



ANIMAL SCIENCE

Amphisbaenians and lizards of the Pernambuco Endemism Center: species richness, sampling gaps, and conservation status in one of the most threatened regions of the Atlantic Forest

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Abstract: In this study, we integrated data from more than 30 years of inventories available in the main herpetological collections of the Pernambuco Endemism Center (PEC), northern Atlantic Forest. We aimed to reduce the Wallacean shortfall of amphisbaenians and lizards (non-snake squamates) in the region, to provide distribution maps of all species, and to direct future survey efforts and conservation strategies in one of the most threatened portions of the Atlantic Forest. The species list was based exclusively on records associated with vouchers from localities in the PEC and transition zones. We recorded 50 species of non-snake squamates in the PEC, distributed across 97 municipalities in four states. Among the species registered in the PEC, seven are topotypical, five are endemic and three are considered threatened with extinction. Only 35% of the municipalities in the PEC have at least one individual deposited in the herpetological collections analyzed and of these only 35% have more than ten species registered. The most representative areas are concentrated in the coastal portion of the PEC, and arranged in four main zones. These zones mainly overlap with areas close to state capitals and around some of the PEC's protected areas.

Key words: Alagoas, Paraíba, Pernambuco, Reptilia, Rio Grande do Norte, Squamata.

INTRODUCTION

Currently, more than 12,000 species of squamate reptiles are known to the world, and about 63% (7,598 species) correspond to amphisbaenians and lizards (from now on together treated as non-snake squamates; Uetz et al. 2023). They are distributed worldwide, from deserts to semi-polar regions and coastal areas to the highest mountains (Reisz 1997, Roll et al. 2017, Uetz et al. 2023). Despite this, their species richness is not homogeneously distributed globally, and

some regions stand out for having high species and phylogenetic diversities (Roll et al. 2017). A great example is the South American rainforests (Amazonia and Atlantic Forest), which shelter more than 4% of the global diversity of non-snake squamates (Ribeiro-Junior & Amaral 2016, Tozetti et al. 2017). However, our knowledge about non-squamate reptiles is still incipient, especially for South American rainforests (Moura & Jetz 2021). Studies estimate that Amazonia and the Atlantic Forest represent the regions

where more reptiles will be described in the coming years (Moura & Jetz 2021). However, the increasing advance of deforestation (Ribeiro et al. 2009, Silva-Junior et al. 2021) can result in the extinction of many species even before they are known to science (Mora et al. 2011, Lees & Pimm 2015).

This scenario is drastic in the Atlantic Forest, which initially extended as a coastal arc along eastern South America, occupying around 150 million ha (Ribeiro et al. 2009). Since European colonization, which mainly took place in this region, the Atlantic Forest has been suffering from the constant conversion of its natural environment to agricultural fields and large cities (Rezende et al. 2018), and currently comprises about 11% of its original cover (Ribeiro et al. 2009). Although highly fragmented and critically endangered, the Atlantic Forest houses an important portion of global biodiversity (for example, more than 110 non-snake squamate species are known; Tozetti et al. 2017), which presents a high degree of endemism (Bergallo et al. 2003, Cardoso-da-Silva et al. 2004, Werneck et al. 2011, Tozetti et al. 2017, Rossa-Feres et al. 2017). These characteristics, among others, have given this environment the status of a biodiversity hotspot, and therefore one of the world's priority areas for conservation (*sensu* Myers et al. 2000, Conservation International 2023).

The biogeographic history of the Atlantic Forest and the climatic (Alvares et al. 2013) and vegetational (Pinto & Brito 2003) diversity, along with its elevational heterogeneity (0–2,700 meters; Ribeiro et al. 2009), are key factors responsible for species richness and the current distribution of its biota (Carnaval & Moritz 2008, Vasconcelos et al. 2014). Even within this rich biome, unique areas hold essential conservation value, as they have high rates of endemism (Silva & Casteleti 2003, Figueiredo et al. 2021).

