

# A New Species of the *Scinax perpusillus* Group (Anura: Hylidae) from Espírito Santo, Brazil

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**A new species of the *Scinax perpusillus* group is described from southern Espírito Santo, Brazil. It differs from the other ten species of the group in having the dorsum of body and limbs densely covered by prominent granules (smooth or with scattered irregular warts in all other species of the group) and in lacking any trace of markings on dorsum, inguinal region, and hidden surfaces of hindlimbs (present in all other species of the group). The new species is known only from the type locality. Unpigmented nuptial pads, never previously reported for the group, are present in all studied species (nine of eleven included in the group). Inguinal glands are easily visible in the new species, *S. alcatraz*, and *S. littoreus*.**

**S**CINAX is currently the most species rich genus in Hylinae, with 97 described species (Frost, 2009) divided in two large clades, the *S. catharinae* and the *S. ruber* clades (Faivovich, 2002). The *S. ruber* clade contains the *S. rostratus*, *S. ruber*, and *S. uruguayus* groups, plus a large number of species still unassigned to any group (Faivovich et al., 2005). The *S. catharinae* clade contains the *S. catharinae* and the *S. perpusillus* groups.

The *Scinax perpusillus* group was first proposed by Peixoto (1987) for three species previously associated with the *S. catharinae* group by Lutz (1968, 1973a, 1973b), *S. alcatraz*, *S. perpusillus*, and *S. v-signatus*, on the basis of two putative synapomorphies, reproduction in bromeliads and the absence or extreme reduction of webbing between Toes II and III. They are distributed in the coastal region of southeastern Brazil, both in the mainland and off shore islands, from the state of Santa Catarina north to the state of Espírito Santo, and they inhabit both mountain regions and coastal areas, from sea level to ca. 1600 m. The monophyly of this group has not yet been rigorously tested, but Faivovich (2002) and Faivovich et al. (2005) recognized it on the basis of the phenotypic evidence mentioned above. Subsequent to Peixoto's (1987) recognition of the *S. perpusillus* group, seven other species were described and assigned to the group that now has ten species: *S. arduous*, *S. atratus*, *S. faivovichii*, *S. littoreus*, *S. melloi*, *S. peixotoi*, and *S. tupinamba*.

Recent field work in Espírito Santo resulted in the discovery of an unusual species of *Scinax*. It lacks webbing between Toes II–III and presumably breeds in bromeliads. For these reasons, we describe and assign it to the *S. perpusillus* group.

## MATERIALS AND METHODS

Webbing formula follows the notation of Savage and Heyer (1967) as modified by Myers and Duellman (1982). Measurements (in millimeters) follow the standards of Duellman (1970) and were taken with a digital caliper to the nearest 0.1 mm under a stereomicroscope. Abbreviations used throughout the text are SVL (snout–vent length), HL (head length), HW (head width), IND (internarial distance), IOD (interorbital distance), ED (eye diameter), EN (eye–nostril distance), TD (tympanum diameter), TL (tibia length), and

FL (foot length). Reported geographic coordinates were taken with a global positioning system (GPS) device (Datum WGS84). Sex was determined by examination of secondary sexual characters (nuptial pads, vocal slits, and expansion of the vocal sac) or, when in doubt, by examination of gonads. Illustrations were made with a drawing tube attached to a Zeiss Stemi stereomicroscope. Institutional abbreviations follow Leviton et al. (1985) with the addition of Universidade Estadual Paulista, Rio Claro, São Paulo, Brazil (CFBH). Information on other species was taken from preserved specimens and complemented with literature data, with the exception of *S. atratus* and *S. tupinamba* for which all the comparative information comes from Peixoto (1988a) and Silva and Alves-Silva (2008), respectively.

## *Scinax belloni*, new species

Figures 1–3

**Holotype.**—CFBH 9733, adult male, Brazil, Espírito Santo, Castelo, surroundings of Parque Estadual de Forno Grande, 20°31'00"S, 41°05'02"W, 1100–1500 asl, 13 March 2007, J. L. Gasparini and J. Bellon.

