








## Lizards from the Alto Sertão region of Sergipe state, northeastern Brazil

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**Abstract:** We present the first detailed inventory of the lizard fauna of Alto Sertão region, west of Sergipe state, based on three field expeditions carried out by the authors and specimens deposited at the Herpetological Collection of Universidade Federal de Sergipe. The three inventories were carried out between 2010 and 2016, in the municipalities of Canindé de São Francisco, Poço Redondo, Monte Alegre de Sergipe, Nossa Senhora da Glória, and Porto da Folha. In total, we sampled 9,485 lizards of 19 species (10 families) of which 10 are new records for the study area. The most abundant species were *Ameivula ocellifera*, *Tropidurus hispidus* and *T. semitaeniatus*. Thirteen species were considered as widely distributed in Caatinga, five presented a relictual distribution and one was exotic. We suggest that future research focus mainly on non-sampled areas and should prioritize the municipalities of Gararu, Nossa Senhora da Glória and Nossa Senhora de Lourdes since they are localities with little or no sampling records. **Keywords:** *Squamata*; *Caatinga*; *Seasonally Dry Tropical Forest*; *Species list*.

## Lagartos da região do Alto Sertão de Sergipe, nordeste do Brasil

**Resumo:** Apresentamos o primeiro inventário detalhado da fauna de lagartos da região do Alto Sertão sergipano, nordeste do Brasil, a partir de três expedições de campo realizadas pelos autores e exemplares depositados na Coleção Herpetológica da Universidade Federal de Sergipe. Os três inventários foram realizados entre 2010 e 2016, nos municípios de Canindé de São Francisco, Poço Redondo, Monte Alegre de Sergipe, Nossa Senhora da Glória e Porto da Folha. No total, foram amostrados 9.487 lagartos de 19 espécies (10 famílias), das quais 10 são novos registros para a área de estudo. As espécies mais abundantes foram *Ameivula ocellifera*, *Tropidurus hispidus* e *T. semitaeniatus*. Treze espécies foram consideradas com ampla distribuição na Caatinga, cinco apresentaram distribuição relictual e uma exótica. Sugerimos que futuras pesquisas se concentrem principalmente em áreas não amostradas e priorizem os municípios de Gararu, Nossa Senhora da Glória e Nossa Senhora de Lourdes por se tratarem de localidades com pouca ou nenhuma amostragem.

**Palavras-chave:** *Squamata*; *Caatinga*; *Floresta Tropical Sazonalmente Seca (FTSS)*; *Lista de espécies*.

## Introduction

The South American dry open diagonal extends from southwest to northeast of the continent, across Chaco, Cerrado and Caatinga vegetations (Ab'Sáber 1974, 1977, Werneck 2011). The Caatinga is an environment exclusively found in northeastern Brazil, covering 912,529 km<sup>2</sup> (Prado 2003, Silva et al. 2017). Its topography varies from a flattened to slightly wavy surface, with residual scattered hills and shallow soils, which are often stony with some areas of exposed solid rock (Ross 2006, Rodal et al. 2013). The Caatinga is characterized by a semi-arid climate, with high temperatures and low annual precipitation (Trovão et al. 2007, Rodal et al. 2013); precipitation is highly seasonal and unpredictable with 50 to 70% of the annual rainfall occurring in three consecutive months (Santos & Andrade 1992, Rodal et al. 2013). The combination of unique geomorphological, pedological, and climatic conditions (Fernandes 2006) results in a xeric formation dominated by small shrubs, cacti, and bromeliads (Cardoso & Queiroz 2007). However, there are forests with a rich flora and medium to large trees that are able to form a canopy, currently classified as a Seasonally Dry Tropical Forest (Pennington et al. 2009, Werneck 2011, Silva et al. 2017).

The Caatinga contains unique biodiversity with high endemism; yet, it is seriously threatened by unrestrained habitat degradation (Rodrigues 2003, Mesquita et al. 2017). Of all the semi-arid regions of the world, it is the most populated, with about 27 million people that are mostly low-income, which makes them dependent on the exploitation of natural resources (Silva et al. 2017). Thereby, 46% of Caatinga's original composition is already deforested (MMA 2020). This scenario is aggravated by its poor network of protected areas; currently, protected areas cover only 7.5% of the Caatinga, with only 1% composed of restricted use areas (Tabarelli & Vicente 2004, MMA 2020).

