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A new species of *Rhinella* Fitzinger, 1826 from the Atlantic Rain Forest, Eastern Brazil (Amphibia, Anura, Bufonidae)

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ABSTRACT

A new species of the genus Rhinella *is described from Canavieiras, southern State of Bahia, in the Atlantic Rain Forest of Eastern Brazil.* Rhinella hoogmoedi *sp. nov. is characterized by the medium size for the genus (SVL 39.4-52.1 mm in males), snout rounded in dorsal view, with a vertical apical ridge which gives a nearly mucronate aspect, and nearly acute in profile, antorbital and supra-orbital crests developed, parietal crest poorly developed, post-orbital crest large, forming a small lateral ledge, tympanum evident, vertebral apophyses not salient on dorsum, presence of a dorsolateral line of pointed tubercles on the external border of the parotoid gland, continuing along the lateral side of body to the groin, a rounded tubercle at the posterior corner of mouth, and vocal slits present. The new species is distributed from the State of Ceará to the State of Paraná, Brazil.*

Keywords: Amphibia. Anura. Bufonidae. *Rhinella hoogmoedi* sp. nov. Atlantic Rain Forest.

INTRODUCTION

Toads of the currently known genus *Rhinella* Fitzinger, 1826, as proposed by Frost *et al.* (2006) for including the former *Bufo typhonius* or *Bufo margaritifer* species groups, have one of the most complex taxonomical history among the anurans (see Caramaschi & Niemeyer, 2003, for a revision). Frost *et al.* (2006) included in the genus all species once associated to the former *Bufo typhonius* or *Bufo margaritifer* groups, resulting in 16 taxons: *R. acutirostris* (Spix, 1824), *R. alata* (Thominot, 1884), *R. castaneotica* (Caldwell, 1991), *R. ceratophrys* (Boulenger, 1882), *R. cristinae* (Vélez-Rodrigues and Ruiz-Carranza, 2002), *R. dapsilis* (Myers & Carvalho, 1945), *R. intermedia* (Günther, 1858), *R. iserni* (Jiménez-de-la-Espada, 1875), *R. margaritifera* (Laurenti, 1768), *R. nasica* (Werner, 1903), *R. proboscidea* (Spix, 1824), *R. roqueana* (Melin, 1941), *R. scitula* (Caramaschi & Niemeyer, 2003), *R. sclerocephala* (Mijares-Urrutia & Arends, 2001), *R. stanlaii* (Lötters & Köhler, 2000), and *R. sternosignata* (Günther, 1858). However, Frost (2006) pointed out that *R. sternosignata* in fact belongs to the genus *Chaunus* Wagler, 1828 according to Vélez-Rodriguez (2005), who transferred this species out of *Rhinella* (as the *Bufo typhonius* group) and into *Chaunus* (as the *Bufo granulosus* group), close to *Chaunus humboldti* (Gallardo, 1965). In his turn, *Bufo intermedius* Günther, 1858, besides the controversy respecting its type locality, was included in the synonymy of *Bufo simus* Schmidt, 1857 [currently in the synonymy of *Chaunus spinulosus*

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(Wiegmann, 1834); see Frost, 2006] by Nieden (1923), and removed from the *Bufo margaritifer* group by Hoogmoed (1989a), who suggested that it was a member of the *Bufo valliceps* group (Frost, 2006); by implication, *R. intermedia* (*sensu* Frost *et al.,* 2006) must be in the genus *Cranopsis* Cope, 1875, as *Cranopsis intermedia* (Günther, 1858). Additionally, *Bufo alatus* Thominot, 1884 was tentatively placed in the synonymy of *Bufo acutirostris* Spix, 1824 by Hoogmoed (1986, 1989b), but posteriorly was recognized as a possibly separated species by Lötters & Köhler (2000), and removed from the synonymy of *B. acutirostris* by Gorzula & Señaris (1999), opinion followed by Frost *et al.* (2006) and Frost (2006). Summing up, by the exclusion of *R. sternosignata* and *R. intermedia,* and by the other hand by maintaining *R. alata* and *R. acutirostris* as separated species, the genus *Rhinella* is actually composed by 14 species.

According to Frost (2006), most of the species included in *Rhinella* occurs in northwestern South America (Colombia, Venezuela, Peru, Equador, Guiana, Bolivia, and Brazilian Amazonia), reaching the southern Central America; one species, *R. scitula,* is associated to the "cerrados" savannas of Central-Western Brazil (Caramaschi & Niemeyer, 2003). Many species did not have well established taxonomic boundaries, other have been synonymized, and a lot of unnamed populations have been detected (see an overview in Caramaschi & Niemeyer, 2003). Among the unnamed populations, one of them was earlier detected by Hass *et al.* (1995) as occurring in the Atlantic Rain Forest of southern State of Bahia, Brazil. In this paper, we describe this new species and present its geographical distribution.

