

Amphibians and reptiles from the Araripe bioregion, northeastern Brazil

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Abstract. We present an inventory list of the herpetofauna of the Araripe bioregion by compiling data from zoological collections and available literature. We found 31 species of anurans of which nine are new records for the study area. Regarding reptiles, we found 78 species of which 14 are new records for the study area. *Mabuya frenata* was recorded for the first time in the State of Ceará. Our results show a higher diversity of reptiles and amphibians for the Araripe bioregion than previously supposed, reinforcing the need for establishing a new protected area in the region.

Key words. Chapada do Araripe, species list, Amphisbaenia, Anura, Squamata, Testudines, rainforest, Cerrado, conservation.

Resumo. Nós apresentamos o inventário da herpetofauna encontrada na Bioregião do Araripe, através da compilação de dados de coleções zoológicas e literatura disponível. Foram registradas 31 espécies de anuros, das quais nove são novos registros para a área estudada. Em relação aos répteis, foram registrados um total de 78 espécies, das quais 14 são novos registros. *Mabuya frenata* foi registrado pela primeira vez para o estado do Ceará. Os dados apresentados indicam a presença de uma alta diversidade de répteis e anfíbios na Bioregião do Araripe, reforçando a necessidade de uma nova Unidade de Conservação na região.

Introduction

The Caatinga is the only biome exclusive to Brazil, and one of the most threatened in the country. Despite this, the Caatinga is considered one of the least represented biome in terms of scientific research, especially regarding its biodiversity (LEAL et al. 2005). Up to the 1980s, the Caatinga was thought of as poor in herpetofaunal endemism and diversity, supposedly harbouring only species typical of open areas and in common with the Cerrado and the Pantanal (VANZOLINI 1974, VANZOLINI et al. 1980). However, later studies found several unknown and endemic species in this biome (RODRIGUES 1996, RODRIGUES & BORGES 1997, RODRIGUES & SANTOS 2008), leading to a considerable increase in the known diversity of reptiles and amphibians of the Caatinga.

The relict forests of Ceará are islands of rainforest at high-altitude sites and surrounded by Caatinga. These relict forests harbour high biodiversity including various endemic species, such as the lizards *Leposoma baturitensis* and *Placosoma* sp., the snake *Atractus ronnie* (RODRIGUES & BORGES 1997, BORGES-NOJOSA & CARAMASCHI 2003, PASSOS et al. 2007, LOEBMANN & HADDAD 2010), and the anurans *Adelophryne baturitensis* and *A. maranguapensis* (HOOGMOED et al. 1994).

The Chapada do Araripe is a relict forest harbouring a myriad of physiognomies from Caatinga *sensu strictu* to Cerrado, Cerradão and important remnants of Atlantic rainforest (MMA 2000). Chapada do Araripe is considered a Priority Area for biodiversity conservation of the Caatinga biome (MMA 2007). However, its herpetofauna

has remained poorly studied. One of the first inventories of anuran amphibians in the region was compiled by the zoologist ANTENOR LEITÃO DE CARVALHO, in 1936 (CARVALHO 1937). This author recorded eight frog species in the municipality of Crato. Later, OTTO SCHUBART documented the Surinam toad *Pipa carvalhoi* in the municipality of Jardim (SCHUBART 1942). Then, about 40 years passed until PAULO EMILIO VANZOLINI recorded 13 lizards, two amphisbaenids, and 11 snakes in the municipality of Barbalha (WILLIANS & VANZOLINI 1980, VANZOLINI 1981). In the same decade, REBOUÇAS-SPIEKER (1981) described the lizard *Mabuya arajara*, also from the locality of Arajara. One decade later, BORGES-NOJOSA (1999) presented seven new anuran records for the region. JULIANO et al. (2001) recorded the amphibian *Dendropsophus soaresi*, and SILVA JR. et al. (2001) recorded the snake *Anilius scytale*, both for the Crato municipality. BORGES-NOJOSA & CARAMASCHI (2003) commented on the fauna of lizards and amphisbaenids of the highland marshes of Ceará. These authors stated that the herpetofaunal diversity in the Chapada do Araripe was lower than in the other humid forest remnants of the state, with low similarity in composition as compared to the Serra de Baturité, Serra de Maranguape and Serra da Aratanha. In the same year, HEYER & JUNCÁ (2003) described the anuran *Leptodactylus caatingae*, providing a record for the municipality of Exú. Over the next two years, BASTOS & SKUK (2004) recorded the anurans *Dendropsophus oliveirai* for the municipality of Crato and NASCIMENTO et al. (2005), *Physalaemus albifrons* and *P. cildada* for the municipality of Brejo Santo. The most comprehensive work on the herpetofauna of the region was eventually provided by RIBEIRO et al. (2008), who presented a compilation of records from the literature and new records for the region, including three snakes. In that same year, CARAMASCHI (2008) recorded *Pleurodema diplolister* and *Leptodactylus troglodytes* for the municipalities of Brejo Santo and Barro, respectively. In 2009, LOEBMANN et al. (2009) recorded the snake *Atractus ronnie*, which had previously been considered endemic to the Serra do Baturité mountain range. In the same year, three new snake records were made for the Caatinga of the Araripe bioregion (ROBERTO et al. 2009a, b, c), and the lizard *Stenocercus squarrosus* was discovered in the Carrasco of the Chapada do Araripe (RIBEIRO et al., 2009). LEMA & DEIQUES (2010), reviewing the taxonomy of *Elapomorphus wuchereri* and *E. lepidus*, described the genus *Coronelaps* and mentioned a specimen of *Coronelaps lepidus* from the Crato municipality. The last published record was the anuran *Trachycephalus atlas*, found in a Caatinga area in the municipality of Jati (ROBERTO et al., 2011).

Despite these studies, the herpetofauna of the southern region of Ceará state still remains little known, and the lack of data makes it difficult to assess its actual local richness and, consequently, establish adequate public policies for the conservation of the Chapada do Araripe.

We performed an extensive literature review and examined the specimens of amphibians and reptiles collected between 2004 and 2012 that are deposited in the collection

of the Zoology Laboratory (URCA-H). These specimens were collected by members of the Universidade Regional do Cariri – URCA during field surveys for the study of the ecology of vertebrates.

Material and methods

The species of amphibians and reptiles presented here were recorded in the Araripe bioregion, which includes the Chapada do Araripe per se and all the municipalities around it, including the Araripe Sedimentary Basin.

The sampled areas contain physiognomies of Caatinga (300–500 m above sea level), Rainforest (600–800 m a.s.l.), Cerrado and Cerradão (800–900 m a.s.l.). The municipalities sampled were: Crato ($07^{\circ}15'$ S, $39^{\circ}28'$ W), Juazeiro do Norte ($07^{\circ}12'$ S, $39^{\circ}18'$ W), Barbalha ($7^{\circ}21'$ S, $39^{\circ}17'$ W), Milagres ($07^{\circ}18'$ S, $38^{\circ}56'$ W), Jati ($07^{\circ}41'$ S, $39^{\circ}00'$ W), and Várzea Alegre ($05^{\circ}21'$ S, $40^{\circ}23'$ W). All these are located in the Araripe Sedimentary Basin in the southern part of the state of Ceará in northeastern Brazil (Fig. 1).