For a long time, lizard fauna of Caatinga was considered to be undersampled, comprising a large proportion of widely distributed species and studies restricted to a few sampling sites (Rodrigues 2003). However, several studies have been published in the past 15 years and have contributed substantially to increasing our knowledge of the species richness and distribution in this region (Mesquita et al. 2017). Mesquita et al. (2017) reported 79 lizard species, similar to that recorded for the adjacent Cerrado (76 species; Brites et al. 2009; Nogueira et al. 2011). Recent studies also have shown moderate to high levels of endemism (Rodrigues 2000, Magalhães et al. 2014, Mesquita et al. 2017). In Sergipe state, little is known about the diversity of lizard fauna. The published studies are limited to some records and deal mainly with the expansion of the geographical distribution of specific species and some small reports of natural history (Delfim et al. 2006, Gouveia et al. 2010, De-Carvalho et al. 2012, Amora et al. 2014, Ferreira et al. 2014, Moura et al. 2015, Caldas et al. 2016a, Mikalauskas et al. 2017). More detailed ecological studies were conducted only in semiarid caatinga of the Monumento Natural Grota do Angico, municipality of Poço Redondo. The first two deal with the population dynamics and behavior of two *Tropidurus* species (Santana et al. 2011, Gomes et al. 2015) and the last relies on diet composition of six lizard species (Ferreira et al. 2017). To date, no species list has been published in Caatinga areas from Sergipe state. Studies that characterize the diversity of the local herpetofauna, as well as long-term studies of community dynamics, are essential to subsidize conservation planning and management for the sustainable use of natural resources (Silveira et al. 2010). Herein, we present a

detailed inventory of lizard species that occur in the Caatinga from the Alto Sertão region of Sergipe state, based on field expeditions carried out by the authors and specimens deposited at scientific collections.

## Material and Methods

### 1. Study area

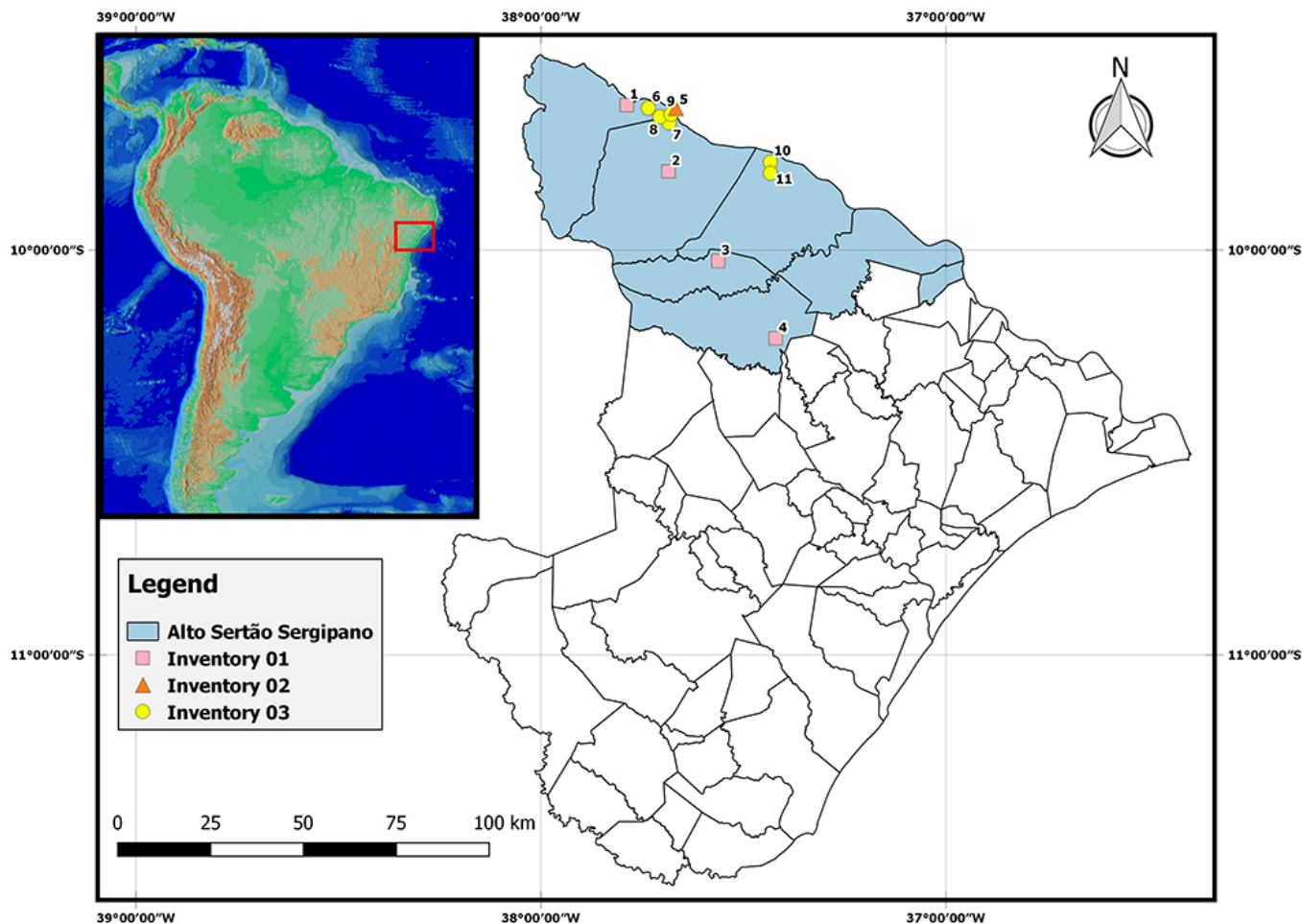
The Alto Sertão region of Sergipe is part of the Caatinga ecoregion called "Depressão Sertaneja Meridional" (Ab'Sáber 1974, Velloso et al. 2002, Silva et al. 2017), and encompasses seven municipalities: Canindé de São Francisco, Gararu, Monte Alegre de Sergipe, Nossa Senhora da Glória, Nossa Senhora de Lourdes, Poço Redondo, and Porto da Folha (Figure 1). The topography is predominantly smooth and wavy, cut by narrow valleys with dissected slopes (Sá et al. 2004). The vegetation is mainly composed of trees and shrubs, where *Poincianella*, *Aspidosperma*, and *Jatropha* predominate (Andrade-Lima 1981; Figure 2). According to the Köppen classification, the local climate is BSh, a mixture of arid and semi-arid regions (Alvares et al. 2013). Temperatures are generally high, ranging from 26 to 28 °C and the average precipitation is approximately 500 mm per year (Nimer 1972). Rainfall is seasonal, occurring from April to August (autumn-winter), and the dry season occurs during spring-summer (Nimer 1972, Santos & Andrade 1992).

