WINTER ACTIVITY OF STRIPED SKUNKS

(Mephitis mephitis) IN EAST-CENTRAL MINNESOTA

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Abstract: The winter activity of 25 radio-tagged striped skunks was studied on the Cedar Creek Natural History Area during the winters of 1967-1968 and 1968-1969. A shift from aboveground and hollow log rest sites to underground dens by skunks began in early October. Den preparation and communal denning were other behavioral changes accompanying this shift. A reduction in home range size and level of activity was observed in October and November. Juvenile skunks showed higher levels of activity than adults in November. Skunks began winter denning in November and early December; juveniles were usually later than adults to begin winter denning. Eighty percent of all activity periods inside winter dens lasted 10 minutes or less. Skunks averaged one to three activity periods per day while inside their winter dens. The percentage of days on which activity inside dens occurred increased as the winter progressed, with juveniles showing a higher percentage of days with activity. Movements outside of dens were generally confined to an area near the den entrance. Snow depth appeared influential in limiting movements from dens. The mean length of the winter denning period was 90 days in 1967-1968 and 115 days in 1968-1969. Air temperature in an occupied skunk den averaged 4.5°C warmer than in unoccupied dens. Weight losses during the winter of 1967-1968 averaged 44.9 percent for males and 53.2 percent for females. The following year, weight losses for males averaged 53.9 percent and for females, 61.4 percent. Mortality related to winter denning was not significantly different between the two winters.

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INTRODUCTION

The periods of inactivity associated with winter denning of striped skunks have been referred to as hibernation (Hamilton 1937, Selko 1938, Jones 1939, Terres 1940), but Davis (1951) stated that striped skunks do not exhibit characteristics of true hibernation. Hock (1960) defined hibernation as a periodic phenomenon in which body temperature approaches ambient, and heart rate, metabolic rate, and other physiologic functions fall to minimum levels. Morrison (1960) stated that a slight reduction in metabolism would probably be necessary to allow skunks to survive on body reserves; however, Verts' (1967) data on rectal temperatures of skunks indicated no reduction in metabolic rate corresponding to decreasing ambient temperatures. Thus, skunks are not true hibernators.

In addition, skunks do not become torpid and difficult to arouse, as do most hibernators (Kayser 1961). Allen (1939) observed that skunks were readily aroused and capable of emitting musk when disturbed in their winter dens.

Although there is ample evidence that skunks remain in their winter dens for extended periods, little information is available on their degree of lethargy. Skunks were thought to "sleep" through the winter. Even true hibernators do not remain completely inactive in their dens but show periods of arousal and torpidity (Kayser 1961, Fisher 1964, Twente and Twente 1965). Verts (1967) reported on skunk activity occurring inside of a winter den. Data collected in December and January indicated activity but the lack of detected activity after January may have been because the skunk lost its radio-transmitter.

Additional information on winter activities of striped skunks is limited to observations of movements from dens and discussion of possible physical and biological factors associated with the timing of these movements (reviewed in Verts 1967).

STUDY AREA

This study was conducted during the winters of 1967-1968 and 1968-1969 on the 5,000 acre Cedar Creek Natural History Area, 30 miles north of Minneapolis, Minnesota. The topography is flat to gently rolling. Deciduous and mixed conifer upland areas are interspersed with abandoned and cultivated fields, bogs, cattail (Typha latifolia) marshes, white cedar (Thuja occidentalis) and alder (Alnus rugosa) swamps, two small lakes and a creek. Detailed descriptions of the area are available in Pierce (1954) and Bray et al. (1959).

METHODS

A total of 25 striped skunks were live-trapped, transported to the laboratory, anesthetized with ether, ear-tagged, sexed and aged. Each animal was equipped with a radio-transmitter collar (Cochran and Lord 1963, Mech et al. 1965) weighing approximately 80 grams and released where captured. Transmitters operated within the frequency range of 53.000 to 54.5000 megahertz. Activity and locations of radio-tagged skunks were monitored continuously by an automatic radio-tracking system (Cochran et al. 1965).