These endemism centers are spread throughout the biome's extension and include areas with singular characteristics, generally delimited by biogeographic barriers historically important for the diversification of the biota (Silva & Casteleti 2003, Ribeiro et al. 2009). One of these areas, located north of the São Francisco River in the northern portion of the biome, is called the Pernambuco Endemism Center (henceforth PEC) and covers the entire coastal Atlantic Forest of the Brazilian states of Alagoas, Pernambuco, Paraíba, and Rio Grande do Norte (Cracraft 1985, Haffer 1985, Silva & Casteleti 2003, Silva et al. 2004, Tabarelli et al. 2006). This portion of the Atlantic Forest is delimited to the south by the São Francisco River, one of the most critical biogeographic barriers for the diversification of biota in the north of the Atlantic Forest (Pellegrino et al. 2005, Tabarelli et al. 2006), in addition to meeting the Atlantic Ocean to the east, and the semiarid Caatinga biome to the west.

Although considered one of the most important areas of the Atlantic Forest, in terms of conservation (Carvalho et al. 2021, Lourenço-de-Moraes et al. 2021a), the PEC is also one of the most degraded areas of this biome (Tabarelli & Roda 2005, Tabarelli et al. 2006, Dias et al. 2023), with only 12% of its original vegetation coverage remaining (Ribeiro et al. 2009), currently threatened by forest rejuvenation, fragmentation, and edge effects (Dias et al. 2023). Most of what is left is small and fragmented, restricted to the tops of mountain ranges (not exceeding an average of 0.02 km²), surrounded by vast arrays of monoculture and pastures (Ribeiro et al. 2009). Nonetheless, the PEC stands out for having a high richness of birds (Barnett et al. 2005, Lima et al. 2022, Araujo et al. 2023), mammals (Asfora & Pontes 2009, Feijó et al. 2023), fishes (Marinho et al. 2023), amphibians (Dubeux et al. 2020, Vieira et al. 2023), and reptiles

(França et al. 2020, Pereira-Filho et al. 2021, 2023), of which a significant portion is endemic, and many are currently considered endangered.

Despite being the focus of an increasing number of studies, the PEC is one of the portions of the Atlantic Forest with the least known biota (Ribeiro et al. 2009, Carvalho et al. 2021) and one of the areas that suffers more seriously from the Linnean shortfall (difference in the number of existing and described species; Hortal et al. 2015) and the Wallacean shortfall (lack of knowledge of the geographic distribution of species; Hortal et al. 2015). This fact can be reinforced by the constant description of new taxa for the region (e.g., Roberto et al. 2017a, Oliveira et al. 2021a, Dickens et al. 2021, Dantas et al. 2021, Lourenço-de-Moraes et al. 2021b, Dubeux et al. 2022a) and the frequent publication of distribution extensions and new occurrence records (e.g., Lima et al. 2020, Ramos et al. 2021, Santos et al. 2021, Dubeux et al. 2022b, 2023a). In addition, the first list of reptile species was only recently published for the PEC (Pereira-Filho et al. 2023). Still, little information is provided regarding the distribution and conservation of this fauna. The knowledge about the occurrence and distribution of these groups is restricted to a dozen faunal inventories conducted in the region (Freire 1996, Moura et al. 2010, Roberto et al. 2015, Lion et al. 2016, Mesquita et al. 2018, Lima et al. 2021, Oliveira et al. 2021b, Santana et al. 2008, Melo et al. 2018, Roberto et al. 2017b, Bezerra et al. 2021, Dubeux et al. 2022b, 2023b) and some isolated records available in the literature. In this study, we integrated data from more than 30 years of inventories available in the main herpetological collections of the PEC. We aimed to reduce the Wallacean shortfall of non-snake squamates in the region, to provide distribution maps of all species, and to direct future survey efforts and conservation strategies in one of the most threatened portions of the Atlantic Forest.

MATERIALS AND METHODS

Study area

The Pernambuco Endemism Center (PEC) presents an altitudinal gradient between 0–1200m a.s.l. with a humid forest that is divided into five phytophysiognomies: Mangroves; Dunes; Restinga, open Restinga, and forest Restinga; “Tabuleiros”, specifically “florestas de Tabuleiro”; humid, mixed, and open Ombrophilous forests, and Semideciduous forests (Tabarelli & Roda 2005, Tabarelli et al. 2006; Figures. 1–2). The region has a humid tropical climate with a defined rainy season between March and August and a dry season between September and February (Alvares et al. 2013).

