Seasonality and Occurrence of the Striped Bark Scorpion (*Centruroides vittatus*) in Franklin County, Nebraska

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Abstract – In the United States, research on scorpions has largely focused on arid environments, yet species like the Striped Bark Scorpion (*Centruroides vittatus*) also inhabit other ecosystems such as grasslands. This study documented the seasonal activity of this scorpion in southern Nebraska, where it represents the northernmost part of its distribution. Additionally, Franklin County, Nebraska, now represents only the second county in the state with published observations for the species. We conducted surveys at Ash Grove Wildlife Management Area (WMA) from 2023 to 2025 and observed that scorpions were active from March to October. At night individuals primarily occupied rocky outcrops in grassland or nearby herbaceous vegetation. Our study expands knowledge of the Striped Bark Scorpion at this northernmost part of its distribution. Understanding its behaviors and ecological interactions can provide insight into energy flow and trophic dynamics, laying the groundwork for future research on scorpion studies in the central Great Plains.

Scorpions are considered model organisms when studying arid ecosystems due to their abundance, ease of observation with ultraviolet light (UV), and their unique mode of external prey digestion (Polis 1990, 2001). Such traits have made scorpions central to numerous ecological studies, particularly in understanding predator prey dynamics, energy flow, and biotic and abiotic interactions in arid environments (e.g.; Polis 2001; Brown et al. 2002; McReynolds 2004, 2020). However, much research has focused predominantly on arid ecosystems, leaving scorpion biology in other habitats understudied. Semi-forested and prairie ecosystems in the Great Plains of the United States, for example, are home to scorpion species such as *Centruroides vittatus* (Say) (Striped Bark Scorpion), yet little is known about their behavior or ecological roles in these regions (Shelly and Sissom 1995, Yamashita 2004). This species is particularly suited for ecological research because it thrives in diverse habitats, including deserts, woodlands, and grasslands, and spans a broad geographical range from eastern New Mexico to western Louisiana and from northern Mexico to as far north as Thayer County, Nebraska (Shelley and Sissom 1995).

Our main objectives for this study were to document the seasonal activity of the Striped Bark Scorpion in Franklin County, Nebraska, and to document this as the second county of occurrence for this species in the state. While ecological research on this species has been conducted in southern and western Texas (Brown et al. 2002; McReynolds 2004, 2020) and northwestern Arkansas (Yamashita 2004), to our knowledge not a single study has yet to explore its biology in more northern habitats. This gap in the literature highlights the need to better understand its adaptability and ecological roles across different environments.

This study was conducted at Ash Grove Wildlife Management Area (WMA) in Franklin County, Nebraska. Ash Grove WMA encompasses 31 ha of gently rolling hills dominated by mixed-grass prairies. The eastern portion of the property has a seasonal earthen pond connected to a temporary creek that runs through the property on wetter years. Scattered rocky limestone outcroppings occur mainly on the northern half of the property. Dominant

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vegetation at Ash Grove WMA around areas of rocky outcrops consist mainly of *Bromus inermis* Leyss. (Smooth Brome), *Schizachyrium scoparium* (Michx.) Nash (Little Bluestem), *Andropogon gerardii* Vitman (Big Bluestem), *Juniperus virginiana* L. (Eastern Red Cedar) and *Rhus glabra* L. (Smooth Sumac) thickets. Franklin County receives a mean annual total precipitation of 65.7 cm (NOAA 2025). Seasonal temperature variations are great, with monthly mean average temperatures 25.1°C in July and -2.6°C in January for data from 2000 to 2022 (NOAA 2025; Franklin # 2 station).

We first documented Striped Bark Scorpions at Ash Grove WMA in 2021 when searching for herpetofauna under rocks. Following our initial sighting, opportunistic observations continued until we formalized data collection in 2023 and sampled on at least a monthly basis during the warmer months. Both diurnal and nocturnal sampling methods were used to maximize detection, with sampling sessions generally lasting around an hour. Daytime surveys included systematic rock-flipping to locate scorpions sheltering beneath rocks and within crevices. For our nighttime surveys, conducted within two hours of sunset, we used UV lights (uvBeast™ V1 X0012ZGOQ7 and V2 X001O91ZLF) to observe scorpions, capitalizing on the natural fluorescence of scorpion exoskeletons when exposed to UV illumination (Cowles 2018). For each observed individual in 2023 through 2025, we documented environmental parameters including general location, microhabitat (e.g., under rock, on rock, in vegetation), and daily high temperature. Data collection aimed to document seasonal activity and habitat used by individuals, with potential environmental attributes influencing scorpion occurrence within the study area.