### 2. Data collection

We conducted three inventories between 2010 and 2016. The first one had two stages, which lasted 20 days each. They were performed between 18 to 26 September 2010 and 5 to 15 April 2011, in dry and rainy seasons, respectively. The sampling sites were at the municipalities of Canindé do São Francisco (09°38'31"S, 37°47'16"W), Poço Redondo (09°48'21"S, 37°41'06"W), Monte Alegre de Sergipe (10°01'37"S, 37°33'43"W) and Nossa Senhora da Glória (10°13'06"S, 37°25'13"W; Figure 1). We used pitfall traps with drift fences and active search to capture lizards. In each locality, 25 traps were installed linearly, where each trap had four 20 L buckets buried at ground level. They were arranged in a Y-shape and interconnected by five meters long plastic fences, fixed on wooden stakes. The traps were approximately 20 m apart from each other and were checked daily. We also performed active searches during the day and night on random tracks.

In the second inventory, monthly expeditions of five consecutive days each were conducted between January 2010 and December 2011 at Monumento Natural Grota do Angico (09°39'S, 37°40'W; Figure 1), municipality of Poço Redondo. The sampling methods were the same as above, but 32 pitfall traps were installed and divided into three transects with a minimum distance of 1 km between them. Active searches were performed whenever possible.

The third inventory was carried out between 2015 and 2016. Two expeditions were performed in each locality, lizards were caught during the rainy season, between September 2015 and February 2016, and during the dry season, between April and August 2016. The sampled sites were: Fazenda Jerimum in Canindé de São Francisco (9°38'58.44"S, 37°44'5.50"W); Fazenda do Senhor João (9°41'10.56"S, 37°40'59.82"W), Fazenda Angico (9°40'15.72"S, 37°42'23.04"W) and Monumento Natural Grota do Angico (9°39'54.42"S, 37°40'44.10"W), in Poço Redondo; and Comunidade Mocambo in Porto da Folha. The latter was separated in two different locations (Figure 1), one composed by arboreal Caatinga



