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Bats of the Jessieville Ranger District, Ouachita National Forest, Arkansas

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Abstract

During July and August 2000 and 2001, mist nets were set concentrated on three drainages in the Jessieville District of the Ouachita National Forest: North Fork Ouachita River (ten sites), Irons Fork Creek (five sites), and Muddy Creek (two sites). A total of 83 bats representing seven species was caught during 20 evenings (43 net nights). Sampled habitats included pools in road ruts, intermittent streams, man-made ponds on ridgelines, a wet road rut fed by a seep, small drainages that flowed only after a heavy rain, a standing pool in a clearing, and larger streams. Eastern red bats (*Lasiurus borealis*) were caught 64 times. Other bats caught included three evening bats (*Nycticeius humeralis*), eight eastern pipistrelles (*Pipistrellus subflavus*), two hoary bats (*Lasiurus cinereus*), three northern long-eared myotis (*Myotis septentrionalis*), one big brown bat (*Eptesicus fuscus*), and two Seminole bats (*Lasiurus seminolus*). A juvenile Seminole bat, only recently volant, represents the first documentation of likely reproduction of this bat in Arkansas.

Introduction

Occurrence and diversity of bats has been studied in several areas of Arkansas (Harvey and McDaniel, 1983; Heath et al., 1983, 1986; Steward et al., 1986; Saugey et al., 1988, 1989; Wilhide et al., 1998b; Caviness and James, 2001) but little work has been done in that part of the Ouachita Mountains north of Lake Ouachita. This study was undertaken to determine the distribution and diversity of species in that area and to check for the possible presence of the endangered Indiana bat (*Myotis sodalis*). Studies of the Indiana bat in hibernacula in Arkansas indicate a decline of 59% in the numbers roosting in the state over the last 20 years (Harvey, in press).

Materials and Methods

Study Site.--The general boundaries of the study site were State Highway 298 to the south, Highway 27 to the west, generally Forest Service (FS) road 11 to the north, and a gas ROW pipeline to the east (Fig. 1). Sites were located on three drainages in the district: North Fork Ouachita River (ten sample sites, sites 1-10 on Fig. 1), Irons Fork Creek (five sites, 11-15 on Fig. 1), and Muddy Creek (two sites, 16 and 17 on Fig. 1). Ten sites occurred in Garland County, two in Perry County, two in Yell County, and three in Montgomery County. Most sites were in Township1N in Ranges 21-23W.

A variety of habitats was sampled, including pools in road ruts, pools in intermittent streams, man-made ponds (upland sites), a wet road rut formed by a small seep, small drainages that contained water only after a heavy rain, pools formed in depressions after a heavy rain, and larger streams. The following list of sample sites corresponds with numbered sites shown on Fig. 1.

1) Garland Co., North Fork Ouachita River at Forest Service Road 154; SW¼ S1 T1N R21W, 30 July 2000. One net across the river at the road, another about 50 m upstream over a canopied pool.

2) Perry Co., man-made pond near Potato Hill Road; NE¼ S31 T2N R21W, 19 and 24 July 2000. A large clear pond.

3) Perry Co., man-made pond near Potato Hill Road; N ½ S32 T2N R21W, 19 and 24 July 2000. A small muddy pool.

4) Garland Co., man-made pond near Potato Hill Road; S4 T1N R21W, 19 and 24 July 2000. Pond intermediate in size to sites 2 and 3.

5) Garland Co., Little Creek on FS 119; S13 T1N R22W, 1 August 2001. One net on the north side of the stream, another downstream (south side of FS 119) in a canopied flyway.

6) Garland Co., Bear Creek on Forest Service road 225; S8 T1N R21W, 7 August 2001. Site dark due to overcast skies, full moon rising about 2330h. One net by the concrete low-water bridge, and one about 10 m downstream. The road was a good flyway, but the stream flyway was occluded by several trees felled during an ice storm that occurred in December 2000.