Data collection

The species list was based exclusively on records associated with vouchers deposited in herpetological collections from localities in the PEC and transition zones. We consulted the following collections: Coleção Herpetológica do Museu de História Natural da Universidade Federal de Alagoas (MHN-UFAL), Coleção Herpetológica da Universidade Federal de Pernambuco (CHUFPE), Coleção Herpetológica e Paleoherpetológica do Laboratório de Estudos Herpetológicos e Paleoherpetológicos da Universidade Federal Rural de Pernambuco (CHPLEHP/UFRPE), Coleção Herpetológica da Universidade Federal da Paraíba (CHUFPB), Coleção Herpetológica da Universidade Federal do Rio Grande do Norte (UFRN-CH), Coleção Herpetológica do Núcleo Regional de Ofiologia da Universidade Federal do Ceará (CHUFC), and Coleção Herpetológica da Universidade Regional do Cariri (URCA-H). When necessary, the identity of specimens was revisited by the curator/collection manager and/or specialist in the group available in each collection (e.g., new state records, records outside the biome and/

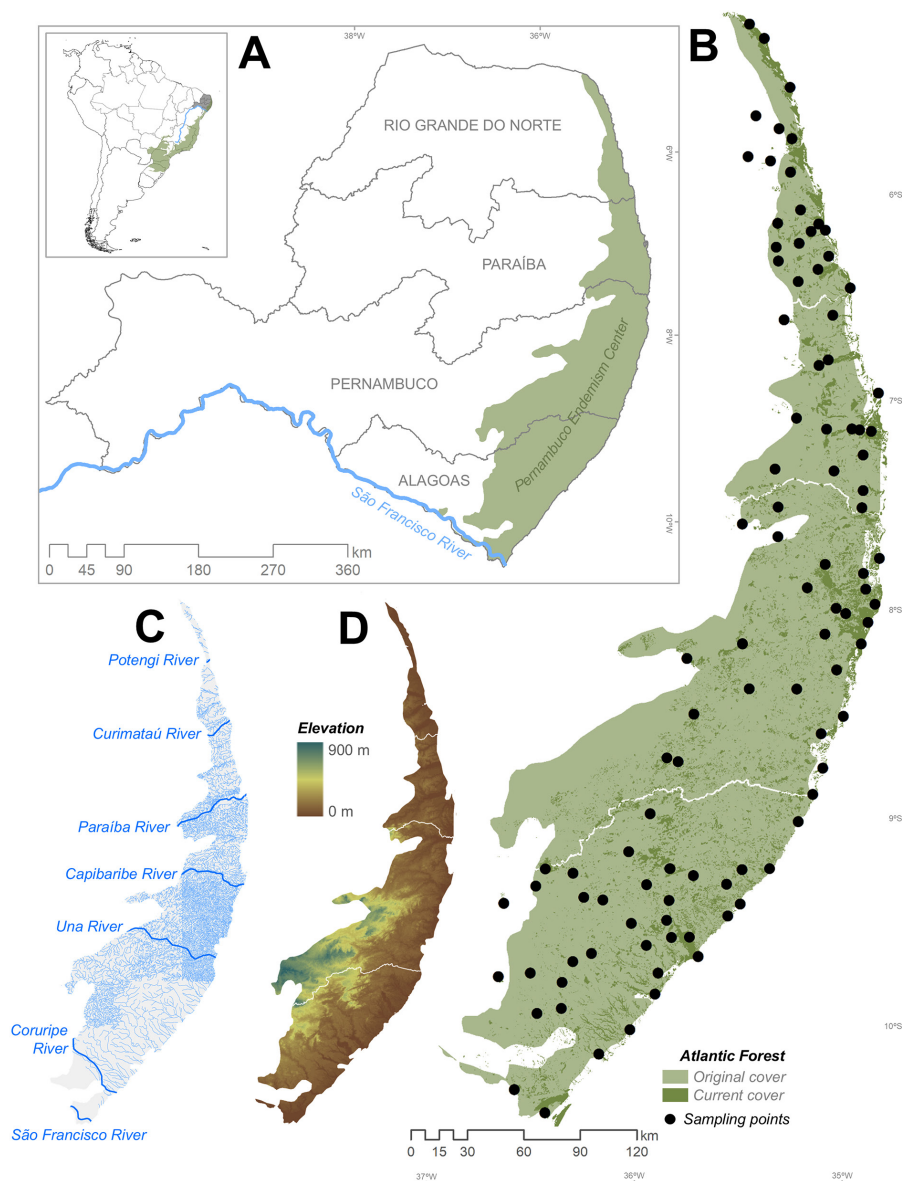


Figure 1. Location, limits, and environmental characteristics of the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. a - a highlight of Brazilian states covered by PEC, indicating the original forest cover. b - emphasis on PEC, showing the original (light green) and remaining forest cover (dark green), as well as centroids of the municipalities for which voucher specimens of non-snake squamates were available and analyzed in the present study (black dots). c - a hydrographic mesh of PEC, highlighting the main rivers. d - elevation map. Inset map: South America.

