

repeated the same movement with the left leg and emitted five additional territorial calls (1104 h) and then it made a short break (5–10 sec) and returned to emit the advertisement calls. At 1105 h after recording five advertisement calls from that individual we interrupted our observations. The visual signals were displayed during the 17 territorial calls, therefore the individual had still not stopped territorial calling to exhibit visual signal, it signaled calling. At this time, no other individual was seen nearby. At 1400 h, another male (invader) was seen 5 m from the resident.

The behaviors described may represent only one of the visual communications used by *H. uai* (foot flagging; Hödl and Amézquita 2001, *op. cit.*). Similar behaviors have also been recorded for many other congeneric species: *H. asper* (Haddad and Giaretta 1999. *Herpetologica* 55:324–333), *H. dactylocinus* (Pavan et al. 2001. *Pap. Avulsos Zool.* 41:407–425), *H. nasus* (Wogel et al. 2004. *Amphibia-Reptilia* 25:219–227), *H. heyeri* (Lingnau and Bastos 2007. *J. Nat. Hist.* 4:1227–1235), *H. cardosoi* (Forti and Castanho 2012. *Herpetol. Bull.* 121:17–22), and *H. japi* (de Sá et al. 2016. *PLoS ONE* 11:e0145444). Therefore, we consider this behavior as a kind of conspicuous behavior for species in this genus.

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ISCHNOCNEMA HENSELII (Robber Frog). DEFENSIVE BEHAVIOR. *Ischnocnema henselii* occurs in subtropical Atlantic rainforest and parts of the *Araucaria* forest of southern and southeast (Serra do Mar) Brazil and Misiones, Argentina (Gehara et al. 2013. *Conserv. Genet.* 14:973–982). Anurans have a wide range of defensive behaviors to escape predators (Toledo et al. 2011. *Ethol. Ecol. Evol.* 23:1–25). For the genus *Ischnocnema* only the defensive behavior thanatosis and motionless have been reported (Haddad et al. 2013. *Guia Dos Anfíbios da Mata Atlântica - Diversidade e Biologia*. Anolis Books, São Paulo. 544 pp.). At 2234 h on 15 November 2014, in an *Araucaria* forest remnant in the municipality of Pitanga, Paraná state, Brazil (24.79900°S, 51.76500°W, WGS 84; 950 m elev.), we observed new defensive behaviors displayed by *I. henselii* (SVL = 33.3 mm; female with eggs visible). After capturing the frog and lightly squeezing it, the specimen made a sequence of defensive behaviors in this order: immobility; warning call; fighting; thanatosis; puffing up the body; mouth gaping; warning call; biting; fighting; thanatosis and immobility (Fig. 1A–D). Defensive call terminology follows Toledo et al. (2015. *Act. Ethol.* 18:87–99) and call terminology follows Duellman and Trueb (1994. *Biology of Amphibians*. McGraw Hill, New York, New York. 670 pp.). The warning call consisted of one note (Fig. 1E–F) with duration of 100 ms. Peak of dominant frequency was 2.43 kHz, minimum frequency was 2.25 kHz, and maximum frequency was 21.3 kHz. This call has harmonics, starting at 8.43 kHz. We recorded the warning call with a Canon EOS Rebel T4i DSLR digital audio recorder positioned 50 cm from the calling individual. Recordings were analyzed at a resolution of 16 bits and 48 kHz of sampling rate. Waveform and spectrogram were analyzed using the Software Raven Pro 1.4 with a Fast Fourier Transformation of 256 points, 50% overlap for an entire call and Window Hamming format. For all other configurations, the default settings of Raven were used. This is

