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A new species of *Crossodactylodes* (Anura: Leptodactylidae) from Minas Gerais, Brazil: first record of genus within the Espinhaço Mountain Range

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Abstract

The genus *Crossodactylodes* comprises three species of Atlantic Rainforest endemic frogs strictly dependent on bromeliads where they spend their entire life cycle. The current geographic distribution of the genus covers highland areas of Atlantic Rainforest in the States of Rio de Janeiro and Espírito Santo, Southeastern Brazil. We describe a new species of the genus from Parque Estadual do Pico do Itambé, at Santo Antônio do Itambé municipality, State of Minas Gerais, South-eastern Brazil. *Crossodactylodes itambe* **sp. nov.** is characterized by the following combination of traits: male SVL 16.2 ± 1.3 (14.0–17.6 mm, n = 10), female SVL 16.2 ± 1.0 (13.5–18.0 mm, n = 15); snout short, rounded in dorsal view, sloping in lateral view; absence of vocal sac and vocal slits in males; absence of vomerine teeth; males with upper arms and forearms hypertrophied; cloacal flap prominent, simple; dorsal skin coarsely granular. The new species inhabits rupicolous bromeliads in open areas of rocky fields, and is recorded in altitudes between 1836 and 2062 m above sea level. This record extends the genus distribution for about 325 km northwest from where it was known. *Crossodactylodes* **sp. nov.** is the only species of the genus that occurs in open field habitats (*campos rupestres*), in very high altitudes of a non-costal mountain range (the Espinhaço Range).

Key words: Amphibia, *Crossodactylodes itambe* **sp. nov.**, endemism, *campos rupestres*, Espinhaço Range

Introduction

Crossodactylodes Cochran, 1938 was initially proposed to allocate a new species, *Crossodactylodes pinto*, a small anuran collected at Serra de Macaé, municipality of Nova Friburgo, State of Rio de Janeiro, Brazil (see Bokermann 1966). In the 1980 decade, new information about the genus was provided with a description of two new species (*Crossodactylodes bokermanni* and *Crossodactylodes izecksohni*) from Santa Teresa, State of Espírito Santo (Peixoto 1983 “1982”). Peixoto (1981; 1983 “1982”) confirmed the bromeligenous (species that have their whole life cycle associated to these plants, *sensu* Peixoto 1995) habit of the genus, and the condition of the aquatic tadpoles. Currently, the genus comprises three species (Frost 2013): *Crossodactylodes pinto* Cochran, 1938, *Crossodactylodes bokermanni* Peixoto, 1983 “1982” and *Crossodactylodes izecksohni* Peixoto, 1983 “1982”. The genus was defined based on few morphological features such as dilated toes and fingers, less roughened vomerine teeth and hidden tympanum (Cochran 1938), but without any comment about the main characteristics: a group of horny spines on the thumb of males. This character was only mentioned by Cochran in 1955, through a redescription of the species-type. Later, Lynch (1971) complemented the morphological and osteological characterization of the genus, including information on reproduction in bromeliads and tadpole habitats. The current known geographic distribution of the genus covers highland areas of Atlantic Rainforest in the States of Rio de Janeiro and Espírito Santo (Cochran, 1955; Peixoto 1983).

During surveys conducted on highland areas within the Espinhaço Mountain Range at Parque Estadual do Pico do Itambé (Santo Antônio do Itambé municipality, State of Minas Gerais, southeastern of Brazil), the

Crossodactylodes specimens were found to differ morphologically from other known species of the genus. This species was found in high altitudes using rupicolous bromeliads at “campos rupestres” (i.e., open field habitats of herbaceous and shrub vegetation on table mountains of quartzite; Rapini *et al.* 2008), and this is the first record of species of genus in this environment at a non-costal mountain range. Herein, we describe a new species of *Crossodactylodes* and discuss conservation status and implications of the expansion of the geographic distribution of the genus.

Material and methods

We analyzed specimens of the following collections (institutional acronyms in parenthesis): Coleção Eugenio Izecksohn, Universidade Federal Rural do Rio de Janeiro, Brazil (EI), Museu de Biologia Mello Leitão, Santa Teresa, Brazil (MBML), Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP), Coleção Herpetológica da Universidade Federal de Minas Gerais, Belo Horizonte, Brazil (UFMG), Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Brazil (ZUF RJ).