MATERIAL AND METHODS

Examined specimens are housed in the Museu Nacional, Rio de Janeiro, RJ, Brazil (MNRJ), Adolpho Lutz Collection, Museu Nacional, Rio de Janeiro, RJ, Brazil (AL-MN), Célio F.B. Haddad Collection, Universidade Estadual Paulista, Rio Claro, SP, Brazil (CFBH), Museu de História Natural, Universidade Estadual de Campinas, Campinas, SP, Brazil (ZUEC), and Museu de Zoologia, Universidade de São Paulo, SP, Brazil (MZUSP). Comparisons with other species were performed mainly on basis of published data. Examined specimens are referred in the Appendix 1.

Measurements were taken with digital calipers to the nearest 0.1 mm. Abbreviations of the measurements are: SVL (snout-vent length); HL (head length); HW (head width); IND (internarial distance); END (eye to nostril distance); ED (eye diameter); UEW (upper eyelid width); IOD (interorbital distance); POCL (postorbital crest length); HTD (horizontal tympanum diameter); VTD (vertical tympanum diameter); PGL (parotoid gland length); HAL (hand length); THL (thigh length); TL (tibia length); FL (foot length). Terminology follows Heyer *et al.* (1990). Plantar formula follows Savage & Heyer (1967), modified by Myers & Duellman (1982).

RESULTS

Rhinella hoogmoedi sp. nov.

Figures 1-3, Table 1

Bufo sp. AA, BB, CC, DD – Hass *et al.* (1995).

Holotype: MNRJ 40325, adult male (Fig. 1), collected at Fazenda Santa Clara, Municipality of Canavieiras (15°41'S, 38°57'W, ca. 5 m in altitude), State of Bahia, Brazil, by B.V.S. Pimenta, in 21-24 October 2005.

Paratypes: All collected at the type locality: MNRJ 40326-40331, males, collected with the holotype; MNRJ 40508-40510, males, collected by B.V.S. Pimenta and R.V. Lopes, in 15-17 December 2005.

Diagnosis: A species belonging to the genus *Rhinella* (*sensu* Vélez-Rodrigues, 2005; Frost *et al.,* 2006), characterized by: (1) medium size for the genus (SVL 39.4-52.1 mm in males); (2) snout rounded in dorsal view, with a vertical apical ridge which gives a nearly mucronate aspect;

TABLE 1. Range, mean ($\bar{x}$), and standard deviation (SD) of the measurements of the type specimens of *Rhinella hoogmoedi* sp. nov. (n = number of specimens).

	Males (n=10)		
	Range	$\bar{x}$	SD
SVL	39.4-52.1	47.9	6.37
HL	12.2-19.4	15.3	2.02
HW	14.4-22.6	17.7	2.34
IND	2.5-4.0	3.2	0.38
END	3.9-5.8	4.6	0.60
ED	3.8-6.0	4.8	0.64
UEW	3.3-4.6	4.0	0.42
IOD	6.0-10.8	7.8	1.39
POCL	4.1-7.2	5.3	0.98
HTD	2.8-4.1	3.4	0.45
VTD	3.3-4.7	4.0	0.44
PGL	5.6-8.7	7.0	1.03
HAL	10.2-16.0	12.4	1.59
THL	15.7-25.8	20.2	2.71
TL	15.1-24.5	19.3	2.75
FL	22.4-35.2	27.7	3.59

(3) snout nearly acute in profile; (4) antorbital and supra-orbital crests developed, parietal crest poorly developed; (5) post-orbital crest large, forming a lateral ledge; (6) tympanum evident; (7) vertebral apophyses generally not salient on dorsum or with four tubercles poorly salient; (8) presence of a dorsolateral line of spinulose tubercles on the external border of the parotoid gland, continuing along the lateral side of body to the groin; (9) a rounded tubercle at the posterior corner of mouth; (10) vocal slits present in males.

