RANA SIERRAE (Sierra Nevada Yellow-legged Frog). **BEHAVIOR and DIET.** *Rana sierrae* is endemic to the Sierra Nevada mountains of eastern California and western Nevada. It is currently listed as "endangered" under both the US and California Endangered Species Acts. A primary cause of extirpations and declines throughout the species' range is the disease chytridiomycosis, caused by the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*, *Bd*). However, some *R. sierrae* populations show resilience and have persisted or recovered despite high prevalence of *Bd* infection (Knapp et al., 2016, PNAS 113:11889–11894). These persistent populations are important sources of frogs that can be translocated to reestablish extirpated populations. Documenting non-disease drivers of survival and mortality in these persistent populations is essential to understanding other constraints on frog abundance and population growth rates.

In July 2021, we observed unusual mortality in a persistent *R. sierrae* population in northern Yosemite National Park, California, USA. The site is a lake at 3025 m elevation, with a surface area of 0.96 ha, and a maximum depth of 6.5 m. It is typical habitat for *R. sierrae* in Yosemite, except for the unusually extensive beds of the aquatic plant, *Sparganium angustifolium* (Narrow-leaved Bur-reed). This plant occurs in water bodies throughout the Sierra Nevada, and is characterized by conspicuous floating stems and long, narrow, smooth leaves (ucjeps.berkeley.edu, 14 Oct 2021). While *S. angustifolium* frequently coexists in lakes with *R. sierrae*, it is notably abundant at this site. The *R. sierrae* population inhabiting this lake is robust despite ongoing *Bd* infection of all non-egg life stages, with visual encounter survey (VES) counts typically exceeding 500 post-metamorphic frogs and 4000 tadpoles.

We were present at this site on 6-7 July 2021, conducting VES and collecting frogs for a translocation. We observed four dead post-metamorphic *R. sierrae* that appeared to have died in a consistent and unusual manner. Three were observed on 6 July 2021, and the fourth was found on 7 July 2021. A fifth frog, observed on 6 July 2021, exhibited similar symptoms as the other four, but remained alive. All five frogs were floating on the water surface, amidst dense *S. angustifolium* beds. Each frog had leaves of *S. angustifolium* in its mouth or esophagus (Fig. 1). With a bolus of leaves lodged in its mouth and the plant rooted to the lake bottom, each floating frog was anchored in place. We attempted to remove the bolus of *S. angustifolium* leaves from two frogs, and in both cases it came free with a gentle pull. Amid the ball of leaves, one bolus also contained an adult damselfly (Fig. 1; probably *Enallagma* sp.). Damselflies were

concurrently emerging en masse, foraging, and laying eggs throughout the site. The other bolus contained unidentifiable insect legs, and the leaves appeared entangled with the frog's tongue. The live frog had also ingested *S. angustifolium* leaves, was not moving, and did not attempt to escape when approached. Left alone, it neither struggled nor attempted to expel the leaves from its mouth. As we lifted this frog to inspect the bolus, it regurgitated the leaves and swam off, apparently unimpaired. Three of the four dead frogs were ≥ 60 mm SVL, adult males, and the fourth was a subadult ≥ 39 mm SVL (apparently male). The live frog was estimated to be 50 mm SVL (sex unknown).

On 14 July 2021, we returned to the site and observed an additional three dead *R. sierrae* in the *S. angustifolium* beds. Based on the absence of obvious signs of decomposition, we assumed that they died in the preceding 1-2 days. As before, each of these dead frogs had a bolus of *S. angustifolium* leaves in its mouth. Adult damselflies were abundant during this visit. On 11 August 2021, we returned but we saw no dead frogs. Damselflies were scarce during this late summer visit, which corresponds with typical damselfly phenology in the Sierra Nevada. Our collective observations suggest that the observed *R. sierrae* adults had unintentionally ingested the *S. angustifolium* leaves while attempting to capture adult damselflies perched on the leaves.

Our observations exemplify how frogs can unintentionally ingest non-target items during attempts to capture prey (Hayes and Tennant 1985. Southwest. Nat. 30:601–605; Anderson, et al. 1999. Copeia 2:515–520; Hothem et al. 2009. J. Herpetol. 43:275–283) and illustrate a potential cost of that error. We suggest that these *R. sierrae* were unable or unwilling to remove or release the boluses of ingested *S. angustifolium* leaves (perhaps because a bolus contained a prey item), and the resulting inability to close their mouths left them susceptible to drowning. Further, the frequency of this behavior and the associated mortality appeared to change with prey phenology and availability. Although rare and conspicuously different than chytridiomycosis-caused mortality, this event highlights how other processes may impact frog population survival.

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FIG. 1. A dead *Rana sierrae* adult, (top) floating on the lake surface with *Sparganium angustifolium* lodged in its mouth, and (bottom) alongside a bolus of leaves and damselfly removed from its mouth. PHOTOS BY ROLAND KNAPP