or core area of the species' distribution, species represented by a single record).

To standardize the geographic scale of the locations of the records, we used the centroids of municipalities' political limits (available at <https://www.ibge.gov.br/geociencias/organizacao-do-territorio/estrutura-territorial>). We prepared a map of taxonomic representation by municipality and an individual map of the distribution records for each species. We emphasize that this research does not consider

the distribution of species richness but rather taxonomic and spatial representation in regional herpetological collections, assuming the heterogeneity of sampling efforts and the incipience of knowledge about the fauna in many regions. To construct the spatial mesh of the sampling effort, we used the non-parametric Kernel density test, including all available records (Rosenblatt 1956, Parzen 1962). We prepared the graphs using the packages "ggplot2" and "viridis"

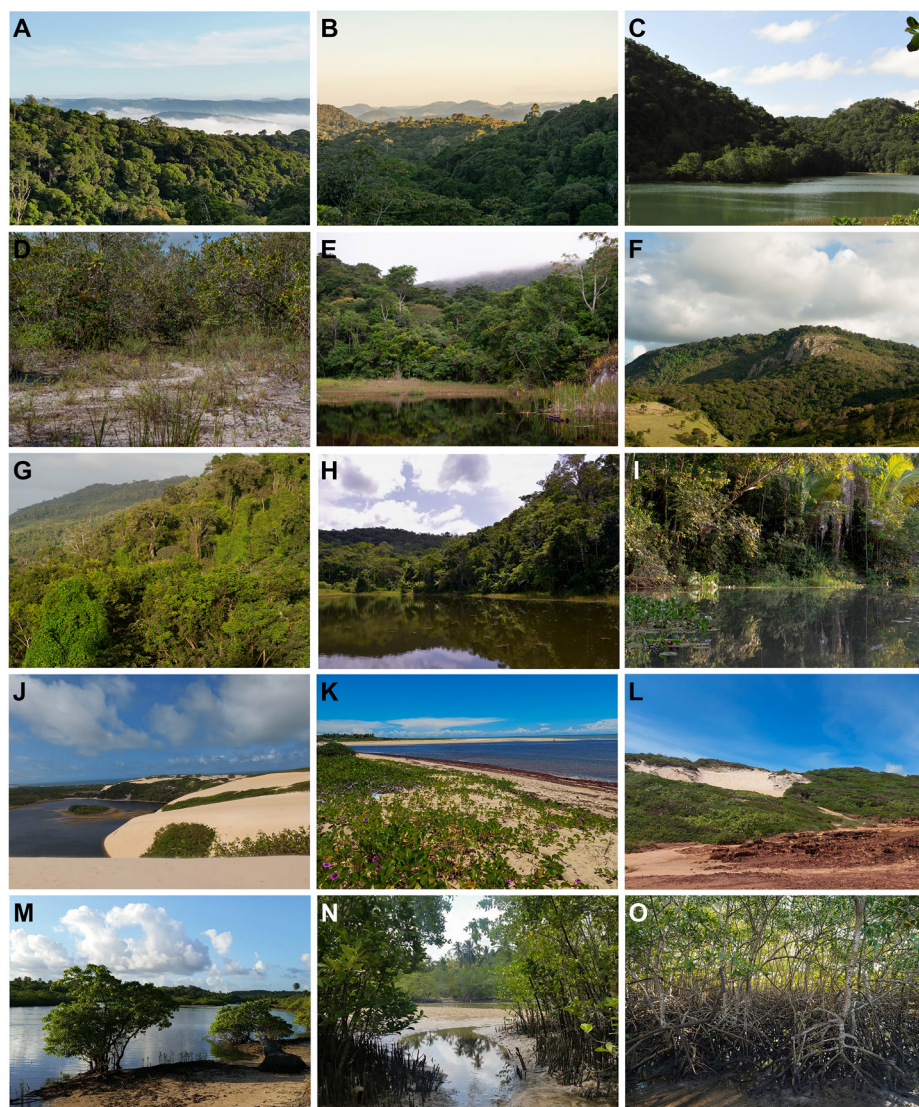


Figure 2. Examples of environments found in the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. a and b: Estação Ecológica de Murici, Alagoas state. c and d: Área de Proteção Ambiental do Catolé e Fernão Velho, Alagoas. e and f: Reserva Biológica de Pedra Talhada, Alagoas and Pernambuco states. g: Refúgio de Vida Silvestre Matas de Água Azul, Pernambuco state. h and i: Estação Ecológica da Serra dos Frios, Alagoas state. j – l: Área de Proteção Ambiental de Genipabu, Rio Grande do Norte state. m – o: Área de Proteção Ambiental Costa dos Corais, Alagoas and Pernambuco states.

(Wickham 2016) implemented in the software R v. 4.3.0 (R Core Team 2023).

The taxonomic nomenclature follows Guedes et al. (2023). We assessed the conservation status of each species using the IUCN Red List of Threatened Species (IUCN 2024) and the Brazilian government's list of endangered species, the Red Book of Brazilian Fauna Threatened with Extinction (ICMBio 2018) and/or its most recent update for these available species (MMA 2022). We determined the endemism status of each species based on its known geographic distribution available

in Guedes et al. (2023), Uetz et al. (2023), and Pereira-Filho et al. (2023).

RESULTS

We recorded 50 species of non-snake squamates in the PEC, distributed across 97 municipalities in all four states (Figure 1; Appendix 1). We recorded seven amphisbaenians, all belonging to the family Amphisbaenidae. Lizards are distributed in 12 families: Gymnophthalmidae was the most diverse, with seven species, followed by Phyllodactylidae and Teiidae (five