Comparisons with other species: Besides the allopatric geographical distribution respectinc all other species of the genus, *Rhinella hoogmoedi* sp. nov. is distinguished from *R. ceratophrys, R. cristinae, R. iserni, R. margaritifer, R. roqueana,* and *R. sclerocephala* by the generally absence

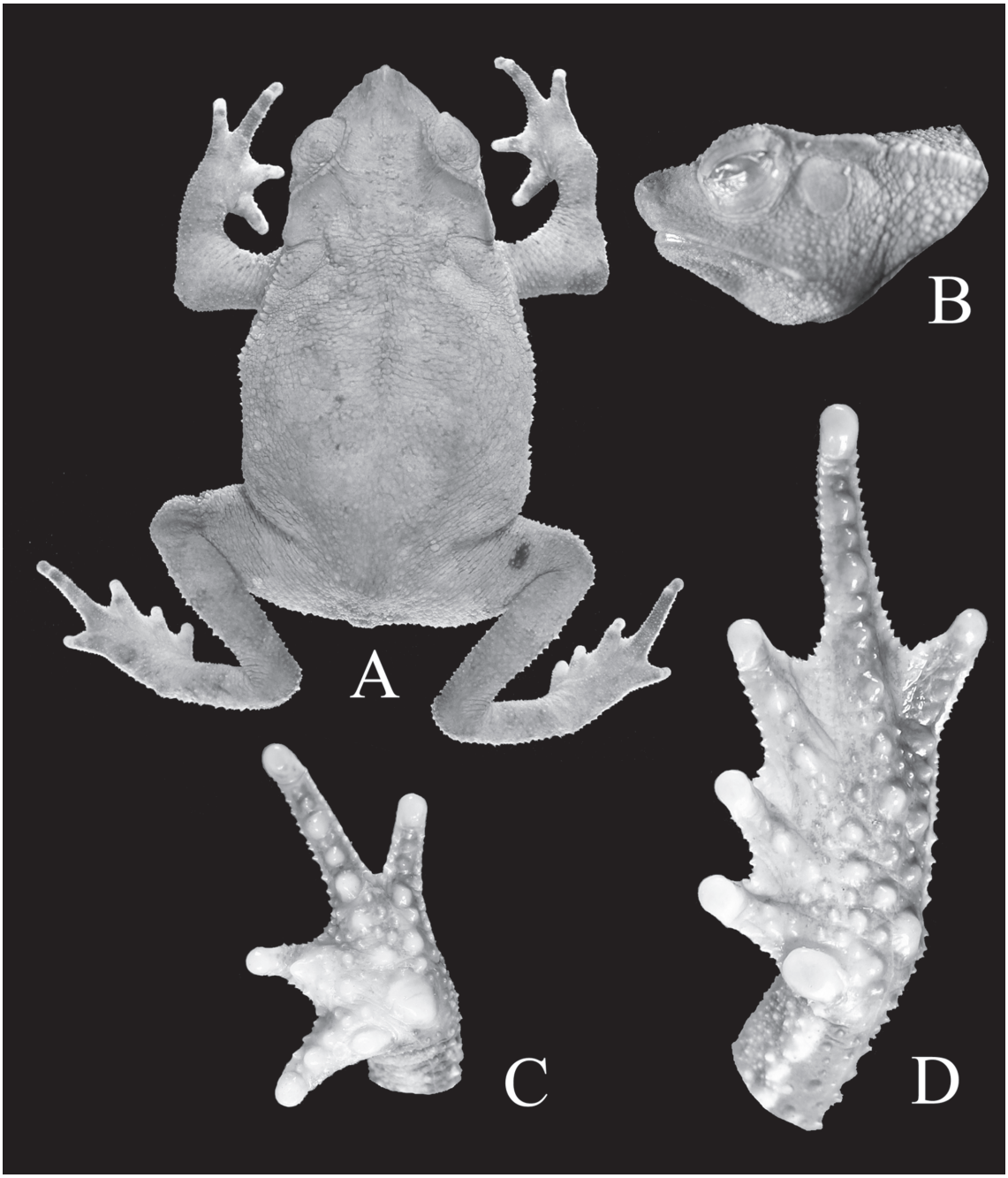

FIGURE 1. *Rhinella hoogmoedi* sp. nov. (MNRJ 40325, holotype, SVL 51.3 mm). (A) Dorsal view. (B) Head profile. (C) Hand. (D) Foot.

