

A NEW MINIATURE TREEFROG OF THE *SCINAX RUBER* CLADE FROM THE CERRADO OF CENTRAL BRAZIL (ANURA: HYLIDAE)

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ABSTRACT: We describe a new species of treefrog of the *Scinax ruber* clade related to *Scinax fuscomarginatus* from southwest of the state of Goiás in central Brazil. The new species is characterized by its small size (snout–vent length of males, 15.9–18.6 mm; females, 18.1–18.7 mm), very slender body, a snout that is strongly acute in lateral view and subelliptical in dorsal view, two lateral broad blackish stripes from the posterior corner of the eye to inguinal region, reduced toe webbing, and advertisement calls that are a single pulsed note with a pulse period of 2–13 ms and a dominant frequency of 2.51–5.95 kHz. Vocalizations of the new species and *S. fuscomarginatus*, *Scinax parkeri*, *Scinax squalirostris*, and *Scinax wandae* are provided and discussed.

Key words: Amphibian; Dendropsophini; New species; *Scinax fuscomarginatus*; *Scinax* sp. nov.; Vocalization

THE HYLID frog genus *Scinax* Wagler, 1830, currently comprises >100 recognized species distributed from eastern and southern Mexico to Argentina and Uruguay, Trinidad and Tobago, and St. Lucia (Frost, 2010; Nunes et al., 2010). Most of these species occur in tropical and subtropical areas, with particularly high diversity in the Atlantic Forest of southeastern Brazil (Faivovich, 2002; Frost, 2010; Pombal et al., 1995). Faivovich et al. (2005) found two monophyletic groups in this genus, the *Scinax catharinae* and *Scinax ruber* clades. Within the *S. ruber* clade, Faivovich et al. (2005) recognized two species groups—the *Scinax rostratus* and *Scinax uruguayus* species groups—and also a large number of species that are unassigned to species groups.

Seventeen species of the *S. ruber* clade, excluding the *S. rostratus* and *S. uruguayus* species group (sensu Faivovich, 2005), are recorded from Cerrado-Caatinga-Chaco region (see Duellman, 1999): *Scinax acuminatus* (Cope, 1862); *Scinax cabralensis* Drummond, Baêta, and Pires, 2007; *Scinax camposseabrai* (Bokermann, 1968); *Scinax castroviejoi* De La Riva, 1993; *Scinax curicica* Pugliese, Pombal, and Sazima, 2004; *Scinax eurydice* (Bokermann, 1968); *Scinax fuscomarginatus* (Lutz, 1925a); *Scinax fuscovarius* (Lutz, 1925b);

Scinax lutzorum Cardoso and Pombal, 2010; *Scinax maracaya* (Cardoso and Sazima, 1980); *Scinax nasicus* (Cope, 1862); *Scinax pachycrus* (Miranda-Ribeiro, 1937); *Scinax parkeri* (Gage, 1929); *Scinax rogerioi* Pugliese, Baêta, and Pombal, 2009; *Scinax squalirostris* (Lutz, 1925b); *Scinax tigrinus* Nunes, Carvalho, and Pereira, 2010; and *Scinax x-signatus* (Spix, 1824).

Here, we describe a new species from the Cerrado Domain (Ab'Saber, 1977) that is similar to *S. fuscomarginatus* and provide descriptions of the advertisement calls of some morphologically similar species.

MATERIALS AND METHODS

We compared the new species with species of the *S. ruber* clade recorded from the Cerrado-Caatinga-Chaco region, excluding the *S. rostratus* and *S. uruguayus* species group (sensu Faivovich et al., 2005). Owing to morphological similarities, the new species also was compared with five species that belonged to the former *Scinax staufferi* species group (sensu Duellman and Wiens, 1992) and are now recognized in *S. ruber* clade (sensu Faivovich et al., 2005) but unassigned to any species group. We did not compare the new species to *S. x-signatus* for the reasons explained by Pombal et al. (1995) and Pugliese et al. (2009).

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The examined specimens are housed in the following collections: Adolpho Lutz collection, Museu Nacional, Rio de Janeiro, Brazil (ALMN); Laboratório de Zoologia dos Vertebrados, Universidade Federal de Ouro Preto, Ouro Preto, Brazil (LZV); Museo Argentino de Ciencias Naturales "Bernardino Rivadavia," Buenos Aires, Argentina (MACN); Museu Nacional, Rio de Janeiro, Brazil (MNRJ); Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP); National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM); Museu de Zoologia Prof. Dr. Adão José Cardoso, Universidade Estadual de Campinas, Campinas, Brazil (ZUEC); Coleção Zoológica da Universidade Federal de Goiás, Goiânia, Brazil (ZUFG); and Coleção de Anfíbios, Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (ZUF RJ). Specimens are listed in the Appendix.

Specimens were fixed in 10% formalin followed by long-term storage in 70% ethanol. The following measurements were recorded from each specimen: snout–vent length (SVL), head length (HL), head width (HW), eye diameter (ED), tympanum diameter (TD), interorbital distance (IOD), internarial distance (IND), eye–nostril distance (END), nostril–snout distance (NSD), thigh length (THD), tibia length (TBL), and foot length (FL). Measurements of adults were taken with an ocular micrometer in a Zeiss stereomicroscope, except for SVL, which was taken with a caliper with 0.1-mm precision. Drawings of the holotype were made using a Zeiss stereomicroscope coupled to a camera lucida. All measurements are in millimeters and follow Cei (1980) and Duellman (2001). Snout standards (dorsal view and profile) follow Heyer et al. (1990). Webbing formula notation follows Savage and Heyer (1997).

