

We did not confirm whether these morphological differences occurred in non-breeding individuals in the breeding season. It is well known that morphological changes occur in one sex (often in males) in breeding individuals (e.g., the development of nuptial pads to hold females). However, morphological changes that occur in both sexes are not common. Previous studies reporting on the functions of spines in frogs found that they are associated with sexual dimorphism (Cadle 1995. *Zool. J. Linn. Soc.* 115:313–345) or anti-predator strategies (e.g., camouflage; Guayasamin et al. 2015. *Zool. J. Linn. Soc.* 173:913–928, weapons with venom; Jared et al. 2015. *Curr. Biol.* 25:2166–2170). In this report, the function of the tiny spines of *O. amamiensis* is not clear, however morphological changes in both sexes may mean that the trait is favored by natural selection rather than sexual selection. Further research is required on the duration and function of the morphological change and whether such traits exist throughout the lineage of *Odorrana*.

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PIPA ARRABALI (Arrabal's Amazonian Toad). **PREDATION.** Amphibians comprise part of the diet of a wide variety of animals including insects, such as water bugs. Water bugs prey on a diversity of aquatic animals, for example insects, cladocerans, amphibians, and small fish (Cullen 1969. *Proc. R. Entomol. Soc.*

A. 44:123–137; Smith 1980. *Nat. Hist.* 89:56–63; Eterovick and Sazim. 2000. *Amphibia-Reptilia* 21:439–461; Hirai and Hidaka 2002. *Ecol. Res.* 17:655–661; Toledo 2003. *Phyllomedusa* 2:105–108; Toledo 2005. *Herpetol. Rev.* 36:395–400; Toledo et al. 2005. *Herpetol. Bull.* 90:29–31). The Pipidae comprises aquatic frogs widely distributed in the Neotropical region, including Amazonian South America, occurring in temporary ponds and swamps (Trueb and Cannatella 1986. *Herpetologica* 42:412–449; Lima et al. 2008. *Guide to the Frogs of Reserva Adolpho Ducke, Central Amazonia*. Áttema Design Editorial, Manaus. 168 pp.). Owing to its aquatic habits, these frogs may be predated by large aquatic insects that occur in the same environment, such as those of the Belostomatidae.

We report the first record of a water bug (*Lethocerus maximus*) preying on an adult *Pipa arrabali* (Fig. 1). At 1833 h on 22 November 2005 we observed the predation in a temporary pond on the reserve ZF-2 (2.6588°S, 60.0660°W; WGS84), located 14 km N of Manaus, Amazonas on Hwy BR-174, Brazil. The *L. maximus* was holding the frog ventrally with all pairs of legs wrapped around the frog's body to immobilize it (Fig. 1B). The frog was immobilized in the ventral region and died likely due to action of enzymes and toxins. Water bugs inject toxins causing paralysis and digestive enzymes producing necrosis (Swart and Felgenhauer 2003. *Ann. Entomol. Soc. Am.* 96:870–882). The *L. maximus* had a length of 68 mm, and began to ingest the frog through the same location of the initial bite. The frog (SVL = 54 mm) showed no other injury, which might indicate that the insect does not remove the proboscis from the prey's body before beginning ingestion.

This study increases the list of invertebrates that can prey on adult frogs. Furthermore, we highlight the ability of *L. maximus* to prey on frogs of robust size such as *P. arrabali*.

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PRISTIMANTIS BACCHUS (Wine Robber Frog). **PARENTAL CARE AND CLUTCH SIZE.** *Pristimantis* is an anuran genus represented by 495 species with a distribution that includes the southern Caribbean, and Central America, and South America. 218 species of *Pristimantis* are known from Colombia (Frost 2016. *Amphibian Species of the World: an Online Reference*. Version 6.0 (accessed 21 July 2016). Electronic Database accessible at <http://research.amnh.org/herpetology/amphibia/index.html>. American Museum of Natural History, New York). As with all terraranan frogs, *Pristimantis* exhibits direct development (Duellman and Lehr 2009. *Terrestrial-Breeding Frogs (Strabomantidae)* in Peru. NTV Natur Und Tier-Verlag, Berlin. 382 pp.). To date, published information on clutch size, nest type, and parental care exist for only ca. 17 species of *Pristimantis*. The aim of this note is to provide these valuable natural history data for an endangered frog located on the western slopes of the Cordillera Oriental in Colombia. *Pristimantis bacchus* is restricted to oak forests in the Department of Santander, Colombia (Lynch 1984. *Milwaukee Public Mus. Contrib. Biol. Geol.* 60:1–19). This species is listed as Endangered by the IUCN due to habitat loss caused by agricultural practices (Castro et



FIG. 1. *Pipa arrabali* being preyed upon by *Lethocerus maximus*.

al. 2004. <http://www.iucnredlist.org/details/56447/0>; accessed 21 Jul 2016).

