Population Decline of the Endangered Indiana Bat, Myotis sodalis, in Arkansas

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General Notes

The spider fauna collected are what we would have expected. Gnaphosids (ground spiders), Lycosids (wolf spiders), Thomisids (crab spiders), and Salticids (jumping spiders) are the families most likely to be wandering, hunting, ambushing, and stalking prey on the ground. Therefore, these spiders are more likely to fall into traps than other families of spiders that make webs or trap prey.

Fewer spiders have been identified from the Bradley County collection than from the Drew County collection which may account for the discrepancy in numbers reported for that county as compared with Drew County. The practices carried out in both treatments were also very different.

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POPULATION DECLINE OF THE ENDANGERED INDIANA BAT, Myotis sodalis, IN ARKANSAS

The Indiana bat, *Myotis sodalis*, is one of three Arkansas bat taxa listed as endangered (specifically, in danger of extinction throughout all or a significant portion of its range) by both the U.S. Fish and Wildlife Service and the Arkansas Game and Fish Commission. Other Arkansas bats also listed as endangered are the gray bat (*Myotis grisescens*) and the Ozark big-eared bat (*Plecotus townsendii ingens*).

The range of *M. sodalis* extends across the eastern United States from Oklahoma, Iowa, and Wisconsin east to Vermont and south to northwestern Florida. Distribution is associated with major Karst regions and areas north of such regions (Hall, 1962). The present total population is estimated to number approximately 500,000, of which more than 85% hibernate at only six locations; two caves and a mine in Missouri, two caves in Indiana, and a cave in Kentucky. In Arkansas, Indiana bats are found primarily in the Ozark Mountain region, the only area of the state where caves are numerous.

Indiana bats hibernate in large dense clusters of up to several thousand individuals, in sections of the hibernacula where temperatures average 3.6–6°C and having relative humidities of 66–95% (Barbour and Davis, 1969). In Arkansas, most Indiana bats have been found hibernating where temperatures were slightly warmer, ca. 8–10°C. Surface temperatures of large clusters taken with an infrared thermometer were usually within ± 0.5°C of the temperature of the cave wall or ceiling near clusters. These bats hibernate from October to April, depending on climatic conditions. Density in clusters is usually about 3,200 bats per m²; however, in one instance, we found as many as 5,000 bats per m² in a tight cluster in an Arkansas hibernaculum in late February.

Females depart hibernacula before males and arrive at summer maternity roosts in mid May (Humphrey et al., 1977). They raise their single young, born during June, under the exfoliating bark of trees in wooded riparian habitats. During September they depart for autumnswarming caves (Cope and Humphrey, 1977; Humphrey et al., 1977). The summer roost of adult *M. sodalis* is apparently in the vicinity of hibernacula, but where most spend the day is not known (Hall, 1962; LaVal et al., 1977).

Until 1974, little was known concerning the summer habitat and ecology of this bat. In 1974, the first known maternity colony was discovered, under the loose bark of a dead bittersweet hickory tree in east central Indiana (Humphrey et al., 1977). The colony, numbering about 50 individuals, also utilized an alternate roost, located under the bark of a living shagbark hickory tree. The total foraging range of the colony consisted of a linear strip along 0.82 km of a creek. Further, foraging habitat was confined to air space from 2 m to approximately 30 m high, near the foliage of riparian and floodplain trees (Humphrey et al., 1977).

During the summers of 1977 and 1978, two additional maternity colonies were discovered, both also in east central Indiana (Cope and Seerley, 1977; Cope et al., 1978a). The two colonies had maximum estimated populations of 100 and 91 respectively, including females and young. Indiana bats were also captured at four additional locations in the same area, but outside the known range of the two maternity colonies. Habitat in the area was similar to that described for the first maternity colony discovered in 1974 (Humphrey et al., 1977). The foraging area of one of the two colonies was found to extend along approximately 1.2 km of stream.

Summer foraging habitat of maternity colonies is in mature riparian forest. Interestingly, Indiana bats have not been observed foraging over cleared portions of streams or over fields away from trees (Cope et al., 1974; Humphrey et al., 1977). In flying to a foraging area, Indiana bats apparently will not fly over open country or open water (Cope et al., 1978a).

Much of what is currently known about summer habitat and ecology of this species is included in the publication of Humphrey et al. (1977), and in unpublished reports by Cope et al. (1978a, 1978b). During recent years additional evidence has accumulated indicating that, during summer, *M. sodalis* are widely dispersed in suitable habitat throughout a large portion of their range. LaVal and LaVal (1980) reported mist netting lactating females and juveniles at 10 locations scattered over northern Missouri and cited a personal communication from J. Bowles indicating similar data from Iowa. Others have also reported capturing females and/or young during summer in Missouri (Easterla and Watkins, 1969), Illinois (Kessler and Turner, 1979, 1980), and Kentucky (Kessler et al., 1981; and Harvey and Kennedy, 1980, 1981).

Our attempts to locate summer colonies of Indiana bats in Arkansas by netting at several locations in various habitat types resulted in failure to capture female bats. Males, however, were netted at some cave entrances. In addition, several (as many as 10 per cave) male *M. sodalis* were observed in Arkansas Ozark caves during summer. It is likely that female Indiana bats from Arkansas hibernacula migrate northward in summer to maternity roost sites located to the north of the Ozark Mountains.

Between early August and mid-September, Indiana bats arrive in the vicinity of their hibernacula where they engage in swarming and copulation. Swarming continues into mid to late October. During this time five reserves are built up hibernation. In Missouri, Indiana bats were found to feed primarily on moths (LaVal and LaVal, 1980). Paradiso and Greenhall (1967) reported a longevity record of 13 yr 10 mo for this species.

Hibernating bats leave little evidence of their past numbers, thus it is difficult to calculate a realistic estimate of population decline for this species. It is likely that the Indiana bat population in Arkansas was as high as reported from other areas. However, we do know that at least 10 Arkansas caves that previously housed hibernating colonies of Indiana bats are no longer inhabited by this species. We also know that one Newton County cave, that only a few years ago contained 7,000 hibernating Indiana bats, now houses less than 200.

Proceedings Arkansas Academy of Science, Vol. XXXX, 1986 87
Harvey (1980) and Harvey et al. (1979) reported that the largest known Arkansas Indiana bat hibernating colony numbered less than 2,000 individuals. That colony had since decreased to fewer than 200 bats. However, Harvey et al. (1981) reported locating an additional Indiana bat hibernating colony that, in February 1981, numbered ca. 5,000 individuals. That colony had decreased to only ca. 1,850 bats, when last checked during the winter of 1984-85.

Currently, we know of only six Arkansas caves where more than 30 individuals can be found hibernating in winter. The present Arkansas population (ca. 2,630) represents a 54% decline for this species since 1981 and is probably only a very small percentage of the numbers that previously hibernated in Arkansas caves. One of the six hibernation caves, located on Buffalo National River lands, has been fenced by the National Park Service to protect Indiana bats and gray bats that hibernate in the cave. Three additional Indiana bat hibernation caves located on Ozark National Forest lands have been closed (warning/interpretive signs) to the public to protect bat colonies. Hopefully, protection of these caves will result in an increase in bat populations at these caves. However, it is unlikely that other caves, previously inhabited by Indiana bats but now abandoned, will be recolonized by this species.

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LITERATURE CITED


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