7) Garland Co., Ouachita River on access road off FS 119; S13 T1N R22W, 2 and 6 August 2001. Larger stream with open flyway located near site 6. The river was about 15

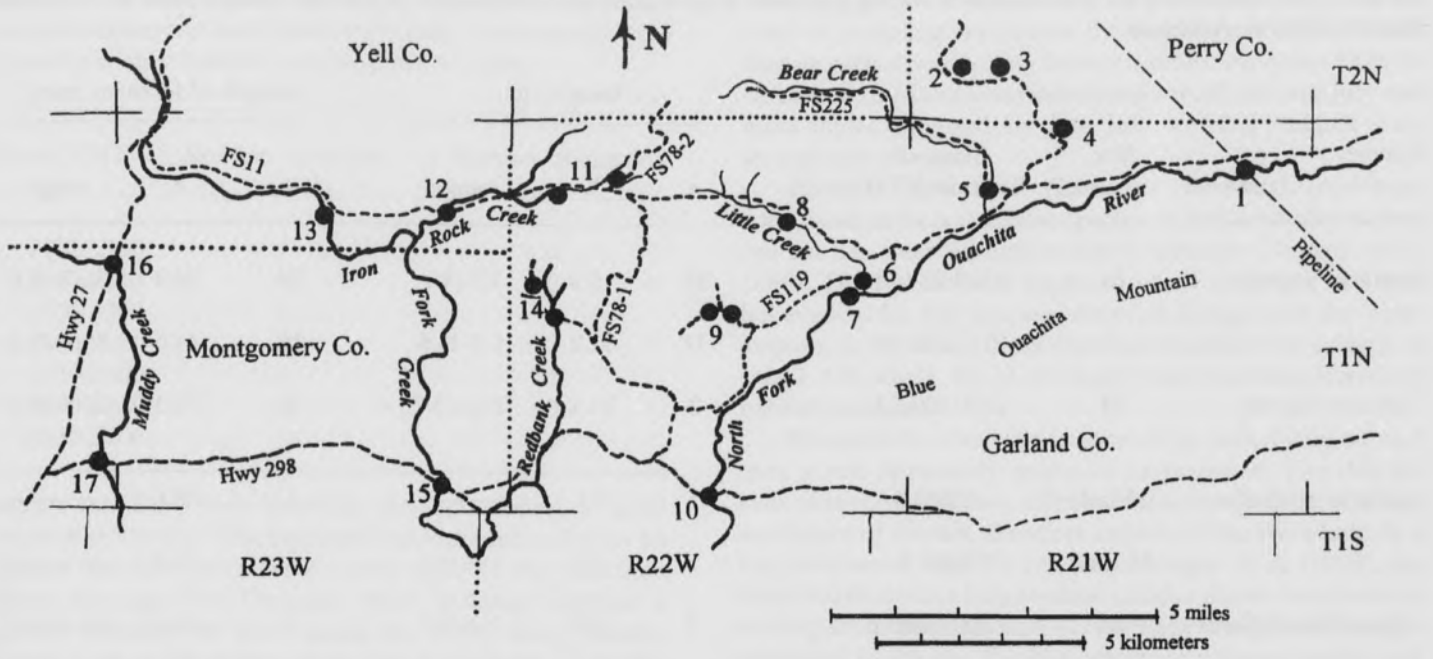

Fig. 1. Map of the study area showing distribution of sample locations (see text for details of each numbered site). "FS" refers to Forest Service roads.

m wide with a good flyway but no closure of canopy. The first sample date had a bright moon, but there had been rain in the afternoon and an overcast sky at night on the second date.

8) Garland Co., Little Creek at FS 35720, off FS 11; S11 T1N R22W, 31 July 2001. One net along the concrete low-water bridge and another downstream in the canopied flyway.

9) Garland Co., FS J30B and J30D near their intersection; S22 T1N R22W, 30 July 2001. Upland site, two nets over road ruts that contained water from a recent rain: a small one on J30D, and one the width of the road on J30B (a depression over a culvert).

10) Garland Co., North Fork of the Ouachita River at State Highway 298; S33/34 T1N R22W, 8 August 2001. Three nets set at the bridge and downstream. Water willow (*Justicea americana*) common in streambed.

11) Garland Co., FS 78-2 off FS 11; and 1.3 km W of this site off FS 11; S 5, 8 T1N R22W, 26 July 2001. Afternoon rains made numerous scattered pools and produced flow in intermittent streams. Net placed in a road rut/stream crossing with some canopy and flyway just onto FS 78-2 (N side of FS 11 in immediate area is a large clearcut). A second net over a new pool in a 0.4 ha clearcut on the south side of FS 11.

12) Yell Co., Rock Creek on Forest Service 11; S11, 12 T1N R23W, 25 July 2001. Two nets at each of two bridges. Pools at the bridges appeared to be the only water source for the area.