We recorded vocalizations with a DAT TASCAM DAPI or MARANTZ PMD 222 and microphone Sennheiser ME66. We recorded the air temperature for each vocalization recording, and here we state the temperature for each of the recordings shown in the figures. The vocalizations were edited at sampling frequencies of 22 kHz with a PC computer and analyzed with Avisoft-SASLAB light and Cool

Edit 2000 software packages. Frequency information was obtained through fast Fourier transformation (FFT) using a width of 1024 points. The spectrograms were made with an overlap value of 87.5%, window flat top, frame = 100%, and FFT length = 256. The call descriptions follow Gerhardt (1998), Gerhardt and Huber (2002), and Wells (2007). Nine traits of the advertisement and possible aggressive calls were analyzed: call duration, note number, pulse number per note, pulse duration, pulse period, dominant frequency, maximum and minimum frequency, and call repetition rate. The dominant frequency is the frequency with the greatest amount of acoustic energy; maximum and minimum frequencies were measured directly in the spectrogram. The recordings of the new species of *Scinax*, *S. fuscumarginatus*, and *S. squalirostris* (recorded in Brazil) were housed in the Laboratório de Herpetologia e Comportamento Animal, Departamento de Ecologia of the Universidade Federal de Goiás. The recordings of *S. wandae* were housed in the Coleção Científica de Vocalizações de Anfíbios Anuros do Museu Nacional, Rio de Janeiro (MNVOC 019/4; 7; 10). The advertisement calls of the *Scinax* cf. *fuscumarginatus*, *S. parkeri*, and *S. squalirostris* from Bolivia were extracted from audio CD Sounds of Frogs and Toads of Bolivia (De la Riva et al., 2002) with software SoundForge Demo version 6.0 and edited at sample rate frequency 22 kHz.

***Scinax pusillus* sp. nov.**

Figs. 1–2

Holotype.—MNRJ 51492, adult male, collected at Fazenda do Arsênio (17°48'6.02"S, 51°05'21.9"W; approximately 800 m above sea level; datum = WGS84), Municipality of Rio Verde, state of Goiás, Brazil, on 6 February 2008 by R. P. Bastos, L. Signorelli, and P. G. Gambale.

Paratopotypes.—MNRJ 51493, 51495–51500, ZUFG 3591–93, 3595, 3600–01, 3616–17, adult males, MNRJ 51494, ZUFG 3594, two adult females, all collected with the holotype.

Referred specimens.—Adult males, ZUFG 4068–4072, collected at Fazenda do Marlon (18°16'21.1"S, 51°56'35.4"W), Municipality of Serranópolis, state of Goiás, on 11–12 November 2008 by L. Signorelli and A. R.



FIG. 1.—*Scinax pusillus* sp. nov., holotype (MNRJ 51442, SVL 16.7 mm).

Morais. Adult males, ZUFG 5340, 5344–5345, Municipality of Jataí (17°44'12"S, 51°37'54"W), state of Goiás, on 10–12 January 2010 by J. Ramos and M. F. de Melo and ZUFG 5454–5473 on 15–17 December 2010 by J. Ramos, P. G. Gambale, and N. M. Maciel.

Diagnosis.—A species belonging to the *S. ruber* clade (sensu Faivovich et al., 2005) characterized by (1) small size (SVL of males, 15.9–18.6 mm; females, 18.1–18.7 mm); (2) body very slender; (3) snout strongly acute in lateral view; (4) subelliptical in dorsal view; (5) two lateral broad stripes blackish from posterior corner of the eye to inguinal region; (6) reduced webbing of toes; and (7) advertisement call is a single pulsed note, with a pulse period of 2–13 ms and a dominant frequency of 2.51–5.95 kHz.

Comparison with other species.—*Scinax pusillus* is the smallest species of the *S. ruber* clade. By its smaller male size (SVL 15.9–18.6 mm), the new species is easily distinguished from *S. acuminatus* (SVL 39.9–45.0 mm; Lutz, 1973), *S. cabralensis* (SVL 22.5–25.0 mm; Drummond et al., 2007), *S. camposseabrai* (SVL 28.9–33.5 mm; Car-

amaschi and Cardoso, 2006), *S. castroviejoi* (SVL 41.9 mm; De la Riva, 1993), *S. curicica* (SVL 25.2–30.2 mm; Pugliese et al., 2004), *S. eurydice* (SVL 30.0–33.0 mm; Bokermann, 1968), *S. fuscovarius* (SVL 41.0–44.0 mm; Cei, 1980), *S. maracaya* (SVL 26.7–28.0 mm; Cardoso and Sazima, 1980), *S. nasicus* (SVL 27.0–35.0 mm; Cei, 1980), *S. pachycrus* (SVL 24.7–31.4 mm; $n = 11$), *S. rogerioi* (SVL 25.1–32.6 mm; Pugliese et al., 2009), and *S. tigrinus* (SVL 28.4–30.8 mm; Nunes et al., 2010). The strongly acute snout in lateral view and reduced webbing of toes are similar between *S. pusillus* and *S. squalirostris*, but the new species is easily distinguished by its smaller size (*S. squalirostris* SVL 24.0–29.0 mm; Lutz, 1973) and snout subelliptical in dorsal view (pointed in *S. squalirostris*).

