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# Cynomys leucurus.

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## *Cynomys* Rafinesque, 1817

*Cynomys* Rafinesque, 1817:45. Type species *Cynomys socialis* Rafinesque [= *Cynomys ludovicianus*], by original designation.

**CONTEXT AND CONTENT.** Order Rodentia, Suborder Sciuromorpha, Family Sciuridae. *Cynomys* contains five living species in two subgenera (following key adapted from Hollister, 1916:12).

1 Tail tipped with black ..... (*Cynomys*) 2
Tail tipped and bordered with white ..... (*Leucocrossuromys*) 3

2 (1) Black on tail covering most of distal half; posterior border of inflected angle of mandible nearly at right angle to axis of jaw ..... *C. mexicanus*
Black on tail confined to distal third; posterior border of inflected angle of mandible at angle of about 45° to axis of jaw ..... *C. ludovicianus*

3 (1) Terminal half of tail with gray center, bordered and tipped with white ..... *C. gunnisoni*
Terminal half of tail white, without dark center ..... 4

4 (3) Color in summer reddish or rich cinnamon (not buffy or grayish); skull with interorbital breadth more than 13.5 mm. ..... *C. parvidens*
Color in summer buffy or grayish; skull with interorbital breadth less than 13.5 mm. ..... *C. leucurus*

## *Cynomys leucurus* Merriam, 1890

*Cynomys leucurus* Merriam, 1890:33. Type locality "Ft. Bridger, Wyoming."

**CONTEXT AND CONTENT.** Context noted in generic summary above. The species *C. leucurus* is not divided into subspecies (Hollister, 1916).

**DIAGNOSIS.** The white-tailed prairie dog is the largest member of its subgenus (total length 340 to 370 mm.), and is only slightly smaller than *C. ludovicianus* and *C. mexicanus*, but has a much shorter tail (40 to 65 mm. rather than 82 to 110 mm.). The general color of upper body parts is yellowish buff, streaked with blackish. A spot above the eye and a large area on the cheek are blackish brown. The tail is white; hairs of the proximal half have bands of blackish interspersed with pale cinnamon, whereas those of the distal half are clear white.

**GENERAL CHARACTERS.** Measurements (in millimeters) are: total length 340 to 370; length of tail 40 to 65; length of hind foot 60 to 65; condylobasal length 56.0 to 61.3; zygomatic breadth 41.7 to 45.4; mastoid breadth 27.4 to 30.0; length of nasal 20.7 to 23.1; length of mandible 41.6 to 44.9; alveolar length of maxillary toothrow 15.1 to 16.0 (modified from Hall and Kelson, 1959, and Hollister, 1916). More detailed descriptions are presented by Hollister (1916), Hall and Kelson (1959) and Long (1965). The skull is illustrated in Figure 1.

**DISTRIBUTION.** This species is found in parts of Colorado, Utah, Wyoming, and Montana (Figure 2). More specifically, it occurs from the Bighorn Basin, in southern Montana, south across central and southwestern Wyoming into western Colorado and northeastern Utah; east to the Laramie Mountains in Wyoming, and into North Park, Colorado; south into the lower Gunnison Valley; west a few miles across the Bear River Divide into extreme northern Utah, and farther south, into the Green River Valley (Hollister, 1916; Hall and Kelson, 1959; Long, 1965; Durrant, 1952; Warren, 1942; Hoffmann *et al.*, 1969; Lechleitner, 1969). The local distributional pattern, particularly in the southern part of the range, is imperfectly known, owing in part to extirpation of the species in some areas.