of vertebral apophyses salient on dorsum (present in those species). Additionally, the new species has evident tympanum and tympanic annulus (hidden in *R. ceratophrys, R. cristinae, R. iserni,* and barely distinct in *R. roqueana*); upper eyelid normal (upper eyelid produced in a spinelike, strongly projecting beyond the eye in *R. ceratophrys*); tubercle at the posterior corner of mouth present (absent in *R. cristinae* and *R. iserni*); post-orbital crest large, forming a ledge (post-orbital crest short, thick, blunt in *R. cristinae,* thickened, as wide as the parotoid gland in *R. iserni,* largely developed, forming expanded bony crests in *R. margaritifer,* and prominent and thick, but not hypertrophied upwards or laterally from body in *R. sclerocephala*); line of tubercles on lateral margin of parotoid gland present (absent in *R. cristinae* and only marked in *R. roqueana*); parietal crest poorly developed

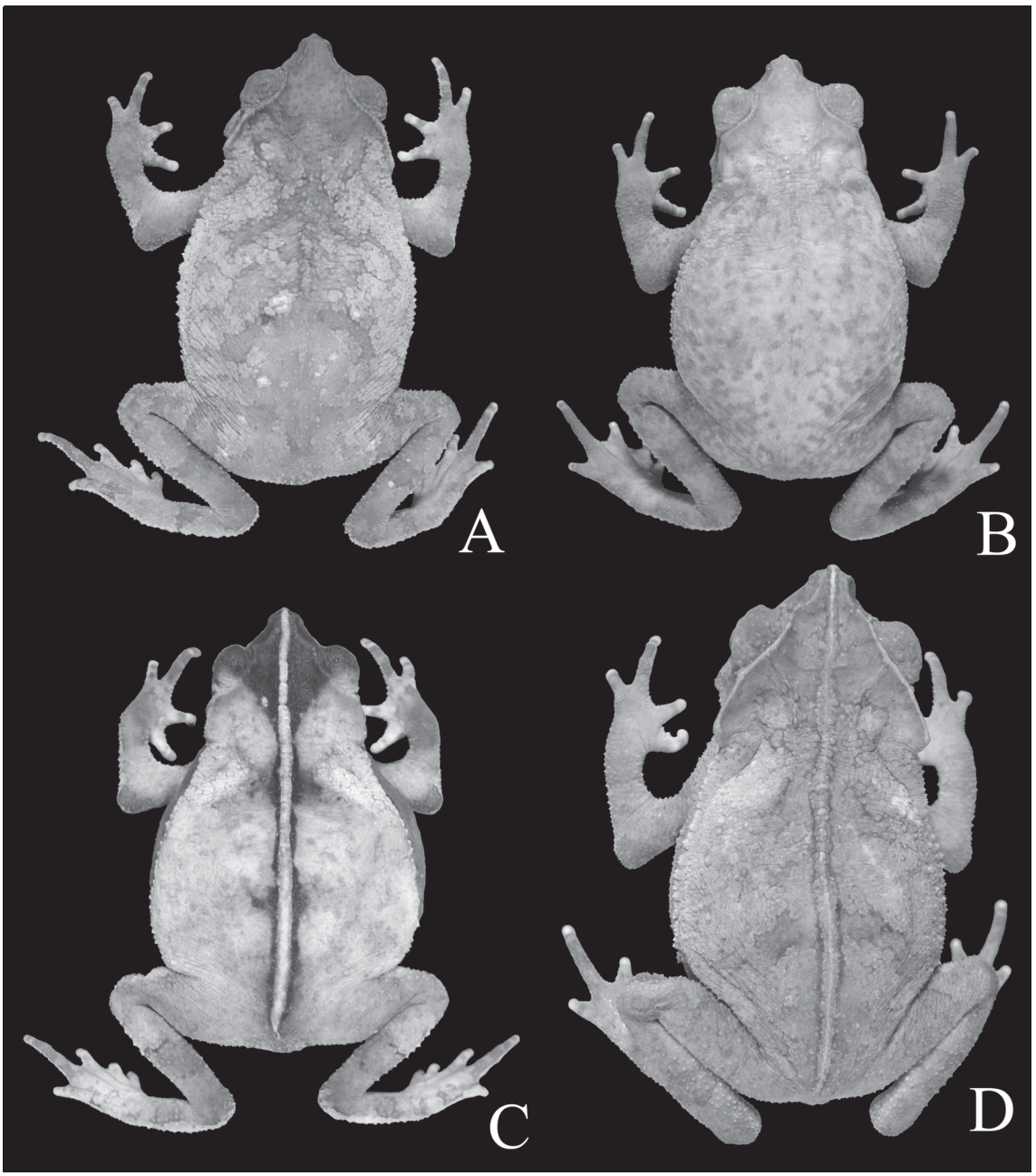

FIGURE 2. Dorsal color patterns of *Rhinella hoogmoedi* sp. nov. (A) MNRJ 40327, SVL 48.2 mm. (B) MNRJ 40326, SVL 48.3 mm. (C) MNRJ 40329, SVL 39.4 mm. (D) MNRJ 40510, SVL 61.7 mm.