The most morphologically similar species to *S. pusillus* are *S. lutzorum*, *S. fuscomarginatus*, *S. parkeri*, *S. trilineatus*, and *S. wandae*. The males of the new species are smaller than *S. lutzorum* (SVL 23.7–25.0 mm; Cardoso and Pombal, 2010), *S. parkeri* (SVL 21.0–22.6 mm; Cardoso and Pombal, 2010), *S. trilineatus* (SVL 19.7–22.0 mm; Cardoso and Pombal,

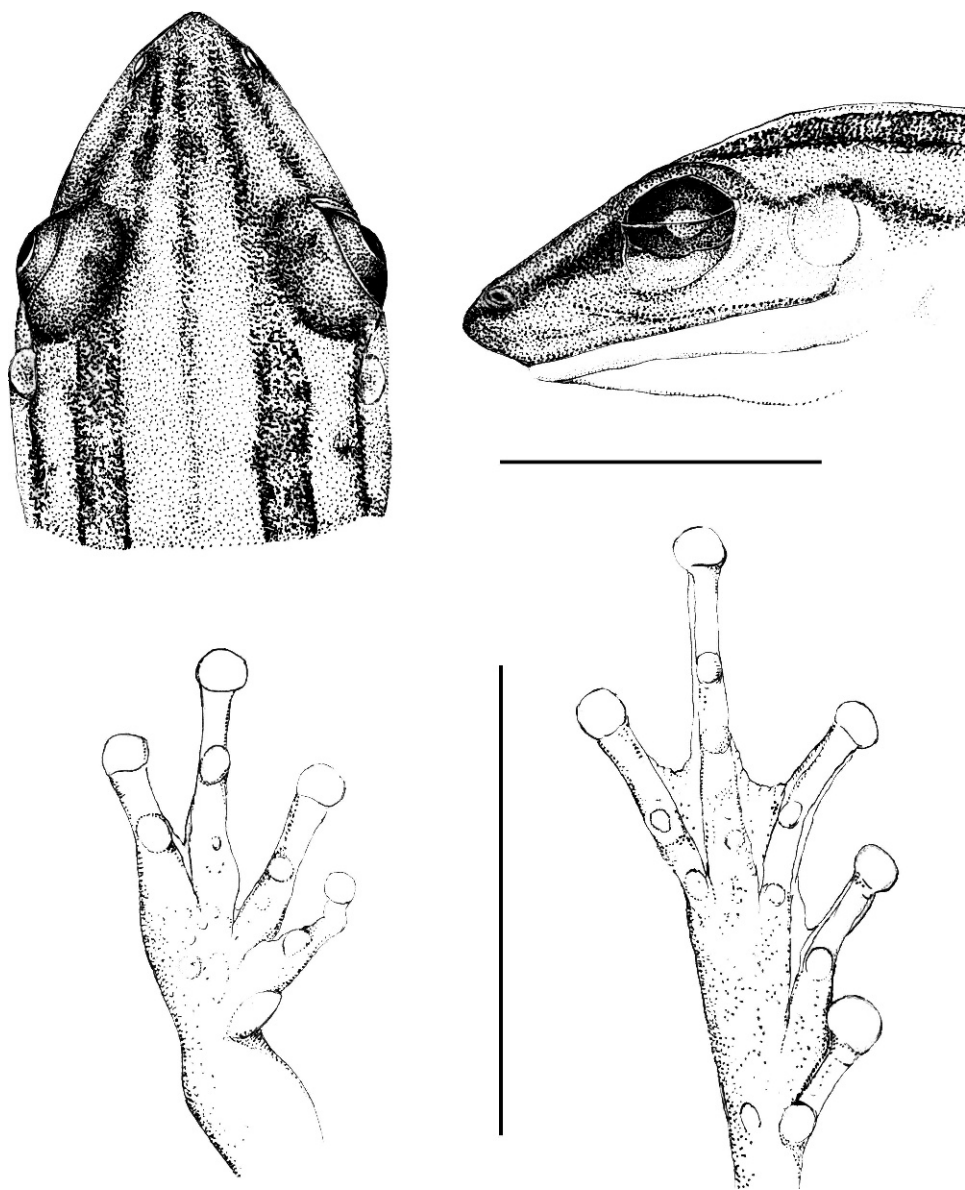


FIG. 2.—*Scinax pusillus* sp. nov., holotype. Dorsal and lateral views of head; ventral views of hand and foot. Scale = 5 mm.