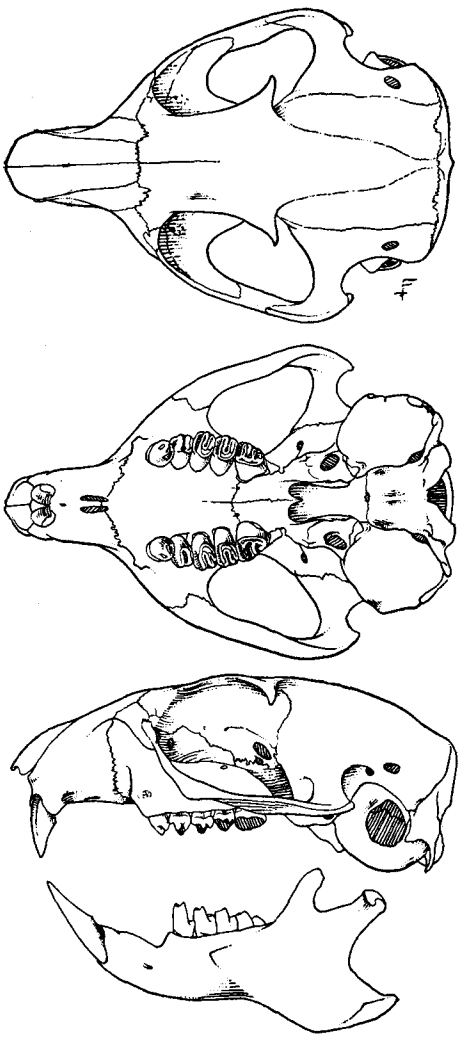

FIGURE 1. Views of skull of *Cynomys leucurus* (Univ. Kansas no. 16802, from Hall and Kelson, 1959:367, by permission of Ronald Press, Inc., New York). From top to bottom, dorsal, ventral, and lateral views of cranium and lateral view of dentary. All × 1.

**FOSSIL RECORD.** According to Black (1963:226), "we do not yet have unequivocal evidence of the existence of *Cynomys* prior to the Pleistocene." However, several Pleistocene prairie dogs have been described. Hay (1921) based *C. niobrarius* on a palate from the "Sheridan beds" in Nebraska, probably equivalent in age to the Loveland formation, late Pleistocene. Green (1960) named and described *C. spispiza* from a mandible collected in Tripp County, South Dakota, from the Sand Hills formation, and later suggested that it might prove to be synonymous with *C. niobrarius* (see Green, 1963); Green (1960:546) claimed that "*C. spispiza* combines characteristics of both *C. ludovicianus* and *C. leucurus* but is closer to the latter species." The late Pleistocene date does not, however, permit the speculation that *spispiza* might be ancestral to both modern species, as Green originally suggested. Black (*op. cit.*) thought *spispiza* not separable from *C. leucurus*. Dalquest (1967), however, thought that *niobrarius* and *spispiza* were black-tailed prairie dogs, referable to the subgenus *Cynomys*.

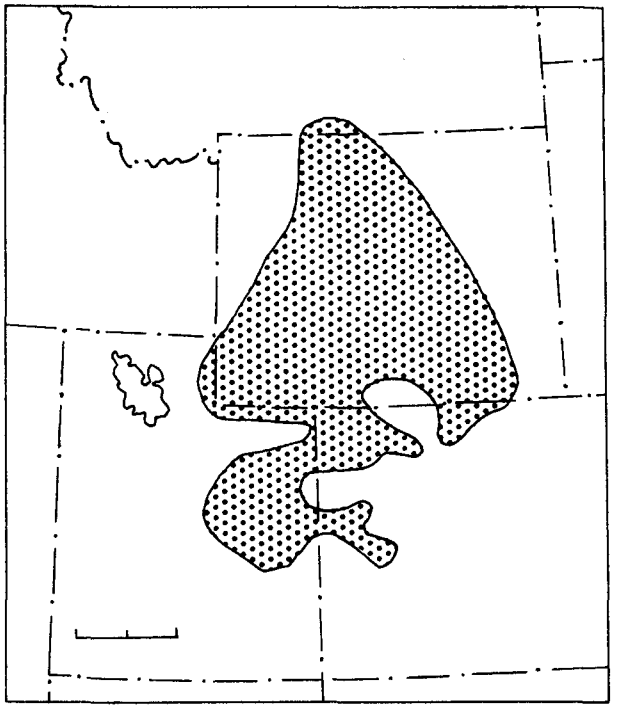

FIGURE 2. Distribution of *Cynomys leucurus* modified after Hall and Kelson (1959:368). The scale at lower left is 100 miles long.