**Paratypes.**—Adult males (9): CFBH 7460, 7461, 9729–9732, 9734, 9736, 18281. Adult females (4): CFBH 7459, 9727, 9728, 18285. Immature females (3): CFBH 18282–18284. All collected on different dates between July 2006 and November 2007 in the type locality by J. L. Gasparini and J. Bellon.

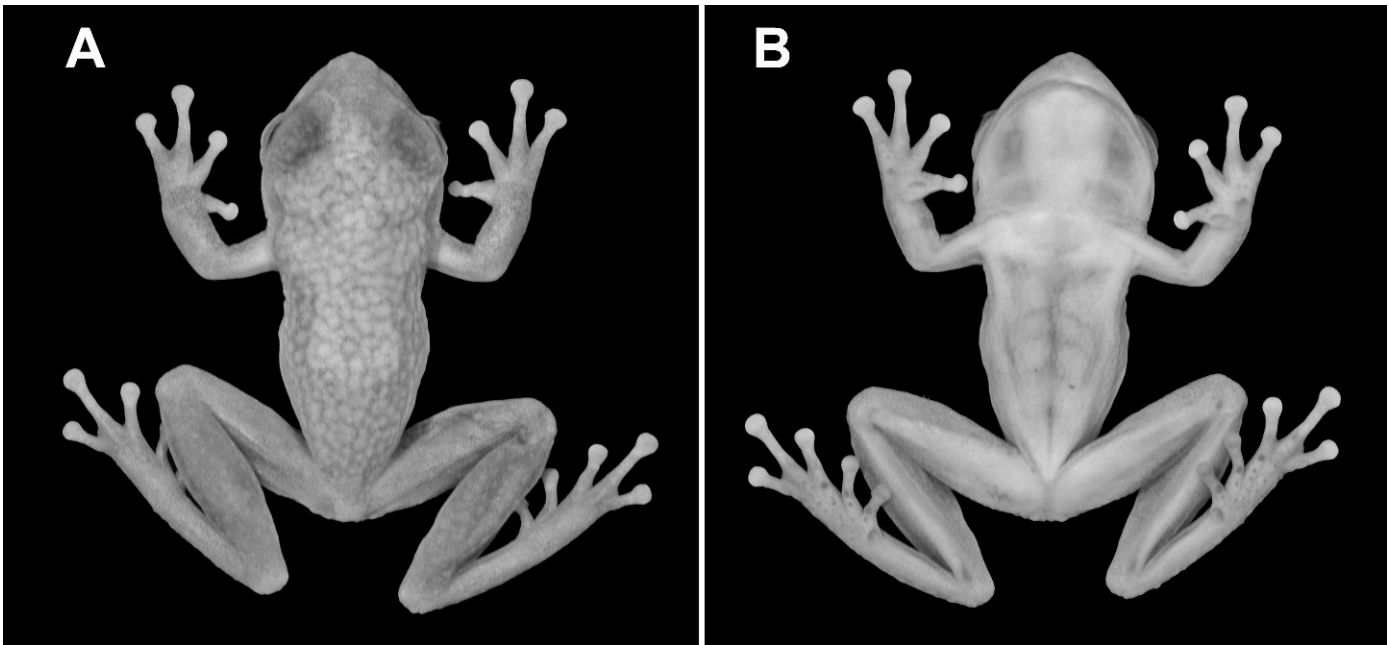
**Diagnosis.**—A species of the *Scinax perpusillus* group characterized by the unique combination of having the dorsal surface of body and limbs densely covered with prominent granules; lacking any markings on dorsum, hind limbs and hidden surfaces (Figs. 1–3).

The new species is immediately distinguishable from all species of the *Scinax perpusillus* group in having the dorsum of body and limbs densely covered by prominent granules (smooth or with scattered, irregular warts in all other species of the *S. perpusillus* group), and in lacking any trace of markings on dorsum, inguinal region, and hidden surfaces of hind limbs (present in all other species of the *S. perpusillus* group). The new species is most similar in size to *S. alcatraz*, some specimens of which also lack dorsal markings, but differs because this species has yellow coloration in the

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**Fig. 1.** *Scinax belloni*, holotype (CFBH 9733), in preservative. Snout–vent length 23.0 mm.

hidden surfaces of limbs (Leão, 1950) and has dorsal skin that is smooth or has a few scattered pustules.