2010; Hoogmoed and Gorzula, 1979), and *S. wandae* (SVL 19.5–23.0 mm males and females; Pyburn and Fouquette, 1971). Some overlapping occurs in male SVL between *S. pusillus* and *S. fuscomarginatus* (SVL of male, 16.7–22.1 mm; Cardoso and Pombal, 2010), but *S. pusillus* is generally smaller. Furthermore, *S. pusillus* can be distinguished from *S.*

fuscomarginatus, *S. lutzorum*, *S. parkeri*, *S. trilineatus*, and *S. wandae* by its much more slender body, snout that is subelliptical in dorsal view and strongly acute in lateral views, and reduced toe webbing (body slender, snout subovoid in dorsal view and protruding in lateral views, and toe webbing not reduced in these species).

Description of holotype.—Body very slender; small-sized; head about as broad as the body and approximately as long as it is broad; snout subelliptical in dorsal view and strongly acute in lateral view; nostrils directed laterally, nearly elliptical, located on a small elevation; canthus rostralis straight, weakly marked; loreal region oblique, narrow; eye medium-sized, protruding; tympanum weakly visible, medium-sized, nearly rounded, a few larger than the adhesive disc of the Finger 3; no developed supratympanic fold; vocal sac single, externally expanded, very large, and subgular; vocal slits large, laterally on mouth floor; tongue medium-sized, elongated, notched posteriorly, barely free behind; vomerine teeth in two series, narrowly separated, between choanae; choanae medium-sized, elliptical. Arm slender, forearm moderately slender; fingers moderately slender, medium-sized; finger lengths $I < II < IV < III$; no nuptial excrescence on inner surface of Finger I; finger discs small-sized, almost rounded; disc of Finger I smaller than those of the other fingers; inner metacarpal tubercle poorly developed, single, large, nearly elliptical; outer metacarpal tubercle weakly visible; subarticular tubercles single, small, rounded or nearly rounded; webbing absence between Finger I and II, very reducing between the other fingers. Legs moderately slender; inner surface of the right tarsus, before of Toe I, with a soft dermal fold (probably due to trauma); toe discs I–II smaller than toe disc III–V; Toe I disc of the right foot larger (probably due to trauma); inner metatarsal tubercle few visible, small, single, nearly oval; outer metatarsal tubercle small, single and protruding; toes long, moderately slender; toe lengths $I < II < III \approx V < IV$; subarticular and supernumerary tubercles single, small and rounded; adhesive toe discs small-sized, slightly expanded or rounded; webbing formula $I\ 2^+ - 2^{1/2}\ II\ 2^- - 3^+ III\ 1^{1/2} - 3^+ IV\ 3^+ - 1^{1/2}\ V$. Skin on upper, lateral and undersurfaces smooth, except by belly where it is weakly granular.

Color of holotype in preservative.—Dorsal general color light brownish with blackish thin dots, mainly on the nostril; two lateral broad stripes blackish from posterior corner of the eye to inguinal region; a thin blackish

longitudinal line between eyes; below the lateral stripes, a blackish dorsolateral stripe from nostrils to middle of flank; a brownish longitudinal line on shank; brownish dots on the shank and foramen. Undersurfaces cream, palm of hand, sole of foot, and lower lip with brownish thin dots. Eyes black.

Color in life and variation.—General dorsal color light brown to cream with brown stripes, which may achieve the cloacal region; drawing pattern always evident. A whitish strip under the eye and tympanum. Concealed parts of the legs light brown. Belly white to light brown. Throat greenish yellow. Iris golden.

The type series is alike in morphological traits and color pattern. In only one specimen the snout in lateral view is acute (others strongly acute). The adhesive discs are rounded to slightly expanded. Males are smaller than females. The measurements of 16 males and two females are summarized in Table 1.

Vocalization.—Two types of vocalizations were recorded. The advertisement call (Fig. 3) presented only a single note and varied from 366 to 700 ms (542 ± 54 ms; $n = 75$). Each call showed 63.86 ± 6.52 pulses (43–80 pulses; $n = 375$), which on average lasted 7 ± 0 ms (3–10 ms; $n = 375$). Minimum frequency ranged from 1808 to 3789 Hz (3031 ± 450 Hz; $n = 75$), and the maximum frequency ranged from 6115 to 9646 Hz (6981 ± 536 Hz; $n = 75$). The dominant frequency varied from 2517 to 5975 Hz (4837 ± 384 Hz; $n = 75$). The repetition rate varied from five to 24 calls/min ($n = 15$). The acoustic parameters are summarized in Table 2.

Only two individuals presented a second type of vocalization (Fig. 3). One of those individuals was from the Municipality of Serranópolis and the other was from the Municipality of Rio Verde. This type of vocalization exhibited only a single note, like the advertisement call. The note had a duration of 95 and 119 ms in the two recordings, respectively. The calls showed 30 and 39 pulses, which on average lasted 3 ± 1 ms (1–5 ms; $n = 10$). Minimum frequency ranged from 3014 to 3273 Hz, and maximum frequency ranged from 6201 to 7235 Hz. The dominant frequencies were 4210 and 5035 Hz.

TABLE 1.—Mean ($\bar{X}$), standard deviation (SD), and range of the measurements (millimeters) of holotype, males ($n = 16$, including the holotype) and females ($n = 2$) of *Scinax pusillus* sp. nov.

