JOURNAL OF THE TENNESSEE ACADEMY OF SCIENCE 79(4):91–93 OCTOBER 2004

TRAP SUCCESS OF STRIPED SKUNKS (*MEPHITIS MEPHITIS*) IN GREAT SMOKY MOUNTAINS NATIONAL PARK

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ABSTRACT—Trap success of striped skunks, *Mephitis mephitis*, is known to vary according to year, month, weather and sex of the animal. In this study, trap success was measured in a population of striped skunks in Great Smoky Mountains National Park. Traps were set along the Cades Cove Loop Road throughout 1993 and 1994 and in the spring of 1995 and 1996. Trap success dropped from 2.25% to 0% over this time, probably due to severe winter weather events. Forty-one percent of captures occurred in February and March, and 85% of skunks captured in February were male, suggesting that males were wandering further in search of food and mates in the spring.

Trap success of striped skunks, *Mephitis mephitis,* is influenced by variables such as year, month, weather, and sex of the animal. Several researchers have reported striking annual and/or monthly variation in striped skunk trapping success. For example, Rosatte et al. (1992) found trap success of striped skunks increased by 120% from 1987 to 1989 and decreased by 25% from 1989 to 1990. Anderson (1981) reported that monthly trap success varied from 1 to 35% over a period of 2 years. However, the reasons behind this variable trap success are not well understood.

Only one researcher (Bailey, 1971) has examined weather variables in relation to trap success in striped skunks. He found a negative correlation with barometric pressure, but no relation of trap success with temperature, precipitation, fog, sky cover, or winds.

Sex ratios of trapped skunks range from 1:1 (Stout and Sonenshine, 1974; Fuller and Kuehn, 1985; Greenwood et al., 1985; Sargeant et al., 1982) to significantly female biased (Bjorge et al., 1981). Some studies show great variation in sex ratio between years within one study (Verts, 1967; Goldsmith, 1981). Again, it is not clear why some studies reveal skewed sex ratios and others do not.

This study examines trap success in a population of striped skunks in Great Smoky Mountains National Park. The effects of year, month, weather, and sex of the animal are discussed.

METHODS

Study Area—Cades Cove is located in Blount County, Tennessee in the northwest portion of Great Smoky Mountains National Park (approximately 35°35′N, 83°51′W to 35°37′N, 83°46′W). It includes a campground, picnic area, Park Service buildings and the Cades Cove Loop Road. The Loop Road encloses approximately 8 km^2 of rolling hills and fields at an altitude of about 600 m. Outside the Loop Road the terrain is steeper, grading to an altitude of 800 m or more, and covered with cove-hardwood forest.

Trapping—Trapping was conducted from mid-January 1993 through March 1995 and February through mid-April 1996. Tomahawk cage traps # 105 were set shortly after dusk and checked just before dawn each day for a total of 3416 trapnights (0–27 trapnights/month; 1–42 traps/night, mode = 10 traps/night). Trapping effort was limited and variable due to the constraints of the author's graduate teaching schedule. Traps were baited with oil-packed tuna and most were set along the Loop Road either in culverts or in nearby woods. Traps also were set in the picnic area and campground. Captured skunks were anesthetized with a 4:1 mixture of ketamine hydrochloride and xylazine (Rosatte and Hobson, 1983). After taking basic data and a blood sample from each animal for use in other studies (Bixler, 2000; Bixler and Gittleman, 2000), skunks were allowed to recuperate from the anesthetic and then released at the point of capture.

Data Analysis—Recaptures were not included in any analyses. Shortly after sunrise each day in Cades Cove, Park personnel recorded the maximum and minimum daily temperatures and precipitation. The effect of each of these variables (maximum daily temperature, minimum daily temperature, precipitation) on the number of skunks trapped each day was determined by Pearson product-moment correlations. The sex ratio of trapped skunks was tested for deviation from 1:1 with a chi-square.

RESULTS AND DISCUSSION

The most dramatic result of this study was the decrease in annual trap success. Twenty-eight skunks were trapped in 1993 (2.25% trap success) and 13 in 1994 (1.14% trap success) but none were trapped in 1995 or 1996. The value for 1993 was within the range reported by others (Bjorge et al., 1981; Fuller and Kuehn, 1985). However, it seems remarkable that no skunks at all were caught in January, February or March 1995 or February, March or April 1996, even though the highest trap success in previous years was in February and March (see below). This suggests that the skunk population decreased greatly over the course of the study.

