



A new *Scinax* Wagler belonging to the *S. catharinae* clade (Anura: Hylidae) from the State of Alagoas, northeastern Brazil

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Abstract

A new species of the *Scinax catharinae* group, morphologically similar to *S. strigilatus*, is described from Municipality of Murici (09°12'S, 35°52'W, 509 m a. s. l.), State of Alagoas, northeastern Brazil. *Scinax muriciensis* **sp. nov.** is characterized by the medium size (adult males SVL 27.0–28.9 mm), W-shaped interocular spot, green flash color in the inguinal region and hidden areas of thigh and shank, rounded snout in dorsal view, externally distinguished vocal sac, marked canthus rostralis, vomerine teeth in two straight series, non-developed nuptial pad, presence of supernumerary tubercles on feet, lack of externally well developed inguinal glands, foot webbing formula I – II 1^{1/2}–3⁺ III 1^{1/2}–2^{1/2} IV 2^{1/2}–1^{1/2} V. This is the northernmost distribution in the *Scinax catharinae* clade.

Key words: Hylinae, *Scinax muriciensis* **sp. nov.**, taxonomy, Atlantic forest, preserved areas

Resumo

Uma nova espécie do grupo de *Scinax catharinae*, morfologicamente similar a *S. strigilatus*, é descrita do Município de Murici (09°12'S, 35°52'W, 509 m a. s. l.), Estado de Alagoas, nordeste do Brasil. *Scinax muriciensis* **sp. nov.** é caracterizada pelo tamanho médio (comprimento rostro-cloacal de machos adultos 27.0–28.9 mm), mancha interocular em forma de W, colorido verde claro na região inguinal e nas áreas ocultas das coxas e tíbias, focinho arredondado em vista dorsal, saco vocal distinto externamente, canto rostral marcado, dentes vomerinos em duas séries retas, calo nupcial não desenvolvido, tubérculos supranumerários presentes, glândula inguinal não desenvolvida externamente, fórmula das membranas interdigitais do pé I – II 1^{1/2}–3⁺ III 1^{1/2}–2^{1/2} IV 2^{1/2}–1^{1/2} V. Esta representa a distribuição mais ao norte do clado de *Scinax catharinae*.

Palavras-chave: Hylinae, *Scinax muriciensis* **sp. nov.**, taxonomia, Floresta Atlântica, áreas preservadas

Introduction

The species of the genus *Scinax* Wagler occur from Mexico to Argentina and Uruguay; currently more than one hundred species are recognized (Frost 2011). These are placed in two clades: the *Scinax catharinae* clade and the *S. ruber* clade (Faivovich *et al.* 2005). The clade of *S. catharinae* is diagnosed by 90 transformations in nuclear and mitochondrial proteins and ribosomal genes (Faivovich *et al.* 2005). Additionally, morphological synapomorphies suggested by Faivovich (2002) include absence of the anterior process of the suprascapula, internal vocal sac, distal division of the middle branch of the *m. extensor digitorum comunis longus*, and insertion of the medial side of this branch on the tendon of the *m. extensor brevis medius digiti IV*. Presently, 29 species are placed in this clade (Pombal *et al.* 2010): *S. agilis* (Cruz & Peixoto), *S. albicans* (Bokermann), *S. angrensis* (B. Lutz), *S. argyreornatus* (Miranda-Ribeiro), *S. ariadne* (Bokermann), *S. aromothyella* Faivovich, *S. berthae* (Barrio), *S. brienti* (De Witte),

S. canastrensis (Cardoso & Haddad), *S. carnevalli* (Caramaschi & Kisteumacher), *S. catharinae* (Boulenger), *S. centralis* Pombal & Bastos, *S. flavoguttatus* (A. Lutz & B. Lutz), *S. heyeri* (Peixoto & Weygoldt), *S. hiemalis* (Haddad & Pombal), *S. humilis* (A. Lutz & B. Lutz In B. Lutz, 1954), *S. jureia* (Pombal & Gordo), *S. kautskyi* (Carvalho e Silva & Peixoto), *S. littoralis* (Pombal & Gordo), *S. longilineus* (B. Lutz), *S. luizotavioi* (Caramaschi & Kisteumacher), *S. machadoi* (Bokermann & Sazima), *S. obtriangulatus* (B. Lutz), *S. ranki* (Andrade & Cardoso), *S. rizibilis* (Bokermann), *S. skaios* Pombal, Carvalho Jr., Canelas & Bastos, *S. strigilatus* (Spix), *S. trapicheiroi* (A. Lutz & B. Lutz In B. Lutz, 1954), and *S. tripui* Lourenço, Nascimento & Pires.

During fieldwork at Fazenda Bananeiras, Municipality of Murici, State of Alagoas, Northeastern Brazil, we collect an undescribed species of *Scinax* that morphology is similar to *S. strigilatus*. Herein, we describe this new species of the *Scinax catharinae* clade from the Atlantic Forest in Northeastern Brazil.