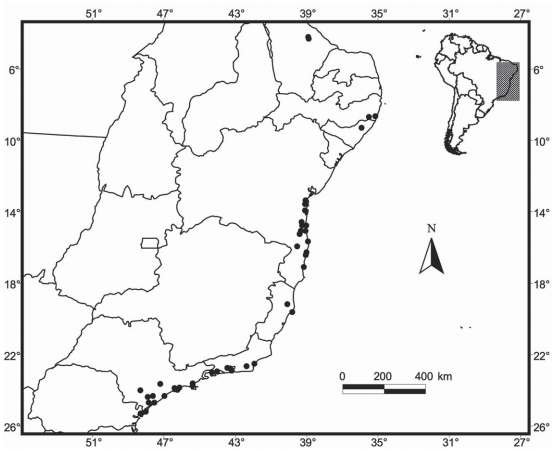

FIGURE 3. Geographic distribution of *Rhinella hoogmoedi* sp. nov.

(largely developed in *R. margaritifer* and *R. roqueana*); snout rounded, nearly mucronate in dorsal view and nearly acute in profile (snout blunt in *R. iserni*, profile nearly vertical in *R. roqueana,* and truncate in dorsal view and truncate, dorsally projected in profile in *R. sclerocephala*); vocal slits present (absent in *R. iserni*); and foot poorly webbed (extensively webbed in *R. sclerocephala*) (see Caldwell, 1991; Hoogmoed, 1977, 1986; Hoogmoed & Ávila-Pires, 1991; Jiménez-de-la-Espada, 1875; Melin, 1941; Mijares-Urrutia & Arends, 2001; Vélez-Rodriguez & Ruiz-C., 2002).

Rhinella hoogmoedi sp. nov. is separated from *R. acutirostris* and *R. alata* by the presence of a vertical ridge at the tip of snout and presence of a tubercle at the posterior corner of mouth (both absent in those species; Hoogmoed, 1986, Leavitt, 1933). From *R. castaneotica,* by the post-orbital crest large, forming a ledge, and by the presence of a line of spinulose tubercles on the lateral side of the parotoid gland, continuing on the lateral surface of body to the groin (post-orbital crest small, not forming a ledge, and lateral line of tubercles absent in *R. castaneotica;* Caldwell, 1991). From *R. dapsilis,* by the snout not produced in a proboscis, post-orbital crest forming a ledge, presence of a line of spinulose tubercles on parotoid gland and lateral of body, and presence of a tubercle on the posterior corner of mouth (snout developed in a proboscis, post-orbital crest thick, not forming a ledge, absence of a line of spinulose tubercles on parotoid gland and lateral of body, and absence of a tubercle at the posterior corner of mouth in *R. dapsilis;* Myers & Carvalho, 1945). From *R. nasica,* by the poorly developed cephalic crests and developed post-temporal crest, forming a ledge, presence of a line of spinulose tubercles on parotoid gland, presence of a tubercle on the posterior corner of mouth, and upper eyelid normal (low, but prominent bony cephalic crests and post-orbital crest not forming a ledge, line of tubercles on parotoid gland absent, but with surface pitted and covered by warts, absence of a tubercle at the corner of mouth, and laterally projecting upper eyelid in *R. nasica;* Hoogmoed, 1977). From *R. proboscidea,* by the dorsal view of head rounded, nearly mucronate, and profile nearly acute, rugose skin, parotoid glands well delimited, and presence of a line of spinulose tubercles on the lateral surface of body (snout rounded in dorsal view, very acute in profile, smooth skin, parotoid glands indistinct, and absence of a lateral line of tubercles in *R. proboscidea;* Hoogmoed, 1986). From *R. scitula,* by the post-orbital crest large, forming a ledge, parotoid gland small, elliptical, and presence of a line of spinulose tubercles on parotoid gland (post-orbital crest poorly developed, parotoid gland large, globose, and absence of a line of spinulose tubercles on parotoid gland in *R. scitula;* Caramaschi & Niemeyer, 2003). From *R. stanlaii,* by the dorsal view of head rounded, nearly mucronate, and profile nearly acute, post-orbital crest developed, forming a ledge, and vocal slits present (snout rounded in dorsal view, protruding in profile, post-orbital crest poorly developed, and vocal slits absent in *R. stanlaii;* Lötters & Köhler, 2000).

