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NOTE

Mating behavior of Eastern Spotted Skunk *Spilogale putorius* Linnaeus, 1758 (Mammalia: Carnivora: Mephitidae) revealed by camera trap in Texas, USA

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Eastern Spotted Skunks *Spilogale putorius* are an understudied small carnivore listed as 'Vulnerable' by the International Union for Conservation of Nature (IUCN Red List; Gompper & Jachowski 2016), and Vulnerable or Imperiled in most states across their range (Trani et al. 2007). Prairie Spotted Skunks *Spilogale putorius interrupta* are listed as a Species of Concern by the United States Fish and Wildlife Services (USFWS; USFWS 2012). Eastern Spotted Skunks were a common furbearer species throughout the eastern and midwestern United States (Kinlaw 1995; Sasse 2017; Eng & Jachowski 2019), before suffering a notable range-wide decline in the mid-1900s (Gompper & Hacket 2005). The cause of this decline and factors shaping their current distribution are not well understood, although overexploitation, habitat loss, and pesticides likely contributed (Thorne et al. 2017; Eng & Jachowski 2019). As a result, current research has primarily focused on quantifying abundance, occupancy, and habitat relationships (Lesmeister et al. 2009; Thorne et al. 2017; Perry et al. 2018; Eng & Jachowski 2019), and determining effective methods of detection which is often as low as 1.6 or 2.8 detections/100 camera trap nights (Hackett et al. 2007; Eng & Jachowski 2019).

Minimal focus has been on studying the demographics or mating behavior of Eastern Spotted Skunks compared to areas such as habitat preferences and distribution, possibly due to the overshadowing knowledge gaps in these areas. Yet, demographic and mating behavioral information is crucial for effective management and conservation and should be a focal point for species of concern. For most solitary carnivores such as skunks, the distribution of females determines the distribution of males during the mating season (Sandell 1989), and male Eastern Spotted Skunk home range size grows substantially during mating season suggesting questing behavior (Lesmeister et al. 2009), although no study has directly examined this. The only detailed demographic study with cause specific mortality for Eastern Spotted Skunks found a low mean annual survival of 0.354 (95% CI= 0.339–0.368) with similar estimates across age and sex categories (Lesmeister et al. 2010). Two studies monitoring Eastern Spotted Skunk den sites documented food provisioning by females to juveniles, demonstrating parental care and providing information

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Figure 1. Photographs via camera trap of Eastern Spotted Skunks mating on Fort Hood Army Installation. Photographs show the male on top of the female and biting her nape in the first picture but not the second. The date and time are documented in upper left corner of each photographs.

about prey selection (mainly herpetofauna and small mammals in these studies, Sprayberry & Edelman 2016; Thorne & Waggy 2017). Like other solitary carnivores, male Eastern Spotted Skunks likely mate with many females during a mating season and do not remain with any female or contribute to offspring care (Sandell 1989). Other similar studies focused primarily on den site selection which is important for adult survival as well as the care and protection of offspring. Sprayberry & Edelman (2018) found that in forests, Eastern Spotted Skunks preferred to den in dense vegetation with ample understory, likely for protection from predators. Contrarily, Harris et al. (2020) found that in dry prairies, den site characteristics were more important than habitat characteristics and breeding females preferred small mammal burrows. To our knowledge, no studies have been published on Eastern Spotted Skunk mating or communication behaviors.

We used camera traps to monitor wildlife at Fort Hood, an Army installation in central Texas, USA. Fort Hood is a de-facto bioreserve with diverse habitats, protected from surrounding development (Hayden 2014). The Eastern Spotted Skunk population decline is likely due in part to habitat loss, making such bioreserves likely important refugia for the species (Gompper & Hackett 2005). We set 20 Reconyx (Hyperfire and Ultrafire; Reconyx Inc., Holmen, Wisconsin USA) camera traps 500m apart in each of seven grids (n= 140 camera trap locations, we moved cameras every five weeks) between December 2019 and May 2020 as part of a larger wildlife monitoring project aimed at understanding carnivore community structure (full details in Avrin et al. In Press). We programmed camera traps to take 10 photos each time the motion sensor was triggered with no delay between triggers. We took a total of 180,562 photos over 4,908 trap nights, including 2,224 independent capture events of carnivores and 56 independent capture events of Eastern Spotted Skunks (minimum time between independent captures= 30 minutes).

On 15 April 2020 at 04.57h one of our cameras captured images of two Eastern Spotted Skunks mating (Figure 1). The skunks were in front of the camera for six minutes, producing 200 images (Supplementary Material 1 <https://doi.org/10.6084/m9.figshare.14650320.v1>). The male appeared to follow the female before wrestling on top of her at 04.59h and biting her nape. They mated for approximately two minutes, the male maintained a hold on the female's nape intermittently throughout. The mating was very active, and the pair appeared to be wrestling during much of the time. The female ran off towards the east once the male let go and the male departed towards the south.

This observation adds to the minimal natural history knowledge of Eastern Spotted Skunks by providing insight into their mating behavior. Similar mating behavior, including the male biting the female while they wrestle, has been documented in Polecats *Mustela putorius* (Blandford 1987) and captive Pygmy Spotted Skunks *Spilogale pygmaea*, though these species exhibited longer mating durations (18 minutes–1 hour) than we documented. The captive spotted skunks had low conception and parturition success (1 out of 9 pairings produced live offspring; Teska et al. 1981) and it is unknown if wild spotted skunks have greater success. Eastern Spotted Skunks mate during March and April (Kinlaw 1995) similar to other carnivores with

defined breeding seasons in North America. Although we found no research on how Eastern Spotted Skunks find mates, most other solitary carnivores use scent marking to find and select mates (Allen et al. 2015, Kean et al. 2011). It is possible Eastern Spotted Skunks share these and other behavioral and demographic traits with other carnivores, but further research is needed to understand how they find and select mates, their reproductive success, and other aspects that affect the fecundity of wild populations. As a species of concern across its range, such information could prove crucial to conservation and management efforts.

Our detection of Eastern Spotted Skunks mating highlights the utility of camera traps for documenting rarely observed behaviors while monitoring wildlife (Caravaggi et al. 2020). Depending on the study design, remote recording may allow for documentation of rarely exhibited behaviors unbiased by human presence (Pesendorfer et al. 2018; Farías-González & Vega-Flores 2019; Caravaggi et al. 2020). Adjusting camera settings (i.e., increasing the number of pictures taken per trigger, decreasing lag times between triggers, or taking videos) can further improve the likelihood of capturing behaviors. We encourage researchers to publish such documentation of rare or novel behaviors as they add to the collective knowledge and inspire more in-depth future research.

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