The Araripe Sedimentary Basin covers an area of approximately 11,000 km² and includes 37 municipalities, which are fully or partially located in the states of Ceará, Pernambuco and Piauí. The northeastern region, corresponding to the Cariri Cearense, where the studied municipalities are located, is a portion with elevated levels of annual precipitation (950–1100 mm), favoured by the effects of the orographic rains of the plateau, due to its windward position on the slope of the state. The average annual temperature of the Araripe Basin varies between 21 and 27°C (PROJETO ARARIPE 1999).

Three distinct geomorphological zones are recognized: the plateau zone, slope zone, and the pediplain zone, with each showing particular characteristics with respect to topography, climate, hydrography and vegetation. The first, located on the plateau of the Chapada do Araripe, exhibits an almost flat, table-like topography, forming an extensive tableland located at the highest altitudes (700–1,000 m). In this zone, there is almost perfect drainage, because the soil is sandy, porous and permeable, and vegetation is limited to relicts of Cerrado, Cerradão (Floresta Subcaducifólia Tropical Xeromorpha) and Carrasco. The Flona Araripe (National Forest of Araripe) is located in this zone (Projeto Araripe 1999). The slope zone, in turn, borders the slope of the Chapada do Araripe. It is a humid valley with soil that is little permeable and fertile, and dense and branched drainage. Hundreds of natural water sources here favour dense forest vegetation of the “Floresta Subperenifólia Tropical Pluvio-Nebular” type (Projeto Araripe 1999). The pediplain zone, finally, constitutes a vast depression with an average altitude of 400 m and native vegetation typical of the Caatinga domain (Projeto Araripe 1999) (Fig. 2).

Our list was compiled using specimens collected between 2004 and 2012 that are deposited in the collection of the Zoology Laboratory of the Universidade Regional do Cariri (URCA-H). Some specimens were deposited in the herpetological collections of the Universidade de Brasília

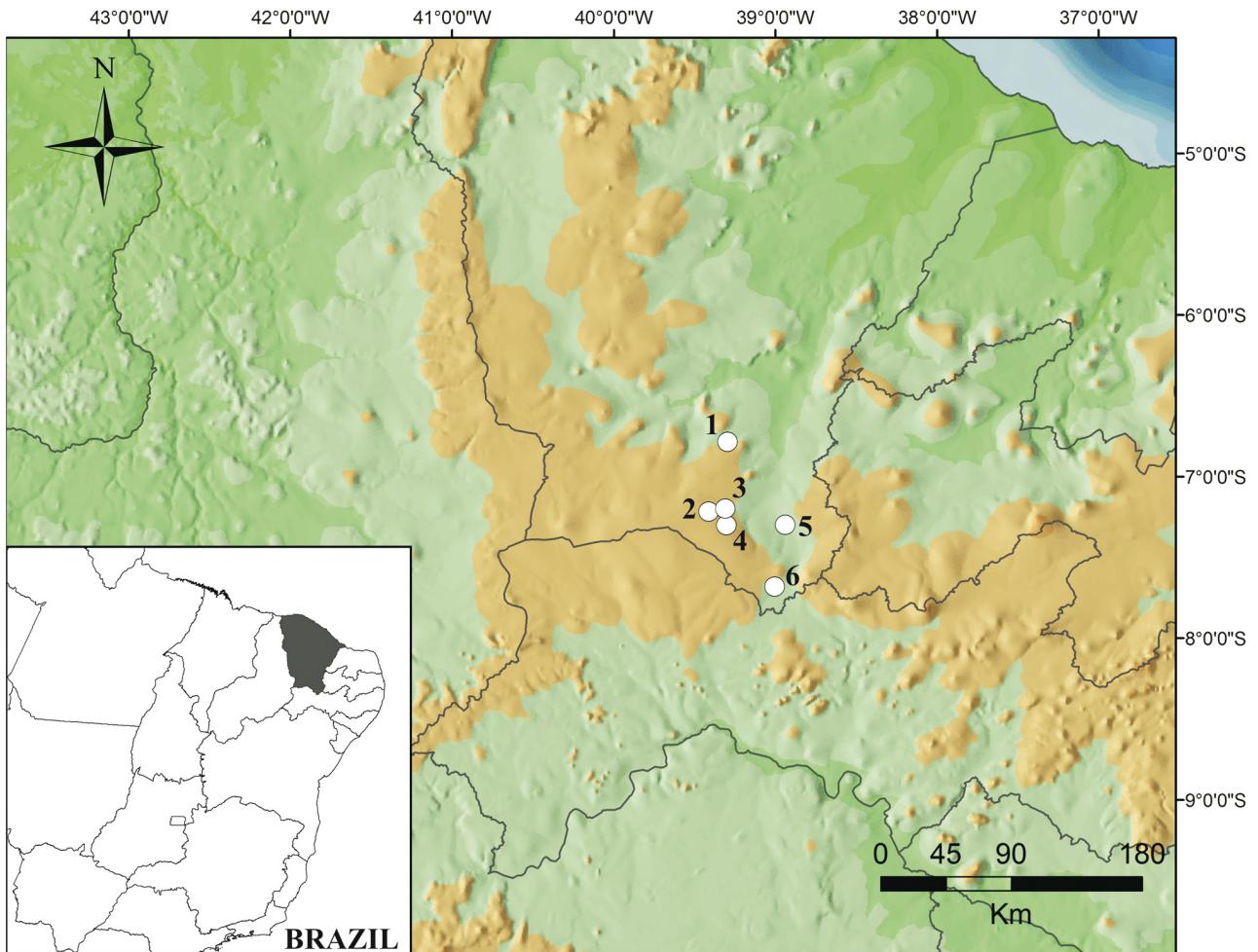


Fig. 1. Map of the Araripe bioregion showing the sampled municipalities (Ceará). 1 = Várzea Alegre; 2 = Crato; 3 = Juazeiro do Norte; 4 = Barbalha; 5 = Milagres; 6 = Jati.

(CHUNB), Museu Nacional do Rio de Janeiro (MNRJ), Collection of the Instituto Butantan (IBSP), and Museu de Zoologia da Universidade de São Paulo (MUZUSP). Additionally, literature records were used to complete the inventory list.

Specimens deposited in the surveyed collections and referred to in the literature were collected from the field using a combination of methods such as active search, visual census, auditory census (amphibians), pitfall traps with 60 and 30 l buckets, and also include animals collected by local people. Photographic records were also considered for our inventory list. No systematic collecting was carried out at specific sites, so that records are based on scattered and random sampling. The conservation status quoted follows IUCN (2011). The species taxonomy applied follows the Brazilian Society of Herpetology (SBH), according to SEGALLA et al. (2012) for amphibians and BÉRNILS & COSTA (2011) for reptiles.