On 14 May 2015, we found an adult female of *P. bacchus* (SVL = 38.15 mm), sitting on a clutch of 57 eggs (Fig. 1A) at El Diviso, Vereda La Colorada, municipality San Vicente de Chucurí, Department of Santander, Colombia (6.7924°N, 73.4798°W, WGS 84; 1373 m elev.). We determined the frog was a female based on her body size (SVL is < 30 mm in males). The female and her egg mass were on a superficial root next to small and medium-sized rocks. At the time we found the clutch, the female was completely covering the egg mass with her head and body, allowing us to deduce the presence of parental care by the female. We temporarily removed the female from the clutch to examine the eggs. The eggs were spherical with a cream coloration and the mass of eggs was roughly conical-shaped, reminiscent of a bunch of grapes. The clutch size of *P. bacchus* is the largest on record for *Pristimantis* in Colombia, and the second largest reported for the genus so far, after the Ecuadorian species *P. vertebralis* with 67 eggs (Lynch and Duellman 1997. Spec. Publ. Nat. Hist. Mus. Univ. Kansas 23:1–236).

Additionally, at 2315 h on 15 May 2015, during a nocturnal visual encounter transect at the same site, we found a pair in axillary amplexus on a leaf ca. 1 m above the ground (Fig. 1B).

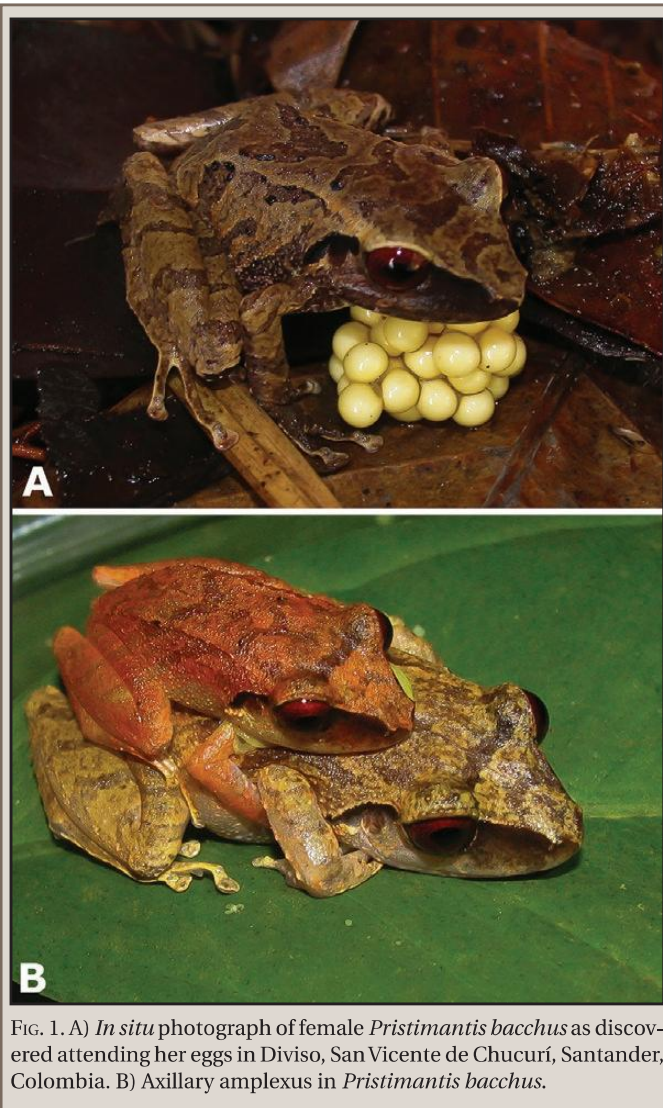


FIG. 1. A) *In situ* photograph of female *Pristimantis bacchus* as discovered attending her eggs in Diviso, San Vicente de Chucurí, Santander, Colombia. B) Axillary amplexus in *Pristimantis bacchus*.

We thank J. Pinzón, V. Hernandez, J. Gomez-Robles for their help with fieldwork, F. Fonseca for English translation, Crystal Kelehear for help with the manuscript, and especially to Martha Patricia Ramirez-Pinilla, for her help and commentaries on the work.

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***RANA AURORA* (Northern Red-legged Frog). PREDATION.** Like most ranids, the American Bullfrog (*Lithobates catesbeianus* = *Rana catesbeiana*) is an opportunistic predator which will eat most prey it can swallow (Dodd 2013. Frogs of the United States and Canada. Johns Hopkins University Press, Baltimore, Maryland. 982 pp.). *Lithobates catesbeianus* was first introduced to Oregon in 1914 by the Oregon Department of Fish and Wildlife (Hazeltine 1915. Oregon Sportsman 3:170–171) and has since become established in many parts of the state (Jones et al. 2005. Amphibians of the Pacific Northwest. Seattle Audubon Society, Seattle, Washington. 227 pp.). *Lithobates catesbeianus* is often cited as a predator of *Rana aurora*, a smaller ranid native to the Pacific Northwest (Corkran and Thoms 1996. Amphibians of Oregon, Washington, and British Columbia. Lone Pine Press, Renton, Washington. 176 pp.; Jones et al. 2005, *op. cit.*), and has been implicated in the decline of the latter species (Nussbaum et al. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho. 332 pp.). To date, however, only a single field observation of such predation has been



FIG. 1. Radiograph of *Lithobates catesbeianus* with tagged *Rana aurora* in stomach (left side of photo). Note long bones and PIT tag (length = 12.5 mm) of the *R. aurora*.