Activity of the skunks was determined by recording changes in amplitude of signal from the transmitters. When a radio-marked skunk

was inactive, the amplitude of signal remained relatively constant. When the animal moved and changed the position of the transmitter, slight shifts in tuning of the transmitter and changes in orientation of the transmitting antenna caused changes in amplitude of signal (Lord et al. 1962). Signals from the transmitters were received every 45 seconds from each radio-tagged animal within range of the tracking towers. Location and activity data based on these signals were permanently recorded on 16 mm film and manually read on a microfilm reader. Possibilities of error in determining activity on the basis of shifts in radio frequency were minimized by using a standardized film reading procedure. An animal was considered active during a five minute period (for example from 0000 to 0005) only if three sets of signals (one set recorded every 45 seconds) recorded during that period indicated activity.

Activity outside and inside of winter dens was determined by the presence or absence of tracks at den entrances and examination of the film record. If no tracks were observed outside the den, all recorded activity during the preceding 24 hours was classified as occurring inside the den; if tracks were observed all recorded activity during the preceding 24 hours for every animal in the den was classified as activity outside. Between 9 November 1967 and 7 March 1968, the location of nine radio-tagged skunks was checked daily with a portable direction finding receiver (Cochran and Lord 1963). Likewise, between 15 November 1968 and 15 March 1969, the location of 14 radio-tagged skunks was checked at least three days per week. Activity which occurred before

and after onset of winter denning, but prior to permanent snow cover was classified as activity outside. After permanent snow cover any tracks observed at den entrances were erased to facilitate identification of fresh tracks.

Analysis of winter activity within dens was conducted on 12 skunks (eight adults, four juveniles). Study animals which either lost transmitters, died during winter denning or whose field locations were too far from the tracking towers to provide adequate signal reception were excluded from analysis. Activity data from within winter dens were analyzed with regard to time, duration, frequency of activity, and age differences. Data from the two winters for adults and juveniles were pooled separately; thus individual differences and variations between the winters were not considered.

Pre-denning weights of skunks were obtained when study animals were trapped or recaptured for transmitter battery changes in the fall. When skunks emerged from dens in the spring they were recaptured and weighed to determine weight loss. The dens of radio-tagged animals which did not emerge in spring were excavated or wire-ferreted (Storm and Dauphin 1965) to obtain information on mortality.

Air temperatures within winter dens were measured from sensors located in seven skunk dens which had been occupied during the winter of 1967-1968. A wire-ferret was inserted into a den until nesting material (grass, leaves) was encountered; the end of the ferret and presumably the nest site was then located by probing with a slender metal rod and the thermocouple was inserted at this location.

Temperature readings at the nest sites were taken between 1200 and 1500

hrs at each den on four to seven different days during February and March 1969. These dens were later excavated to determine the depth and position of the sensor relative to the nest cavity. Weather data (Table 1) were obtained from a U.S. Weather Bureau Station on the study area.

RESULTS

Winter activity of each skunk and events related to the winter season were subdivided into three periods: (1) from approximately August until December (pre-denning period), this included events such as den preparation and selection, communal denning and fat deposition; (2) from approximately December until mid-March (denning period), this began with onset of denning which is the date an animal began using its winter den and made no subsequent den changes. It continued until a skunk emerged from its den. The criterion for emergence was daily movement from the den or movement to a different den. (3) from approximately mid-March until August (post-denning period), this included the events from emergence until the next pre-denning period.

PRE-DENNING PERIOD

The pre-denning period in skunks is characterized by several behavioral changes. A noticeable shift from use of aboveground and hollow log rest sites to underground dens by skunks began in early October (Houseknecht 1969). His study showed that by early November underground dens were used almost exclusively. While summer rest sites changed almost daily and apparently involved little preparation, fall dens were typically occupied on successive days for varying periods and

involved some preparation. Each skunk scraped large amounts of herbaceous ground cover (leaves, grass) into each den which it used, whether or not the den was later used as the winter den. The first date of observed den preparation in the fall of 1968 was 20 September, in the fall of 1969 it was 30 September (Houseknecht 1971). Allen (1939) frequently observed signs of den refurbishing in early October. Den preparation began well in advance of the winter denning period and usually involved many dens. For example, Skunk 1209 (juvenile male) prepared at least five dens between 9 November and 7 December 1967, none of which were used for its winter den.

