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Cynomys gunnisoni.

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Cynomys gunnisoni (Baird, 1858)

Gunnison's Prairie Dog

Spermophilus gunnisoni Baird, 1855:334. Type locality "Cochetope Pass" (Cochetopa Pass, Saguache Co., Colorado).
Cynomys gunnisoni: Baird, 1858:xxxix. First use of current name combination.

CONTEXT AND CONTENT. Order Rodentia, Suborder Sciuromorpha, Family Sciuridae, Genus *Cynomys*, Subgenus *Leucocrossuromys*. See Clark *et al.* (1971) for a diagnostic key to the five living species of *Cynomys*. *Cynomys gunnisoni* is divided into two subspecies (Hollister, 1916).

Cynomys gunnisoni gunnisoni (Baird, 1858:xxxix), see above.
Cynomys gunnisoni zuniensis Hollister, 1916:32. Type locality "Wingate, McKinley County, New Mexico."

DIAGNOSIS. Total length of adult Gunnison's prairie dogs varies from 309 to 373 mm and adults weigh 650 to 1200 g; males average larger than females. The species thus is smaller than *C. leucurus*, but slightly larger than *C. parvidens*, the other two species in the subgenus *Leucocrossuromys*. The dorsal color is yellowish buff intermixed with blackish hairs. The top of the head, sides of cheeks, and "eyebrows" are noticeably darker than other parts of the pelage. The species differs from black-tailed prairie dogs (*C. ludovicianus* and *C. mexicanus*, subgenus *Cynomys*) in having a much shorter tail (39 to 68 mm), less than one-fifth the total body length. The proximal half of the tail is the same color as the dorsal pelage; the distal one-half has a grayish center tipped with grayish-white hairs. Tail color usually demarcates *C. gunnisoni* from other white-tailed species, which possess pure white hairs on the distal one-half of the tail (Clark *et al.*, 1971).

GENERAL CHARACTERS. Gunnison's prairie dog is a stout-bodied spermophile-like mammal found in semi-social aggregations (see Ecology and Behavior). The subspecies differ slightly in color and size; *zuniensis* averages slightly larger, has a larger hind foot and heavier skull, and exhibits a paler color (more cinnamon cast and less yellowish buff). Hollister (1916) described the cranial characteristics of *C. gunnisoni* as follows: "Skull smaller than *leucurus*, larger than *parvidens*; differs from both in more broadly spreading maxillary arm of zygoma; mastoids smaller and more obliquely placed, rather than in general occipital plane; auditory bullae smaller; occiput viewed from behind higher and less broadened; inferior rim of angle of ascending branch of jugal averaging less pointed, more rounded with little trace of special lateral flattened surface." Ranges of some measurements in adults (including both subspecies) are (in millimeters, modified from Hall and Kelson, 1959; Durrant, 1952; and Hollister, 1916): total length 309 to 373; length of tail 39 to 68; length of hind foot 52 to 62.5; condylobasal length of skull 51.9 to 59.0; length of nasals 20.0 to 22.4; zygomatic breadth 40.4 to 45.0; interorbital breadth 12.0 to 15.2; mastoid breadth 26.0 to 27.7; palatal length 27.6 to 30.1; and alveolar length of maxillary toothrow 14.0 to 15.6. The skull is illustrated in figure 1. For a more detailed description of morphology see Hollister (1916), Bailey (1931), Durrant (1952), and Lechleitner (1969). Although several physical attributes can be used to distinguish *C. gunnisoni* from other species of prairie dogs, vocalizations, particularly alarm barks, are species-specific and permit identification (see Ecology and Behavior).

DISTRIBUTION. The species is limited to high mountain valleys and plateaus in the southern Rocky Mountains at elevations of 1830 m (6000 ft) to 3660 m (12,000 ft). Its distribution centers around the "Four Corners" region where the states of Utah, Colorado, New Mexico, and Arizona meet (figure 2). *C. g. zuniensis* occurs in parts of all four states, whereas *C. g. gunnisoni* is found only from central Colorado through north-central New Mexico. In many areas distribution is limited by pronounced physiographic barriers. The most northerly populations of *C. g. gunnisoni* are found in South Park, Colorado; from there the range extends southward through the Arkansas River Valley into the San Luis Valley, and westward into the upper Gunnison River drainage where it closely approaches the range of *C. leucurus* in southwestern Gunnison County. It is in this area that suspected hybridization with *C. leucurus* has been reported (Lechleitner, 1969), and is under current investigation by Pizzimenti. South of the San Luis Valley, populations extend to north-central New Mexico where their distribution is partially checked by the Sangre de Cristo, San Juan, and Jemez mountain ranges. It is in this area that "they grade into the lightly marked subspecies *zuniensis*" (Bailey, 1931:126). *C. g. zuniensis* is found in extreme southwestern Colorado and extreme southeastern Utah, where it is separated from *C. leucurus* to the north and east by the