	Holotype	Males			Females
		$\bar{X}$	SD	Range	Range
SVL	16.7	17.0	0.7	15.9–18.6	18.1–18.7
HL	5.0	4.5	0.4	3.5–5.0	4.7–4.8
HW	5.2	5.0	0.3	4.4–5.4	5.4–5.5
ED	1.9	1.7	0.1	1.6–1.9	1.7
TD	0.8	0.8	0.1	0.6–1.2	0.9–1.0
IOD	1.7	1.9	0.2	1.7–2.1	1.8–2.1
IND	1.3	1.3	0.1	1.2–1.4	1.4
END	1.7	1.5	0.3	0.4–1.8	1.7
NSD	0.4	0.6	0.1	0.4–0.7	0.7–0.8
THL	6.6	6.9	0.4	6.0–7.8	7.1–7.2
TBL	7.7	8.4	0.5	7.6–9.3	8.1–9.5
FL	6.5	6.4	0.5	5.8–7.3	6.4–7.0

Natural history.—The Cerrado Biome covers approximately 2 million km², representing 22% of Brazil, plus small areas in eastern Bolivia and northwestern Paraguay. This biome extends from the southern borders of the Amazonian forest to areas in the southern states of São Paulo and Paraná, Brazil. The distribution of Cerrado is coincident with the plateau of central Brazil (Oliveira-Filho and Ratter, 2002).

Scinax pusillus has been found in permanent ponds located close to areas of crops and pasture (Fig. 4), as well as in veredas. Veredas are valley-side marshes where the water reaches or almost reaches the surface during the rainy season; these environments are widespread in the Cerrado Biome and may

include palm groves (*Mauritia flexuosa*; Oliveira-Filho and Ratter, 2002). Males were observed vocalizing with their heads oriented upward (Fig. 5) or slightly downward while perched on branches of vegetation located above the surfaces of shallow waters. Males of *S. fuscomarginatus* were observed vocalizing in deeper places in these same ponds.

Distribution.—The new species is known from the type locality in Rio Verde (17°48'6.02"S, 51°05'21.9"W), Jataí (17°44'12"S, 51°37'54"W), and Serranópolis (18°16'21.1"S, 51°56'35.4"W) municipalities in southwestern of state of Goiás, central Brazil (Fig. 6).

Etymology.—The specific name is a Latin word, an adjective that means very small and

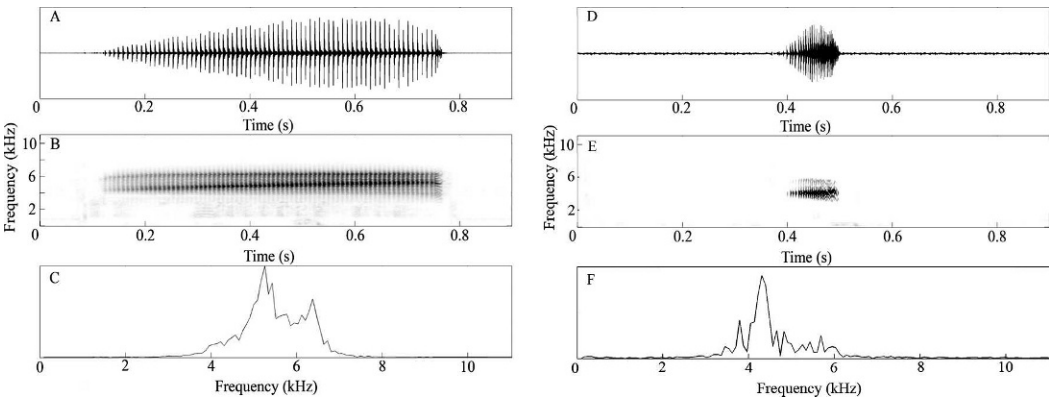


FIG. 3.—Left (top) waveform, (middle) spectrogram, and (bottom) power spectrum of the advertisement call of *Scinax pusillus* sp. nov. (ZUGF 3596) from type locality at Rio Verde, state of Goiás, Brazil, recorded on 6 February 2008; 2020 h. Air temperature, 25.5°C. Right (top) waveform, (middle) spectrogram, and (bottom) power spectrum of the second type of vocalization of *S. pusillus* sp. nov. (ZUGF 4070) from Serranópolis, state of Goiás, Brazil, recorded on 12 November 2008; 2100 h. Air temperature, 21.0°C.

TABLE 2.—Acoustic parameters of *Scinax fuscumarginatus* from Municipality of Rio Verde, Goiás, Brazil (air temperature, 22.3°C); *Scinax* cf. *fuscumarginatus* from Estación Biológica del Beni, Beni, Bolivia (air temperature, 24.5°C; De la Riva et al., 2002; track 72); *Scinax parkeri* from Buena Vista, Santa Cruz, Bolivia (De la Riva et al., 2002; track 77; air temperature, not available); *Scinax pusillus* sp. nov. from Municipality of Rio Verde and Serranópolis (air temperature, 19.5–25.5°C); *Scinax squillostris* from Municipality of Cristalina, Goiás, Brazil (air temperature, 18°C) and from La Paz, Bolivia (De la Riva et al., 2002; track 79; air temperature, 18°C); and *Scinax wandae* from San Martín, Colombia (MNVOC 197; air temperature, 24°C). Data are presented as mean $\pm$ SD, range, and (*n*).

