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**A study of subspecific variation in the Yellow Pocket-Gopher  
(*Geomys lutescens*) in Nebraska, and of the geographical and  
ecological distribution of the variants**

Myron H. Swenk

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## MISSOURI VALLEY FAUNA

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Lincoln, NebraskaA STUDY OF SUBSPECIFIC VARIATION IN THE YELLOW  
POCKET-GOPHER (*GEOMYS LUTESCENS*) IN NE-  
BRASKA, AND OF THE GEOGRAPHICAL  
AND ECOLOGICAL DISTRIBUTION  
OF THE VARIANTS

By MYRON H. SWENK

The Yellow Pocket-gopher (*Geomys lutescens*) was described by Merriam (14) in 1890, as a paler and smaller subspecies of *Geomys bursarius*, based on "numerous specimens received from the sand hills of western Nebraska", and especially upon an adult ♀ type specimen (No. 23595, U. S. N. M.) collected in the sandhills along Birdwood Creek, Lincoln County, Nebraska, May 27, 1889, by A. B. Baker. In 1895 Merriam (15) established it as a distinct "pallid species inhabiting the arid plains west of the ninety-ninth meridian", and added that "its characters are very constant throughout most of its range, and if it intergrades with *bursarius* it must do so in the narrow strip between the ninety-eighth and ninety-ninth meridians".

Although even as late as 1931 Scheffer (17) classified *Geomys lutescens* as a subspecies of *G. bursarius*, it is without doubt specifically distinct from *G. bursarius*. In all of its variations it is decidedly smaller, the fully adult ♂♂ averaging fully 35 to 50 mm. less, and the fully adult ♀♀ 29 to 44 mm. less, in total length, than the average of full adults of the corresponding sexes of *Geomys bursarius majusculus*. Among old adults there is little or no overlapping in measurements between the two species, when the same sex of each is compared. *G. lutescens* is also constantly distinctly paler in color than *G. b. majusculus* in the corresponding pelage. As compared with *G. b. majusculus*, the skull of *G. lutescens* is smaller and relatively shorter and less angular, with, even in the adult ♂♂, a shorter and relatively broader rostrum; the temporal impressions are normally united in the adults to form a relatively low sagittal ridge (which is never high and crested as in *G. bursarius* ♂♂), but sometimes remaining apart; and the brain case is shorter and posteriorly flatter. Sexual and age differences are of much the same character as in *G. bursarius*.

There is no intergradation between *G. lutescens* and *G. bursarius* "between the ninety-eighth and ninety-ninth meridians". *G. lutescens* is the only pocket-gopher of its genus occurring in Nebraska west of the 98th meridian, except possibly for very limited areas in western Knox and northwestern Antelope Counties, north of the Platte River, and in the western parts of Hamilton, Clay and Nuckolls, southeastern Hall, eastern Adams, northeastern and southern Webster Counties, and the Republican River Valley in Franklin County, south of the Platte, in which localities *G. b. majusculus* occurs, and from which localities immediately eastward it is the exclusive pocket-gopher. There is a definite

western line of distribution of *G. b. majusculus*, correlated with the physical character and moisture content of the soil; and where that form leaves off *G. lutescens* begins, its eastern line of distribution paralleling very closely the western limits of *G. b. majusculus*, with only a very few small areas along the common line of distributional limits of the two species where apparently neither occurs. This line of distributional limits of the two species in Nebraska lies wholly between longitudes 97° 30' and 100°.

Lying to the north and west of the center of Nebraska, and covering a total area of 18,000 square miles or more, is a vast expanse of rounded or conical sand dunes or irregular sand ridges, often capped with drifting sand and varied with blow-outs, separated by narrow pockets or broad and flat, dry or wet valleys, known as the Sandhill Region. The sand is covered more or less and kept from blowing by a sod composed of a large number of both tall and short grasses. This habitat is very different from the loess soils of eastern Nebraska inhabited by *Geomys bur-sarius majusculus*, but is truly the home of typical *Geomys lutescens*, which, more or less locally, abounds there, especially in the more fertile valleys and along their edges. It is also common to abundant in several smaller areas of modified sandhills lying outside of the Sandhill Region proper of central Nebraska, where the sand is usually finer and firmer than in the main body, as in southwestern Lincoln, southeastern Perkins, northeastern Chase, northwestern Hayes and western Dundy Counties. It occupies practically the whole of Cherry County, extending in almost unbroken abundance across that county from west to east and from its southern boundary north to the state line. In the other typical sandhill counties of Nebraska—Grant, Arthur, Hooker, McPherson, Thomas, Logan, Blaine, Loup, Garfield and (mostly) Wheeler—typical *G. lutescens* occupies the entire area, and in only a little, if any, less abundance than in Cherry County. In a survey made in 1919, it was found abundantly present in southwestern Lincoln County and numerous in the alfalfa fields of the river bottoms between the two branches of the Platte River in eastern Keith County, but westward in the South Platte Valley, about Ogallala, it became rather uncommon. In Perkins County, about 15 miles south of Ogallala, it again became fairly numerous. It was also abundant in the sandhills of western Dundy County. From Cherry County its range extends a short distance from Nebraska northward into southwestern South Dakota. Merriam (15) has recorded 2 specimens from the "Pine Ridge Agency" (probably the sandhills of the present Bennett County) and 3 specimens from "Rosebud Agency" (probably the sandhills of the southwestern part of the present Todd County). Blossom (6) has also recorded 2 specimens of non-typical *G. l. lutescens* from Dog Ear Lake, Tripp County.