Results and discussion

Richness of amphibians

We found 31 species of anuran amphibians in the Chapada do Araripe and adjacent Caatinga (Tab. 1 and Fig. 3). These species are distributed in 15 genera, belonging to seven families (Hylidae, nine species [32.5%]; Leptodactylidae, eight [25.5%]; Leiuperidae, seven [21%]; Bufonidae, two [7%]; Microhylidae, two [7%]; and Cyclocramphidae and Pipidae, only one species each [3.5%]). We here present nine new records of amphibians for the Chapada do Araripe, namely the species *Dendropsophus minutus*, *Scinax* gr. *ruber* (Hylidae), *Physalaemus* sp., *Pseudopaludicola* sp. (gr. *mystacalis*), *Pseudopaludicola* sp. (gr. *falcipes*) (Leiuperidae), *Leptodactylus* sp. (aff. *andreae*), *Leptodactylus mystaceus*, *Leptodactylus* sp. (aff. *syphax*) (Leptodactylidae), and *Elachistocleis piauiensis* (Microhylidae).

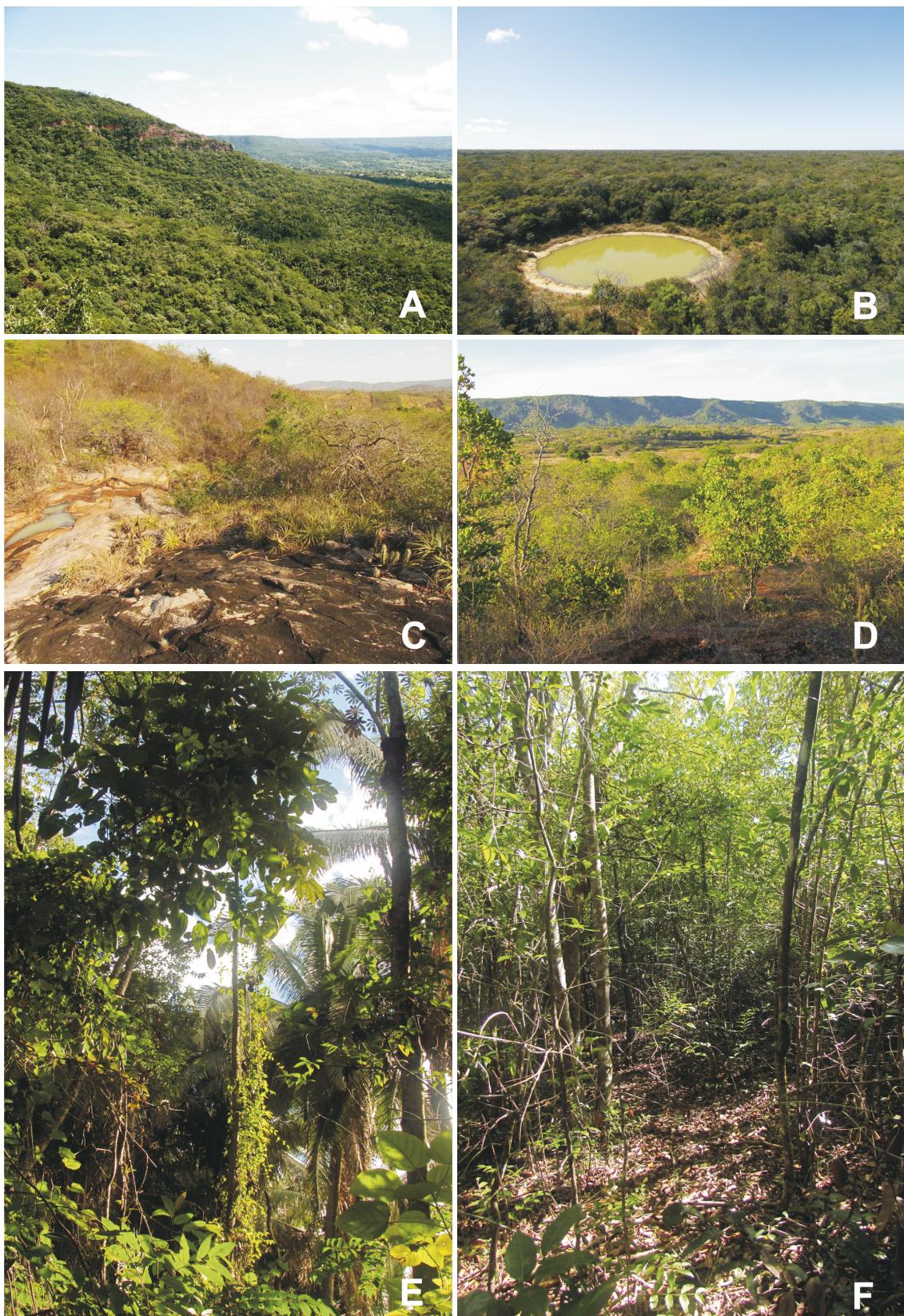


Fig. 2. Phytophysiognomies sampled in the Araripe bioregion. A = View of the slopes of the Chapada do Araripe; B = View of the Cerrado located in FLONA-Araripe; C = Caatinga, view of the “lajeiro”; D = Caatinga; E = Rainforest; F = Cerrado.

Table 1. Species of anuran amphibians from the Araripe bioregion, northeastern Brazil. Legend: *not collected; LC = Least concern; DD = Data deficient. Habitats registered: Caa = Caatinga; Rf = Rainforest; Cer = Cerrado. Source: 1 = CARVALHO (1937), 2 = SCHUBART (1942), 3 = BORGES-NOJOSA (1999), 4 = JULIANO et al. (2001), 5 = HEYER & JUNCÁ (2003), 6 = BASTOS & SKUK (2004), 7 = NASCIMENTO et al. (2005), 8 = CARAMASCHI (2008), 9 = ROBERTO et al. (2011).

