

DISTRIBUTION AND STATUS OF CHIROPTERA IN KENTUCKY AND TENNESSEE

MICHAEL J. HARVEY

Department of Biology
Tennessee Technological University
Cookeville, TN 38505

JOHN R. MACGREGOR

U. S. Forest Service
Daniel Boone National Forest
Berea, KY 40403

ROBERT R. CURRIE

U. S. Fish and Wildlife Service
Asheville Endangered Species Field Station
Asheville, NC 28801

ABSTRACT

Fifteen species of bats occur in Kentucky and Tennessee. Three cave bats (Indiana bat, *Myotis sodalis*; gray bat, *Myotis grisescens*; and Townsend's big-eared bat, *Plecotus townsendii*) are considered endangered. Three other cave bat species (southeastern bat, *Myotis austroriparius*; eastern small-footed bat, *Myotis leibii*; and Rafinesque's big-eared bat, *Plecotus rafinesquii*) are under review for possible listing as endangered or threatened. Also occurring in the two-state area are: little brown bat, *Myotis lucifugus*; northern long-eared bat, *Myotis septentrionalis*; silver-haired bat, *Lasionycteris noctivagans*; eastern pipistrelle, *Pipistrellus subflavus*; big brown bat, *Eptesicus fuscus*; red bat, *Lasiurus borealis*; hoary bat, *Lasiurus cinereus*; Seminole bat, *Lasiurus seminolus*; and the evening bat, *Nycticeius humeralis*.

INTRODUCTION

Of 42 bat species native to the United States, 18 occur in the 31 states east of North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas (Harvey 1991). Fifteen species occur in Kentucky and Tennessee. Of those found in Kentucky and Tennessee, three cave species (Indiana bat, *Myotis sodalis*; gray bat, *Myotis grisescens*; and Townsend's big-eared bat, *Plecotus townsendii*) are listed by the U. S. Fish and Wildlife Service as endangered (i.e., in danger of extinction throughout all or a significant portion of their ranges). The Indiana bat and gray bat are considered endangered throughout their ranges, while only the two easternmost subspecies of Townsend's big-eared bat (the Ozark big-eared bat, *P. t. ingens*, found in Arkansas and Oklahoma; and the Virginia big-eared bat, *P. t. virginianus*, found in Kentucky, Virginia, West Virginia, and North Carolina) are presently listed as endangered.

Three additional Kentucky/Tennessee cave bat species (southeastern bat, *Myotis austroriparius*; eastern small-footed bat, *Myotis leibii*; and Rafinesque's big-eared bat, *Plecotus rafinesquii*) are currently under review for possible listing as endangered or threatened. In the

following species accounts, more emphasis is given to those species either currently listed as endangered, or under review for possible listing as endangered or threatened.

SPECIES ACCOUNTS

Indiana bat (*Myotis sodalis*). The Indiana bat ranges in the eastern United States from Oklahoma, Iowa, and Wisconsin east to Vermont and south to northwestern Florida. Distribution is associated with major cave regions and areas north of cave regions (Hall 1962). The present total population is estimated at less than 400 thousand, with more than 85% hibernating at only seven locations: two caves and a mine in Missouri, two caves in Indiana, and two caves in Kentucky.

Indiana bats hibernate in large, dense clusters of up to several thousand individuals, in sections of the cave where temperatures average 3 to 6°C and relative humidities are between 66 and 95% (Barbour and Davis 1969). They hibernate from October to April, depending on climatic conditions. Density in tightly packed clusters is usually estimated at 300 bats per square foot.

Though more than 100 hibernating colonies, of from a few bats to many thousands of individuals, are known to occur in Kentucky and Tennessee caves, their numbers have continued to decrease during the past several years. The current Kentucky/Tennessee population is estimated to number ca. 100 thousand.

Female Indiana bats form small maternity colonies, usually under loose tree bark, and most often in riparian habitat. Most maternity colonies discovered to date have been located north of their hibernation caves. Pregnant or lactating female Indiana bats have been found in five Kentucky counties, all bordering the Ohio or Mississippi rivers. No maternity colonies are known from Tennessee.

Gray bat (*Myotis grisescens*). The range of the gray bat is concentrated in the cave regions of Arkansas, Missouri, Alabama, Kentucky, and Tennessee, with a few colonies in adjacent states (Barbour and Davis 1969). The present total population numbers over 1.5 mil-

lion; however, about 95% hibernate in only eight caves: two in Tennessee; three in Missouri; and one each in Kentucky, Alabama, and Arkansas (Harvey 1991).

Gray bats are cave residents year-round, although different caves are usually occupied in summer and winter. They hibernate primarily in deep vertical caves with large rooms that act as cold air traps. They hibernate in clusters of up to several thousand individuals at sites where temperatures average 6 to 11°C (Barbour and Davis 1969).

