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# Mound Development by a Pioneer Population of the Banner-tailed Kangaroo Rat, *Dipodomys spectabilis baileyi* Goldman, in Eastern New Mexico

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**ABSTRACT:** The development stages of two den complexes of *Dipodomys spectabilis baileyi* Goldman were observed from July 1966 to November 1970 in eastern New Mexico. Each mound was observed to develop from a single burrow. The area around the initial burrow was cleared of vegetation, the number of burrow entrances increased, and characteristic mounds developed after a period of 23 to 30 months. Removal of one *D. s. baileyi* from each mound resulted in noticeable degradation by weathering within 1 month and very marked deterioration within 1 year. Blackwater Draw, a broad, sandy-soiled drainage basin, extending eastward across Roosevelt Co., New Mexico, into Texas, is indicated as the route of dispersal for this species.

## INTRODUCTION

In east-central New Mexico *Dipodomys spectabilis baileyi* Goldman is reported by Bailey (1931:260) to occur along the Pecos River northward to 8 or 10 miles N of Santa Rosa, Guadalupe Co. The current study was conducted approximately 20 miles E of the Pecos River at 9 miles S and 1 mile W Tolar, T1N, R29E, Sec. 7, Roosevelt Co., New Mex. Although it has possibly occurred in earlier times, I am confident the species was not present here prior to 1966. This confidence is based upon reports by local ranchers, lack of mounds in the area and my own observations during the previous several years.

The burrow system, or den, in which *D. spectabilis* stores its food materials, has its nest and remains throughout the hours of daylight, is a complicated labyrinth of tunnels within a very noticeable mound. The mound is built up through the cleaning out of chaff and other food refuse, and also through extension and modification of the tunnels. Old tunnels, entrances, and caches of musty food materials are from time to time closed up and others excavated, repair and rebuilding being especially necessary after the collapse of portions of the den as a result of heavy rains or trampling by cattle. Ejected material is most commonly simply thrown out in a fan from the openings, without much apparent effort to add to the height of the mound (Vorhies and Taylor, 1922:28). These characteristic mounds are as unmistakable as muskrat houses or beaver dams, and are built for as definite a purpose—home and shelter. They are, furthermore, among the most notable of all kangaroo rat dwelling places (Nelson, 1918:400).

Information on the time necessary to develop a burrow system is not available, although Tappe (1941:119) speculated that the slight, relatively permanent mound sometimes formed by *D. heermanni tularensis* was built over a period of years. Hawbecker (1940:390) stated that burrows of *D. venustus*, known to be at least 2 years old,

did not show greater complexity than those only months old, and Bailey (1905) said the size of *D. spectabilis* mounds slowly increases with age. Compton and Hedges (1943) studied well-developed *D. spectabilis* mounds on 4-year-old earthen structures, and Peterson (1968) stated that *D. spectabilis* mounds develop in 3-4 years.

Records of range extensions of mammalian species are common, but it is rare that the actual invasion of a new territory can be studied. Packard and Judd (1968), Judd and Schmidly (1969) and Ramsey and Carley (1970) have reported range extensions of *D. s. baileyi*, but the species probably had been established for several years prior to being recorded. The purpose of the present paper is to describe the development of complex mounds associated with the first arrival of *D. s. baileyi* in a study area in eastern New Mexico.

### METHODS

Observations on the development of two mounds were recorded and photographs taken at irregular intervals from the first sighting of the species in July 1966 through November 1970. Rattraps, Sherman and Havahart live traps, and Museum Special mousetraps were set from time to time in the vicinity of the mounds. All specimens collected were preserved as study skins and skulls and are deposited in the Eastern New Mexico University Natural History Museum and the collection of recent mammals at the University of Oklahoma, Stovall Museum of Science and History.

