

Distribution extension, new state record and geographic distribution map of *Ceratophrys joazeirensis* Mercadal, 1986 (Anura: Ceratophryidae)

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The genus *Ceratophrys* Wied-Neuwied, 1824 currently comprises eight species occurring in Tropical South America (Frost, 2013). *Ceratophrys joazeirensis* was described by Mercadal (1986), and is the only species of the genus that occurs in the Caatinga biome, a typical semi-arid morphoclimatic domain in northeastern Brazil (Ab'Saber, 2003). This species is reported from the type locality (vicinities of Joazeiro, Bahia, Brazil; Mercadal, 1986), north of Triunfo, Pernambuco (Santos et al., 2009), Araruna, northern Paraíba, and from the vicinities of Passa-e-Fica, northern Rio Grande do Norte (Vieira et al., 2006a). Recently, two records were reported: one from Santa Maria, Rio Grande do Norte (Jorge et al., 2012) and the other from Pindobaçu, Bahia (Zaidan and Leite, 2012). The last authors also described the advertisement call of the species.

In the present paper, we report a new record for *Ceratophrys joazeirensis* to the Cerrado biome. We also present a map of the current known distribution of this species based on literature.

Specimens were collected at Fazenda Jatobá (17°21'03" S and 44°57'43" W), Buritizeiro, Minas Gerais, Brazil at December 10th, 2004. Voucher specimens were housed at the Coleção Herpetológica of the Universidade de Brasília (CHUNB), Brasília, Distrito Federal, Brazil (CHUNB 44326–32). We analyzed seven specimens collected in open formations of Cerrado (04 males: CHNUB 44326–27, 44329–30 and 03 females CHUNB 44328, CHUNB 44331–32; Figure 1). This is the first record of *Ceratophrys joazeirensis* in the state of Minas Gerais and also in the Cerrado biome. The record of *C. joazeirensis* in Buritizeiro extends its geographic distribution in approximately 884 km southwest of its nearest known distribution, Pindobaçu, Bahia (Figure 2). Voucher specimens had some diagnostic characters that confirmed their identification, such as color patterns of head: a blot between the interocular space to the nostrils and features of upper eyelids: upper eyelid fairly pronounced (Mercadal, 1986). According to the original description, *C. joazeirensis* is most similar to *C. cranwelli* Barrio, 1980. *Ceratophrys cranwelli* also occurs in semi-arid environments and Chaco of Argentina, Bolivia, and Paraguay (Mercadal, 1986). The main difference between the two species is the ploidy level, since *C. cranwelli* is a 2n species and *C. joazeirensis* is an 8n species (Mercadal, 1981; 1986; Mercadal de Barrio and Barrio, 2002; Vieira et al., 2006b). *Ceratophrys aurita* is the species with the nearest distribution to *C. joazeirensis*, although not parapatric. However, the former species occurs in the Atlantic Brazilian forest, whereas the last mainly in open formations of the Caatinga and Cerrado. Also, *C. aurita* has a prominent upper eyelid, inner metatarsal tubercle without cornification, and pointed finger extremities, in contrast to the rounded fingers of *C.*

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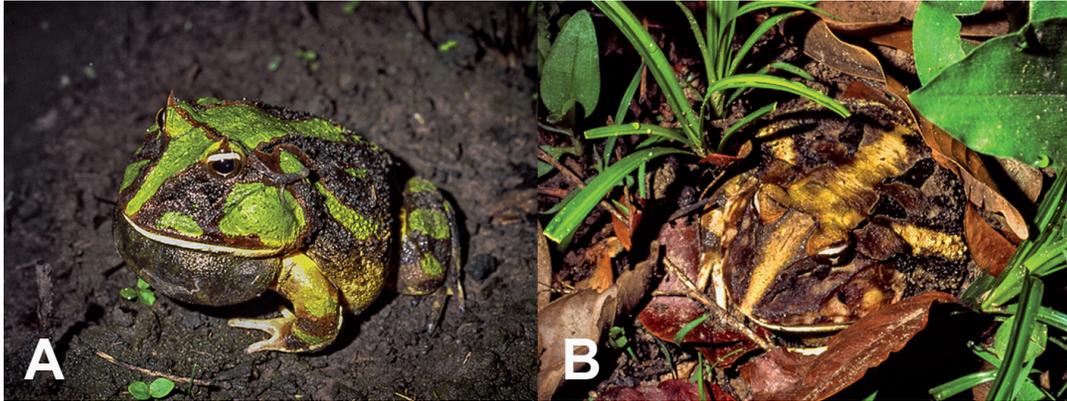


Figure 1. Specimens of *Ceratophrys joazeirens* from Buritizeiro, Minas Gerais, Brazil. A: male and B: female.