species each), Gekkonidae, Tropiduridae, and Scincidae (four species each), Diploglossidae, Sphaerodactylidae and Dactyloidae (three species each), Leiosauridae and Polychrotidae (two species each) and Iguanidae (one species) (Figures. 3 – 6). We provided the complete list of species and the states of occurrence and conservation status (Table I).

Only 35% of the municipalities from the PEC have at least one individual deposited in the

herpetological collections analyzed. Of these 95 municipalities, only 35% have more than ten species registered; for 18%, only one species is available (Figures. 7a and b). The municipality with the highest representation of taxa was São Lourenço da Mata (Pernambuco State), with 27 species, followed by João Pessoa (Paraíba State) and Maceió (Alagoas State) with 25 species each, and Murici (Alagoas State) and Natal (Rio Grande do Norte state) with 22 species each. The most



Figure 3. Amphisbaenians from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. **a** and **b** - *Amphisbaena alba*; **c** - *A. heathi*; **d** - *A. littoralis*; **e** - *A. carvalhoi*; **f** - *A. pretrei*; **g** - *A. vermicularis*; **h** - *Leposternon polystegum*. We took all photos of individuals found in the study area. Photos: **a, b, f, g, h** (Marcos Dubeux); **c, d, e** (Raul Sales).

representative areas are concentrated in the coastal portion of the PEC and were arranged in four main zones. These zones overlap, in particular, with areas close to state capitals and around some of the PEC's protected areas (Figure 7c).

Rio Grande do Norte is the state with the highest number of taxa recorded (41 species), followed by Alagoas (38 species), Pernambuco (34 species), and Paraíba (32 species; Figure 8a). Furthermore, the type locality of seven species

is in the PEC: *Phyllopezus selmae* (municipality of Boca da Mata, Alagoas state; Dubeux et al. 2022a), *Coleodactylus elizae* (municipality of Maceió, Alagoas state; Gonçalves et al. 2012); *C. meridionalis* (municipality of Igarassu, Pernambuco state; Boulenger 1888); *C. natalensis* (municipality of Natal, Rio Grande do Norte state; Freire 1999), *Cercosaura olivacea* (Pernambuco state; Gray 1845), *Dryadosaura nordestina* (municipality of João Pessoa, Paraíba state; Rodrigues et al. 2005), and *Stenolepis*