A series of faunas from Meade County in southwestern Kansas span much of the Pleistocene record; the earliest prairie dog appears to be *C. meadensis*, described by Hibbard (1956) from the Deer Park fauna of the early Pleistocene (Aftonian). This animal was about the size of *C. leucurus*, but its cheekteeth were not so high-crowned. From the following glacial period (Kansan), *Cynomys ludovicianus* is identified, and in the Illinoian it was joined by *C. vetus* (Hibbard, 1942), a fossil species even smaller than *gunnisoni*. Hibbard placed *C. vetus* in the subgenus *Cynomys*, but Gromov *et al.* (1965) assigned *vetus* to the subgenus *Leucocrossuromys*. Dalquest (1967) thought that the specimens of *Cynomys* cf. *gunnisoni* reported by Semken (1966) from deposits of Illinoian age in northwestern Kansas were best referred to *C. vetus*, and that "*Cynomys vetus* may be the direct ancestor of *Cynomys gunnisoni* and its related forms." Both *ludovicianus* and *vetus-gunnisoni* were still present in the Sangamon interglacial, but by the Wisconsin, only *ludovicianus* remained. Remains of black-tailed prairie dogs from the Wisconsin are widespread on the Great Plains. During the full-glacial conditions of the Wisconsin period, 25,000 to 40,000 BP (before present), *C. ludovicianus* also occurred in central Texas (Slaughter and Ritchie, 1963). It evidently had a more southerly distribution than at present. The related *C. mexicanus* has a relict distribution in northern Mexico. The relatively few reports of *C. gunnisoni* or *C. leucurus* from the Wisconsin may be due to the scarcity of fossil deposits in areas and habitats occupied by these prairie dogs. Specimens of the former, of uncertain Pleistocene-Recent age, were found in the Isleta Caves, northern New Mexico (Harris and Findley, 1964). The latter species is apparently unreported in the Pleistocene, save as it may be represented by *C. spispiza*, or by specimens now listed as *Cynomys* sp. from near or within the present range of *C. leucurus* (Anderson, 1968). The record supports the generally held contention that "prairie dogs did not branch off from the spermophile line before the later Pliocene" (Black, 1963).

**FORM.** Gross anatomy was studied by Keener (1930). Hollister (1916:25–26) described molting in *C. leucurus* from Wyoming as follows: "Specimens taken before May 10 are still in the old winter coat, with little evidence of molt. Skins collected from May 20 to June 1 have renewed [the pelage] over most of the underparts and somewhat on the head and shoulders. Numerous examples taken from June 1 to 10 are all in fresh coat except on the lower rump and tail. Skins collected July 15 to 30 are in full summer coat. By August 10 there is much evidence of wear over the forward half of the body, and by early September the fall renewal has commenced. As in the case of *C. ludovicianus*, this progresses forward, and by September 25 to October 1 is complete."

**FUNCTION.** Electrophoretic patterns of blood sera have not previously been reported. Albumins of *C. leucurus* and *C. gunnisoni* migrate more rapidly than do those of *C. ludovicianus*. Five transferrin bands were observed among *C. leucurus*, *C. gunnisoni*, and *C. ludovicianus*; *C. leucurus* from Wyoming is characterized by the slowest pair of bands (Tf 5,5), which do not occur in the other two species. Work in progress by J. J. Pizzimenti confirms that *C. leucurus* from other localities show similar transferrin band patterns.

**ONTOGENY AND REPRODUCTION.** Some gross morphological changes in gonads were reported by Stockard (1929, 1934) and Tileston and Lechleitner (1966), and histological changes were described by Bakko and Brown (1967). Copulation occurs in late March and early April at which time the accessory sex glands exhibit peak activity and the testes are regressing from their peak development of a week or so earlier (Bakko and Brown, 1967). Gestation requires about 30 days (Stockard, 1934; Bakko and Brown, 1967) and parturition occurs in late April or early May. The mean litter size from embryo counts ($N = 25$) is 5.64 ± 0.74 S.D. (range 3 to 8); corpora lutea counts ($N = 48$) average 5.40 ± 0.72; and placental scars ($N = 20$) average 4.90 ± 0.77 (Bakko and Brown, 1967). One litter is produced annually. Nothing is known of the growth and development of young prior to their first appearance above-ground in late May or early June.

**ECOLOGY.** The ecological roles of prairie dogs in general (including *C. leucurus*) were reviewed by Clark (1968). Because of their presumed "direct competition" with livestock, prairie dogs have for about 100 years been subject to continuous disturbance and killing by federal, state, and private interests (Cottam and Caroline, 1965). Prairie dogs have been regarded as "pests" since the settlers began intensive use of the Great Plains, deserts, and intermountain grassland for grazing and agriculture. Wholesale slaughter of natural predators of prairie dogs (badgers, coyotes, bobcats, weasels, and raptors) has accompanied this intensive use.