Measurements of adult specimens follow Duellman (1970): SVL (snout-vent length), HL (head length), HW (head width), ED (eye diameter), END (eye to nostril distance), NSD (nostril to tip of snout distance), IND (internarial distance), EW (eyelid width), and FL (foot length); Duellman *et al.* (1997): FAL (forearm length), and FAB (forearm breadth); Heyer *et al.* (1990): HAL (hand length), TBL (tibia length), THL (thigh length), and TAL (tarsal length); Napoli (2005): 3FD (third finger disk diameter), and 4TD (fourth toe disk diameter); Garcia *et al.* (2003): AMD (distance between the anterior margins of eyes).

The measurements SVL, HL, HW, FAL, FAB, HAL, THL, TBL, TAL and FL were taken with calipers (0.01 mm, Digimess), whereas ED, END, NSD, IND, EW, 3FD, 4TD and AMD were made through ImageTool (version 3.00) software: photographs with scale of head (dorsal view), hand and foot (ventral view) of specimens fixed in the same way, and similarly positioned with the aid of pins were taken with a Leica M205A stereomicroscope. Images were opened in the software and the scale was taken as reference value. Snout-vent length from adult individuals (include the type-series) of *C. pintoii*, *C. izecksohni* and *C. bokermanni* were taken for comparison with the new species. All specimens examined (Appendix) were measured by the same observer. Sex was determined by presence or absence of secondary sexual characters (forearm hypertrophy, and spines on thumbs), after examination of the gonads (n=10). The datum used for geographic coordinates was WGS84.

Results

Crossodactylodes itambe sp. nov.

Itambe's Bromeliad Frog
(Fig. 1)

Holotype: UFMG 11239, adult male, Parque Estadual do Pico do Itambé, 18°23'53.1"S, 43°20'39.6"W, 1921 m above sea level (a.s.l.), municipality of Santo Antônio do Itambé, State of Minas Gerais, Brazil, collected by I.M. Barata, C.M. Correia, and R. Alcântara on 13 January 2010.

Paratypes: UFMG 11236–11238, three adult females, and UFMG 11240–11242, one adult female and two juvenile males, collected by I.M. Barata, R. Alcântara, and I.P. Reis on 6 October 2011; UFMG 11244, one male (probably an adult), UFMG 11243 and UFMG 11245, two adult female, collected by I.M. Barata, and M. Viotti on 15 February 2012; UFMG 11246–11247 one male and one female; UFMG 11248, a female collected by I.M. Barata, and R. Alcântara on 01 September 2011; UFMG 13375–13387, five adult males, seven adult female and one juvenile, collected by M.T.T. Santos, P.C. Rocha, and L.O. Drummond on 20–21 November 2012, all collected at the type-locality between 18°23'55.7"S, 43°20'26.5"W and 18°23'56.6"S, 43°20'54.8"W, ranging from 1836–2060 m a.s.l.

Diagnosis. Following Cochran (1938, 1955) and Lynch (1971), we allocated the new species in the genus *Crossodactylodes*, by the following combination of characters: 1) head and body flattened; 2) tympanum absent; 3) males with cluster of spines on thumbs; 4) first finger shorter than second; 5) fingers and toes without web or fringes; 6) discs on fingers II–IV and toes moderately expanded; 7) life cycle in bromeliads. Additionally, the new species is diagnosed by: 8) snout short, rounded in dorsal view, sloping in lateral view; 9) vocal sac and vocal slits absent in males; 10) vomerine teeth absent; 11) males with upper arms and forearms hypertrophied; 12) cloacal flap prominent, simple; 13) dorsal skin coarsely granular.