No radio-tagged skunk was known to have previously used its winter den in the fall of 1967; however, no backlog of information on den use prior to 9 November was available. Data from the following years indicated prior use of a winter den was a common occurrence. Eight of 14 study animals in fall 1968 and four of five animals in fall 1969 had previously used their winter den (Houseknecht 1971). Winter dens selected by study animals were almost exclusively in upland habitats and on sloping terrain, indicating the possible importance of good drainage as suggested by Verts (1967).

Between April and October no animals, except females with young, were observed to den together (Houseknecht 1969). Communal denning was first recorded during fall 1967 and 1968 on 9 November and 17 October, respectively; it continued through the winter denning period and was last observed on 5 March 1968 and 3 April 1969. During the winter of 1967-1968 four of nine animals (44.4%) denned communally;

the five remaining animals did not den with other radio-tagged animals. The following winter eight of 14 animals (57.1%) denned communally. One radio-tagged adult male skunk and five radio-tagged females denned together, but were disturbed by a red fox (Vulpes fulva) on 18 December 1968 and separated to four different dens (Houseknecht and Huempfer 1970). One female skunk remained in the den following the encounter and was presumably killed. After this incident, six of 14 animals denned communally. The eight remaining animals did not den with other radio-tagged animals. These percentages represent minimum estimates of communal denning since some dens may have been occupied by both untagged and radio-tagged animals. It was not known whether animals that denned together were related.

Associations of one adult male skunk and several females in the same winter den have been reported by Allen (1939). Seton (1926) found 20 females and one male skunk in the same winter den. Adult male skunks are apparently intolerant of other males (Seton 1926, Allen and Shapton 1942) and adult males were not observed to den communally with other adult males in this study.

A reduction in home range size and amount of activity was observed in the pre-denning period. Houseknecht (1971) computed home ranges for selected 2-week periods from emergence in spring until onset of winter denning; he found that home range size for both adult males and females decreased during October and November. Accompanying this reduction was a marked decrease in level of activity. While each skunk was usually active during 60 to 100 percent of any hour of the night

in July, August and September (Houseknecht 1971), by November activity had dropped significantly (Figs. 1, 2). Variation in levels of activity appeared to be a differential response to some factor other than temperature. It suggests that some animals may be physiologically prepared for the winter denning period well in advance of actual denning. This may explain differences in levels of activity for adults and juveniles. Juveniles show higher levels of activity than adults (Figs. 1, 2) in November which may be related to a physiological state of preparedness since younger animals have had less time to prepare for winter denning. Juvenile ground squirrels (Citellus lateralis) were reported to accumulate fat later than adults (Jameson and Mead 1964).

WINTER DENNING PERIOD

The dates on which study animals began using their winter dens are presented in Table 2. Two skunks in the winter of 1968-1969 changed den locations every 2-3 weeks; their activities appeared to be influenced by a nearby dump containing animal carcasses. Juvenile skunks of both sexes were usually later than adults to begin winter denning.

While skunks were inside winter dens their activity periods were of short duration and occurred at a low frequency. In November and early December, when skunks were engaged in pre-denning activities, 70 percent of the activity periods lasted 35 minutes or longer (Table 3). By contrast, 80 percent of all activity periods inside winter dens lasted 10 minutes or less and no activity period was longer than 35 minutes (Table 3). The mean activity period for adults and juveniles inside

dens was six to seven minutes long with little variation throughout the winter (Table 4). Skunks averaged one to three activity periods per day. Activity inside dens did not occur every diel. The percentage of days on which it occurred increased as the winter progressed, with juveniles showing a higher percentage of days with activity throughout the winter (Table 4).

The temporal distribution of activity inside winter dens resembled the activity pattern observed in pre- and post-denning periods, although levels of activity were greatly reduced. While skunks were inside winter dens, 77 and 70 percent of the activity of adults and juveniles, respectively, occurred at night with peaks of activity occurring near sunset (Figs. 3, 4). During pre- and post-denning periods skunks were primarily active at night with activity beginning about sunset (Houseknecht 1971).

In December and March, when skunks made movements outside of winter dens, the activity pattern more closely resembled the pattern of non-denning months. This suggests the importance of environmental cues for maintenance of the activity pattern. Because physical conditions within an underground den covered by snow probably change very little on a daily basis except perhaps for light intensity at the den entrance, skunks would presumably have few external or exogenous cues available for maintaining the activity pattern.