Material and methods

Museum acronyms are Adolpho Lutz collection, housed in the Museu Nacional, Rio de Janeiro, Brazil (AL-MN), Museu Nacional, Rio de Janeiro, Brazil (MNRJ), Museu de História Natural da Universidade Federal de Alagoas, Maceió, Brazil (MUFAL), and National Museum of Natural History, Washington DC, USA (USNM). Specimens used for comparisons are listed in the Appendix. Abbreviations used for measurements of adult specimens are SVL (snout-vent length), HL (head length), HW (head width), ED (eye diameter), TD (tympanum diameter), UEW (upper eyelid width), IOD (interorbital distance), IND (internarial distance), END (eye-nostril distance), THL (thigh length), TBL (tibia length), and FL (foot length, including tarsus). All measurements are in millimeters and, except for FL, follow Duellman (1970). Webbing formula notation follows Savage and Heyer (1967), as modified by Myers and Duellman (1982). The degree of development of the nuptial pads follow Lourenço *et al.* (2009).

Taxonomic account

Scinax muriciensis sp. nov.

Figures 1–2

Holotype. MNRJ 60189, adult male (Fig. 1), collected at Fazenda Bananeiras (09°12'S, 35°52'W, 509 m a. s. l.), Municipality of Murici, State of Alagoas, Brazil, on 15–17 November 2005, by M.G. Lima, G. Skuk, M.C.C. Silva, F.F. Silva, and C.A.G. Cruz.

Paratypes. MNRJ 60187–60188 and MUFAL 5856, adult males, collected with the holotype.

Diagnosis. The new species differs from other species in the *Scinax catharinae* clade by the following combination of traits: medium size (adult males SVL 27.0–28.9 mm); W-shaped interocular blotch; green flash color in the inguinal region and hidden areas of thigh and shank; mucronate snout in dorsal view; externally distinguished vocal sac; marked canthus rostralis; vomerine teeth in two straight series; non-developed nuptial pad; presence of supernumerary tubercles on feet; absence of externally well developed inguinal glands; foot webbing formulae I – II 1^{1/2}–3⁺ III 1^{1/2}–2^{1/2} IV 2^{1/2}–1^{1/2} V.

Comparison with other species. *Scinax muriciensis* can be distinguished from *S. agilis*, *S. angrensis*, *S. argyreornatus*, *S. aromothyella*, *S. berthae*, *S. carnevallii*, *S. centralis*, *S. heyeri*, *S. luizotavioi*, *S. machadoi*, *S. ranki*, and *S. tripui* by the greater SVL in males (combined SVLs 13.5–26.5 mm of males in those species; Cruz & Peixoto 1983 “1982”, Andrade & Cardoso 1987, Peixoto and Weygoldt 1987, Caramaschi & Kisteumacher 1989, Pombal and Bastos 1996, Faivovich 2005, Lourenço *et al.* 2009, present study), and from *S. rizibilis* by the greater SVL, but with slight overlap (SVLs of males 25.0–27.0 mm; B. Lutz 1973). The smaller SVL of males separates *S. muriciensis* from *S. ariadne*, *S. brieni*, and *S. catharinae* (combined SVLs 30.4–38.1 mm of males in these species; Bokermann 1967, Heyer *et al.* 1990, Lourenço *et al.* 2009, present study). The W-shaped interocular spot differentiates *S. muriciensis* from *S. agilis*, *S. albicans*, *S. argyreornatus*, *S. ariadne*, *S. aromothyella*, *S. berthae*, *S. brieni*, *S. canastrensis*, *S. carnevallii*, *S. catharinae*, *S. centralis*, *S. hiemalis*, *S. jureia*, *S. longilineus*, *S. luizotavioi*, *S. machadoi*, *S. obtriangulatus*, *S. ranki*, *S. rizibilis*, and *S. skaios*, in which the interocular spot is an inverted triangle and, sometimes, T-shaped, and from *S. trapicheiroi* by its very large W-shaped interocular spot. In life, green flash