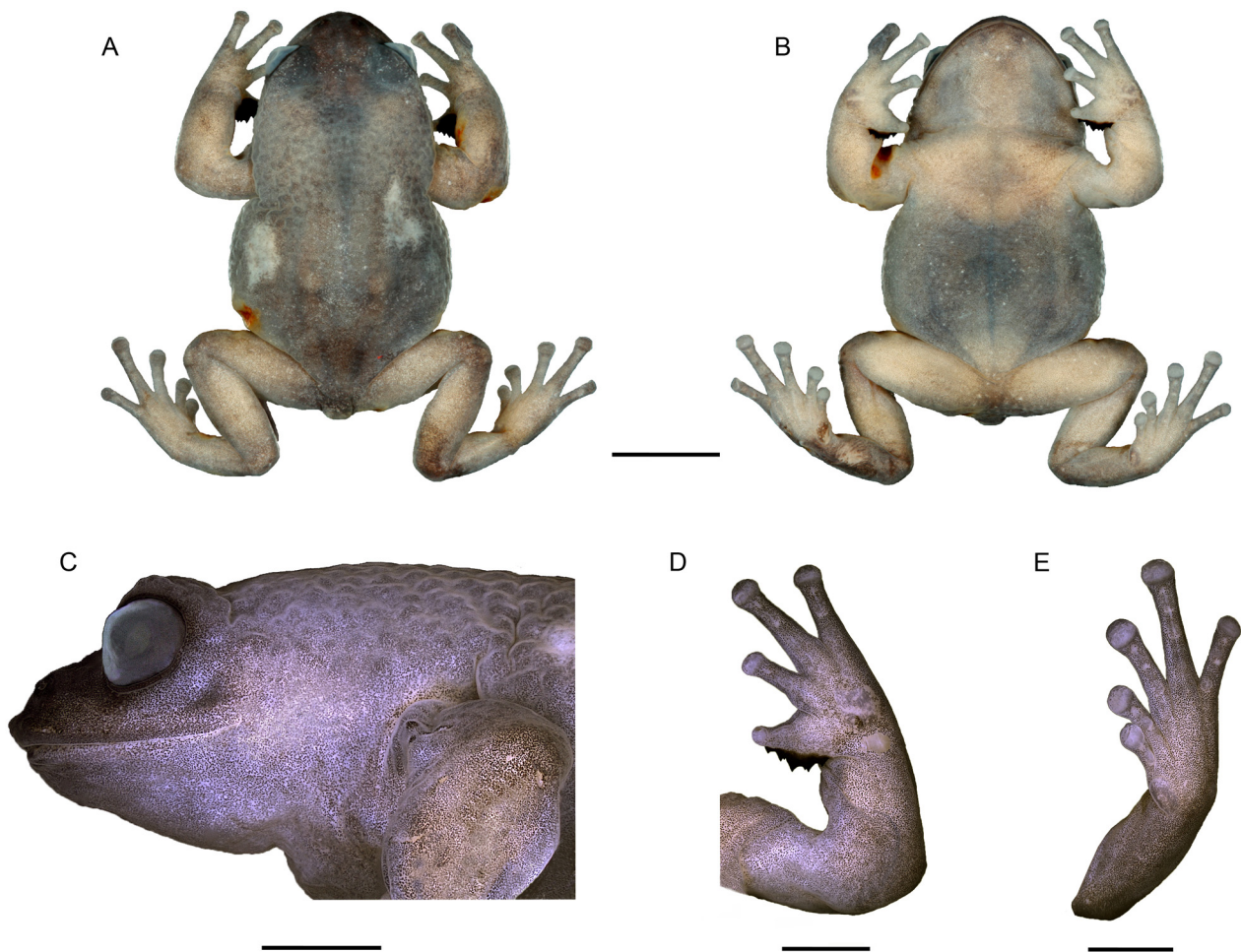


FIGURE 1. Holotype of *Crossodactylodes itambe* **sp. nov.**, UFMG 11239, adult male from Parque Estadual do Pico do Itambé, municipality of Santo Antônio do Itambé, State of Minas Gerais, Southeastern Brazil. SVL 17.0 mm. (A) body in dorsal and (B) ventral views (horizontal line equals 5,0 mm), (C) head in lateral view (scale 2.0 mm), and (D) details of the left hand and the left foot in ventral view (scale 2.0 mm). (photos: B. Fehlberg; M.T. Santos).