Acoustic parameter	<i>S. fuscumarginatus</i> (<i>n</i> = 1)	<i>S. cf. fuscumarginatus</i> (<i>n</i> = 1) (note A)	<i>S. parkeri</i> (<i>n</i> = 1) ^a	<i>Scinax pusillus</i> (<i>n</i> = 15)	<i>S. squillostris</i> Brazil (<i>n</i> = 1)	<i>S. squillostris</i> Bolivia ^b (<i>n</i> = 1)	<i>S. squillostris</i> Bolivia ^b (<i>n</i> = 1)	<i>S. wandae</i> (<i>n</i> = 1)	<i>S. wandae</i> (<i>n</i> = 1)
Call repetition rate	15 $\pm$ 3 12–18 (3)	—	—	15.91 $\pm$ 4.97 5–24 (15)	62 62 (1)	—	—	22 22 (1)	25 25 (1)
Call duration (ms)	520 $\pm$ 36 412–580 (30)	431 $\pm$ 10 418–451 (7)	348 (1) 1	542 $\pm$ 54 366–700 (75)	664 $\pm$ 20 629–700 (20)	391 $\pm$ 8 378–407 (10)	402 $\pm$ 24 369–437 (10)	649 $\pm$ 34 585–710 (10)	539 $\pm$ 49 442–598 (9)
No. of notes	1	(7)	1	1	1	1	1	1	1
No. of pulses	90 $\pm$ 7 70–99 (21)	96 $\pm$ 3 93–101 (7)	(1) 66 (1)	(75) 63.86 $\pm$ 6.52 (43–80) (375)	46 $\pm$ 1 44–48 (20)	10 10 (10)	10 $\pm$ 1 10–11 (10)	100 $\pm$ 5 90–108 (10)	85 $\pm$ 7 70–93 (9)
Pulse duration	4 $\pm$ 1 3–5 (50)	3 $\pm$ 0 3–4 (35)	—	7 $\pm$ 0 3–10 (375)	6 $\pm$ 1 4–8 (100)	26 $\pm$ 2 18–33 (50)	26 $\pm$ 2 20–35 (50)	4 $\pm$ 0 3–5 (50)	—
Pulse period (ms)	5 $\pm$ 0 5 (50)	4 $\pm$ 0 4 (35)	5.14 $\pm$ 0.36 5–6 (14)	8.8 $\pm$ 0 2–13 (375)	14 $\pm$ 0 14–15 (100)	40 $\pm$ 1 29–45 (50)	40 $\pm$ 1 30–48 (50)	6 $\pm$ 0 5–7 (50)	6 $\pm$ 0 5–7 (45)
Range of frequency minima (Hz)	3395 $\pm$ 140 3100–3615 (30)	3705 $\pm$ 70 3617–3789 (7)	3875 (1)	3031 $\pm$ 450 1808–3789 (75)	2932 $\pm$ 19 2928–3014 (20)	3040 $\pm$ 42 3014–3100 (10)	2954 $\pm$ 152 2756–3186 (10)	2670 $\pm$ 0 2670–2756 (10)	2736 $\pm$ 38 2670–2756 (9)
Range of frequency maxima (Hz)	4690 $\pm$ 106 4478–4823 (30)	5512 $\pm$ 0 5512 (7)	2928 (1)	6981 $\pm$ 536 6115–9646 (75)	5085 $\pm$ 19 5081–5167 (20)	4995 $\pm$ 57 4909–5081 (10)	4918 $\pm$ 154 4565–5081 (10)	5676 $\pm$ 137 5426–5943 (10)	5847 $\pm$ 118 5684–6029 (9)
Dominant frequency (Hz)	4189 $\pm$ 75 4048–4392 (30)	4429 $\pm$ 46 4392–4478 (7)	4478 (1)	4837 $\pm$ 384 2517–5975 (75)	4273 $\pm$ 74 4048–4306 (20)	4366 $\pm$ 42 4306–4392 (10)	4151 $\pm$ 98 4048–4392 (10)	5081 $\pm$ 41 4995–5167 (10)	3378 $\pm$ 38 3359–3445 (9)

^a The quality of the sound recording did not permit analysis.
^b Individuals that apparently vocalized in an antiphonal manner.



FIG. 4.—Vereda (see text), the type locality of *Scinax pusillus*. This location is surrounded by cattle pasture.

refers to the small body sizes of frogs in the new species.

DISCUSSION

Table 2 summarizes the acoustic parameters from *S. fuscomarginatus* from Rio Verde, Goiás, Brazil; *S. cf. fuscomarginatus* from Estación Biológica del Beni, Beni, Bolivia (De la Riva et al., 2002); *S. parkeri* from Buena Vista, Santa Cruz, Bolivia (De la Riva et al., 2002); *S. squalirostris* from Cristalina, Goiás, Brazil, and from La Paz, Bolivia (De la Riva et al., 2002); *S. wandae* from San Martin, Colombia (MNVOC 019/07); and *S. pusillus* from Rio Verde (11 males) and Serranópolis (four males), Goiás, Brazil. Although on the average values may be distinct, we found overlapping of ranges parameter values in advertisement calls between the species analyzed here. The calls (Fig. 7) of *S. fuscomarginatus*, *S. cf. fuscomarginatus*, *S. parkeri* (not shown due to noise in the recording), *S. pusillus*, and *S. wandae* are similar, with pulsed notes, high number of pulses, and short pulse duration. To the human ear, these calls resemble a high buzz. Also, the morphology of these species is similar in having small and slender body and a large vocal sac (Cardoso and Pombal, 2010). The similarity of vocalizations and morphologies of *S. fuscomarginatus*, *S. parkeri*, and *S. pusillus* suggest a species group; however, these characters need to be evaluated as potential synapomorphies.