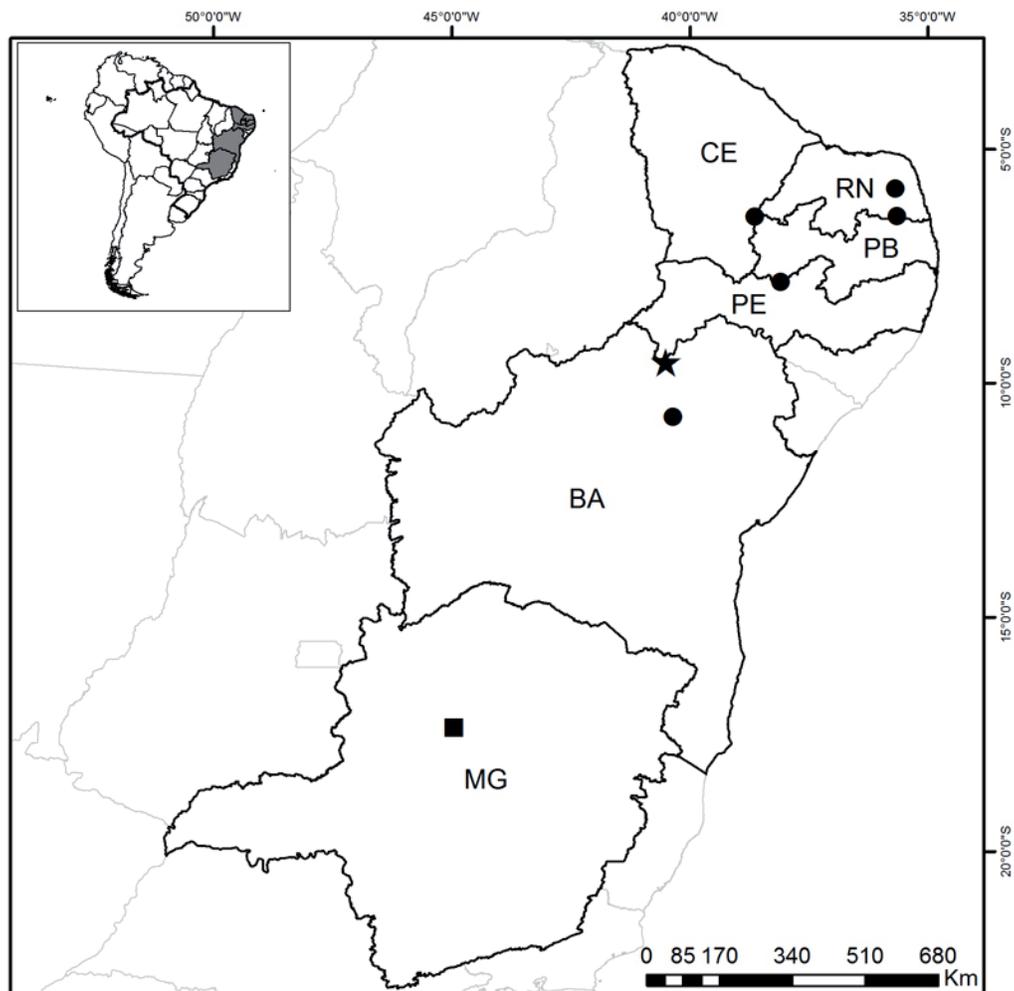


Figure 2. Distribution map of *Ceratophrys joazeirens*. Circles = literature registers (see text); star (type locality; vicinities of Joazeiro, Bahia - BA); square = new record: Fazenda Jatobá, Buritizeiro, and Minas Gerais - MG, Brazil. PB = Paraíba; RN = Rio Grande do Norte; PE = Pernambuco.

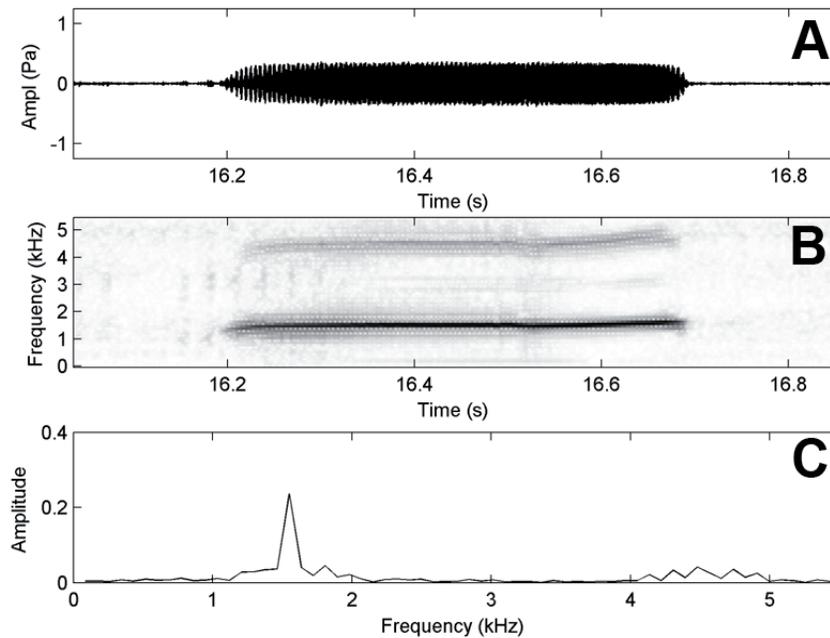


Figure 3. Advertisement call of *Ceratophrys joazeirensis* from Fazenda Jatobá, Buritizeiro, Minas Gerais, Brazil. A: sonogram, B: spectrogram, and C: power spectrum. Code: Ceratophrysjoazeirensiscanto084FazendaJatobá. Voucher: private collection MNCK 0085.

joazeirensis. Valdujo et al. (2012) identified a specimen from Buritizeiro (CHUNB 38786) as *C. aurita*, but did not provide arguments for their identification. Based on our examination of individuals from Buritizeiro and the literature, we argue that this population should not be identified as *C. aurita*.