Comparison with other species. *Crossodactylodes itambe* **sp. nov.** can be separated from *C. izecksohni* by its slightly larger size (SVL males 11.8–14.3 mm, $n = 18$; SVL females 11.2–13.7, in *C. izecksohni*; SVL males 14.0–17.6 mm and SVL females 13.5–18.0 mm, in *Crossodactylodes itambe* **sp. nov.**), and absence of marks on the dorsal surface of the hands and body (presence of X mark on dorsum and brownish transversal bands on hands in *C. izecksohni*). Thumb is robust in *C. izecksohni* males and slightly less robust in *Crossodactylodes itambe* **sp. nov.** males. Inner metacarpal tubercle is lateral and developed on *C. izecksohni* and weakly developed on *Crossodactylodes itambe* **sp. nov.** Hand length proportions of *Crossodactylodes itambe* **sp. nov.** are larger (HAL/SVL males 0.27–0.33 mm, mean 0.29, $n=10$; HAL/SVL females 0.26–0.31 mm, mean 0.27, $n=15$) when compared to *C. izecksohni* (HAL/SVL males 0.23–0.25 mm, mean 0.24 mm, $n=18$; HAL/SVL females 0.20–0.24 mm, mean 0.23, $n=24$). Iris is yellow with reticulate brown pattern and separated by a brown horizontal line in the base of the pupil in *C. izecksohni*, and differs from iris completely black in *Crossodactylodes itambe* **sp. nov.** *Crossodactylodes itambe* **sp. nov.** differs from *C. pintoii* by the absence of vocal sac and simple cloacal flap (median subgular vocal sac and bilobed cloacal flap in *C. pintoii*; Peixoto 1982). *Crossodactylodes itambe* **sp. nov.** differ from *C. bokermanni* by the absence of vocal sac and vocal slit (present in *C. bokermanni*), discs on finger and toes sizes moderately expanded (expanded in *C. bokermanni*), dorsal skin of body coarsely granular (smooth in *C. bokermanni*), absence of vomerine teeth (present in *C. bokermanni*), and absence of marks on the dorsal surface of the legs and body (presence of marks on dorsum and dark transversal bands on legs in *C. bokermanni*). Thumb is robust in *Crossodactylodes itambe* **sp. nov.** males when compared to discrete enlargement of thumb in *C. bokermanni* males.



FIGURE 2. Paratype UFMG 13384 of *Crossodactylodes itambe* sp. nov. (A) living adult male and (B) egg clutch attached to a bromeliad from Parque Estadual do Pico do Itambé, municipality of Santo Antônio do Itambé, State of Minas Gerais, Southeastern Brazil. (photos: L.O. Drummond; M. Viotti).

Description of the holotype. UFMG 11239, adult male, SVL 17.0 mm (Fig. 1). Head 1.1 times wider than long (HW/HL); head width is one quarter of snout vent length (HW/SVL=0.4); and head length 0.4 SVL (HL/SVL). Head flat. Snout short, rounded in dorsal view, sloping in lateral view. *Canthus rostralis* indistinct. Loreal region slightly concave. Nares protuberant, directed laterally. Eye prominent, antero-laterally oriented, its diameter 0.3 times head length. Tympanum absent. Vomerine teeth indistinct. Choanae rounded, separated by a distance larger than five times maximum diameter. Tongue not notched, attached overall, narrowly free around lateral and posterior margin, medium-sized, occupying half of oral cavity. Vocal slits absent; vocal sac indistinct. A single, small toothlike process in front of lower jaw, with socket in between premaxillae. Low elongated tubercle on upper eyelid margin. Arms robust and forearms hypertrophied. Fingers with elliptical discs, slightly expanded. Relative lengths of fingers I < II < IV < III. Fingers not webbed, with a few developed dermal fringe. Subarticular tubercles rounded; two tubercles on fingers III and IV, absent on fingers I and II. Outer metacarpal tubercles large and rounded; inner metacarpal tubercle weakly developed. Cluster of 16 spines on right and left thumbs. Tibia length

0.4 SVL; foot length 0.4 SVL. Inner metatarsal tubercle distinct, elliptical; outer metatarsal tubercle small and conical. Toes relative length $I < II < III \approx V < IV$; disc width $V < I < II \approx III \approx IV$. Subarticular tubercles distinct, rounded, large and flat; three on fingers V, III, and IV, one on fingers II and I. Cloacal opening directed posteriorly at level of thighs; cloacal flap present. Dorsal and ventral skin granular; chest and gular region smooth. Pectoral fold absent.

Color of the holotype in preservative. Dorsum and venter are dark gray with no distinguished marks.

Measurements of the holotype (mm). SVL 17.0; HL 6.2; HW 7.1; ED 1.8; END 1.4; NSD 1.1; IND 1.3; EW 1.4; AMD 3.4; FAL 3.6; HAL 4.8; 3FD 0.7; THL 6.7; TBL 6.2; TAL 3.9; FL 6.0; 4TD 0.7; FAB 1.8.