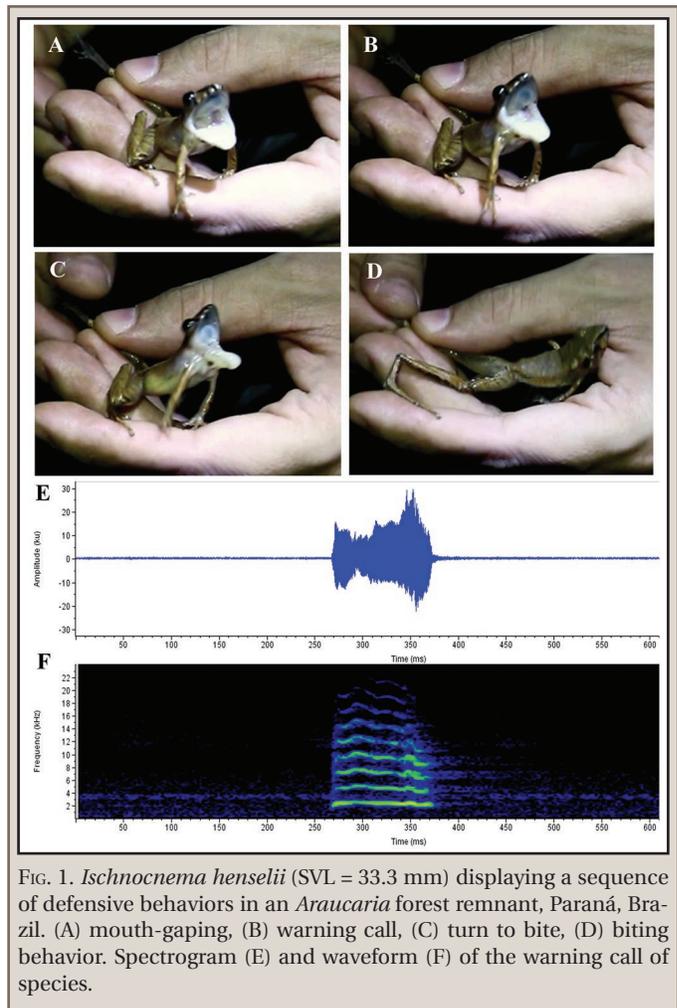


FIG. 1. *Ischnocnema henselii* (SVL = 33.3 mm) displaying a sequence of defensive behaviors in an *Araucaria* forest remnant, Paraná, Brazil. (A) mouth-gaping, (B) warning call, (C) turn to bite, (D) biting behavior. Spectrogram (E) and waveform (F) of the warning call of species.

the first report of the sequence and diversity of behaviors of *I. henselii*, and is the first report of a warning call, mouth-gaping, and biting for the genus *Ischnocnema*. The voucher specimen was deposited in Museu de Zoologia da Universidade Estadual de Londrina (MZUEL-1803).

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LEPTODACTYLUS ELENAE. PREDATION. *Leptodactylus elenae* is found extensively in northern Argentina, Paraguay, and lowlands of Bolivia and central Brazil (Heyer and Heyer 2002. *Cat. Am. Amphib. Rept.* 742:1–5). Some information has

been published on its natural history, but data on its predators are lacking. At 2052 h on 6 December 2015, in the floodplain of the Cuiabá River in the RPPN SESC-Pantanal, Mato Grosso, Brazil (16.7072°S, 56.4802°W, WGS 84; 121 m elev.), we observed predation of *L. elenae* by *Leptodactylus chaquensis*. We observed an adult female *L. chaquensis* (SVL = 84 cm) biting a female *L. elenae* (SVL = ca. 40 cm) in the inguinal region. The frog was alive and attempting to escape. As the observer approached, the *L. chaquensis* flattened its body and remained motionless. Both frogs were left undisturbed. Fifty minutes later, we returned to the pond and found the *L. elenae* dead. The frog's hind limbs had been bitten by the *L. chaquensis*, and the internal organs were exposed. *Leptodactylus chaquensis* feeds on a variety of invertebrates and vertebrates, including other anurans (Dure 1999. Herpetol. Rev. 30:92; Piatty and Souza 2011. Braz. J. Biol. 71:653–651; Pereira et al. 2015. Herpetol. Notes 8:345–346); however, this is the first report of *L. elenae* as prey of *L. chaquensis*. Both species inhabit open grasslands and their distribution overlaps central areas of South America. Thus, we suggest that predation of *L. elenae* by *L. chaquensis* may be a frequent occurrence in these areas.

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LEPTODACTYLUS LATRANS (Butter Frog). DIET. *Leptodactylus latrans* is a large frog with a wide geographic distribution that includes Brazil, Argentina, Paraguay, and Uruguay (Maneyro et al. 2004. Iheringia, Sér. Zool. 94:57–61). It feeds mainly on arthropods (Teixeira and Coutinho 2002. Bol. Mus. Biol. Mello Leitão 14:13–20) but also on fishes, annelids, mollusks, and anurans (Teixeira and Vrcibradic 2003. Cuad. Herpetol. 17:113–120), including conspecifics (Kokubum and Rodrigues 2005. Herpetol. Rev. 36:303).