In the sandhills of Brown and Rock Counties typical *G. lutescens* is likewise common; but on the Ainsworth Table (an elevated area in Brown County bounded by Plum Creek Canyon on the west, the Niobrara Valley on the north and Long Pine Creek Canyon on the east), and on the Long Pine Table (another elevated area in eastern Brown and western Rock Counties, just east of the Ainsworth Table and across Long Pine Creek Canyon from it), on both of which tables rather firm loam or fine sandy loam soils of the Holdrege and Marshall series predominate, interspersed with small areas of the more sandy phases of several series of soils, conditions seem unfavorable for this species to prosper, and there is no evidence of its presence on these tablelands, except perhaps scatteringly in the most sandy spots. But in the hills of dune sand that nearly surround the Ainsworth Table and begin at the southern edge of the Long Pine Table, extending thence southward across both Brown and Rock Counties, this mammal occurs quite commonly.

It also occurs commonly in the extensive areas of dune and Valentine sand of southern, and especially of southwestern, Holt County, chiefly

south of the Elkhorn River, but only sparingly in the more sandy soils of the Prairie Plains haylands or "hay flats", which extend from the Long Pine Table eastward across Rock County and thence southeastward across central Holt County into northern Wheeler County. In Holt County, north of the Elkhorn River, in the firmer soils of the gently rolling plain of the Holt Table that have been developed on the Pierre shale, *Geomys lutescens* is generally absent; but it occurs, though not abundantly, in the strips of dune sand that lie in the areas between the lower parts of Brush, Turkey, Eagle and Redbird Creeks northward to the Niobrara River, and also in limited numbers in the sandy loam soils along the eastern edge of Holt County, from Ewing, from which locality Merriam (15) has recorded it, north to the vicinities of Page and Star. Along the western edge of Holt County, north of the Elkhorn, from a little north of Stuart westward, the species is again common in the prevailing Valentine and dune sand areas. But over the greater part of northern and central Holt County this mammal is scarce or entirely absent.

Northward across the Niobrara River Valley opposite Brown, Rock and Holt Counties and adjacent areas—in extreme northeastern Cherry, Keya Paha, Boyd and extreme northwestern Knox Counties—occurs a series of hard, nearly flat to undulating or hilly, mixed tall and short grass plains plateaus, cut by numerous draws and canyons, known (west to east) as the Crookston Table, the Springview Table and the Pierre Plains and Hills. The Crookston Table occupies northeastern Cherry County, north of Minnehaduzza Creek and the Niobrara River, east to a narrow strip of sandhills along the Cherry-Keya Paha County line, and north into South Dakota. Its prevailing soils are those of the Rosebud series, with a few small areas of sandy land interspersed. Beed (3) has recorded that *Geomys lutescens* is present in the tall-grass dry meadow biotic community of the Crookston Table, but absent on the short-grass uplands, on the western yellow pine-clad canyon edges and sides, and in the deciduous shrub thickets and stream-side woodlands lower down in the canyons. On the Springview Table in Keya Paha and extreme western Boyd Counties and on the Pierre Plains and Hills in Boyd and western Knox Counties the prevailing hard soils are the dark-colored, granular soils of the Boyd series, derived from Pierre shale, and the Holt soils, derived from limy sandstones, both of which support a growth of both tall and short grasses, but, except in sandy areas or patches of dune sand occurring here and there, are not occupied by pocket-gophers. In a survey made in August of 1919, C. E. Mickel found no evidence of pocket-gophers on the Springview Table in Keya Paha County, except for a few in the sandy soil developed from sandstone outcroppings occurring along the north bank of the Niobrara River, as far at least to the eastward as Meadville, these probably having penetrated there from the above-mentioned sandhill area in the extreme northeastern corner of Cherry County and the adjacent extreme western part of Keya Paha County.

However, farther east there are also some areas of Moody silt loam on the uplands (this being the most extensively represented cropped soil), of the very similar Hall very fine sandy loam on the lower terraces, and of loamy fine sand and fine sandy loam of the Cass series in the bottom lands. In these soils at least, which are extensively cropped, pocket-gophers are known to be irregularly distributed. These soils occur along the valley of the Ponca River across all or most of Boyd County, and also, less extensively, in the valley of the Keya Paha River and its tributaries in western Boyd and eastern Keya Paha Counties; and pocket-gophers have definitely been reported as present in alfalfa fields near Lynch and Spencer in Boyd County, in hay flats near Springview, Keya Paha County, and in the Niobrara Valley at Penbrook, in extreme northeastern Cherry County. It is also not improbable that they would be

found to follow the main streams in Gregory, Tripp, eastern Lyman, and the western parts of Charles, Mix, Brule, Buffalo and Hughes Counties, South Dakota, in the similar soils of the Boyd-Holt soil area of the south-central part of that state.

On August 5 to 14, 1919, inclusive, C. E. Mickel trapped 67 specimens of *Geomys lutescens* in alfalfa fields near Spencer, Boyd County. Of the distribution of this mammal in that locality he reported as follows: "The period from August 5 to 15 was spent at Spencer. The only pocket-gophers that could be found were in or near the valley of the Ponca River. In the alfalfa fields which were situated either in the Ponca River Valley, or in some cases fields that were two or three miles back from the river itself, this gopher was found fairly abundantly. In one field 33 traps were put out just after a rain. After a period of 8 hours from the time the first trap was set, 28 gophers were caught." Of these 67 specimens, 15 ♂♂ and 16 ♀♀ were carefully measured in the flesh by Mickel, but only a small series of adult ♂♂ was preserved. These prove, however, to represent a very well-marked subspecies of *Geomys lutescens*, characterized by maximum size and distinctive cranial characters. It may be known as

*Geomys lutescens levisagittalis* subsp. nov.

SMOOTH-CROWNED YELLOW POCKET-GOPHER

*Type*.—Spencer, Boyd County, Nebraska, August 13, 1919. Old adult ♂, skin and skull. C. E. Mickel, collector. Two adult paratopotype ♂♂, skins and skulls, August 13, 1919 (C. E. Mickel). Collection of M. H. Swenk.

