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STATUS OF THE ENDANGERED OZARK BIG-EARED BAT (*Plecotus townsendii ingens*) IN ARKANSAS

Three bat taxa endemic to Arkansas are now considered to be endangered (in danger of extinction throughout all or a significant portion of their range). The Indiana bat, *Myotis sodalis*, and the gray bat, *M. grisescens*, are currently on the United States list of endangered species. The Ozark big-eared bat, *Plecotus townsendii ingens*, (along with the Virginia big-eared bat, *P. t. virginianus*) will be added pending final legislation.

The Ozark big-eared bat has been reported in small numbers from only a few caves in northwestern and north central Arkansas, southwestern Missouri, and eastern Oklahoma (U. S. Department of the Interior, Fish and Wildlife Service 1973; Handley 1959; Harvey 1975, 1976, 1978; McDaniel and Gardner 1977; Sealander 1951, 1956; Sealander and Young 1955). The Department of the Interior, Fish and Wildlife Service (1973) estimated the total number surviving to be less than 100 and stated that never more than four individuals had ever been found at one time. That information is incorrect. Sealander (1951) reported collecting 11 individuals from a Washington County, Arkansas, cave in 1951. It was not until 24 years later that a number greater than 11 was reported. Harvey (1975, 1976) reported finding 60 *P. t. ingens* in a western Arkansas cave in February, 1975.

Due to the small number known, relativity little information is available concerning this particular subspecies. However, much is known about the species in other parts of its range, most of which may also apply to *P. t. ingens*. Humphrey and Kunz (1976) published a detailed account concerning the ecology of the southern Great Plains population of *P. townsendii*, considered to be an intergrade of *P. t. pallescens* of the southern Rocky Mountains and *P. t. ingens*. In addition, several authors have reported on the biology of the more abundant western subspecies (Handley 1959; Barbour and Davis 1969; Graham 1966; Dalquest 1974; Pearson et al. 1952; Twente 1955).

In the eastern part of their range *P. townsendii* inhabit caves during both summer and winter, although occasional individuals have been observed in buildings during the summer. In the western part of their range they are often found in buildings. *P. townsendii* hibernate in caves or mines where the temperature is 12° C or less, but generally above freezing. They are usually found clustered in groups of a few to a hundred or more individuals. The species is very intolerant of human disturbance and will sometimes vacate a cave if disturbed (Humphrey 1969; Humphrey and Kunz 1976; Twente 1955; Barbour and Davis 1969).

During the past 5 years numerous caves in northwestern and north central Arkansas were searched in an attempt to locate colonies of Ozark big-eared (as well as other) bats. Name, location, and a brief description of each cave, as well as a record of bat taxa and numbers present, were recorded. Collection of specimens was minimal and usually bats were handled only if necessary for identification purposes. Ecological data such as temperature and humidity of bat microhabitats were recorded. During warmer seasons limited mist netting was conducted in a variety of habitat types.

The colony of 60 *P. t. ingens* reported by Harvey (1975, 1976) from a western Arkansas cave in February, 1975, was not present in the cave when checked during the following winter. However, in early March, 1978, we discovered a cluster of 35 hibernating *P. t. ingens* in another cave in the same general area. Both caves are in Washington County. In November, 1974, we found eight *P. t. ingens* clustered above a guano pile in a Marion County cave. Two skeletons of this bat were found in the guano. An additional Ozark big-eared bat was found in a Marion County mine in February, 1974.

Although numerous other caves and mines in northwestern and north central Arkansas were searched, no additional *P. t. ingens* were discovered. Summer mist netting also failed to result in the capture of Ozark big-eared bats. However, netting was not done in areas near caves and mines from which *P. t. ingens* have been reported.

Our records indicate that *P. t. ingens* prefer relatively cold areas of caves for hibernation. Temperatures where Ozark big-eared bats were found ranged from 4° C to 9° C; humidity was 85-95%. We know nothing concerning summer habitat of this taxon. Quite likely nursery colonies exist somewhere in Ozark caves, but thus far none have been found.

The discovery in the last few years of groups of *P. t. ingens* numbering from eight to 60 individuals indicates that these bats may be present in greater numbers than previously thought. However, the total surviving population may number no more than a few hundred individuals. Their exact status is still relatively unknown. Known colonies will be monitored and attempts will be made to locate additional colonies as well as to identify critical habitat requirements for this taxon. Because no cave regularly inhabited by *P. t. ingens* has been discovered, no critical habitat has as yet been proposed.

