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Cover Page Footnote

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Status of the Isolated, Threatened Valle de la Trinidad Round-Tailed Ground Squirrel, Baja California, Mexico

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The round-tailed ground squirrel (*Xerospermophilus tereticaudus*) is a diurnal rodent adapted to a wide range of arid environments of the southwestern U.S. and northwestern Mexico. Along the western margin of its range some populations have been historically isolated in valleys, and have been distinguished as distinct subspecies. One such population, historically isolated from the continuous range of the species, has been restricted to suitable habitat in the Valle de la Trinidad region, Baja California, west of the Sonoran Desert (Hall 1981). Nelson and Goldman collected the first specimens from this population during a brief visit in 1905, but not until Huey did further collecting and taxonomic analysis, was this population named as a different subspecies, the Valle de la Trinidad round-tailed ground squirrel, *X. t. apricus* (Huey 1927). The range of this subspecies has been usually considered as geographically unconnected from that of other subspecies (Ernest and Mares 1987; Huey 1964), but Hafner et al. (1998) suggest that it was connected through the Arroyo de San Matías, which leads from Paso de San Matías to the desert floor (Fig. 1). We surveyed this wash in 2015 and found suitable habitat to be sparse with no round-tailed ground squirrels present, and concluded that the Valle de la Trinidad and Sonoran desert populations were not connected.

Valle de la Trinidad, as defined by Huey, is an isolated valley, measuring roughly 6 × 30 km, which lies between two mountain ranges, Sierra de Juárez to the north and the Sierra de San Pedro Mártir to the south. Whereas Huey and other U.S. writers have considered the whole area as Valle de la Trinidad, in Mexico it is considered as two valleys. Valle de la Trinidad, is on the western side and has been extensively transformed by agriculture. Valle de San Matías, on the eastern side, consists of higher ground less suitable for farming, but used as cattle range (Fig. 1).

No data are available on the habitat prior to the onset of cattle ranching in the region, but Lawrence M. Huey (6 July 1927 field notes) recorded at Newhouse's ranch that "... [at] the western end of the valley ... a permanent stream of water flows. Here also the heaviest growth of mesquites occurs." About 5 km east, on the north side of the valley, Huey noted that conditions were "vastly different" and "Creosote [*Larrea tridentata*] proved to be the most common shrub with Squaw Tea [*Ephedra* sp.] and Catclaw [*Senegalia greggii*] as close seconds." Mesquites (*Prosopis glandulosa*) were scattered and not abundant. It is likely that such shrubs in the area, especially the mesquites, had increased since contact time, promoted by cattle grazing, as has been documented elsewhere (Mellink and Contreras 2014). Currently the Valle de la Trinidad

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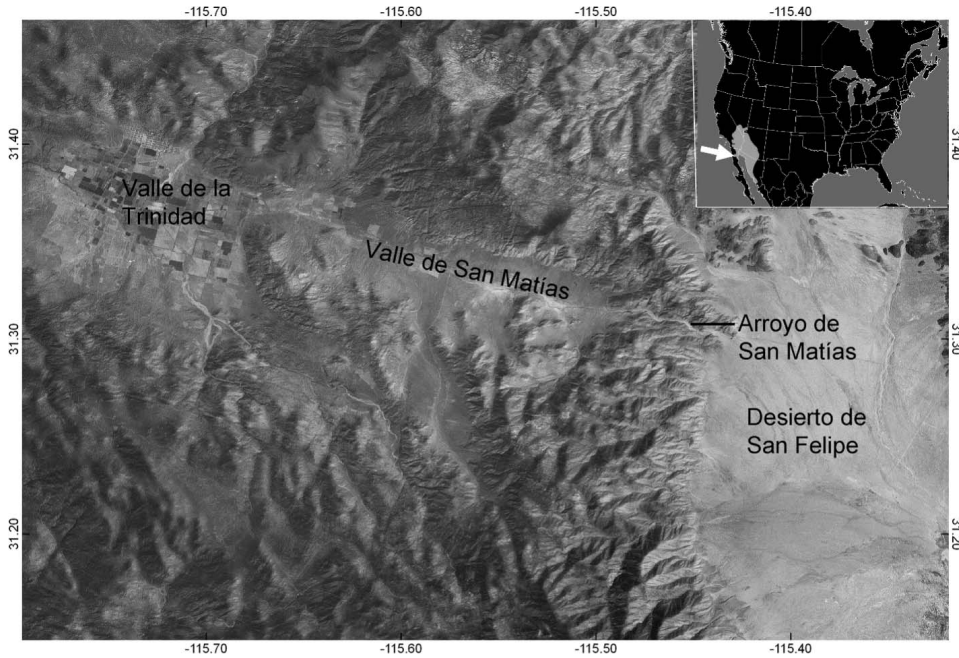


Fig. 1. Study area. In older literature, often both valleys, de la Trinidad and San Matías, have been considered under a single name, “Valle de la Trinidad”. Species distribution (light gray) insert from: https://naturalhistory.si.edu/mna/full_image.cfm?image_id=1179. White arrow indicates the range of the Valle de la Trinidad round-tailed ground squirrel.

proper is widely farmed, but in the Valle de San Matías vegetation is similar to that described by Huey in 1927.