### HABITAT

The study area is located near the southern edge of Blackwater Draw, a broad, sandy-soiled drainage basin, extending eastward across Roosevelt Co., New Mexico, into Texas. Blackwater Draw is probably the route of dispersal for this species into east-central New Mexico. This theoretical route of dispersal is supported by an observation of a *D. spectabilis* 4 miles W Floyd, Roosevelt Co., on 1 June 1967, also on the south side of Blackwater Draw, and unconfirmed reports of sightings south of Portales, Roosevelt Co., indicating the species may already be present as far east as Bailey Co., Texas.

The general vegetation of the area is the mixed-grassland climax of Castetter (1956). At the study plot the relatively undisturbed pastureland, where one of the mounds is located, is dominated by blue grama (*Bouteloua gracilis*) thickly interspersed with soapweed (*Yucca* sp.), lesser amounts of mesquite (*Prosopis juliflora*) and a few small cholla cactus (*Opuntia imbricata*). The second mound is located on an adjacent disturbed area last cultivated in 1947. This area, in addition to the vegetation of the pastureland, has a greater amount of threeawn (*Aristida* sp.), sandbur (*Cenchrus* sp.), vine-mesquite (*Panicum obtusum*), broomweed (*Gutierrezia* sp.), scattered Russian thistle (*Salsola kali*) and mixed small annuals. The two mounds studied are 80 m apart.

The pastureland is composed of Springer Loamy Fine Sand. Both the surface layer and subsoil are noncalcareous. It has very weak

granular structure and is about 14 inches thick. The subsoil has weak prismatic structure and is 30-40 inches thick underlain by the strongly calcareous, coarse-textured parent material. Internal drainage is good and runoff is slow (Ross and Bailey, 1967:17). This area was overgrazed for several years before it was fenced and there has been moderate wind erosion.

In the disturbed area the soil is of the Amarillo-Clovis type, and has been farmed and severely damaged by wind. The average slope is 0-3% with good drainage and slow runoff. The surface soil ranges in depth from 4-18 inches, and is loose, structureless and contains little organic matter. The subsoil is prismatic sandy clay loam and is 10-40 inches thick. It is noncalcareous above but is more strongly calcareous with depth because of its strongly calcareous substratum (Ross and Bailey, 1967:6-7).

Mammalian species collected at this locality during the study period, some of which were from adjacent habitats, include: *Sylvilagus audubonii*, 3; *Lepus californicus*, 3; *Spermophilus spilosoma*, 18; *Geomys bursarius*, 3; *Perognathus flavus*, 25; *P. hispidus*, 16; *Dipodomys ordii*, 178; *D. spectabilis*, 10; *Reithrodontomys* sp., 3; *Peromyscus leucopus*, 29; *Onychomys leucogaster*, 42; *Sigmodon hispidus*, 3; *Neotoma micropus*, 27; *Mus musculus*, 13; *Canis latrans*, 6; *Vulpes* sp., 1 (not preserved); *Taxidea taxus*, 1; *Mustela frenata*, 1, and *Antilocapra americana* (numerous observations).

### RESULTS

*Observations.*—On 23 July 1966 I observed an adult *D. spectabilis* in the study area under a small mesquite. No burrows were noted. A



Fig. 1.—The burrow entrance of *Dipodomys spectabilis baileyi* as it appeared 6-8 months after the onset of den construction (November 1967). Note the scattered seeds

total of 1000 trap-nights were expended from July to December of 1966 and no other specimens were observed or collected. The first specimen was secured, after several hundred additional trap-nights, on 30 May 1967. At this time four burrows of the species were distinguishable. They were not present when I visited the locality in late March of 1967. The initial step in mound construction had thus begun between March and May. The burrows closely resembled the subsidiary burrows described by Vorhies and Taylor (1922:32) for *D. s. spectabilis*. The burrows were easily distinguishable from the smaller, more symmetrical burrows of *D. ordii medius* which occur here in great numbers.