13) Yell Co., Irons Fork Creek at FS 11 and 148, 23 July 2001. One net over ruts on FS 148 near the creek and another over the creek.

14) Garland Co., Redbank Creek on FS 736; S18 T1N R22W, 24 July 2001. One net over a dirt road with wet ruts fed by a small spring, and another net across a pool at the concrete bridge. Flyway along the road narrowed at sites of water.

15) Montgomery Co., Irons Fork Creek at State Highway 298; S35/36 T1N R23W, 12 July 2001. Two nets were set, one on either side of the east bridge (two bridges occur near each other). Site revisited 17 July 2001 due to rain and lightning possibly disturbing bat activity during the first sampling: two nets, one on the north side of each bridge.

16) Montgomery Co., Muddy Creek at State Highway 27; S13 T1N R 24W, 19 July 2001. One net was set west and one east of the bridge.

17) Montgomery Co., Muddy Creek at State Highway 298; S36 T1N R24W, 11 and 18 July 2001. Two nets were set over two pools on the north and south sides of the bridge. Water willow surrounded pools, good flyway available.

Standard mist nets were used to sample diversity of bats at each sample site. In addition, a night-vision scope was used to watch bats as they foraged, to observe their behavior

Table 1. Measurements for bats captured during July and August 2000 and 2001 in the Jessieville Ranger District, Ouachita National Forest, Arkansas.

Species	Sex	Time of Capture (CDT)	Weight (g)			Length of forearm (mm)		
			n	$\overline{X}$	range	*n*	$\overline{X}$	range
Lasiurus borealis	M	2039-2345 h	28	9.9	7.7-14.1	39	39.4	36.7-44.0
	F	2117-2355 h	14	11.2	6.5-13.8	18	41.6	39.8-44.5
Lasiurus cinereus	M	2130-2355 h	2	21.4	21.1-21.7	2	52.1	51.8-52.4
Lasiurus seminolus	M (ad)	2200 h	1	9.1	-------	1	39.0	--------
	M (juv)	2220 h	1	7.0	-------	1	37.4	--------
Pipistrellus subflavus	M	2200-0003 h	3	4.8	3.8-6.0	3	35.0	34.2-35.5
	F	2140-2210 h	4	4.6	3.7-6.4	4	33.7	32.4-34.8
Myotis septentrionalis	F	2230-2330 h	3	5.9	4.6-7.5	3	34.7	34.0-35.0
Eptesicus fuscus	M	2140 h	1	13.3	-------	1	48.0	--------
Nycticeius humeralis	M	2100-2340 h	2	7.7	7.6-7.8	2	34.3	34.2-34.3

while foraging and in relation to time, and to observe their activity around nets.

Bats collected were identified, sex was noted, and age was determined (juvenile, subadult, or adult, on the basis of epiphyseal cartilage being present or absent in the joints of the fingers). This was accomplished by shining a light through the fingers in the wing and noting the degree of ossification. Calipers were used to obtain the length of the left forearm, and a spring scale was used to obtain weight of the individual.

To obtain weight of live bats, each was placed in a plastic bag suspended from a clip on the scale. After weighing, bats were placed in a cloth holding bag and retained to prevent recapture. Holding bags were left near nets as "bait" to attract other bats responding to distress calls. After each sampling period, bats were released at the site with the exception of voucher specimens of each species. These specimens are housed in the Henderson State University collection of vertebrates.

Results and Discussion

One objective of this study was to survey for the endangered Indiana bat (*Myotis sodalis*). However, only the northern long-eared myotis (*Myotis septentrionalis*) represented that genus during the study.

The species caught most frequently (64 individuals – 77% of total bats) was the eastern red bat (*Lasiurus borealis*). Other bats captured included the evening bat (*Nycticeius humeralis*), the eastern pipistrelle (*Pipistrellus subflavus*), the hoary bat (*Lasiurus cinereus*), the northern long-eared myotis (*Myotis septentrionalis*), the big brown bat (*Eptesicus fuscus*), and the Seminole bat (*Lasiurus seminolus*). The Ouachita River drainage produced individuals of all species collected. However, only eastern red, pipistrelle, and hoary bats were captured on Muddy Creek. Only an eastern red and a Seminole bat were collected from the Iron Fork drainage. Part of the reason for this difference is that more sample sites occurred in the Ouachita River drainage due to accessibility. Both sites on Muddy Creek had open flyways, but some

Table 2. A comparison of times of capture for male and female eastern red bats (*Lasiurus borealis*). Nets usually were closed just after 2400h. Sample size is 42 bats.

