

ELEVATIONAL RANGE EXTENSION FOR THE HISPID COTTON RAT,
SIGMODON HISPIDUS, (RODENTIA: MURIDAE)

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The hispid cotton rat (*Sigmodon hispidus*) has one of the largest geographic distributions within the genus *Sigmodon* (Wilson and Reeder, 1993; Peppers and Bradley, 2000). Its range encompasses the southern United States, from central Virginia and southern Nebraska in the north, to northern Mexico in the south, and from the Atlantic Ocean in the east to the lower Colorado River in the west (Wilson and Reeder, 1993; Peppers and Bradley, 2000). As is typical for members of the genus, the hispid cotton rat is primarily associated with warm grassland habitats. In the Southwest it is almost exclusively associated with desert grasslands and shortgrass plains. For example, Hoffmeister (1986) overlaid specimen locality records with a map of biotic communities and found that 20 of 22 locality records of *S. hispidus* in Arizona were in desert scrub or plains and desert grassland communities; the remainder were mapped in encinal and Mexican oak-pine woodland. In the Trans-Pecos of Texas, *S. hispidus* is associated with areas of moderate grass cover at lower elevations and may be particularly abundant in river valleys and cultivated fields (Schmidly, 1977). In New Mexico, Mohlhenrich (1961) provided a comparative study of the distribution and ecology of *S. hispidus* and the yellow-bellied cotton rat (*S. fulviventer*). Although he did not fully characterize the habitat of the hispid cotton rat, Mohlhenrich did describe subtle differences between the plant associations at localities where the 2 species were collected. For example, he found that in western New Mexico, *S. hispidus* was more likely to be associated with cottonwoods (*Populus wislizeni*) than was *S. fulviventer*. Similarly, he found that in southwestern New Mexico, increasing percentages of *S. hispidus* were taken as the vegetation became sparse and more typical of disturbed areas. In this area, *S.*

hispidus also was more commonly associated with plants such as saltbush (*Atriplex*), mesquite (*Prosopis juliflora*), creosote-bush (*Larrea tridentata*), and various cholla and prickly pear (*Opuntia* spp.) than was *S. fulviventer* (Mohlhenrich, 1961).

Mohlhenrich (1961) determined that climate was an important limiting factor in controlling the distribution of *Sigmodon*. More specifically, he found that the normal maximum elevation for *S. hispidus* in New Mexico was typically below 2,133 m and corresponded to areas with mean annual temperatures above 12.8°C, mean January temperature above 1.1°C, mean July temperature above 23.9°C, and an average growing season of at least 180 days (Mohlhenrich, 1961).

We report an unusual occurrence of the hispid cotton rat at high elevation. On 7 November 1997, an adult female *S. hispidus* was collected from a Long-Term Ecological Research site near the summit of South Baldy Peak in the Magdalena Mountains, Socorro County, in west-central New Mexico (12 mi S, 3 mi E of Magdalena, 33°59.6'N, 107°11.0'W, elevation 3,109 m.). It was captured along with high numbers of Mogollon voles (*Microtus mogollonensis*) and deer mice (*Peromyscus maniculatus*). Identification of the cotton rat was based on pelage characteristics, external measurements (262-107-32-21 = 88 g), and skull morphology. In addition, the karyology (2n = 52) agrees with that reported for *S. hispidus* (Zimmerman, 1970). The specimen (catalog number 87162), frozen tissues, and cell suspension are deposited in the Museum of Southwestern Biology, University of New Mexico.

The first capture of *S. hispidus* at this site was on 18 October 1997 during an annual mark-recapture study of small mammals. The animal was taken to a field camp for several hours and data

were collected; it was then released at its capture site. The mark-recapture study began in 1990 and consisted of 6 small mammal-trapping webs (816 total traps): 3 located in subalpine meadow (including the location where the cotton rat was captured) and 3 located in subalpine forest. Trapping normally occurred during late summer or early fall of each year. In addition to this mark-recapture study, extensive ancillary trapping sessions, typically as part of mammalogy classes, occurred in the vicinity of the collection site. Thus, we estimate over 15,000 trap-nights have been carried out in this area, resulting in no additional cotton rat captures.

Despite the absence of other records of cotton rats from the Magdalena Mountains, it apparently was not a transient. The individual was recaptured in November 1997 within 7 m of its original capture locality; it had been present at this location for at least 20 days. In addition, a burrow entrance of >5 cm in diameter was located beside the trap and was connected by runways to known Mogollon vole and deer mouse burrows that were no larger than 3.8 cm in diameter. Thus, the larger burrow at the capture locality likely was constructed by the cotton rat. However, the collection of only a single individual, in spite of intensive collecting effort, indicates that a viable population is not present at this site. It also is possible, however unlikely, that this specimen was introduced, accidentally or on purpose, by humans. The nearest road is approximately 0.5 km away. A subsequent trapping session ($>3,000$ trap nights) was carried out in September 1998 with no further cotton rat captures.