It is doubtful that skunks are maintaining an activity pattern geared to endogenous system of food assimilation (Lord 1964) since they apparently do not cache food in winter dens. Reports (Allen 1939, Verts 1967) of dens containing side tunnels filled with skunk droppings

indicates some activity is related to elimination of metabolic waste products, but the periodicity of this activity is not known.

Movements outside of dens during both winters were generally confined to an area near the den entrance. Except for an adult male skunk which moved about 91 meters to a different den on 19 January 1968, no tracks exceeded a distance of 23 meters from the den entrance. It was impossible to relate short-distance movements to a particular animal because it was not known whether untagged skunks occupied dens with radio-tagged animals and because of accuracy limitations in the tracking system (Heezen and Tester 1967). Movements outside of dens were recorded on days with maximum ambient temperatures ranging from -1.1°C to -17.8°C but snow depth appeared more influential than cold temperatures in limiting movements from dens (Table 5).

Skunks traveled farther from their dens in late February and March than they did in December and January and these extensive movements are probably related to breeding activity and hunger. Three radio-tagged female skunks moved to the dens of an adult male between 3-21 March 1969. This was a reunion of animals forced from their den by a fox on 18 December 1968 (Houseknecht and Huempfer 1970). Their movements occurred at a time normally associated with the breeding season and may represent females searching for males. Male skunks are reported to make extensive movements during the breeding season, possibly in search of females (Allen and Shapton 1942, Selko 1938, Dean 1965, Ferris and Andrews 1966).

Striped skunks commonly remained in their winter dens from December until March with a yearly difference related in part to snow

conditions. During the winter of 1967-1968 only three of eight den entrances remained closed by snow from early January until late February and most animals were making daily movements from their dens by early March. The mean length of the winter denning period in 1967-1968 was 90 days with a range of 79 to 103 days. In the winter of 1968-1969 six of nine den entrances remained closed by snow from early December until mid-March and no radio-tagged skunk was known to have been outside of its winter den from mid-December until late February, a period of approximately 75 days. The mean length of the winter denning period in 1968-1969 was 115 days with a range of 91 to 135 days. No difference in mean length of the winter denning period was observed between adults and juveniles in either winter.

Included in the winter denning period were time periods when skunks were known not to have been outside of their dens; the longest such period was 83 consecutive days in 1967-1968. In 1968-1969, four skunks were known to have remained underground for more than 100 consecutive days and one of these, an adult male, was underground for 118 consecutive days. Similar observations have been reported for skunks in Illinois. Verts (1967) felt certain a juvenile female skunk had not left its winter den for a period of 87 days. Storm (1972) reported that an adult female skunk remained in a den for 62 days, and except for a single movement, would have been underground for 84 consecutive days.

Air temperature in an occupied den averaged 4.5°C warmer than in unoccupied dens. Temperatures in nest cavities of six unoccupied dens

and one occupied den were obtained between 7 February and 15 March 1969. Fifty-six to 36 centimeters of snow covered the ground during this period and mean ambient air temperatures ranged from 0.7°C to -20.7°C (Table 1). Excavation showed nest cavities were approximately 0.6 meters below ground surface. In the den occupied by at least two skunks, the average air temperature was 6.7°C with a range of 5.5° to 8.3°C . The average air temperature in unoccupied dens was 2.2°C with a range of 1.1° to 3.3°C .

Determination of caloric expenditures necessary to maintain a 4.5°C elevation of den temperature was not possible because the amount of heat lost to the surrounding soil and the den-soil interface temperature were not known. However, energy expenditures are undoubtedly high considering the internal body-den temperature gradient. Rectal temperatures of skunks housed in outdoor cages in Illinois averaged 35.7°C when the ambient temperature was about -5.5°C and 35.6°C with an ambient temperature of 4.4°C (Verts 1967). Den temperature data reported here further substantiate the fact that no large reduction occurs in metabolic rate. Hence, true hibernation by skunks does not occur during boreal winters.

