Notes on the unexpected reproductive behavior of *Scinax luizotavioi* (Caramaschi & Kisteumacher, 1989) (Anura, Hylidae)

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Breeding success in anurans depends on male and female habitat choices, which may be related, at least partially, to environmental features that support offspring survivorship and development (Afonso and Eterovick, 2007; Eterovick and Ferreira, 2008). Among microhabitats usually considered safe for spawn and tadpoles are tank bromeliads or bamboo chambers, which are generally free of the predators that occur in ponds, swamps or rivers (Lehtinen *et al.,* 2004). However, little information is available on the association between anurans and bromeliads, and Brazilian species of at least 10 anuran genera are known to breed in bromeliads: *Aparasphenodon, Crossodactylodes, Dendrophryniscus, Flectonotus, Gastrotheca, Hypsiboas, Melanophryniscus, Phyllodytes, Physalaemus* and *Scinax* (Cruz and Peixoto, 1985; Peixoto, 1995; Haddad and Pombal-Jr, 1998; Langone *et al.,* 2008; Moura *et al.,* 2011). In the genus *Scinax,* the use of bromeliads for oviposition has been reported only for the *S. perpusillus* species group (Faivovich, 2002; Faivovich *et al.,* 2005), and has until now not been recorded for the *S. catharinae* species group. Herein, we report the first use of bromeliads as breeding site within the *catharinae* group.

Scinax luizotavioi is a small tree frog of the *S. catharinae* clade, together with the *S. perpusillus* group (Faivovich, 2002). It inhabits gallery forests in Cerrado and transition areas in Atlantic Forest (Caramaschi and Kisteumacher, 1989), occurring from the southern part of the Espinhaço mountain range (Nascimento *et al.,* 2005) to the northeastern region of the Mantiqueira mountain range (Cruz *et al.,* 2009; Lourenço *et al.,* 2009; Carvalho-Jr *et al.,* 2010). This tree frog is relatively common at the Serra do Brigadeiro State Park (PESB), a conservation unit with approximately 15,000 ha in the municipalities of Araponga, Divino, Ervália, Fervedouro, Miradouro, Muriaé, Pedra Bonita and Sericita, all in the state of Minas Gerais, southeastern Brazil.

From April-August of each year, the stream near the parking lot of the PESB (20°43'19"S; 42°28'43"W, datum SAD1969, 1320 m elevation) usually presented a high-density chorus of *Scinax luizotavioi.* On 21 February 2010, at around 21:30 h, an adult male of *S. luizotavioi* was observed calling from within an axil of a giant tank bromeliad *Alcantarea extensa* (Pertel *et al.,* 2006; Fig. 1A) located approximately 1 m from a temporary stream. On the same night, a group of *ca.* 30 unidentified tadpoles in early stages of development was observed inside a neighboring bromeliad (Fig. 1B). Between 18-22 March 2010 we did not observe any specimens (adult, tadpoles or juveniles) occupying the bromeliads at this site. On 17-20 April 2010, we observed a gravid female of *S. luizotavioi* using a bromeliad as shelter (Fig. 1C), as well as tadpoles of *S. luizotavioi* tadpoles in two leaf tanks of another *A. extensa* (Fig. 1D), together with an egg clutch (Fig. 1E). Apparently, *S. luizotavioi* tadpoles were not feeding on the egg clutch. We collected seven tadpoles and reared them through metamorphosis. Specimens were deposited in the herpetological collection of the Museu de Zoologia João Moojen, Universidade Federal de Viçosa (MZUFV). On 24 May 2010, another adult female *S. luizotavioi* was observed inside an individual of *A. extensa* at the same locality, and on 20 June 2010 we found a froglet of *S.* cf. *luizotavioi* at the leaf tank of this bromeliad.

Among the seven tadpoles collected on 20 April 2010, we identified two developmental classes. The first was composed of a single tadpole in Gosner (1960) stage 28 (MZUFV 218-1), whereas the second was composed of six tadpoles in

Table 1: Morphometric data (in mm) for *Scinax luizotavioi* tadpoles collected in bromeliads at Serra do Brigadeiro State Park, Araponga, Minas Gerais, Brazil, compared to data from Bertoluci *et al.* (2007).

Parameters	Stage 28 (MZUFV 218-1)	Stage 37 (MZUFV 218-7)	Stage 37 (Bertoluci *et al.*, 2007)
Body length	7.1	9.3	7.0 ± 1.0
Total length	16.2	29.1	28.8 ± 2.2
Tail length	9.1	19.8	19.0 ± 1.5
Maximum tail height	4.3	6.5	5.2 ± 0.6
Maximum height of upper tail fin	0.9	1.7	2.0 ± 0.2
Maximum height of lower tail fin	0.9	1.6	1.6 ± 0.3
Rostronarial distance	0.7	1.0	1.8 ± 0.5
Naropupillar distance	0.6	1.3	1.5 ± 0.3
Internarial distance	1.9	2.2	2.3 ± 0.2
Interorbital distance	2.9	4.4	4.2 ± 0.6
Maximum diameter of eye	0.9	1.1	1.3 ± 0.1
Maximum body width	4.4	5.9	5.8 ± 0.7
Maximum body height	3.3	5.3	4.6 ± 0.4
Tail muscle height	2.9	4.0	2.5 ± 0.5

development stages prior to stage 25. The egg clutch collected with the tadpoles failed to develop and samples were not collected for DNA analysis, making it impossible to confirm its identity. However, it was similar to other clutches of species of the *S. catharinae* group, with eggs pigmented and dark with a white spot in their lower section (Pombal-Jr. and Gordo, 1991;