**Figure 1.** Map of South America showing the location of the study site. The outlined map on the right shows the municipalities of Sergipe state, with the Alto Sertão region shaded in blue and the eleven sampling sites in pink, orange and yellow. Sites 1-4 (pink squares) refer to the first inventory: 1) Canindé de São Francisco; 2) Poço Redondo; 3) Monte Alegre de Sergipe; 4) Nossa Senhora da Glória. Point 5 (orange triangle) refers to the second inventory carried out at the Monumento Natural Grota do Angico and points 6-11 (yellow circles) refer to the third inventory: 6) Fazenda Jerimum; 7) Fazenda do Senhor João; 8) Fazenda Angico; 9) Monumento Natural Grota do Angico; 10) Arboreal Caatinga in Comunidade Mocambo; 11) Recently abandoned pastures in Comunidade Mocambo.

(9°46'59.46"S, 37°26'0.36"W) and the other comprised of recently abandoned pastures (9°48'36.70"S, 37°25'59.50"W). Lizards were sampled with pitfall traps with drift fences, arranged as in the second inventory, and active searches were made throughout the day and night. All animals were captured or recorded.

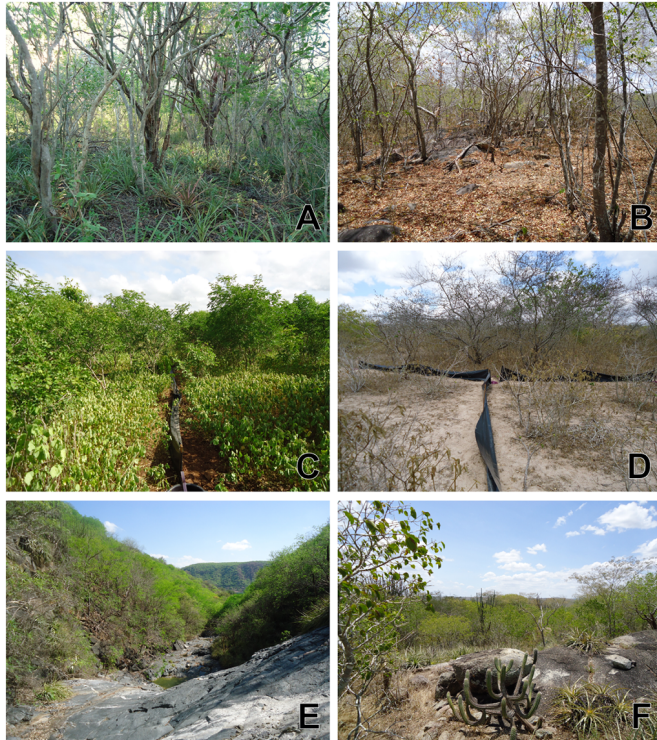
Studies were performed with permits from IBAMA (189/2010-CGFAP), Secretaria do Meio Ambiente e Recursos Hídricos (SEMARH) of the state of Sergipe (2010.04.1008/00104-002 and 032.000.01920/2011-1) and SISBIO-ICMBio (48122-2). Lizards collected in all inventories were deposited in the Coleção Herpetológica da Universidade Federal de Sergipe (CHUFS) or Coleção Herpetológica da Universidade Federal da Paraíba (CHUFPB), and a list of the vouchers is presented in Appendix. The number of specimens collected in each inventory followed the limit imposed by our respective license. However, the other animals captured and released were also computed, since they were identified and marked. Recapture data is not considered in our analysis. Finally, records from CHUFS were also used as complementary data.

### 3. Statistical analyses

To evaluate the sampling effort, we built an individual-based rarefaction curve (Gotelli & Colwell 2001) coupled with the non-parametric richness estimator Chao2P, using EstimateS v. 9.10 and Microsoft Excel (Colwell 2006, Lopez et al. 2012). The curve was built using 100 randomizations of the original data without replacement. The Chao2P is a factor correction based in Chao2 estimator able to reduce the bias under sampling conditions.

### Results

We performed a detailed inventory of Caatinga lizards from Caatinga from the Alto Sertão region of Sergipe and obtained data from 9,485 individuals, representing 19 species and 10 families (Table 1; Figures 3-5). Teiidae and Gekkonidae were the most represented families, with three species each (Table 1). Moreover, *Ameivula ocellifera* (47.95%),



**Figure 2.** Habitats sampled during the lizards survey at the Alto Sertão region of Sergipe state, Brazil. A, B) Typical arboreal and arbustive Caatinga vegetation in rainy and dry seasons, respectively. C, D) Pitfall trap in open habitat during the rain and dry seasons, respectively. E) The bedrocks of dry streams. F) Rocky outcrops.