POST-DENNING PERIOD

Data on weight losses for study animals are presented in Tables 6 and 7. Body weights were obtained from 14 animals within three weeks after emergence. In the winter of 1967-1968, weight losses for four males averaged 44.9 percent and for three females, 53.2 percent (Table 6). The following year weight losses for three males averaged 53.9 percent and for four females, 61.4 percent (Table 7). The

difference in mean weight loss between the two winters was significant ($t = 2.583$, 12 df, $P < 0.05$). Animals which emerged from the winter of 1968-1969 were very thin and weight losses probably approached the critical maximum. Similar weight losses were reported by Verts (1967) for skunks in Illinois. He recorded mean weight losses of 47.7 and 55.1 percent for males and females, respectively.

Mortality related to winter denning was not significantly different ($\chi^2 = 1.481$, 1 df) between the two winters. One juvenile female died during the winter of 1967-1968. It was active in its winter den until early January but no further activity was noted. Cause of death is unknown because excavation of the den showed the animal had been used as a food source. Five skunks died during the following winter. One animal was presumably killed by a fox and another was trapped under a building. Two adult female skunks, which were in the same den, died of unknown causes. A juvenile male skunk was active in its winter den until early January; its emaciated body was recovered in the spring. An adult female skunk died about one month after emergence, presumably from starvation. Parasite burdens and other diseases may have contributed to winter mortality or deaths following emergence, but no absolute evidence was collected.

DISCUSSION

Low ambient air temperatures, deep snow, and the unavailability of food appear to make winter denning essential to the survival of skunks in boreal winters. While many conditions in the den (e.g. amount and quality of insulation, number of animals) undoubtedly influence

energy expenditures, fat reserves are probably the most critical factor affecting winter survival. Skunks, like woodchucks and ground squirrels (Citellus lateralis, Eutamias speciosus, E. amoenus) attain maximum body weights in October and gradually lose weight during the winter (Verts 1967, Snyder et al. 1961, Jameson and Mead 1964). The time-giver (zeitgeber) associated with the annual rhythm of fat deposition in skunks is not known. Davis (1967) concluded that seasonal changes in weights of woodchucks resulted from an endogenous rhythm of food consumption.

The amount of fat accumulated is important because energy deficits must be met from body reserves. Dubinin and Leshkovich (1945) observed that some marmots (Marmota sibirica Radde) which had insufficient fat before going into hibernation either went into hibernation very late, or awakened before the snow melted, and died. Mech et al. (1968) reported that winter mortality of raccoons was greatest in juveniles, which are less capable of storing fat (Whitney and Underwood 1952). In skunks, adult females which bred late and their young would probably have insufficient time to acquire adequate fat reserves, although Verts (1967) recorded substantial weight increases for adult females in September and October. Animals suspected of having died from starvation in this study were either juveniles or adult females.

Recovery from severe weight loss is also important, especially at this time when caloric intake is minimal and loss of subcutaneous fat increases body heat loss. Skunks must travel widely in search of food and sustained snow cover and cold temperatures may kill animals that might otherwise have survived. Pregnant skunks would probably be under additional energy requirements.

Data from this study suggest that a skunk entering winter in central North America (permanent snow cover from about 30 November to 15 March) weighing 1.8 kg has little chance of surviving the winter. If the length of the winter denning period is extended another month beyond normal, fat reserves may become a limiting factor even for heavier animals.

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Table 1. Average maximum and minimum temperature, snowfall and estimated snow depth for 2-week periods.

		Ave. Temp. °C 1.7 Meters In Air In Woods		Cumulative Snowfall (cm)	Estimated Snow Depth (cm)
		Max.	Min.		
<u>1967-1968</u>					
Nov	1-15	5.5	-7.8	0	
	16-30	0.5	-8.8	0	
Dec	1-15	-2.5	-11.2	3.8	2.5
	16-31	-7.6	-18.0	4.6	2.5
Jan	1-15	-14.2	-24.9	23.7	15.2
	16-31	-1.4	-12.3	33.8	10.2
Feb	1-15	-6.0	-19.4	39.6	15.2
	16-29	-8.7	-19.9	43.4	12.7
Mar	1-15	1.8	-10.7	44.0	2.5
<u>1968-1969</u>					
Nov	1-15	4.6	-4.2	0	
	16-30	1.4	-7.0	17.1	7.6
Dec	1-15	-4.0	-11.7	34.9	10.2
	16-31	-9.8	-20.2	84.4	33.0
Jan	1-15	-13.0	-23.5	111.1	45.7
	16-31	-7.6	-17.0	142.2	60.9
Feb	1-15	-7.3	-20.7	147.9	55.9
	16-28	0.7	-8.8	154.9	53.3
Mar	1-15	-0.2	-15.4	155.5	35.6
	16-31	2.3	-9.2	163.2	17.8
Apr	1-15	13.4	1.0	163.8	5.1

