

Some Observations on a Summer Colony of *Myotis Lucifugus*

JAMES B. COPE, RUSSELL E. MUMFORD and NIXON WILSON, Earlham College, University of Michigan and Purdue University

The use of numbered bands as an aid in studying the natural history of bats was initiated in 1916 by Allen (1), who banded 4 *Pipistrellus*. Since this small beginning many investigators in Europe and America have used this method in studying the life histories and behavior of bats.

Cope and Mumford (4) gave a summary of bat banding in Indiana through July 1954, at which time 6,400 bats had been banded in the state. Since that time the authors have continued their activities and over twice that many have been banded to date. Interest in compiling data concerning the range, populations, and seasonal distribution of all species of Indiana bats continues. However, incidental to these aims, other data have been obtained which seem appropriate to bring to the Academy at this time.

It has been demonstrated by several investigators that bats have a well-developed homing instinct (3, 8, 9, 10). The aim in this paper is to report to the Academy the work that has been done thus far on a summer colony of *Myotis lucifugus* in Indiana, with the hope of obtaining cooperation in locating additional summer colonies in the future. This type of information would greatly facilitate the investigation.

Banding

A large *Myotis lucifugus* breeding colony was located by Mumford in August 1954, at Tunnelton, Lawrence County, Indiana. He banded 156 females and 73 males. None of these was aged, as it is difficult to determine immatures at that time of the year. They were taken to West Terre Haute, Indiana (77 air miles northwest of Tunnelton) and released the same night. The colony was checked again by Cope and Mumford on October 1, 1954. They banded 28 females and 151 males and released them at Bedford, 10 miles northwest, the same day.

In the spring of 1955, Mumford and Ralph D. Kirkpatrick banded 278 females and 5 males, liberating them 2 miles south of the colony. The colony was not visited again until July 4, 1956, when Cope and Wilson banded 302 individuals. Wilson took 52 adult males, 14 adult females, and 15 subadults of both sexes and released them at Bardstown, Kentucky, 82 air miles southeast of Tunnelton, the next day. Cope took 141 adult males, 40 adult females and 40 subadults of both sexes and liberated them in Richmond, Indiana, 107 air miles northeast of the point of capture. Cope and Wilson returned to the colony that fall, banded 44 males and 2 females, and liberated them at Spring Mill State Park, 4 air miles southwest of Tunnelton. On July 4, 1957, Cope and Wilson banded 364 (281 adult females, 16 adult males, and 67 subadults of both sexes). Of these 118 adults were liberated in West Lafayette, 120 air miles northwest; 120 adults and 13 subadults were liberated in

Crawfordsville, 93 air miles northwest; 59 adults were liberated in Greencastle, 66 air miles northwest; and 54 subadults were released south of Buddha, 4 miles northwest of Tunnelton. On August 7, 1957, Mumford and Wilson banded 371 (258 females and 113 males) which were all released at Spring Mill State Park, 4 air miles southwest of Tunnelton. The total number of bats banded to date in the colony is 1,774 (1,196 adult females, 65 subadult females, 456 adult males, and 57 subadult males).

An analysis of Table I gives several clues as to what is happening at the Tunnelton colony. The first thing that becomes evident is that there is a shift in the sex ratio between the first and last part of the season. The two October dates indicate a high percentage of males, while the spring and summer counts indicate a high percentage of females. Although it was impossible to capture all of the bats on any one visit, a concerted effort was made to collect all of the banded ones. It is probable that about the same number of individuals escaped capture each trip. Thus, the difference cannot be correlated with the ease of capture of one sex over the other at the various seasons. We feel that the observed disparity in the sex ratio is real.

The males in the Tunnelton colony exhibited a different pattern of behavior from that suggested by other workers. Griffin (6) states of summer colonies of *Myotis lucifugus* in New England, "on rare occasions an adult male may be taken, usually very early or late in the summer". Cagle and Cockrum (2), working in Illinois, say, "a few adult males were always present in the colony but the majority of them did not return until the first week of June". Eisentraut (5) states that in the European species (*Myotis myotis*) "the sexes are promiscuously mixed in winter quarters, but the males and females are separated for at least the first half of the warm season".

