Late-winter Observations of Red Bats, *Lasiurus borealis,* and Evening Bats, *Nycticeius humeralis,* in Missouri

Justin G. Boyles, John C. Timpone, and Lynn W. Robbins

Department of Biology, Southwest Missouri State University, Springfield, Missouri 65804.

**Introduction**

Red bats (*Lasiurus borealis*), which generally are considered a migratory species, winter as far north as Illinois, Indiana, and Missouri (Davis and Lidicker, 1956; Whitaker and Hamilton, 1998), but their winter roosting ecology is virtually unstudied. In Arkansas, Saugey et al. (1998) report radiotracking a female red bat in December to a short-leaf pine (*Pinus echinata*) and a small shrub, before the bat moved into leaf litter for the remainder of the transmitter’s life. Other biologists describe *L. borealis* emerging from leaf litter during winter in response to approaching prescribed burns (Moorman et al., 1999; Rodrigue et al., 2001), but most of this information is anecdotal. In addition to roosting observations, Whitaker et al. (1997) note that the majority of red bats feed during winter in North Carolina and Virginia.

Even less is known concerning the winter whereabouts of evening bats (*Nycticeius humeralis*), which also are considered migratory. Bat-rehabilitation specialists have reported evening bats roosting in and around man-made structures during winter in Texas and Oklahoma (French and Bunyard, 2002; B. French, pers. comm.). Although dayroosts of *N. humeralis* have been studied in summer (Bowles et al., 1996; Hutchinson, 2001; Menzel et al., 1999; Menzel et al. 2001), no evening bats have been radiotracked in winter.

Our initial project focused on the summer roosting ecology of evening bats, but given the paucity of information concerning the winter ecology of various species of bat, we began netting in our study area in late winter—weeks earlier than we normally would have for a summer study. This paper reports the findings of this early netting endeavor.

**Study Area and Methods**

The study area was the Bull Shoals Field Station (BSFS) of Southwest Missouri State University, located on the Drury/Mincy Wildlife Area in Taney County, Missouri. Drury/Mincy is a 2,300-ha area that consists of upland oak/hickory forest with interspersed riparian areas and glades. The area, which is actively managed by the Missouri Department of Conservation, is within the Ozark Mountains and borders Bull Shoals Lake.

We captured bats using mist nets of varying lengths (6–12 m) and heights (4–6m) that we placed across roads where the entire flyway could be blocked. We netted on nights when the daytime air temperature was greater than 16°C and removed the nets when the temperature dropped below 10°C. Weather data were obtained from the National Weather Service in Springfield, Missouri (Table 1), approximately 55 km NW of the study site. We identified each bat and recorded sex and age. Select individuals were fitted with 0.51-g radiotransmitters (Holohil Systems Ltd., Carp, Ontario, Canada) between the scapulae, using a surgical adhesive (Skin Bond, Smith and Nephew United, Inc., Largo, Florida). All other bats that were captured were marked with a black marking pen (Sharpie, Sanford, Bellwood, Illinois) on the ventral surface of each wing to determine if they were recaptured on the same or successive nights.

**Results**

On 8 March 2003, we captured two male *L. borealis,* one female *N. humeralis,* and one male eastern pipistrelle (*Pipistrellus subflavus*). Air temperatures during the day reached ca. 20°C, and at sunset (1813 hours CST), air temperature was ca. 10°C. Bats tentatively identified as *L. borealis* or big brown bats (*Eptesicus fuscus*) were observed foraging above service roads about 45 min before sunset. All bats were netted between 1845 and 1900 hours. On 15 March, one adult male *L. borealis* and one adult female *E. fuscus* were captured, and on 26 March, three additional *L. borealis* adult males were taken. On 27 March, one female *L. borealis* was captured, as well as two adult female and two adult male *N. humeralis* and one adult male *E. fuscus.*
We attached transmitters to one L. borealis and the N. humeralis captured on 8 March, and the bats were located every day thereafter (4 days for the L. borealis and 7 days for the N. humeralis). On 9 March, the red bat was found buried under ca. 2-3 cm of leaf litter, on the top of a ridge in a location that received full sunlight. Several cool days followed (Table 1), and the bat remained in the same location until 12 March, when it was observed emerging from the litter, presumable to begin foraging. After that day, the bat could not be located.

