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Telemetric Observations of Foraging Ozark Big-Eared Bats in Arkansas

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Abstract

Ozark big-eared bat (*Corynorhinus townsendii ingens*) foraging activities were studied during 1995 in Marion County, Arkansas. Adult bats were equipped with radiotransmitters and tracked during June and July. Foraging activities were generally within 1 kilometer (km) of the roost cave. Male bats ranged farther than females with the exception of one female that flew 2.5 km into a different watershed. Male big-eared bats and northern long-eared bats (*Myotis septentrionalis*) were also found within the maternity colony.

Introduction

Ozark big-eared bats (*Corynorhinus townsendii ingens*) once occurred across the Ozark Plateau of northern Arkansas, southern Missouri, and eastern Oklahoma (Kunz and Martin, 1982; U.S. Fish and Wildlife Service, 1995). Surveys of caves previously occupied in Missouri produced no evidence of recent use by big-eared bats during the late 1980's. Populations in Arkansas have decreased, and searches for new roosts during 1988 proved unsuccessful (Harvey and Barkley, 1990). Ozark big-eared bats use numerous caves in eastern Oklahoma, but only five caves are used extensively (Clark et al., 1993). The remaining populations in Arkansas and Oklahoma are estimated to number from 1,600 to 2,300 individuals (U.S. Fish and Wildlife Service, 1995).

Throughout their lives Ozark big-eared bats are dependent on limestone caves. Although males and females hibernate together in caves during winter, in summer females choose/select different caves where they form maternity colonies, give birth, and rear pups. Males apparently lead a solitary existence roosting in caves other than those used for maternity roosts (Clark et al., 1993; Harvey and Barkley, 1990).

Clark et al. (1993) investigated temporal changes in foraging activities by lactating adult female Ozark big-eared bats in Oklahoma. We investigated foraging activities of male and female Ozark big-eared bats with respect to habitat use and distance from cave to foraging sites. Our study demonstrates the relevance of the findings by Clark et al. (1993) to the easternmost populations of Ozark big-eared bats. Further, we note the presence of adult male Ozark big-eared bats and Northern long-eared bats (*Myotis septentrionalis*) in a maternity colony.

Methods

This study was conducted in Marion County, Arkansas (Fig. 1). Two physiographic areas of the Ozark Highland province dominate Marion County. The Salem Plateau is exposed across the north and east, and the Springfield Plateau is exposed in parts of the west central and across most of the southern part of the county. The Salem Plateau is characterized by gently sloping to rolling uplands and steep, stony, side-slopes. Elevations range from 200 to 300 meters (m). The Springfield Plateau is adjacent to and higher than the Salem Plateau. Elevations atop the ridges in the Springfield Plateau range from 300 to 400 m. This plateau has been strongly dissected by streams and is characterized by steep, v-shaped valleys separated by gently sloping to moderately sloping, narrow ridges. Our study site was located along the interface of the two plateaus, but was more characteristic of the Springfield Plateau.

The study area was located on the watershed of Jimmie Creek, a low-order spring-fed stream. Oak-hickory forests dominate the area, which at one time had been cleared for cattle and crop production. The forest is open with little or no undergrowth. Dense vegetation occurs within and 4-6 m upslope of Jimmie Creek. Reed cave is located in a box canyon running north and south (Fig. 2) with a small waterfall (3-5 m) at the northern end. The cave is located on the east side of the canyon and has two entrances. The larger entrance is located near the north end, whereas a smaller entrance is located 10-12 m to the south or downstream. This tributary of Jimmy Creek is intermittent, flowing only after substantial rain.

Forty-four Ozark big-eared bats were captured during June and July 1995 with a large hoop net inside Reed cave. Seven females and five males were banded with numbered plastic bands, and sex, body mass (g), and left forearm lengths were recorded (Table 1). Bats having a mass less