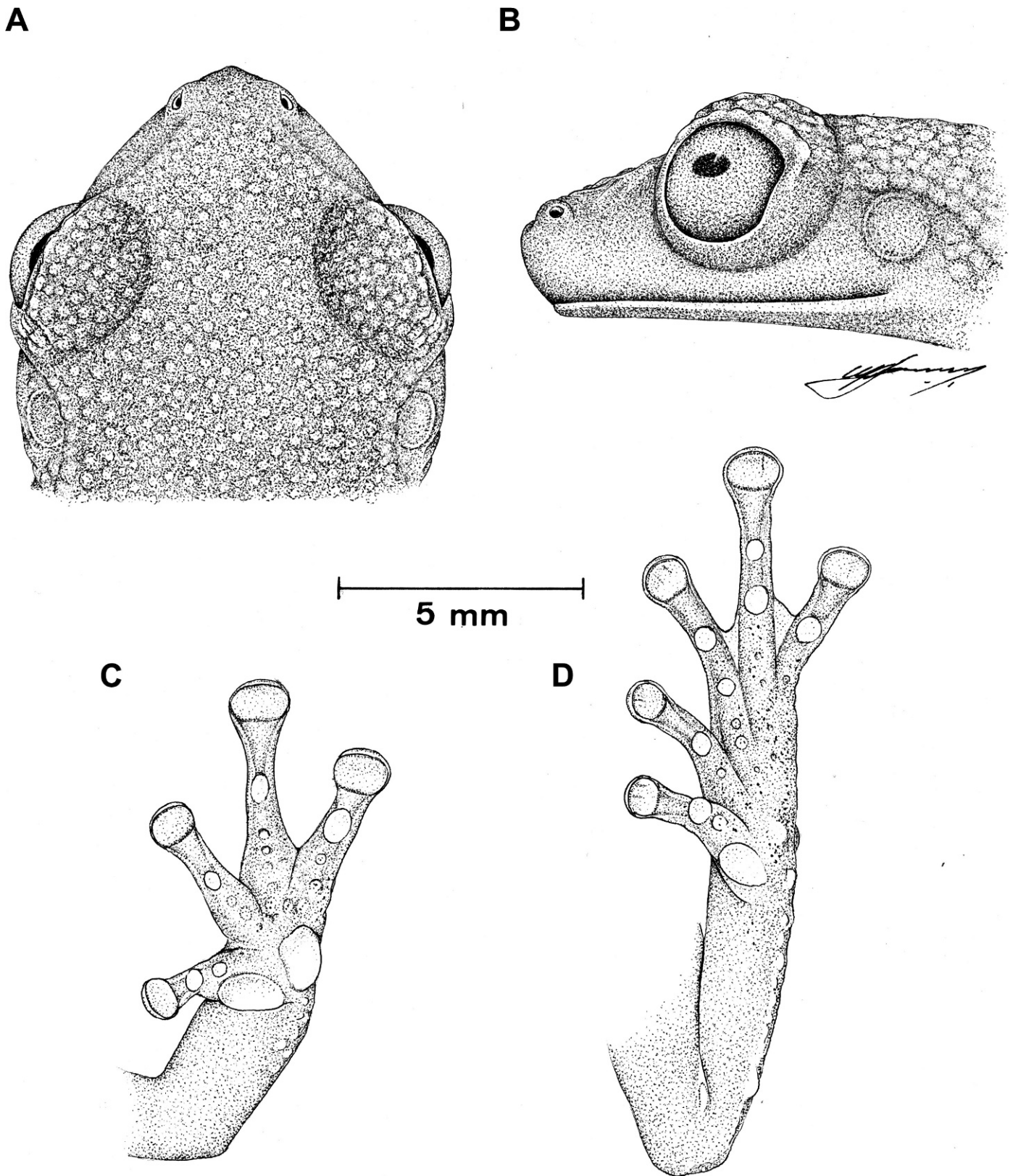
*Scinax faivovichi*, *S. peixotoi*, *S. perpusillus*, *S. tupinamba*, and *S. v-signatus* further differ in having protruded nostrils (not protruded in the new species), loreal region gently sloping toward lips, giving the lips a flared aspect (loreal region in a steep slope towards the lips in the new species), and for having traces of webbing between Toes II and III (absent in the new species). The larger SVL of mature females differentiates the new species from *S. atratus*, *S. faivovichi*, and *S. melloi* (combined SVL 18.6–21.7; Peixoto, 1988a; Brasileiro et al., 2007a). Mature females of *S. arduous*, *S. littoreus*, *S. peixotoi*, *S. perpusillus*, *S. tupinamba*, and *S. v-signatus* also are generally smaller (combined SVL range 22.1–26.2; Peixoto, 1988b, 2002; Brasileiro et al., 2007b); Silva and Alves-Silva, 2008), but SVL range of females of the new species (26.3–29.2) is continuous; available juvenile female paratypes of the new species have an SVL of 21.7–22.6.