colors in the inguinal region and on the hidden surfaces of thigh and shank distinguish *S. muriciensis* from *S. argyreornatus*, *S. aromothyella*, *S. berthae*, *S. canastrensis*, *S. centralis*, *S. flavoguttatus*, *S. heyeri*, *S. longilineus*, and *S. machadoi* (yellow or orange in these species; Faivovich 2005), *S. Luizotavioi* (brown marbling; Caramaschi & Kisteumacher 1989), *S. brienii* and *S. trapicheiroi* (blue; B. Lutz 1973, Lourenço *et al.* 2009), *S. humilis* (pale blue to pallid turquoise; B. Lutz 1954, 1973), and *S. obtriangulatus* (grayish violet, Lutz 1973), and, sometimes, *S. carnevallii* and *S. jureia* (black blotches on a whitish or green background; Caramaschi & Kisteumacher 1989, Pombal and Gordo 1991). The mucronate snout in dorsal view differentiates *S. muriciensis* from the rounded snout of *S. ariadne*, *S. aromothyella*, *S. brienii*, *S. catharinae*, *S. hiemalis*, *S. humilis*, *S. jureia*, *S. obtriangulatus*, *S. ranki*, *S. strigilatus*, and *S. trapicheiroi*, the sub-elliptical snout of *S. angrensis*, *S. argyreornatus*, *S. canastrensis*, *S. centralis*, *S. longilineus*, *S. Luizotavioi*, and *S. rizibilis*, the subovoid snout of *S. flavoguttatus*, *S. heyeri*, *S. skaios*, and *S. tripui*, and the truncate snout of *S. machadoi*. *Scinax muriciensis* is distinguished from *S. aromothyella* and *S. berthae* by the externally distinguished vocal sac. *Scinax muriciensis* can be differentiated by its marked canthus rostralis from *S. agilis*, *S. albicans*, *S. angrensis*, *S. argyreornatus*, *S. ariadne*, *S. aromothyella*, *S. berthae*, *S. canastrensis*, *S. carnevallii*, *S. centralis*, *S. flavoguttatus*, *S. hiemalis*, *S. humilis*, *S. kautskyi*, *S. littoralis*, *S. longilineus*, *S. Luizotavioi*, *S. rizibilis*, *S. skaios*, *S. strigilatus*, and *S. tripui* (well marked canthus rostralis). Vomerine teeth in two straight series distinguishes *S. muriciensis* from *S. agilis*, *S. angrensis*, *S. argyreornatus*, *S. ariadne*, *S. canastrensis*, *S. kautskyi*, *S. littoralis*, and *S. longilineus* (vomerine teeth oblique in *S. agilis*, *S. angrensis*, *S. argyreornatus*, *S. kautskyi*, *S. littoralis*, and *S. longilineus*; convex in *S. ariadne* and *S. canastrensis*). The presence of a non-developed nuptial pad sets *S. muriciensis* apart from *S. rizibilis* (developed and hypertrophied nuptial pad) and *S. tripui* (developed and non-hypertrophied nuptial pad). *Scinax muriciensis* can be differentiated from *S. angrensis*, *S. Luizotavioi*, and *S. skaios* by the presence of supernumerary tubercles on the feet (absent in those species). The lack of externally well developed inguinal glands distinguishes *S. muriciensis* from *S. centralis* and *S. hiemalis*. The foot webbing formula of *S. muriciensis* (I – II 1^{1/2}–3⁺ III 1^{1/2}–2^{1/2} IV 2^{1/2}–1^{1/2} V) differentiates this new species from *S. aromothyella* (I – II 2–3⁺ III 2–3⁺ IV 3–2 V), *S. skaios* (I – II 1–3⁻ III 1–2 IV 2–1 V), *S. strigilatus* (I – II 2–3⁻ III 1^{1/2}–3⁻ IV 3–1^{1/2} V), and *S. tripui* (I – II 1^{1/2}–2^{1/2} III 1^{1/2}–2^{1/2} IV 2^{1/2}–1⁺ V). In addition, *Scinax muriciensis* can be distinguished from *S. strigilatus*, the most morphologically similar species, by the large granules on the forearm, higher and more acuminate snout in profile, and rounded finger discs (scattered small granules on the forearm, lower snout in profile, and elliptical finger discs in *S. strigilatus*).

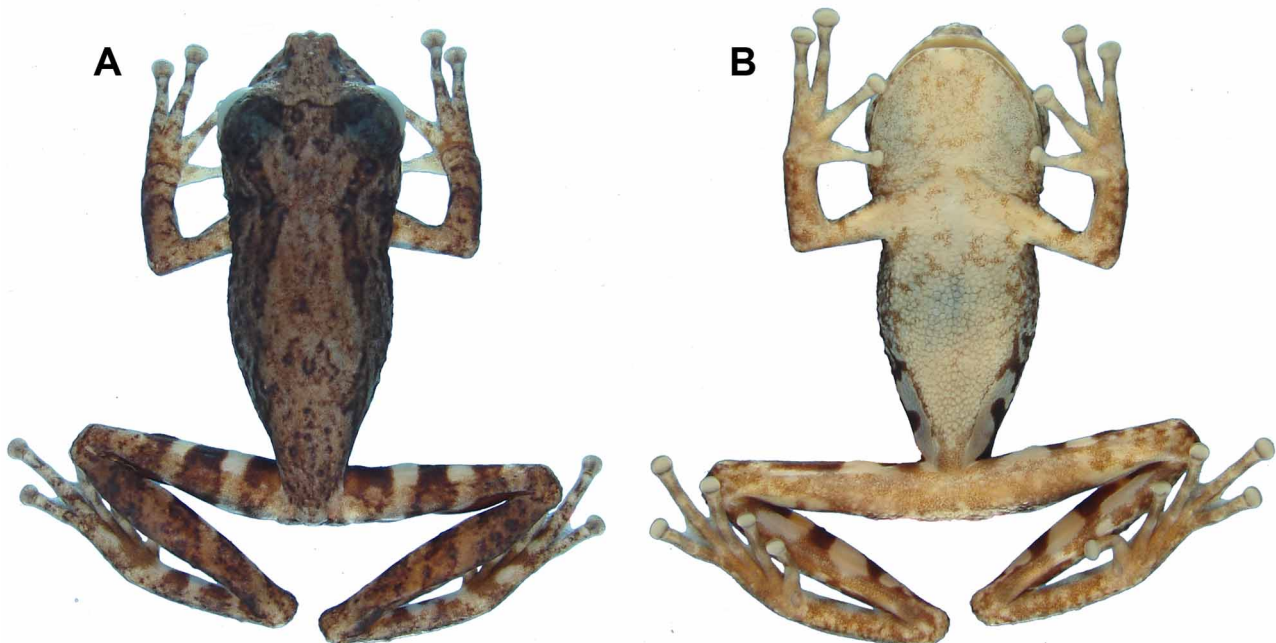


FIGURE 1. *Scinax muriciensis* sp. nov. (A) Dorsal and (B) ventral views of holotype, MNRJ 60189, adult male, SVL 27.0 mm.