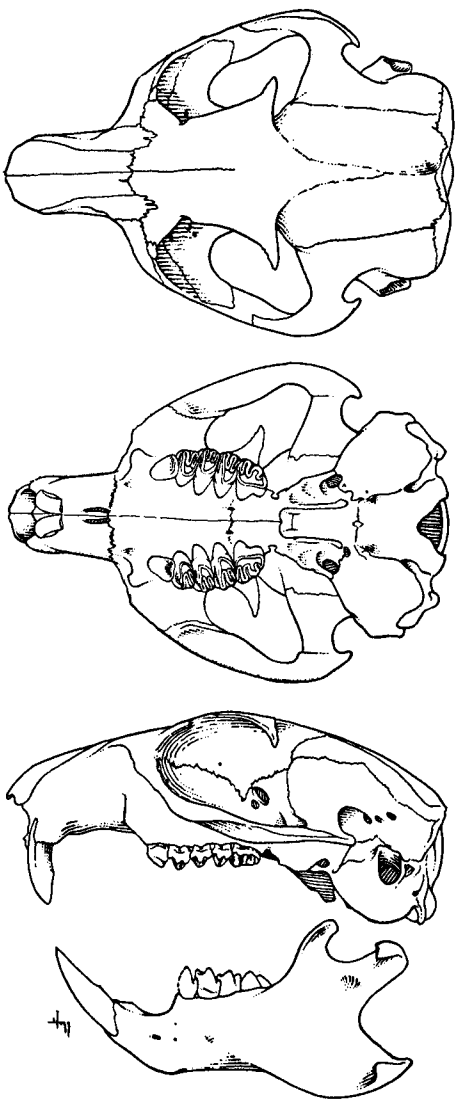

FIGURE 1. Views of skull of *Cynomys gunnisoni gunnisoni* (Univ. Kansas no. 6236, from Hall and Kelson, 1959:369, by permission of Ronald Press, Inc., New York). From top to bottom, dorsal, ventral, and lateral views of cranium and lateral view of dentary, all × 1.

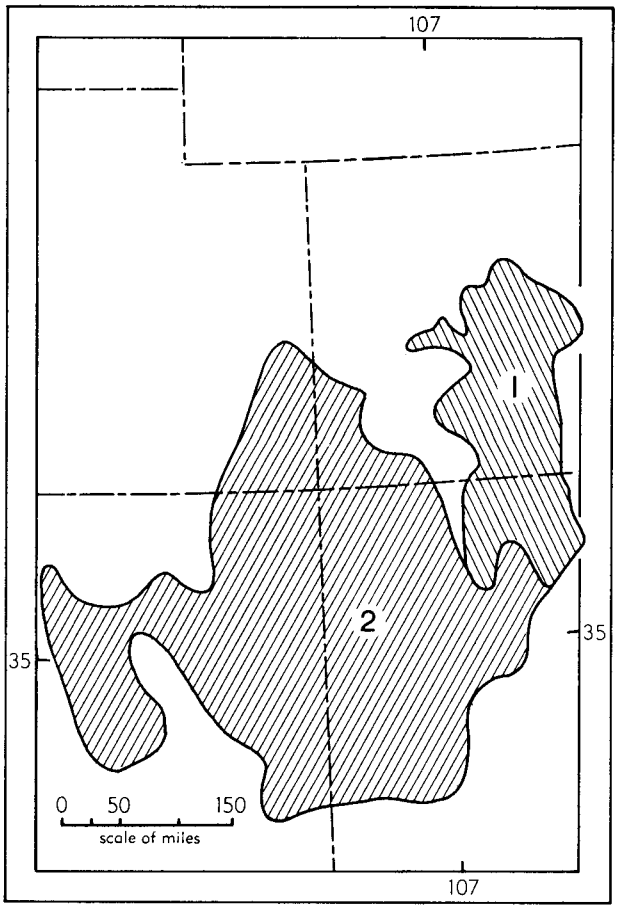

FIGURE 2. Distribution of *Cynomys gunnisoni* (modified after Hall and Kelson, 1959:368), and of the subspecies: 1, *C. g. gunnisoni*; 2, *C. g. zuniensis*.

