

Burrow Excavation by an Eastern Spotted Skunk and Visitation by a Long-tailed Weasel

Gregory P. Detweiler^{1,*}, Stephen N. Harris¹, Colleen Olfenbutter², and David S. Jachowski¹

Abstract - In this field note, we detail video evidence of *Spilogale putorius* (Eastern Spotted Skunk) further excavating a den site that was subsequently visited by *Mustela frenata* (Long-tailed Weasel). In October 2019 in Burke County, NC, we tracked a radio-collared Eastern Spotted Skunk to a small ground burrow. A camera trap was set outside the den entrance for 7 days. During this period, we observed that the burrow was occupied by 1 or more individual spotted skunks, and concurrently occupied by 2 spotted skunks on at least 1 occasion. The burrow was further excavated by 1 of the spotted skunks, representing the first recorded footage of this behavior in the Eastern Spotted Skunk. On 1 occasion, between visits to the den by the spotted skunks, a Long-tailed Weasel investigated the burrow. This observation represents one of the first close associations between these cryptic species.

Spilogale putorius (L.) (Eastern Spotted Skunk) is a small skunk native to much of the central and southeastern United States (Kinlaw 1995) that has undergone a range-wide decline since at least the middle of the 20th century (Gompper and Hackett 2005). *Spilogale p. putorius* (L.) (Appalachian Spotted Skunk) is a subspecies of the Eastern Spotted Skunk that occurs in forested environments throughout the Appalachian Mountains (Diggins et al. 2015, Eng and Jachowski 2019a, Sprayberry and Edelman 2018, Thorne et al. 2017). Dens are particularly important to the Eastern Spotted Skunk, a small carnivore, because they provide secure rest areas, refugia from inclement weather and predation, and protected locations to raise young (Crabb 1948). Eastern Spotted Skunks in forested environments have been reported denning in a variety of structures, including rocky outcrops, ground burrows, tree cavities, tree root systems, woody debris, and nests of *Neotoma floridana* (Ord) (Eastern Woodrat) (Eng and Jachowski 2019b, Lesmeister et al. 2008, Sprayberry and Edelman 2018).

Our observations occurred as part of ecological research on Eastern Spotted Skunks in the South Mountains, a disjunct remnant of the larger Appalachian Mountains, in western North Carolina. The study site was a private preserve located in Burke County, NC, located in the Eastern Blue Ridge Foothills ecoregion where mixed *Quercus* (oak) or oak–*Carya* (hickory)–*Pinus* (pine) forests predominate (Griffith et al. 2002). The mountainous terrain (~350–650 m in elevation) at the site included several valleys and associated stream drainages. The dominant understory species along the drainages were *Rhododendron* spp., grading into areas of

¹Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC 29631. ²North Carolina Wildlife Resources Commission, Pittsboro, NC 27312. *Corresponding author - gdetweiler11@gmail.com.

predominantly *Kalmia latifolia* L. (Mountain Laurel) at higher elevations, culminating in areas of mature mixed forest with little to no understory at the peaks of ridges.

To better understand den-site selection by Eastern Spotted Skunks in western North Carolina, we trapped and fitted spotted skunks with very high frequency (VHF) radio-transmitter collars (Model #: M1740; Advanced Telemetry Systems, Inc., Isanti, MN) and tracked them to den sites during daytime hours. On 27 September 2019, we collared a 460 g juvenile female (Study ID: F4) that was of particular interest, as little is known about the behavior, movement ecology, or potential post-independence dispersal movements of juvenile Eastern Spotted Skunks. To monitor this skunk's behavior and ensure that the fitted collar was not adversely affecting the juvenile skunk as it grew, we placed a motion-activated camera trap (Strike Force HD Pro, Browning, Morgan, UT) at each identified den site throughout fall 2019. We set the camera trap to record 30 s of video with a 3-s delay between subsequent recordings. We followed American Society of Mammalogists (Sikes et al. 2016) guidelines and a Clemson University Animal Care and Use Committee protocol (AUP2017-065) for all field work involving spotted skunks in this study.

On 14 October 2019, we tracked F4 to a ground burrow with fresh soil at its entrance and subsequently placed the camera trap ~1 m from the den entrance. We left the camera on the den through 21 October 2019 (7 days). Also on 14 October 2019, we tracked a collared male spotted skunk (Study ID: M21) to a den site ~90 m away.