During summer, female gray bats form maternity colonies of a few hundred to many thousands of individuals, often in caves that contain streams. Bats in maternity colonies prefer caves that, because of their configuration, trap warm air or provide restricted rooms or domed ceilings capable of trapping the combined body heat of clustered individuals (Tuttle 1975; Tuttle and Stevenson 1978). Other caves are utilized during spring and autumn transient periods.

We currently estimate the Kentucky summer gray bat population at ca. 130 thousand and the Tennessee population at ca. 200 thousand. Although these numbers seem high, estimates based on guano accumulations and ceiling stain suggest an 89% decline in Kentucky and a 76% decline in Tennessee. The Kentucky gray bat hibernating population is estimated to be ca. 250 thousand, while ca. 200 thousand hibernate in Tennessee caves.

Southeastern bat (*Myotis austroriparius*). Southeastern bats are found throughout much of the southeastern United States, from coastal North Carolina to eastern Oklahoma and north into Illinois, Indiana, and Kentucky (Barbour and Davis 1969). In the northern parts of their range, they roost primarily in caves, while farther south they often inhabit buildings. They are usually associated with bodies of water, over which they feed.

Relatively large hibernating colonies of up to 3000 bats inhabit some of the westernmost Kentucky caves. No hibernating colonies are known from Tennessee. Mist-netting in western Kentucky during summer has resulted in few captures of this bat, although Graves and Harvey (1974) reported that it was the second most common bat netted over ponds and streams in western Tennessee.

Eastern small-footed bat (*Myotis leibii*). Eastern small-footed bats range from eastern Canada and New England south to Georgia and west to Oklahoma. They are considered relatively rare throughout their range, though more abundant in the north. They hibernate in caves or mines and are considered the hardiest of eastern United States cave bats. In summer, they often inhabit buildings. No colonies are known from Kentucky or Tennessee, and only a few individuals have been reported.

Little brown bat (*Myotis lucifugus*). The little brown bat ranges across the northern United States and into Canada, Alaska, and south to Arkansas, Oklahoma, Alabama, and Georgia (Barbour and Davis 1969). During winter, they hibernate in caves and mines. In summer they usually inhabit buildings, where they form maternity colonies of hundreds or even thousands of individuals. They occur statewide in both Kentucky and Tennessee, but are more abundant in cave areas.

Northern long-eared bat (*Myotis septentrionalis*). Until recently, this bat was called Keen's bat (*Myotis keenii*). What was previously considered to be one species with two disjunct populations is now considered two different species. The northwestern United States and Canada population retains the name *Myotis keenii*, while the more eastern population is now called *Myotis septentrionalis* (van Zyll de

Jong 1979).

Northern long-eared bats occur from North and South Dakota east to Maine and north to Canada. The southern part of the range extends into Arkansas, Alabama, and Georgia. This bat is not abundant in Kentucky and Tennessee, although they are sometimes netted during summer. Small hibernating colonies inhabit certain caves.

Silver-haired bat (*Lasiorycteris noctivagans*). The silver-haired bat ranges from southern Alaska across southern Canada and south through much of the United States. They are relatively scarce throughout much of their range. These bats seldom enter caves, but rather hibernate in buildings, rock crevices, and similarly protected shelters. They are widespread in Kentucky and Tennessee.

Eastern pipistrelle (*Pipistrellus subflavus*). Eastern pipistrelles occur over much of the eastern United States, north into Nova Scotia and Quebec, and south through eastern Mexico, Guatemala, and Belize. Although these bats are abundant in much of the eastern United States, their summer roosts there are unknown; they are rarely found in buildings, and it is assumed that most roost in trees. Caves, mines, and rock crevices are used as winter hibernacula. They inhabit more caves in eastern North America than any other bat species, usually roosting singly in warmer parts of caves. They are very abundant and widespread in Kentucky and Tennessee.

Big brown bat (*Eptesicus fuscus*). The big brown bat ranges from Alaska and Canada south through the United States and Mexico, to northern South America, including many Caribbean islands. This species is relatively abundant throughout most of its range and is the bat most often found in man-made structures. Summer roosts occur in attics, barns, or other man-made structures, where from a few to several hundred individuals gather to form maternity colonies. Such colonies are found throughout Kentucky and Tennessee. Where these bats spend most of the winter is unknown; they move into caves, mines, and other underground structures to hibernate only during the coldest weather. In Kentucky and Tennessee, many can be found hibernating in caves.

Red bat (*Lasiurus borealis*). Red bats are one of the most abundant bats wherever they occur. Except for the Florida peninsula, they are found throughout the eastern two-thirds of the United States and into Canada. Though one of the most abundant bats in Kentucky and Tennessee, they are seldom found in caves.

Hoary bat (*Lasiurus cinereus*). Hoary bats are the most widespread United States bats, occurring throughout much of Canada, the 48 contiguous states, and south through Mexico, Central America, and into Chile, Argentina, and Uruguay. They also occur in Iceland, Bermuda, and the Dominican Republic, and are the only land mammals endemic to Hawaii, where they are considered endangered. These primarily tree bats are present, but nowhere abundant, throughout Kentucky and Tennessee.