Bond (1945), Taylor and Davis (1947), Osborn and Allen (1949), and Norris (1950) indicated that prairie dogs tend to be most numerous on range depleted by livestock overgrazing. These investigators concluded that large populations of prairie dogs are more often an effect of range deterioration rather than its cause, and may be symptomatic of poor range condition (Fichter, 1953). It is commonly believed that prairie dogs cause range deterioration, but according to Bond (1945) under certain conditions prairie dogs actually accelerate recovery of deteriorated ranges. Rodents feed mainly on annual forbs and other plants typical of early stages of succession (overgrazed range) and as a result favor the increase of climax plant species, principally good forage grasses. Clements and Clements (1940) have shown that when forbs are present they are preferred by prairie dogs over grass as forage. Koford (1958) stated that if man does not alter the grassland, it is improbable that prairie dogs alone will reduce the range vegetation below the stage where short grasses are dominant. Although most of the ecological studies cited above were based on *C. ludovicianus*, the general conclusions seem valid for *C. leucurus* also.

Revegetation patterns of burrow mounds were investigated by Clark (1970) and range relationships by Clark and Kinker (1970). Mean density of burrow openings varies from 59.1 per hectare (= 23.9 per acre, Clark, 1969) to 54.1 per hectare (= 21.9 per acre, Tileston and Lechleitner, 1966). Prairie dog density averages 3.2 per hectare, range 0.7 to 6.2 (= 1.3 per acre, range 0.3 to 2.5). Maximum densities coincide with the initial appearance of pups above-ground and are as high as 8.4 per hectare (= 3.4 per acre, Tileston and Lechleitner, 1966).

Immigration occurs chiefly in early spring (March and April). In one colony in Wyoming, 12 new animals took up residence one spring and three the next (Clark, 1969). Tileston and Lechleitner (1966) found that immigration played a relatively important role in a town in northern Colorado. From the Wyoming colony, two males emigrated to other towns and took up residence. Movements up to 2.7 km. (1.7 miles) have been reported.

No figures on longevity or population turnover are available

in the literature. However, Clark (1969) noted an 8.9 % loss of members of one colony between June and October of 1966. Total loss due to mortality and emigration from September 1966 to spring 1967, was 50 % (36 animals) of the population. The major predators, golden eagle and badger, seemed to be only a minor cause of mortality. Tileston and Lechleitner (1966) reported that only 25 % of a population in Colorado was retaken the following year. Of the 24 animals lost, the fate of 75 % was not determined. Plague seems to be a major mortality factor among prairie dogs (Clark, 1969; Lechleitner *et al.*, 1962). Between June and September an 86 % loss was sustained by a colony in Wyoming, presumably from plague.

Home ranges of juveniles are generally larger than those of adults. The mean of maximum measured lengths of home ranges for adults is 106 m. (347 ft.) or about 90 % of that of the mean of 116 m. (380 ft.) for juveniles. Mean home range size for adults is 5.9 hectares (2.4 acres) or 86 % of that of the mean for juveniles of 6.9 h. (2.8 acres) (Clark, 1969). Home ranges are more or less similar in size from year to year, but the position of the home range of an individual is not always the same. Sometimes home ranges of individuals overlap, and sometimes the home range size of a juvenile is reduced the following year when it is an adult. A few juveniles move to the periphery of the colony to establish their adult home ranges.

**BEHAVIOR.** Some aspects of behavior were studied by Tileston and Lechleitner (1966). Waring (1970) recorded sounds produced by white-tailed prairie dogs. He noted that these sounds are similar to those produced by *C. gunnisoni*, although sufficiently distinct for species identification. Lechleitner (1969), also reported differences. Erpino (1968) described copulatory behavior of *C. leucurus*. White-tailed prairie dogs do not have a system of social organization similar to that seen in the black-tailed prairie dog (King, 1955; Smith, 1958). The only functional social unit is a transitory one involving the lactating female and her dependent young. Tactile social interactions include sexual and agonistic behavior, "play" (between young and rarely between young and adults), and "kissing" (naso-nasal contact). Mutual grooming and group cooperation in burrow construction has not been reported in *C. leucurus*. Vocal stimuli (sounds) and visual stimuli, to some degree, do coordinate and unify the behavior of the colony.