*Tropidurus hispidus*, (19.00%) and *T. semitaeniatus* (13.85%) were the most abundant species (Figure 6). The shape of the rarefaction curve and the estimated value of Chao2P indicated our sampling was adequate and had a low probability of new species being collected with additional samples (Figure 7). Finally, considering the Caatinga distribution patterns proposed by Rodrigues (2003), we observed that 73.68% of the sampled species were widely distributed (14 species, one being invasive) and 26.32% had a relictual distribution (five species; Table 1).

## Discussion

We here present ten new records of lizards for the Alto Sertão region of Sergipe. The species are *Hemidactylus brasilianus*, *H. mabouia* (Gekkonidae), *Acratosaura mentalis*, *Vanzosaura multiscutata* (Gymnophthalmidae), *Iguana iguana* (Iguanidae), *Psychosaura agmosticha*, *P. macrorhyncha* (Mabuyidae), *Polychrus acutirostris* (Polychrotidae), *Coleodactylus meridionalis* (Sphaerodactylidae), *Ameiva ameiva* and *Salvator merianae* (Teiidae). These species already have their occurrence registered for the Caatinga region, but has no previous records for Caatinga from Alto Sertão region of Sergipe state.

The species richness observed in the Alto Sertão region ( $n = 19$ ) was higher or equal than that from eight studies conducted in the Caatinga (Rodrigues 1986, Vitt 1995, Borges-Nojosa & Cascon 2005, Freire et al. 2009, Garda et al. 2013, Cavalcanti et al. 2014, Magalhães et al. 2015, Caldas et al. 2016b), which averaged  $17 \pm 1.30$  lizard species. We highlight PARNA Chapada Diamantina ( $n = 15$ ; Magalhães et al. 2015) and Estação Ecológica Raso da Catarina ( $n = 19$ ; Garda et al. 2013) as

they are the closest to the Alto Sertão region of Sergipe State. However, the richness found in the present study is lower than that recorded for the sand dunes of the São Francisco river ( $n = 30$  species; Rodrigues 1996), PARNA Catimbau ( $n = 25$ ; Pedrosa et al. 2014), and Araripe bioregion ( $n = 27$ ; Ribeiro et al. 2012). This variation in species richness may be result of different sampling efforts, differences in sample sizes or simply intrinsic differences of the locations.

Although our sampling effort seemed adequate, other species could be registered with the addition of new sampling points (Cornell & Lawton 1992). For example, *Psilops paeminosus* was previously recorded in Canindé de São Francisco (Delfim et al. 2006), but we did not record this species. Other species have also been observed in nearby locations and were not found in this study, such as *Tropidurus cocorobensis*, which occurs in sandy areas between Bahia and Pernambuco (Rodrigues 2003), and *Micrablepharus maximiliani*, whose type locality is the state of Sergipe and has a wide distribution in Caatinga (Rodrigues 1996, Moura et al. 2010). Thus, we suggest that new samplings be carried out in unsampled areas of the municipalities in the Alto Sertão region of Sergipe state. New efforts should prioritize the municipalities of Gararu, Nossa Senhora da Glória and Nossa Senhora de Lourdes since they are localities with little or no sampling records.

The lizards *Ameivulla ocellifera*, *Tropidurus hispidus*, and *T. semitaeniatus* were predominant in the study area. These species are widely distributed throughout Caatinga, and *A. ocellifera* may also occur in coastal Restingas, being more common in open areas, occupying sandy soils and high insolation (Vitt 1995, Werneck et al. 2009, Oliveira et al. 2015). *Tropidurus hispidus* is widely distributed throughout Caatinga, Cerrado, and Restingas (Rodrigues 1987). It is considered a habitat-generalist and can be found on rock surfaces, forest edges, tree trunks, fences, and walls, among other substrates (Rodrigues 1987, Vitt et al. 1997, Van-Sluyts et al. 2004, Carvalho et al. 2005). Although, *T. semitaeniatus* is widespread in Caatinga, it has high fidelity to rocky microhabitats (Freitas & Silva 2007, Gomes et al. 2015). Niche differences in microhabitat use, added to trophic and temporal differences, can be the main reason for the high abundance of these species, since smaller overlays can decrease the effect of competition between them (Pianka 1973, Giacomini 2007).

