

**A NORTHWARD RANGE EXTENSION OF
SIGMODON HISPIDUS INTO
MONTGOMERY COUNTY, TENNESSEE**

BY

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A NORTHWARD RANGE EXTENSION OF SIGMODON HISPIDUS
INTO MONTGOMERY COUNTY, TENNESSEE

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by
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To the Graduate Council:

I am submitting herewith a Research Paper written by David Robert Winters entitled "A Northward Range Extension of Sigmodon hispidus into Montgomery County, Tennessee." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Biology.

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This research is dedicated to my father, the late Richard William Winters, who aspired for a good and meaningful education for each of his children.

LIST OF TABLES

TABLE

PAGE

- I. List of all known Sigmodon, and their identifying
characteristics, found in Montgomery County,
Tennessee 12

TABLE OF CONTENTS

	PAGE
LIST OF TABLES	v
CHAPTER	
I. INTRODUCTION	1
Statement of the Problem	1
Importance of the Study	1
Limitations of the Study	2
Review of the Literature	2
II. MATERIALS AND METHODS	4
III. DESCRIPTION OF THE STUDY AREA	8
IV. RESULTS	10
V. DISCUSSION	13
VI. SUMMARY	15
LITERATURE CITED	16

Limitations of the Study

The study was conducted in the spring and summer months of 1972. The study was confined to Montgomery County, Tennessee.

Review of the Literature

The life history and ecology of the cotton rat has been studied and reported by various investigators over a number of years.

Odum (1955) studied density, cycles of population, and age distribution in a classic eleven year study of the cotton rat. Natural predation of cotton rats was studied by Schnell in 1968. Reproduction variation has been reported by Goertz (1965a). Kilgore (1970) studied reproduction variation but also included other information such as growth rates for northern cotton rats. In 1944 Meyer and Meyer wrote a classic paper on the growth and reproduction of the cotton rat under laboratory conditions. Energy flow through cotton rats was described by Golley (1959). Food habits of the cotton rat and its ecological equivalent Microtus ochrogaster, the prairie vole, have been reported by Fleharty and Olson (1969). Age classes of Sigmodon during a population decline were studied by Chipman (1966) and the effect of habitat quality upon density of Sigmodon populations was reported by Goertz (1965b).

The northward boundaries of Sigmodon populations have been fairly well documented over most of its geographical range. In the West, Mohlhenrich (1961) and Anderson and Berg (1959) have worked on range extensions and population densities of Sigmodon. In the Midwest, Rinker (1942), Cockrum (1948), and Jones (1960; 1964) have

studied the distribution and range extension of cotton rats. The presence of Sigmodon in Kentucky has been established on the basis of two cotton rats trapped in Lyon County (Goodpaster; 1952). In the East, Patton (1941) has studied the range of the cotton rat in Virginia.

In Tennessee, Komarek (1938) reported populations of cotton rats in Knox and Sevier counties. Kellogg (1939), whose reporters trapped in most counties of the state including Montgomery and Stewart counties found cotton rats only in Hamilton, Fayette, Giles, and Lincoln counties. Cotton rats were trapped in large numbers in Sequatchie County in 1952. (Howell; 1952) Goodpaster (1952) reports Sigmodon as being found in the Mississippi Embayment area of West Tennessee. Carter (1960) trapped in Davidson county and made an annotated list of all mammals found. Sigmodon was not included in this list.

No reports indicate the presence of Sigmodon hispidus in the central-central or north-central parts of Tennessee.

MATERIALS AND METHODS

For the purpose of this study, the county was divided into four zones of approximately the same size. Zone 1, the northwest corner of the county, was trapped approximately 180 days. Zone 2, the southwest corner, was trapped approximately 210 days. Zone 3, the northeast block, was trapped approximately 240 days while the southeast area, or zone 4, was trapped approximately 180 days. Trapping was conducted in twenty-seven different locations.

Trapping sites were selected by the researcher driving down a road until an area that appeared to contain abundant food and cover for Sigmodon was located. Closer observations were made by walking through the site to determine whether it had good permanent cover, a food supply, and if runways were present. Traps were placed on private property by permission and also were located on certain railroad banks or land where the ownership could not be ascertained. The traps were placed in what appeared to be the most productive locations as indicated by droppings, cuttings, and runways.

The traps consisted of three types: Single catch Sherman metal live traps with outside dimensions of 3 1/4 by 3 1/4 by 9 inches; Single catch Havahart live traps (3 1/4 by 3 by 10 inches); and homemade multiple-catch traps that measured 3 1/2 by 5 by 12 inches.

The homemade traps were pieces of wood of the previously stated dimensions which were nailed together to form a rectangular box. Each end of the trap had a door constructed of one-fourth inch mesh hardware cloth. The wire was secured at the top to an aluminum rod which in turn was secured to the box by running it through small holes in the wood. The door was bent inward to let the animal in and also this prevented the animal from forcing his way out.