The Magdalena Mountains are a relatively small, isolated massive (ca. 38 km \times 24 km) that reach a maximum elevation of 3,286 m on South Baldy Peak. Typical of southwestern mountain ranges, different biotic community zones exist at different elevations, including (from highest to lowest elevation) Petran subalpine coniferous forest, Petran montane coniferous forest, Great Basin conifer woodland, and extensive areas of interior chaparral on the lower eastern slopes (Brown and Lowe, 1980; Brown, 1994). These montane habitats grade into Great Basin grassland to the west and semidesert grassland to the east (Brown and Lowe, 1980; Brown, 1994). The collection site is in a subalpine meadow, a different habitat type than is typical for *S. hispidus*. Vegeta-

tion at the capture site is characterized by heavy grass cover ($>95\%$ coverage, 15 to 45 cm in height) dominated by *Bromus*, *Sporobolus*, *Bouteloua*, and *Muhlenbergia*; forbs, including *Potentilla* and *Iris*; small patches of trumpet gooseberry (*Ribes leptanthum*); and a few dwarf Douglas-firs (*Pseudotsuga menziesii*). The meadow is located on a talus slope of approximately 45 degrees; however, the immediate area around the capture site has deeper soil with a lower rock content than the surrounding area. The meadow is approximately 150 m by 250 m and is surrounded on 3 sides by coniferous forest. However, the upper (south) end of the meadow is contiguous with a patchwork of subalpine meadows and coniferous forest. During the warmer months these meadows are grazed by cattle.

At an elevation of 3,109 m, the Magdalena Mountains locality of record represents the highest reported for *S. hispidus*. With a mean annual temperature of 5.2°C and a mean growing season of less than 100 days, this site is far cooler than Mohlhenrich (1961) reported as necessary to support *Sigmodon* populations. However, Jones et al. (1983) reported that cotton rats on the High Plains of western Kansas occupy burrows that extend well below the frost line and are much deeper than is typical for the species, suggesting a behavior that has allowed for the successful invasion of the northern Great Plains. Behavior of this nature may allow for elevational expansion as well. Previously, the highest reported elevation record was 2,133 m from 3 mi E and 3 mi N of Monticello, Sierra County, New Mexico (Mohlhenrich, 1961:23). This site was 213 m higher than the next highest localities of record (i.e., Lincoln Co.: "Capitan, 6300'"; Grant Co.: "2.5 mi. W White Signal, 6300'") reported by Mohlhenrich (1961:23). Mohlhenrich (1961:17) explained this finding by noting, "Local exposure conditions at this station have caused lower zone plants to ascend to an unusual altitude". However, the elevation reported for the Monticello locality is likely incorrect. Mohlhenrich (1961:14) used the 1955 provisional edition of the New Mexico base map of the United States Geological Survey to determine his collection locations and elevations. Monticello is located at the southern base of the San Mateo Mountains. The descriptive locality corresponds almost exactly to the junction be-

tween a major United States Forest Service road (FR 139) and Jose Maria Canyon in the southern end of the San Mateo Mountains (DeLorme, 1998), which is a likely place to survey for cotton rats. However, modern topographic maps place this site on a 6,000-foot (=1,829 m) contour interval rather than at 7,000 feet (=2,133 m) as reported by Mohlenrich (1961). We examined the 1955 provisional map used by Mohlenrich (1961) and found that contour intervals were incorrectly labeled compared with modern maps. Indeed, this map (United States Geological Survey, 1955) included a statement of ongoing work and provisional results. A cursory comparison of other localities of record reported by Mohlenrich (1961) suggested that other reported elevations were incorrect as well. Thus, the descriptive locality of record reported by Mohlenrich (1961) was correct, but the elevation of this site is actually lower. Thus, our specimen extends the known elevation for *S. hispidus* by 1,280 m.

Whereas the Magdalena Mountain record represents the highest known elevation for *S. hispidus*, it does not increase the elevational record of the genus. Cotton rats are able to occupy relatively higher elevations with decreasing latitude. Several members of the genus at southernmost latitudes are found above 3,000 m. For instance, *Sigmodon leucotis* has been recorded at 3,200 m from Monte Rio Frio, 45 km ESE of Mexico City (Davis, 1944), the type locality for *S. alleni vulcani* is from 3,048 m at Volcan de Fuego in Jalisco (Allen, 1906), and *S. inopinatus* is known from 2 high-elevation localities in Ecuador, including 3,508 m on Mount Chimborazo and 3,800 m near Cuenca in Provincia Azuay (Voss, 1992).

Resumen—*Sigmodon hispidus* (Rodentia: Muridae) es una especie de pradera restringida normalmente a bajas elevaciones. Presentamos un nuevo registro de elevación. En noviembre de 1997 colectamos una hembra adulta a 3,109 m en las montañas Magdalena en Nuevo México.

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