**Description of holotype.**—Body moderately robust, head rounded in dorsal view, slightly protruding in profile; head barely longer than wide, 40% of SVL. Nostrils barely protruded, dorsolateral; distance between nostrils 64.5% of IOD. Tubercle between nostrils absent. Canthus rostralis curved. Loreal region concave, forming a steep slope toward lip. Eye large, ED 80% of IOD, almost equal to EN. Tympanum rounded, separated from eye by a distance almost equal to TD. TD 18% larger than width of the disc of Finger III. Supratympanic fold barely evident in profile by the presence of several flat tubercles from the corner of the eye to the insertion of the arm. Some scattered, flat, barely distinguishable rounded tubercles above tympanum and on upper eyelid. Vocal sac subgular, externally evident by the loose skin on the sides of the jaw and immediately above the pectoral region. Tongue oval, free laterally and posteriorly, shallowly notched. Vomerine teeth in two barely convex series between choanae, each bearing three (right) and four (left) teeth. Choanae elliptical. Vocal slits present, longitu-

dinal, originating on the side of the tongue and running towards the corner of the mouth. Upper arm and forearm slender. Axillary membrane absent. Row of low, irregular ulnar tubercles contiguous to a row of tubercles extending through the margin of Finger IV. Fingers slender; subarticular tubercles single, conical on Fingers I and II; rounded on Fingers III and IV. Palmar tubercle somewhat flat, medially bifid; thenar tubercle elliptical. Discs elliptical, wider than long; disc on Finger I not noticeably smaller than the others. Webbing absent between Fingers I and II; basal between Fingers II and III, and III and IV. Thick, unpigmented nuptial pad covering base of thumb dorsomedially, extending medially up to the outer margin of the palmar tubercle, and distally up the base of the first phalanx. Hind limbs slender; TL equals 52% SVL. Several rounded, low tubercles present on the heel, and contiguous with a series of irregular, slightly larger tubercles that extend through the margin and lower part of the tarsus up to the lateral margin of foot. Toes slender; subarticular tubercles conical. Outer metatarsal tubercle rounded, small; inner metatarsal tubercle subcircular, more than twice as large as outer tubercle. Rounded, low supernumerary tubercles present along the metatarsi. Discs subelliptical, wider than long. Webbing formula I–II–III 2–3½ IV 3–2 V. Tarsal fold absent.

Thin, irregular patch of glandular tissue present in inguinal region. Pectoral fold absent. Cloacal opening at upper level of thighs. Skin on throat smooth; granular on belly and undersurfaces of thigh. Dorsum of head and body densely covered by rounded, low granules; similar tubercles are also scattered at much lower densities on dorsum of limbs.

**Color in preservative.**—Overall yellowish cream dorsally and ventrally, with the exception of the dark eyeballs visible by transparency (Fig. 1). Dorsally the whole body is densely covered by dark reddish brown dots, quite likely single melanophores. These are present at much lower densities or absent from the top of most tubercles, which became delimited peripherally by the dots, thereby giving the



**Fig. 2.** *Scinax belloni*, holotype (CFBH 9733). (A) Head in dorsal view; (B) head in lateral view; (C) left hand in ventral view; (D) left foot in ventral view.

dorsum a spotted appearance. The dots are present as well on ventral surfaces of hand, foot, and tarsus.