Species	Habitat	IUCN Status	Source
Bufoidae (2 spp.)			
<i>Rhinella granulosa</i> (SPIX, 1824)	Caa; Cer	LC	1, 3
<i>Rhinella jimi</i> (STEVAUX, 2002)	Caa; Cer; Rf	LC	3
Cycloramphidae (1 sp.)			
<i>Proceratophrys cristiceps</i> (MÜLLER, 1884 "1883")	Caa; Rf	LC	3
Hylidae (10 spp.)			
<i>Corythomantis greeningi</i> BOULENGER, 1896	Caa; Rf	LC	3
<i>Dendropsophus minutus</i> (PETERS, 1872)	Caa; Cer; Rf	LC	this study
<i>Dendropsophus nanus</i> (BOULENGER, 1889)	Caa	LC	1
<i>Dendropsophus oliveirai</i> (BOKERMANN, 1963)	Caa	LC	6, *
<i>Dendropsophus soaresi</i> (CARAMASCHI & JIM, 1983)	Caa; Cer	LC	4
<i>Hypsiboas raniceps</i> COPE, 1862	Caa	LC	1, 3
<i>Phyllomedusa nordestina</i> CARAMASCHI, 2006	Caa; Cer	DD	3
<i>Scinax</i> sp. (gr. <i>ruber</i>)	Caa; Cer	?	this study
<i>Scinax x-signatus</i> (SPIX, 1824)	Caa; Cer	LC	1, 3
<i>Trachycephalus atlas</i> BOKERMANN, 1966	Caa	LC	9
Leiuperidae (7 spp.)			
<i>Physalaemus</i> sp.	Cer	?	this study
<i>Physalaemus albifrons</i> (SPIX, 1824)	Caa	LC	3, 7
<i>Physalaemus cicada</i> BOKERMANN, 1966	Caa	LC	7
<i>Physalaemus cuvieri</i> FITZINGER, 1826	Caa; Cer; Rf	LC	3
<i>Pleurodema diplolister</i> (PETERS, 1870)	Caa	LC	8
<i>Pseudopaludicola</i> sp. (gr. <i>falcipes</i>)	Caa	LC	this study
<i>Pseudopaludicola</i> sp. (gr. <i>mystacalis</i>)	Caa	?	this study*
Leptodactylidae (8 spp.)			
<i>Leptodactylus</i> sp. (aff. <i>andreae</i>)	Cer; Rf	?	this study
<i>Leptodactylus</i> sp. (aff. <i>syphax</i>)	Caa	?	this study
<i>Leptodactylus caatingae</i> HEYER & JUNCÁ, 2003	Caa		5
<i>Leptodactylus fuscus</i> (SCHNEIDER, 1799)	Caa	LC	1, 3
<i>Leptodactylus macrosternum</i> MIRANDA-RIBEIRO, 1926	Caa; Rf	LC	1, 3
<i>Leptodactylus mystaceus</i> (SPIX, 1824)	Cer; Rf	LC	this study
<i>Leptodactylus troglodytes</i> A. LUTZ, 1926	Caa, Cer	LC	3, 8
<i>Leptodactylus vastus</i> A. LUTZ, 1930	Caa; Rf	LC	1, 3
Microhylidae (2 spp.)			
<i>Dermatonotus muelleri</i> (BOETTGER, 1885)	Caa; Cer	LC	1
<i>Elachistocleis piauiensis</i> CARAMASCHI & JIM, 1983	Caa	LC	this study
Pipidae (1 sp.)			
<i>Pipa carvalhoi</i> (MIRANDA-RIBEIRO, 1937)	Caa; Cer	LC	2

Amphibians not identified at species level are those that turned out questionable by comparison with their original descriptions, or groups with recognized taxonomic problems (e.g., *Pseudopaludicola* genus). Some of these species are currently being assessed or in the process of description, justifying our preliminary imperfect classification, including reptiles that are presented below.

Around 87% of the species were found in the herpetological collection of the Universidade Regional do Cariri, showing the scientific importance of this collection for this biome. The URCA collection is of regional scope (see AURICCHIO & SALOMÃO, 2002), focusing on species representation of the states of Ceará, Pernambuco, Piauí and Maranhão, and comprises approximately 3,500 specimens.

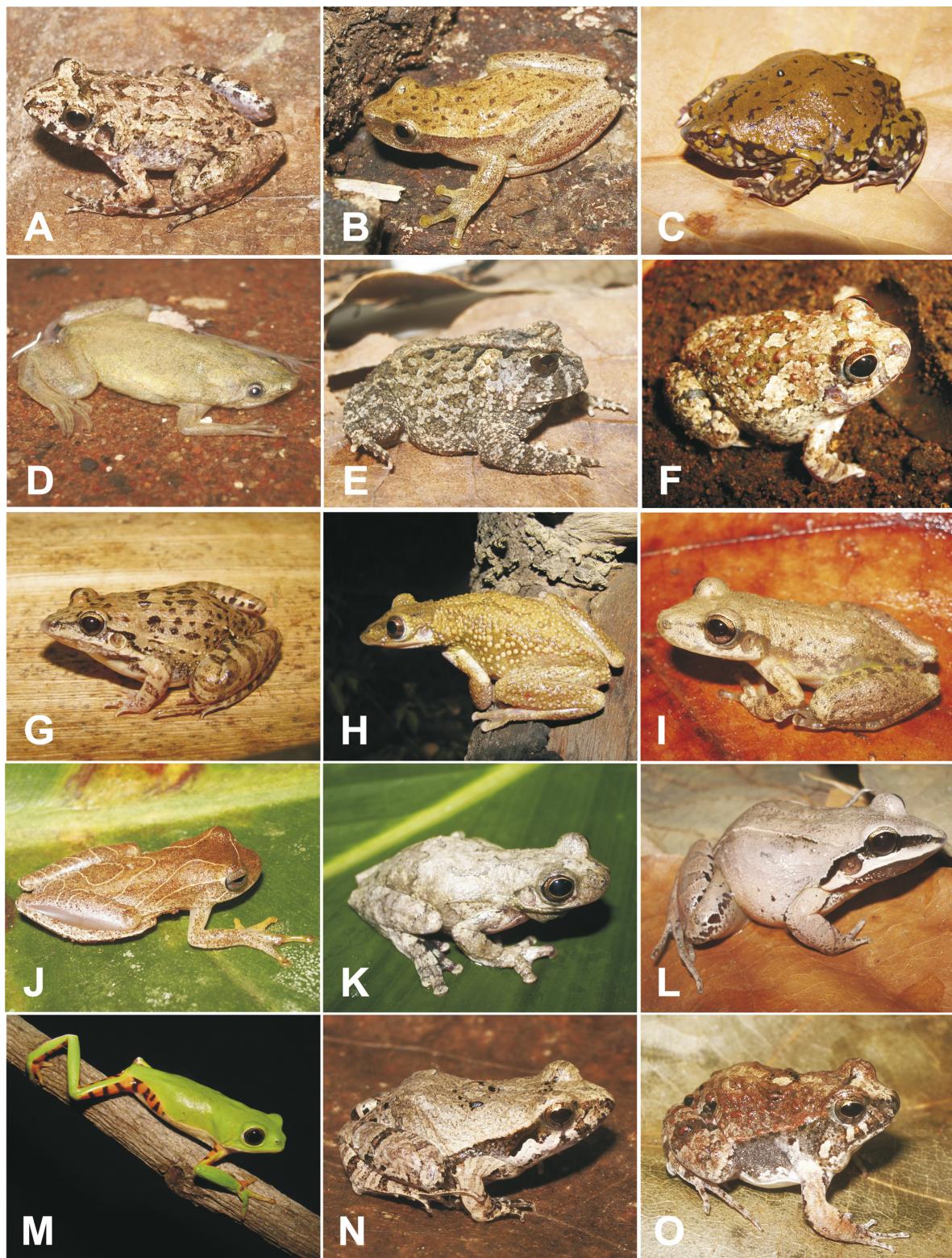


Fig. 3. Species of anuran amphibians from Araripe bioregion, Northeastern Brazil. A = *Leptodactylus* sp. (aff. *andreae*); B = *Dendropsophus nanus*; C = *Dermatonotus muelleri*; D = *Pipa carvalhoi*; E = *Proceratophrys cristiceps*; F = *Pleurodema diplolister*; G = *Leptodactylus fuscus*; H = *Corythomantis greeningi*; I = *Scinax* gr. *ruber*; J = *Dendropsophus minutus*; K = *Dendropsophus soaresi*; L = *Leptodactylus mystaceus*; M = *Phyllomedusa nordestina*; N = *Physalaemus cuvieri*; O = *Physalaemus albifrons*. Photos: A, B, C, D, E, G, I, J, K, L, M, N, O (R. W. ÁVILA); F, H (S. C. RIBEIRO).