Huey found round-tailed ground squirrels to be abundant at his two survey sites, in Valle de la Trinidad proper, where he collected several specimens. Other collectors also collected on the western side. Later, two 1979 specimens from “East Valle de la Trinidad” (SDNHM mammal collection) could have been from Valle de San Matías, but this is unclear. In 2010 E. Mellink and J. Luévano surveyed Valle de la Trinidad extensively and found only two individuals, next to the cemetery among mesquites and creosote bush. They found none on return visits. Low success by Mellink and Luévano in their 2010 surveys generated fears that the subspecies could be extinct. Thus, in order to find out the status of this population, we carried out extensive field work in 2015 in and around Valles de la Trinidad and San Matías.

Pelage color of round-tailed ground squirrels allow them to blend with the light desert soils on which they live, making them difficult to detect visually unless they run. However, they emit a distinctive, high-pitched birdlike “peeeet” call, which allows for reliable acoustic surveys. We combined visual and auditory detection along transects through patches that conformed to known preferred habitat and different habitat patches. In the spring and summer of 2015 we surveyed 456 points, spaced about 200 m along 28 transects that ended usually after the habitat was clearly unsuitable. At each point we observed and listened for 3 minutes. Each point was surveyed once. Most detections in our surveys were auditory, and whenever possible, triangulation of a call allowed for identification of an individual. As it can be difficult to determine precisely how many squirrels were calling, we recorded relative abundance as: not detected; low = 1–2 individuals; medium = 3–5, or high ≥ 5 . At each point we recorded habitat

Table 1. Number of points surveyed for the presence of Valle de la Trinidad round-tailed ground squirrel on different dates, points at which it was detected, and groups sizes at detection (low = 1-2 individuals; medium = 3-5, or high = >5).

Date	# of points	Points with detections	Group size		
			Low	Medium	High
28-04-15	39	20	4	2	1
29-04-15	15	11	6	3	2
06-05-15	6	3	2	1	0
16-05-15	28	14	13	1	0
10-06-15	104	52	51	1	0
11-06-15	107	95	95	0	0
30-06-15	23	0	0	0	0

characteristics (topography, soil type, vegetation type, percent bare ground), and land use (active agriculture, fallow, range, housing, other). Our procedures conformed to published American Society of Mammalogy guidelines for the use of wild mammals in research, and to official Mexican requirements.

We obtained positive presence records at 195 different points (Table 1, Fig. 2). All positive presence points were in Valle de San Matías, and none in Valle de la Trinidad proper. No individuals were found in the area where EM and JL had documented the species in 2010, in