In the colony under discussion, we found that 98 percent of the animals caught April 20 were females. Two collections made in July were composed of 78 and 95 percent females, respectively. One late August visit revealed that still over half (68 per cent) of the colony was made up of females. By the first of October the picture had changed and 84 per cent were males. By the second week of October, most of the bats had left, but males comprised 96 per cent of the bats captured.

It seems that this colony is used in late spring and most of the summer as a nursery ward, but serves as a male roosting colony in late summer and early fall. This might be evidence of a congregation roost for males, before they go into the caves for the winter. There are a number of caves within a few miles of the Tunnelton site.

Homing

The homing ability of the Tunnelton bats is not outstanding, but does show that regardless of the direction in which liberated, a small per cent return. Smith and Hale (11) report 2 *Myotis lucifugus* which returned after being released at a distance of 228 air miles. The greatest distance from which bats have returned to Tunnelton is 120 air miles. This was a group released at West Lafayette, from which 20 per cent

TABLE 1
 Banding, Release Point and Return of a Colony of *Myotis lucifugus* from Tunnelton, Indiana

Place Liberated	Air Miles from Colony	Number Banded				Total	Percent Return				
		adult female	adult male	s ad.	s ad.		10-1-54	4-20-55	7-4-56	10-7-56	7-4-57
1. 8-30-54 W. Terre Haute	77	156	73		229	.05	.03	.03	.007	.08	.12
2. 10-1-54 Bedford	10	28	151		179	.02	.08	.01	.04	.05	
3. 4-20-55 S. of Tunnelton	2	278	5		283		.09	0	.18	.22	
4. 7-4-56 Bardstown, Ky.	82	52	14		66		.03	.12	.23		
"				13	2	15		0	0	0	0
5. 7-4-56 Richmond	107	141	40		181		.01	.09	.13		
"				20	20	40		0	0	0	0

6. 10-7-56 Spring Mill	4	2	44	46	.17	18
7. 7-4-57 W. Lafayette	120	110	8	118		21
8. 7-4-57 Crawfordsville	93	120	13	133		18
9. 7-4-57 Greencastle	66	51	8	59		31
10. 7-4-57 S. of Buddha	4		32	22	54	.07
11. 8-7-57 Spring Mill	4	258	113	371		
Total	1196	456	65	57	1774	

of the females and 25 per cent of the males homed successfully, when checked 34 days later.

Griffin (7) observed that *Myotis lucifugus* liberated near the roost had a lower per cent return than those released at a greater distance. Hitchcock and Reynolds (9) have also observed this. Smith (10) working in north central Ohio found that 14.3 per cent of the bats liberated at the place of capture returned, and only 6.5 per cent returned when released 49 miles from the point of capture.

In analyzing our data, it is apparent that we cannot substantiate what these workers have found with regard to the frequency of return from greater or shorter distances. The highest per cent return (31) was from a release point 66 miles from the point of capture. There were 5 release sites at greater distances (120, 107, 93, 82, and 77 miles). The smallest percentage of return, excluding subadults, was 0.05, from a distance of 10 miles. There were 3 release locations with shorter distances (4, 4, and 2 miles). From the shortest distance, 22 per cent returned.

Summer and Winter Locations

We have captured in the Tunnelton colony, 5 little brown bats which were banded in caves in winter. It is interesting to note that the distances traveled by these animals are not great, varying from 8 to 37 miles. Three had been banded northwest of the colony and two had been banded southeast of it. It is interesting to us that individuals from a wintering colony should become a part of a different colony during the summer, as these five records indicate. This seems to indicate a general break-up and dispersion of winter colonies in the spring, and of summer colonies in the fall.

Summary

A colony of *Myotis lucifugus* in southern Indiana has been studied for the last three years with a total of 1,774 bats banded.

Visits to the colony at different times of the summer indicate a shift from a predominate female population from April to September to a predominately male population in October.

Homing experiments have been conducted and from the greatest distance (120 air miles) from point of capture, 21 per cent returned 34 days later.

There are five winter banding records which give an indication of wintering-summering range. The greatest distance from winter cave to summer colony was 37 miles, the shortest, 8 miles. They were from a northwest and a southeast direction.

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