The majority of the recorded species has a wide distribution in the Caatinga domain, and is typical of open ecosystems (see RODRIGUES 2003) with exception of *Leptodactylus* sp. (aff. *andreae*), which, in the state, was only found in ecotonal areas of dry and humid forests at altitudes above 500 m, in the Serra de Baturité, Serra de Maranguape, Serra da Aratanha, Serra da Ibiapaba, and Serra das Almas mountain ranges, and *Pipa carvalhoi*, which, in Ceará, is restricted to altitudes above 400 m in the southern region of the state. The list of the anuran fauna presented here for the Chapada do Araripe does not contain any threatened species or those endemic to the Caatinga biome.

Compared to the last compilation that recorded 12 species of amphibians (BORGES-NOJOSA 1999), our study reveals a considerably greater richness of anurans to exist in the Araripe bioregion. This number of species is still low compared to other relict forests of the northeast, which were more effectively sampled, however. For example, the Planalto da Ibiapaba in the state of Ceará currently has a total of 38 known species (LOEBMAN & HADDAD 2010).

The Chapada do Araripe was recently identified as a priority area for the conservation of anurans by CAMARDELLI & NAPOLI 2012, despite they underestimated the bioregion diversity. These authors indicated that 24 species were present, but failed to provide information about relevant records or references in the literature. We here provide a detailed list including data on the habitats of the species.

Richness of reptiles

We recorded a total of 78 species of reptiles distributed in 55 genera, belonging to 21 families (Tab. 2; Fig. 4, 5). Of these, 43 are snakes (54%), 27 lizards (35.5%), five amphisbaenids (6.5%), and three chelonians (4%). Herein we present 14 new records of reptiles for the Chapada do Araripe.

Gekkonidae and Scincidae were the most representative lizards with four species (14.8%), followed by Tropiduridae, Teiidae and Gymnophthalmidae with three species (11.1% each, Phyllodactylidae and Polychrotidae with two species (7.4%) each, and Anguidae, Diploglossidae, Iguanidae, Leiosauridae, and Sphaerodactylidae with only one species (3.7%) each. Colubridae was the richest snake family with 32 species (73.8%), Boidae and Viperidae with three (7.1% both, Elapidae and Leptotyphlopidae with two (4.7%) each, and Aniliidae with only one species (2.3%).

The majority of the records (83.1%) were found in the herpetological collection of the Universidade Regional do Cariri (URCA), showing the scientific importance of this collection for this biome.

Our list of the reptile fauna does not contain any threatened species and only two that are endemic to the Caatinga biome (the lizards *Phyllopezus periosus* and *Mabuya agmosticha*). However, there are rare species or those with a relict distribution in the Caatinga, such as the lizards *Coleodactylus meridionalis*, *Colobosaura modesta*, *Diploglossus lessonae*, *Enyalius bibrornii*, *Hemidactylus agrius*, *Mabuya arajara*, *Ophiodes* sp. (aff. *striatus*), and *Stenocercus squarro-*

sus, and the snakes *Atractus ronnie*, *Chironius flavolineatus*, *Corallus hortulanus*, *Drymoluber brasili*, *Liophis reginae*, *Oxyrhopus melanogenys*, *Psomophis joberti*, *Sibynomorphus mikani*, and *Trilepida brasiliensis* (see RODRIGUES 2003, NOGUEIRA & RODRIGUES 2006, RIBEIRO et al. 2009, LOEBMANN et al. 2009, ROBERTO & LOEBMANN 2010).

Mabuya frenata is a species typical of the Cerrado and Chaco domains (VANZOLINI 1988, COLLI et al. 2002), but can occur associated with forests and dense savannas (GALLARDO 1968), or even in clearings of the Atlantic Forest (SAZIMA & HADDAD 1992). It was found in the humid portions of the slope of the Chapada do Araripe in the municipality of Crato and on the plateau of the Cerrado. It is a species that is widely distributed in South America in general and in Brazil in particular (VRCIBRADIC et al. 2006, COSTA et al. 2008 and respective references given there). We present here the first record of the species from the state of Ceará and the second record from northeastern Brazil, lying about 350 km southwest of the closest record from the Serra das Confusões in the state of Piauí (WHITING et al. 2006).

It is evident that the reptile fauna of the Chapada do Araripe is characterized by species that are typical of the Caatinga, but it also includes components typical of the Cerrado, such as the lizards *Mabuya frenata* and *Colobosaura modesta*, and components of the rainforest with distribution ranges in Amazonia, such as the snakes *Drymoluber dichrous* (BORGES-NOJOSA & LIMA 2001), *Anilius scytale* (SILVA JR. et al. 2001), and *Oxyrhopus melanogenys* in addition to the amphisbaenid *Amphisbaena fuliginosa*.

Conclusions

We conclude that this pattern of richness agrees with studies conducted in other highland marshes in Ceará (e.g., VANZOLINI 1981, BORGES-NOJOSA & CARAMASCHI 2003, LOEBMANN & HADDAD 2010), supporting the theory of refuges proposed by HAFFER (1969) and corroborated by VANZOLINI (1981), VANZOLINI & WILLIAMS (1970) and VANZOLINI & WILLIAMS (1981).

Despite the higher diversity of the herpetofauna in the Chapada do Araripe, the region does not exhibit the elevated levels of endemism found in the other forest refuges in Ceará State, such as Serra do Baturité and Serra de Maranguape (HOOGMOED et al. 1994; BORGES-NOJOSA & CARAMASCHI 2003). The position of the Chapada do Araripe, distant from the littoral, influences its species composition, with fewer species with distributions in the Atlantic Rainforest north to the São Francisco River, when compared to the other forest refuges of the Ceará. We emphasize the need for further research on the herpetofauna in the Chapada do Araripe, especially focusing on natural history aspects, which should be executed in a standardised manner. This is regarded as an essential tool for the conservation of this region and the Caatinga biome, which are home to a great richness of species and, at the same time, are severely threatened.

Table 2. Species of reptiles from the Araripe bioregion, northeastern Brazil. Legend: *not collected; †not native; LC = Least concern. Habitats registered: Caa = Caatinga; Carr = Carrasco; Cer = Cerrado; Rf = Rainforest. Source: 1-WILLIAMS & VANZOLINI (1980); 2-VANZOLINI et al. (1980); 3-REBOUCAS-SPIEKER (1981); 4-VANZOLINI (1981); 5-BORGES-NOJOSA (1998); 6-SILVA JR. et al. (2001); 7-BORGES-NOJOSA & CARAMASCHI (2003); 8-ALMEIDA et al. (2006); 9- RIBEIRO et al. (2008); 10- LOEBMANN et al. (2009); 11-ROBERTO et al. (2009a); 12-RIBEIRO et al. (2009), 13-LEMA & DEIQUES (2010), 14-ROBERTO et al. (2009b), 15-ROBERTO et al. (2009c), 16-(A. MAGALHÃES JR. unpubl. data).