Hypsiboas bischoffi is a medium-sized hylid that can be found throughout the southern portion of the Atlantic Forest, from Rio de Janeiro to Rio Grande do Sul. It is well adapted to open areas, occurring at the forest edge and within anthropogenic environments (Ribeiro et al. 2005. Biota Neotrop. 5:2). *Hypsiboas bischoffi* is prey of snakes (Pombal 2007. Rev. Bras. Zool. 24:841–843).

At 2149 h on 21 December 2009, one individual of *H. bischoffi* was scared by our presence and jumped in front of an individual of *L. latrans*, which then swallowed the *H. bischoffi* (Fig. 1). The



FIG. 1. *Leptodactylus latrans* ingesting a *Hypsiboas bischoffi*.

animals were near a pond located in the grass beside a fragment of Atlantic Forest in the Parque Ecológico e Ecoturístico de Pedras Grandes, south of Santa Catarina, Brazil (28.4847°S, 49.2558°W, WGS 84; 300 m elev.).

There are several published records of *L. latrans* preying on anurans such as *Hypsiboas albomarginatus*, *Physalaemus crombiei* (Teixeira and Vrcibradic 2003, *op. cit.*), *Hypsiboas raniceps* (Ferreira et al. 2011. Herpetol. Rev. 42:86–87; Chaves et al. 2012. Herpetol. Rev. 43:464), *Rhinella ornata* (Bovo et al. 2014. Herpetol. Rev. 45:115), *Scinax fuscovarius* (Bezerra et al. 2015. Herpetol. Rev. 46:239), and other anuran species (Heitor et al. 2012. Herpetol. Notes. 5:23–25). This is the first record of *Hypsiboas bischoffi* as an item in the diet of *L. latrans*.

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LITHOBATES CATESBEIANUS (American Bullfrog). REPRODUCTIVE ACTIVITY. The American Bullfrog was introduced into Brazil in the 1930s for commercial breeding, and currently invasive populations are reported from several localities (Both et al. 2011. S. Amer. J. Herpetol. 6:127–134). Few studies assessed the reproductive activity of invasive *L. catesbeianus* in Brazil. Two of them, carried out in the southern region, described reproductive biology based on gonad development characterization of captured frogs (Kaefer et al. 2007. Ann. Zool. Fennici 44:435–444; Leivas et al. 2012. J. Herpetol. 46:153–161). In southeastern Brazil, Afonso et al. (2010. Biotemas 23:85–91) studied *L. catesbeianus* breeding activity in the field, but this was limited to estimating frequencies of occurrence of tadpoles in different development stages and male calling activity, with no information on females or egg clutches.

Herein I present data on the reproduction of invasive *L. catesbeianus* recorded at four sampling sites on the Universidade Federal de Viçosa campus, Viçosa, Minas Gerais, southeastern Brazil (20.7605°S, 42.8689°W, WGS 84; 660 m elev.). I collected data from August 2005 to April 2007, during a study about *L. catesbeianus* food habits, for which there is a description of the sampling habitats (Silva et al. 2009. S. Amer. J. Herpetol. 4:286–294). I characterized the gonad development stages of 55 females according to the macroscopic morphology patterns proposed by Costa et al. (1998. R. Bras. Zootec. 27:642–650). Voucher specimens are deposited at the Museu de Zoologia João Moojen, Universidade Federal de Viçosa (MZUFV). Calling males occurred from August 2005 to March 2006 and from August 2006 to March 2007, always partially submerged at pond margins. Physical combat between males were witnessed in October and November 2006. Females with ovaries at the beginning of maturation (N = 3) were collected in August 2005, March 2006, and November 2006. Mature females with intermediate stage mature gonads (N = 14) occurred from September–November 2005, in February, March, August, November and December 2006, and February 2007. Females with advanced mature ovaries (N = 12) were sampled from September to November 2005, February, September, and November 2006, and in March 2007. Females having spent ovaries (N = 5) were found in January and December 2006, and in February 2007. Egg clutches were recorded in February (N = 1), November 2006 (N = 4), Decem-