Time (CDT)	Number of males	Number of females
2030-2100	4	0
2100-2130	7	2
2130-2200	7	1
2200-2230	4	3
2230-2300	2	1
2300-2330	3	3
2330-2400	1	4

within the Iron Fork drainage did not possess a good "tunneling" flyway. The Seminole bat was captured from an upland site (an intermittent creek) close to the Ouachita River drainage. The Ouachita River drainage included a greater diversity of sites: along the river, along smaller creeks feeding the river, and permanent upland ponds (the only locations at which the northern long-eared myotis and big brown bat were captured).

Inadvertent captures included one cottonmouth (*Agkistrodon piscivorous*), two green sunfish (*Lepomis cyanellus*), and several dobsonflies, dragonflies, and beetles (especially Scarabeidae). These were removed from the nets to reduce the chances that bats would detect the nets.

Bright moonlight and lightning may explain inactivity of bats near nets on several occasions. No bat was caught at sites 7, 9, 12, 15, and 17 when these conditions were noted. At sites 8 and 11, bats were captured on a moonlit night, but only in a shaded flyway. At site 6, bats were caught early (about 1700h) before a net became moonlit, whereas other bats were captured at the site later but only in a shaded flyway. Site 7 was revisited, and the bright moon rose about 2330h. One eastern red bat was captured before and one after the moon lighted the area (the net had been shaded by the trees). At site 5, the moon rose about 2330h and was bright, but 11 captures were made prior to that time, when the area was dark.

Female eastern red bats captured during this study averaged slightly larger than males (Table 1). Many of the subadults captured were males, apparently lowering the average size of males. Interestingly, males tended to be captured more often in early evening, and females in the later evening (Table 2).

All species combined, males were taken more often than females (49 males versus 25 females). However, only females were caught of the northern long-eared myotis. Further, the larger number of eastern red bats biased the sample, but four species (hoary, Seminole, big brown, and evening bats) were represented only by males. Because the time of sampling represents the beginning of the normal mating period, males may be more active and more likely to be captured. Males were becoming scrotal by mid-July and most males captured by late July to early August were scrotal and enlarged.

Eastern Red Bat (Lasiurus borealis).--Although considered to be a common species in Arkansas, the eastern red bat has received little research attention (Saugey et al., 1998). This species was captured in all drainages and was believed to be the species observed foraging in the early evening at all sites. Sixty-four individuals were caught at sites 1, 4-8, 10, 11, 13, 14, 16, and 17, representing almost all habitats sampled.

Researchers often are frustrated by bats flying to and over a net, apparently aware of its presence. The distress calls of several bats may offer a distraction to detection and avoidance of the net, therefore captured bats were held in a bag positioned near the net. Like Saugey et al. (1998), we observed that other bats became curious about vocalizations coming from the bag, and occasionally these bats became entangled in the net. Further, efforts to remove eastern red bats from a net attracted and resulted in capture of additional bats, apparently curious about the events at the net.

A night vision scope was used to observe the behavior of bats during sampling periods. Well after dark at site 10, two eastern red bats were observed foraging just under the bridge for Hwy 298. They flew between the bridge supports and occasionally flew out over the grassy roadside to forage, but when approaching the net set in the area, they flew over it.

In late July, the night vision scope provided interesting observations of a swarm of eastern red bats at Site 1 on the Ouachita River. By dusk, eastern red bats (identified when they briefly came down to drink) could be seen above clearings. With early nightfall, there was no activity near the nets but, with the aid of the night vision scope, many *L. borealis* were seen flying just under the canopy. With increasing darkness, these bats gradually descended until some were captured. Groups of 2-3 consistently were seen flying together along the creek bed, and occasionally these hit the nets as a group. Often, these were young bats of the same age (based on similar epiphyseal closure of finger bones, and forearm measurements). This could mean that siblings born this season still were flying together at the time of capture.

Similar "cluster catches" were comprised of an adult female and one or two scrotal males, all of different forearm lengths. Perhaps this represented the beginning of mating, which occurs in August and September (Sealander and Heidt, 1990). Saugey et al. (1989) made a similar

observation regarding eastern red bats, as well as evening bats (Saugey et al., 1988).