Ten other species recorded in this study are also considered widely distributed in Caatinga. *Ameiva ameiva*, *Iguana iguana*, *Polychrus acutirostris*, *Salvator merianae* and *Phyllorhynchus pollicaris* are distributed throughout the dry diagonal in South America, including the Caatinga, Cerrado, and Chaco (Vanzolini et al. 1980, Werneck & Colli 2006, Delfim & Freire 2007, Garda et al. 2012). The teiids *A. ameiva* and *S. merianae* occur in different vegetation types, but these lizards seem prefer open vegetation (forest ecotones or disturbed areas) and forest borders, which receive more direct sunlight (natural or not; Vitt & Colli, 1994, Werneck et al. 2009, Sales et al. 2011). *Iguana iguana* often use vegetation microhabitats close to bodies of water (Lara-López & González-Romero, 2002). *Polychrus acutirostris* prefers a heterogeneous arboreal environment, but predominantly lower tree branches and twigs and are often found near human habitations (Vanzolini 1974; Renous et al. 2010). *Phyllorhynchus pollicaris* has been frequently associated with rocky outcrops, but can be found within a wide range of microhabitats, like trees trunks, fallen logs and human

**Table 1.** Lizard species from Alto Sertão region of Sergipe state, Brazil. **Municipalities** = CSF – Canindé de São Francisco; MA – Monte Alegre de Sergipe; NSG – Nossa Senhora da Glória; PF – Porto da Folha; PR – Poço Redondo. **Distribution Pattern (DP)** = WD – widely distributed; WD(I) – widely distributed (invasive species); RD – relictual distribution; SFR – related with paleoquaternary sandy dunes from São Francisco River. = CHUFS – Herpetological Collection of the Universidade Federal de Sergipe; PS – Present study; 1 – De-Carvalho et al. 2012; 2 – Santana et al. 2011; 3 – Amora et al. 2014; 4 – Ferreira et al. 2014; 5 – Gomes et al. 2015; 6 – Moura et al. 2015; 7 – Caldas et al. 2016a; 8 – Ferreira et al. 2017; 9 – Mikalauskas et al. 2017. \* = visual record; \*\* = not collected.

Taxon	Municipalities	DP	Source
<b>Anguidae</b>			
<i>Diploglossus lessonae</i> (Peracca 1890)	MA	RD	7, PS
<b>Gekkonidae</b>			
<i>Hemidactylus brasiliensis</i> (Amaral, 1935)	CSF, PR	WD	PS
<i>Hemidactylus mabouia</i> (Moreau de Jonnés, 1818)	CSF, MA, PR	WD(I)	PS
<i>Lygodactylus klugei</i> (Smith et al., 1977)	CSF, MA, NSG, PF, PR	WD	8, CHUFS, PS
<b>Gymnophthalmidae</b>			
<i>Acratosaura mentalis</i> (Amaral, 1933)	CSF, MA, PF, PR	RD	PS
<i>Vanzosaura multiscutata</i> (Amaral, 1933)	CSF, MA, NSG, PF, PR	WD	PS
<b>Iguanidae</b>			
<i>Iguana iguana</i> (Linnaeus, 1758)	CSF*, MA, PF, PR	WD	CHUFS, PS
<b>Mabuyidae</b>			
<i>Brasiliscincus heathi</i> (Schmidt and Inger, 1951)	CSF, MA, PF, PR	WD	8, CHUFS, PS
<i>Psychosaura agmosticha</i> (Rodrigues, 2000)	PR	RD	PS**
<i>Psychosaura macrorhyncha</i> (Hoge, 1947)	MA	RD	PS
<b>Phyllodactylidae</b>			
<i>Gymnodactylus geckoides</i> (Spix, 1825)	CSF, MA, PF, PR	WD	1, 8, CHUFS, PS
<i>Phyllopezus pollicaris</i> (Spix, 1825)	CSF, PF, PR	WD	3, CHUFS, PS
<b>Polychrotidae</b>			
<i>Polychrus acutirostris</i> (Spix, 1825)	PF*, PR	WD	CHUFS, PS
<b>Sphaerodactylidae</b>			
<i>Coleodactylus meridionalis</i> (Boulenger, 1888)	MA, PF	RD	PS
<b>Teiidae</b>			
<i>Ameiva ameiva</i> (Linnaeus, 1758)	MA, PF, PR	WD	PS
<i>Ameivula ocellifera</i> (Spix, 1825)	CSF, MA, NSG, PF, PR	WD	6, 8, CHUFS, PS
<i>Salvator merianae</i> (Duméril and Bibron, 1839)	CSF*, PF*, PR	WD	PS
<b>Tropiduridae</b>			
<i>Tropidurus hispidus</i> (Spix, 1825)	CSF, MA, NSG, PF, PR	WD	2, 4, 5, 8, CHUFS, PS
<i>Tropidurus semitaeniatus</i> (Spix, 1825)	CSF, MA, PF, PR	WD	2, 5, 8, 9, CHUFS, PS