Description of the holotype: Body robust; head wider than long, head width 35% of SVL. Snout rounded in dorsal view (Fig. 1A), with a vertical apical ridge which gives a nearly mucronate appearance; in profile (Fig. 1B), nearly acute. Top of snout and head slightly concave; canthus rostralis well defined by the canthal crests, curved; loreal region concave. Nostrils lateral, protuberant, slightly directed backwards, nearer to the tip of snout than to eyes; internarial distance smaller than the eye-to-nostril distance, eye diameter and upper eyelid width, and larger than the tympanum diameter; eye-to-nostril distance smaller than the eye diameter, approximately equals the upper eyelid width, and larger than the tympanum diameter; eye diameter larger than the upper eyelid width, length of post-orbital crest, and tympanum diameter; upper eyelid width 60% of interorbital distance. Antorbital and supra-orbital crests developed, parietal crest poorly developed; post-orbital crest large, forming a small lateral ledge; post-orbital crest length 95% of eye diameter. Tympanum large, vertically elliptical, with a distinct annulus; horizontal diameter of tympanum 93% of the vertical diameter and 70% of post-orbital crest length. Parotoid glands, in dorsal view, small, elliptical; in lateral view, elliptical, separated from the post-orbital crest by a small notch; parotoid gland length larger than

the post-orbital crest length. External border of the parotoid gland with a line of pointed tubercles which continues along the lateral side of body to the groin. Vertebral apophyses not salient on dorsum. Lips not flared; eyes visible from below. A V-shaped incision in the maxilar symphysis; a small rounded tubercle at the posterior corner of mouth. Vocal sac subgular, poorly developed; vocal slits small, lateral to the tongue. Choane small, lateral, widelly separated; tongue large, two times as long as wide, free and not notched behind.

Forelimbs robust, forearms as robust as arms; a line of small pointed tubercles along the lateral border of forearm. Hand (Fig. 1C) with long, slender fingers not webbed, in crescent order of size, II<IV<I<III; lateral fringes poorly developed, formed by a line of spinulose tubercles. Fingers tips slightly expanded, smooth, posteriorly delimited on the dorsal and ventral faces by a groove. Palmar tubercle large, ovoid, flat, smooth; thenar tubercle approximately one third of the palmar tubercle, ovoid, flat, smooth. Subarticular tubercles developed, rounded, unique. Supranumerary tubercles of varied sizes, distinct, rounded, irregularly distributed on the ventral surfaces of hand and fingers. A small, elongate, poorly distinct nuptial pad on the dorsal surface of finger I.

Hindlimbs short, robust. Tibia length slightly smaller than the thigh length, 41% of the SVL; sum of tibia and thigh lengths 84% of the SVL; tarsus-foot length larger than the tibia and thigh lengths, 58% of the SVL. A line of conical, spinulose tubercles along the anterior and posterior borders of tarsus. Outer metatarsal tubercle small, rounded; inner metatarsal tubercle large, approximately two times the outer, ovoid, with the external border free. Foot (Fig. 1D) with short toes, robust, in crescent order of size, I<II<V<III<IV; webbing moderately developed, plantar formula I 1-2 II 1-3⁻ III 1-2½ IV 2½-1 V. Lateral fringes of toes and border of the interdigital membranes with a line of spinulose tubercles. Tips of toes in small rounded bulbs, smooth, posteriorly delimited on the dorsal and ventral faces by a groove. Subarticular tubercles small, round, unique. Supranumerary tubercles distinct, round, inequal in size, irregularly distributed on the ventral surfaces of foot and toes.

Skin on dorsum and limbs granulose, with many tubercles small, round, irregularly distributed without forming a defined pattern. Ventral surfaces finely granulose, with many slightly larger granules scattered over all the surface.

Color: Dorsum and laterals uniformly brown; a grayish brown bar on elbow and on wrist, and on tibia and on tarsus. Venter uniformly clear brown with larger granules cream. Lateral surface of forearms gray, suffusing on the ventral surface. Proximal ventral surface of thighs like the venter and distal half of thighs and ventral surface of tibiae with irregular gray stains and white granules. Posterior surface of tarsus to the ventral surface of toes IV and V, gray. Iris yellow with black vermiculations.

In life, the general color is similar to preserved specimens; sometimes it can be reddish (see color picture in Pombal & Gordo, 2004).

