

Cave use by the threatened *Amerana draytonii* (Baird & Girard, 1852) in Central California, USA

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The range of the California Red-legged Frog, now called *Amerana draytonii* but previously recognized as a member of the genus *Rana*, includes much of central and southern California, from the coastal mountains (i.e., Mendocino County) and the Sierra Nevada (i.e., Butte County), south to San Diego County, along with a disjunct population in Baja California, Mexico, south and east of Ensenada. The species ranges from habitats in coastal dunes at an elevation near sea level to mountain meadows at an elevation of 2100 m (Fellers and Kleeman, 2007; Peralta-Garcia et al., 2016). It typically reproduces from December–March and during this period occupies ephemeral and perennial ponds and creeks, as well as the surrounding uplands for foraging, refuge, and dispersal (Storer, 1925; Jennings and Hayes, 1994; Thompson et al., 2016).

Amerana draytonii is considered a threatened species by the United States Fish and Wildlife Service, which generates management actions that include protocol-driven visual encounter surveys for monitoring presence/lack of presence for the species. Numerous researchers have reported habitat and microhabitat use for the species, which has aided in supporting and expanding the number of known occurrences and range of the species (Reis, 1999; Alvarez, 2004; Fellers and Kleeman, 2007; Tatarian, 2008; Alvarez et al., 2013; Halstead et al., 2018; Alvarez and Wilcox 2021). Pierce et al. (2021) reported that “cryptic use of habitats and microhabitats or using habitats in a manner that would not meet expectations,

may mean that the species goes undetected when it is actually present”. We found *A. draytonii* using habitats that may not meet expectations and may otherwise lead to a lack of detection when the species was, in fact, extant. Here we report on *R. draytonii* using cave systems for refuge and foraging habitat that we believe would be considered atypical for the species.

At the Carnegie State Vehicular Recreation Area, a site in San Joaquin County, California, we regularly surveyed Kiln Cave, which is an abandoned mine adit approximately 55 m long, 2 m tall, and 1.5 m wide (Fig.1). The site has perennial water that presumably seeps upward into the adit from an underground spring. Maximum water depth was 0.76 m with an average depth of 0.60 m. The excess flow is connected to Kiln Creek, then to Corral Hollow Creek, and finally to agricultural ditches that may drain to the San Joaquin River in San Joaquin County. We surveyed this site 12 times from 2015–2023, during late spring (i.e., April–June), and each time we documented 1–7 adult *A. draytonii* that used the site for refuge and foraging. The frogs were found at the mouth of the cave and as far back as 28.2 m. This site is fenced from public access and is protected by the California State Parks. It is relatively undisturbed and will remain accessible to *A. draytonii* in the area.

A second cave site occurs in San Benito County, California, at Pinnacles National Park. Twice annually we hike the Bear Gulch Trail and Bear Gulch cave system, which comprises bedrock-scale talus and collapsed boulders forming an approximately 0.5 km-long navigable cave (Fig. 2). Portions of the cave are up to 15 m high and 5 m wide but it narrows to 3 m high and 0.5 m wide, with a high level of variability in cave substrate, size, lighting, and moisture levels. Bear Gulch Creek flows from Bear Gulch Reservoir (upslope of the cave system) and through the cave. The site is perennial, with a maximum water depth of 1.0 m and an average depth of 0.15 m. The excess flow is connected to Bear Gulch Creek, which flows to Chalone Creek, and finally to the Salinas River in Monterey County. Among nine

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Figure 1. Kiln Cave, Carnegie State Vehicular Recreation Area, San Joaquin County, California. Photo by Jeff Alvarez.

visits to the cave from 2019–2022 – each visit made in mid-October – we observed 13–39 subadult and adult *A. draytonii* that were distributed from the cave mouth to near the Bear Gulch Dam (Fig. 3). Approximately half of the frogs were found in sections of the cave that were in complete or near complete darkness (Alvarez et al., 2021). This site is open to the public, with hundreds of visitors traveling through the caves daily (pers. obs.). It is a relatively disturbed site with significant public use, yet our observations suggest that the general public remains unaware of the presence of frogs, which allows them to persist relatively unmolested in this habitat.

These observations of the use of cave habitat by *A. draytonii* adds to the growing body of evidence that this species utilizes a wide range of habitats and microhabitats (Reis, 1999; Alvarez, 2004; Tatarian, 2008; Alvarez et al., 2013; Peralta-Garcia et al., 2016; Halsted et al., 2018; Pierce et al., 2021). Although we found no evidence that these two habitats were used for breeding, the long-term use of these sites suggests that they are important to the

species in these areas. We are certain that both adults and post-metamorphic *A. draytonii* are using this type of habitat for dispersal, foraging, and refuge (Alvarez et al., 2021; pers. obs.). We contend that any aquatic habitat that is within the range of *A. draytonii* should be considered occupied and therefore should be carefully investigated, and managed accordingly.

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Figure 2. Bear Gulch Cave, Pinnacles National Park, San Benito County, California. Photo by Jeff Alvarez.



Figure 3. California red-legged frog (*Rana draytonii*) perched on a rock ledge, above aquatic habitat in the Bear Gulch Cave, Pinnacles National Park, San Benito County, California. Photo by Jeff Alvarez.

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