edifications (Vanzolini et al. 1980, Vitt 1995, Recoder et al. 2012). This species has also been recorded in the Atlantic Forest, a humid forest located in Brazilian coast (Feio & Caramaschi, 2002).

*Brasiliscincus heathi*, *Hemidactylus brasiliensis* and *Gymnodactylus geckoides*, in addition to the Caatinga, also permeate neighbor environments, such as the Cerrado and Atlantic Forest (Mesquita et al. 2006, Freitas & Silva 2007, Freitas 2014, Travassos et al. 2015), while *B. heathi* preferentially inhabits areas with bromeliads (Rodrigues 2003). *Hemidactylus brasiliensis* can be found both in trees and in the soil and *G. geckoides* are most commonly seen under logs fallen or rocks and moving in litter (Vanzolini et al. 1980, Vitt 1995, Souza et al. 2013, Mesquita et al. 2017). Finally, despite occurring almost exclusively in Caatinga, *Lygodactylus klugei* also inhabit trees in SDTF enclaves of

the Cerrado and *V. multiscutata* has a single isolated population in a dry forest habitat in the eastern Cerrado (Recoder et al. 2014). In Caatinga, *V. multiscutata* occur in litter and in other areas with little vegetation cover, but in areas with high cacti abundance, since they seem to prefer clumps in this type of plants (Delfim & Freire 2007).

Five species present relictual distribution in Caatinga. *Psychosaura agmosticha* and *P. macrorhyncha* are more associated with bromeliads, especially *Bromelia laciniosa* (Rodrigues 2003). These species are also distributed in Restinga, an ecosystem associated with the Atlantic Forest, occurring all along the Brazilian coast (Rodrigues 2003, Dias & Rocha 2014). Ultimately, *Acratosaura mentalis*, *Coleodactylus meridionalis* and *Diploglossus lessonae* are closely associated with forest environments, be can found in leaf litter (Rodrigues et al. 2005, Mesquita et al. 2017).



**Figure 3.** Lizards from Alto Sertão region of Sergipe state, Brazil: A) *Diploglossus lessonae*; B) *Hemidactylus brasiliensis*; C) *Hemidactylus mabouia*; D) *Lygodactylus klugei*; E) *Acratosaura mentalis*; F) *Vanzosaura multiscutata*; G) *Iguana iguana*; H) *Brasiliscincus heathi*. A, C, F, G – specimens were recorded in municipality of Monte Alegre; B, D, E, H – specimens were recorded in municipality of Poço Redondo. Photos by Daniel Mesquita, Daniel Santana and Renato Faria.



**Figure 4.** Lizards from Alto Sertão region of Sergipe state, Brazil: A) *Psychosaura agnosticha*; B) *Psychosaura macrorhyncha*; C) *Gymnodactylus geckoides*; D) *Phylllopezus pollicaris*; E) *Polychrus acutirostris*; F) *Coleodactylus meridionalis*; G) *Ameiva ameiva*; H) *Ameivula ocellifera*. A, D, E, G, H – specimens recorded in municipality of Poço Redondo; B, C, F – specimens recorded in municipality of Monte Alegre. Photos by Daniel Mesquita, Daniel Santana and Renato Faria.