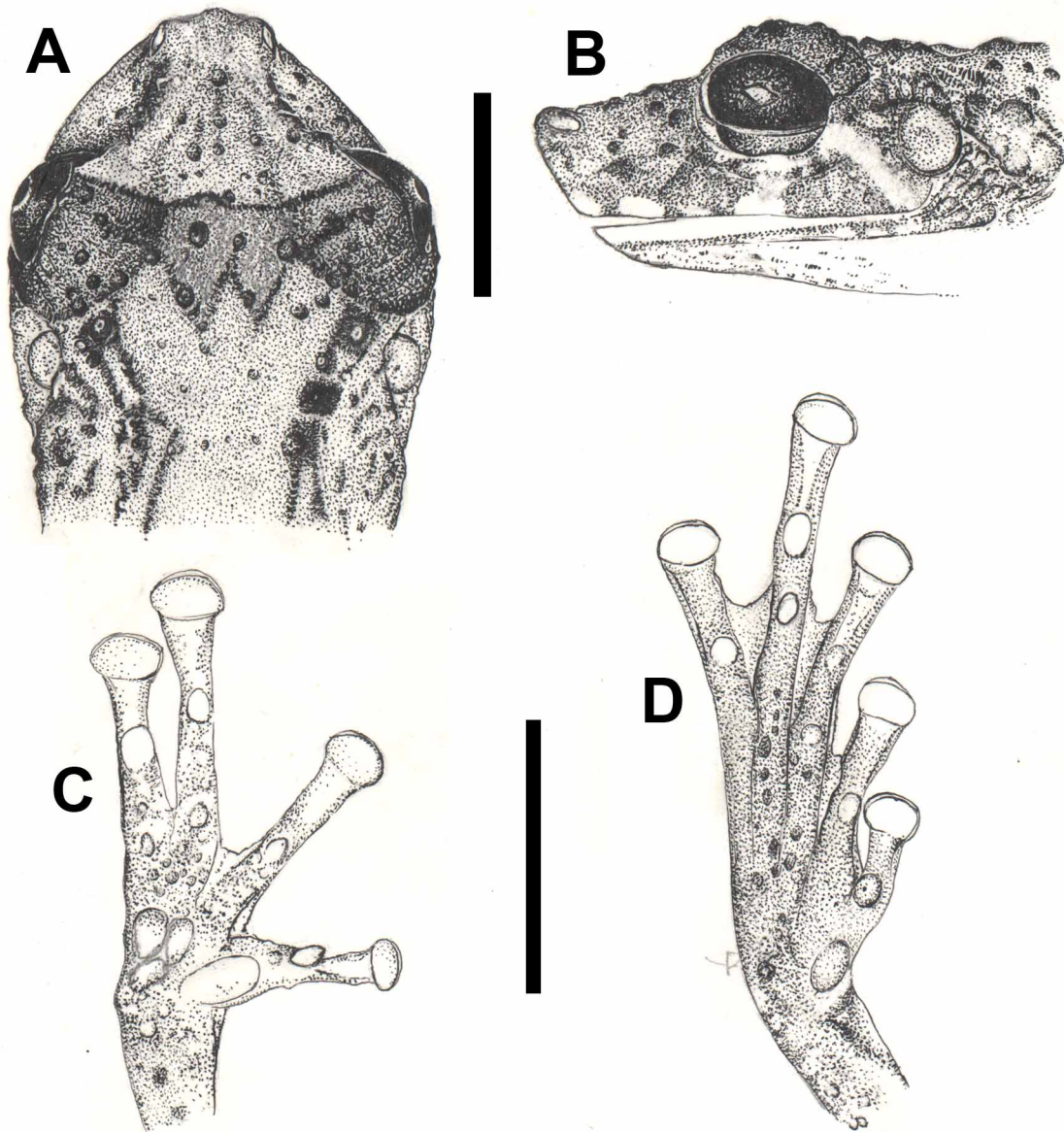


FIGURE 2. Holotype of *Scinax muriciensis* sp. nov., MNRJ 60189, adult male. (A) Dorsal and (B) lateral views of head, and ventral views of (C) hand, and (D) foot. Scale 0.5 mm.

Description of holotype. Body slender; head longer than wide (head length 39.6% of SVL, head width 37% of SVL); snout mucronate in dorsal view, and protruding in profile (Figs 2A, B); nostrils lateral with elliptical opening, dorsolateral, protruding at a level slightly posterior to tip of snout; internarial distance 77% of END; canthus rostralis curved with some tubercles dispersed; loreal region slightly concave; eye large (32% of HL), protruding laterally; interorbital distance 27% of HW; tympanum large (47% of ED), rounded, with distinct tympanic ring; and supratympanic fold well defined, granular; tongue cordiform, free posteriorly; choanae large, ovoid, well separated from one another; vomerine teeth in two short transverse series between choanae; vocal slits large. Arms and forearms slender; forearm longer than upper arm; hand (Fig. 2C) lacking nuptial pads; length of fingers $I < II < IV < III$; webbing basal between Fingers I, II, and III, absent between Fingers III and IV; elliptical finger discs wider than long; single and conical subarticular tubercles; inner metacarpal tubercle large, elliptical; outer metacarpal tubercle divided in three ovoid parts, two anterior and one posterior; supernumerary tubercles small, dispersed on the hand. Legs slender, tibia longer than thigh, sum of thigh and tibia lengths greater than SVL; foot slender (Fig. 2D), approximately two thirds of the sum of thigh and tibia lengths; length of toes $I < II < III < V < IV$; webbing formula $I - II \ 1^{1/2} - 3^+ \ III \ 1^{1/2} - 2^{1/2} \ IV \ 2^{1/2} - 1^{1/2} \ V$; toe discs elliptical, wider than long; subarticular tubercles single, conical.

cal; outer metatarsal tubercle small, rounded; inner metatarsal tubercle medium-sized, elliptical; supernumerary tubercles small, dispersed on the foot. Skin of dorsal surfaces and flanks moderately rugose, covered by tubercles of different sizes; ventral surfaces uniformly granular; inguinal gland not visible.