Striped Bark Scorpions were first observed at Ash Grove WMA on 22 September 2021. We conducted 26 sampling sessions from 2023 to 2025, with a total of 396 observations of scorpions. All observations of individuals occurred between 28 March and 20 October. Scorpions were observed in both diurnal and nocturnal surveys, with notable differences in behavior and visibility. During daylight hours, individuals were exclusively located beneath rocks. At night, scorpions emerged and were frequently observed amongst rocks or in herbaceous vegetation in or near rocky outcroppings. The greatest number of observations tended to be during summer with lower numbers per unit effort in spring and autumn (Table 1). We did not directly observe mating, individuals consuming prey, or climbing behavior during our surveys.

This study provided the first known documentation of Striped Bark Scorpions in Franklin County, Nebraska, extending its known range within the state. Previously, this species was documented only from Thayer County, another county bordering Kansas, three counties to the east of Franklin County (Shelley and Sissom 1995). This demonstrated that its distribution in Nebraska is broader than previously understood and highlights the importance of continued field surveys to refine the species distribution. We suspect the species might also occur in Nuckolls and Webster counties, the two counties between Franklin and Thayer counties, in rocky outcrops in grasslands. Additionally, scorpions might occur in any rocky habitats in southern Nebraska along the Kansas border, albeit there are not many rocky habitats in the region as these rocky areas generally are isolated.

Seasonal activity of scorpions was recorded from 28 March to 20 October in Franklin County, which included finding individuals under rocks at the ground surface. In northwestern Arkansas, scorpions were active aboveground away from rocks from 1 April to 21 November, but the author noted finding individuals under rocks only on warm days in December and January (Yamashita 2004). Nothing was stated about scorpions in February–March in the paper (Yamashita 2004). Given that Franklin County is located at a more northern latitude, a shorter activity season would be expected compared to populations

Table 1. Monthly scorpion observations in 2021 and from 2023 to 2025, mainly counting individuals documented under rocks during daylight hours in Franklin County, Nebraska. If a month is not given, no sampling occurred. CPUE = Catch Per Unit Effort (Total Scorpions Observed / (Total Time x Total Observers)).

Month and Year	Total Scorpions Observed	Total Sampling Session	Total Observers	Daytime High Average (°C)	Total Time (hrs)	CPUE
Sept 2021	30	1	20	12.8	1.5	1.00
Apr 2023	77	2	14	27.5	2.0	2.75
Sept 2023	40	3	7	28.7	3.0	1.90
Oct 2023	21	5	5	19.9	5.0	0.84
Apr 2024	38	2	3	15.9	2.0	6.33
Jun 2024	40	2	2	24.2	1.5	13.33
Jul 2024	44	1	1	21.1	1.0	44.00
Aug 2024	45	2	3	25.8	2.5	6.00
Sept 2024	23	2	2	19.7	2.0	5.75
Oct 2024	19	5	5	23.0	4.5	0.84
Nov 2024	0	1	1	13.9	1.0	0.00
Mar 2025	19	1	1	26.7	1.0	19.00

to the southeast in Arkansas. The seasonal activity period appears to correspond in part with regional climatic temperature regimes, as lower temperatures in late fall and winter reduces scorpion activity (Yamashita 2004). At more southern latitudes this species has been observed active year-round (McReynolds 2020). Temperature alone may not fully explain seasonal variation in observed scorpion numbers, as other environmental factors, such as precipitation levels and moon phases can influence overall scorpion activity as well (Bradley 1988).

While we did not observe behaviors such as climbing, feeding, or mating during our study, our findings nonetheless documented the presence and seasonal activity of Striped Bark Scorpions. These results provide a valuable foundation for future research in Nebraska and other areas of the central Great Plains. Investigating this species at the northernmost extent of its range has the potential to advance our understanding of scorpion biology and ecology.

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