The evening bat was tracked to a dead white oak (Quercus alba) on 9 March and remained there until 12 March, when it was observed leaving at 1825 hours from a small hole, which presumably was the entrance to an old woodpecker cavity. The following day, it was tracked to a live white oak, ca. 100 meters from the first, where it remained until the transmitter was shed.

**Discussion**

Most biologists believe that L. borealis and N. humeralis migrate south during the winter months. However, to our knowledge, there are no data indicating from how far north, nor are there any data on how far south these bats may go. Previous studies indicate that all red bats captured during winter were males (Davis and Lidicker, 1956; Saugy, 1989), with the exception of Padgett and Rose (1991), who collected one female in March. We captured one female at BFS and found another on the ground, on the campus of Southwest Missouri State University, on 25 March.

The winter of 2002-2003 in southwest Missouri was one of the harshest on record, and very few days before we began netting were warm enough for bats to forage (Table 1). This weather pattern, combined with the fact that both bats fitted with transmitters remained in the area for at least 4 days, suggests that the bats that we captured were residents of the area for the entire winter and were not recent migratory arrivals from wintering areas farther south. Interestingly, the several days following our first captures again had nighttime temperatures that were below freezing, and the day after we captured the female L. borealis, 1.74 cm of snow was recorded (Table 1). Further field work during winter will be necessary to determine the roosting ecology of these species and to ascertain whether red and evening bats that overwinter in southern Missouri remain as year-round residents or spend the summer farther north. In addition, L. borealis has now been documented roosting in leaf litter during winter in at least four states, suggesting that this is a common overwintering behavior, and resource agencies may need to reevaluate the timing of prescribed burns to avoid impacting this species.

**Acknowledgments**

Funding was provided by the Missouri Department of Conservation and the Dickerson Park Zoo. We thank N. Nelson, S. Kelly, M. Yuri Miller, and T. Fobian, for assistance in netting and radiotelemetry, and M. McKnight and T. Tonnasi for helpful comments. The authors would appreciate receiving any appreciation on winter records or behavior of L. borealis and N. humeralis.

**Literature Cited**


---

**Table 1. Daily weather records for March 2003, from the National Weather Service in Springfield, Missouri.**

<table>
<thead>
<tr>
<th>Day in March 2003</th>
<th>Maximum Air Temperature (°C)</th>
<th>Minimum Air Temperature (°C)</th>
<th>Air Temperature at Sunset (°C)</th>
<th>Precipitation (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>Trace*</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>-6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>-7</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>-2</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>-2</td>
<td>-7</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>-7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>17</td>
<td>-2</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>23</td>
<td>-3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>-8</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>-7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>14</td>
<td>-3</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>24</td>
<td>6</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>12</td>
<td>6</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>4</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>21</td>
<td>5</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>22</td>
<td>8</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>22</td>
<td>9</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>21</td>
<td>11</td>
<td>17</td>
<td>0.03</td>
</tr>
<tr>
<td>19</td>
<td>14</td>
<td>9</td>
<td>10</td>
<td>2.74</td>
</tr>
<tr>
<td>20</td>
<td>14</td>
<td>7</td>
<td>8</td>
<td>0.46</td>
</tr>
<tr>
<td>21</td>
<td>13</td>
<td>2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>17</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>21</td>
<td>3</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>25</td>
<td>8</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>16</td>
<td>1</td>
<td>8</td>
<td>0.41</td>
</tr>
<tr>
<td>26</td>
<td>18</td>
<td>-2</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>23</td>
<td>8</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>11</td>
<td>2</td>
<td>4</td>
<td>1.74</td>
</tr>
<tr>
<td>29</td>
<td>6</td>
<td>3</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>9</td>
<td>-4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>21</td>
<td>-1</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

*Indicates snow or ice.