Measurements of holotype. SVL 27.0, HL 10.7, HW 10.0, IND 2.4, END 3.1, ED 3.4, TD 1.6, UEW 3.0, IOD 2.7, THL 14.3, TL 15.6, FL 19.2.

Color. In life, general pattern pale brown, with a dark brown W-shaped interocular mark (Fig. 3); presence of fragmented dark brown stripe from nostril to anterior corner of eye; vertical white stripe from eye to maxilla and another one from eye to shoulder; pair of wide pale brown stripes from the upper eyelids to the inguinal region; pair of fragmented pale brown stripes from the posterior corner of the eye, covering tympanum, extending to midflank, both with narrow, dark brown borders; granules on dorsum and flanks pale brown; scattered dark brown lines and spots on dorsum at midbody and sacral region. White spot in axilla; arms pale tan with transverse pale brown bars bordered by dark brown; hands with many small dark brown spots. Legs pale brown with four dark brown transverse bars on anterior and dorsal surfaces; posterior surfaces of thighs almost completely dark brown. Tarsus and feet pale brown with many dark brown. Hidden surfaces of flanks and thighs green. Ventral surfaces white with scattered, dark brown dots on gular region and forelimbs, densely dotted on legs. In preservative, the color pattern is the same, but colors are faded.



FIGURE 3. Topotype of *Scinax muriciensis* sp. nov., photographed in life (unvouchered photo) by M.G. de Lima.

Variation. Male specimens are congruent with respect to the morphologic characters. Some specimens have the snout less protruding. The color in preservative could be more or less faded; ventral region of specimens vary in their degree of dotted and/or marbled of dark brown over cream background. Females are unknown. The measurement variation is presented in the Table 1.

Geographical distribution and Natural History. *Scinax muriciensis* is known from the Fazenda Bananeira, in the Mata da Bananeira (09°12'S, 35°52'W, 509 m a. s. l.; Fig. 4), a mountainous region characterized by rugged terrain with elevations of 200–600 m. mostly covered by tropical rain forest. The Mata da Bananeira is located in the Municipality of Murici, about 52 km north from the Municipality of Maceió; is placed in the Serra da Palha and, together with the Serra do Ouro and the Serra das Águas Belas, compose the Estação Ecológica (ESEC) de Murici, which has an area of 6,116 ha and lies within the municipalities of Murici, Messias, and Flexeiras, State of Alagoas, Northeastern Brazil. The area has warm, humid climate, with a dry summer and a wet autumn-winter sea-

son. The rainy season begins in April and lasts until August, and the highest rainfall occurs between May and July. The period of greatest drought occurs between November and January, December being the driest month. The average annual precipitation and temperature are 2,167 mm and 24°C, respectively. Specimens of *Scinax muriciensis* were captured near a forest stream, standing upright 1.0–1.5 m above the ground. In this environment were collected adults of *Aplastodiscus sibilatus* (Cruz, Pimenta and Silvano), *Chiasmocleis* sp., *Crossodactylus dantei* (Carcerelli and Caramaschi), *Hypsiboas semilineatus* (Spix), *H. freicanecae* (Carnaval and Peixoto), *Ischnocnema* aff. *ramagi*, and tadpoles of *Aplastodiscus sibilatus*, *Crossodactylus dantei*, *Agalychnis granulosa* (Cruz), *Hypsiboas freicanecae*, and *Proceratophrys renalis* (Miranda-Ribeiro).

TABLE 1. Range, mean, and standard deviation (SD) of the measurements (mm) of the type specimens of *Scinax muriciensis* sp. nov. (n = 4 adult males).

Characters	Range	Mean	SD
SVL	27.0–28.9	27.6	0.86
HL	10.7–11.8	11.0	0.51
HW	9.8–10.8	10.1	0.46
IND	2.1–2.4	2.2	0.15
END	3.0–3.6	3.2	0.29
ED	3.2–3.7	3.4	0.21
UEW	2.6–3.0	–	–
IOD	2.7–2.9	2.8	0.11
TD	1.5–2.1	1.7	0.26
THL	14.0–14.6	14.3	0.24
TL	15.2–15.8	15.5	0.25
FL	18.9–19.6	19.2	0.29

The Mata da Bananeira is in the “Pernambuco Center of Endemism” (*sensu* Prance 1982, 1987), which includes forest fragments north of the Rio São Francisco with a high degree of endemism for species of birds, bromeliads, reptiles, and amphibians, that currently are threatened by human activities, mainly by deforestation for the development of sugar-cane plantations, subsistence farming and pastures for cattle.

Etymology. Specific epithet in allusion to the type-locality, the Municipality of Murici, State of Alagoas, Northeastern Brazil.