Uncompaghre Plateau and San Juan Mountains. The range extends to the south and east into the Santa Fe, New Mexico area, and to the Rio Grande Valley near Albuquerque, where they have been taken at the same localities with *C. ludovicianus arizonensis* (Bailey, 1931:127). The southern limit is reached in the Mogollon Mountains in southwestern New Mexico. In Arizona, *C. g. zuniensis* occurs from the "Four Corners" region as far south as Graham County; north of the Gila River and to west-central Arizona in Coconino, Yavapai, and Maricopa counties. Disturbance has greatly reduced numbers and range of prairie dogs in Arizona (Cockrum, 1960) and this is undoubtedly true in other areas as well. For further details of distribution see Cary (1911), Bailey (1931), Warren (1942), Durrant (1952), Cockrum (1960), Lechleitner (1969), and Hall and Kelson (1959).

FOSSIL RECORD. For a discussion of the fossil record of *C. gunnisoni* and other species of the genus *Cynomys*, see Mammalian Species no. 7 (Clark *et al.*, 1971).

FORM. Hollister (1916) described two annual molts, occurring in the spring and again in autumn, except on the tail where only a single annual renewal prevails. Spring molt begins anteriorly and proceeds posteriorly until finally the tail hair is renewed. The tail may retain its winter pelage as late as 10 August at higher altitudes and latitudes. Winter coat renewal proceeds from the posterior part of the body anteriorly. Molt is usually complete by 15 September and mid-October specimens have a long full coat with dense underfur. Molt patterns are more pronounced in the warmer parts of the range, whereas autumn renewal in colder areas is more subtle due to the short summer season and slight wear on summer pelage. Hollister (1916) mentioned partly and totally melanistic individuals of *C. gunnisoni* in South Park, but did not himself examine any.

Gunnison's prairie dog has five pairs of mammae (two pectoral, three inguinal) as do other members of the subgenus (Longhurst, 1944; Moore, 1961); members of the subgenus *Cynomys* possess only four pairs. Hollister (1916) claimed that in *Leucocrossuromys* six pairs of mammae occurred rarely, but did not provide details.

Burt (1960) compared bacular morphology of several prairie dogs. The bacula of two specimens, one of *gunnisoni* and one of *leucurus*, were similar, but both were easily distinguished from bacula of *C. ludovicianus*. Bryant (1945) examined bacula from *C. gunnisoni* and *C. mexicanus*. Both authors noted the resemblance between bacula of *Cynomys* and those of ground squirrels (genus *Spermophilus*).

Bryant (1945) noted that within the genus *Cynomys* the masticatory muscles are, proportionally, the stoutest and most highly developed among the Nearctic Sciuridae, and that the crown height of cheekteeth equals or exceeds that of all other Nearctic Sciuridae; these characteristics reflect the adaptation of prairie dogs to a graminivorous diet.

FUNCTION. Nadler *et al.* (1971) reported on electrophoretic mobilities of some serum proteins. Albumins of *C. gunnisoni* showed no differences from those of *C. leucurus* and *C. parvidens*, but differed from slower albumins of *C. ludovicianus*. Serum transferrins were unique among all species of prairie dogs. Transferrin mobilities were designated 1 to 5 in order of fastest to slowest mobility. *C. gunnisoni* was monomorphic (homozygous) for Tf 4; *C. leucurus* for Tf 5; whereas *C. ludovicianus* was polymorphic, exhibiting homozygous and heterozygous states for three fast moving bands (Tf 1, 2, and 3) with a maximum of two bands per individual (Tf 1-2, 2-2, 2-3).

ONTOGENY AND REPRODUCTION. Onset of reproduction is somewhat variable and is dependent on latitude, elevation, and seasonal variation (Aldous, 1935; Longhurst, 1944; Scheffer, 1947). Females bear a single litter per year and are capable of reproducing at 1 year of age (Longhurst, 1944). Gestation lasts approximately 30 days. Scheffer (1947) examined nine pregnant *C. g. zuniensis* females in northern Arizona and estimated that parturition would occur in April or early May. Females were lactating in mid-May and pups were above ground by 3 June at elevations of 2135 to 2590 m (7000–8500 ft). Aldous (1935) found that 27 of 29 females examined were pregnant, most in advanced stages, on 17 April at Norwood, Montrose Co., Colorado, 2135 m (7000 ft). Longhurst (1944) reported the first emergence of *C. g. gunnisoni* pups for several elevations in Costilla County, Colorado as: 27 June at 2590 m (8500 ft); 1 July at 2680 m (8800 ft); 14 July at 2800 m (9200 ft); and 16 July at 2900 m (9500 ft). A female from Cochetopa Pass, 2800 m, contained three near-term embryos (38 mm in crown-rump length) on 3 June (Pizzimenti, unpublished).