Normal snowfall accumulation from November-March in Minneapolis, Minnesota (30-yr average): 124.2 cm. Normal period of permanent snow cover is 30 November to 15 March (Baker, Haines, and Strub 1967).

Table 2. Dates of striped skunk winter den selection.

1967-1968

Animal No.	Age	Sex	Date	Den No.	Location
1206	Juv	Female	11/09/67	50	Log pile
1207	Ad	Male	11/09/67	50	Log pile
1201	Ad	Male	11/13/67	3	Woods
1204	Ad	Female	11/13/67	3	Woods
1205	Juv	Female	11/16/67	16	Open field
1202	Ad	Female	11/18/67	190	Open field
1208	Ad	Female	11/23/67	40	Woods
1203	Ad	Male	11/26/67	5	Woods
1209	Juv	Male	12/08/67	22	Woods

Permanent snow cover -- December 10, 1967

1968-1969

Animal No.	Age	Sex	Date	Den No.	Location
1202	Ad	Female	11/14/68	173	Woods-open field edge
1248	Ad	Female	11/14/68	173	Woods-open field edge
1241	Ad	Male	11/14/68	20	Under building
1232*	Ad	Female	11/14/68	51	Woods
1233*	Ad	Female	11/14/68	51	Woods
1217	Ad	Male	11/15/68	193	Open field
1247	Juv	Female	11/15/68	194	Woods
1213	Ad	Female	11/18/68	196	Woods
1249	Ad	Male	11/19/68	197	Open field
1246	Juv	Female	11/22/68	51	Woods
1235	Juv	Male	11/26/68	201	Open field
1201*	Ad	Male	12/01/68	51	Woods
1244*	Juv	Female	12/01/68	51	Woods
1250*	Juv	Female	12/01/68	51	Woods

Permanent snow cover -- December 2, 1968

*Animals forced out of den by fox on 18 December (Houseknecht and Huempfner 1970).

Table 3. Length of activity periods for striped skunks during winters
of 1967-1968 and 1968-1969.

Length of Activity Periods
Outside of Dens from November
to early December
(min) N = 1010

Mean Percent S. D.

5	10.10 $\pm$ 8.30
10	5.10 $\pm$ 2.40
15	3.00 $\pm$ 1.40
20	2.97 $\pm$ 1.24
25	3.60 $\pm$ 0.90
30	1.50 $\pm$ 0.36
35	4.20 $\pm$ 3.90
> 35	69.53 $\pm$ 13.00

Length of Activity Periods
Inside of Dens from December
to mid-March
(min) N = 1145

Mean Percent S. D.

5	61.50 $\pm$ 0.59
10	18.40 $\pm$ 4.50
15	9.60 $\pm$ 4.10
20	4.90 $\pm$ 1.40
25	3.40 $\pm$ 2.40
30	1.50 $\pm$ 3.10
35	0.70 $\pm$ 1.30
> 35	0.00

Table 4. Activity for striped skunks inside winter dens.