**Measurements of the holotype.**—SVL 23.0; HL 9.2; HW 8.5; IND 2.0; IOD 3.1; ED 2.5; EN 2.6; TD 1.3; TL 12.0; FL 8.9.

**Variation among paratypes.**—See Table 1 for measurements. The type series is quite homogeneous morphologically. Externally there is some variation in the level of pointedness of the tip of the snout in dorsal view. There is extensive variation in the number of vomerine teeth with large



**Fig. 3.** *Scinax belloni*, female paratype (CFBH 9727 or 9728). Notice the granules covering the dorsal surface of body and limbs.

females generally having more teeth. The numbers of teeth observed in males are two (two specimens), three (seven specimens), or four (two specimens) on the left process, and two (three specimens), three (four specimens), four (two specimens), or five (one specimen) on the right process. In adult females there are four (one specimen), five (two specimens), or eight (one specimen) teeth on the left process, and four (two specimens), five (one specimen), or eight (one specimen) teeth on the right process. In two juvenile female paratypes (CFBH 18283, 18284), the left process is absent, and there are two and four teeth in the right process. All available mature females are notably larger than males, and males generally have a more robust forearm. Females, like males, do have an inguinal gland. Most color variation among paratypes involves the density

of pigmentation on the dorsum and the concomitant contrast between the background and the dorsal granules.

**Color in life.**—Based on slides of several specimens taken by JLG. Flanks, arms, and thighs cream; dorsum and exposed surfaces of shank and feet light salmon. Granules on dorsum sometimes lighter than the background, thereby giving a spotted appearance. Iris gold with extensive black reticulation; pupil horizontal, ovoid; its contour is obscured by a black streak that bisects the iris and pupil horizontally (Fig. 3).

**Natural history.**—Most specimens were collected in the rupicolous bromeliad *Alcantarea* sp. Males were most frequently found while calling inside the bromeliads. Calls were not recorded.

**Geographic distribution.**—*Scinax belloni* is only known from the type locality, in the state of Espírito Santo, Brazil.

**Conservation status.**—The bromeliad where most specimens of the new species were found, *Alcantarea* sp., is heavily exploited for gardening. It is not clear whether this trade creates pressure on the populations of *Scinax belloni* that inhabit these bromeliads.

**Etymology.**—Dedicated to José Bellon, who discovered the first specimen of this new species.

## DISCUSSION

The description of *Scinax belloni* brings to 11 the number of species included in the *S. perpusillus* group. The new species

**Table 1.** Ranges (in mm) of *Scinax belloni*. Ranges followed by means and one standard error in parentheses.

	Males ( <i>n</i> = 11)	Females ( <i>n</i> = 4)
SVL	19.8–23.0 (21.7 ± 0.33)	26.3–29.2 (28.4 ± 0.69)
HL	7.5–9.2 (8.2 ± 0.13)	10.3–11.8 (11.0 ± 0.32)
HW	7.1–8.8 (8.0 ± 0.15)	9.7–11.1 (10.4 ± 0.28)
IND	1.5–2.0 (1.8 ± 0.04)	2.1–2.5 (2.2 ± 0.11)
IOD	2.5–3.1 (2.7 ± 0.05)	3.5–4.0 (3.8 ± 0.10)
ED	1.9–2.5 (2.2 ± 0.05)	2.5–3.0 (2.9 ± 0.12)
EN	2.1–2.7 (2.5 ± 0.05)	2.8–3.5 (3.2 ± 0.14)
TD	0.9–1.3 (1.2 ± 0.03)	1.3–1.8 (1.6 ± 0.09)
TL	10.7–12.7 (11.7 ± 0.18)	13.4–16.7 (15.3 ± 0.70)
FL	7.9–9.1 (8.6 ± 0.12)	11.4–12.5 (11.8 ± 0.24)

is remarkably different morphologically from other species in the group, being comparable in snout–vent length only with the insular species *S. alcatraz*.

While the oviposition in bromeliads is one of the synapomorphies of the *S. perpusillus* group (Peixoto, 1987), we still have no direct observations of *Scinax belloni* reproducing in bromeliads. However, the fact that males call in bromeliads with no other nearby water body and that the species has the other synapomorphy of the *S. perpusillus* group (webbing between Toes II–III extremely reduced or absent) suggest that it apparently breeds in bromeliads. Furthermore, three tadpoles of the *S. perpusillus* group were collected in the same bromeliads where males of the new species were calling; even though no other species of the *S. perpusillus* group is known in the area, we refrain from assigning these tadpoles to *S. belloni* until direct evidence concerning their identity can be gathered.