We also recorded (MNCK 0085) a specimen from Buritizeiro and analyzed the advertisement call of another specimen (not collected) from the same locality. Recordings were edited with frequency at 22 KHz and 16 bits resolution and analyzed in SoundRuler (Marcos Gridi-Papp, Phys. Science, UCLA, USA) software. Fundamental frequency ranges from 710.59 to 790.72 Hz (733.34 ± 32.84 Hz), dominant frequency ranges from 1421.19 to 1593.45 Hz (1476.55 ± 72.51 Hz) and call duration from 462.22 to 555.55 ms (514.61 ± 25.83 ms). This call resembles that from Pindobaçu, Bahia, Brazil in spectral and temporal features (Zaidan and Leite 2012), which had dominant frequency at 1550.4 Hz and call duration ranging from 618 to 721 ms (674.9 ± 28.5 ms). We observed that call duration between the two populations analyzed had some degree of variation. Temporal call parameters, such as call duration are dynamic features that could vary more among

populations. Temporal properties are more variable than spectral ones (Ryan, 1998).

Considering that the Cerrado is an area of low diversity of Certophryidae, and that *Ceratophrys joazeirensis* is a quite distinctive species, Cerrado and Caatinga populations may support the biogeographical hypothesis of the dry diagonal open areas (e.g., Cabrera and Willink, 1973), including *C. cranwelli* found in Chaco.

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References

- Ab'Saber, A.N. (2003): Os domínios de natureza no Brasil: potencialidades paisagísticas. São Paulo, Ateliê Editorial, 159pp.
- Cabrera, A.L., Willink, A. (1973): Biogeografía de América Latina. Monografía-Serie de Biología **13**: 1-122.
- Frost, D.R. (2013): Amphibian Species of the World: an Online Reference. Version 5.6 (9 January 2013). Accessible at <http://research.amnh.org/herpetology/amphibia/index.html>. American Museum of Natural History, New York, USA. Accessed on: June 8, 2013.
- Jorge, J.S., Kokubum, M.N.C., Sales, R.D.F., Freire, E.M.X. (2012): Geographic distribution: *Ceratophrys joazeirensis*. Herpetological Review **43**: 297-298.
- Mercadal, I.T. (1981): Determinación del nivel de ploidia en ejemplares preservados del género *Ceratophrys*. Amphibia-Reptilia **1**: 205-212.
- Mercadal de Barrio, I.T. (1986): *Ceratophrys joazeirensis* sp. n. (Ceratophryidae, Anura) del noreste de Brazil. Amphibia-Reptilia **7**: 313-334.
- Mercadal, I.T., Barrio, A. (2002): Tetraploidía en *Ceratophrys* (Anura, Leptodactylidae). Análisis del registro fósil. Iheringia, Série Zoologia **92**: 17-31.
- Ryan, M.J. (1988): Constraints and patterns in the evolution of anuran acoustic communication. In: The Evolution of the Amphibian Auditory System, p. 637-677. Fritsch, B., Ryan, M.J., Wilczynski, W., Walkowiak, W., Hetherington, T. Eds., New York, John Wiley and Sons Inc.
- Santos, E.M., Silva, G.L., Campo, T.F., Quirino, M.S. (2009): Geographic distribution: *Ceratophrys joazeirensis*. Herpetological Review **40**: 107.
- Valdujo, P.H., Silvano, D.L., Colli, G.R., Martins, M. (2012): Anuran species composition and distribution patterns in Brazilian cerrado, a Neotropical hotspot. South American Journal of Herpetology **7**: 63-78.
- Vieira, K.S., Arzabe, C., Vieira, W.L.S. (2006a): Amphibia, Ceratophryidae, Ceratophryinae, *Ceratophrys joazeirensis*: distribution extension. Check List **2**: 28-29.
- Vieira, K.S., Silva, A.P.Z., Arzabe, C. (2006b): Cranial morphology and karyotypic analysis of *Ceratophrys joazeirensis* (Anura: Ceratophryidae, Ceratophryinae): taxonomic considerations. Zootaxa **1320**: 57-68.
- Zaidan, B.F., Leite, F.S.F. (2012): Advertisement call of the rare, explosive breeding caatinga horned frog *Ceratophrys joazeirensis* Mercadal de Barrio, 1986 (Anura, Ceratophryidae). Zootaxa **3540**: 65-66.