkansas, and Oklahoma, those states that share an “artificial” boundary with Missouri.
References

- Amphibians and Reptiles in Kansas (Collins 1993)
- Census Bureau ([http://www.census.gov/](http://www.census.gov/)) for maps
- EPA ([http://www.epa.gov/](http://www.epa.gov/)) for ecoregions
- The Amphibians and Reptiles of Missouri (Johnson 1987, 2000)
- The Reptiles of Missouri (Anderson 1965)