

First record of *Hypsiboas geographicus* (Spix, 1824) (Hylidae) and *Physalaemus centralis* Bokermann, 1962 (Leptodactylidae) for coastal ecosystems in the state of Maranhão, Brazil

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ABSTRACT: This note reports the first record of *Hypsiboas geographicus* and *Physalaemus centralis* for coastal ecosystems “restinga environments” in the Maranhão state, Brazil. These records expand the geographic distribution of these species for restinga environments and contribute to the knowledge of anurofauna of Maranhão state.

DOI: 10.15560/10.3.702

Brazil has the greatest diversity of frogs in the world (Segalla *et al.* 2012). However, this diversity has been threatened by continuous degradation, fragmentation and habitat loss in almost all Brazilian biomes (Myers 2000; Alencar *et al.* 2004; Leal *et al.* 2005; Klink and Machado 2005), the main causes of local extinctions and global decline of amphibian populations (Stuart *et al.* 2008; Verdade *et al.* 2011).

In the state of Maranhão the growing expansion of soybean croplands and *Eucalyptus* woodlots in the Cerrado biome and the real estate exploration and urbanization in the restinga areas (Silva *et al.* 2008) are real threats to biodiversity of this region. In this paper, we present the first record of *Hypsiboas geographicus* (Spix, 1824) and *Physalaemus centralis* Bokermann, 1962 in restinga ecosystems, a typical physiognomy of sandy coastal plains (Araujo *et al.* 1998) in the northeast of Maranhão state (Figure 1). Collection permits were given by the Instituto Chico Mendes de Conservação da Biodiversidade - ICMBio (license number 20896-1).

Hypsiboas geographicus (Spix 1824) is widely distributed in Bolivia, Colombia, Ecuador, French Guiana, Guyana, Trinidad and Tobago, Peru, Suriname, Venezuela and Brazil (Lima *et al.* 2006; IUCN 2013; Frost 2014). In Brazil it is found in preserved and disturbed areas in the Amazon Rainforest, Cerrado and Pantanal biomes, with the exception of the coastal region from the state of Alagoas to the state of Santa Catarina (Lima *et al.* 2006; Stuart *et al.* 2008; IUCN 2013; Frost 2014). *Hypsiboas geographicus* is usually found on trees, branches and twigs along streams, rivers, lentic water bodies (ponds and lakes), lowland forests and clearings forests, being more frequent during the rainy season (Duellman 1973; Duellman 1978;

Rodríguez and Duellman 1994; Bartlett and Bartlett 2003; Lima *et al.* 2006; IUCN 2013). This species is usually observed at elevations below 500 m. However, in Ecuador, it has been observed above 1200 m, suggesting that its populations could represent a species complex (Stuart *et al.* 2008; IUCN 2013).

In this study, specimens of *H. geographicus* were recorded in two municipalities in the northeast of Maranhão state between February and April 2010. In Belágua (3°07'30" S, 43°31'35" W; 88 m a.s.l.) on 15 March 2010, two males were captured (SVL = 57.5 mm and 50.9 mm, Figure 2) calling between 19:00 and 19:30h on soil with grassy vegetation on the banks of a temporary pond in restinga ecosystem. This is the first record of *H. geographicus* to this environment in Brazil. In Icatu (2°40'29" S, 43°59'28" W; 29 m a.s.l.) on 20 April 2010 a male was seen calling between 20:30 and 21:00h in a slow lotic environment in gallery forests with crystalline waters with the predominance of palm trees (*Mauritia flexuosa* L. [Arecaceae]) 10–25 m height, which are called “buritizais”, also in restinga environments (Figure 3A).

Our new records extend the geographical distribution of *H. geographicus* by approximately 2492 km northeast of the type locality (Tefé River, Amazonas, Brazil) and 567 km northeast of the single record in the municipality of Estreito, Ituaneiras farm (06°31'49" S, 47°23'34" W), state of Maranhão (Brasileiro *et al.* 2008). Voucher specimens were deposited in the Museu de Zoologia da Universidade Federal da Bahia (MZUFBA 11236 and 11237).

Physalaemus centralis Bokermann, 1962 is widely distributed in Bolivia, Paraguay and Brazil (Uetanabaro *et al.* 2008; IUCN 2013; Frost 2014). In Brazil it is associated with open areas in the Atlantic Forest biome, Pantanal

and Cerrado formations in the Distrito Federal, in the states of Minas Gerais, Mato Grosso, Mato Grosso do Sul, São Paulo, Tocantins and Maranhão (IUCN 2013; Frost 2014). In Maranhão, *P. centralis* was recorded only in Cerrado areas (Brasileiro et al. 2008). Males of this species are usually found calling in the undergrowth in the short

periods after heavy rains associated with temporary and permanent ponds, swamps, wetlands and farm dams (Brasileiro et al. 2005; Vasconcelos and Rossa-Feres 2005; Santos et al. 2007; Zina et al. 2007). We observed in this study specimens in anthropized restinga environments, contradicting the results of Brasileiro and Martins (2006) that suggested that *P. centralis* does not adapt to anthropic environments.

In this study, specimens of *P. centralis* were recorded in three municipalities in northeastern Maranhão state, between February and April 2010: In Morros ($2^{\circ}50'56''$ S, $43^{\circ}51'36''$ W; 71 m a.s.l) on 22 February 2010 (SVL = 22.72 mm, Figure 4), in Icatu ($2^{\circ}40'29''$ S, $43^{\circ}59'28''$ W; 29 m a.s.l) on 31 March 2010 (SVL = 29.84 mm) and in Belágua ($3^{\circ}06'51''$ S, $43^{\circ}31'46''$ W; 86 m a.s.l) on 5 April 2010 (SVL = 33.74 mm and 34.76 mm), being the first record of *P. centralis* in restinga ecosystems in the state of Maranhão. All individuals were found calling between 19:00 and 22:00h in grassy undergrowth on the banks of temporary wetlands and ponds in restinga environments (Figure 3 B-C).