Remarks. The species of the *Scinax catharinae* clade are distributed in well preserved environments in Atlantic or Cerrado gallery forests associated with streams (Pombal *et al.* 2010). These areas covered a wide geographic distribution, from the Argentina to the State of Bahia in northeastern Brazil, plus the states of Minas Gerais and Goiás in Central Brazil (Frost 2011). Thus, the new species here described represents the northernmost geographic limit to the *S. catharinae* clade.

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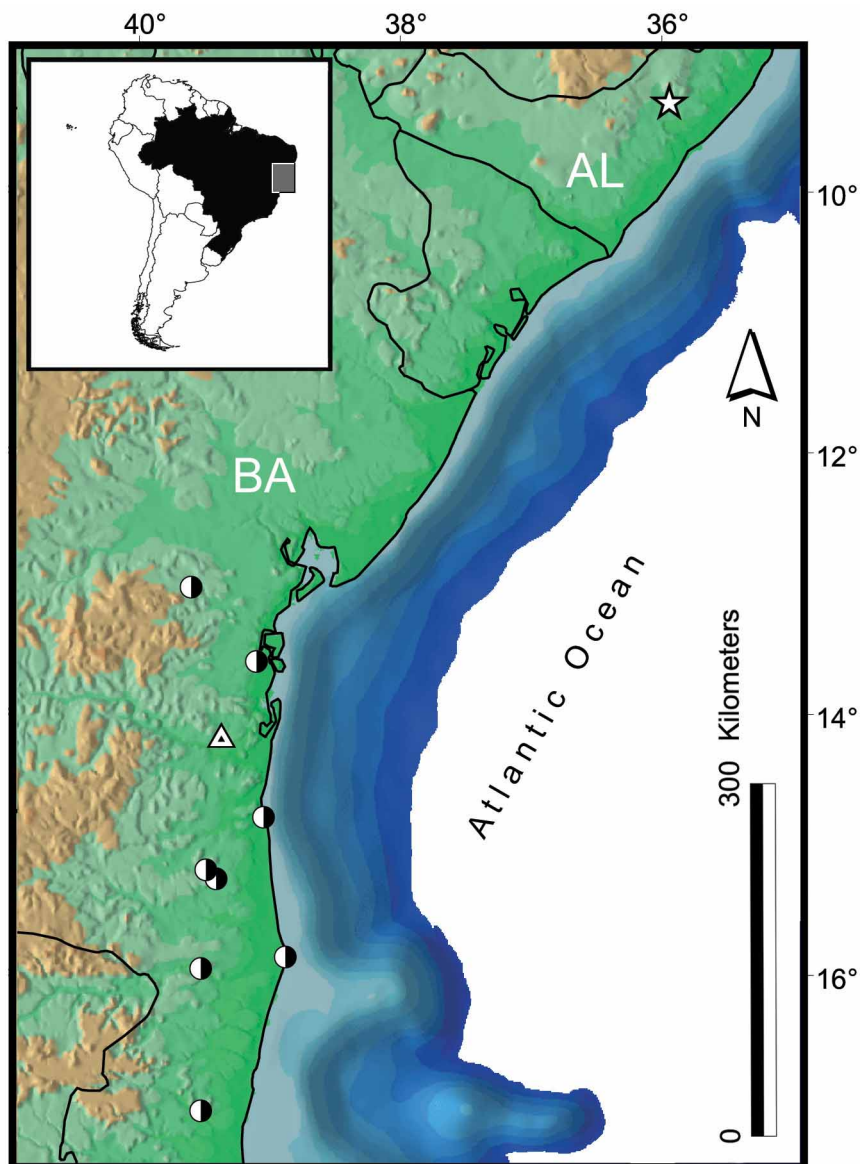


FIGURE 4. Geographic distribution map of *Scinax muriciensis* **sp. nov.** (star) and morphologically similar *S. strigilatus* (triangle = type-locality and circle = further localities) in Northeastern Brazil. AL = State of Alagoas; BA = State of Bahia.

References

- Andrade, G.V. & Cardoso, A.J. (1987) Reconhecimento do grupo *rizibilis* e descrição de uma nova espécie de *Hyla* (Amphibia, Anura). *Revista Brasileira de Zoologia*, 3, 433–440.
- Bokermann, W.C.A. (1967) Dos nuevas especies de *Hyla* del grupo *catharinae* (Amphibia, Hylidae). *Neotropica*, 13, 62–66.
- Caramaschi, U. & Kistumacher, G. (1989) Duas novas espécies de *Oloolygon* Fitzinger, 1843, do Sudeste do Brasil (Amphibia, Anura, Hylidae). *Boletim do Museu Nacional, Nova Série, Zoologia*, 327, 1–15.
- Cruz, C.A.G. & Peixoto, O.L. (1982) Uma nova espécie de *Hyla* do Estado do Espírito Santo, Brasil (Amphibia, Anura, Hylidae). *Revista Brasileira de Biologia*, 42, 721–724.
- Duellman, W.E. (1970) The hylid frogs of Middle America. Monograph of the Museum Natural History, University of Kansas, 753pp.
- Faivovich, J. (2002) A cladistic analysis of *Scinax* (Anura: Hylidae). *Cladistics*, 18, 367–393.
- Faivovich, J. (2005) A new species of *Scinax* (Anura: Hylidae) from Misiones, Argentina. *Herpetologica*, 61, 69–77.
- Faivovich, J., Haddad, C.F.B., Garcia, P.C.A., Frost, D.R., Campbell, J.A. & Wheeler, W.C. (2005) Systematic review of the frog family Hylidae, with special reference to Hylinae: phylogenetic analysis and taxonomic revision. *Bulletin of the American Museum of Natural History*, 294, 1–240.