Variation. The type-series includes 15 adult females and 10 adult males. Males and females are distinguished by the presence of spines on males' thumbs, which varies in number and aggregation: large adult males have clustered spines and smaller adult males (probably juveniles) have few isolated spines. Spines on males' thumb on *Crossodactylodes itambe* **sp. nov.**, varies from 6–16 spines by thumb, which is similar to *C. izecksohni*, 3–12 spines and *C. bokermanni*, 3–8 spines (Peixoto 1982). We examined the gonads of six males and four females, all males possessing spines on thumbs. *Crossodactylodes itambe* **sp. nov.** seems not to have sexual dimorphism in SVL (males 16.2 ± 1.3 ; females 16.2 ± 1.0), but males have forearms more robust than females (FAB/FAL 0.48–0.69 in males ; FAB/FAL 0.34–0.46 in females; Table 2). All adults are similar in coloration varying the presence of a light brown rectangle shape at the dorsum, but there is no color distinguishing between sexes. Color in preservative varies from dark gray to black.

TABLE 1. Measurements (min, minimum; max, maximum, with mean and (\pm) standard deviation, in mm) of *Crossodactylodes itambe* **sp. nov.**, type-series from Parque Estadual do Pico do Itambé, municipality of Santo Antônio do Itambé, Espinhaço Range, State of Minas Gerais, Southeastern Brazil. (see Material and methods for abbreviations).

Measurements	Males (n = 10)					Females (n= 15)				
	Min	Max	Mean	\pm	SD	Min	Max	Mean	\pm	SD
SVL	14.0	17.6	16.2	\pm	1.3	13.5	18.0	16.2	\pm	1.0
HL	5.7	6.6	6.2	\pm	0.3	5.3	6.5	6.0	\pm	0.3
HW	6.1	7.1	6.7	\pm	0.3	5.8	7.0	6.4	\pm	0.3
ED	1.6	1.9	1.7	\pm	0.1	1.4	2.0	1.8	\pm	0.1
END	1.4	1.5	1.4	\pm	0.1	1.2	1.5	1.4	\pm	0.1
NSD	0.9	1.2	1.1	\pm	0.1	1.0	1.1	1.0	\pm	0.1
IND	1.2	1.4	1.3	\pm	0.0	1.1	1.4	1.3	\pm	0.1
EW	1.2	1.4	1.3	\pm	0.1	1.2	1.4	1.3	\pm	0.1
AMD	3.2	3.7	3.5	\pm	0.1	3.1	3.6	3.3	\pm	0.2
FAL	3.2	3.8	3.6	\pm	0.2	3.1	3.9	3.6	\pm	0.2
FAB	1.5	2.4	2.0	\pm	0.3	1.2	1.7	1.4	\pm	0.1
HAL	4.0	5.2	4.7	\pm	0.4	3.9	4.9	4.4	\pm	0.3
3FD	0.6	0.7	0.6	\pm	0.1	0.5	0.7	0.6	\pm	0.1
THL	5.9	7.1	6.6	\pm	0.4	5.7	6.9	6.5	\pm	0.4
TBL	5.5	6.7	6.3	\pm	0.4	5.3	6.7	6.2	\pm	0.3
TAL	3.4	4.1	3.8	\pm	0.2	3.1	4.1	3.7	\pm	0.2
FL	5.2	6.3	5.8	\pm	0.4	4.8	6.3	5.7	\pm	0.4
4TD	0.5	0.8	0.7	\pm	0.1	0.5	0.8	0.7	\pm	0.1

Color in life. Dorsum and venter are dark to light brown. During daylight specimens are dark brown (sometimes even black) and color pattern is uniform (Fig. 2A). At night specimens are light brown, with variable pattern which includes darker marble marks on dorsal surface of arms and legs and a dorsal light brown rectangle shape in some specimens. When exposed to flashlight a variable number of small white spots are apparent and spread in the dorsum, arms, and legs of some specimens, and these white spots are quite imperceptible when examined without accuracy. Palmar and plantar surfaces of hand and foot are darkly pigmented. Iris black.