Species	Habitat	IUCN (2011)	Source
Amphisbaenidae (5 spp.)			
<i>Amphisbaena alba</i> LINNAEUS, 1758	Caa; Cer; Rf	LC	8, 9
<i>Amphisbaena pretrei</i> DUMÉRIL & BIBRON, 1839	Cer; Rf	LC	4, 9
<i>Amphisbaena vermicularis</i> WAGLER, 1824	Caa	?	2, 9
<i>Amphisbaena fuliginosa</i> LINNAEUS, 1758	Rf	?	This study, *
<i>Amphisbaena polystega</i> (DUMÉRIL, 1851)	Caa	?	4, 9
Anguidae (1 sp.)			
<i>Ophiodes</i> sp. (aff. <i>striatus</i>)	Rf	?	This study
Diploglossidae (1 sp.)			
<i>Diploglossus lessonae</i> PERACCA, 1890	Caa; Rf	LC	1, 2, 4, 5, 9
Gekkonidae (4 spp.)			
<i>Hemidactylus agrius</i> VANZOLINI, 1978	Caa	?	2, 5, 9
<i>Hemidactylus brasiliensis</i> (AMARAL, 1935)	Caa; Cer	?	2, 5, 9
<i>Hemidactylus mabouia</i> (MOREAU DE JONNÈS, 1818)	Caa; Cer; Rf; †	LC	2, 5, 9
<i>Lygodactylus klugei</i> (SMITH, MARTIN & SWAIN, 1977)	Caa	?	2
Gymnophthalmidae (3 spp.)			
<i>Micrablepharus maximiliani</i> (REINHART & LUETKEN, 1862)	Caa; Cer	?	1, 2, 4, 5, 9
<i>Vanzosaura rubricauda</i> (BOULENGER, 1902)	Caa	?	2, 5, 9
<i>Colobosaura modesta</i> (REINHARDT & LUETKEN, 1862)	Cer; Rf	?	This study
Iguanidae (1 sp.)			
<i>Iguana iguana</i> (LINNAEUS, 1758)	Caa; Cer	?	2, 5, 9
Leiosauridae (1 sp.)			
<i>Enyalius bibronii</i> BOULENGER, 1885	Cer; Rf	LC	5, 9
Phyllodactylidae (3 spp.)			
<i>Gymnodactylus geckoides</i> SPIX, 1825	Caa	?	1, 2, 4, 5, 9
<i>Phyllopezus periosus</i> RODRIGUES, 1986	Caa	?	This study
<i>Phyllopezus pollicaris</i> (SPIX, 1825)	Caa; Rf	?	1, 2, 4, 5, 9
Polychrotidae (2 spp.)			
<i>Anolis brasiliensis</i> (VANZOLINI & WILLIAMS, 1970)	Cer; Rf	?	1, 4, 5, 9
<i>Polychrus acutirostris</i> SPIX, 1825	Caa; Cer; Rf	?	1, 2, 4, 5, 9
Scincidae (4 spp.)			
<i>Mabuya arajara</i> REBOUÇAS-SPIEKER, 1981	Caa; Cer; Rf	?	3, 9, 5, 9
<i>Mabuya agmosticha</i> RODRIGUES, 2000	Caa	?	16, *
<i>Mabuya frenata</i> (COPE, 1862)	Cer; Rf	?	This study
<i>Mabuya heathi</i> SCHMIDT & INGER, 1951	Caa	?	1, 2, 4, 5, 9
Sphaerodactylidae (1 sp.)			
<i>Coleodactylus meridionalis</i> (BOULENGER, 1888)	Caa; Rf	?	1, 2, 4, 5, 9
Teiidae (3 spp.)			
<i>Ameiva ameiva</i> (LINNAEUS, 1758)	Caa; Cer; Rf	?	1, 2, 4, 5, 9
<i>Cnemidophorus ocellifer</i> (SPIX, 1825)	Caa; Cer; Rf	?	1, 2, 4, 5, 9
<i>Tupinambis merianae</i> (DUMÉRIL & BIBRON, 1839)	Caa, Cer; Rf	LC	2, 5, 9
Tropiduridae (3 spp.)			
<i>Tropidurus hispidus</i> (SPIX, 1825)	Caa; Cer; Rf	?	1, 2, 4, 5, 9
<i>Tropidurus semitaeniatus</i> (SPIX, 1825)	Caa	LC	1, 2, 4, 5, 9
<i>Stenocercus squarrosus</i> NOGUEIRA & RODRIGUES, 2006	Carr; Cer	?	12