The acoustic parameters (call duration, number of pulses, pulse duration, and pulse



FIG. 5.—Male of *Scinax pusillus* vocalizing (individual was not collected); Municipality of Jataí, state of Goiás, central Brazil. Photo by N. M. Maciel.

period) of *S. squalirostris* from Brazil (Cristalina, Goiás) and Bolivia (La Paz; see Table 2) may indicate the existence of more than one species. Furthermore, the sizes and morphologies are variable among populations, which suggests a species complex.

Because of large variation in snout shape, vocal sacs, and inner metatarsal tubercles, Cardoso and Pombal (2010) suggested that *S. fuscomarginatus* is a species complex. The *S. fuscomarginatus* populations plus *S. parkeri* and *S. trilineatus* need a taxonomic revision.

As currently recognized, *S. fuscomarginatus* shows large variation. Hence, previous specimens of *S. pusillus* were probably mistakenly identified as *S. fuscomarginatus* in herpetological collections. The geographic ranges of species inhabiting lowlands, such as the Cerrado Biome, tend to be large (Duellman, 1999), and often include artificial environments. Although we found *S. pusillus* at only three sites, it probably has a broad distribution.

The discovery of *S. pusillus* and other species recently described from Cerrado (e.g., Cardoso and Pombal, 2010; Nunes et al., 2010; Pugliese et al., 2009) show that anurans are undersampled in this Biome. Faunal Inventories, particularly those focusing

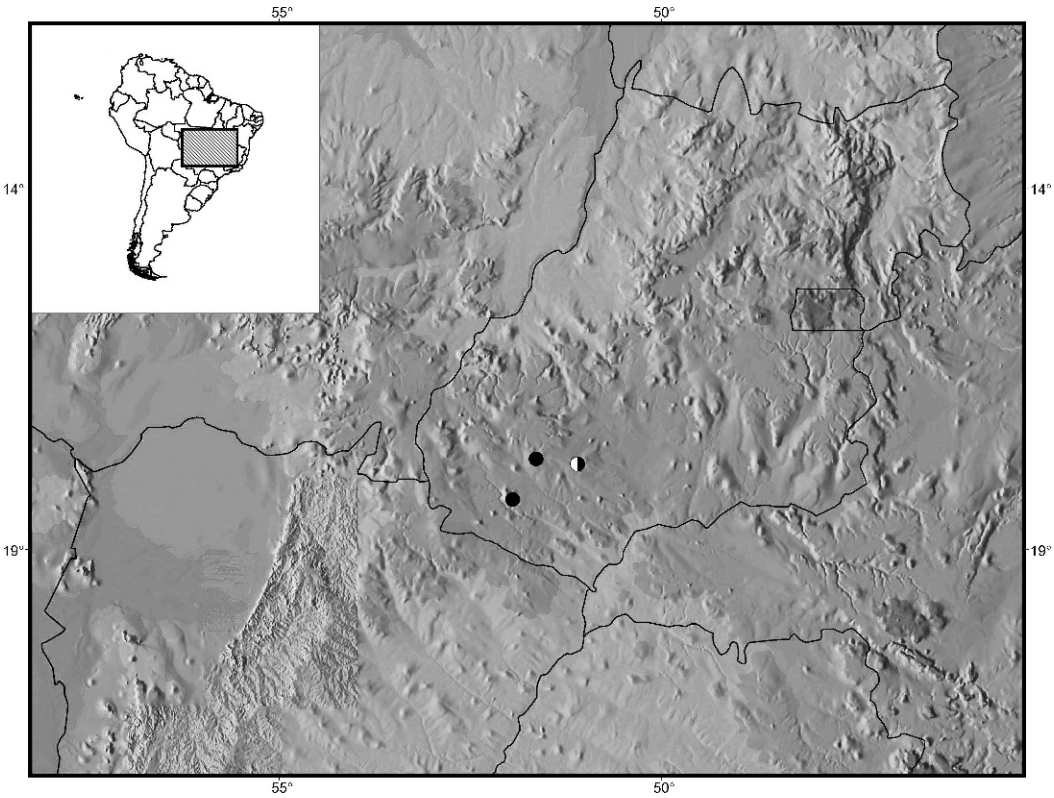


FIG. 6.—Geographical distribution of *Scinax pusillus*. The black-and-white circle marks the type locality.