*Subspecific Characters*.—Similar to typical *G. l. lutescens* Merriam, but old adults of both sexes averaging larger in body size, and especially with a decidedly longer hind foot, and with distinctive cranial characters (see following tables of comparative measurements). Similar in body size to *G. l. hylaeus* Blossom (but averages of adult ♂♂ slightly greater and of adult ♀♀ slightly less), the hind foot averaging somewhat longer in both sexes, the upperparts paler and more tinged with grayish fulvous, without a well-developed mid-dorsal darker stripe, and with distinctive cranial characters.

*Distribution*.—Known only from the type locality, but probably present in sandy soil areas in stream bottoms over Boyd County, Nebraska, and adjacent areas in the Boyd-Hall soil area in Nebraska and South Dakota.

*Color*.—Practically the same as that of typical *G. l. lutescens*, but possibly averaging slightly more reddish in color of upperparts.

*Body Measurements* (in mm.).—Of type ♂: Length, 292; tail, 91; hind foot, 36. Of 2 paratopotype ♂♂: 279, 275; 77, 79; 37, 37. The largest old adult ♂♂ of *G. l. levisagittalis* are approximately of the same size as the smallest adult ♂♂ of *G. b. majusculus*.

*Skull*.—Similar to that of *G. l. lutescens* but in fully adult ♂♂ with the brain case distinctly flatter and less inflated, especially in the region of the parietals; the rostrum slightly broader and heavier; the zygomatic processes of the maxilla less heavy and terminally less angulate, causing the zygoma as a whole to be less spreading and angulate anteriorly in dorsal profile; frontals less depressed medially; temporal impressions but feebly developed, well separated, the sagittal area smoothly slightly convex and not forming or tending to form a sagittal crest, even in old adult ♂♂; interparietal distinctly developed, triangular, not obliterated by a crowding of the parietals; lambdoidal crest well developed in old adult ♂♂, but less strongly and much less sharply so than in *G. l. lutescens*; postorbital ridge weaker; basioccipital not narrowed, yet audital bullae

distinctly larger and more inflated, chiefly by external expansion; mastoid bullae smaller, more triangular and less rounded in outline, much less inflated; paroccipital processes of exoccipital more prominent. Measurements (in mm.). Of type ♂: Greatest basal length, 50.0; basal length, 47.5; basilar length of Hensel, 43.6; zygomatic breadth, 32.0; greatest breadth across squamosals, 30.8; breadth at postglenoid notch, 21.3; interorbital breadth, 6.8; height of cranium above palate, 19.0; height of cranium above basion, 13.6; upper molar series on alveoli, 8.5; breadth of muzzle at root of zygoma, 10.0; greatest length of single half of mandible without teeth, 34.0; greatest breadth of mandible across angular processes, 33.0; distance from condyle to angular process, 12.0. Of 2 paratopotype ♂♂: 49.9, 45.6; 47.5, 43.3; 43.4, 39.2; 31.5, 27.3; 30.7, 26.0; 20.7, 19.2; 6.6, 6.7; 18.8, 17.1; 13.5, 13.1; 8.8, 7.8; 10.0, 9.5; 33.3, 31.5; 33.3, 29.0; 11.4, 9.3.

Merriam (15, p. 128) stated of *Geomys lutescens* that "along the eastern and southern limits of its range the upper parts are decidedly more fulvous than in the typical animal." So far as the few specimens examined by the writer from the eastern edge of its range in Nebraska indicate, this coloration character has not been found to be sufficiently marked to warrant subspecific recognition. South of the Elkhorn River, across Antelope County and on into northwestern Madison County, is an extension of the sandhills that is plentifully occupied by *Geomys lutescens*. It has been recorded from near Neligh and Oakdale, Antelope County, and from near Tilden, Meadow Grove and Battle Creek, Madison County, all in the Elkhorn Valley. Neligh specimens collected by M. Cary, referable on size and cranial characters to *G. l. lutescens*, are somewhat redder than typical. In northwestern Antelope County it has been reported from sandy-soiled alfalfa fields near Orchard, and in southeastern Madison County from near Newman Grove. The relatively few pocket-gophers reported from Boone (Petersburg, Bradish, St. Edward and Cedar Rapids), Nance (Fullerton) and Merrick (Central City, Clarks and Silver Creek) Counties, are, so far as is known, all referable to this species.

Though only the northwestern portion of Custer County lies in the true Sandhill Region, typical *Geomys lutescens* not only occurs there (Anselmo, Merna) but also has pushed southeastward in the more sandy soils of the Holdrege series, and especially along the stream valleys, across the county and beyond. It has been reported from along the Middle Loup near Sargent and Comstock, from along Muddy Creek near Broken Bow and Mason City, and from along the South Loup near Arnold and Callaway. Along the North Loup it has pushed eastward to North Loup, Valley County, Scotia, Greeley County, and St. Paul, Howard County, and in Greeley County it occurs also in Spring Creek Valley, near Wolbach. Along Muddy Creek it occurs as far as Litchfield, Sherman County. Along the South Loup it has penetrated to Sweetwater, Buffalo County, and occurs also as far east as Taylor's Spur, northwest of Grand Island, in Hall County.

Proceeding eastward down the valley of the Platte River, we find that typical *Geomys lutescens* is most common in Dawson County in its extreme western portion, mostly on the south side of the river, extending about half way between Gothenburg and Lexington, or west of the 100th meridian. Of course stragglers occur in other parts of the county. They have been reported injuriously numerous in alfalfa fields as far east as Cozad. In June, 1919, C. E. Mickel found no pocket-gophers around Lexington, in eastern Dawson County, except a few right in the river valley, and those were all typical *G. l. lutescens*. At Overton, in the extreme eastern part of the county, they have been found fairly numerous in some hay meadows. In Buffalo County these mammals are practically confined to the Platte Valley, where they are not numerous, but occur

in small numbers as far east as Kearney and Gibbon. Merriam (15) has recorded *G. lutescens* from Kearney. Western Hall County seems to mark about the eastern limits of the species in the Platte Valley.

South of the Platte River, typical *Geomys lutescens* is found in sand or sandy loam areas along Dry Creek, near Lowell, Kearney County; in the sandy loam and dune sand areas along Sand Creek southeast of Heartwell, Kearney County; and (authority of Harold Turner) southwest and south of Holstein, in southwestern Adams County. In Adams County, except in the southwestern corner, *G. b. majusculus* seems to be the dominant if not the exclusive pocket-gopher, and several specimens of it have been collected by A. M. Brooking of Hastings, and identified by the writer. In western Kearney County, and in Phelps and Gosper Counties, *G. l. lutescens* apparently is largely confined to the sandy soils of the Platte River Valley proper (authority of W. R. Ward). Such few pocket-gophers as occur on the uplands of Franklin County (Campbell) and Phelps County (Holdrege) are apparently *G. l. lutescens*, which is also the exclusive one present along the Medicine Creek and its tributaries in Frontier County (Maywood, Curtis, Moorefield, Stockville) and Plum Creek (Eustis), as well as the head waters of Coon Creek (near Centerpoint). *G. l. lutescens* occurs along the Frenchman River in Hitchcock County (Palisade), along the Republican River in Redwillow (McCook), Furnas (Holbrook, Arapahoe, Oxford) and Harlan (Orleans, Alma) Counties, and along Beaver Creek in Redwillow (Danbury), Furnas (Wilsonville, Beaver City) and Harlan (Stamford) Counties. It also occurs sparingly on the uplands of Furnas and Harlan (Mascot) Counties.

North of the Platte River system, the western margin of the main body of the sandhills, constituting the Sandhill Region proper, runs along the eastern boundary of Sheridan County to the Niobrara River, thence southwest across that county, south of the Niobrara, to and across the southern edge of Box Butte County, and thence south to the northern edge of the North Platte Valley proper, in northern Morrill County. South of the South Platte River, the western margin of the smaller bodies of sandhills in Nebraska forms an irregular and more or less broken line in west-central Lincoln, northern, south-central and western Perkins, and northwestern and west-central Chase Counties, thence extending from southwestern Chase and western Dundy Counties into adjacent parts of northeastern Colorado. From these western limits westward, across Nebraska, the dune sand rather abruptly gives way to a series of high, flat to undulating, or even rough and broken tablelands, which form the divides between gently to strongly eroded slopes along the stream valleys. This area is collectively known as the High Plains or Tableland Region of Nebraska. The principal tables, from north to south, are the Pine Ridge and Dawes Table, Box Butte Table, Wildcat Ridge, Cheyenne Table and Perkins Table. These tables originally were covered with buffalo grass (*Bulbils dactyloides*), grama grass (*Bouteloua hirsuta* and *B. oligostachya*) and other short grasses, and were almost or entirely devoid of trees.

The upland soils of these High Plains are chiefly the grayish to brownish loams, silt loams, very fine sandy and sandy loams, loamy fine sand and gravelly sandy loams of the Rosebud series, which have been derived from underlying calcareous Tertiary sandstones and shales, which parent materials are usually encountered at depths of but a few feet below the surface. These Rosebud soils are especially dominant on the Dawes Table, Box Butte Table, Wildcat Ridge and Cheyenne Table. In extreme southwestern Nebraska, from western Frontier and Redwillow Counties westward, the hard soils of the rather smooth uplands are chiefly the dark grayish brown silt loams, fine sandy loams and very fine sand of the Keith series, derived partly from wind-deposited silt, along with material from underlying weathered Tertiary rocks. These soils

grade eastwardly into the Holdrege and Hall soils of south-central Nebraska, which they much resemble, and westwardly into the Rosebud, Dawes and Valentine soils of the Perkins Table and the sandhills of southwestern Chase and western Dundy Counties. At places on the High Plains and the valleys dissecting them, extensive areas of very sandy soil occur, sometimes forming patches of dune sand, as in southern Sioux County, but frequently merely fine and very fine sandy loams or fine sand of the Bridgeport and other series.

In the sandhills covering that part of Garden County lying north of the North Platte River, typical *Geomys lutescens* occurs abundantly, but in the harder Cheyenne Table soils of that county lying south of the river it is much less numerous, though sparingly present. The same is true of Morrill County, where this mammal is abundant in the sandhills north of the river, but decreases in the harder plains soils of the extreme southern part of the county. It is likewise only sparingly present on the uplands of Deuel and eastern Cheyenne Counties. On the Cheyenne Table in the extreme southwestern part of Morrill County, the western two-thirds of Cheyenne County, the southern one-third of Banner County, and all of Kimball County, *G. lutescens* drops out entirely on the uplands, where it is replaced by *Thomomys*. But *Geomys* follows the more loose and sandy soils in the valley of Lodge Pole Creek, and up its principal tributaries for a short distance, across Cheyenne and Kimball Counties. In Banner County it is locally common in the valley of Pumpkin Creek in the northern part of the county, and in Bull Canyon in its western part, southward up the slopes of the Cheyenne Table nearly to its top, where it again drops out and is replaced by *Thomomys*, and northward to the slopes of Wildcat Ridge. It occurs also over the North Platte Valley in Scotts Bluff County, north of Wildcat Ridge, southern, and especially southwestern, Sioux County, and central Morrill County.

The population of *Geomys lutescens* occurring in the Lodge Pole and Pumpkin Creek valleys, in Bull Canyon, and in the North Platte Valley east to west-central Morrill County, and on the uplands of eastern Cheyenne, Deuel, southern Garden, and that part of Keith County lying between the North Platte and South Platte rivers, has undergone some modification as compared to typical *Geomys lutescens* from the Sandhill Region of the state, in that the animals are slightly brighter colored, with smaller skulls, and some other minor cranial differences. Specimens examined from near Ogallala, Keith County, Bridgeport, Morrill County, and Dalton, Cheyenne County, show the least differentiation, while those from the Lodge Pole Valley near Chappell, Deuel County, Lodgepole and Sidney, Cheyenne County, Kimball, Kimball County, Bull Canyon, Banner County, and the North Platte Valley in Scotts Bluff County, show the maximum differentiation. Locality records in Scotts Bluff County are from near Minatare, Scottsbluff, Mitchell, Morrill and Caldwell. Probably the *Geomys lutescens* of eastern Wyoming, from where Merriam (15) has recorded 3 specimens from Lusk, Niobrara County, and 1 from Uva, Platte County (in the North Platte River Valley), also represent this variant. Altogether, this form seems to have become sufficiently differentiated to warrant subspecific recognition, and it is proposed to call it

*Geomys lutescens vinaceus* subsp. nov.

#### PLAINS YELLOW POCKET-GOPHER

*Type*.—Scottsbluff, Scotts Bluff County, Nebraska, August 17, 1920. Old adult ♂, skin and skull. M. H. Swenk, collector. Allotopotype adult ♀, skin and skull, August 17, 1920 (M. H. Swenk). Three ♂ and 3 ♀ topotypes, skins and skulls. Six ♂ and 5 ♀ paratypes, skins and skulls, from Ogallala, Keith County; Chappell, Deuel County; Dalton, Lodgepole and Sidney, Cheyenne County; Kimball, Kimball County; and Bull Canyon, Banner County. Collection of M. H. Swenk.



*Subspecific Characters.*—Similar to the typical Sandhill Yellow Pocket-gopher (*G. l. lutescens* Merriam), of the Sandhill Region of central Nebraska and sandy areas in western Kansas and southeastern Colorado, and of about the same average body size (see following Table 1), but general color of upperparts slightly more vinaceous or buffy and slightly less grayish, the skull averaging decidedly smaller, especially in the adult ♀♀ (see following Table 2), with narrower nasals, especially in the adult ♂♂, and with the exoccipital with somewhat more strongly developed paroccipital processes and condyles in both sexes.

*Distribution.*—Sandy valley areas of the High Plains of the southern part of the Nebraska Panhandle and probably also adjacent parts of Wyoming and Colorado.

*Color.*—Upperparts in early summer (June) averaging slightly more vinaceous (about Avellaneous of Ridgway<sup>1</sup>) instead of the slightly more grayish brown (about Wood Brown) of *G. l. lutescens*, and distinctly paler than the darker grayish brown (about Sayal Brown) of the Pine Ridge Yellow Pocket-gopher (*G. l. hylaesus*) of the Pine Ridge Region, which latter also usually has a distinct darker dorsal stripe that is lacking in both typical *G. l. lutescens* and *G. l. vinaceus*. Upperparts in late summer and fall (September and October) more buffy than in the early summer (from about Mikado Brown to Cinnamon), and with more black-tipped hairs, especially mid-dorsally, as compared with a slightly less vinaceous or buffy (about Sayal Brown) average base color in typical *G. l. lutescens*, and a still darker average color (about Snuff Brown to Saccardo's Umber) in *G. l. hylaesus*. Upperparts in spring (May) darker than in early summer and less buffy than in late summer and fall, with still more black-tipped dorsal hairs (base color about Cinnamon-Drab), slightly less grayish than in typical *G. l. lutescens* (which is about Drab). Forearms, feet and throat pure white, rest of underparts grayish white to pale grayish.

*Body Measurements* (in mm.).—Of type ♂: Length, 278; tail, 86; hind foot, 33. Of largest paratopotype ♂: 272; 88; 35. Of allotype ♀: 240; 76; 31.

*Skull.*—Almost identical with that of *G. l. lutescens*, with the same medially depressed frontals, well developed temporal impressions usually forming or tending to form a well-developed sagittal ridge in old adult ♂♂, small or very feebly developed interparietal, strong and sharply developed lambdoidal crest in adult ♂♂, well-developed postorbital ridge, moderately inflated audital bullae, etc.; but the posterior half of nasals more narrowed and more sharply cuneate in adult ♂♂, the mastoid bullae rather smaller, paroccipital processes of exoccipital slightly more prominent, and the exoccipital condyles rather more strongly developed. Measurements (in mm.). Of type ♂: Greatest basal length, 48.0; basal length, 44.5; basilar length of Hensel, 41.5; zygomatic breadth, 31.5; greatest breadth across squamosals, 29.0; breadth at postglenoid notch, 20.7; interorbital breadth, 7.9; height of cranium above palate, 17.0; height of cranium above basion, 13.6; upper molar series on alveoli, 8.5; breadth of muzzle at root of zygoma, 11.8; greatest length of single half of mandible without teeth, 31.0; greatest breadth of mandible across angular processes, 32.0; distance from condyle to angular process, 11.5. Of largest paratopotype ♂: 50.2; 46.0; 43.0; 31.0; 28.0; 19.5; 6.5; 18.0; 14.3; 9.5; 10.5; 32.3; 33.0; 11.3. Of allotype ♀: 42.8; 39.5; 36.0; 27.5; 25.5; 19.3; 7.0; 16.5; 11.5; 8.0; 10.0; 28.5; 26.8; 9.5.

<sup>1</sup>Named colors are those of Ridgway, *Color Standards and Nomenclature* (1912).

Proceeding northward from the North Platte Valley across the Box Butte Table, one finds that, except in the sandhills of southern Sioux County, there are very few if any pocket-gophers until the valley of the Niobrara River is passed and the pine-clad and deeply eroded canyons of the northern escarpment of the Pine Ridge of Sioux County together with the Hat Creek Basin lying directly north of this escarpment, are reached, where there occurs a form of *Geomys lutescens* that is darker in color than either the typical form or *G. l. vinaceus*, which Blossom (6) has recently named *Geomys lutescens hylaecus*. This form ranges eastward along the Pine Ridge well on to the Dawes Table south of the White River in Dawes County (Crawford, Chadron) but gives way to more typical *Geomys lutescens* as the sandhills of Sheridan County south of the Niobrara River are approached. Records of the occurrence of *G. lutescens* in Sheridan County are at hand from Adaton, Whiteclay, Hay Springs, Rushville, Gordon, the Niobrara Valley, Spade, Antioch, Ellsworth and Bingham, all attesting to the wide distribution of the species in that county. But in that part of Dawes County lying north of the White River and Little Cottonwood Creek, and in extreme northern Sioux County, north of Indian Creek, where the soil changes abruptly to a "gumbo" (Pierre clay from exposed and weathered Pierre shale), the distribution of *Geomys lutescens* is just as abruptly cut off, and its place is taken by a form of *Thomomys*.

TABLE 1.—Extreme and average body measurements in millimeters of the Nebraska subspecies of *Geomys lutescens*

Locality	Specimens			Total Length			Tail Vertebrae			Hind Foot		
	No.	Age	Sex	Mini- mum	Aver- age	Maxi- mum	Mini- mum	Aver- age	Maxi- mum	Mini- mum	Aver- age	Maxi- mum
<i>G. l. lutescens:</i>												
Nebraska Sandhills	4	Ad.	♂	255.0	271.5	289.0	71.0	78.4	84.5	31.0	33.0	35.0
Do.	4	Ad.	♀	235.0	246.7	265.0	60.0	77.7	86.0	31.0	31.7	33.0
Do.	5	Imm.	♀	190.0	211.6	226.0	57.0	69.2	76.0	27.0	29.3	32.5
Western Nebr.(15)	12	Ad.	♂		270.5							33.5
Do.	10	Ad.	♀		246.0				84.0			31.5
Do.	28	Ad.	♂ ♀		256.0				77.0			32.0
<i>G. l. vinaceus:</i>												
Nebr. Panhandle	10	Old Ad.	♂	260.0	270.0	285.0	64.0	78.0	86.0	31.0	33.5	36.0
Do.	6	Yng. Ad.	♂	247.0	254.0	257.0	70.0	73.0	75.0	31.0	33.5	36.0
Do.	16	Ad.	♂	247.0	264.0	285.0	70.0	76.1	86.0	31.0	33.5	36.0
Do.	7	Imm.	♂	187.0	207.7	230.0	50.0	57.4	65.0	27.0	29.2	32.0
Do.	7	Old Ad.	♀	240.0	248.9	261.0	61.0	70.4	77.0	30.0	31.3	33.0
Do.	4	Yng. Ad.	♀	236.0	237.5	239.0	61.0	65.0	70.0	30.0	30.7	31.0
Do.	11	Ad.	♀	237.0	244.7	261.0	61.0	68.4	77.0	30.0	31.1	33.0
Do.	17	Imm.	♀	183.0	215.1	234.0	53.0	62.5	80.0	27.0	29.9	33.0
<i>G. l. hylaecus:</i>												
Nebr. Pine Ridge	8	Old Ad.	♂	267.0	277.5	289.0	74.0	81.0	89.0	33.0	34.9	37.0
Do.	18	Yng. Ad.	♂	233.0	250.3	266.0	54.0	71.7	84.0	30.0	32.0	34.0
Do.	26	Ad.	♂	233.0	258.6	289.0	54.0	74.5	89.0	30.0	32.9	37.0
Do.	3	Imm.	♂	192.0	210.0	226.0	61.0	61.7	68.0	28.0	29.7	32.0
Do.	5	Old Ad.	♂	257.0	261.6	269.0	74.0	77.8	84.0	31.0	32.0	33.0
Do.	8	Yng. Ad.	♀	237.0	242.7	251.0	62.0	70.7	80.0	29.0	31.1	33.0
Do.	13	Ad.	♀	237.0	250.0	269.0	62.0	73.5	84.0	29.0	31.4	33.0
Do.	2	Imm.	♀	221.0	223.5	226.0	62.0	65.0	68.0	28.0	28.5	29.0
<i>G. l. levisagittalis:</i>												
Spencer, Boyd Co.	6	Old Ad.	♂	275.0	285.6	296.0	77.0	87.0	93.0	34.0	35.7	37.0
Do.	9	Yng. Ad.	♂	230.0	255.1	275.0	70.0	78.5	85.0	31.0	33.7	37.0
Do.	15	Ad.	♂	230.0	267.3	296.0	70.0	81.9	93.0	31.0	34.5	37.0
Do.	6	Old Ad.	♀	254.0	259.0	265.0	75.0	76.2	80.0	32.0	33.0	34.0
Do.	9	Yng. Ad.	♀	230.0	241.8	251.0	70.0	74.4	85.0	29.0	32.4	35.0
Do.	15	Ad.	♀	230.0	248.7	265.0	70.0	75.1	85.0	29.0	32.7	34.0
Do.	1	Imm.	♀		213.0				75.0			32.0

Larger or smaller areas of dune sand are well distributed over the plains of eastern Colorado, and in such areas, as well as in sandy soils

TABLE 2.—*Extreme and average cranial measurements in millimeters of the Nebraska subspecies of Geomys lutescens*

Locality	Specimens		Greatest Basal Length			Zygomatic Breadth			Greatest Breadth Across Squamosals			Greatest Length of Mandible		
	No.	Age and Sex	Mini- mum	Aver- age	Maxi- mum	Mini- mum	Aver- age	Maxi- mum	Mini- mum	Aver- age	Maxi- mum	Mini- mum	Aver- age	Maxi- mum
<i>G. l. lutescens:</i>														
Nebr. Sandhills....	7	Ad. ♂	45.4	48.6	53.5	30.0	31.7	34.3	26.0	27.4	28.6	30.0	32.3	34.0
Do.....	4	Ad. ♀	45.0	46.0	47.5	28.5	29.9	30.5	26.5	26.7	27.0	30.0	30.7	31.5
Do.....	4	Imm. ♀	35.5	38.2	43.5	22.1	24.3	27.0	20.9	22.2	24.8	23.3	25.3	28.4
<i>G. l. vinaceus:</i>														
Nebr. Panhandle..	7	Old Ad. ♂	45.0	47.5	50.2	23.5	30.2	31.5	24.8	27.3	29.3	30.5	31.6	33.5
Do.....	2	Yng. Ad ♂	43.4	44.3	45.2	27.8	28.6	29.4	24.8	26.3	27.8	28.8	29.2	29.6
Do.....	9	Ad. ♂	43.4	46.7	50.2	27.8	29.9	31.5	24.8	27.1	29.3	28.8	31.1	33.5
Do.....	2	Imm. ♂	39.5	39.7	40.0	24.0	24.4	24.8	23.0	23.0	23.0	26.3	26.7	27.2
Do.....	3	Old Ad. ♀	40.4	41.2	42.8	25.0	25.8	27.5	22.5	23.7	25.5	26.6	27.3	28.5
Do.....	2	Yng. Ad ♀	39.0	39.5	40.0	24.2	24.3	24.5	22.5	22.5	22.5	26.0	26.2	26.5
Do.....	5	Ad. ♀	39.0	40.5	42.8	24.2	25.2	27.5	22.5	23.2	25.5	26.0	26.9	28.5
Do.....	3	Imm. ♀	31.6	34.8	37.2	19.6	21.7	23.5	19.2	20.8	22.0	21.7	23.2	25.0
<i>G. l. hylaeus:</i>														
Nebr. Pine Ridge..	1	Old Ad. ♂		51.5			33.0		29.5				34.5	
Do.....	5	Yng. Ad ♂	43.0	45.9	47.0	26.0	29.2	32.0	25.5	26.1	27.0	28.5	30.7	32.0
Do.....	6	Ad. ♂	43.0	46.8	51.5	26.0	29.8	33.0	25.5	26.6	29.5	28.5	31.3	34.5
Do.....	2	Ad. ♂					28.0*							
Do.....	1	Ad. ♀					25.2*							
Do.....	4	Ad. ♀					25.4*							
<i>G. l. levisagittalis:</i>														
Spencer, Boyd Co..	2	Old Ad. ♂	49.9	49.9	50.0	31.5	31.7	32.0	30.7	30.7	30.8	33.3	33.6	34.0
Do.....	1	Yng. Ad ♂		45.6			27.3			26.0			31.5	
Do.....	3	Ad. ♂	45.6	48.5	50.0	27.3	30.3	32.0	26.0	29.2	30.8	31.5	32.9	34.0

\* Measurements by Blossom (6) from specimens in the University of Michigan Museum of Zoology, including those of type (ad. ♀, No. 77890).

in the river bottoms and elsewhere, *Geomys lutescens* usually occurs, abundantly in some places, especially where the soil is very loose and sandy, uncommonly in other locations, where the soil is less favorable for burrowing. Merriam (15) has recorded 21 specimens from Colorado, taken at Burlington, Kit Carson County (1); Limon, Lincoln County (3); Chivington, Kiowa County (6); Las Animas, Bent County (6); Denver, Denver County (1); and Pueblo, Pueblo County (4). The specimens from Limon and Pueblo were probably secured by C. P. Streater in the sandy river bottoms along Big Sandy Creek and the Arkansas River, respectively, and the one from Denver by W. D. Hollister. Elliot (9) has recorded an adult ♂ and 4 adult ♀♀ collected at Boulder, Boulder County, by R. T. Young. Cary (7) found it in company with or on areas adjacent to *Thomomys* in northwestern Logan County, on the grassy plateau north of Chimney Cliffs 2 miles south of the Nebraska boundary, and in northern Weld County. Specimens were collected on sandy soil in the South Platte River valley at Sterling, Logan County, by A. K. Fisher. It was reported to Cary (7) to be abundant in sandy soil and destructive to trees at Wray, Yuma County, and as prevalent on the Arkansas Divide as far west as Eureka Hill, Cheyenne County. Cary (7) also reported specimens from Avalo, Weld County; Loveland, Larimer County; Valmont, Boulder County; Seibert, Kit Carson County; Kit Carson and Twin Buttes, Cheyenne County; and Hugo, Lincoln County, and found it abundant in sandy country in the vicinity of Lamar, Prowers County, where on the adjacent hard soil flats *Cratogeomys* was the prevailing pocket-gopher. Warren (18) has recorded its occurrence additionally in Jefferson and Adams Counties; at Colorado Springs, El Paso County; and at Monon, Baca County, in the extreme southeastern corner of the state.

Merriam (15) recorded a series of 36 specimens from Canadian, Hemp-hill County (5), Tascosa, Oldham County (4), Newlin, Hall County (3), Childress, Childress County (12), Vernon, Wilbarger County (9) and Colorado, Mitchell County (3), in northwestern Texas, as referable to his *Geomys lutescens*. But Bailey (2), in his description of "the large, light-colored form" of *Geomys breviceps* that "follows up the river valleys from eastern Texas and becomes differentiated as it enters the open country", which he named *llanensis*, stated after apparently having examined much the same material as was studied by Merriam, that "specimens from Colorado, Stanton, Brazos, Childress, Vernon, Newlin, Canadian, Lipscomb and Tascosa, Tex., are referable to it (*G. b. llanensis*)", thus eliminating the Texas area of distribution indicated for *Geomys lutescens* by Merriam. The only Texas specimens referred to *Geomys lutescens* by Bailey (2) were "two specimens of barely adult females from near Texline" that "agree with *lutescens* in external characters, but possess cranial characters that suggest the possibility of a local subspecies. Howell reported numerous burrows in a range of sand hills 15 miles east of Texline, where the two specimens were caught, but elsewhere in the region none were seen." Apparently, *Geomys lutescens* reaches the state of Texas only in the extreme northwestern corner of the Panhandle (Dallas County), and there in a non-typical form.

Merriam (15) also recorded 3 specimens of *Geomys lutescens* from Woodward, Woodward County, in northwestern Oklahoma. But Elliot (8) recorded 8 specimens collected at Alva, Woods County, less than 50 miles northeast of Woodward, as well as 2 specimens collected at Noble, Cleveland County, in the central part of the state, all taken by Thaddeus Surber, as *Geomys breviceps*. Jackson and Warfel (11) refer specimens taken in 3 counties just to the east of Woodward County—near the Cherokee Plain in Alfalfa County, in sand dunes and along the banks of the Cimarron River near Waynoka, Woods County, and along the Cimarron 3 miles south of Cleo Springs, Major County—to *Geomys breviceps llanensis*, which form they report to be "very common in the regions adjacent to the salt plains of northwestern Oklahoma", where "their presence is evident by extensive 'workings' found wherever the soil is fairly moist and suitable for tunnelling." Also, Blair (5), in a recent treatise on Oklahoma mammals, has referred the pocket-gopher occurring in "approximately the western half of the main part of Oklahoma" to *G. b. llanensis*, which form he has specifically recorded from Woods, Alfalfa, Kay, Major, Payne, Oklahoma, Pottawatomie, Cleveland, Cotton, Jackson and Harmon Counties. He did not list *G. lutescens* from Oklahoma at all, but the fact that apparently no pocket-gopher specimens had been examined by him from the short-grass plains district west of the 99th meridian and in the Panhandle still leaves the occurrence of *G. lutescens* in extreme northwestern Oklahoma as a possibility.

Merriam (15) recorded 3 "typical or nearly typical" Kansas specimens of *Geomys lutescens* from Trego County, and 18 "non-typical" specimens from Ellis, Hays County (1), Cairo, Pratt County (6), Kiowa, Barber County (2), Garden Plain, Sedgwick County (4), and Belle Plain, Sumner County (5). Of most of these "non-typical" specimens, he writes: "In southeastern Kansas an aberrant form exists that seems to be an intergrade between the three types, *bursarius*, *lutescens* and *breviceps*, but a larger series of specimens than at present available is needed to prove it. This animal is smaller than *lutescens*, nearly as dark above as *bursarius*, and paler below than either. Some specimens indeed have the belly pure white, as in *texensis*. Specimens of this apparently intermediate form (mostly immature) have been examined from Cairo, Kiowa, Garden Plain, and Belle Plain, Kansas." The specimen from Ellis, Hays County, also recorded by Merriam as "non-typical", apparently did not fall in this group of "aberrant intergrades", but probably was otherwise "non-typical", as would be expected from the proximity of its locality to

"nearly typical" specimens recorded from Trego County, just a few miles to the west. Allen (1) recorded 5 specimens of *Geomys lutescens* collected between September 16 and October 13 at Long Island, Phillips County, Kansas, in the Prairie Dog Creek Valley just south of the Nebraska line, by W. W. Granger.

Lantz (12) wrote that *Geomys lutescens* was "common in the sandy parts of western Kansas" and that it was "found in the western part of the state, mostly in sandy situations", but did not give any specific localities. The year after Bailey differentiated *Geomys breviceps llanensis*, Lantz (13) wrote of that form: "It was taken by me at Medicine Lodge (Barber County), Kan., and to it are to be referred nearly all the specimens from southern Kansas which have hitherto been regarded as intermediates between the three forms. *G. breviceps*, *G. bursarius*, and *G. luteus* (sic!)." Scheffer (16) stated that *Geomys bursarius* is the dominant species of pocket-gopher in Kansas and "is most abundant in the central and northeastern parts of the state, and ranges at least as far west as the ninety-ninth meridian", where "it is partly, and a little further west fully, replaced by the paler, sand-colored species, *G. lutescens*. \* \* In no part of western Kansas have I found the plains pocket-gopher very plentiful. It is more scattering in its distribution than *G. bursarius*, being locally abundant only in the gravel flats along the streams or among the sand-hills. The harder soil of the buffalo-grass tracts has little attraction for this burrowing animal. In the lower Arkansas valley of south-central Kansas the species (more correctly, *Geomys breviceps llanensis*) becomes as abundant, however, as does *G. bursarius* in any quarter of the state." Hibbard (10) stated that *Geomys lutescens* was "common in Kansas west of the 99th meridian and south to Oklahoma", while *G. b. llanensis* was "found in south central Kansas in the sandy regions south of the Arkansas River. It is confined mainly to Barber, Pratt, and Stafford Counties." Black (4) stated of *Geomys lutescens*: "There are records of this gopher from Logan, Trego and Morton Counties. Probably occurs over the western one-third of the state." Of *G. b. llanensis* he wrote: "South central part of state from Sumner County west to Seward County and north at least to Stafford County."

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