Gunnison's prairie dog has smaller litters than the white-tailed prairie dog (*C. leucurus*), in which mean embryo counts are about 5.5 (Stockard, 1929; Clark *et al.*, 1971). Scheffer (1947) reported a modal litter size of three for *C. g. zuniensis* in Arizona based on observations of emerging pups. In the 27 pregnancies examined by Aldous (*op. cit.*), mean embryo count was 4.78 (range, 1 to 7); the modal number was four. Two specimens from Flagstaff, Arizona, 2135 m (7000 ft), had four and three uterine scars respectively; one female from Dolores Pass, Colorado, 3050 m (10,000 ft), contained three embryos near term on 9 May. Longhurst (1944) examined 55 *C. g. gunnisoni* females from Costilla County, Colorado; 12 yearlings and 34 adults were pregnant and averaged 4.1 and 4.9 uterine scars, respectively. Eight of the 20 yearlings were nulliparous, whereas only one of 35 adults failed to breed that season. Thus, although *gunnisoni* females are capable of reproduction when near 1 year of age, fewer yearlings produce young than do adults 2 years of age or older, and those that do have smaller litters.

Young remain underground for about a month. Nothing is known about growth and development during this period; however, growth and development have been described for *C. ludovicianus* (Johnson, 1927) and probably are similar for *C. gunnisoni*. Nursing may continue for a short period after emergence but the young are soon independent and feeding on vegetation. As soon as the young are weaned, the female abandons them at the nesting burrow and establishes herself at another burrow; shortly thereafter the young disperse to other unoccupied burrows.

ECOLOGY AND BEHAVIOR. There have been few intensive ecological studies of *C. gunnisoni* and much of what follows is from Longhurst (1944), Scheffer (1947), and personal field observations (JJP). Colonies of *C. gunnisoni* are generally smaller than those of other species of prairie dogs,

often consisting of fewer than 50 to 100 individuals. Social organization is loosely knit and more closely resembles that of ground squirrel aggregations than it does the more highly structured organization of *C. ludovicianus* (see King, 1955). Compared to black-tailed prairie dog habitat, the habitat of *C. gunnisoni* is topographically and vegetationally highly variable, and as a consequence, visual contacts between individuals of an aggregation are sometimes obstructed. Where habitat is open and the animals have been afforded protection (for example, at Blue Mesa Reservoir, Gunnison County, Colorado) colonies can become extensive and densely populated. However suitable areas are more often small and patchy, resulting in more spermophile-like living habits.

Territoriality is not pronounced in *C. gunnisoni*; old males may defend a small area near their burrows but often feed alongside other members of the colony. Social structure consists mainly of mother-offspring relationships. Longhurst (1944) noted that adult males were living somewhat apart from females and offspring in June and this tendency increased throughout the summer. Yearling males lived closer to females. In *C. ludovicianus*, females are highly territorial and aggressive during the post-natal period. However, as soon as the pups emerge above ground, aggressive behavior subsides and they soon resume normal social interactions (King, 1955). Female Richardson's ground squirrels (*Spermophilus richardsonii*) show similar aggressiveness and territoriality during the reproductive season (Clark, 1970; Clark and Denniston, 1970). It seems likely that Longhurst's (*op. cit.*) observations result from territorial behavior in female *C. gunnisoni* even though there are no reports of agonistic behavior or territorial disputes.

Waring (1970) studied sound communication in prairie dogs. The alarm call of *C. gunnisoni* differs from those of other species of prairie dogs, and is important to the cohesion and survival of a colony. The call consists of a series of high pitched barks of one or two distinct syllables, which may be frequently repeated for as long as one-half hour. The second syllable is more gutteral, being equal or lower in pitch than the first, and may be formed by inhalation. Frequency of repetition and intensity increases as danger becomes more imminent, culminating in a chatter as the animal disappears down its burrow.