Measurements of the holotype: SVL 51.3; HL 15.8; HW 18.1; IND 3.4; END 4.7; ED 6.0; UEW 4.6; IOD 7.6; POCL 5.7; HTD 3.9; VTD 4.2; PGL 6.6; HAL 13.2; THL 21.7; TL 21.2; FL 29.7.

Variation in type series: Rhinella hoogmoedi sp. nov. presents small variation in measurements; its range, mean, and standard deviation are presented in Table 1. Regarding the color pattern, however, there is great variation, with three very distinctive types (Fig. 2). One type, as described for the holotype, presents the dorsum uniformly brown without a mid-dorsal line (MNRJ 40326, 40328), or with a poorly defined mid-dorsal line (MNRJ 40327, 40331, 40508), and further without a mid-dorsal line but with the fore and hindlimbs darkened to a grayish brown. The second pattern appears in three specimens (MNRJ 40329, 40330, 40509) and is composed by a cream mid-dorsal stripe bordered by black, head and interorbital area black forming a distinctive lozenge-shaped stain, lateral side of head and body black, and ventral surface black on gular region and chest, and gray on anterior half of belly, suffusing in gray and cream on the posterior half of belly and ventral surfaces of thighs. Finally, one specimen (MNRJ 40510) presents dorsum and venter uniformly brown, with only a distinctive mid-dorsal cream stripe.

Geographic distribution: Rhinella hoogmoedi sp. nov. is distributed along the Atlantic Rain Forest of Eastern Brazil, from the State of Ceará to the State of Paraná (Fig. 3). There are three juvenile specimens from Leopoldina, State of Rio de Janeiro, collected in 1938. Currently, Leopoldina is inside the City of Rio de Janeiro and *R. hoogmoedi* sp. nov. is not find in that city (Izecksohn & Carvalho e Silva, 2001).

Natural history: According to Pombal & Gordo (2004), in a population from Juréia, south of State of São Paulo, subadults of *Rhinella hoogmoedi* sp. nov. may be found inside forest at night resting on vegetation a few centi-

meters above the ground. The reproduction is explosive, when males can be heard by day and night. Males were found vocalizing on the ground or tree trunks until 60 cm above the ground near ponds or slack water of rivulets inside forest or restinga (see fig. 21.2 in Pombal & Gordo, 2004).

Etymology: The name of the species honors Dr. Marinus S. Hoogmoed (Nationaal Natuurhistorisch Museum, Leiden, The Netherlands, currently in the Museu Paraense Emílio Goeldi, Belém, Pará, Brazil), for his contribution to the knowledge of the Neotropical herpetofauna and specially for his efforts to understand the highly complex *Bufo margaritifer* species group, now genus *Rhinella.*

DISCUSSION

The genus *Rhinella* Fitzinger, 1826, as proposed by Frost *et al.* (2006) do not present synapomorphies, and actually exists the possibility that *Rhinella* and *Rhamphophryne* Trueb, 1971 are not reciprocally monophyletic or that *Rhinella* would be imbedded in *Chaunus* Wagler, 1828. However, Vélez-Rodrigues (2005) pointed out the presence of a ventrolateral process of the quadratojugal as a synapomorphy for *Rhinella* (called in this work as *B. typhonius* clade). Recently, Pramuk (2006), in a combined analysis of morphological and mitochondrial ribosomal DNA of species of the genus *Bufo* (including species now included in *Chaunus, Rhinella,* and *Rhaebo, sensu* Frost *et al.,* 2006) found that the unreversed morphological synapomorphy supporting the monophyly of the *B. margaritifer* group is the expansion of the posterior ramus of the pterygoid. *Bufo ocellatus* Günther was considered as *incertae sedis* by Frost *et al.* (2006) and as a sister taxon to the *B. margaritifer* species group by Pramuk (2006). However, based on overall similarity, not synapomorphy, Hoogmoed (1990) and Duellman & Schulte (1992) defined respectively the so called *Bufo margaritifer* complex and the *Bufo typhonius* group, and both propositions currently embase the genus *Rhinella.* The new species perfectly fits in the external characters of the genus *Rhinella.*

Rhinella hoogmoedi sp. nov., besides the morphological distinctive characters, is currently the only known species of the genus in the Atlantic Rain Forest of Eastern Brazil. However, modern techniques of genetic studies applied to phylogenetic and phyllogeographic analysis would identify new species currently hidden in cryptic complexes.