	Mean Length of Activity Periods Inside Winter Dens (minutes)		Mean Number of Activity Periods Inside Winter Dens/Day Examined N = 565 N = 580		Percent of Days Examined Showing Activity Inside Dens	
	<u>Adults</u>	<u>Juveniles</u>	<u>Adults</u>	<u>Juveniles</u>	<u>Adults</u>	<u>Juveniles</u>
Dec.	6.30 $\pm$ 0.69	7.23 $\pm$ 1.46	1.50 $\pm$ 1.30	1.98 $\pm$ 1.59	58.5 (94)	60.3 (63)
Jan.	6.85 $\pm$ 1.51	6.15 $\pm$ 1.73	1.18 $\pm$ 0.68	2.37 $\pm$ 2.79	58.9 (151)	66.7 (63)
Feb.	7.31 $\pm$ 2.31	6.27 $\pm$ 0.66	1.56 $\pm$ 0.92	3.04 $\pm$ 1.75	64.1 (131)	87.3 (71)
Mar.	6.09 $\pm$ 1.18	6.64 $\pm$ 1.11	1.21 $\pm$ 0.41	2.31 $\pm$ 0.20	69.2 (26)	88.9 (25)

Number in parenthesis is number of days examined

Table 5. Movements outside of winter dens for striped skunks during periods of permanent snow cover.

Date	No. of Days	No. Dens Checked/Day	Total No. Times Tracks Observed	Percent Activity	Estimated Snow Depth (cm)
1967-1968					
December 10-15	6	7	1	2.4	2.5
16-31	16	7	7	6.3	2.5
January 1-15	15	7	5	4.8	15.2
16-31	16	8	8	6.3	10.2
February 1-15	15	8	4	3.3	15.2
16-29	14	8	18	16.1	12.7
March 1-6	6	7	33	78.6	2.5
1968-1969					
December 1-15	15	8	14	11.7	10.2
16-31	16	8	1	0.8	33.0
January 1-15	15	9	0	0.0	45.7
16-31	16	9	0	0.0	60.9
February 1-15	15	9	0	0.0	55.9
16-28	13	9	1	0.9	53.3
March 1-15	15	9	11	8.2	35.6
16-31	16	7	15	13.4	17.8

Table 6. Striped skunk winter weight losses.

1967-1968

Animal Number	Age	Sex	Date	Fall Weight (kg)	Date	Spring Weight (kg)	% fall Weight lost
1201	Ad	M	10/5/67	5.1	3/14/68	2.3	54.4
1202	Ad	F	10/5/67	3.5	3/14/68	1.5	57.9
1203	Ad	M	10/8/67	3.1	3/25/68	1.6	49.3
1204	Ad	F	10/11/67	2.9	3/18/68	1.5	47.6
1205	Juv	F	10/12/67	2.3	3/15/68	1.0	54.0
1206	Juv	F	10/20/67	1.8	died	-	-
1207	Ad	M	10/20/67	3.4	3/28/68	1.9	44.7
1208	Ad	F	10/23/67	3.5	not recaptured	-	-
1209	Juv	M	10/24/67	2.8	3/18/68	1.9	31.1

Percent weight loss computed from lbs.

Table 7. Striped skunk winter weight losses.

1968-1969

Animal Number	Age	Sex	Date	Fall Weight. (kg)	Date	Spring Weight (kg)	% fall Weight lost
1201	Ad	M	11/4/68	3.8	3/25/69	1.9	50.0
1202	Ad	F		-	died	-	-
1213	Ad	F	11/1/68	2.4	4/10/69	1.0	58.2
1217	Ad	M	10/22/68	3.3	4/4/69	1.2	63.0
1233	Ad	F	11/2/68	2.3	3/18/69	0.9	60.0
1235	Juv	M	10/23/68	1.8	died	-	-
1241	Ad	M	10/24/68	4.3	died*	-	-
1244	Juv	F	10/22/68	2.8	3/18/69	0.9	68.8
1246	Juv	F	10/23/68	3.2	died**	-	-
1247	Juv	F	10/24/68	2.0	not recaptured	-	-
1248	Ad	F	10/30/68	2.2	died	-	-
1249	Ad	M	11/2/68	3.5	4/30/69	1.8	48.7
1250	Juv	F	11/3/68	2.4	4/4/69	1.0	58.5

*Trapped under building by ice.

**May have been killed by fox on 18 December 1968.

Figure 1. Pattern of activity outside of dens for adult striped
skunks. (N = 8)

Figure 2. Pattern of activity outside of dens for juvenile striped
skunks. (N = 4)

Figure 3. Pattern of activity inside of dens for adult striped skunks.

(N = 8)

Figure 4. Pattern of activity inside of dens for juvenile striped
skunks. (N = 4)

Figure 1

Figure 2

Figure 3

Figure 4