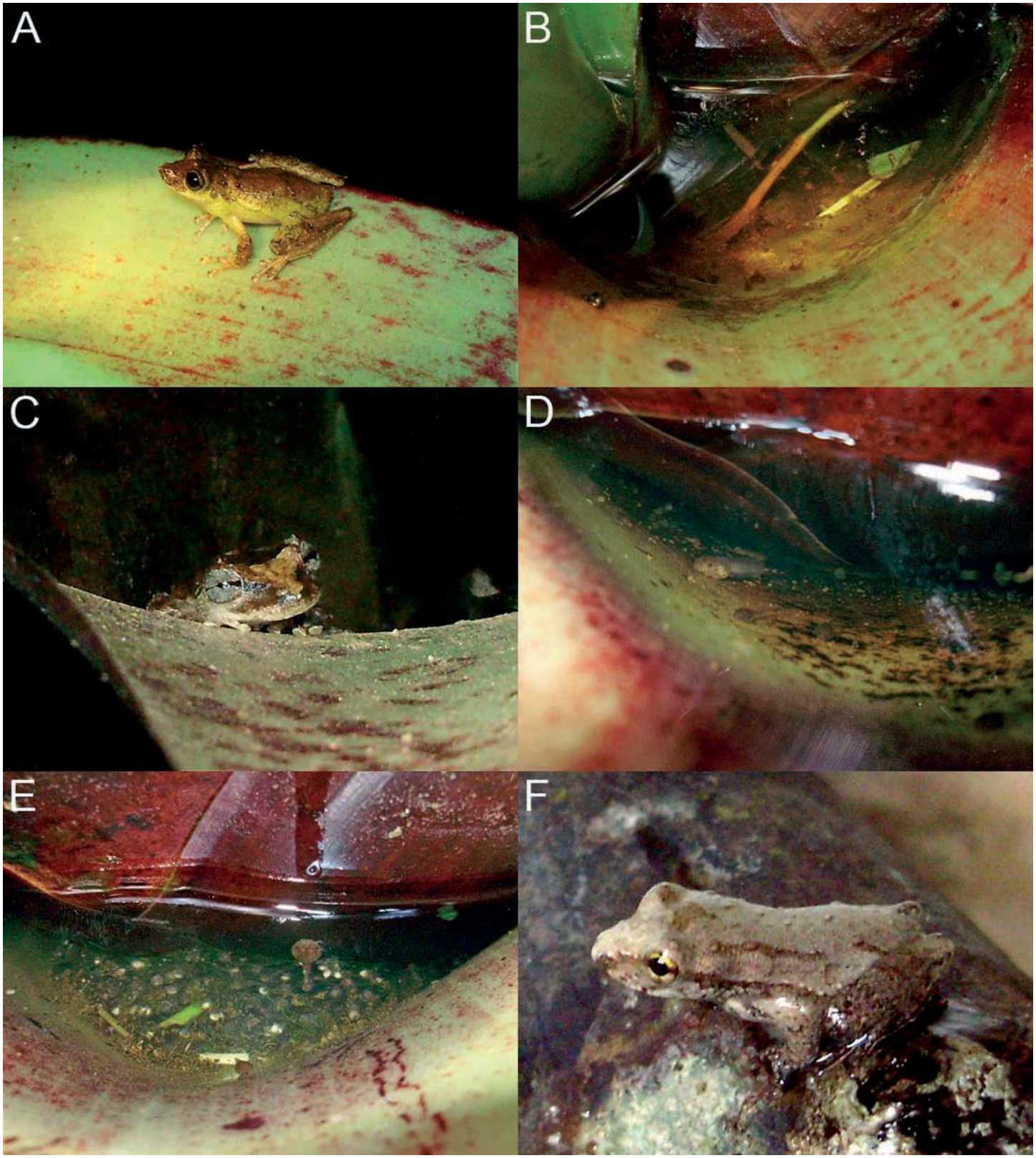

Figure 1: Specimens of *Scinax luizotavioi* associated with bromeliads at Serra do Brigadeiro State Park, municipality of Araponga, Minas Gerais. **(A)** Adult male calling on the bromeliad leaf. **(B)** Unconfirmed *S. luizotavioi* tadpole group inside a leaf tank. **(C)** Gravid female inside the bromeliad leaf tank. **(D)** Tadpoles inside leaf tank. **(E)** Tadpoles and egg clutch inside leaf tank. **(F)** A froglet of *S. luizotavioi* following metamorphosis 53 days after collection from a bromeliad (MZUFV 218-2).

