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Authors: Miles, Danielle C, Burrus, Kelsey R, and Shoemaker, Kevin T

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FIRST RECORDS OF CALIFORNIA KANGAROO RATS, *DIPODOMYS CALIFORNICUS*, IN NEVADA

DANIELLE C MILES, KELSEY R BURRUS, AND KEVIN T SHOEMAKER

ABSTRACT—We report the 1st documented occurrence of California Kangaroo Rats, *Dipodomys californicus*, in the state of Nevada. These captures, located in juniper woodland habitat between 1627 and 1900 m in elevation, represent both the easternmost-known occurrence and the highest reported elevation for this species.

Key words: California Kangaroo Rat, *Dipodomys californicus*, Nevada

Kangaroo rats (genus *Dipodomys*) are a diverse and ecologically important group of rodent species in the western United States, with 15 species and 33 subspecies documented in California alone (Grinnell 1922). Kangaroo rats can be separated into 2 groups by the number of toes on the hindfoot: 4-toed kangaroo rats (6 species) and 5-toed kangaroo rats (9 species). Previously, only 4 species were thought to occur in Nevada (Reid 2006). Of the 4-toed species, only the Desert Kangaroo Rat (*Dipodomys deserti*) and Merriam's Kangaroo Rat (*Dipodomys merriami*) have been documented to occur in northern Nevada. The California Kangaroo Rat (*Dipodomys californicus*; Fig. 1) can be distinguished from other 4-toed species by its distinctive tail coloration of broad black stripes on the top and bottom with a white tip (Fig. 2, Fig. 3; Grinnell 1922; Reid 2006). The range of the California Kangaroo Rat extends farther north than any other 4-toed kangaroo rat species, and of the 5-toed group only Chisel-toothed (*Dipodomys microps*) and Ord's (*Dipodomys ordii*) Kangaroo Rats have more northerly ranges (Reid 2006). Here we present the 1st documented occurrences ($n = 11$ captures) of the California Kangaroo Rat in Nevada. These captures, located in juniper woodland and juniper-sagebrush ecotone habitat $\geq$1300 m elevation, represent both the easternmost known occurrence and the highest reported elevation for this species.

In 2017 and 2018, we deployed lines of baited box traps at field sites in northwestern Nevada and northeastern California (Fig. 4) as part of a study investigating the biodiversity impacts of conifer removal projects in the Great Basin. These trapping efforts resulted in the capture of 15 California Kangaroo Rats (Table 1), 11 of which were located in Nevada. For each capture, we recorded hindfoot, tail, and ear length, as well as number of toes, weight, and descriptions of coloration to confirm identification. Individuals were marked with permanent marker to indentify recaptures within trap sessions.

These captures extend the known range of the California Kangaroo Rat approximately 100 km east of the species' previously described eastern range boundary. Our observations also provide new information on habitat association and elevations at which the species occurs. California Kangaroo Rats have been primarily associated with chaparral habitats, but they have been identified as a potential disperser of juniper seeds where the 2 species co-occur (Kelt 1988; Reid 2006; Longland and Dimitri 2016). Our observations, which occurred in juniper woodlands and juniper-sagebrush ecotones, suggest that Western Juniper (*Juniperus occidentalis*) seeds may serve as an important food resource for California Kangaroo Rats when their preferred forage species (shrubs and grasses; Dimitri and others 2017) are less prevalent. In addition, the California Kangaroo Rat was previously thought to be a low-elevation species, typically found at sites $<$400 m, with a maximum of 1300 m (Kelt 1988; Reid 2006). However, our capture locations in Nevada ranged from 1627 m in elevation to a new maximum elevation of 1900 m. Other studies of western small mammal species have documented a shift to higher-elevation habitats as a result of rising temperatures (Moritz and others 2008), and we speculate that the high-elevation occurrences documented in this study may also be associated with a recent climate-driven range shift. However, we lack the baseline species lists for our study sites that would be required to corroborate this hypothesis. Evidence of recent colonization events at high-elevation sites could counterbalance recent evidence for declines of California Kangaroo

FIGURE 1. A California Kangaroo Rat capture from July 2017, showing the dark fur pattern of this species. Notice the bicolored ears of this species compared to the pale pink ears of the Desert Kangaroo Rat.

FIGURE 2. A California Kangaroo Rat caching its seeds from the trap bait in September 2018. Note the distinctive tail markings for species identification of the black and white stripes with a white tail tip preceded by black. Still image taken from a video. Full video available upon request.