By November 1967 there were definite changes in appearance of the burrows and only two of the original four remained, one in the disturbed area and one in the adjacent pastureland. In addition to the three or four paths approaching each burrow, there were scattered grass seeds in front of the burrow entrances (Fig. 1). The floors of the burrows were covered with loose soil intermixed with the seeds. Several authors (Bailey, 1931; Monson, 1943; Monson and Kessler, 1940; and Vorhies and Taylor, 1922) have noted the prevalence of grass seed as food for *D. spectabilis*, and it is, therefore, not surprising that some seed may be scattered around. However, as the den began to develop further, grass seed was not observed. It may have been stored.

In late January 1968 the bare area in front of the burrows was greatly enlarged (Fig. 2) and a second burrow opening was present at the remaining den in the disturbed area and two additional openings at the den remaining in the pastureland. During the next several months the areas around the burrow entrances were cleared of vegetation and when the sites were revisited in September 1968 there were 4-5 burrows at each den and a mound about 12 cm high and 1.3 m across. From this point the mounds developed in height and numbers

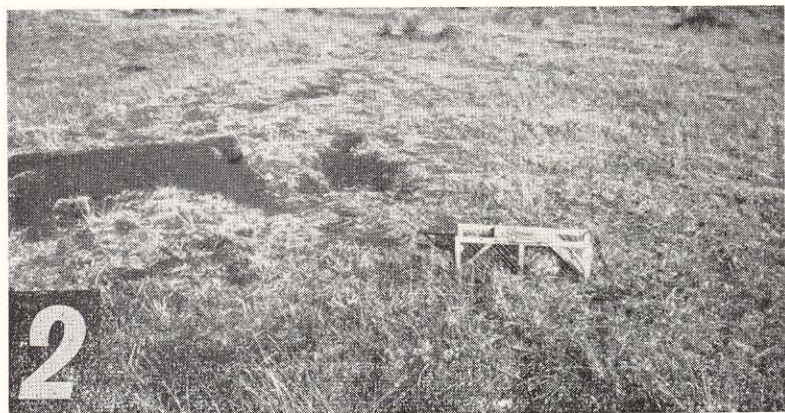


Fig. 2.—Two burrow entrances within the cleared area were present within 8-10 months. The second burrow entrance is to the right and facing opposite the obvious one (January 1968)

of burrow openings until no growth was noted at checks made from June to November 1969. Figure 3 shows the completed mound in the disturbed area as it appeared 29 November 1969. At completion the mound in the disturbed area measured 3.1 m in diameter and 36 cm high at its center. In the pastureland the mound was 3.7 m long, 2.2 m wide and 41 cm high at its center. From the September 1968 observation the burrow openings in the mounds shifted frequently and appeared to be dictated only by random cave-ins or, in the case of the disturbed area, occasional trampling by livestock.

The overall time for the two observed dens to be developed covered minimally 23 months and maximally 30 months. No other dens have been developed in the area through November 1970.

*Effect of removal.*—On 30 November 1969 an adult male *D. s. baileyi* was removed from the slightly larger mound in the pastureland and an adult female from the mound in the disturbed area. It



Fig. 3.—The mature mound as it appeared 29 November 1969. Burrow entrances varied in number from 8-12 during the latter half of 1969. The vegetation is noticeably shorter adjacent to the mound



Fig. 4.—The same mound as in the previous three figures on 24 November 1969, 1 year after removal of one adult female. Note the heavier growth of annuals near the deteriorated mound as compared to Figures 2 and 3

was thought at the time these animals would quickly be replaced by other members of the species. However, no further activity was observed at either mound and by December the mounds had begun to cave in and the burrows were filled with dead weeds and blown sand. Figure 4 shows the mound in the disturbed area as it appeared 24 November 1970. There was no evidence of activity, the mound was completely collapsed, and only rapidly weathering columns of packed earth remained. This would appear to indicate that the mounds were being used by one animal each, as found by Vorhies and Taylor (1922:36), Taylor and Vorhies (1923:255) and Monson and Kessler (1940:38), although young were probably produced there. At least two specimens collected previously were subadults.

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