Other researchers have reported marked changes in trap success. For example, Fuller and Kuehn (1985) reported trap success of less than 1% in 1977; this increased to approximately 4% in 1980 and decreased to only about 0.5% by 1983 (numbers esti-

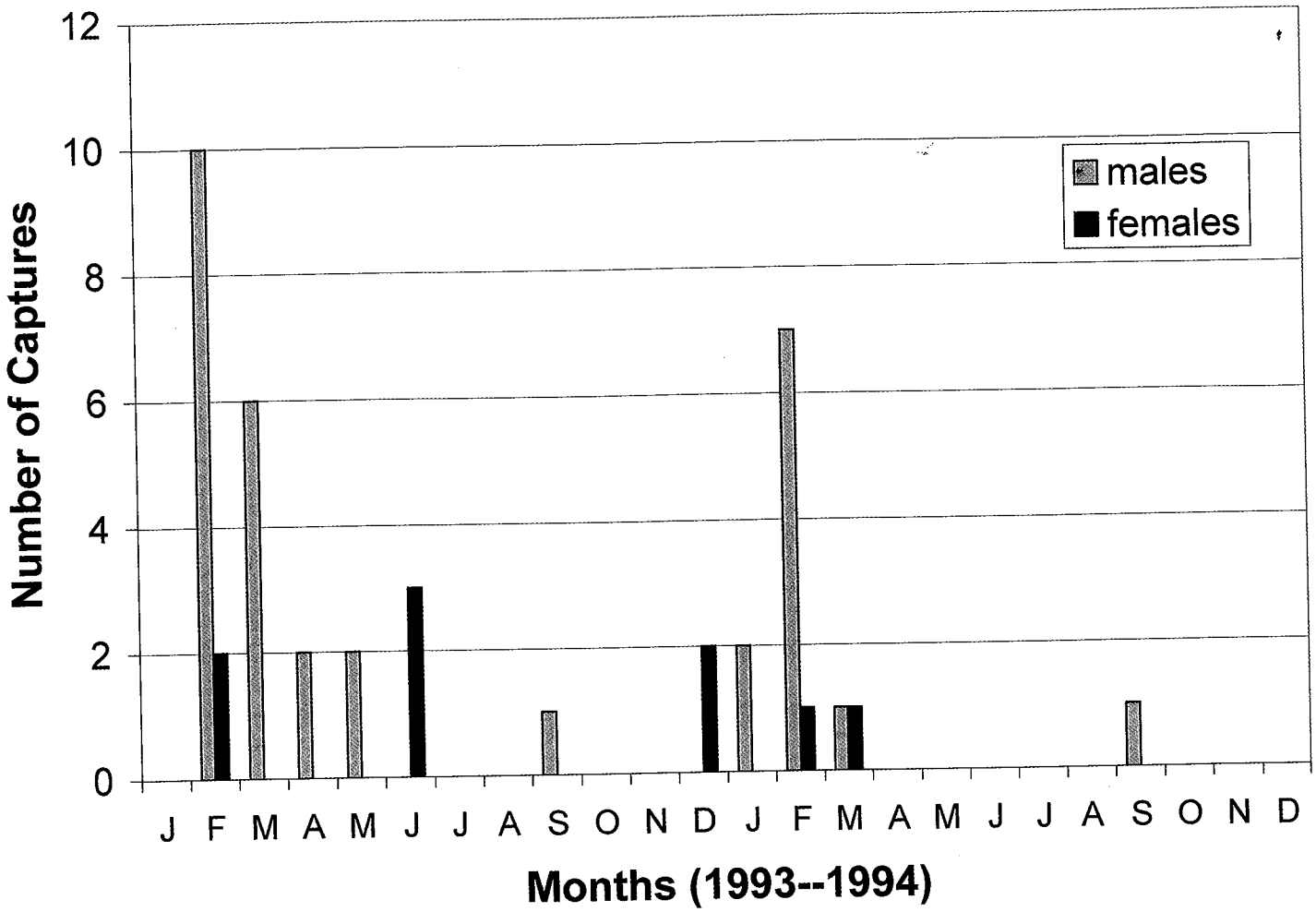

FIG. 1. Captures of male and female striped skunks in Cades Cove, Great Smoky Mountains National Park in 1993 and 1994. No skunks were caught during trapping sessions in January–March 1995 and February–April 1996.

mated from Figure 1, p. 814). There are a number of possible causes for this fluctuation, including diminution of trapping effort, trap avoidance or mortality, disease epizootics, and severe weather conditions.

The effect of trapnights in this study is difficult to evaluate because the number varied from month to month. However, fluctuations in trapping effort apparently had little effect on trap success. A linear correlation of the two parameters for each month shows little relationship between them ($r^2 = 0.14$). There was no indication that skunks learned to avoid traps, since several skunks were recaptured multiple times. Evidence from repeated captures of some skunks and radio-tracking others for up to 13 months (Bixler and Gittleman, 2000) suggests that the trapping program itself did not dramatically increase mortality. Decreases in striped skunk population size are often attributed to disease epizootics (Fuller and Kuehn, 1985; Wade-Smith and Verts, 1982) but no one working in the Park found any anecdotal evidence of disease in the study population.