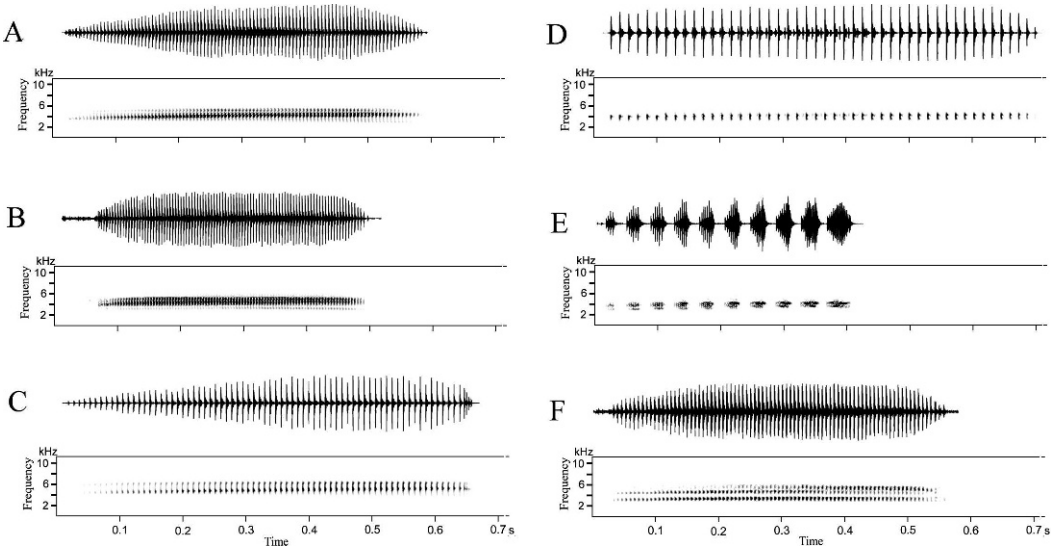


FIG. 7.—Waveform and spectrograms of the advertisement call of the six species of *Scinax*. (A) *Scinax fuscomarginatus* from Rio Verde, Goiás, Brazil. (B) *Scinax* cf. *fuscomarginatus* from Estación Biológica del Beni, Beni, Bolivia. (C) *Scinax pusillus* from Rio Verde, Goiás, Brazil. (D) *Scinax squalirostris* from Cristalina, Goiás, Brazil. (E) *Scinax squalirostris* from La Paz, Bolivia. (F) *Scinax wandae* from San Martin, Colombia. For other *Scinax* species, see Table 2.

on anurans, are urgently needed due to rapid conversion of Cerrado landscape into farmland and pastureland (Klink and Moreira, 2002).

Acknowledgments.—We are grateful to M. W. Cardoso, B. Jennings, and I. Nunes for suggestions and comments on the manuscript; to F. R. Costa by English review; to P. R. Nascimento for the line drawing and I. Nunes for Fig. 1; to S. P. Carvalho e Silva, J. Faivovich, R. W. Heyer, C. Mello, M. R. S. Pires, I. Sazima, and H. Zaher for loaned and/or permitted study of material under their care; to A. R. Morais and N. M. Maciel for assistance with the fieldwork; and to J. D. Lynch, J. J. Mueses-Cisneros, and D. Sanchez for assistance and kindness to JPP in Bogota and Villavicencio, Colombia. N. M. Maciel made the picture of the specimen alive. We thank the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Fundação Carlos Chagas de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ), Fundação de Amparo à Pesquisa do Estado de Goiás (FAPEG), and ANPCyT PICT 2007/202 for financial support. The Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) issued the collecting permit.

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Accepted: 22 May 2011

Associate Editor: Christopher Raxworthy

APPENDIX

Specimens Examined

Scinax acuminatus.—BRAZIL: MATO GROSSO: Cáceres MNRJ 2370; Cuiabá MNRJ 39698; PARAGUAY: Ciudad de Asunción MNRJ 39903; no data MNRJ 40352. *Scinax cabralensis*.—BRAZIL: MINAS GERAIS: Joaquim Felício MNRJ 42883 (holotype), MNRJ 42884–88 (paratopotypes); Buenópolis MNRJ 42886 (paratype). *Scinax camposseabrai*.—BRAZIL: BAHIA: Maracás MNRJ 4048 (paratype); MINAS GERAIS: Matias Cardoso MNRJ 21739–42, MNRJ 36258. *Scinax cardosoi*.—BRAZIL: RIO DE JANEIRO: Resende: MNRJ 61178–91; Teresópolis ZUF RJ 4125–26 (paratypes). *Scinax cur-icica*.—BRAZIL: MINAS GERAIS: Catas Altas, Serra do Caraça MNRJ 55010–11; Diamantina MNRJ 39552–55; Mariana LZV 125A–129A; Ouro Branco LZV 477A; Ouro Preto MNRJ 41693–701; Santana do Riacho

BRAZIL: MINAS GERAIS: Lima Duarte MNRJ 46439–43; Santana do Riacho MNRJ 45341–44; SÃO PAULO: São José do Barreiro MNRJ 56529. ***Scinax staufferi***.—HONDURAS: OLANCHO: Salamá MNRJ 58989–90; NICARAGUA: REGIÓN AUTÓNOMA DEL ATLÁNTICO NORTE: Gracias a Dios cape, Caño Awawás stream MNRJ 58991–92. ***Scinax trilineatus***.—BRAZIL: PARÁ: Belém MNRJ 60201–06. *Scinax* aff. *trilineatus*: BRAZIL: PARÁ: Belém MNRJ 60207–10. ***Scinax wandae***.—COLOMBIA: META: Villavicencio USNM 151965–66.