Etymology. The specific epithet *itambe*, derives from the type-locality where individuals were collected at Parque Estadual do Pico do Itambé, municipality of Santo Antônio do Itambé, within the Espinhaço Range, State of Minas Gerais. The Itambé summit is the highest point at the Espinhaço Range in the State of Minas Gerais (2062 m a.s.l.), and from the Tupi-Guarani language Itambé means “sharp rock”. The epithet is noun in apposition.

TABLE 2. Measurements of adult specimens (min, minimum; max, maximum; and mean, in mm) of *Crossodactylodes itambe* **sp. nov.**, type-series from Parque Estadual do Pico do Itambé, municipality of Santo Antônio do Itambé, Espinhaço Range, State of Minas Gerais, Southeastern Brazil. (see Materials and methods for abbreviations).

Measurements	Males (n = 10)			Females (n = 15)		
	Min	Max	Mean	Min	Max	Mean
HL/SVL	0.36	0.40	0.38	0.36	0.40	0.37
HW/SVL	0.38	0.44	0.41	0.37	0.44	0.40
FAL/SVL	0.20	0.25	0.22	0.20	0.24	0.22
HAL/SVL	0.27	0.33	0.29	0.26	0.31	0.27
THL/SVL	0.37	0.46	0.41	0.38	0.44	0.40
TBL/SVL	0.37	0.45	0.39	0.36	0.40	0.38
TAL/SVL	0.22	0.25	0.23	0.21	0.24	0.23
FL/SVL	0.34	0.40	0.36	0.33	0.38	0.35
FAB/SVL	0.10	0.14	0.12	0.08	0.10	0.09
FAB/FAL	0.48	0.69	0.56	0.34	0.46	0.39
HW/HL	1.01	1.14	1.08	1.04	1.12	1.06
ED/HL	0.25	0.30	0.28	0.24	0.31	0.29
END/HL	0.22	0.26	0.23	0.20	0.24	0.23
NSD/HL	0.15	0.18	0.17	0.16	0.19	0.17
IND/HL	0.19	0.23	0.21	0.19	0.23	0.21
EW/HL	0.19	0.23	0.21	0.18	0.24	0.21
AMD/HL	0.53	0.60	0.56	0.52	0.59	0.55
3FD/HAL	0.13	0.15	0.13	0.12	0.17	0.14
4TD/FL	0.10	0.13	0.12	0.10	0.14	0.12
4TD/3FD	0.97	1.22	1.08	0.94	1.33	1.12

Geographic Distribution. *Crossodactylodes itambe* **sp. nov.** is known only from type-locality, in Itambé summit, within the Pico do Itambé State Park, at the municipality of Santo Antônio do Itambé, state of Minas Gerais, Southeastern Brazil. *Crossodactylodes itambe* **sp. nov.** extends the genus distribution for about 325 km northwest from where it was currently known (Fig. 3).

Natural history. *Crossodactylodes itambe* **sp. nov.** occurs in high-elevation (in altitudes ranging from 1836–2062 m a.s.l.) rocky mountain meadows called *campos rupestres* (Rapini *et al.* 2008), a typical phytophysognomy of the Espinhaço Range. Individuals of the new species were found in open field (exposed to the sun) rupicolous bromeliads. The species is active by night and most individuals were found during this period inside bromeliads’ tanks and leaves usually with half of their body inside the water line. No records were made inside dry bromeliads. Despite our efforts we did not hear species vocalizations, if there is any (males do not have vocal slits). To date, no *Crossodactylodes* species have been registered in vocal activity despite *C. pinto* and *C. bokermanni* have vocal slits. Considering monthly field samples done from January and October 2011 (except April and July) *Crossodactylodes itambe* **sp. nov.** was found in every sampled month except in May and August, but was most abundant in September and October 2011 (61.3% of 235 records). Egg masses contained only one egg (Fig. 2B), and were laid attached to lateral leaves of bromeliad tanks, at the water level. Clutches were found in February and November 2012.

