PREDATION BY THE GRAPSID CRAB, *ARMASES ANGUSTUM* (SMITH, 1870), ON TADPOLES OF THE GREEN POISON FROG, *DENDROBATES AURATUS* GIRARD, 1855

BY

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On Taboga Island, Republic of Panama, a grapsid crab, *Armases angustum* (Smith, 1870), was found in one of the treeholes of a buttress tree that was used heavily by *Dendrobates auratus* Girard, 1855 for breeding. The crab ate tadpoles in captivity and thus is a new potential predator of *D. auratus*.

D. auratus is a species of terrestrial frog with parental care. After a lengthy courtship, females deposit up to 6 eggs under a leaf where the male fertilizes them. When the tadpoles emerge, the male transports them on his back, usually one at a time, either to small ephemeral pools, such as those in fallen leaves and fruit husks, or to larger, more permanent pools, such as those in treeholes. Both environments pose risks for tadpoles. Small pools frequently dry up before tadpoles complete metamorphosis and permanent water sources may be easily exploited by predators as a predictable source of prey. Although adult *D. auratus* have potent skin toxins (Myers & Daly, 1983), these toxins are diet derived, so the palatable tadpoles are vulnerable to predators (Daly et al. 1994a, b). The use of ephemeral pools and difficult to observe treeholes means that the complete range of dendrobatid tadpole predators is unknown. As the nontoxic stages are the most vulnerable to predation, the main sources of dendrobatid mortality may be overlooked. The most studied cause of mortality to *D. auratus* tadpoles is cannibalism (Summers, 1990; Caldwell & De Araújo, 1998). *D. auratus* tadpoles not only consume each other, but also any other tadpole or larval invertebrates living in the same waterpool (Summers, 1990; Caldwell & De Araújo, 1998).

On Taboga, a large pool which held water even during dry periods, was heavily used by *D. auratus* for tadpole deposition. This treehole was near the base of a tree

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(65 cm above the ground) found growing on the bank of the Quebrada del Pueblo, a small stream that runs through a protected forest reserve. The tree was located approximately 1 km from the sea at an elevation of over 100 m. The treehole was 45 cm long, 6 cm wide and 14 cm deep, and at any given time during the summer of 1999, contained over 20 *D. auratus* tadpoles. During the month of June 1999, a crab was repeatedly seen in the treehole. When approached, the crab would hide in the crevice at the back of the treehole. To determine if the crab was a tadpole predator, it was captured and offered tadpoles as prey. The crab was housed in a clear plastic box with a plastic jar of water (200 ml) in the center. Individual *D. auratus* tadpoles were placed in the central jar and the crab ate them within 24 hours. Over 4 weeks, the crab was offered, and consumed, 6 tadpoles (6.0-7.5 mm snout-vent length).

The crab was a large (carapace width = 18.0 mm, carapace length = 18.6 mm), fully adult *Armases angustum* female (Abele, 1992). She was in excellent condition showing no sign of physical trauma or autotomy, though the teeth in the gape of her chelae were slightly worn. Hepatopancreas, but not ovarian tissue, was visible through her sternum and her gonopores were fully calcified suggesting she was not near reproduction. *A. angustum* has been extensively collected from streams on islands in the eastern Pacific, always at locations less than 100 m from the sea (Abele, 1992). The occurrence of this female at approximately 1 km from the sea considerably extends the known inland limit of the distribution of this species. The diet of *A. angustum* has not been described. Its generalized chela morphology and widespread distribution suggest it is an opportunistic predator of *D. auratus* tadpoles.

This is the first report of a predator that could exploit the high density of *Dendrobates auratus* tadpoles in large treeholes. It also is one of the few accounts of crabs as predators of an anuran lifestage. The egg stage has been shown to be vulnerable to crab predation. The grapsid crab *Armases roberti* (H. Milne Edwards, 1853) (but see Abele, 1992) was observed to eat the frog embryos out of centrolenid jelly masses in Costa Rica (Hayes, 1983). As little is known about the diet and ecology of tropical terrestrial crabs, many may turn out to be significant, albeit opportunistic, anuran tadpole predators.

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