- Frost, D.R. 2011. Amphibian Species of the World: an Online Reference. V5.5 (31 January 2011). Available in: <http://research.amnh.org/vz/herpetology/amphibia/index.php>. American Museum of Natural History, New York, USA (accessed on 23 May 2011).
- Heyer, W.R., Rand, A.S., Cruz, C.A.G., Peixoto, O.L. & Nelson, C.E. (1990) Frogs of Boracéia. *Arquivos de Zoologia*, 31, 237–410.
- Lourenço, A.C.C., Nascimento, L.B. & Pires, M.R.S. (2009) A new species of the *Scinax catharinae* species group (Anura: Hylidae) from Minas Gerais, southeastern Brazil. *Herpetologica*, 65, 468–479.
- Lutz, B. (1954) Anfíbios anuros do Distrito Federal. *Memórias do Instituto Oswaldo Cruz*, 52, 155–238.
- Lutz, B. (1973) *Brazilian Species of Hyla*. University of Texas Press, Austin and London, xviii + 260 pp.
- Myers, C.W. & Duellman, W.E. (1982) A new species of *Hyla* from Cerro Colorado, and other tree frog records and geographical notes from Western Panama. *American Museum Novitates*, 2752, 1–32.
- Peixoto, O.L. & Weygoldt, P. (1987) Notes on *Ololygon heyeri* Weygoldt, 1986 from Espírito Santo, Brazil (Amphibia: Salientia: Hylidae). *Senckenbergiana Biologica*, 68, 1–9.
- Pombal Jr., J.P. & Bastos, R.P. (1996) Nova espécie de *Scinax* Wagler, 1830 do Brasil Central (Amphibia, Anura, Hylidae). *Boletim do Museu Nacional, Nova Série, Zoologia*, 371, 1–11.
- Pombal Jr., J.P. & Gordo, M. (1991) Duas novas espécies de *Hyla* da Floresta Atlântica no Estado de São Paulo (Amphibia, Anura). *Memórias do Instituto Butantan*, 53, 135–144.
- Pombal Jr., J.P. Carvalho Jr., R.R., Canelas, M.A.S. & Bastos R.P. (2010). A new *Scinax* of the *S. catharinae* species group from Central Brazil (Amphibia: Anura: Hylidae). *Zoologia*, 27, 795–802.
- Prance, G.T. (1982) Forest refuges: evidences from woody angiosperms. In: Prance, G.T. (ed.) *Biological Diversification in the Tropics*. Columbia University Press, New York, pp. 137–158.
- Prance, G.T. (1987) Biogeography of neotropical plants. In: Whitmore, T.C. & Prance, G.T. (Eds.) *Biogeography and Quaternary History in Tropical America*. Clarendon Press, Oxford, pp. 175–196.
- Savage, J.M. & Heyer, W.R. (1967) Variation and distribution in the tree-frog genus *Phyllomedusa* in Costa Rica, Central America. *Beiträge zur Neotropischen Fauna*, 5, 111–131.

APPENDIX. Additional specimens examined.

- Scinax agilis*: BRAZIL, State of Bahia: Porto Seguro (MNRJ 29803), Belmonte (MNRJ 46853–46854); State of Espírito Santo: Linhares (MNRJ 4146, MNRJ 14210–14213, paratypes); Guarapari (MNRJ 43094–95).
- Scinax albicans*: BRAZIL, State of Rio de Janeiro: Parque Nacional da Serra dos Órgãos, Teresópolis (MNRJ 4053, paratype, MNRJ 39930–35); Nova Friburgo (MNRJ 23393–96); Cachoeiras de Macacu (MNRJ 40080–82).
- Scinax angrensis*: BRAZIL, State of Rio de Janeiro: Angra dos Reis (MNRJ 2018–2512); Mangaratiba (MNRJ 43504–08); Parati (MNRJ 44115–17).
- Scinax argyreornatus*: BRAZIL, State of Bahia: Porto Seguro (MNRJ 37929–30); Canavieiras (MNRJ 40303–08); State of Espírito Santo: Linhares (MNRJ 22967–23038); Santa Teresa (MNRJ 26100–31, MNRJ 38390–36); State of Rio de Janeiro: Itaguaí (MNRJ 32036–42); Magé (MNRJ 54987–95).
- Scinax ariadne*: BRAZIL, State of São Paulo: São José do Barreiro (MNRJ 4051, paratype, MNRJ 43611); State of Rio de Janeiro: Teresópolis (MNRJ 55654).
- Scinax aromothyella*: ARGENTINA, Province Misiones: San Vicente (MNRJ 56445, paratype).
- Scinax berthae*: ARGENTINA, Province Buenos Aires: Punta Lara (MNRJ 3590, paratype), San Isidro (MNRJ 59527–28). BRAZIL, State of São Paulo: Botucatu (MNRJ 34761–65); State of Rio Grande do Sul: Santa Maria (MNRJ 39897).
- Scinax brienti*: BRAZIL, State of São Paulo: Paranapiacaba (AL-MN 2592–94 topotypes).
- Scinax canastrensis*: BRAZIL, State of Minas Gerais: São Roque de Minas (MNRJ 4147, holotype, MNRJ 4148, paratype).
- Scinax carnevallii*: BRAZIL, State of Minas Gerais: Marliéria (MNRJ 4182, holotype, MNRJ 4183–200, paratypes); Caratinga (MNRJ 4201–09).
- Scinax catharinae*: BRAZIL, State of Santa Catarina: Corupá (MNRJ 168), São Bento do Sul (MNRJ 44411–414, MNRJ 1738, MNRJ 1801–1803, MNRJ 9475), Florianópolis (MNRJ 55639); State of Paraná: Guaratuba (MNRJ 35106–107, MNRJ 1789); State of São Paulo: São José do Barreiro (MNRJ 2084–87).
- Scinax centralis*: BRAZIL, State of Goiás: Silvânia (MNRJ 17465, holotype, MNRJ 17466–17475, paratypes, MNRJ 32239–44, topotypes).
- Scinax flavoguttatus*: BRAZIL, State of São Paulo: Serra da Bocaina, São José do Barreiro (AL-MN 2090, holotype, AL-MN 2091, paratype, MNRJ 23404–07, topotypes); State of Rio de Janeiro: Cambuci (MNRJ 51483–84); Duque de Caxias (MNRJ 53688–03); Petrópolis (MNRJ 57575–76); Vale da Revolta, Teresópolis (MNRJ 53950–58); Reserva Ecológica de Guapiaçu, Cachoeiras de Macacu (MNRJ 46536, MNRJ 53311); State of Minas Gerais: Parque Nacional do Itatiaia, Itamonte (MNRJ 59457).
- Scinax heyeri*: BRAZIL, State of Espírito Santo: Santa Teresa (USNM 255230, paralectotype).
- Scinax hiemalis*: BRAZIL, State of São Paulo: Campinas (MNRJ 5973–74, topotypes), Botucatu (MNRJ 30645–75; MNRJ 40008–09), São Sebastião (MNRJ 32530–32).
- Scinax humilis*: BRAZIL, State of Rio de Janeiro: Duque de Caxias (MNRJ 1478, paralectotype); Nova Iguaçu (MNRJ 2248,