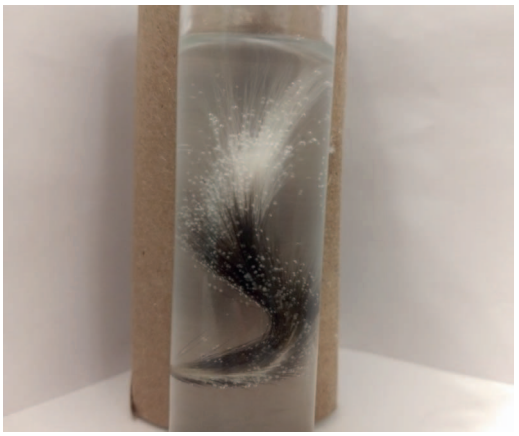

FIGURE 3. Tissue collected from a California Kangaroo Rat captured 15 September 2018. This tissue sample demonstrates the black and white striped pattern followed by a white tail tip used to differentiate the California Kangaroo Rat from other species in the region. Tails from captures sometimes get removed by the doors of the box traps and all of these tissue samples are collected for storage at the University of Nevada–Reno Museum of Natural History.

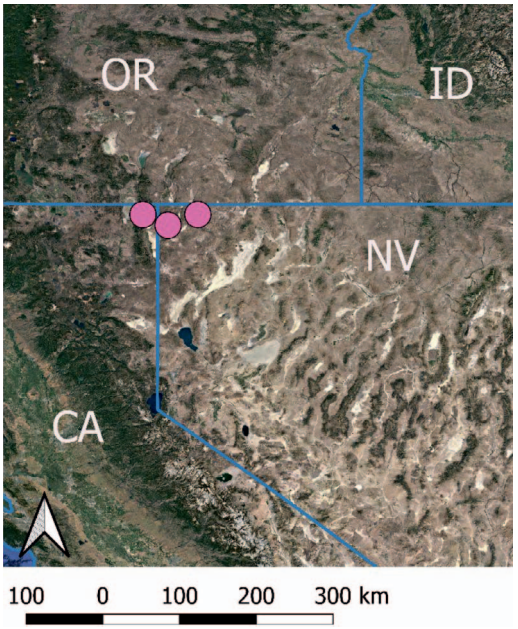

FIGURE 4. Study area in northern Nevada and California. The 3 circles represent the general areas where captures of California Kangaroo Rats occurred.

TABLE 1. Individual captures of California Kangaroo Rats excluding recaptures. Of the 15 unique captures, 11 were in the state of Nevada adding to the species list for the state. Latitude and longitude are center points for trap lines in decimal degrees.

Date	State	Latitude	Longitude	Elev. (m)	Habitat
17 July 2017	NV	41.907	–119.931	1737	Mixed sagebrush – juniper ecotone
17 July 2017	NV	41.971	–119.932	1627	Juniper woodland
27 Aug 2017	NV	41.971	–119.932	1627	Juniper woodland
29 Aug 2017	NV	41.907	–119.931	1737	Mixed sagebrush – juniper ecotone
03 Sep 2017	NV	41.900	–119.611	1787	Juniper woodland
08 Sep 2018	CA	41.977	–120.032	1640	Juniper woodland
08 Sep 2018	CA	41.977	–120.032	1640	Juniper woodland
09 Sep 2018	CA	41.977	–120.032	1640	Juniper woodland
09 Sep 2018	CA	41.977	–120.032	1640	Juniper woodland
10 Sep 2018	NV	41.906	–119.929	1738	Juniper woodland
10 Sep 2018	NV	41.906	–119.929	1738	Juniper woodland
10 Sep 2018	NV	41.906	–119.929	1738	Juniper woodland
11 Sep 2018	NV	41.907	–119.931	1737	Mixed sagebrush – juniper ecotone
15 Sep 2018	NV	41.899	–119.596	1754	Juniper woodland
17 Sep 2018	NV	41.816	–119.594	1900	Mixed sagebrush – juniper ecotone

Rats at historically occupied sites (Gillespie and others 2008). Continued monitoring of the small mammal community in this region of California and Nevada is important, both to document range expansions and to continue to catalogue the species diversity of under-studied regions of Nevada and the Northern Great Basin.

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University of Nevada–Reno, 1664 N Virginia Ave, Reno, NV 89557 USA (DCM, KRB, KTS); daniellecmiles@nevada.unr.edu. *Submitted 2 May 2019, accepted 21 October 2019. Corresponding Editor: Robert Hoffman.*