Rico *et al.,* 2004). Tadpoles of the second class were reared in an aquarium (30 × 15 × 20 cm) through metamorphosis, which was completed after 53-69 days (n = 5, snout-vent length of froglets at metamorphosis 12.1-13.1 mm; MZUFV 218-2 to MZUFV 218-6; Fig. 1F). To allow further comparisons, one of the tadpoles of the second class was fixed in stage 37 (MZUFV 218-7, Fig. 2). Morphometric data on tadpoles of *S. luizotavioi* from bromeliads at PESB are in agreement with the description presented by Bertoluci *et al.* (2007; Table 1).

Species of the *Scinax catharinae* group usually reproduce in clear waters, mainly streams, but also rarely in lentic water bodies. Field observations at PESB (Moura *et al.* 2012) indicate a more generalist habitat choice in *S. luizotavioi,* often occurring in lentic aquatic habitats. The use of lentic habitats has been reported in other species of the *S. catharinae* group, including *S. hiemalis* (Haddad and Pombal-Jr 1987), *S. rizibilis* (Bastos and Haddad 1999), and *S. centralis* (Alcantara *et al.* 2007). Bertoluci *et al.* (2007) identified the tadpoles of *S. luizotavioi* as benthic, commonly inhabiting stream backwaters within forests, although they could develop in ponds and swamps, since calling males were frequently observed at these sites. The bromeligenous behavior of *S. luizotavioi* observed here, associated with the utilization of other aquatic breeding habitats, indicates plasticity in the reproductive mode of this species.

The use of bromeliads by anurans is more frequent in plants exposed to the sun than in those located in the shade (Silva *et al.,* 2010). Limnological parameters of water accumulated in tropical bromeliads may differ in relation to surrounding vegetation; compared to shaded plants, plants exposed to sun can present four times as much dissolved oxygen and almost half the ammonium and dissolved organic carbon (Guimarães-Souza *et al.,* 2006). These chemical conditions may represent important factors in the selection of bromeliads by anurans (Silva *et al.,* 2010). It is worth noting that *S. luizotavioi* tadpoles were observed at the locality where Moura *et al.* (2011) found tadpoles of *H. pardalis* (M. R. Moura, *pers. obs.*), suggesting an unusual occurrence of anurans among bromeliads at this site. Since the bromeliads used by *S. luizotavioi* and *H. pardalis* are in an open field, factors related to limnological parameters might have contributed to this unsual habitat use. This report increases to 10 the number of species occupying the bromeliads at PESB (Lacerda *et al.* 2009), adding three species that also breed in these plants (Lacerda *et al.* 2009; Moura *et al.* 2011).

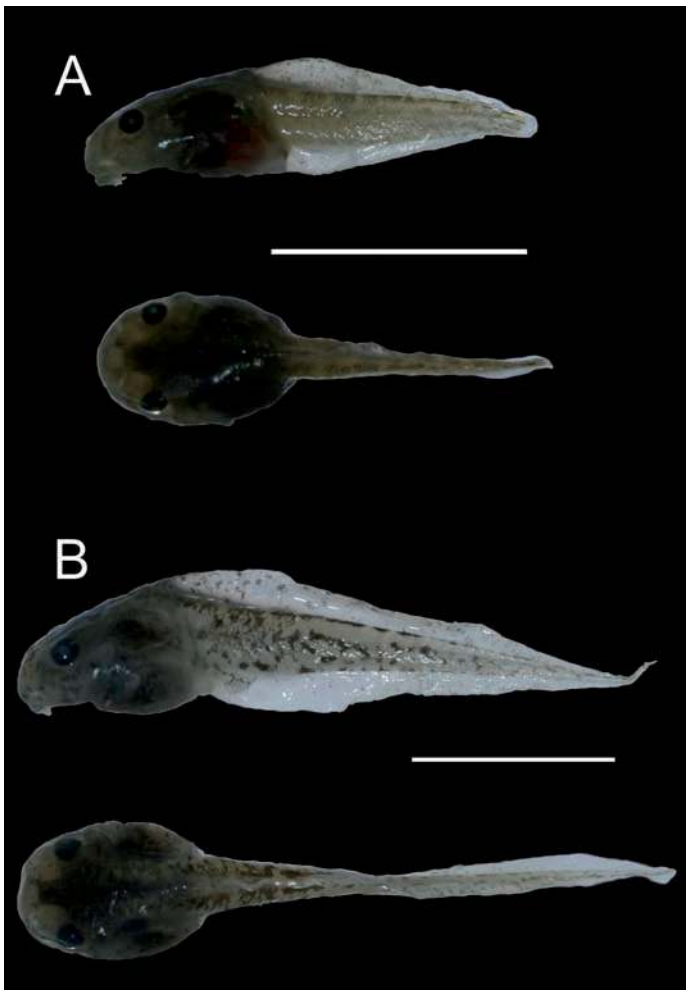

Figure 2: Lateral and dorsal views of tadpoles of *Scinax luizotavioi* collected within a bromeliad leaf tank. **(A)** Tadpoles in stage 28 (MZUFV 218-1). **(B)** Tadples in stage 37 (MZUFV 218-7). Scale bar: 9 mm.

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Polychrus marmoratus, São Luis, MA. Foto: Fabio Maffei.