Four species of *Crossodactylodes* are known to date: *Crossodactylodes pinto*, *C. bokermanni*, and *C. izecksohni* occur in forested habitats located in the coastal mountains of the States of Rio de Janeiro (Serra do Mar) and Espírito Santo. *Crossodactylodes itambe* **sp. nov.** is the only one which occurs in open field habitats (*campos*

rupestres), in very high altitudes of a non-costal mountain range (the Espinhaço Range). Because of its distance to the ocean and its proximity to the savanna-like Cerrado biome, the Espinhaço Range is likely drier and more seasonal than the coastal mountains of eastern Brazil. However, the Itambé summit with its 2062 m a.s.l. acts as a

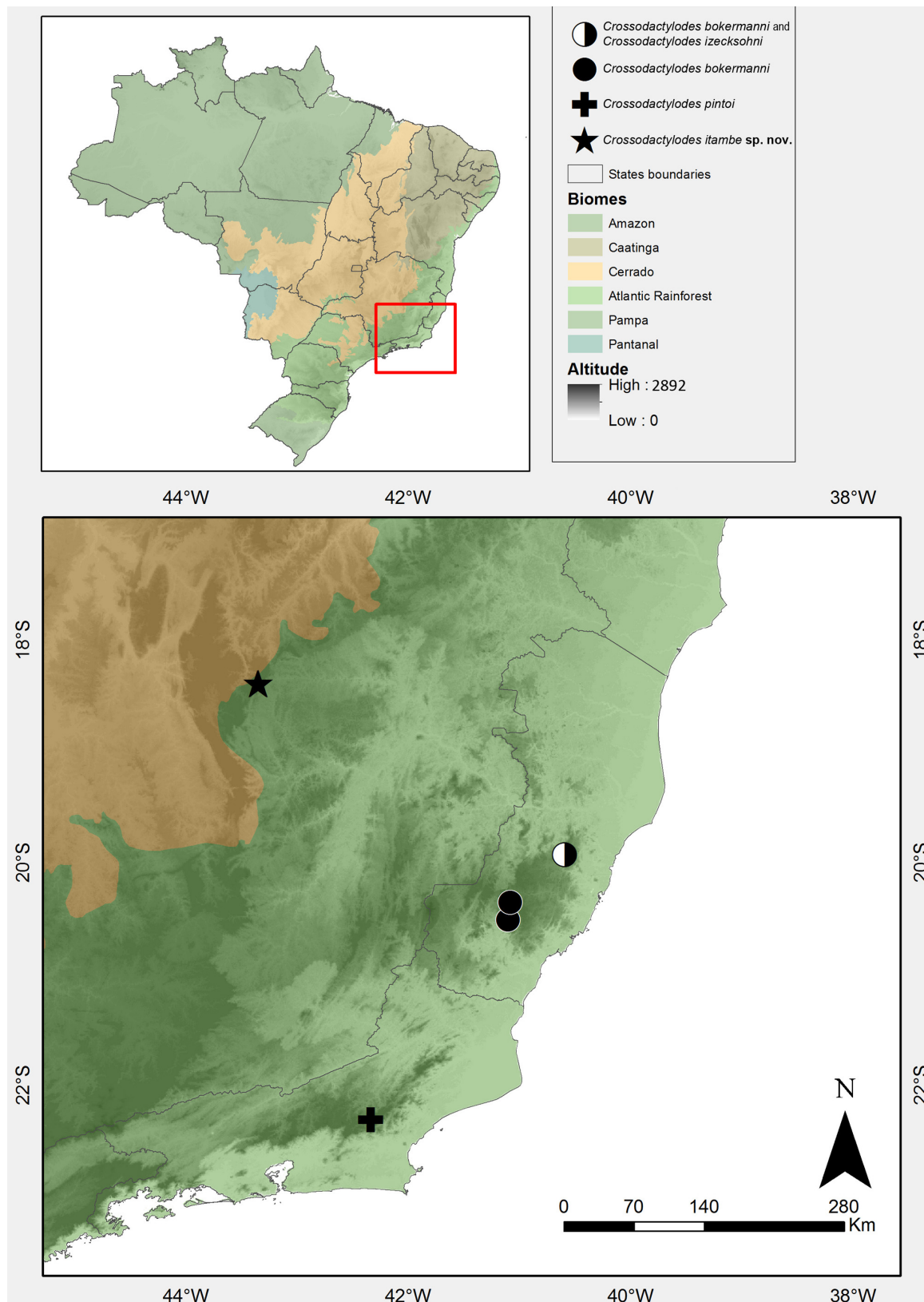


FIGURE 3. Geographic distribution of *Crossodactylodes itambe sp. nov.* from Parque Estadual do Pico do Itambé, municipality of Santo Antônio do Itambé, State of Minas Gerais, Southeastern Brazil. Star, *C. itambe sp. nov.*, cross, *C. pintoii*; close circle, *C. bokermanni*; and black and white circle, *C. bokermanni* and *C. izecksohni*.

