REPTILES & AMPHIBIANS

An Invasive Threat: Predation on California Red-legged Frog (*Amerana draytonii*) Egg Masses by the Red Swamp Crayfish (*Procambarus clarkii*) in Baja California, Mexico

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The California Red-legged Frog, *Amerana draytonii* (Baird and Girard 1852), is the largest native frog in western North America (Peralta-García et al. 2016). Due to population declines in the northernmost parts of Baja California and most of California, this species is listed as Threatened under the U.S. Endangered Species Act (USFWS 2025) and Endangered by the NOM-059-SEMARNAT in Mexico (SEMARNAT 2019). One of the main threats in both countries is the introduction of non-native species such as the Mosquito Fish (*Gambusia affinis*), the Green Sunfish (*Lepomis cyanellus*), the American Bullfrog (*Aquarana catesbeiana*), and the Red Swamp Crayfish (*Procambarus clarkii*) for human consumption or biological control (Jennings and Hayes 1985; Peralta-García et al. 2016; GISD 2025).

At 1222 h on 26 January 2024, during a *A. draytonii* egg-mass density survey in Arroyo San Rafael, Municipality of Ensenada, Baja California, Mexico (31.11935, -115.96720), we observed a Red Swamp Crayfish feeding on one of the egg masses (Fig. 1). The egg mass was attached to grass in a slow-flowing portion of the stream section, 50 cm from the edge of the stream and 4 cm below the surface. The egg mass had a diameter of 12 cm, embryos were at Gosner stage 17 (Gosner 1960), and some eggs appeared infertile based on the whitish color of some eggs (JHV-V and AT-V, pers. obs.). An adult female *A. draytonii* was resting immobile on aquatic vegetation ~30 cm from the egg mass. On 31 January 2024, we observed *P. clarkii* feeding on two additional egg masses. The crayfish used their chelipeds to bring the eggs to its feeding appendages before removing the capsules and consuming the embryos.

To the best of our knowledge, these observations represent the first records of *P. clarkii* feeding on *A. draytonii* egg masses; however, Red Swamp Crayfish are known to feed on a variety of amphibian larvae and egg masses (Gamradt and Kats 1996; Renai and Gherardi 2004; Bucciarelli et al. 2014; Amin et al. 2020). In laboratory experiments, *P.*

Figure 1. Red Swamp Crayfish (*Procambarus clarkii*) feeding on a California Red-legged Frog (*Amerana draytonii*) egg mass in Arroyo San Rafael, Baja California, Mexico. Note the adult female frog at the top of the image. Photograph by Jorge. H. Valdez-Villavicencio.

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clarkii has been observed using its maxillipeds to scrape off the mucus layer of California Newt (*Taricha torosa*) egg masses to consume the embryos, which are toxic to their natural predators (Gamradt and Kats 1996). Tadpole predation has been reported in experiments on the Pacific Chorus Frog (*Pseudacris regilla*) (Pease and Wayne 2014), which is sympatric with *A. draytonii*. In nature, Riley et al. (2005) documented lower tadpole and egg mass densities of California Chorus Frogs (*Pseudacris cadaverina*) in the presence of *P. clarkii*, although no direct evidence of predation was reported. Although anurans are known prey during all life stages to a large variety of vertebrates and invertebrates, direct observations of these predatory events are uncommon, and most observations are incidental, making it difficult to identify specific patterns (Pombal 2007; Toledo 2007). Our observations enhance our understanding of prey-predator interactions and how this invasive species can affect the survival of an endangered frog.

Eradication or robust control actions targeting *P. clarkii* are essential, especially prior to the frog's reproductive season, to increase the chances of successful reproduction. Such actions will reduce the risk of extirpation of the *A. draytonii* population and its unique genetic diversity in this watershed, as this site supports one of the four genetic populations remaining in Baja California (Peralta-García 2017). Other endangered species, including the Arroyo Toad (*Anaxyrus californicus*), also could be affected by the presence of *P. clarkii* in this stream.

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