Clark and Brown (1968) and Tileston and Lechleitner (1966) have described daily and seasonal activity patterns. The general pattern for a colony in Wyoming at an elevation of 2195 m. (7200 ft.) was as follows. Prairie dogs were never observed before sunrise or after sunset. The exact time of emergence each morning varied with the season, being earliest in mid-summer. After emerging from its burrow sometime after sunrise, the prairie dog sits or stands in or near the burrow, looks around for a few minutes, and then proceeds to forage near the burrow, moving farther away as the day progresses. In the hot summer months (June through August) the prairie dog returns to its burrow by mid-morning and usually remains there during the high mid-day temperatures. In late afternoon the prairie dog again emerges from its burrow and begins foraging, but before sunset it retires to its burrow for the night.

Daily mid-summer activity (from late May to early August) thus tends to be bimodal, with activity periods in summer occurring between sunrise and the hours 0900 to 1000, when the temperature begins to rise, and from about 1500, when the temperature begins to drop, until before sunset. In contrast, early and late in the season (from February to April and September to November), daily activity is characterized by unimodal curves peaking usually in the early afternoon.

Generally, not all adults are active above ground at the same time, even in favorable weather. Within a colony there is some activity throughout the day except when weather conditions (such as heavy rain, hail, or high temperature) discourage above-ground activities. Daily activity is not restricted by wind until velocities near 65 to 80 kph (40 to 50 mph) are reached, above which there is an obvious decline in activity. At wind velocities of 90 to 95 kpm (55 to 60 mph) prairie dogs remain near their burrows and activity consists mainly of sitting in or near the burrow.

Temperature is an important regulator of activity. Activity mostly takes place within the range of −10° to +20°C (15° to 70°F). At temperatures of 24° to 27°C (75° to 80°F) animals are active for short periods of time (10 to 15 minutes), but activity is restricted to brief appearances above ground at the burrow entrance. Animals left in open wire traps at temperatures of 24°C (75°F) begin salivating after about 30 minutes, and die when exposed to direct sunlight and 27°C (80°F) temperatures for 2 to 3 hours.

During heavy snow storms of several hours duration, prairie dogs go below ground, and afterwards above-ground movements in fresh snow are limited. Light rain showers lasting only a few minutes do not suppress above-ground activity, but during prolonged heavy rain and during hail storms all above-ground activity ceases.

Initial emergence of white-tailed prairie dogs in the spring varies from year to year, but appears to be independent of above-ground weather conditions. Prairie dogs in the Laramie, Wyoming, area were first out in early March of 1964 and in late February in 1965, 1966 (Bakko and Brown, 1967), 1967, and 1968 (Clark and Brown, 1968). In 1967 and 1968, prairie dogs continued to emerge from hibernation until mid-March. Adult males became active about 2 to 3 weeks before adult females. Juveniles emerged in late May and the first week in June and thereafter activity in the colony as a whole greatly increased.

The number of prairie dogs observed above ground begins to decline in about the second week of July. Many adults that disappear during the summer months reappear the following spring in the same areas in which they were last seen. Possibly these animals hibernate for the entire period of disappearance although some adult prairie dogs that become dormant early in the season may reappear for a few days in August. Adult males disappear below ground several weeks before adult females, and by late August, all adults are inactive. Some juveniles begin hibernating in late August, but others do not enter hibernation until late October or early November. There is no apparent difference in time of seasonal disappearance between juvenile males and females.

Animals were active in a Wyoming colony (elevation 2195 m. or 7200 ft.) for a total of about 8½ months (Clark and Brown, 1968), adults for about 5 months (from late February to mid-August) and juveniles for about the same length of time (from June to late October or early November). Tileston and Lechleitner (1966) reported that white-tailed prairie dogs in northern Colorado (elevation 2500 m. or 8200 ft.) were active a total of only 7 months.

**GENETICS.** The diploid chromosome number in *C. leucurus* is 50; the karyotype contains seven pairs of metacentric chromosomes and 18 pairs of submetacentric or subtelocentric chromosomes. Five females from Wyoming collected by Clark were analyzed by Nadler; sex chromosomes were not therefore identified and are included in the above enumeration. Although both *C. leucurus* and *C. ludovicianus* have a $2N$ of 50, they differ considerably in their complements of metacentric and submetacentric chromosomes, the latter having 15 pairs of metacentric and nine pairs of submetacentric or subtelocentric autosomes (Nadler and Harris, 1967). Work in progress by J. J. Pizzimenti confirms the $2N = 50$ from elsewhere within the range of *C. leucurus*.

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