RESUMO

Uma nova espécie do gênero Rhinella *é descrita de Canavieiras, no sul do Estado da Bahia, na Floresta Atlântica do leste do Brasil.* Rhinella hoogmoedi *sp. nov. é caracterizada pelo tamanho médio para o gênero (CRA 39,4-52,1 mm em machos), focinho arredondado em vista dorsal, com uma prega apical vertical que lhe dá um aspecto aproximadamente mucronado, e próximo de agudo em perfil, cristas anterorbital e supra-orbital desenvolvidas, crista parietal pouco desenvolvida, crista pós-orbital grande, formando uma pequena aba lateral, tímpano evidente, apófises vertebrais não salientes no dorso, presença de uma linha dorsolateral de tubérculos pontiagudos na borda externa da glândula parotóide, continuando-se ao longo da lateral do corpo até a virilha, um tubérculo arredondado no canto posterior da boca e fendas vocais presentes. A nova espécie está distribuída do Estado do Ceará até o Estado do Paraná, Brasil.*

PALAVRAS-CHAVE: Amphibia. Anura. Bufonidae. *Rhinella hoogmoedi* sp. nov. Floresta Atlântica.

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APPENDIX 1

Additional Specimens Examined

Rhinella hoogmoedi – BRAZIL: Ceará: Serra do Baturité (MNRJ 28561-28563, 28647-28649); Pacoti (MZUSP 92037-97041, 102612-102616). PERNAMBUCO: Água Preta (MZUSP 134123); Rio Formoso (MZUSP 63131). ALAGOAS: Murici (MNRJ 9724). Bahia: Arataca (MNRJ 26484); Camamu (MNRJ 28906); Cumuruxatiba (MZUSP 59421, 63075-63076); Ilhéus (MNRJ 0383; 1498, 16253-16277; 1504, 16278; 1634, 16370-16388; 1650, 16390-16409; 1689; 1715, 9260-9269, 9270; 1521, 16290-16339; 1533, 16344-16345, 16347-16353; 1694, 43105-43109;1699, 8877; 1700, 8878-8909, 8911-8933, 8936-8956;1702, 8957-9019; 1713, 9186, 9188-9200, 9202-9209, 9211-9248, 9250-9259; 1723, 9294-9299; 2883; MZUSP 711236, 95667-95671, 97334-97342, 97497-97509, 117837); Itabuna (MZUSP 1018-1045, 1118, 1121-1125); Itapebi (MNRJ 26477, 28964); Nilo Peçanha (MNRJ 28910); Porto Seguro (MNRJ 28898-28899, 28913-28914; MZUSP 63193-63194); Santa Cruz Cabrália (MNRJ 26486); São José da Vitória (MZUSP 63492-63494); Una (MNRJ 26478-26483; MZUSP 63701-63718, 81130, 126302, 126310-126354, 134120-134121); Uruçuca (MNRJ 26485); Valença (MNRJ 28686-28690, 28883-28890). Espírito Santo: Sooretama (MZUSP 108370-108376); Rio Doce (MZUSP 0782). Rio de Janeiro: Angra dos Reis (MNRJ 1999); Duque de Caxias (MNRJ 1280, 7405; 2344; 2348); Baixada Fluminese (AL-MN 3368-3375); Juparnaiba (MNRJ 0567); Mangaratiba (MNRJ 0571, 6839); Rio de Janeiro (MNRJ 0569); Rio das Ostras (MNRJ 43110; 43117-43125); Nova Iguaçu, Tinguá (MZUSP 108367-108369). São Paulo: Araçatuba, Anhangaí (MZUSP 1126); Cananéia, Ariri (MZUSP 70418-70423, 70858-70859, 71135-71139); Bertioga (MZUSP 134744-134752); Varjão de Guaratuba (MZUSP 16075-16078, 30437; 108380-108381); Capão Bonito (MZUSP 69812); Caraguatatuba (MZUSP 30438); Guaraú (MZUSP 58919-58920); Guarujá (MZUSP 30436, 134129); Iguape (CFBH 305, 407, 5686, 5688; ZUEC 5932, 8926-8931, 8932-8935; MZUSP 70512, 71717, 84583-84584, 127986); Juqueí (MZUSP 122896); Juquiá (MNRJ 2911; MZUSP 1109-1112); Pariquera-açu (MZUSP 64762); Peruíbe (MZUSP 58298); Piassaguera (MZUSP 0077, 0733); Santos (MNRJ 2932; MZUSP 134122); São Vicente (MZUSP 0058); Sete Barras (MNRJ 28650-28654, 28684, 30350-30356). Paraná: Guaraqueçaba (MNRJ 28671-28672).