

Predation of a Threatened Frog by a Common Garter Snake Includes an Equal Risk for Predator and Prey

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Most pond-breeding anurans transition through metamorphosis, from gill-breathing aquatic larvae to air-breathing terrestrial froglets, in mid-summer (Storer 1925). Newly transitioned froglets spend their immediate post-metamorphic period near their natal ponds, feeding as much as possible to gain size and store lipids to survive their first winter (Clausen and Layne 1983). California Red-legged Frogs (*Rana draytonii*) metamorphose during the driest period of the season; bound to moist riparian and littoral areas by the threat of desiccation (Mokhatla et al. 2019, Seebacher and Alford 2002). With moisture provided by the first fall rains, froglets are released (Allaback et al. 2010) to disperse across otherwise arid lands by the elevated humidities resulting from precipitation (Garcia-Dean 2025). Prior to the first rainfall, several factors challenge the individual survival of *R. draytonii* froglets. As the dry summer lingers, ponds and reservoirs shrink in size, stranding littoral vegetation and reducing the availability of moist, shaded refuge. Further, crowding in a diminishing pond results in increased competition for food, and diminishing cover increases exposure to predation from many sources while froglets wait for the liberating fall rains. *Rana draytonii* is listed as Threatened by the United States government (USFWS 1996).

Young snakes face similar size and condition challenges (Shine and Mason 2004), as winter approaches. Colubrid snakes of the genus *Thamnophis* undergo an ontogenetic shift in diet, from smaller to larger prey, that also involves a change in foraging behavior (Lind and Welsh 1994). Neonate snakes are ambush predators, but as they reach juvenile size, they transition to active foraging; the behavior exhibited most often in adult *Thamnophis* (Lind and Welsh 1994). Presumably, an increased size confers an ability to capture and consume larger prey while allowing snakes to feed less often, reducing their exposure to predation (Huey and Pianka 1981). Predation events are rarely directly observed (Van Vuren 2001). Here we describe an apparent predation event that involved a single *R. draytonii* froglet being consumed by a young Diablo Range Garter Snake (*Thamnophis atratus zaxanthus*), possibly illustrating a recent ontogenetic shift in garter snake foraging like that described by Lind and Welsh (1994).

While censusing post-metamorphic *R. draytonii* in a stock pond in eastern Contra Costa County,

California, USA (37.780098°N, -121.762038°W; elev. 413 m) on the evening of 21 September 2012, we discovered a small *T. a. zaxanthus* in the process of consuming a *R. draytonii* froglet (Fig. 1). We discovered the snake on a muddy substrate, left by a rapidly diminishing pond, in the shade of the canopy of a dense stand of tule (*Schoenoplectus* spp.) approximately a meter from the wet pond edge. The snake was motionless and we made no attempt to capture or handle it. We approximated its snout-to-vent length to be roughly 320 mm, its weight to be 15-20 g, and concluded it to be a young-of-the-year (*sensu* Lind and Welsh 1994). Based on our previous



Fig. 1. A juvenile Diablo Range Garter Snake (*Thamnophis atratus zaxanthus*) consuming a California Red-legged Frog (*Rana draytonii*) froglet at the edge of a pond in eastern Contra Costa County, California. Photo by authors.

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experience, we estimated the *R. draytonii* froglet to be approximately 45 mm in length (snout-to-urostyle), and 11-12 g (Wilcox et al., unpubl. data). Our observations are best estimates but the *R. draytonii* prey potentially had a mass of approximately 60-70% of the predator's mass, making this a significant meal.

A unique foraging opportunity may have resulted from an increase in prey density created by the crowding of recently transitioned froglets in the littoral zone of ponds as they dry down late in the season. Young snakes undergoing an ontogenetic shift in foraging behavior—prey size selection—may enjoy multiple opportunities to test developing foraging skills, (i.e., ambush or active attacks; Lind and Welsh 1994). While a large meal confers many benefits to the snake, it also leaves small snakes exposed to both predators and the elements (Wilcox et al. 2021). Professional time constraints did not allow us to return and observe the snake again, so we did not know how the snake fared after its meal.

Diminishing ponds may leave frogs exposed to predation, as was observed here. The predator-prey relationship is a ubiquitous law of nature; our observation illustrates that even agency protections have little to no influence over natural predator/prey relationships.

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