Usually ten traps were set out at each site between 4 and 6 in the afternoon on the initial day an area was to be trapped. The traps were left for three consecutive nights and were checked at least once daily to remove the catch, renew feed if needed, and to re-open sprung empty traps. However, on a few occasions traps had to be left at a particular area an extra night or two to make up for nights lost due to traps having been stolen or damaged. Each study area was trapped for thirty trap days except for a few instances.

An equal distribution of the various trap types was included in each area so that bias due to preference for a trap design would be eliminated.

Cardboard sunshelters were placed over the traps during the summer to keep the internal heat of the traps at the lowest possible temperature.

The multiple-catch traps were baited with poultry scratch feed that consisted of cracked and broken corn kernels, sunflower seeds, millet, and seeds of several field plants. Ample bait was provided at all times. The single-catch traps were baited with "crunchy" peanut butter. The peanut butter was changed frequently

in the warmer months because of its tendency to harden and lose its odor. Also, pilfering insects would sometimes deplete a supply of bait since no insect repellant of any kind was added to any traps.

Trapped animals were handled by use of a cone described by Provo (1962). This cone was collapsible and consisted of fourteen stiff long wires attached to a sleeve of heavy cotton cloth on one end and a one-half inch wire ring on the other. The cloth sleeve was large enough to fit over the end of the traps. The end covered by the cloth was opened and the animal was induced to enter the cone.

Animals that were not to be sacrificed were marked by clipping the toes after the method described by Provo (1962). The front toes were assigned numbers one through eight while the back toes represented the tens digit. For example, if an animal was the twenty-third to be caught, the rear left second toe observed (with the animal lying on his back) would be cut with manicure scissors at the first joint to represent twenty. The next innermost toe would be cut at the first joint to represent three.

Following the marking, the animal was transferred to a cloth animal bag. A triple-beam Ohaus balance, accurate to the nearest 0.1 gram, was used to weigh the animal while he was in the bag. The animal was then released or quickly sacrificed. Sacrificing was accomplished by holding the animal bag under an automobile tail pipe while the car engine was running. After the animal was removed from the bag, the bag was weighed again, the difference between the two weights being considered the animals weight. Care was taken to prevent any unnecessary discomfort to the animal during all procedures.

The Sigmodon were divided into three age groups on the basis of their weight using the criteria of Odum (1955), and Meyer and Meyer (1944a). Animals under sixty grams were considered to be juvenile. Rats between sixty and one hundred and ten grams were considered young adults and those one hundred and ten grams and above were considered old adults.

The animals were identified by use of criteria found in the guides of Palmer (1954) and Burt and Grossenheider (1954). The date, location, and general habitat with reference to vegetation was noted for all areas that produced Sigmodon.

DESCRIPTION OF THE STUDY AREA

A brief description of each area that produced Sigmodon follows.

Site 1 was a waste area adjacent to a railroad track. The main cover was Honeysuckle (Lonicera japonica) with little other vegetation within a one-fourth mile radius excepting Johnson Grass (Sorghum halepense).

Site 2 was a narrow railroad right of way. The main plants were Honeysuckle, Sericea ambrosia, and Johnson Grass.

Site 3 was an abandoned field consisting chiefly of Honeysuckle and Johnson Grass.

Site 4 was an abandoned pasture with a farm pond. Curly Dock (Rumex crispus), Red Clover (Trifolium pratense), and Sorghum halepense were the most common species.

Site 5 was an abandoned upland field with Sassafras albidum, Goldenrod (Solidago sp.), and Sorghum halepense being the main species found.

Site 6 was an abandoned field near a river. Large rocks with nests underneath were observed. Lactuca sp. or Wild Lettuce and Horseweed (Erigeron sp.) were the most abundant tall plants. Some Sericea lespedeza and Johnson Grass was present. A small amount of

Broom Sedge (Andropogon sp.) was also noticed.

Site 7 was a forest glade which consisted of sowed Kentucky grass, Honeysuckle thickets, and an area of planted Sericea lespodeza.

Site 8 was the only true Broom Sedge field. In fact, it was the only field where Broom Sedge played a great part in species make-up. Other plants noted were Poke (Phytolacca americana) and Passion Flower (Passiflora lutea).

RESULTS

Several kinds of mammals were trapped during the study to find Sigmodon hispidus in Montgomery County. The animal found at more trap sites than any other was the white-footed mouse, Peromyscus leucopus. It was captured in nearly every trapping site and in totality more of them were caught than any other animal. Sigmodon were the second most prevalent by trap sites. They were found in eight of the twenty-seven areas trapped. Microtus ochrogaster, the prairie vole, were found in three of the trapping sites. Mus musculus, the house mouse, was trapped at two of the sites. Rattus norvegicus, the Norway rat, and Tamias striatus, the Eastern chipmunk, were each found at one trap site.