The burrow systems and mounds are more similar to those of ground squirrels than are those of other species of prairie dogs. Dirt is loosened and scraped with the forefeet and haphazardly kicked out of the entrance with the hind feet. As a result, a mound of subsoil accumulates at the entrance, but no effort is made to modify the mound. Entrances are usually situated on slopes or small hummocks rather than in depressions, which protects the burrows from flooding. The few burrow systems that have been excavated indicate that they are shallower than those of *C. ludovicianus*. Longhurst (1944) illustrated four systems; depth averaged 840, 740, 1400, and 2030 mm. In general, older systems are deeper, have more entrances at the surface, and more bifurcations below. Old tunnels are sometimes plugged. Usually a single nest consisting of dried vegetation is constructed. There is no evidence that prairie dogs store food in their burrows. Few scats are found in the burrows, defecation occurring on the surface near the mound or at feeding sites. Scheffer (1947) reported similar findings for *C. g. zuniensis* in Arizona.

Prairie dogs are strictly diurnal and are not seen above ground when the sun is below the horizon. Greatest activity occurs in the early morning and late afternoon. Dogs tend to remain in the burrows during inclement weather and midday heat. Above-ground activities are mostly concerned with feeding and to some extent playing and grooming. There is a constant vigilance for possible danger, and while above ground, prairie dogs continually sit up on their hind feet to survey their surroundings; mounds are often used as sentinel posts. Their eyes, positioned on the sides of the head, are adapted for detecting movement from a wide arc.

Analysis of stomach contents from 157 *C. g. gunnisoni* was reported by Longhurst (1944). In general, grasses are the most important food item with forbs, sedges, and shrubs of lesser importance. Smith (1915), Burnett and McCampbell (1926), Stockard (1929), and Kelso (1939), reported grasshoppers, beetles, and cutworms in the prairie dog diet but these are of minor importance.

Winter is a period of inactivity for *C. gunnisoni* in most localities. Higher elevations may have several feet of snow for long periods of time. The dogs undoubtedly remain underground, using as an energy supply stored fat that has been accumulated over the summer. Emergence probably occurs in early spring depending on latitude and elevation. Burnett and McCampbell (1926) reported above-ground activity of *C. g. zuniensis* from April through October in Montezuma County, Colorado; Scheffer (1947) observed tracks of *C. g. zuniensis* in snow leading into burrows during late March in northern Arizona. There is little direct evidence regarding hibernation in prairie dogs, but periods of inactivity, which may last several months, support the contention that Gunnison's prairie dog hibernates, at least in colder parts of its range. There is no information regarding body temperatures of prairie dogs during winter. However, Anthony (1953) was able to induce periods of dormancy resembling cold narcosis lasting up to 2 weeks in captive *C. ludovicianus* by subjecting the animals to cold temperatures and depriving them of succulent vegetation. Observations (of JJP) of a laboratory colony during winter months indicate that *C. gunnisoni* enters a deep sleep for short periods with low food intake; disturbance while servicing the colony often caused little or no arousal during this time. The increasing use of radiotelemetry may soon answer the questions regarding hibernation in prairie dogs.

Most prairie dog mortality results from predators, disease, and disturbance by man. Predators include the badger, coyote, weasel, and several species of raptors. Although rattlesnakes often inhabit burrow systems of prairie dogs, there is little evidence of predation; possibly an occasional pup falls prey to a rattlesnake. *C. gunnisoni* carries several kinds of ectoparasites including fleas, ticks, and *Cuterebra* larvae. Fleas carry the plague organism, *Yersinia pestis*, to which prairie dogs are susceptible, and this disease can drastically reduce or eliminate entire colonies (Lechleitner, 1962). The greatest danger to this species is man. As with other species of prairie dogs, extermination programs have been in existence since the turn of the century. Cary (1911) noted that drowning, carbon bisulfide, and strychnine were used to control this species near McElmo Valley, Montezuma Co., Colorado. Recently, more powerful agents such as the fluoride compound 1080 have been used, and prairie dogs have been since extirpated from the McElmo Creek area (Pizzimenti, unpublished). At present *C. gunnisoni* is on the endangered species list and probably will continue to decline in numbers because it is considered economically deleterious and an agricultural pest.

GENETICS. Nadler *et al.* (1971) reported *C. gunnisoni* to have a diploid number of 40. The karyotype consists of six pairs of metacentric, eight pairs of submetacentric, and five pairs of subtelocentric autosomes; the X and Y chromosomes are subtelocentric and submetacentric, respectively. The karyotype is strikingly different from that of all other species of prairie dogs that have been thus far examined, in which $2N = 50$.

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