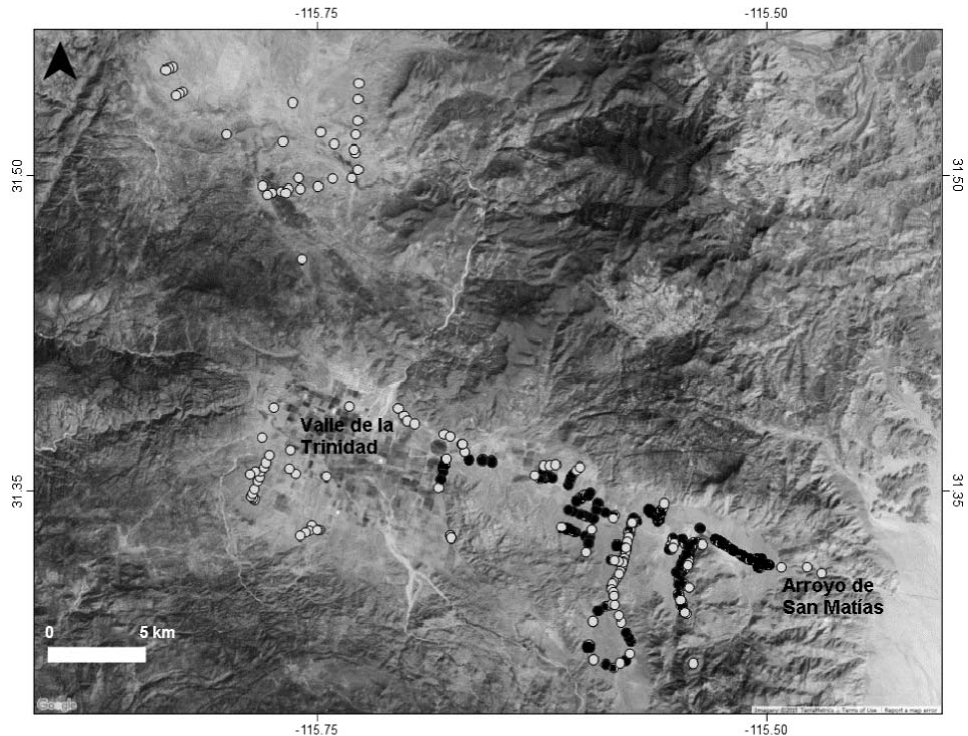


Fig. 2. Presence (black dots) and no detection (white dots) of round-tailed ground squirrels in Valle de la Trinidad – Valle de San Matías and nearby areas, Baja California, Mexico. 2015.

Table 2. Number of points surveyed for the presence of Valle de la Trinidad round-tailed ground squirrel according to habitat, points at which it was detected, and groups sizes at detection (low = 1-2 individuals; medium = 3-5, or high = >5).

Habitat	# of points	Points with detections	Number detected		
			Low	Medium	High
Mesquite with scrub, actual grazing	7	0	0	0	0
Mesquite with scrub, little actual grazing	123	108	108	0	0
Mesquite without scrub, little actual grazing	24	19	18	1	0
Plowed agriculture	1	1	1	0	0
Fallow	10	8			

Valle de la Trinidad. Most individuals were found in open mesquite communities on sandy soils (Table 2). Although most points with positive detections were in areas that exhibited little presence of cattle at the time of our surveys (Table 2), the entire area has a long history of grazing.

Agreeing with the species preference for mesquite scrub woodland with herbaceous native desert plants, we found most individuals in open communities of large leguminous trees or shrubs, principally mesquite. We repeatedly observed the species feeding on the seed pods and flowers of mesquite, and inferred these to be critical seasonal components of the diet, especially as no other food plants were available at several sites. It is not clear to what extent grazing has degraded this landscape, but the presence of non-native annual grasses (predominantly *Schismus barbatus*) suggests some history of intensity of grazing. Before grazing, this habitat may have had quite different soil properties and cover (*sensu* Mellink and Contreras 2014). We found the squirrel to be denser in areas with some disturbance from cattle and/or yucca (*Yucca schidigera*) extraction, suggesting an association with soil disturbance.

From our survey, the currently known geographical distribution of the Valle de la Trinidad round-tailed ground squirrel is restricted to Valle de San Matias. The points at which we recorded the subspecies extend in elevation from 760 to 1,100 m. The presence of a dominant perennial legume, particularly mesquite, appears to be a preference for this species' distribution in this area. This is similar to what happens in San Felipe and Laguna Salada populations, in the Sonoran plain to the east, where we detected very few round-tailed ground squirrels in areas without leguminous trees (unpub. obs.). The persistence of the Valle de la Trinidad round-tailed ground squirrel might depend on the continued presence of dominant legumes in these rangelands, and habitat connectivity throughout the valley.

Although round-tailed ground squirrels are found in agricultural context both in Imperial Valley and Valle de Mexicali, as well as in Arizona and Sonora, they do not occur in the Valle de la Trinidad farmland. Anthropogenic activities that may have caused this include the type of crop produced and possibly pest control. The alfalfa grown in the past may have favored the round-tailed ground squirrel as it does in Valle de Mexicali and Imperial Valley, as well as in Sonora (E. Mellink, N. Siordia and S. Tremor, unpub. obs.; see also Drabek 1970). However, the shallots and other crops grown today seem unfavorable. Conversion to cultivation in greenhouses eliminates habitat for the squirrel and creates barriers that may result in habitat fragmentation. Although some uncultivated patches with mesquite vegetation remain between farmed plots in Valle de la Trinidad, round-tailed ground squirrels are not in them. It is possible that these patches are too small and, or the squirrels were locally extirpated by agricultural pest control activities; and isolation from the current colony prevents their recolonization. Our field work

allows us to conclude that: (i) the Valle de la Trinidad round-tailed ground squirrel is not extinct, (ii) this small, single population is vulnerable to extinction from future agricultural expansion eastward and use of pesticides, (iii) the remaining population warrants formal protection and, (iv) reintroduction of squirrels to patches where they were apparently extirpated should be considered, along with habitat restoration if needed.

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