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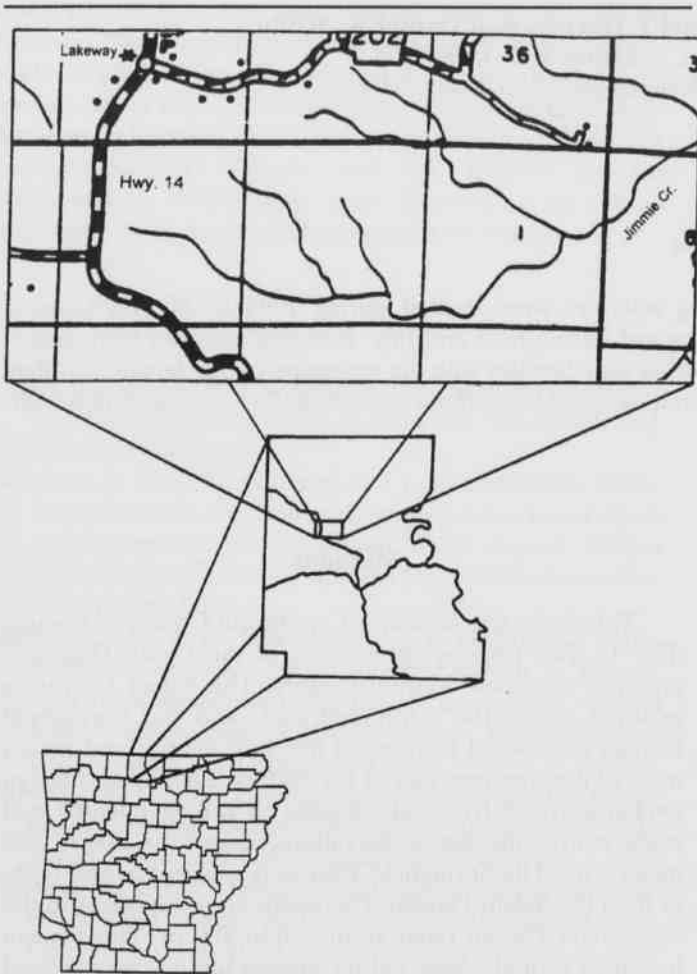


Fig. 1. Upper Jimmie Creek watershed, Marion County, Arkansas

than 10g were not radio-tagged because they probably represented juvenile, unskilled flyers and not established foragers. One of two types of radio-transmitters, (0.67g model DB-2Brd or a 0.51g model LB-2rd, Holohil Systems Ltd., Ontario, Canada) was attached directly to the pelage of bats with surgical glue (Skin Bond). When released, bats appeared to have no difficulty flying with the added weight of the transmitters. These small transmitters had a signal range of 1 km and a battery life of 2-3 weeks. Bats were tracked simultaneously from two stationary locations with receivers (Model TRX-1000s and Falcon Five w/Model APS-164 SCAT Scanner, Wildlife Materials, Carbondale, IL). Radio-synchronized bearings were taken at 15-30 minute intervals. Most observations were made between sunset and 0100 hrs CST. Triangulation was not possible with only two receivers, so gain and signal strength were noted. Occasionally due to an individual bats close proxim-

ity (high signal strength), it would be monitored continuously for 5-10 minutes to provide micro-details of foraging. All recorded locations and times were plotted on 7.5 minute United States Geological Survey quadrangle maps.

Results and Discussion

Twelve adult Ozark big-eared bats were radio-tracked during June and July 1995. Typically bats begin flying 30-45 minutes prior to sunset, during which time they usually fly out of the cave, circle, and return. This activity has been precisely documented and attributed to light sampling (Twente, 1955). Males were present within the colony early in the maternal period, but their numbers dwindled as the summer progressed. Male Northern long-eared bats (*Myotis septentrionalis*) were also present in small numbers (<10) within the colony throughout the summer. Adult female Ozark big-eared bats remained in the colony through lactation, but as the young became volant, the number of these adult females also decreased.

Edge habitat has been demonstrated as the preferred foraging sites for Ozark big-eared bats as it may provide cover for both bats and moths, the bats primary prey (Clark, 1991). Open forest situations allow easy feeding because bats are able to discriminate insects at greater distances; however, open habitats provide little structural protection from predators (Erkert, 1982). The area along Jimmie Creek provides horizontal edge habitat along the creek itself and vertical edge habitat along the side of the valley. Although dense undergrowth occurs along the bottom of the valley near the creek, the forest is generally open under the canopy.

All radio-tagged bats remained within the area of the roost (< 1 sq. km) with the exception of one female (#1610) which flew 2 km to an adjacent watershed containing Blue Heaven Cave, another known maternity site (Fig. 2). Within the Jimmie Creek watershed, males foraged farther from the cave than did females. One male was observed to forage progressively farther from the cave over the three consecutive nights it was tracked. All adults began foraging activity near the cave, later moving farther away, but never leaving the Jimmie Creek watershed.

Preservation of these and other endangered cave bats should focus on protection of caves and management of surrounding foraging areas (Harvey and Barkley, 1990; White and Seginak, 1987; Harvey and McDaniel, 1986). Clark et al. (1993) stated that female Ozark big-eared bats foraged at progressively greater distances from the roost cave during the lactation period. We did not find this to be the case in the Jimmie Creek area. This study reveals that the area actually used by this population of Ozark big-eared bats appears to be rather small (1-2 km²).