barrier blocking Atlantic moisture-laden winds, making it one of the wettest part of the Espinhaço Range (Leite 2012). The orographic effects lead to enhanced rainfall amounts and to thick banks of orographic fog that cover the upper parts of the Itambé summit for much of the year, even during seasonal drought (from April to September), providing the humid microclimate required by *Crossodactylodes* species, which are always associated to highly humid areas of eastern Brazil.

Conservation. If considered the total area above 1800 m a.s.l. of the Itambé summit *Crossodactylodes itambe* **sp. nov.** would have an extent of occurrence (EO, *sensu* IUCN 2001) smaller than ca. 0.5 km². However, the species EO is fully located within the Pico do Itambé State Park a small (4,696 ha) strictly protected reserve (equivalent to IUCN categories I and II; IUCN 1994). Anthropogenic fires, grazing, and selective removal of plant species with economic value (including bromeliads) are the main potential threats to *Crossodactylodes itambe* **sp. nov.** These impacts are not expected to be extirpated but are likely to be avoided since the creation of the reserve in 1998. Even with the mentioned pre and post reserve potential negative impacts, *Crossodactylodes itambe* **sp. nov.** was found relatively easily and in a high abundance (n = 78 in September; n = 66 in October, during one night survey). Even though the current scenario suggests a stable population trend, species with very small ranges are expected to be more vulnerable to adverse natural events and anthropogenic activities and therefore most prone to extinction, stressing the need of protection of its habitat.

Based on the insular pattern of distribution of some Espinhaço Range endemic anurans and the degree of isolation of its highland islands Leite *et al.* (2008) hypothesized that the inventory of the unexplored isolated plateaus and summits of this mountain range would lead to the discovery of new narrowly endemic species. The recent description of the narrowly endemics *Bokermannohyla sagarana* from Serra do Cabral, State of Minas Gerais (Leite *et al.* 2011), *B. flavopicta* which is restricted to the highlands of southwestern Chapada Diamantina, State of Bahia (Leite *et al.* 2012), and *Crossodactylodes itambe* **sp. nov.** (present study) corroborate the importance of the highlands to the diversification and conservation of the Brazilian biota.

Remarks. Until recently there was no cladistics analysis including the genus *Crossodactylodes*. Thereby, Frost *et al.* (2006) based on Lynch (1971), included *Crossodactylodes* in the tribe Cycloramphini of Cycloramphidae, while Pyron and Wiens (2011) left *Crossodactylodes* as genera *incertae sedis* within Hyloidea. For the first time Fouquet *et al.* (2013), included the genus in a cladistics analysis, and *Crossodactylodes* was unambiguously grouped with *Rupirana*, *Paratelmatobius* and *Scythrophrys*. For this clade the authors introduced the new nomen *Crossodactylodinae*, but as explained by Dubois (2013) this nomen is a junior synonym of *Paratelmatobiinae* Ohler & Dubois, 2012. Fouquet *et al.* (2013) also present a new species, not yet described, of *Crossodactylodes* occurring in Southern Bahia.

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APPENDIX. Specimens examined.

- Crossodactylodes pinto*. Brazil, state of Rio de Janeiro: Serra de Macaé, municipality of Nova Friburgo (22°19'S, 42°20'W); MZUSP 00104 (paratype), 56467 (holotype).
- Crossodactylodes bokermanni*. Brazil, state of Espírito Santo, municipality of Santa Teresa: EI 7173 (holotype), 7174–76, 7180–83, 7189 (paratypes), MZUSP 58077–79 (paratypes), 73759–60 (paratypes); ZUF RJ 1377–78, 1380, 1382, 1933–34, municipality of Domingos Martins: MBML 01774, 01779–80.
- Crossodactylodes izecksohni*. Brazil, state of Espírito Santo, municipality of Santa Teresa: EI 7192 (holotype), 7193–7222 (paratypes), MZUSP 58080–86 (paratypes); ZUF RJ 361, 365, 1392, 1400–01, 1932, 1935, UFMG 00397, 00399; MBML 3834–40.