Seminole bat (*Lasiurus seminolus*). The Seminole bat ranges from Arkansas, Tennessee, and North Carolina south, and along the Texas coast into Mexico. They are very abundant in most areas where they occur. Until 1977, this species had not been reported from Kentucky or Tennessee. Kennedy et al. (1984) reported one specimen taken in 1977, and two additional specimens taken during 1983. These three individuals came from widely separated locations in southwestern and southeastern Tennessee. Externally, this species is difficult to

differentiate from the red bat (*Lasiurus borealis*), and it may be more abundant in Tennessee than the known records suggest.

Evening bat (*Nycticeius humeralis*). The evening bat inhabits much of the eastern United States from Iowa, Illinois, Michigan, Ohio, and Pennsylvania, west to Nebraska, Kansas, Oklahoma, and Texas, and south throughout the southeastern states into Mexico. They usually inhabit tree cavities or buildings in summer. Winter habitat is almost completely unknown. They occur throughout Kentucky and Tennessee, but are nowhere abundant.

Virginia big-eared bat (*Plecotus townsendii virginianus*). The Virginia big-eared bat occurs only in certain sections of Kentucky, Virginia, West Virginia, and North Carolina. The total population of this race is estimated at ca. 10,000. With rare exceptions, it has been reported only from caves during both winter and summer. Virginia big-eared bats hibernate in caves where the temperature is 12°C or less, but generally above freezing. Cave hibernation sites are often near entrances in well-ventilated areas. If temperatures near entrances become too extreme, they move to more thermally stable parts of the cave (Humphrey and Kunz 1976). They hibernate in tight clusters of a few to a hundred or more individuals.

Virginia big-eared bat maternity colonies are usually located in relatively warm parts of caves. During the maternity period, males are apparently solitary. Where most males spend the summer is unknown.

This bat is known from nine Kentucky counties; all sites are located within the Daniel Boone National Forest. The major Kentucky hibernation cave, when first reported in 1965 (Rippy and Harvey 1965), contained ca. 1000 bats. The most recent estimate at that cave was 3700 in 1991. The second largest hibernation colony in Kentucky contained only 12 bats. This species has not been reported from Tennessee, although there is a good chance it may be present in the northeastern section of the state.

Rafinesque's big-eared bat (*Plecotus rafinesquii*). Rafinesque's big-eared bat occurs in the southeastern United States from Texas and Oklahoma to the east coast, and north to Illinois, Indiana, Ohio, West Virginia, and Virginia (Barbour and Davis 1969). In the north of their range they hibernate in caves, mines, or similar habitats, including cisterns and wells. They are not usually found in caves in the more southern part of their range. These bats appear widespread in distribution but are nowhere abundant. A summer maternity colony of several hundred individuals inhabits a building in Mammoth Cave National Park.

LITERATURE CITED

- Barbour, R. W., and W. H. Davis. 1969. Bats of America. Univ. Press of Kentucky, Lexington.
- Graves, F. F., Jr., and M. J. Harvey. 1974. Distribution of Chiroptera in western Tennessee. *J. Tenn. Acad. Sci.* 49:106-109.
- Hall, J. S. 1962. A life history and taxonomic study of the Indiana bat, *Myotis sodalis*. Reading Public Mus. and Art Gallery, Sci. Publ. 12:1-68.
- Harvey, M. J. 1986. Arkansas bats: a valuable resource. Arkansas Game and Fish Comm., Little Rock.
- Harvey, M. J. 1991. Bats of the eastern United States. Arkansas Game and Fish Comm., Little Rock. In press.
- Humphrey, S. R., and T. H. Kunz. 1976. Ecology of a Pleistocene relict, the western big-eared bat, *Plecotus townsendii*, in the southern Great Plains. *J. Mammal.* 57:470-494.
- Kennedy, M. L., P. K. Kennedy, and G. D. Baumgardner. 1984. First record of the Seminole bat (*Lasiurus seminolus*) in Tennessee. *J. Tenn. Acad. Sci.* 59:89-90.
- Rippy, C. L., and M. J. Harvey. 1965. Notes on *Plecotus townsendii virginianus* in Kentucky. *J. Mammal.* 46:499.
- Tuttle, M. D. 1975. Population ecology of the gray bat (*Myotis grisescens*): factors influencing early growth and development. *Occas. Pap. Mus. Nat. Hist., Univ. Kans.* 36:1-24.
- Tuttle, M. D., and D. E. Stevenson. 1978. Variation in the cave environment and its biological implications. Pp. 108-121 in: Zuber, R., J. Chester, S. Gilbert, and D. Rhodes, (eds.) *Natl. Cave Manage. Symp. Proc. Speleobooks*, Albuquerque, NM.
- van Zyll de Jong, C. G. 1979. Distribution and systematic relationships of long-eared *Myotis* in western Canada. *Can. J. Zool.* 57:987-994.