Numerous individuals have been involved in our attempts to ascertain the status of the endangered Ozark big-eared bat in Arkansas. Personnel of the Arkansas Game and Fish Commission, Arkansas Department of Parks and Tourism, U. S. Forest Service, and National Park Service have supplied information and otherwise aided in many ways. A number of graduate students and faculty members were involved in field work. We sincerely appreciate the efforts of all those who contributed their time and expertise.

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THE DESIGN AND CONSTRUCTION OF AN INEXPENSIVE ANECHOIC CHAMBER

When any degree of precision is needed in obtaining data on the radiation properties of an acoustical device such as a loudspeaker or musical instrument, measurements are usually taken under free space conditions without the presence of complicating stationary save patterns. Indoor free space measurements require an anechoic room, a room with completely sound absorbing walls. However, a specially designed chamber can be used as a good approximation of an anechoic room.

A portable chamber, as detailed in Figures 1 and 2, can be utilized as an anechoic chamber. In never having any opposite wall face parallel to another, stationary wave patterns will be prevented from establishing themselves. This, combined with the greatly increased surface area due to approximately thirty-five hundred polyurethane wedges, will give the central area of the chamber an anechoic effect. Transmitted noise from outside the chamber is prevented by insulating the chamber with rock wool fiberglass and acoustical ceiling tile.

The walls of the chamber consist of four layers. The outer external layer consisting of three-quarter inch plywood, and, although its primary purpose is that of the skeleton of the chamber, it also serves as the first barrier against external noise. The second layer consist of two inches of rock wool fiberglass insulation, acting as an acoustical absorber of any noise which is able to penetrate the external layer. The third layer, three-quarter inch acoustical ceiling tile, provides three functions: acting as a final barrier to incident noise from the outside, providing a base from which the polyurethane foam can be attached, and absorbing sound generated from the inside of the chamber. The inner layer is a polyurethane foam forming a mosaic of alternating vertical and horizontal wedges projected normally from each surface. Each foam wedge is four square inches at its base and projects four inches toward the central area of the chamber.

The chamber is constructed in two equal parts, allowing for greater mobility, and joined with a latched tongue and groove joint. Steel mesh serves to support equipment placed in the chamber. Quarter-inch holes packed with insulation are placed on either end of the chamber giving access for microphone leads or any other test equipment leads.

While this chamber will not replace a complete full size anechoic room, it will allow for acceptable measurements of acoustical radiation. However, certain limitations are inherent in the dimensions of the chamber. Frequencies lower than 1000 Hz are of sufficient wavelength to cause concern. Any application of the chamber should be restricted to making measurements of radiation above the 1000 Hz limit. Measurements of high frequency resonance response characteristics of string instruments, frequency response of loudspeakers, or frequency characteristics of microphones are but a few of the applications of the chamber.

This chamber was constructed using funds from a grant made possible by the Bendix Corporation through the Society of Physics Students.

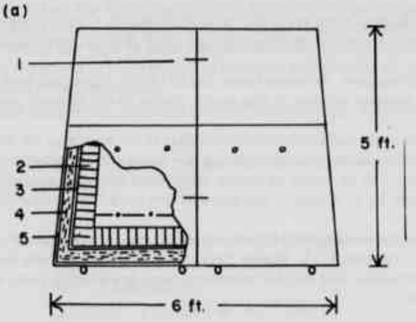

Figure 1(a). End view of chamber showing cut out view of the inside and the locations of: (1) - latches, (2) - polyurethane foam wedges, (3) - ¾ inch acoustical ceiling tile, (4) - 2 inches rock wool insulation, (5) - ¾ inch plywood.

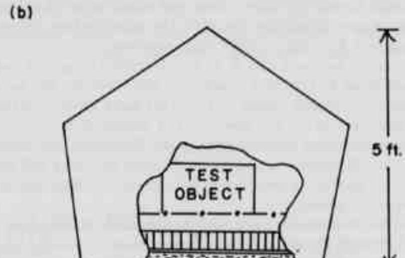

Figure 1(b). Side view of chamber showing placement of a test object supported by wire mesh.