Our new records extend the geographical distribution of *Physalaemus centralis* by approximately 1460 km northeast of the type locality (Rio Coluene, Xingu, Mato Grosso) and by 535 km northeast of the nearest locality records at Jacuba farm ($06^{\circ}16'24''$ S, $47^{\circ}21'41''$ W) and Maravilha farm ($06^{\circ}00'38''$ S, $47^{\circ}25'43''$ W), municipality of Porto Franco, Maranhão (Brasileiro et al. 2008). Voucher specimens were deposited in the Coleção de herpetologia da Universidade Federal do Maranhão (CHUFMA 1011, 1160, 1166 and 1167).

One parameter used when selecting priority areas for planning conservation units is the total species richness (Drummond et al. 2005). The state of Maranhão is inserted in a wide and diverse biogeographic transition zone (Ab' Saber 1989) with the Amazon Rainforest in its western portion, patches of the Caatinga in the east, Cerrado in the center and northeast (IBGE 1984), and coastal ecosystems (restingas and mangroves) in the north and northeast.

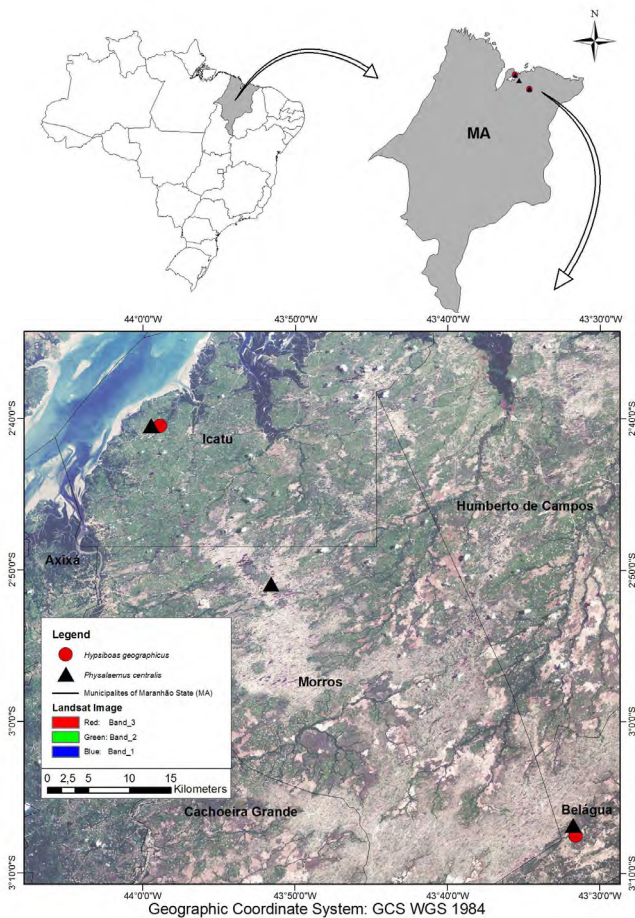


FIGURE 1. Map pointing the new records of *Hypsiboas geographicus* (red circles) and *Physalaemus centralis* (black triangle) in restinga ecosystems in the northeast of Maranhão state, Brazil.



FIGURE 2. Adult male of *Hypsiboas geographicus* (SVL= 57.5 mm; MZUFBA 11236) recorded in the municipality of Belágua, in the northeast of Maranhão state, Brazil. A) Dorsal view and B) Ventral view. Photo: Camila Trevisan and Lucas Menezes.



FIGURE 3. Sampled sites in coastal ecosystems (restinga environments) in the northeast of Maranhão state, Brazil. A) Slow lotic environment preserved "buritizal" in Icatu. B) Temporary pond in Morros. C) Temporary pond in Icatu. Photo: Rodrigo Matavelli.

This allows the occurrence of a high biodiversity with communities sharing faunistic elements of different biomes (De Marco *et al.* 2005; Rebêlo *et al.* 2010; Dos Santos *et al.* 2012; Rêgo and Albuquerque 2012; Campos *et al.* 2013; Matavelli *et al.* 2013a, 2013b, 2014).

Because of the scarcity of data on species diversity in different regions and biomes of the state of Maranhão, additional information on the geographical distribution of species is important for future conservation strategies and one of the most important criteria used to assess species' conservation status (Bressan *et al.* 2009; IUCN 2013).



FIGURE 4. Adult male of *Physalaemus centralis* (SVL= 22.72 mm; CHUFMA 1011) recorded in the municipality of Morros, in the northeast of Maranhão state, Brazil. Photo: Rodrigo Matavelli.

ACKNOWLEDGMENTS: We thank Marcelo Felgueiras Napoli and Luiz Norberto Weber for identification of specimens. Gustavo Klinke for helping with the distribution map. Camila Trevisan and Lucas Menezes (UFBA) for helping with pictures of *H. geographicus*. João do Vale (SEMABE/Icatu) for fieldwork assistance. We also thank Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq (Casadinho/620163/2009-8), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - CAPES (master fellowship to RM and AMC) for financial support and Instituto Chico Mendes de Conservação da Biodiversidade ICMBio/SISBIO (Autorização-20896-1) for collecting permits.

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RECEIVED: November 2013

ACCEPTED: February 2014

PUBLISHED ONLINE: July 2014

EDITORIAL RESPONSIBILITY: Natan Medeiros Maciel