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about the same latitude. Other localities where white bass 8 or more years old have been reported are: Oneida Lake, New York, 10 years (Forney and Taylor, N. Y. Fish Game J. 10:194-200, 1963); Spirit Lake, Iowa, 9 years (Sigler, Agric. Exp. Stn. Iowa State Coll. Res. Bull 366:236-244, 1949); and Shafer Lake, Indiana, 8 years (Riggs, Ph.D. Thesis, Univ. Michigan 224 p., 1953).

Three fish were 3-year-olds at the time of tagging; therefore one was an 8-year-old when recaptured in 1974, and two were 9 years old when recaptured in 1975. Total lengths at tagging were 315, 350, and 354 mm respectively. The last two fish listed establish a longevity record for white bass in the southern United States. One fish, 248 mm long was a 1-year-old when marked in November, 1968 and was over 8 years old when recaptured in 1976. Based on the angler's recapture report, the fish was 501 mm long and had gained about 900 g. Its weight at tagging was estimated from the average weight of several fish of the same length in a 1969 gillnet sample. This fish established a record for the length of time (7.6 years) a white bass has carried a tag.

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EFFECT OF LIMESTONE ON SPRING WEED POPULATIONS IN A FERTILIZED COASTAL BERMUDAGRASS SOD*

In 1968 a nitrogen-potassium fertilizer experiment was initiated at the Main Arkansas Agricultural Experiment Station to study the effects of these fertilizers on the yield and winter hardiness of Coastal Bermudagrass (*Cynadon dactylon* L.). Various research investigations have been conducted on this site dealing with the effect of fertilizer treatments on the yield and chemical composition of the forage, on the chemistry and acidity of the soil (Allured, 1976; Nagel, 1977), and on weed population and species. Allured et al. (1974) studied the effect of varying rates of N and K fertilizer on weed populations and species in 1973 and found that total week count was affected only by the highest rate of N (672 kg/ha) and that these treatments contained less than half as many weeds as did the N treatments of 0 and 336 kg/ha. They observed that the average number of weed species on treatments receiving the highest N rate was only about 60% as high as those with the two lower N rates. Also, as K rates increased to 168 kg/ha, weed species also increased but decreased as higher K rates (336 and 672 kg/ha) were applied.

Meijden (1974) reported that ragwort (*Senecio jacobaea* L.) populations increased as exchangeable calcium increased. Beard (1973), who recognized the influence of soil fertility on weed populations, stated that certain turf specialists have recommended allowing acidic conditions to exist in turfgrass soils to control weeds. Buchanan et al. (1975) reported that certain weeds such as common chickweed (*Stellaria media* [L.] Cyrillo) redroot pigweed (*Amaranthus retroflexus*), and common dandelion (*Taraxacum officinale*) were sensitive to low soil pH. The Geigy Weed Tables state that henbit (*Lamium amplexicaule* L.) thrives in fertile soils when pH is between 6 and 7 (1968).

Fifteen fertilizer treatments were applied to a Coastal Bermudagrass sod on a Pembroke silt loam at the Main Experiment Station, University of Arkansas, Fayetteville, for the years 1968-1976. Nitrogen rates of 0, 336, and 672 kg/ha and K rates of 0, 84, 168, 336, and 672 kg/ha were applied annually. The experimental design was 3 X 5 factorial arrangement in a randomized complete block. There were four replications. Nitrogen, as NH_4NO_3, was applied in three equal applications after the first three harvests; and K, as KCl, was applied in two equal applications each season. A broadcast application of superphosphate was applied uniformly as needed to supply the phosphorus needs of the plants. In May of 1974, the 2.45 by 6.10 meter plots were split, and finely ground calcitic limestone was applied randomly to one half of each plot at the rates of 2.5, 5.0 and 7.5 MT/ha to the no-N, 336N and 672N treatments, respectively. In May 1976, each of these three N treatments was relimed at the rate of 2.4 and 6 MT/ha, respectively.

The number of weeds and the species were counted 14-15 March 1977, before the bermudagrass emerged, within an area one meter square, randomly selected from the center of each plot. The data collected were subjected to an analysis of variance to determine the nature of the relationship between the soil amendments and total weed population.

The mid-March weed counts showed that henbit (*Lamium amplexicaule* L.) plants accounted for 80% of the total weed population. Other weed species, in decreasing order of abundance, were little barley (*Hordeum pusilium* Nutt.) at 10%, chickweed at 5%, dandelion at 4%, and wild garlic (*Allium vineale* L.), mint (*Labeate* spp) and other weeds at less than 0.5% each.

The average density of all weeds amounted to 8.7/m². Neither the N, the K, nor the N X K interaction affected weed counts. However, both the limestone and the limestone X nitrogen interaction affected the weed population at the 1% level of significance (Table 1). None of the other limestone X fertilizer interactions were significant. The limestone had no effect on the weed population in the no-N treatments, but as N rates increased, weed counts significantly declined in unlimed plots and significantly increased in the limed plots. Visual observation indicated that there was no amendment X weed species interaction; i.e., the ratio of the several weed species remained constant on the variously limed and fertilized treatments. The limed, high-N treatment had almost four times as many weeds as its unlimed counterpart.

Throughout this experiment the soil of the treatments receiving the highest N rate became progressively more acid. By the time these weed counts were made, this surface soil had a pH in the mid to high 3's. This extreme soil acidity may have been the factor that suppressed weed growth. When the weed counts were taken, the experimental site had a striking checkerboard appearance caused by the bright purple flowers of the henbit in the subplots of the N fertilized treatments which had been limed.

While the high N rates on the unlimed treatments affected the weed population in much the same manner as reported by Allured et al. (1974) the effect of N fertilization on weed populations of the limed treatments in 1977 was markedly different. There was no limestone variable in Allured's 1974 experiment.

*Published with the approval of the Director of the Arkansas Agricultural Experiment Station.

Table 1. Effect of long-term annual nitrogen applications, and 1974 and '76 limestone applications, on early spring weed populations in a Coastal Bermudagrass sod. Weeds/m².

	annual N rates, kg/ha			
	0N	336N	672N	ave
no limestone	7.9c*	5.5d	4.1d	5.8b
limed in 1974 & '76	7.7c	11.5b	15.3a	11.5a

*Values in the average column and in the interaction table not followed by the same letter are significantly different at the 5% level of probability.

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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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