We observed F4 emerge from and return to the den on a number of occasions between 14 October 2019 and the morning of 16 October 2019 (see Table 1 for all

Table 1. Timeline of animal observations recorded by a motion-activated camera trap placed outside of a ground burrow in the South Mountains of western North Carolina, from 14 October 2019 to 21 October 2019. The burrow was known to be used as a den site by *Spilogale putorius* (Eastern Spotted Skunk). F4 refers to a radio-collared juvenile female Eastern Spotted Skunk, while M21 refers to a radio-collared adult male Eastern Spotted Skunk. [Table continued on following page.]

Date	Time (EDT)	Activity
15 October 2019	0422 h	F4 emerges from the den, sits at den entrance
	0425 h	F4 departs the area
	0527 h	F4 returns and enters the den
	0536 h	F4 emerges and departs the area
	0636 h	F4 returns and enters the den
	0807 h	<i>Tamias striatus</i> (L.) Eastern Chipmunk passes by the den area
	0809 h	F4 emerges briefly, then retreats into the den
	1928 h	F4 emerges and departs the area
	2254 h	F4 passes by the den area
	2322 h	F4 returns and enters the den
	16 October 2019	0438 h
0442 h		F4 passes by the den area
0643 h		F4 returns and enters the den
1925 h		F4 emerges and departs the area
2128 h		M21 approaches and enters the den
2133 h		M21 emerges and departs the area
2322 h		F4 returns and enters the den

observations of animals at the den site). The first notable event occurred on the evening of 16 October 2019, when F4 emerged and departed the den. Soon after, a second spotted skunk entered the den only to depart a few minutes later. This observation of 2 skunks using the same burrow was supported by differences in the black and white coat patterns of these skunks, with the white patch visible on the hind quarter of F4 appearing markedly smaller and less round than the white patch in the same location on M21 (Fig. 1). Less conclusively, the length of the tail fur of F4 appears shorter and less bushy than the tail fur of M21 (Fig. 1). We believe the second skunk was M21 based on the close proximity of his previous den to F4's den and the fact that this skunk also had a collar visible in the video footage. Later that evening, F4 returned and entered the den. Later that same night M21 attempted

Table 1, continued.

Date	Time (EDT)	Activity
17 October 2019	2347 h	M21 attempts to enter the den, but retreats and pulls soil from the den entrance
	2348 h	M21 continues excavating soil at the den entrance
	2352 h	M21 departs the area
	0039 h	M21 returns and continues excavating soil at the den entrance
	0042 h	M21 departs the area
	0048 h	M21 returns and continues excavating soil at the den entrance
	0050 h	M21 departs the area
	0609 h	F4 emerges and departs the area
	0629 h	F4 returns and enters the den
18 October 2019	0645 h	M21 attempts to enter the den briefly, but retreats and departs the area
	1924 h	F4 emerges from the den and begins grooming
	1929 h	F4 departs the area
	0041 h	F4 returns and enters the den
	0654 h	M21 enters the den and immediately retreats, expelling soil briefly before departing the area
	0659 h	M21 returns to the den, places head into the den entrance, then retreats and departs the area
	1910 h	F4 emerges from the den and begins grooming
	1914 h	F4 departs the area
	2241 h	M21 returns and enters the den
19 October 2019	2242 h	M21 emerges and departs the area
	2321 h	F4 returns and enters den
	1913 h	F4 emerges and departs the area
	1957 h	Long-tailed Weasel approaches and enters the den
	1958 h	Long-tailed Weasel emerges and departs the area
20 October 2019	2222 h	F4 returns and enters the den
	0111 h	F4 emerges and departs the area
	0331 h	F4 returns and enters the den
	0534 h	F4 emerges and departs the area
	0659 h	M21 returns and enters the den
	0909 h	Eastern Chipmunk passes the den area
21 October 2019	1923 h	M21 emerges and departs the area
	0045 h	M21 returns and enters the den
	0241 h	M21 emerges and departs the area

to enter the occupied den, placing its head into the burrow, before retreating from the burrow, expelling soil from the den entrance, and leaving the vicinity of the den entrance. Twice within the next hour, M21 returned to the den and excavated soil from the den entrance for 2–3 min before departing again (Fig. 2). The next activity of note occurred on the morning of 17 October 2019, when M21 again attempted (briefly) to enter the den while it was occupied by F4, before departing. Similarly, M21 arrived and entered the den while it was occupied by F4 on the morning of 18 October 2019, before immediately exiting the den, pulling some soil from the den entrance, and leaving the den area. M21 once again entered the den that evening, while the den was unoccupied by F4, but quickly departed.