Bjorge et al. (1981) suggested that population fluctuations were due to differential mortality and reproductive success following winters of variable severity, a factor that should not be important in the southern United States. However, the population decline in my study area began following a blizzard in March 1993 (snowfall in March 1993 = 4.2 cm; average snowfall in March 1994, 1995 and 1996 = 9.0 cm) and the worst flooding on record for the area in March 1994 (rainfall in March 1994: 31.2 cm; average rainfall in March 1993, 1995 and 1996: 14.5 cm). Since skunks breed in late February and March and have a life expectancy in the wild of only about 2 years (Wade-Smith and Verts, 1982), it is likely these unusual conditions caused the population decline: mortality of adults and juveniles increased and surviving adults were unable to reproduce successfully in the two consecutive years of bad weather. Since these weather effects were widespread, it is also unlikely that many skunks from outside Cades Cove would have moved into the area by 1995.

Monthly Trap Success—Trap success also varied by month (Fig. 1). In 1993 and 1994, 41% of the captures were made in February alone and most (61%) occurred in February and March together. However, as mentioned above, trap success was 0% for January–March 1995 and February–April 1996. Notably, 85% of the skunks captured in February were male and more than half (53%) of the total captures of males were made in February. Thus, trap success of males was much greater in February than the rest of the year.

These dramatic differences were probably due to the fact that males were wandering farther in search of food and mates during the spring, and were therefore more likely to be caught. Bailey (1971) also reported greatest trap success of males in March and

TABLE 1. Temperature and precipitation given as mean ± *SD* for those days on which traps were set.

Month	Maximum temperature (°C)	Minimum temperature (°C)	Precipitation (cm)
January	8.9 ± 6.2	−0.9 ± 6.3	0.6 ± 1.2
February	9.7 ± 7.0	−3.6 ± 5.5	0.6 ± 1.3
March	12.3 ± 6.7	0.6 ± 5.0	0.7 ± 1.0
April	25.1 ± 4.1	6.6 ± 5.4	0.6 ± 1.3
May	22.6 ± 4.7	8.3 ± 4.4	0.7 ± 1.5
June	27.5 ± 2.7	14.6 ± 3.0	0.5 ± 1.4
July	29.6 ± 2.1	17.1 ± 1.9	0.4 ± 0.6
August	27.0 ± 1.4	15.3 ± 2.2	0.0 ± 0.1
September	24.2 ± 3.2	10.6 ± 5.4	0.2 ± 0.6
October	22.4 ± 2.1	6.1 ± 5.0	0.3 ± 0.8
November	17.1 ± 5.2	1.7 ± 7.7	0.1 ± 0.2
December	13.0 ± 0.3	1.5 ± 6.1	1.0 ± 1.0

suggested his high trap success in March was due to sexual activity of males and the scarcity of food.

Effects of Weather on Trap Success—Average temperature and precipitation values recorded on days traps were set are reported in Table 1. The negative relationship between trap success and temperature is significant, despite the fact that r^2 values were quite low (maximum temperature: $r^2 = 0.084$, $n = 206$, $P < 0.0001$; minimum temperature: $r^2 = 0.086$, $n = 206$, $P < 0.0001$). However, this relationship appears to be due to the monthly differences in trap success noted above; temperature affects trap success only when the month of February is included in the analysis (for example, minimum temperature, February only: $r^2 = 0.0003$, $n = 32$, $P = 0.5139$; minimum temperature, all months but February: $r^2 = 0.013$, $n = 177$, $P = 0.5381$). There was no relationship between precipitation and trap success ($r^2 = 0.0003$, $n = 20$, $P = 0.8207$). Bailey (1971) found that trap success was unrelated to temperature, precipitation, fog, sky cover or winds.

Trap Success by Sex—Trap success of females was significantly lower than that of males (sex ratio 3.56:1; $\chi^2 = 12.9$, $P < 0.0001$). This sex ratio is very different from any reported previously. Most other studies (Bailey, 1971; Stout and Sonenshine, 1974; Schowalter and Gunson, 1982; Greenwood et al., 1985) have reported sex ratios not significantly different from 1:1 (Bjorge et al., 1981; Verts, 1967; Goldsmith, 1981). Again, the results of the present study seem likely to be due to greater male movement in the spring.

This study shows yet another example of fluctuating trap success of striped skunks, and suggests that severe weather events were the major cause. However, weather variations did not affect daily trap success, although there were monthly differences attributable to males being more active in the spring. On a practical level, those who undertake to trap striped skunks (or similar species) should remember that trap success can fluctuate greatly and plan to use multiple study sites to reduce dependence on a single population that might dwindle.

ACKNOWLEDGEMENTS

F. Schnee, M. Bixler, and two anonymous reviewers provided helpful comments on the manuscript. I thank J. L. Gittleman, G. M. Burghardt, A. C. Echternacht and G. F. McCracken for advice throughout this project. S. E. Cates, J. New and M. Pelton provided logistical support. Permission to work in Cades Cove was granted by K. DeLozier, J. Piepenbring and C. Schell. Funding was provided by the Dept. of Zoology (now the Dept. of Ecology and Evolutionary Biology) and the Graduate Program in Ethology at the Univ. of Tennessee, Knoxville; a Theodore Roosevelt Memorial Grant from the American Museum of Natural History; and a Carlos Campbell Memorial Grant from the Great Smoky Mountains Conservation Association.

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