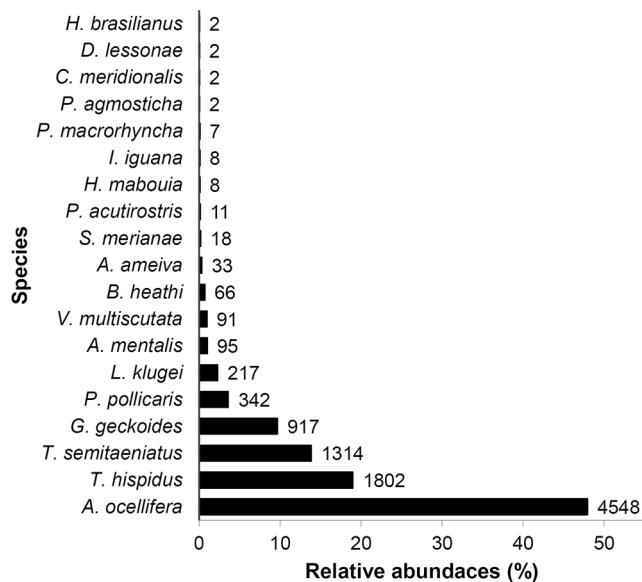
This type of distribution may be related to the theory of Pleistocene refuges, which postulates that the decline of forests and expansion of xeric environments during the Quaternary promoted the isolation of these species locked into the relictual vegetation where they occurred previously (Haffer 1969, Vanzolini & Williams 1970, Vanzolini & Williams 1981). *Acratosaura mentalis* occurs in mesic habitats and relictual forests in the Caatinga, in semideciduous forests in the Cerrado and in the agreste, a transition zone between the Atlantic Forest and the semi-arid Caatinga, in which species from both biomes coexist (Queiroz & Lema 1996, Rodrigues et al. 2009, De-Carvalho et al. 2010); *C. meridionalis* is a typical Atlantic Forest species (Vanzolini et al. 1980); and *D. lessonae* occurs in all of northeastern Brazil, both in the Atlantic Forest, in the agreste and in the caatingas (Vanzolini et al. 1980, Caldas et al. 2016a).

The only introduced species recorded in this work is *Hemidactylus mabouia*. It is dispersed from Africa and is widely distributed in the Caribbean, South America, and Florida (Vanzolini 1978, Gamble et al. 2011). It is generally found in urban environments but can also be found in several Brazilian environments (Rödter et al. 2008).

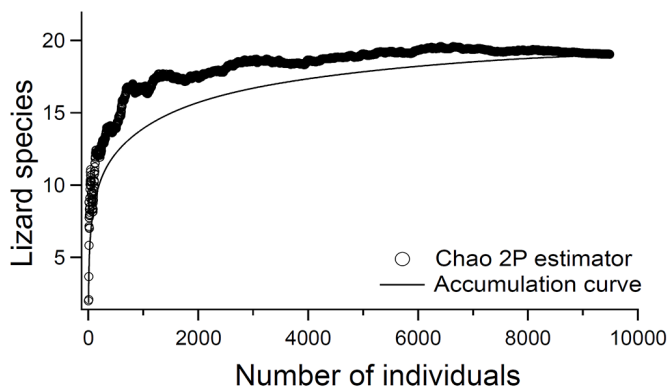
Finally, lizard fauna of the Caatinga in Sergipe is still poorly known when compared to other states that are also located in this environment (Rodrigues 2003). Although recent studies have been made about



**Figure 5.** Lizards from Alto Sertão region of Sergipe state, Brazil: A) *Salvator merianae*, adult; B) *Salvator merianae*, juvenile; C) *Tropidurus semitaeniatus*; D) *Tropidurus hispidus*. Specimens recorded in municipality of Poço Redondo. Photos by Renato Faria and Stéphanie Rocha.



**Figure 6.** Relative and absolute abundances of the lizard species of the Alto Sertão region of Sergipe state, Brazil (N = 9,485). The numbers next to the black bars refer to the absolute abundances of each species.



**Figure 7.** Individual-based rarefaction curve (line) and Chao2P species estimator (circles) for lizard species recorded in Alto Sertão region of Sergipe state, Brazil.

ecology and geographical distribution of lizards, much work should be carried out for achieving more knowledge on Caatinga's saurofauna. Therefore, we suggest that future research focus mainly on non-sampled areas, due to this prior knowledge of species distribution, so that more complex studies can be developed.

## Supplementary Material

The following online material is available for this article:  
Appendix

## Acknowledgements

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## Author Contributions

Stéphanie Menezes Rocha: Contributed to data collection, in the concept and design of the study, in the manuscript preparation, to data analysis and interpretation and in to critical revision, adding intellectual content.

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## Conflicts of Interest

The authors declare that they have no conflict of interest related to the publication of this manuscript.

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