

Pedal luring in the leaf-frog *Phyllomedusa burmeisteri* (Anura, Hylidae, Phyllomedusinae)

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Luring behavior as a strategy of prey capture has evolved independently in several squamate lineages, including pygopodid lizards (Murray *et al.* 1991), and boid (Murphy *et al.* 1978, Radcliffe *et al.* 1980), viperid (Greene and Campbell 1972, Heatwole and Dawson 1976, Henderson 1970, Sazima 1991), elapid (Carpenter *et al.* 1978), and colubrid snakes (Sazima and Puerto 1993). Bavetz (1994) reported pedal luring related to predation in ambystomatid salamanders. In anurans, this feeding behavior has been described only for the terrestrial leptodactylid frogs *Ceratophrys calcarata* (Murphy 1976) and *C. ornata* (Radcliffe *et al.* 1986). Pedal luring apparently does not occur in the terrestrial leptodactylids *Caudiverbera caudiverbera* and *Odontophrynus americanus* tested by Radcliffe *et al.* (1986). Hödl and Amézquita (2001) reviewed visual signaling in anuran amphibians including signals addressed toward potential prey. Here I describe for the first time pedal luring behavior in a hylid frog, the highly arboreal leaf-frog *Phyllomedusa burmeisteri*.

Observations were made of a captive adult female (82 mm snout-vent length) collected on 03 November, 2001 in the Serra do Caraça, an Atlantic forest reserve of Southeastern Brazil;

the frog was maintained in a 60 × 30 × 37-cm glass terrarium containing soil and a bromeliad. On the fourth day of acclimation at 2300 h and under dim light, pedal luring was observed in response to offering the frog an individual adult cricket (Orthoptera); the same observations were made the next night. During the next three days, the frog fed on domestic cockroaches (Blattaria), but pedal luring was not observed in these circumstances. Larval mealworms (*Tenebrio* sp.) also were offered to the frog, but always were refused.

Phyllomedusa burmeisteri is a sit-and-wait predator that typically perches with its hands and feet firmly grasping the substrate while searching for prey. When the frog noticed the cricket in the terrarium, it faced it frontally. Pedal luring consisted of slow undulations of Toes IV and V of each foot alternately. Each complete display lasted about 5 s. As the cricket approached the frog, toe movements became more frequent. White circles on the dorsal surface of expanded toe discs contrast with the overall dorsal green coloration of the frog; thus, the toes and toe movements are perceptible under low light conditions (Figure 1). The distal lateral fringe of Toe V also is whitish; the fringe, combined with the white circle, resembles a vermiform animal. I did not observe any finger movements during the luring behavior, but it is possible that they occur because the fingertips also have white circles on them.

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The crickets were captured by tongue protraction accompanied by a slow and rigid movement forward of the animal as soon as the insects were at a reachable distance. The frog seems to facilitate swallowing the prey by posturing the body and head almost vertically and also by pulling its eyes in.

Luring behavior is typical of relatively sluggish, sit-and-wait anuran predators that ambush preys more agile than themselves (Murphy 1976, Radcliffe *et al.* 1986). This is the case of *Phyllomedusa* species, which are highly arboreal hylids with opposable thumbs; these frogs feed primarily on orthopterans, cockroaches and spiders (Parmelee 1999). I hypothesize that white circles on the dorsal surface of digital discs in *P. burmeisteri* and other *Phyllomedusa* species make the digits more visible when they are moved and thereby enhance prey attraction. When the frog rests by day, the digital markings are concealed under the body, as in visually signaling frog species, where conspicuous coloration remains hidden during resting positions (Hödl and Amézquita 2001).

In the terrestrial leptodactylid frog *Ceratophrys calcarata* pedal luring includes lifting the hind limb above substrate during toe movements (Murphy 1976); this posture is necessary because *Ceratophrys* remains partially hidden in the leaf litter and the pedal movements would not be visible otherwise. *Phyllomedusa burmeisteri* moves the same toes (i.e. IV and V) in pedal luring as does *C. calcarata* (Murphy 1976); however, *Ceratophrys ornata* uses Toes II, III, and IV. The occurrence of pedal luring in these three species suggests that Murphy (1976) was incorrect in his suggestion that pedal luring in *C. calcarata* might be a behavioral pattern acquired by the single individual that he observed. Instead, it seems more likely that pedal luring behavior in *P. burmeisteri* and *Ceratophrys* represents an innate action pattern (Barlow 1977) triggered by the sight of prey and which functions as a lure to any susceptible prey, as suggested by Radcliffe *et al.* (1986) for *C. ornata*.

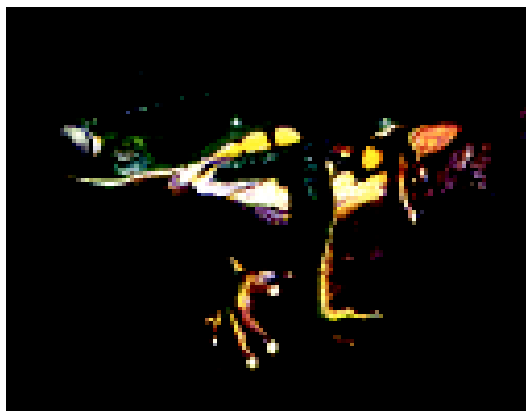



Figure 1 - Adult female *Phyllomedusa burmeisteri* used in observations of pedal luring behavior showing the high visibility of toe and finger tips and the fringe of Toe V under low light conditions.

Because Murphy (1976) observed pedal luring in *Ceratophrys calcarata* only in the presence of a leptodactylid, *Pleurodema* sp., and not of crickets, he concluded that anurans that feed mainly on invertebrate prey would not require digital luring. However, Bavetz (1994) observed pedal luring in the salamanders *Ambystoma talpoideum* and *A. tigrinum* in presence of crickets, and both larval and adult mealworms. I argue that pedal luring in anurans is not associated to prey type, but to the necessity to provoke the prey to approach predators that cannot readily reach their prey. An arboreal environment challenges many types of predators to reach their prey. Phyllomedusinae is the only hylid lineage that has highly protrusible tongues (Deban and Nishikawa 1992). It seems reasonable that such a tongue and pedal luring might be associated with the arboreal habits and relatively slow body movements of these anurans.

Pedal luring in frogs also seems to be associated with cryptic coloration, because both *Ceratophrys* spp. (Murphy 1976, Radcliffe *et al.* 1980) and *Phyllomedusa burmeisteri* are cryptically colored; this same pattern is

observed in snakes that use caudal luring (Sazima and Puerto 1993). In this context, these anurans may have evolved pedal luring behavior to increase their effective encounter rate with prey items (Radcliffe *et al.* 1986). I suggest that pedal luring may occur in other species of Phyllomedusinae, like *Phyllomedusa bicolor*, as well as other sit-and-wait anurans.

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