Species	Habitat	IUCN (2011)	Source
Aniliidae (1 sp.)			
<i>Anilius scytale</i> (LINNAEUS, 1758)	Rf	?	6, *
Boidae (3 spp.)			
<i>Boa constrictor</i> LINNAEUS, 1758	Caa; Cer; Rf	?	2, 5, 9
<i>Corallus hortulanus</i> (LINNAEUS, 1758)	Caa; Rf	?	9
<i>Epicrates assisi</i> MACHADO, 1945	Caa	?	2, 5, 9
Colubridae (32 spp.)			
<i>Atractus ronnie</i> PASSOS, FERNANDES & B. NOJOSA, 2007	Rf	?	10
<i>Apostolepis cearensis</i> GOMES, 1915	Caa, Cer	?	This study
<i>Boiruna sertaneja</i> ZAHER, 1996	Caa	?	2, 5, 9
<i>Chironius flavolineatus</i> (BOETTGER, 1885)	Caa	?	5, 9
<i>Coronelaps lepidus</i> LEMA & HOFFSTADLER DEIQUES, 2010	Rf	?	13, *
<i>Drymoluber dichrous</i> (PETERS, 1863)	Rf	?	5, 9, *
<i>Drymoluber brasili</i> (GOMES, 1918)	Caa; Cer	?	This study
<i>Helicops angulatus</i> (LINNAEUS, 1758)	Caa	?	11
<i>Helicops leopardinus</i> (SCHLEGEL, 1837)	Caa	?	2, 5, 9, *
<i>Leptodeira annulata</i> (LINNAEUS, 1758)	Caa	?	9
<i>Leptophis ahaetulla</i> (LINNAEUS, 1758)	Caa	?	2, 5, 9
<i>Liophis dilepis</i> (COPE, 1862)	Caa	LC	1, 5, 9
<i>Liophis mossoroensis</i> HOGE & LIMA-VERDE, 1972	Caa	?	2, 5, 9
<i>Liophis poecilogyrus</i> (WIED, 1825)	Caa	?	1, 5, 9
<i>Liophis reginae</i> (LINNAEUS, 1758)	Rf	?	1, 5, 9
<i>Liophis taeniogaster</i> JAN, 1863	Caa	?	This study
<i>Liophis viridis</i> GÜNTHER, 1862	Caa	LC	2, 5, 9
<i>Oxybelis aeneus</i> (WAGLER, 1824)	Caa; Cer	?	1, 2, 5, 9
<i>Oxyrhopus melanogenys</i> (TSCHUDI, 1845)	Rf	LC	This study
<i>Oxyrhopus trigeminus</i> DUMÉRIL, BIBRON & DUMÉRIL, 1854	Caa; Cer; Rf	?	1, 2, 5, 9
<i>Philodryas nattereri</i> STEINDACHNER, 1870	Caa; Cer; Rf	?	2, 5, 9
<i>Philodryas olfersii</i> (LICHENSTEIN, 1823)	Caa; Cer; Rf	?	1, 2, 5, 9
<i>Pseudoboa nigra</i> (DUMÉRIL, BIBRON & DUMÉRIL, 1854)	Caa	?	2, 5, 9
<i>Psomophis joberti</i> (SAUVAGE, 1884)	Caa	?	1, 5, 9
<i>Sibynomorphus mikanii</i> (SCHLEGEL, 1837)	Rf	?	1, 5, 9
<i>Spilotes pullatus</i> (LINNAEUS, 1758)	Caa; Cer; Rf	?	2, 5, 9
<i>Taeniophallus occipitalis</i> (JAN, 1863)	Cer	?	This study
<i>Tantilla melanocephala</i> (LINNAEUS, 1758)	Caa; Cer	?	This study
<i>Thamnodynastes</i> sp. (aff. <i>nattereri</i>)	Caa	?	This study
<i>Thamnodynastes almae</i> FRANCO & FERREIRA, 2003	Caa	?	14
<i>Thamnodynastes sertanejo</i> BAILEY, THOMAS & SILVA-JR, 2005	Caa	?	2, 15
<i>Xenodon merremii</i> (WAGLER, 1824)	Caa	?	1, 2, 5, 9
Elapidae (2 spp.)			
<i>Micrurus ibiboboca</i> (MERREM, 1820)	Caa; Rf	?	1, 2, 5, 9
<i>Micrurus</i> cf. <i>lemniscatus</i>	Rf	?	This study
Leptotyphlopidae (2 spp.)			
<i>Trilepida brasiliensis</i> (LAURENT, 1949)	Caa	?	5, 9, *
<i>Epictia borapeliotes</i> (VANZOLINI, 1986)	Caa	?	This study
Viperidae (3 spp.)			
<i>Bothrops erythromelas</i> (AMARAL, 1923)	Caa; Cer	LC	2, 5, 9
<i>Bothrops leucurus</i> Wagler, 1824	Cer; Rf	LC	5, 9
<i>Crotalus durissus</i> LINNAEUS, 1758	Caa	LC	2, 5, 9
Chelidae (2 spp.)			
<i>Mesoclemmys tuberculata</i> (LÜDERWALDT, 1926)	Caa	?	2
<i>Phrynosoma</i> sp. (aff. <i>geoffroanus</i>)	Caa; Rf	?	2
Kinosternidae (1 sp.)			
<i>Kinosternon scorpioides</i> (LINNAEUS, 1758)	Caa	?	2

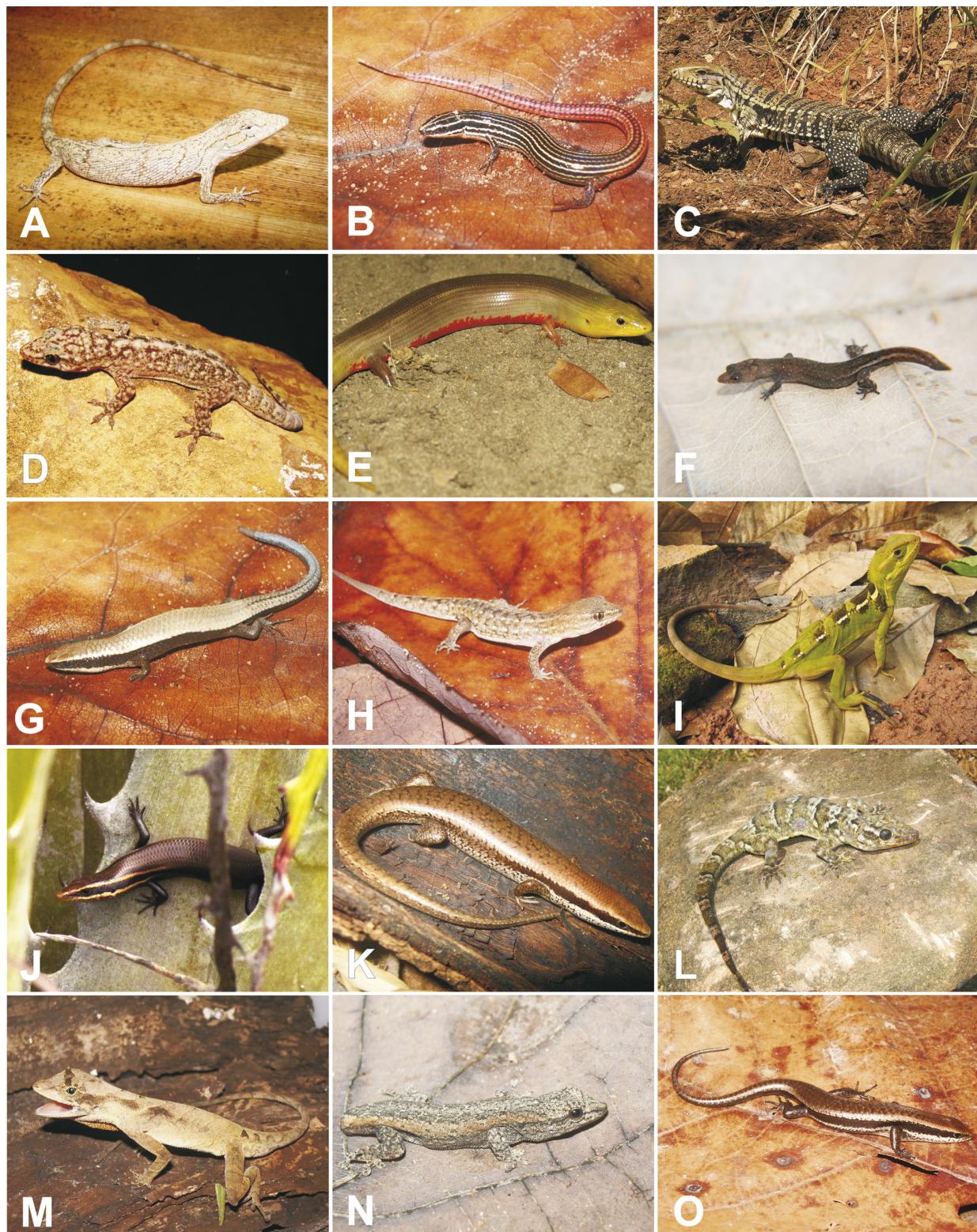


Fig. 4. Species of lizards from the Araripe bioregion, northeastern Brazil. A = *Polychrus acutirostris*; B = *Vanzosaura rubricauda*; C = *Tupinambis merianae*; D = *Phyllopezus pollicaris*; E = *Diploglossus lessonae*; F = *Coleodactylus meridionalis*; G = *Micrablepharus maximiliani*; H = *Gymnodactylus geckoides*; I = *Enyalius bibronii*; J = *Mabuya agmosticha*; K = *Mabuya arajara*; L = *Phyllopezus periosus*; M = *Anolis brasiliensis*; N = *Lygodactylus klugei*; O = *Mabuya frenata*. Photos: A, B, D, G, H, M, N, O (R. W. ÁVILA); C, E (D. LOEBMANN); F (C. B. C. BIONE); I, J, K, L (S. C. RIBEIRO).