As stated previously, Montgomery County was divided into four zones for trapping purposes. In zone 1, or the northwest zone, no Sigmodon were captured. In zone 2, the southwest zone, Sigmodon were found at five sites. These sites were described in the immediately preceding section of this paper as sites 1 - 5. In zone 3, the northeast area, cotton rats were found at one site (site 6), and in zone 4, southeast, they were found at two sites (sites 7 and 8).

The following table is a listing of all Sigmodon substantiated by the researcher as being found in Montgomery County. The first three

were found prior to the beginning of this study by other collectors. Two Sigmodon were trapped by other collectors while the study was in progress. All of these have been prepared as study skins and are stored in the Biology Department museum of Austin Peay State University. All other Sigmodon were trapped by the author.

TABLE I

LIST OF ALL KNOWN SIGMODON, AND THEIR IDENTIFYING
CHARACTERISTICS, FOUND IN MONTGOMERY COUNTY, TENNESSEE

Collector	Date	Weight	Sex
1. Nelson Hunter	October 4, 1967	80 grams	not reported
2. Jonathan Wert	October 10, 1967	95 grams	female
3. Steven Overby	October 29, 1967	no report	no report
4. David Winters	October 17, 1971	102.8 grams	female
5. David Winters	October 19, 1971	135 grams	female*
6. Billie Grounds	November 7, 1971	156 grams	male
7. David Winters	April 13, 1972	112 grams	female
8. David Winters	April 14, 1972	116 grams	female
9. David Winters	April 14, 1972	115 grams	male
10. David Winters	April 15, 1972	114 grams	female
11. David Winters	April 16, 1972	125 grams	male
12. Leon Lange	May 28, 1972	160 grams	male
13. David Winters	June 28, 1972	body mangled - data unavailable	
14. David Winters	July 6, 1972	76.8 grams	female
15. David Winters	July 6, 1972	63.5 grams	male
16. David Winters	July 10, 1972	145.2 grams	female*
17. David Winters	July 18, 1972	64.5 grams	male
*pregnant females			

DISCUSSION

Fourteen Sigmodon of various age groups were found at eight trap sites located in different areas of Montgomery County. Of the fourteen animals captured, two were pregnant adults. This alone suggests that an inference of range extension might be drawn because it suggests permanent residence in the area. This extension would be of approximately ninety miles north of the last county in which cotton rats had previously been reported in central Tennessee. The former northern border was described in Sequatchie County by Howell and Conway in 1952.

Another factor which helps to verify this permanence of Sigmodon populations was that ecological factors necessary for survival and growth of Sigmodon populations were found in the areas observed.

Stoddard (1936), Hamilton (1943), Provo (1962), and Schnell (1968) all state that dense overhead cover with covered runways for the animals to utilize must be present at all times of the year for the survival of Sigmodon populations. One reason for the screening overhead vegetation is the fact that cotton rats are a favored food of Marsh Hawks, Barred Owls, and other avian predators as shown by Schnell (1968).

The temperature of the area was obviously warm enough since it

is warmer in Montgomery County than in Kansas (Cockrum; 1948) and Nebraska (Jones; 1960).

In the South broom sedge (Andropogon) supplies both the cover and main food source for Sigmodon as indicated by Provo (1962) and Fleharty (1969). In the sites trapped during this study, Andropogon was sparse and often nonexistent. However, Lonicera japonica, Lespedeza Sp., Sorgum halepense, and planted grasses provided a substitute cover. Sorgum, lactua, and Rumex crispus provided a possible alternate food source.

No analysis could be made on the relationship of population density of Microtus ochrogaster to Sigmodon due to the small number found.

Due to the number and various age classes of Sigmodon found as well as the abundance of suitable habitat, it is felt that Sigmodon could be considered as permanent residents of Montgomery County, Tennessee.

SUMMARY

The study was conducted during the Spring and Summer of 1972 for the purpose of determining whether Sigmodon hispidus populations reside in Montgomery County, Tennessee. Prior to this study, Sigmodon had not been reported in either central-central or north-central Tennessee.

The county was divided into four approximately equal areas for trapping purposes and each area was trapped at least 180 days. Ten traps were placed at each site and remained there for three nights.

The sex and weight of each Sigmodon collected was recorded. A vegetational analysis of each area that produced Sigmodon was also noted. Records were kept of all other mammals trapped. Fourteen Sigmodon were found in eight of the twenty-seven sites trapped. Microtus ochrogaster, the ecological equivalent of Sigmodon, was found in three of the sites trapped.

It seems evident that Sigmodon are permanent residents of Montgomery County not only due to the numbers trapped but due to the fact that several pregnant females and young cotton rats were found in areas suitable for continuing growth. Nothing conclusive could be ascertained regarding the relationship of Microtus ochrogaster to Sigmodon populations due to the small number found.

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