Figure 4. Lizards from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. a - *Diploglossus fasciatus*; b - *D. lessonae*; c - *Ophiodes striatus*; d - *Hemidactylus agrius*; e - *H. brasiliensis*; f - *H. mabouia*; g - *Lygodactylus klugei*; h - *Gymnodactylus darwini*; i - *G. geckoides*; j - *Phyllopezus lutzae*; k - *P. pollicaris*; l - *P. selmae*; m - *Coleodactylus elizae*; n - *C. meridionalis*; o - *C. natalensis*. We took all photos of individuals found in the study area. Photos: a (Marco Freitas); b, d (Daniel Mesquita); c (José Neto); e, g, i (Adrian Garda); f, h, j, k, l, n (Marcos Dubeux); m (Gabriel Skuk); o (Raul Sales).

ridleyi (municipality of Igarassu, Pernambuco state; Boulenger 1887) (Figure 8b).

Five recorded species are currently considered endemic to PEC (*Coleodactylus elizae*, *C. natalensis*, *Enyalius* sp., *Phyllopezus selmae*, and *Dryadosaura nordestina*). Two other species (*Leposoma baturitensis* and *Stenolepis ridleyi*) are restricted to the PEC and Brejos Nordestinos (highland humid forest remnants scattered throughout the semiarid lowlands in the states of Pernambuco, Paraíba, and Ceará).

Some recorded species were considered rare in the PEC (less than three recorded localities: *Amphisbaena carvalhoi*, *Cnemidophorus cryptus*, *Diploglossus fasciatus*, *Hemidactylus agrius*, *Lygodactylus klugei*, *Phyllopezus pollicaris*, *Tropidurus cocorobensis*, *Leposoma baturitensis*, *Vanzosaura multiscutata*, and *Psychosaura agmosticha*). We provide the complete maps with the collection areas of each species (Figures 9-12).

Three species are currently considered endangered in at least one of the consulted