Fig. 5. Species of snakes from the Araripe bioregion, northeastern Brazil. A = *Atractus ronnie*; B = *Anilius scytale*; C = *Chironius flavolineatus*; D = *Bothrops erythromelas*; E = *Drymoluber dichrous*; F = *Epictia borapeliotes*; G = *Drymoluber brasili*; H = *Liophis taeniogaster*; I = *Crotalus durissus*; J = *Tantilla melanocephala*; K = *Helicops angulatus*; L = *Thamnodynastes* sp. (aff. *nattereri*); M = *Bothrops leucurus*; N = *Sibynomorphus mikianii*; O = *Liophis viridis*. A (D. LOEBMANN); B, C, D, E, H, I, J, K, N (R. W. ÁVILA); F, M, O (S. C. RIBEIRO); G, L (I. J. ROBERTO).

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Appendix

Voucher specimens of amphibians and reptiles from the Araripe bioregion, northeastern Brazil.

Anurans: Bufonidae: *Rhinella granulosa* (URCA 581), *Rhinella jimi* (URCA 268); Cycloramphidae: *Proceratophrys cristiceps* (URCA 083); Hylidae: *Corythomantis greeningi* (URCA 267), *Dendropsophus minutus* (URCA 655), *Dendropsophus nanus* (URCA 074), *Dendropsophus soaresi* (URCA 1054), *Hypsiboas raniceps* (URCA 258), *Phyllomedusa nordestina* (URCA 089), *Scinax* sp. (gr. *ruber*) (URCA 1395), *Scinax x-signatus* (URCA 447); Leiuperidae: *Physalaemus cuvieri* (URCA 528), *Physalaemus* sp. (URCA 1331), *Physalaemus albifrons* (URCA 604), *Pleurodema diplolister* (URCA 076); Leptodactylidae: *Leptodactylus* sp. (aff. *andreae*) (URCA 095), *Leptodactylus fuscus* (URCA 634), *Leptodactylus macrosternum* (URCA 590), *Leptodactylus mystaceus* (URCA 073), *Leptodactylus* sp. (aff. *syphax*) (MNRJ 71655), *Leptodactylus vastus* (URCA 636), *Leptodactylus troglodytes* (URCA 652), *Pseudopaludicola* sp. (gr. *mystacalis*) (MNRJ 55887); Microhylidae: *Dermatonotus muelleri* (URCA 591), *Elachistocleis piauiensis* (URCA 1287); Pipidae: *Pipa carvalhoi* (URCA 1250); Amphisbaenians: Amphisbaenidae: *Amphisbaena alba* (URCA 355), *Amphisbaena fuliginosa* (MZUSP 7059), *Amphisbaena vermicularis* (URCA 013); Lizards: Anguidae: *Ophiodes* sp. (aff. *striatus*); Diploglossidae: *Diploglossus lessonaeanus* (URCA 248); (URCA 165); Gekkonidae: *Hemidactylus agrius* (URCA 1284), *Hemidactylus mabouia* (URCA 775), *Lygodactylus klugei* (URCA 097); Gymnophthalmidae: *Colobosaura modesta* (URCA 159), *Micrablepharus maximiliani* (URCA 161), *Vanzosaura rubricauda* (URCA 177); Iguanidae: *Iguana iguana* (URCA 914); Leiosauridae: *Enyalius bibronii* (URCA 078); Phyllodactylidae: *Phyllopezus periosus* (CHUNB 56581), *Phyllopezus pollicaris* (URCA 859), *Gymnodactylus geckoides* (URCA 1091); Polychrotidae: *Anolis brasiliensis* (URCA 1214), *Polychrus acutirostris* (URCA 257); Scincidae: *Mabuya arajara* (URCA 656), *Mabuya heathi* (URCA 167), *Mabuya frenata* (URCA 173); Sphaerodactylidae: *Coleodactylus meridionalis* (URCA 363); Teiidae: *Ameiva ameiva* (URCA 004), *Cnemidophorus ocellifer* (URCA 293), *Tupinambis merianae* (URCA 010); Tropiduridae: *Tropidurus hispidus* (URCA 199), *Tropidurus semitaeniatus* (URCA 1285), *Stenocercus squarrosus* (URCA 549); Snakes: Boidae: *Boa constrictor* (URCA 1160), *Corallus hortulanus* (URCA 379), *Epicrates assisi* (URCA 1217); Colubridae: *Apostolepis cearensis* (URCA 651), *Atractus ronnie* (URCA 149), *Chironius flavolineatus* (URCA 023), *Drymoluber brasili* (IBSP 76968), *Helicops angulatus* (URCA 006), *Leptodeira annulata* (URCA 007), *Liophis dilepis* (URCA 585), *Liophis reginae* (URCA 242), *Liophis poecilogyrus* (URCA 088), *Liophis taeniogaster* (URCA 086), *Liophis viridis* (URCA 359), *Oxybelis aeneus* (URCA 520), *Oxyrhopus trigeminus* (URCA 323), *Oxyrhopus melanogenys* (URCA 3411) *Philodryas olfersii* (URCA 413), *Philodryas nattereri* (URCA 036), *Pseudoboa nigra* (URCA 507), *Psomophis joberti* (URCA 163), *Sibynomorphus mikianii* (URCA 085), *Tan-*

tilla melanocephala (URCA 147), *Thamnodynastes* sp. (aff. *nattereri*) (IBSP 76973), *Thamnodynastes almae* (IBSP 76969), *Thamnodynastes sertanejo* (IBSP 76971), *Xenodon merremii* (URCA 386); Elapidae: *Micrurus cf. lemniscatus* (URCA 452), *Micrurus ibiboboca* (URCA 164); Leptotyphlopidae: *Epictia borapeliotis* (URCA 255); Viperidae: *Bothrops erythromelas* (URCA 1286), *Bothrops leucurus* (URCA 658); Chelidae: *Mesoclemmys tuberculata* (URCA 1225), *Phrynosoma* sp. (aff. *geoffroanus*) (URCA 1221); Kinosternidae: *Kinosternon scorpioides* (URCA 1222).