Following these events, on 19 October 2019, a *Mustela frenata* Lichtenstein (Long-tailed Weasel) approached and entered the den (Fig. 3). The weasel

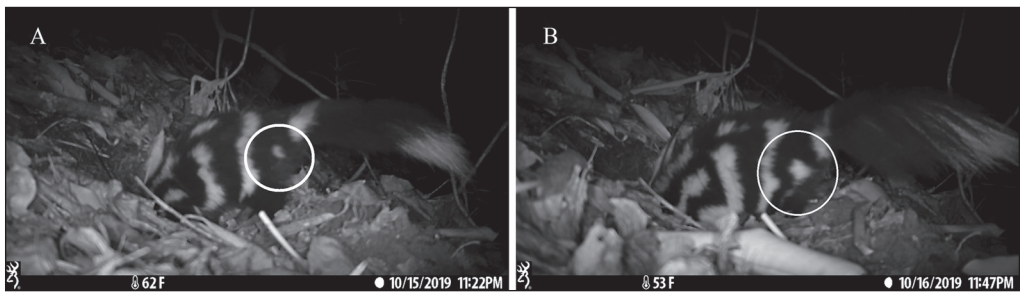


Figure 1. Two collared *Spilogale putorius* (Eastern Spotted Skunk), identified as (A) juvenile female F4 and (B) adult male M21, at the entrance of a ground burrow in the South Mountains of western North Carolina on 15 October 2019 and 16 October 2019, respectively. The white circles in A and B show the distinct white patch that differs between the 2 individuals.



Figure 2. *Spilogale putorius* (Eastern Spotted Skunk) expelling soil from a ground burrow in the South Mountains of western North Carolina, on 17 October 2019.

departed the den 1 min later. Following the Long-tailed Weasel's visit to the den, F4 visited the den on 2 other occasions that night. On the morning of 20 October 2019, M21 returned and entered the den, later emerging and departing from the den that evening. Our last observations before we pulled the camera occurred in the early hours of 21 October 2019, when M21 entered the den and later departed about 2 h later.

Subsequent to our removal of the camera, we tracked M21 to the burrow on 25 October 2019, after F4 was confirmed to have left the area. Later we tracked M21 to a different den site (ground burrow) on 11 December 2019, which F4 had occupied on 25 November 2019. These observations, along with the brief concurrent use of the ground burrow by 2 individuals, add to infrequent but increasing evidence that multiple Eastern Spotted Skunks may utilize the same den site (Eng and Jachowski 2019b, Harris et al. 2020, Lesmeister et al. 2008, Sprayberry and Edelman 2018). We are unsure as to why a female and male spotted skunk would be inclined to use the same den site outside of the breeding season, especially as ground burrows like this particular den site were readily available at the study site and in the immediate vicinity (G.P. Detweiler, pers. observ.).

Eastern Spotted Skunks are known to use burrows excavated by other mammals (Kinlaw 1995, Lesmeister et al. 2008), and it has been suggested that they can indeed dig their own burrows (Crabb 1948, Howell 1906, Seton 1929). Likewise, the closely related *Spilogale gracilis amphialus* Dickey (Island Spotted Skunk) is thought to excavate its own burrows, being the only burrowing animal that occurs on Santa Cruz Island, CA (Crooks 1994). To our knowledge, our observations of an Eastern Spotted Skunk digging part of a ground burrow is the first confirmation of



Figure 3. *Mustela frenata* (Long-tailed Weasel) at a ground burrow in the South Mountains of western North Carolina that was previously and subsequently used as a den site by 1 or more *Spilogale putorius* (Eastern Spotted Skunk). Photograph taken on 19 October 2019.

this species excavating any portion of a den site. Although the skunks in our video footage were improving an existing burrow, our observations suggest that Eastern Spotted Skunks can likely excavate an entire burrow on their own if soil conditions are amenable. Likewise, we believe our observation of a Long-tailed Weasel entering a burrow recently occupied by an Eastern Spotted Skunk is the first report of an association between these 2 mesocarnivores and potential competitors for food resources (Kinlaw 1995), though it has been suggested that Eastern Spotted Skunks may use burrows originated by Long-tailed Weasels (Crabb 1948). Our observations of the Eastern Spotted Skunk add novel information to a growing body of literature on the natural history and ecology of this cryptic, declining species.

Acknowledgments

The project was funded by the Pittman–Robertson Federal Aid to Wildlife Restoration Grant and is a joint research project between the North Carolina Wildlife Resources Commission and Clemson University. We thank R.L. Sparks and the Foothills Conservancy of North Carolina for providing property access and for their continued support of this research. We also thank C.G. Dukes with the North Carolina Wildlife Resources Commission for logistical support of this research.

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