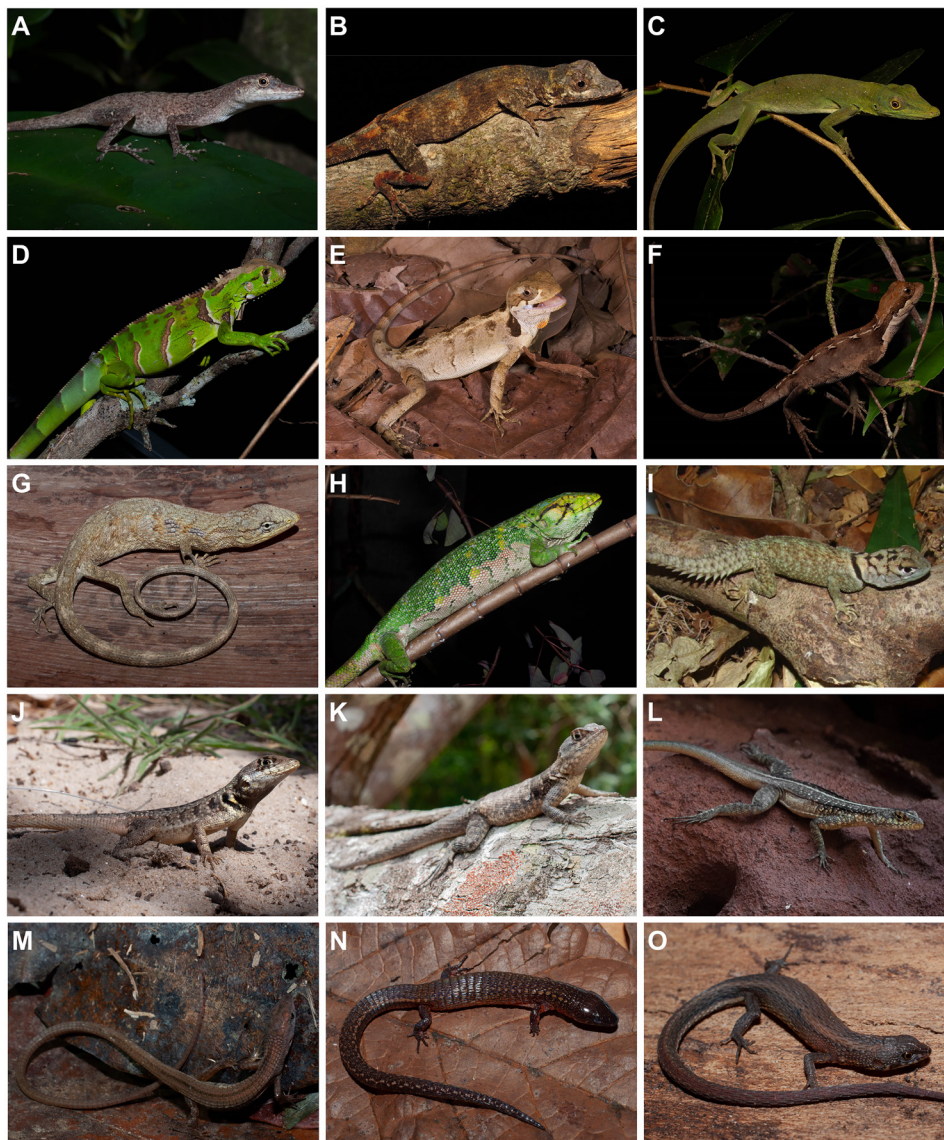


Figure 5. Lizards from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. a - *Norops fuscoauratus*; b - *N. ortonii*; c - *Dactyloa punctata*; d - *Iguana iguana*; e - *Enyalius bibronii*; f - *Enyalius* sp.; g - *Polychrus acutirostris*; h - *P. marmoratus*; i - *Strobilurus torquatus*; j - *Tropidurus cocorobensis*; k - *T. hispidus*; l - *T. semitaeniatus*; m - *Cercosaura olivacea*; n - *Dryadosaura nordestina*; o - *Leposoma baturitensis*. We took all photos of individuals found in the study area. Photos: e (Adrian Garda); a, c, d, f, g, h, j, k, l, m, n, o (Marcos Dubeux); b (José Neto); i (Anna Mello).

lists. *Amphisbaena carvalhoi* is considered Endangered (EN) according to the global list (IUCN 2024), while *C. natalensis* and *L. baturitensis* are considered EN according to both lists (ICMBio 2018, MMA 2022, IUCN 2024). Furthermore, one species is considered Near Threatened [NT] (*A. heathi*), three are Data Deficient (DD) for the evaluation in one or both lists (*A. littoralis*, *Ophiodes striatus*, and *C. elizae*), and the conservation status of the newly described species *P. selmae* (Dubeux et al. 2022a) has not yet been assessed – Not Evaluated (NE).

DISCUSSION

Species richness

Although proportionally insufficiently studied, the PEC harbors one of the richest faunas of non-snake squamate in the Atlantic Forest

(Tozetti et al. 2017, *present study*). About 28.7% of the species known for the biome are recorded for this portion, two of which are endemic (*Coleodactylus elizae* and *C. natalensis*). However, we only considered occurrence records of animals collected and listed in zoological collections. This demonstrates the importance of collecting specimen testimonials, thereby reducing the loss of crucial information to ensure the reproducibility of scientific studies and the conservation of species. Given the constant description of new taxa (e.g., Roberto et al. 2017a, Oliveira et al. 2021a, Dickens et al. 2021, Dantas et al. 2021, Lourenço-de-Moraes et al. 2021b, Dubeux et al. 2022a) and the various indicators of undescribed species complexes for the region (e.g., Pellegrino et al. 2005, Rodrigues et al. 2014), this richness is undoubtedly underestimated.



Figure 6. Lizards from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. a - *Acratosaura mentalis*; b - *Micrablepharus maximiliani*; c - *Stenolepis ridleyi*; d - *Vanzosaura multiscutata*; e - *Ameiva ameiva*; f - *Ameivula ocellifera*; g - *Kentropyx calcarata*; h - *Salvator merianae*; i - *Brasiliscincus heathi*; j - *Copeoglossum nigropunctatum*; k - *Psychosaura agmosticha*; l - *P. macrorhyncha*. We took all photos of individuals found in the study area. Photos: a, h, i, k, l (Daniel Mesquita); b, f, g (Adrian Garda); c (José Neto); d, e, j (Marcos Dubeux).

Table I. Amphisbaenians and lizards from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. States: AL= Alagoas, PE= Pernambuco, PB= Paraíba, RN= