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New Distributional Records and Observations of Natural History for the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) in Southwestern New Mexico

Kenneth N. Geluso and Keith Geluso

Abstract

Distribution of the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) extends northward from north-central Mexico to the southwestern United States into southeastern Arizona, southwestern New Mexico, and the Trans-Pecos region of Texas. In New Mexico, *S. ochrognathus* previously was known only from Hidalgo and Grant counties, with limited information known about its natural history in the state. Herein, 10 new localities of occurrence are reported for *S. ochrognathus* in southwestern New Mexico, representing the northernmost distributional records for this species in the state and North America. New information also is reported on habitat, reproduction, and other aspects of its natural history in New Mexico. Many aspects of the natural history of *S. ochrognathus* in New Mexico were similar to those in Arizona, Texas, and Mexico.

Key words: activity, behavior, distribution, food, habitat, natural history, New Mexico, reproduction, runways, *Sigmodon ochrognathus*, Yellow-nosed Cotton Rat

Introduction

Distribution of the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) extends northward from north-central Mexico to the southwestern United States (Hall 1981) with northern limits in the Trans-Pecos region of Texas (Hollander et al. 1990; Schmidly and Bradley 2016), southeastern Arizona (Hoffmeister 1986), and southwestern New Mexico (Findley et al. 1975; Cook 1986; Geluso 2009a). Prior to 2009, published records in New Mexico were only from the Animas Mountains, Animas Valley, and Peloncillo Mountains in southern Hidalgo County (Findley et al. 1975; Cook 1986). Since that time, Geluso (2009a) reported additional records from Grant County in the Big Burro Mountains and along the southwestern edge of the Mogollon Mountains (individuals were captured in 2003 and 2006, respectively). Those records represented the northernmost known limits for the species in New Mexico and North America. However, while trapping for the Northern Pygmy Mouse (*Baiomys taylori*) in 2015, Geluso et al. (2017) discovered *S. ochrognathus* farther north than previously reported in Grant County. Thus, additional trapping was conducted in Grant and Catron counties, and herein new northern records are reported for *S. ochrognathus* in New Mexico.

Aside from brief accounts of habitat by Findley et al. (1975), Cook (1986), and Geluso (2009a), limited information is known regarding the biology of *S. ochrognathus* in New Mexico. For example, information on reproduction in the state has been reported only for three individuals (Geluso 2009a). In the account below, additional information for *S. ochrognathus* is presented on habitat, reproduction, and other aspects of its natural history in New Mexico.

METHODS AND MATERIALS

Trapping was conducted in Grant and Catron counties in 2015 (May, June, July, October, and November), 2016 (February, March, April, October, and November), 2017 (January, July, October, and December), and 2018 (July and September; Appendix I). Sherman live-traps (folding model, 7.6 by 8.9 by 22.9 cm and non-folding model, 7.6 by 7.6 by 25.4 cm; H. B. Sherman Traps, Inc., Tallahassee, FL) were baited with a mixture of birdseed and rolled oats and set at 10 localities (Sites 1–10; Fig. 1) farther north than previous northernmost records of *S. ochrognathus* in New Mexico (Sites A, B, and C; Fig. 1). Most traps were set along the roadside of US Highway 180 (Sites 1–3 in Grant County and 4–6 and 8–10 in Catron County; Fig. 1). Traps also were set along a stream bank at a fish hatchery in Catron County (Site 7). In addition, traps were set at the previous northern record in New Mexico (Site A; Fig. 1) where a single individual of *S. ochrognathus* was captured in Grant County in 2006 (Geluso 2009a). Some sites were trapped only once during the years (Sites 1, 2, 8, and 10), whereas others were trapped multiple times (2–12 nights; Appendix I). Except for determining activity during daylight and in darkness (see following description), traps were set in late afternoon and checked the following morning. A maximum of four sites was trapped on some nights (Appendix I). Latitude and longitude were recorded for each locality with handheld Global Positioning Systems (GPS 12 or 72, Garmin International, Olathe, Kansas), using North American Datum 1983 (NAD 83). Elevations were determined by plotting coordinates in Google Earth Pro (accessed on 25 September 2018). Trapping success (= rate of captures) was calculated as the number of individuals captured per 100 trap nights, where a trap night was defined as one trap set for a single overnight period.

Sex, body weight, and reproductive condition (lactating, near-term pregnancy, or not noticeably pregnant) were recorded for almost all individuals of *S. ochrognathus*. Females were reported as lactating only if milk was expressed from mammary glands. For pregnant females collected as voucher specimens, number of offspring was recorded along with the crown-to-rump length for the largest fetus or along with the largest uterine swelling containing an embryo. For males prepared as vouchers, length and width were recorded for one testis. Sex and reproductive condition were recorded for other mammals captured in traps. Most Yellow-nosed Cotton Rats were released at capture sites, but some were kept as voucher specimens (n = 21) and deposited in the Museum of Southwestern Biology (MSB), University of New Mexico, Albuquerque. Skin tags of all prior specimens of *S. ochrognathus* from New Mexico were examined at MSB for additional details regarding capture sites and reproduction in the state. Additionally, electronic databases were searched on VertNet (vertnet.org; accessed September 2018) for possible unpublished information about *S. ochrognathus* from New Mexico. New Mexico State University also was contacted for records from New Mexico because that institution was not linked to VertNet. Finally, electronic databases were used to determine whether historical sampling of small mammals occurred in our study area.

To determine whether *S. ochrognathus* was active during daylight hours, traps were set along roadsides in daylight and checked periodically during the day. Those traps also were left in place overnight and checked the following morning. Because of the potential for recaptures and to obtain more accurate trapping data, a small patch of hair was cut on the rump of individuals captured during daylight hours to determine whether subsequent captures during the day or next morning represented recaptures or new individuals. A recaptured individual was counted as a single capture for determining the total number of captures

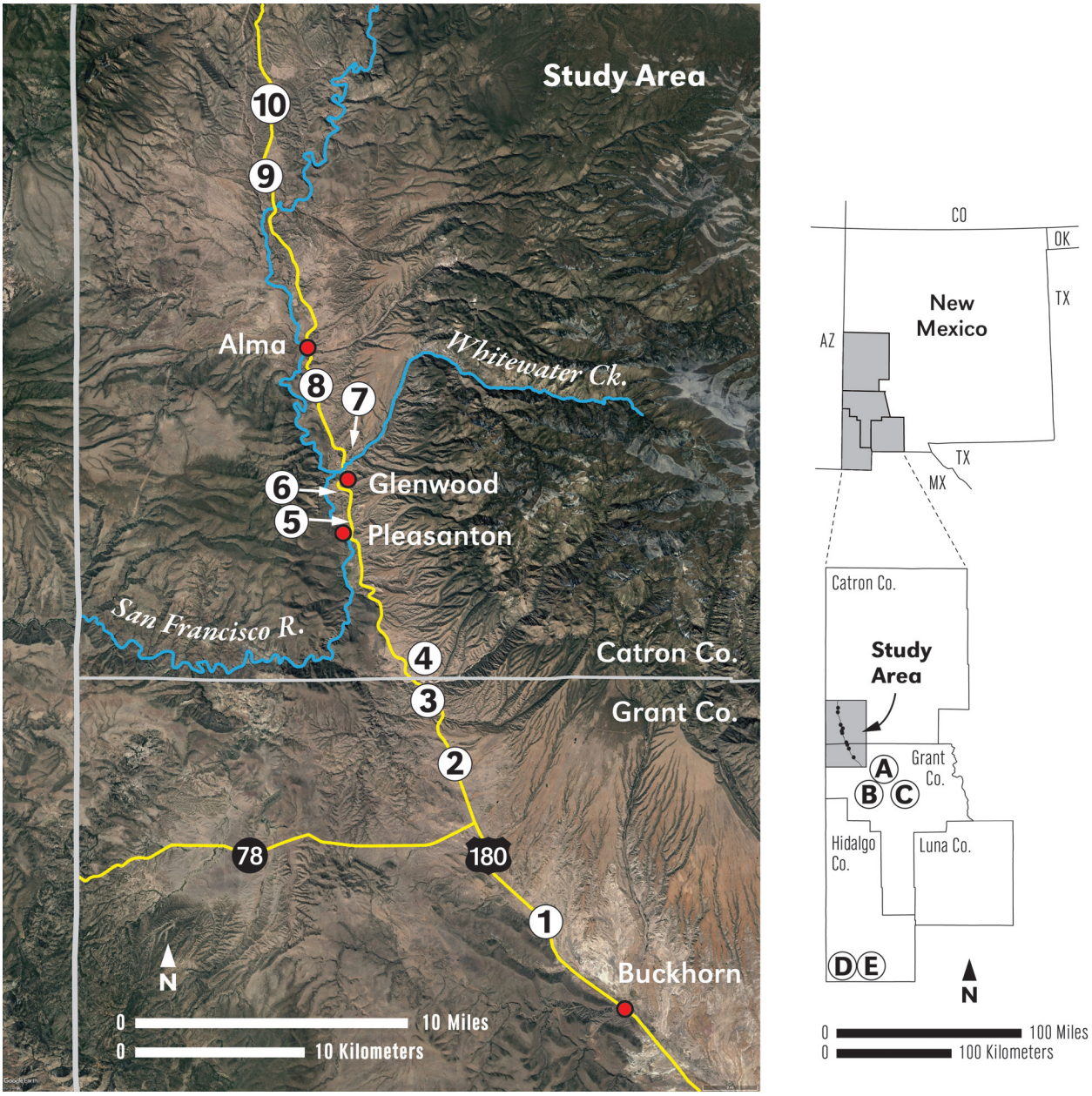

Figure 1. *Colored portion of map*.—Study area in southwestern New Mexico showing 10 new localities of occurrence for the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) in the state (circles labeled 1–10). Localities 1–6 and 8–10 represent capture sites along the roadside of US Highway 180, whereas locality 7 represents a site along a human-made stream at the Glenwood State Fish Hatchery. *Black and white portion of map*.—Circles labeled A–E represent other locations in southwestern New Mexico with records of occurrence for *S. ochrognathus*. A—southwestern edge of the Mogollon Mountains, B—north end of the Big Burro Mountains, C—Little Walnut Creek, D—Peloncillo Mountains and surrounding area, and E—Animas Mountains and surrounding area. For specific information on localities, see Appendices I and II.

and trap success. Daytime activity was determined on 1 November 2016 (traps checked twice in daylight) and 9 January 2017 (checked once). Nighttime activity was determined by placing traps (with doors closed and without bait) along roadsides in early afternoon of 18 October 2017 (new moon occurred on the 19th). Beginning at 1925 h in darkness on the 18th, traps were baited and doors opened. Subsequently, traps were checked once in darkness after midnight. Individuals captured at night were not released until the trapping session was completed the following morning.

At Site 9 on 1 November 2016, three separate samples of vegetative cuttings were collected along surface runways used by *S. ochrognathus* (Fig. 2). The number of cut sections was determined for each sample, and the length of each section was measured.

Figure 2. Grassy right-of-way along US Highway 180 in Catron County, New Mexico. At this location (Site 9), sideoats grama (*Bouteloua curtipendula*) and blue grama (*B. gracilis*) were the dominant grasses, silver bluestem (*Bothriochloa laguroides*) and green sprangletop (*Leptochloa dubia*) also were present, and honey mesquites (*Prosopis glandulosa*) were present but widely dispersed. Photo taken on 2 November 2016.

RESULTS AND DISCUSSION

From 2015 to 2018, 136 Yellow-nosed Cotton Rats were captured (68 males, 64 females, and 4 individuals of unknown sex). Of the aforementioned total, 132 captures were at new localities in southwestern New Mexico (Sites 1–10; Fig. 1). Some individuals likely were recaptured during the survey because some sites were trapped multiple times each year, and individuals only were marked in order to determine daytime activity. Yellow-nosed Cotton Rats also were present at Site A (not a new locality; Fig. 1), where three individuals were captured on 18 October 2015 and one individual on 19 July 2018 (Appendix I). Overall trapping success for *S. ochrognathus* at the 11 localities was 10.5 captures per 100 trap nights (136 individuals in 1,293 trap nights), but trapping success was not uniform across years (see subsection—*Relative abundance 2015–2018*).

Our northernmost capture site (Site 10) was 62.6 km northwest of the former northern record in Grant County (Site A) and is the northernmost known locality of *S. ochrognathus* in North America. Twenty-four additional unpublished localities of occurrence for *S. ochrognathus* from New Mexico were obtained via museum holdings (Appendix II), and each was south of the former northern record in the state (Site A).

Habitat use (vegetative and substrate associations).—Most Yellow-nosed Cotton Rats (95.6%, 130 captures) were captured in grassy roadsides along US Highway 180 where most traps were set (83.8%, 1,083 trap nights). Individuals also were captured in lush vegetation along a stream (two captures in 50 trap nights, Site 7) and in an old field near the confluence of the Gila River and Mogollon Creek (four captures in 160 trap nights, Site A). Yellow-nosed Cotton Rats were captured in dense and sparse grass; on bare ground between clumped grass; under canopies of shrubs with and without understories of grass; on soggy ground along a stream bank; and in areas with and without a stony substrate. Elevations of capture sites ranged from 1,420 to 1,650 m (Appendix I), and all were within the known elevational range for *S. ochrognathus* in New Mexico (e.g., 1,330–1,350 m in the Big Burro Mountains [Geluso 2009a] and 1,554–2,408 m in the Animas Mountains [Cook 1986]). *Sigmodon ochrognathus* occurs at elevations as low as 1,160 m and as high as 2,560 m (Findley and Jones 1960).

Grasses at capture sites along the highway included sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), hairy grama (*B. hirsuta*), alkali sacaton (*Sporobolus airoides*), James' galleta (*Hilaria jamesii*), Johnsongrass (*Sorghum halepense*), three-awn (*Aristida*), silver bluestem (*Bothriochloa laguroides*), green sprangletop (*Leptochloa dubia*), bluestem (*Andropogon*), streambed bristlegrass (*Setaria leucopila*), and lovegrass (*Eragrostis*). Although most stretches of land along the highway were dominated by one or more species of *Bouteloua* (e.g., Sites 1, 2, 5, 9, and 10; Site 9 is shown in Fig. 2), gramas were not always the dominant grasses at trapping sites. For example, James' galleta was more prevalent at Site 3; alkali sacaton was more prevalent at Site 4; and streambed bristlegrass and Johnsongrass were more prevalent at Site 8. At Site 6, gramas, alkali sacaton, and Johnsongrass each was dominant in different areas of our traplines. Additionally, different combinations of woody vegetation and other conspicuous plants were dispersed through grasses, including rabbitbrush (*Chrysothamnus*), fourwing saltbush (*Atriplex canescens*), junipers (*Juniperus*), honey mesquite (*Prosopis glandulosa*), broom snakeweed (*Gutierrezia sarothrae*), cholla (*Opuntia*), prickly pear (*Opuntia*), catclaw (*Acacia* or *Mimosa*), and common mullein (*Verbascum thapsus*). Along the highway, presence of small rocks (i.e., stones) varied from stones present in all areas (including those between grasses, Site 10) to stones noticeable only in a few open areas of exposed soil that bordered grasses (Site 3).

At the northernmost capture site (Site 10, elevation 1,650 m), *S. ochrognathus* was captured on relatively level ground containing the three species of gramas, bluestem, and three-awn as well as junipers, rabbitbrush, mesquite, catclaw, cholla, prickly pear, broom snakeweed, and mullein (Fig. 3). Numerous stones covered a fine-grained, powdery soil including large stones 20–40 mm in length (mean = 30.6 mm, n = 25) scattered over small stones averaging 10 mm in length.

Beyond the fence separating state land (= the roadside right of way) from private land at Site 10 (Fig. 3), the ground sloped upward and contained junipers, pinyon pines (*Pinus edulis*), oaks (*Quercus*), shrubs, and grassy areas with rocks up to 30.5 cm in

Figure 3. Northernmost capture site for the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) in New Mexico (Site 10 in Catron County, N33°30.186', W108°55.659'). Numerous stones covered a fine-grained, powdery soil. Grasses included sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), hairy grama (*B. hirsuta*), bluestem (*Andropogon*), and three-awn (*Aristida*). Other vegetation included junipers (*Juniperus*), rabbitbrush (*Chrysothamnus*), honey mesquite (*Prosopis glandulosa*), catclaw (*Acacia* or *Mimosa*), cholla (*Opuntia*), prickly pear (*Opuntia*), broom snakeweed (*Gutierrezia sarothrae*), and common mullein (*Verbascum thapsus*). Beyond the fence, junipers, pinyon pines (*Pinus edulis*), and oaks (*Quercus*) were present; and the ground contained patches with large rocks. Photo taken on 9 January 2017.

length. Such habitats are similar to those occupied by *S. ochrognathus* in other parts of its range. For example, in New Mexico, individuals were observed on rocky hillsides with bunch grass, succulents, shrubs as well as pinyons, junipers, and oaks (Findley and Jones 1960; Findley et al. 1975). In Arizona, individuals were captured in grassy, rocky slopes near or within the oak belt with mention of blue grama, side-oats grama, three-awn, catclaw, mesquite, prickly pear, and junipers (Hoffmeister 1963). In Texas, *S. ochrognathus* was documented in rocky slopes with gramas, bluestem, pinyons, junipers, and oaks (Baker 1969; Baccus 1971; Schmidly 1977; Schmidly and Bradley 2016). In Durango, Mexico, specimens were taken on rocky slopes covered with scattered shrubs with mention of catclaw, prickly pear, composites, and blue grama (Baker 1969). In Coahuila, Mexico, individuals were captured on rocky foothills with mention of bunch grass, pinyons, oaks, and prickly pear (Baker 1956, pp. 137 and 278). And in Chihuahua, Mexico, Anderson (1972) reports the habitat of *S. ochrognathus* as characterized by authors mentioned above (i.e., Findley and Jones 1960; Baker 1969).

At the Glenwood State Fish Hatchery (Site 7, elevation 1,445 m), *S. ochrognathus* was captured under matted vegetation in an area with water-saturated soils along a human-made stream within the hatchery. To support operations, the hatchery obtains water from adjacent Whitewater Creek, a tributary of the San Francisco River near the town of Glenwood (Fig. 1). After use by the hatchery, water is directed down a narrow, permanent stream (Fig. 4). The stream flows into a large pond before most of the water is returned to the creek. Plants along the stream bank included softstem bulrush (*Schoenoplectus tabernaemontani*), horsetails (*Equisetum*), and areas with tall fescue (*Schedonorus arundinaceus*), Johnsongrass, and lovegrass. Yancey and Jones (1996) describe a capture site in Texas that was similar to the hatchery but perhaps not as lush. That is, a Yellow-nosed Cotton Rat was captured in a seasonal streambed near a permanent spring with grass and shrubs. The adjacent, surrounding habitat consisted of desert scrub with a rocky substrate.

At the former northern capture site in Grant County (Site A, elevation 1,420 m; Fig. 1), *S. ochrognathus* was captured in an ungrazed old field. The abandoned field was in a floodplain near the confluence of the Gila River and Mogollon Creek along the southwestern edge of the Mogollon Mountains. The field had a sandy, friable substrate and contained dense patches of Johnsongrass and a variety of forbs. Dominant trees surrounding the grassy area included Arizona sycamores (*Platanus wrightii*), Rio Grande cottonwoods (*Populus deltoides wislizeni*), and junipers. Yellow-nosed Cotton Rats also are known to inhabit bottomland pastures (1,554 m) and fields of grama and bluestem near the Animas Mountains in New Mexico (Cook 1986). In Texas, *S. ochrognathus* has been reported inhabiting flat meadows above 1,500 m (Schmidly 1977).

Seasonal, daytime, and nighttime activity.—At its northernmost known distributional limit, *S. ochrognathus* was active throughout the year. Individuals were captured in winter (January and February, total number = 28), spring (late March and April, $n = 21$), late spring (early June, $n = 11$), summer (July, $n = 12$), autumn (October and November, $n = 60$), and late autumn (mid-December, $n = 4$). *Sigmodon ochrognathus* also has been reported to be active year-round in Texas (e.g., June and February; Hollander et al. 1990) and Arizona (e.g., June, July, and January–March; Hoffmeister 1963).

In southwestern New Mexico, *S. ochrognathus* was active during diurnal and nocturnal hours. On 1 November, a female (body weight = 91.5 g) was active between 0816 and 1215 h, and another female (52 g) was active in daylight between 1235 and 1647 h (Mountain Daylight Saving Time). On 9 January, three individuals (male, 88.5 g; female, 63.5 g; and unknown sex, 38.5 g) were active in daylight between 1315 and 1635 h (Mountain Standard Time). In October, two individuals were nocturnally active. A female (71.5 g) was active between 1925 h on the 18th and 0347 h on the 19th and a male (48.5 g) between 1931 h on the 18th and 0353 h on the 19th (Mountain Daylight Saving Time). The new moon occurred on 19 October. On the basis of more information than ours, Hoffmeister (1963) reported that *S. ochrognathus* is more active during diurnal hours in Arizona.

Reproduction and body weight.—Published data on reproduction and body weight for *S. ochrognathus* in New Mexico only consisted of information pertaining to three individuals captured in northern Grant County (two females and one male; Geluso 2009a). Information from the present study and unpublished data discovered in museum collections greatly increase reproductive data for *S. ochrognathus* in the state. Except for two pregnant females (8 April and 5 October) and one lactating female (early October) from Hidalgo County (Table 1), all information herein concerning New Mexico represents reproductive activity from individuals captured in northern Grant County and southern Catron County.

Earliest reproductive activity in New Mexico occurred on 31 March, as evidenced by a female that was pregnant and lactating at the same time (Table 1). Because this individual contained tiny embryos (largest uterine swelling = 8 mm), she likely was already nursing a litter born earlier in the month, and thus, she would have been pregnant in February (gestation lasts approximately 34 days; Hoffmeister 1963). On 26 April, another female was pregnant and produced some milk; in this case, the female was close to parturition and milk likely was for young soon to be born. Other lactating females were captured in April, June, July, and October (Table 1). No females were lactating during late November–February ($n = 30$) or on 20 March ($n = 6$), and none prepared as specimens were pregnant during those times ($n = 7$; Appendix I). A lactating

Figure 4. Habitat along a permanent, human-made stream at the Glenwood State Fish Hatchery in Catron County, New Mexico (Site 7). Plants along the bank included softstem bulrush (*Schoenoplectus tabernaemontani*), horsetails (*Equisetum*), Johnsongrass (*Sorghum halepense*), tall fescue (*Schedonorus arundinaceus*), and lovegrass (*Eragrostis*). Photo taken on 24 November 2015.

female captured on 20 October represented the latest direct evidence of reproductive activity in New Mexico. Thus, females are reproductively active (pregnant and/or lactating) in the state at least from March to October. However, the female captured on 31 March 2003 suggests occasional reproductive activity in mid to late winter. In Arizona and Texas, females are reported to be reproductively active throughout the year (Hoffmeister 1963; Baccus 1971).

Pregnant *S. ochrognathus* from New Mexico contained four to eight young (arithmetic mean = 5.7, n = 6; Table 1). Thus, potential litter size in New Mexico is likely larger than those reported from Arizona and Texas but similar to that from Mexico. In Arizona, the number of embryos in wild-captured females averaged 3.0 (contained two to four young, n = 4) and litter size in captive females also averaged 3.0 young (two to six young, n = 8; Hoffmeister 1963). Pregnant females from Texas contained three to five embryos (mean = 3.6, n = 7; Baccus 1971) and from Coahuila, Mexico, two to nine embryos (mean = 5.7, n = 6; Baker 1956).

Among males prepared as voucher specimens from Catron County and northern Grant County, a significant correlation existed between testis length and body weight, with heavier individuals having longer testes (r = 0.78, P < 0.01, n = 11; Table 2). The correlation between testis length and body length also was significant (r = 0.72, P < 0.01, n = 12). Males with the

Table 1. Information on pregnant and lactating Yellow-nosed Cotton Rats (*Sigmodon ochrognathus*) from Catron, Grant, and Hidalgo counties in southwestern New Mexico. Numbers in parentheses represent greatest crown-to-rump length for fetuses or the largest uterine swelling containing an embryo (mm). Body weights of females are given in grams. For capture sites, refer to Figure 1 and Appendices I and II.

Date	Lactating	Fetuses/ embryos	Bodyweight	Capture sites
31 March 2003	Yes	5 embryos (8)	66	Grant [B]
8 April 1977	no	8 embryos	115	Hidalgo [D]
26 April 2016	Yes	near term[2]	87	Grant [3]
26 April 2016	Yes[1]	none[3]	60	Grant [3]
6 June 2015	Yes	none	72	Grant [2]
8 June 2015	no	6 fetuses (34)	102	Catron [4]
12 July 2017	Yes	unknown[4]	83.5	Grant [3]
28 September 2014	no	4 embryos	63.1	Grant [C]
early October 2007	Yes	none	?[5]	Hidalgo [E]
5 October 1964	no	6 embryos	62.9	Hidalgo [D]
17 October 2015	Yes	unknown[4]	70	Catron [6]
17 October 2015	no	5 fetuses (34)	127	Catron [4]
18 October 2015	Yes	unknown[4]	71	Grant [A]
20 October 2017	Yes	unknown[4]	76.5	Catron [5]

[1]female possessed five pair of mammae

[2]female noticeably pregnant and was released

[3]reproductive tract had five placental scars (three in the right uterine horn and two in the left horn)

[4]female was released; pregnancy not determined

[5]body weight not accurate—see MSB 230871, Appendix II

longest testes (11–14 mm) were captured in June and July, while males with testes measuring 5–7 mm were captured in June, September, and November (Table 2).

Excluding the capture of a juvenile male weighing 8.7 g, body weights of males from Catron County and northern Grant County ranged from 24.5 to 107 g, whereas females weighed 24–127 g. For both sexes, the 10-g interval containing most individuals was 50–59 g (Table 3). Heaviest males were captured in June and July (91–107 g, $n = 8$) and heaviest females in October (127 g), June (102 g), and November (91.5 g). The lightest reproductively active female (i.e., lactating) captured in our study weighed 60 g (Table 1). Other lactating females weighed 66–87 g. Pregnant females weighed 62.9–127 g. Females that weighed 66 and 87 g were both lactating and pregnant (Table 1).

The young male weighing 8.7 g was captured on 12 July, and a lactating female in a nearby trap might have been its mother. In Arizona, average weight of *S. ochrognathus* at birth was approximately 5 g (range = 4.5–6.6 g; Hoffmeister 1963). Thus, the young male captured in July was several days old when discovered in the Sherman live-trap, and it likely was capable of entering the live-trap on its own, according to observations of locomotion in two-day old young (Hoffmeister 1963). Other young individuals in our study weighed

Table 2. Testis length, body weight, and body length (total length minus tail length) for Yellow-nosed Cotton Rats (*Sigmodon ochrognathus*) captured in northern Grant County and southern Catron County in southwestern New Mexico. Measurements of testes are from individuals captured in the present study (in 2015 and 2016), except for two individuals captured prior to our study in Grant County (1983 and 2006; see footnotes).

Date of capture	Testis length (mm)	Body weight (g)	Body length (mm)
17 July 2015	14	107	153
17 July 2015	14	105	150
6 June 2015	13	98	148
6 June 2015	12	97	140
8 June 2015	10	92	152
6 June 2015	13	91	141
8 June 2015	11	88	146
24 November 2015	7	85	148
1 November 2016	6	58	127
26 June 2006[1]	8	44	115
5 September 1983[2]	8	34.5	110
8 June 2015	5	?[3]	78

[1]MSB 125022, Site A, Appendix I, Geluso (2009a)

[2]MSB 181030, Site B—Rough Canyon, Appendix II

[3]body weight unknown; however, the individual has the shortest body length and likely is the lightest individual (MSB 326278, Site 4, Appendix I)

24–27 g ($n = 6$), and each was captured in mid-October. Three were captured at the same site on 17 October and another two at a different site on 19 October, suggesting that these individuals might have been littermates at each site.

Visual sign of cotton rats.—Presence of cotton rats was detected in our study area by observing piles of cut vegetation along surface runways. Runways were easiest to detect in dense grass. Runways were not as obvious in sparse grass and were difficult to detect over bare or stony ground. Although many individuals of *S. ochrognathus* were captured along surface runways, average width of runways is not reported because of the probable influence on width due to other species using runways formed by cotton rats or due to cotton rats using runways formed by other species (e.g., woodrats). However, narrowest runways likely formed by Yellow-nosed Cotton Rats were 5 cm wide at ground level. Baccus (1971) reported that runways of *S. ochrognathus* in Texas averaged 5.1 cm in width, and Hoffmeister (1963) reported that runways of *S. ochrognathus* in Arizona averaged about 3.2 cm in width but varied considerably.

Piles of vegetation ($n = 3$) along runways used by *S. ochrognathus* consisted of 41, 54, and 64 separate cuttings. Except for two twigs, cuttings consisted of grass stems (= culms). Lower parts of stems with nodes and internodes comprised the bulk of the grass clippings. Almost all ends of cuttings were beveled on both ends (Fig. 5). On the basis of all cuttings ($n = 159$), the frequency distribution of lengths was positively skewed (geometric mean = 46.5 mm; median = 45 mm). Hoffmeister (1963) mentioned that grass clippings of *S. ochrognathus* in Arizona usually were cut into sections about 32 mm long from near the base of the plant.

Table 3. Body weights for Yellow-nosed Cotton Rats (*Sigmodon ochrognathus*) captured in northern Grant County and southern Catron County in southwestern New Mexico. Weights are from individuals captured in the present study, 2015–2018, except for five individuals captured prior to our study in Grant County (see footnotes).

Body weight (g)	Males	Females
<10	1	0
10–19	0	0
20–29	4	2
30–39	3[1]	8
40–49.5	12[2]	13
50–59	17	16[3]
60–69	10	11[4 & 5]
70–79	7	10
80–89	3	3
90–99	6	1
100–109	2	1
110–119	0	0
120–129	0	1
Total	65	66

[1]male captured in 1983 (MSB 181030, Appendix II)

[2]male captured in 2006 (MSB 125022, Appendix I, Geluso 2009a)

[3]female captured in 2003 (MSB 124221, Appendix II, Geluso 2009a)

[4]female captured in 2014 (MSB 284736, Appendix II)

[5]female captured in 2003 (MSB 124219, Appendix II, Geluso 2009a)

Other rodents at capture sites.—At 11 localities in Catron and Grant counties, 290 individuals of other species were captured with *S. ochrognathus* (Table 4). Other species (n = 13) included the Western Harvest Mouse (*Reithrodontomys megalotis*), Western White-throated Woodrat (*Neotoma albigula*), Brush Deermouse (*Peromyscus boylii*), White-footed Deermouse (*Peromyscus leucopus*), North American Deermouse (*Peromyscus maniculatus*), Tawny-bellied Cotton Rat (*Sigmodon fulviventer*), Ord's Kangaroo Rat (*Dipodomys ordii*), Southern Grasshopper Mouse (*Onychomys torridus*), Silky Pocket Mouse (*Perognathus flavus*), Northern Pygmy Mouse (*Baiomys taylori*), Piñon Deermouse (*Peromyscus truei*), House Mouse (*Mus musculus*), and Hispid Pocket Mouse (*Chaetodipus hispidus*). Similar to *S. ochrognathus*, some individuals of those other species likely were captured more than once during our survey. Rate of capture for all rodents (including *S. ochrognathus*) at the 11 localities was 32.9 captures per 100 trap nights (426 individuals in 1,293 trap nights) from 27 May 2015 to 29 September 2018.

Yellow-nosed Cotton Rats were most often associated with *R. megalotis* and *N. albigula*. Those species occurred at 81.8 and 72.7% of capture sites (9 and 8 of 11 sites, respectively) occupied by *S. ochrognathus* (Table 4). The remaining species were captured at ≤45.5% of sites. Yellow-nosed Cotton Rats were captured with *S. fulviventer* at two locations along Highway 180 (Sites 3 and 4; Appendix I), and in 2006,

Figure 5. Sample of cut grass stems collected along a surface runway where a Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) was captured along US Highway 180 in Catron County, New Mexico. Originally, stems in the photograph were part of a pile of stems that contained 64 cut sections.

S. ochrognathus was captured with the Hispid Cotton Rat (*Sigmodon hispidus*) at Site A (Geluso 2009a, 2009b). Yellow-nosed Cotton Rats also have been reported to be sympatric with *S. fulviventer* in Durango and Chihuahua, Mexico (Baker 1969; Anderson 1972) and with *S. hispidus* in Arizona (Hoffmeister 1963).

Relative abundance 2015–2018.—During our last survey periods in July and September 2018, a pronounced drop in trap success was observed compared to previous years. Overall trapping success (all species together at 11 localities) decreased from >30 individuals captured per 100 trap nights during each of the first three years of the study (40.3 in 2015, 40.9 in 2016, and 30.6 in 2017) to 4.5 individuals/100 trap nights in 2018. This trend was particularly noticeable for the two most frequently captured species (*S. ochrognathus* and *R. megalotis*) at the two sites most frequently trapped (Sites 3 and 6; Table 5).

Fluctuations in population densities of rodents have been documented in short-term (16 months in Texas; Abuzeineh et al. 2011) and long-term studies (eight years in Arizona; Brown and Zeng 1989). Those previous researchers observed that population fluctuations primarily were associated with variation in precipitation, with concomitant changes in primary productivity and food availability. The apparent population decline of several species in 2018 (Table 5) likely was due to species with similar resource requirements responding in a similar fashion to changing conditions in a common environment (Brown and Zeng 1989).

Range expansion or extension.—Extralimital records can reflect a recent expansion in distribution of a species or represent the discovery of previously undocumented populations. New distributional records representing formerly undocumented populations are best considered range extensions (Frey 2009). It is important to examine the potential explanation of ex-

Table 4. Occurrence of rodents at localities inhabited by Yellow-nosed Cotton Rats (*Sigmodon ochrognathus*) in Catron and Grant counties in New Mexico, 2015–2018. Capture sites include nine roadside right-of-ways along US highway 180 (Sites 1–6 and 8–10), a stream bank at the Glenwood State Fish Hatchery (Site 7), and an old field in the floodplain near the confluence of Mogollon Creek and Gila River (Site A; Fig. 1). Numbers in brackets indicate the number of localities along roadsides inhabited by each species. Numbers in parentheses indicate the total number of individuals captured of each species.

Species	Roadsides	Stream bank	Old field
Sigmodon ochrognathus (136)	Yes [9]	Yes	Yes
Reithrodontomys megalotis (116)	Yes [7]	Yes	Yes
Neotoma albigula (52)	Yes [7]	No	Yes
Peromyscus boylii (43)	Yes [3]	Yes	Yes
Peromyscus truei (4)	Yes [3]	No	No
Peromyscus leucopus (22)	Yes [2] [1]	No	Yes
Peromyscus maniculatus (9)	Yes [2] [1]	No	Yes
P. leucopus/maniculatus (5)	Yes [1] [2]	No	Yes
Baiomys taylori (5)	Yes [2]	No	Yes
Sigmodon fulviventer (8)	Yes [2]	No	No
Onychomys torridus (7)	Yes [1]	No	Yes
Dipodomys ordii (8)	Yes [1]	No	Yes
Perognathus flavus (6)	Yes [1]	No	Yes
Chaetodipus hispidus (1)	Yes [1]	No	No
Mus musculus (4)	No	Yes	No

[1]captured at Sites 4 and 6

[2]captured at Site 4

tralimital records because of conservation and management implications. For example, the false conclusion of a range expansion can result in the perception that a species is not of conservation concern (Frey 2009).

Frey (2009) provided a method for testing between hypotheses of range expansion and extension by evaluating results of historical sampling in areas with new distributional records. She suggested that if other species commonly associated with the species of interest had been captured in the past (i.e., "the background species") but the target species was absent, then new records of occurrence for the target species likely represent an expansion in distribution. Conversely, if an area was not sampled in the past or if trapping was otherwise inadequate to document background species and the target species, then new records are best considered a range extension.

Davis and Dunford (1987) suggested that a northward expansion of *S. ochrognathus* has occurred in the southwestern United States since the 1930s by plotting the year of first capture of *S. ochrognathus* across its known distribution. However, Geluso (2009a) concluded that records from the Big Burro Mountains and the southwestern edge of the Mogollon Mountains in New Mexico might represent previously undocumented populations in Grant County because of inadequate past sampling of small mammals in those areas (Fig 1). Frey (2009) similarly concluded that the

Table 5. Rates of capture for *Sigmodon ochrognathus* and *Reithrodontomys megalotis* at one locality each in Catron (Site 6) and Grant (Site 3) counties in New Mexico, 2015–2018. Also shown is the combined rate of capture for other species of rodents captured at those localities, excluding *S. ochrognathus* and *R. megalotis*. Rates are given as the number of individuals captured per 100 trap nights. Data are shown for days when ≥40 trap nights were attained. Number of trap nights = 40 for each date except 19 October 2017 (trap nights = 55).

Date	*Sigmodon ochrognathus*	*Reithrodontomys megalotis*	Other species	All species
2015				
17 October (Site 6)	27.5	12.5	5.0	45.0
24 November (Site 6)	40.0	22.5	2.5	65.0
2016				
15 February (Site 6)	27.5	22.5	10.0	60.0
20 March (Site 6)	25.0	15.0	15.0	55.0
26 April (Site 6)	12.5	12.5	17.5	42.5
2 November (Site 6)	7.5	10.0	20.0	37.5
2017				
11 January (Site 6)	10.0	7.5	7.5	25.0
12 July (Site 3)	10.0	10.0	0.0	20.0
19 October (Site 3)	12.7	3.6	0.0	16.4
18 December (Site 3)	10.0	5.0	0.0	15.0
2018				
28 September (Site 3)	0.0	0.0	0.0	0.0
29 September (Site 6)	0.0	0.0	5.0	5.0

purported range expansion of *S. ochrognathus* in the Rincon Mountains in southeastern Arizona was best interpreted as a range extension.

On the basis of our trapping records (Table 4) and known habitat associations (Webster 1999), the Western Harvest Mouse provided the most suitable background species to interpret our extralimital records. Searches for historical records of rodents along the grassy roadsides of US Highway 180 and other surrounding habitats revealed no records of *R. megalotis* from the Glenwood State Fish Hatchery and only a single record of *R. megalotis* that might have been captured along the highway (i.e., a female captured at "Pleasanton" in 1908, National Museum of Natural History, USNM 158322; note that western Socorro County was renamed Catron County in 1921). Other habitats were present near the highway passing through Pleasanton, and it is unknown which one was sampled in 1908. Three other individuals of *R. megalotis* were captured in the region, but they were 0.6, 1.9, and 7.3 km away from the highway (USNM 148319, MSB 179465, and UAZ 22595 [University of Arizona], respectively). Three individuals of *R. megalotis* also were collected along

Dry Creek that crosses the highway, but distances from the highway are unknown (USNM 158319–158321). Except perhaps for one record of *P. boylii* captured in the "Town of Pleasanton" (MSB 92666), no conclusive evidence was discovered that grassy roadsides along Highway 180 in Catron or northern Grant counties were trapped in the past. Because historical sampling seemed inadequate to have documented cotton rats or harvest mice along Highway 180 and because other habitats along the highway were not sampled by us (e.g. wooded hillsides), the extralimital occurrence of *S. ochrognathus* reported herein is best referred to as a range extension. However, a recent or temporary expansion of *S. ochrognathus* into Catron County cannot be ruled out.

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Addresses of authors:

KENNETH N. GELUSO

Department of Biology
University of Nebraska at Omaha
Omaha, NE 68182
kgeluso@unomaha.edu

KEITH GELUSO

Department of Biology
University of Nebraska at Kearney
Kearney, NE 68849
gelusok1@unk.edu

APPENDIX I

Localities of occurrence for Yellow-nosed Cotton Rats (*Sigmodon ochrognathus*) captured in Catron and Grant counties in southwestern New Mexico from 2015 to 2018. Numbers in parentheses before each locality correspond to circles labeled 1–10 in the colored portion of Figure 1. The letter A before the last locality corresponds to the circle labeled A in the black and white portion of Figure 1. For each locality, latitude and longitude were recorded using North American Datum 1983 (NAD 83). Elevations (elev.) of capture sites were determined by plotting coordinates of each locality in Google Earth (accessed on 25 September 2018). Trapping effort at each locality is given as the total number of trap nights amassed during the study period. Sex (if known) and date of capture are given for each Yellow-nosed Cotton Rat. Also included are other species of rodents captured at each locality, including the number of individuals captured. Voucher specimens of *S. ochrognathus* are shown in brackets with their corresponding catalog number at the Museum of Southwestern Biology, University of New Mexico, Albuquerque (MSB). Reproductive information and length of hind foot (measured from back edge of heel to tip of longest claw in mm; HF) are given for voucher specimens. Individuals not kept as specimens were released at capture sites.

Catron County

(10) 13.64 km N, 2.25 km W Alma, 33°30.186'N, 108°55.659'W, elev. 1,650 m, 10 January 2017 (1 male and 2 females [MSB 326291, no embryos, HF 28]). Besides *S. ochrognathus* (n = 3), other species captured at Site 10 included *Peromyscus boylii* (13), *Reithrodontomys megalotis* (4), *Neotoma albigula* (3), and *Peromyscus truei* (2). Total trap nights = 40.

(9) 9.92 km N, 2.65 km W Alma, 33°28.199'N, 108°55.929'W, elev. 1,615 m, 24 November 2015 (no *S. ochrognathus* captured); 1 November 2016 (2 males [MSB 326292, testis 6 by 3 mm, HF 28] and 1 female); 9 January 2017 (1 male, 1 female, and 1 unknown sex each captured in daylight); 10 January 2017 (1 new male and 2 recaptures); 12 July 2017 (1 male); and 28 September 2018 (no *S. ochrognathus* captured). Besides *S. ochrognathus* (n = 8), other species captured at Site 9 included *Reithrodontomys megalotis* (28), *Neotoma albigula* (11), *Dipodomys ordii* (2), and *Peromyscus truei* (1). Total trap nights = 100.

(8) 1.79 km S, 0.17 km E Alma, Intersection of Highways 180 and 159, 33°21.791'N, 108°54.089'W, elev. 1,530 m, 17 July 2015 (1 male [MSB 326293, testis 14 by 7 mm, HF 28]). Besides *S. ochrognathus* (n = 1), another species captured at Site 8 was *Neotoma albigula* (4). Total trap nights = 25.

(7) Glenwood Fish Hatchery, 33°19.271'N, 108°52.819'W, elev. 1,445 m, 24 November 2015 (1 male and 1 female [MSB 326294, no embryos, HF 28]); 12 July 2017 (no *S. ochrognathus* captured); and 15 July 2018 (no *S. ochrognathus* captured). Besides *S. ochrognathus* (n = 2), other species captured at Site 7 included *Mus musculus* (4), *Reithrodontomys megalotis* (2), and *Peromyscus boylii* (1). Total trap nights = 50.

(6) 1.09 km S, 0.16 km W Glenwood, 33°18.411'N, 108°53.092'W, elev. 1,485 m, 17 July 2015 (3 males [MSB 326295, testis 14 by 7 mm, HF 28] and 1 female); 17 October 2015 (5 males and 6 females—one was lactating); 24 November 2015 (5 males [MSB 326296, testis 7 by 3 mm, HF 29] and 11 females); 15 February 2016 (3 males, 7 females [MSB 326297, no embryos, HF 27 and MSB 326274, no embryos, HF 28], and 1 unknown sex); 20 March 2016 (5 males and 5 females [MSB 326275, no embryos, HF 28 and MSB 326298, no embryos, HF 28]); 26 April 2016 (1 male, 3 females, and 1 unknown sex); 1 November 2016 (2 females both captured in daylight); 2 November 2016 (1 new male and 2 recaptures); 11 January 2017 (3 males and 1 female); 12 July 2017 (1 male); 19 October 2017 (2 males and 1 unknown sex); 28 September 2018 (no *S. ochrognathus* captured); and 29 September 2018 (traps set in different area than previous day, no *S. ochrognathus* captured). Besides

S. ochrognathus (*n* = 68), other species captured at Site 6 included *Reithrodontomys megalotis* (45), *Neotoma albigula* (19), *Peromyscus boylii* (13), *Perognathus flavus* (4), *Peromyscus leucopus* (3), *Peromyscus truei* (1), and *Peromyscus maniculatus* (1). Total trap nights = 390.

(5) Pleasanton (0.34 km SSE of town's north sign post located along US Highway 180), 33°17.390'N, 108°52.713'W, elev. 1,425 m, 20 October 2017 (2 females—one was lactating) and 28 September 2018 (no S. ochrognathus captured). Besides *S. ochrognathus* (*n* = 2), other species captured at Site 5 included *Neotoma albigula* (2) and *Reithrodontomys megalotis* (1). Total trap nights = 25.

(4) 11.9 km S, 3.4 km E Glenwood, 33.20914°N, 108.84198°W, elev. 1,470 m, 8 June 2015 (4 males [MSB 326276, testis 10 by 5 mm, HF 28; MSB 326278, testis 5 by 3 mm, HF 25; and MSB 326279, testis 11 by 6 mm, HF 29] and 1 female [MSB 326277, 6 fetuses, HF 27]); 17 October 2015 (4 males and 1 female [MSB 326280, 5 fetuses, HF 28]); 25 November 2015 (2 males and 3 females); 15 February 2016 (2 males and 1 female [MSB 326281, no embryos, HF 28]); 20 March 2016 (2 males and 1 female); and 26 April 2016 (no *S. ochrognathus* captured). Besides *S. ochrognathus* (*n* = 21), other species captured at Site 4 included *Reithrodontomys megalotis* (18), *Neotoma albigula* (9), *Sigmodon fulviventer* (7), *Peromyscus leucopus* (7), *Peromyscus maniculatus* (3), *Peromyscus leucopus*/*maniculatus* (3), and *Onychomys torridus* (3). Total trap nights = 220.

Grant County

(3) 17.4 km N, 11.2 km W Buckhorn, 33.19465°N, 108.83078°W, elev. 1,550 m, 6 June 2015 (2 males [MSB 326282, testis 13 by 7 mm, HF 28 and MSB 326283, testis 12 by 7 mm, HF 28]); 26 April 2016 (1 male and 2 females [MSB 326284, lactating with 5 placental scars, HF 27] and the other female was pregnant, produced some milk, and was released); 10 January 2017 (2 males and 1 female); 12 July 2017 (2 males and 2 females—one was lactating); 18–19 October 2017 (1 male and 1 female captured in darkness); 19 October 2017 (3 new males and 2 new females); 18 December 2017 (2 males and 2 females); and 28 September 2018 (no *S. ochrognathus* captured). Besides *S. ochrognathus* (*n* = 23), other species captured at Site 3 included *Reithrodontomys megalotis* (13), *Peromyscus boylii* (1), *Sigmodon fulviventer* (1), and *Chaetodipus hispidus* (1). Total trap nights = 223.

(2) 14.2 km N, 9.7 km W Buckhorn, 33.16458°N, 108.81476°W, elev. 1,600 m, 6 June 2015 (1 male and 1 female [MSB 326285, lactating, HF 28]). Besides *S. ochrognathus* (*n* = 2), other species captured at Site 2 included *Reithrodontomys megalotis* (3), *Neotoma albigula* (3), and *Baiomys taylori* (1). Total trap nights = 30. This is the same locality as Site 1 in Geluso et al. 2017.

(1) 4.8 km N, 4.5 km W Buckhorn, 33.08095°N, 108.75848°W, elev. 1,515 m, 6 June 2015 (1 male [MSB 326286, testis 13 by 8 mm, HF 28] and 1 female). Besides *S. ochrognathus* (*n* = 2), another species captured at Site 1 was *Baiomys taylori* (1). Total trap nights = 30. This is the same locality as Site 2 in Geluso et al. 2017.

(A) 9.1 km N, 4.3 km E Gila, 33.04643°N, 108.53172°W, elev. 1,420 m, 27 May 2015 (no *S. ochrognathus* captured); 18 October 2015 (2 males and 1 lactating female); and 19 July 2018 (1 female). Besides *S. ochrognathus* (*n* = 4), other species captured at Site A included *Peromyscus boylii* (15), *Peromyscus leucopus* (12), *Dipodomys ordii* (6), *Peromyscus maniculatus* (5), *Onychomys torridus* (4), *Baiomys taylori* (3), *Peromyscus leucopus*/*maniculatus* (2), *Reithrodontomys megalotis* (2), *Perognathus flavus* (2), and *Neotoma albigula* (1). Total trap nights = 160. This is the same locality as Site 3 in Geluso et al. 2017. This locality (Site A in Fig. 1) also is the same location where a male *Sigmodon ochrognathus* (MSB 125022, testis 8 by 5 mm; Geluso 2009a) and several *Sigmodon hispidus* (MSB 125023; Geluso 2009b) were captured on 26 June 2006. The coordinates given by Geluso (2009a,b) were incorrect. Those animals actually were captured 0.45 km NW of the incorrect location. The correct coordinates in decimal degrees are shown above, and the correct coordinates in degrees and minutes are 33°02.786'N, 108°31.903'W.

APPENDIX II

Localities of occurrence for the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) in southwestern New Mexico, excluding localities 1–10 and A in Appendix I. Letters in parentheses before each locality correspond to circles labeled B–E in the black and white portion of Figure 1. Localities in the same region of the state are listed together and are represented by the same letter. Pregnant and lactating females are noted with their date of capture. Records are based on voucher specimens (in brackets) housed at the following museums: American Museum of Natural History (AMNH); University of Kansas Biodiversity Institute (KU); Museum of Southwestern Biology, University of New Mexico (MSB); Museum of Vertebrate Zoology, University of California at Berkeley (MVZ); New Mexico State University (NMSU); Sam Noble Oklahoma Museum of Natural History, University of Oklahoma (OMNH); Museum of Texas Tech University (TTU); and Western New Mexico University (WNMU). Occasionally, additional information related to specific localities is inserted in parentheses. Previously published records that are referred to in Findley et al. (1975), Cook (1986), and Geluso (2009a) also are indicated.

Grant County

(B) Big Burro Mountains, 32°48.914'N, 108°35.963'W [MSB 124219, lactating and five embryos, 31 March 2003; Geluso 2009a].

(B) Big Burro Mountains, 32°50.012'N, 108°36.430'W [MSB 124221; Geluso 2009a].

(B) Middle Box on east side of Gila River, north side of Rough Canyon, T18S, R17W, Sec. 18, NE ¼ of NW ¼ (in Big Burro Mountains; "Middle Box" refers to a narrow canyon along a river) [MSB 181030].

(C) North of Little Walnut Creek, Gila National Forest, 32.85689799°N, 108.275935°W (8.6 km N Silver City) [adult female MSB 284736 and four embryos, one of which was kept as a separate specimen MSB 284745, 28 September 2014].

Hidalgo County

(D) Post Office Canyon in Peloncillo Mts. [MSB 59919, eight embryos, 8 April 1977 and MSB 59920].

(D) 37.3 km S, 17.4 km W Animas (in Coronado National Forest) [MSB 291657 and 294763].

(D) Skeleton Canyon, 26.9 km S, 0.32 km E, Rodeo, T31S, R22W, Sec. 24 [WNMU 6908].

(D) Geronimo Trail, 16.1 km N Cloverdale [WNMU 1031].

(D) Coronado National Forest, Clanton Draw, Geronimo Trail on Forest Road 63, about 2.41 km W of Forest Boundary [MSB 140174].

(D) Peloncillo Mts., Geronimo Pass [MSB 59908–59918].

(D) Geronimo Pass, 56.3 km SW Animas, T32S, R22W, Sec. 13 [WNMU 1029, six embryos, 5 October 1964 and WNMU 1030].

(D) Coronado National Forest, 45.1 km S, 11.7 km W Animas (by road) [OMNH 17301 and 17302].

(D) 12.2 km N, 4.18 km W Cloverdale, T32S, R21W, Sec. 15 [NMSU 2788].

(D) 11.6 km N, 5.95 km W Cloverdale, T32S, R21W, Sec. 16 [NMSU 2959].

(D) 11.3 km N, 6.44 km W Cloverdale [MSB 66855 and 66856; AMNH 263426 and 263427].

(D) 10.9 km N, 1.45 km W Cloverdale, T32S, R21W, Sec. 13 [NMSU 3128–3132].

(D) Geronimo Pass, 10.8 km N, 11.3 km W Cloverdale, T32S, R22W, Sec. 23 [NMSU 2789].

(D) Pass on Geronimo Trail at top of Peloncillo Mts., 35.4 km S, 3.22 km E Rodeo (T32S, R21W, Sec. 17) [MSB 2282; Findley et al. 1975].

(D) Peloncillo Mts., Geronimo Pass, T32S, R22W, N ½ Sec. 24, 31°030.614'N, 109°02.217'W [NMSU 2320 and 2333].

(D) 9.5 km N, 12 km W Cloverdale, T32S R22W [NMSU 2072].

(D) 56.3 km SSW Animas. [WNMU 1892–1894 and 1977].

(D) 6.44 km N Cloverdale Picnic Grounds [TTU 48053–48056].

(D) Coronado National Forest, 3.22 km NW of Cloverdale [originally housed at the New Mexico Museum of Natural History, Albuquerque, NMMNH 6169, presently at MSB 287470].

(D) Peloncillo Mts., Cloverdale Creek [NMSU 2321 and 2322; MSB 96177].

(D) Peloncillo Mts., Guadalupe Canyon, 48.3 km E Douglas [KU 145285].

(E) Animas Mts., Mouth of Indian Creek Canyon [MSB 13041; Findley et al. 1975; Cook 1986].

(E) Animas Mts., Indian Creek Canyon, 35.4 km S Animas (T31S, R19W) [MSB 6501–6503; Findley et al. 1975; Cook 1986].

(E) Animas Mts., Indian Creek [MSB 230871, lactating, early October 2007; MSB 230938; and MSB 232453]. On the skin tag of MSB 230871, total length = 250 mm, tail length = 110 mm, and body weight = 27.9 g. Thus, body length is 140 mm. The body weight of MSB 230871 probably is incorrect. Our specimens of *S. ochrognathus* with similar body lengths are markedly heavier (e.g., MSB 326283, body length = 140 mm, body weight = 97 g; MSB 326282, 141 mm, 91 g; and MSB 326285, 141 mm, 72 g). Specimens with shorter body lengths also are heavier (e.g., MSB 326284, 120 mm, 60 g; MSB 326275, 125 mm, 52 g; MSB 326281, 125 mm, 55 g; and MSB 326298, 126 mm, 51 g).

(E) Animas Mts., Indian Creek Canyon, Aspen Spring (T31S, R19W, NE ¼ Sec. 33) [MSB 5517–5521; Findley et al. 1975; Cook 1986].

(E) Animas Mts., 1.61 km SW Aspen Spring [MSB 5522–5525; Findley et al. 1975; Cook 1986].

(E) Animas Mts., 1.61 km NW OK Bar, T31S, R19W, Sec. 13 [MSB 46323; Cook 1986].

(E) Animas Valley, Gray Ranch HQ, T32S, R20W, E ½ Sec. 16 [MSB 46322; Cook 1986].

(E) Animas Valley, 6.44 km NW San Luis Pass [MVZ 50863; Findley et al. 1975; Cook 1986].

(E) McKinney Flats, Diamond A Ranch (formerly Gray Ranch; “Flats” include grassland areas west of Whitewater Mountains) [MSB 145807].

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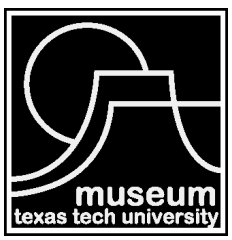

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