lectotype), Mangaratiba (MNRJ 39886–91), Guapimirim (MNRJ 23411–12, MNRJ 40095–103, MNRJ 47987, MNRJ 59027–29).

Scinax jureia: BRAZIL, State of São Paulo: Estação Ecológica Juréia-Itatins, Iguape (MNRJ 14202–03, paratypes).

Scinax kautskyi: BRAZIL, State of Espírito Santo: Reserva Biológica de Duas Bocas, Cariacica (MNRJ 27889–30, MNRJ 27956).

Scinax longilineus: BRAZIL, State of Minas Gerais: Poços de Caldas (MNRJ 4060, holotype, MNRJ 40618, topotype); Belo Horizonte (MNRJ 16003–07, MNRJ 30966–69).

Scinax luizotavioi: BRAZIL, State of Minas Gerais: Serra do Caraça, Catas Altas (MNRJ 4210, holotype, MNRJ 4211–16, paratypes); Peti, São Gonçalo do Rio Abaixo (MNRJ 4473–508 and MNRJ 4509–16, paratypes, MNRJ 32462–74, MNRJ 36781–804; MNRJ 50619–21); MNRJ 52361–63, MNRJ 56475–78).

Scinax machadoi: BRAZIL, State of Minas Gerais: Serra do Cipó, Jaboticatubas (MNRJ 17476–77, paratypes, MNRJ 39696, topotype).

Scinax ranki: BRAZIL, State of Minas Gerais: Poços de Caldas (MNRJ 49657 topotype).

Scinax rizibilis: BRAZIL, State of São Paulo: Ribeirão Branco (MNRJ 18224–25, MNRJ 17654); Parque Estadual Intervales, Ribeirão Grande (MNRJ 28131–52); State of Santa Catarina: Serra Alta, Rio Vermelho (MNRJ 50150–97).

Scinax strigilatus: BRAZIL, State of Bahia: Amargosa (MNRJ 55860); Arataca, Fazenda Santa Cruz (MNRJ 44987–88); Belmonte, Fazenda Taquara (MNRJ 38099); Ibirapitanga, Fazenda Pedra Formosa (MNRJ 38098 Neotype, 38091–97 topotypes); Ilhéus, Cabruca do Campus da UESC (MNRJ 48694); Itamaraju, Fazenda Nova Pau Brasil (MNRJ 46805–06); Itapebi, Fazenda Palmeira (38101–03); Jussari, Reserva Particular do Patrimônio Natural Serra do Teimoso (MNRJ 38980, 44946–49); Nilo Peçanha, Fazenda São João (MNRJ 38100).

Scinax obtriangulatus: BRAZIL, State of Minas Gerais: Parque Nacional do Itatiaia, Brejo da Lapa, Itamontes (MNRJ 4035).

Scinax skaios: BRAZIL, State of Goiás: Santa Rita do Novo Destino (MNRJ 54471 holotype, 54472–74 paratypes).

Scinax trapicheiroi: BRAZIL, State of Rio de Janeiro: Rio de Janeiro (MNRJ 3615–17, MNRJ 3618–25, syntypes); Magé (MNRJ 56154–55).

Scinax tripui: BRAZIL, State of Minas Gerais: Ouro Preto (MNRJ 42890 holotype, MNRJ 48763, MNRJ 48765–48767, MNRJ 48762, MNRJ 48764, MNRJ 48743–48745).