J. D. Wilhide, V. Rick McDaniel, Michael J. Harvey, and Daniel R. White

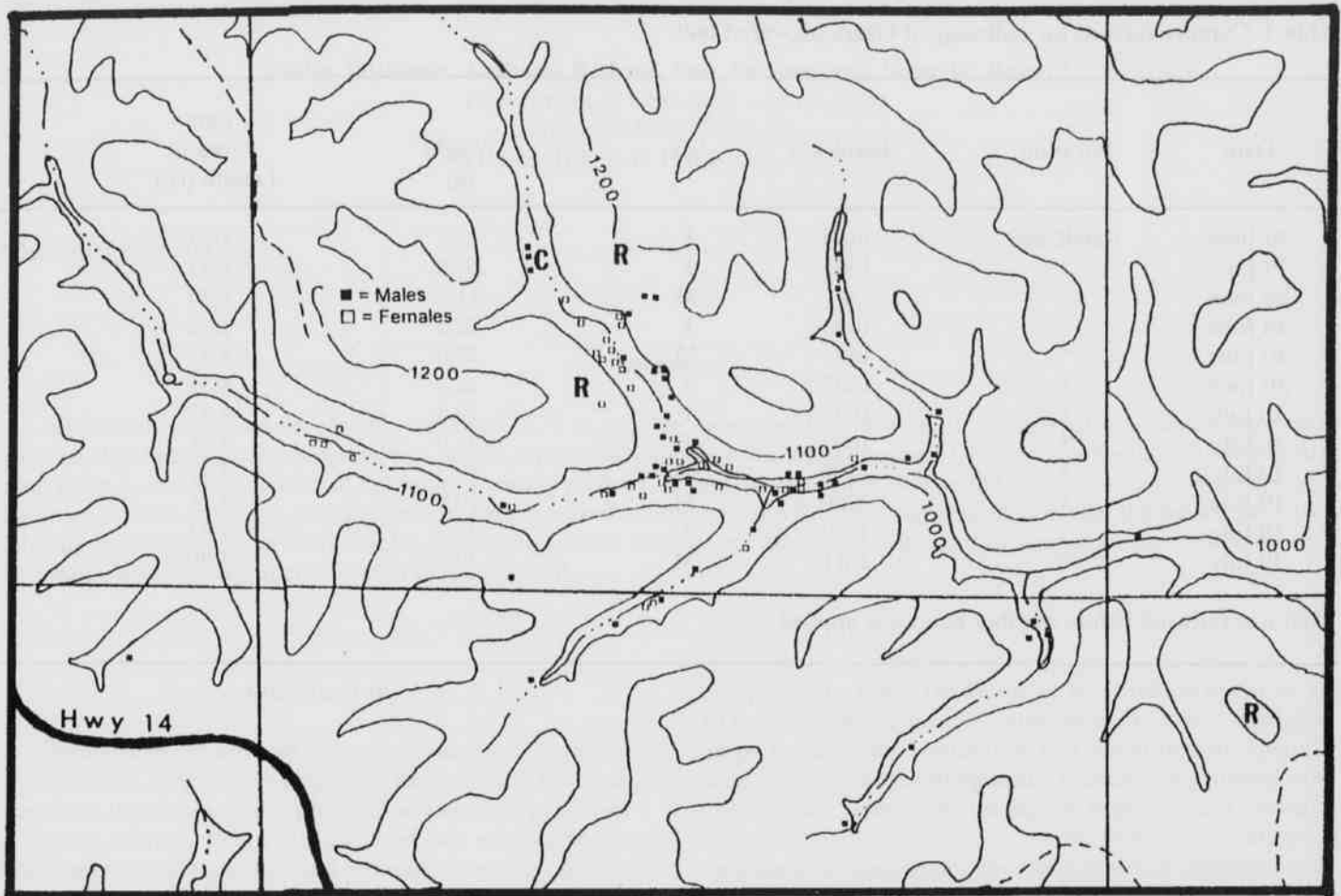


Fig. 2. Foraging activity of Ozark big-eared bats along Jimmie Creek, Marion Co., Arkansas (T19N, R17W, Sec 2.).
C = Cave R = Receiver locations

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Table 1. Capture records for radiotagged Ozark big-eared bats.

Date	Location	Band #	Sex	Weight (g)	Left Forearm Length (cm)
19 June	ReedCave	1600	F	13.5	4.55
19 June	"	1601	F	12.02	4.33
20 June	"	◆	M	11.5	4.46
20 June	"	1603	F	12.5	4.62
20 June	"	1604	M	12.0	4.37
20 June	"	1605	F	12.5	4.35
16 July	"	1606	F	12.5	4.37
16 July	"	1607	F	14.0	4.51
19 July	"	1608	M	10.5	4.47
19 July	"	1609	M	10.0	4.41
19 July	"	1610	F	12.5	4.54
19 July	"	1611	M	10.5	4.39

◆ bat was released before number band was applied.