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Predation on the toxic *Oophaga pumilio* (Anura: Dendrobatidae) by *Rhadinaea decorata* (Squamata: Collubridae)

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Aposematism is broadly hypothesized as an explanation for the conspicuous colouration of amphibians, and because they are diurnal, colourful and toxic, Dendrobatid frogs are a popular target for studies of this phenomenon (Santos and Cannatella, 2011). The presentation of model prey items to wild predator communities has demonstrated a role for colouration in deterring predation; for example, brightly coloured *Oophaga pumilio* (Schmidt 1857) models experience lower attack rates than brown ones (Saporito et al., 2007). However, precisely because aposematic animals have evolved mechanisms to discourage attack, observations of predation (or attempted predation) in the wild are scarce. Nonetheless, they are critical to formulating and testing adaptive hypotheses. Here, we report the depredation of an adult *O. pumilio* by the snake *Rhadinaea decorata* (Gunther 1858) on Isla Bastimentos in the Bocas del Toro archipelago of Panama. *O. pumilio* is native to Central America, ranging from southern Nicaragua to western Panama (Guyer and Donnelly, 2005). This frog has been of particular interest in the Bocas del Toro region because of the stunning diversity of colour morphs in and around this archipelago (Daly and Myers, 1967). *R. decorata* occurs from eastern Mexico through Ecuador. This small snake (< 400 mm) is a common diurnal leaf litter predator, and is reported to feed primarily on *Eleutherodactylus* adults and eggs (Savage, 2002). Both *R. decorata* and *O. pumilio* are abundant, diurnal species that forage in leaf litter, and so seem likely to encounter each other frequently.

On 10 July 2013, on the western tip of Isla Bastimentos, Panama, we observed a *R. decorata* consuming an adult *O. pumilio* (Fig. 1). When we first noticed the event, the snake had captured the frog by the left posterior leg and was slowly swallowing it; neither made any pronounced movements. After the snake had swallowed ~75% of the frog, the frog partially re-emerged (whether this was snake- or frog-driven was unclear), but the snake quickly resumed swallowing. After ~7 min., the snake had almost entirely consumed the frog, and coiled under adjacent leaf litter; ~3 min. later, the snake left the area. We observed no immediate ill effects on the snake, but such effects may take up to a day to become apparent (Ringler et al. 2010). Shortly after making this observation, we observed a *R. decorata* stalking another *O. pumilio* about 10 m from the original observation, however a strike was not observed. Although we cannot be certain this was a different individual snake, no bulge (from the consumed frog) was evident, and so we suspect it was. However, on seven subsequent visits to the same site over the next six weeks, we observed no additional predation events.

Existing observations suggest that snakes are the most diverse predators of poison frogs (Santos and Cannatella, 2011). Predation by *R. decorata* on *O. pumilio* has been reported elsewhere (personal observation cited in Solorzano, 2004) and *R. decorata* has been observed consuming *O. pumilio* tadpoles (J. Stynoski pers. comm.). Both of these observations were made in Costa Rica, indicating that *R. decorata* could be a widespread predator of poison frogs. These three observations suggest that this snake is not entirely dissuaded by toxins present in *O. pumilio* skin, and any physiological adaptations that make this possible may be of interest in future work. Moreover, because *R. decorata* is so widespread and abundant, its importance as a predator on *O. pumilio* warrants further investigation and perhaps incorporation into empirical and theoretical considerations of the evolution of warning coloration in this frog.

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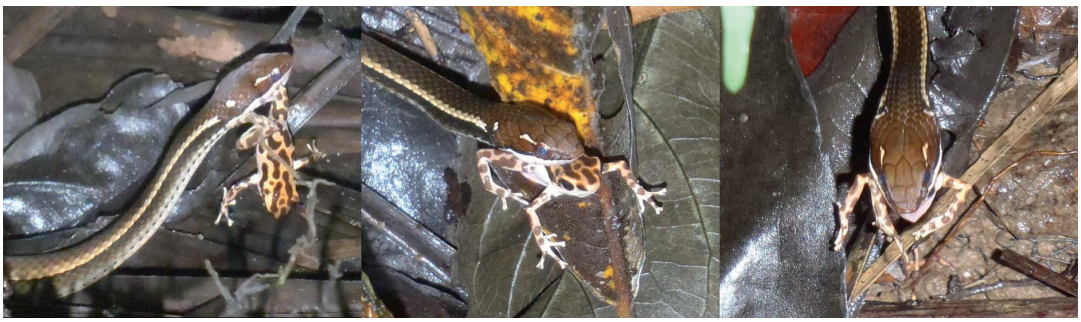

Figure 1. An adult *Oophaga pumilio* being consumed by an adult *Rhadinaea decorata* on Isla Bastimentos, Panama in July 2013.

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