All available descriptions of the species included in the *Scinax perpusillus* group (Peixoto, 1988a, 1988b, 2002; Brasileiro et al., 2007a, 2007b) make no reference to presence of nuptial pads. Direct study of topotypes of most species in the group (exceptions: *S. atratus* and *S. tupinamba*) indicate that they all have the glandular nuptial pad that we report in the new species and that occurs, with different degrees of development, in most species of *Scinax* (Faivovich, pers. obs.). Furthermore, we note that the nuptial pad of *S. melloi* is particularly thicker than in the other species of the group available for study (all but *S. atratus*, a species quite similar to *S. melloi*).

Similarly, inguinal glands have never been reported in species of the *Scinax perpusillus* group, but they were observed in its sister group, the *S. catharinae* group. These glands have been recorded so far in 11 of the 27 species included in the *S. catharinae* group (*S. albicans*, *S. aromothyella*, *S. brieni*, *S. canastrensis*, *S. centralis*, *S. flavoguttatus*, *S. hiemalis*, *S. longilineus*, *S. obtriangulatus*, *S. strigilatus*, and *S. trapicheiroi*; Cochran, 1955; Pombal and Bastos, 1996; Haddad and Pombal, 1987; Heyer et al., 1990; Faivovich, 2002, 2005; Pimenta et al., 2007). Among the species of the *S. perpusillus* group, besides *S. belloni*, inguinal glands are more easily visible in *S. alcatraz* and *S. littoreus*. Faivovich (2002) noticed macroscopic differences in gland morphology within the *S. catharinae* group. In some cases the gland forms a thick glandular patch (e.g., in *S. centralis* and *S. hiemalis*), and in the remaining species the glandular acini are more scattered (all other species). The morphology observed in *S. belloni* corresponds with this latter character state.

The presence of glands in the inguinal or lumbar region is sexually dimorphic in some anurans, where they occur mostly in males (e.g., *Cycloramphus*, de Lucas et al., 1996; Gonçalves and Brito-Gitirana, 2008). In *Scinax belloni* and other species of *Scinax* where they are known to occur, these glands occur in both males and females. Although macroscopically difficult to quantify, it also seems that there is some variation in development within males where they are always more evident than in females. It is still unknown if the development of these glands varies seasonally. Histological and ultrastructural studies are required to better define the different states observed in *Scinax* and to gain some insights on its biological function. If truly sexually dimorphic, and variable within males (as our observations suggest) perhaps more attention should be given to these glands in studies of sexual selection and courtship involving *Scinax*.

## MATERIAL EXAMINED

*Scinax alcatraz*: Brazil: São Paulo: Ilha dos Alcatrazes: CFBH 10456–457, 10459–463, 11919–928, 12882, 12878 (topotypes).

*Scinax arduous*: Brazil: Espírito Santo: Santa Tereza: CFBH 17980–17991, 17996–17997 (topotypes).

*Scinax faivovichii*: Brazil: São Paulo: Ubatuba: Ilha de Porcos Pequena: CFBH 11602 (holotype), 11603–11621 (paratypes).

*Scinax littoreus*: Brazil: Rio de Janeiro: Cabo Frio: Arraial do Cabo: MZUSP 61116 (paratype).

*Scinax melloi*: Brazil: Rio de Janeiro: Teresópolis: Parque Nacional da Serra dos Orgãos: MZUSP 61118–61122 (paratypes).

*Scinax peixotoi*: Brazil: São Paulo: Itanhaem: Ilha de Queimada Grande: CFBH 9437 (holotype), 9438–9440 (paratypes).

*Scinax perspusillus*: Brazil: Rio de Janeiro: CFBH 19505–19509 (topotypes).

*Scinax v-signatus*: Brazil: Rio de Janeiro: Teresópolis: Parque Nacional da Serra dos Orgãos: CFBH 14033–14035, 19493–19502 (topotypes).

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