Mating aggregations of large numbers of bats have been called "swarms" and some researchers have caught from dozens to >100 *L. borealis* during swarming (Cassidy et al., 1978; Saugey et al., 1998). More eastern red bats may be caught at such times simply because they locally are more numerous. Observations with the night vision scope revealed additional explanations for more numerous captures: (1) interests of the bats are focused more on mating than detection of minor irregularities (nets) in the environment, and (2) the background ultrasonic noise may make it more difficult to echolocate nets in the environment.

Evening Bat (Nycticeius humeralis).--The evening bat was taken in the Ouachita drainage (3 individuals) at Sites 2 and 10. These sites represent an upland man-made pond and a larger stream. One individual escaped the holding bag prior to collection of data, but the other two were males.

Eastern Pipistrelle (Pipistrellus subflavus).--The eastern pipistrelle was caught in the Ouachita River and Muddy Creek drainages (8 individuals) at sites 10, 16, and 17. The smaller specimens (Table 1) were juvenile females that had not yet replaced the grayish juvenile pelage with the buffy adult coloration.

Hoary Bat (Lasiurus cinereus).--The hoary bat was caught in the Ouachita River and Muddy Creek drainages at sites 3 and 16. Site 3 was a man-made pond and an upland site, but site 16 was a larger creek. The individual from site 3 was caught at 2130h, and the other specimen was taken at 2355h. Sometimes considered to be a late flyer, this bat often is taken prior to 2400h (Caire et al, 1986; Saugey et al., 1989).

Northern Long-eared Myotis (Myotis septentrionalis).--The northern long-eared myotis was taken in the Ouachita River drainage (three individuals), at sites 2 and 3. These sites were man-made ponds at higher elevations along ridge lines. This species was believed to be rare in Arkansas (Harvey and McDaniel, 1983) until Wilhide et al. (1998b) found them to be common in their study of ridgetop ponds in the Ozarks. All three specimens caught in the present study were females (Table 1).

Wilhide et al (1998b) noted that <2% of 770 banded bats were recaptured on subsequent nights. It is not known whether a bat, once captured and escaped, will be recaptured in the same net the same night. On 24 July 2000 at Site 3, capture of a northern long-eared myotis may support this possibility. An undamaged mist net had been set up (bats sometimes are able to chew their way free if left in a net long enough). At 2130h, a northern long-eared myotis was removed from the highest section of the net, but it was unexplainably soaking wet. Perhaps the bat had crashed into the water at another time, regained flight, then experienced the net for the first time while wet. However, there was a new hole at the bottom of the net near the water. It was deemed probable that an earlier capture of the bat at that spot caused the net to sag into the water, wetting the bat. The bat then chewed out and flew away, only to return and be caught in an upper bag of the net.

Big Brown Bat (Eptesicus fuscus).--The big brown bat was caught in the Ouachita River drainage at Site 4, which was a man-made pond. Although not captured in the mist nets, several big brown bats were observed roosting in the bridge at Site 10 over the Ouachita River at State Highway 298.

Seminole Bat (Lasiurus seminolus).--In Arkansas, the Seminole bat was known primarily from southern counties until Wilhide et al. (1998a) extended the range northward by documenting specimens from Baxter and Franklin counties. Specimens collected from other counties (Heath et al., 1983; Heath et al., 1986; Saugey et al., 1989) all were adults. The species is presumed to be migratory due to its seasonal distribution and the presence of individuals north of the range of Spanish moss (*Tillandsia usneoides*), the purported preferred roost for the species (Barbour and Davis, 1969). Menzel et al. (2000), however, found that Seminole bats in South Carolina roosted during the summer on small branches of pines away from Spanish moss. Thus, it is not clear whether the few specimens previously collected from Arkansas represent individuals that have moved north of their breeding range.

Seminole bats were captured in the Ouachita and Irons Fork River drainages at Sites 1 and 11. A juvenile specimen collected 26 July 2001 from a small tributary to Rock Creek in the Irons Fork drainage (Site 11, Table 1), had recently become volant, and therefore represents the first inference of reproduction of this bat in Arkansas. Similarly, Barkalow and Funderburg (1960) suggested probable breeding in North Carolina based on finding immature Seminole bats. The Arkansas site was an intermittent stream with small canopy flyway adjacent to a large clearcut area.

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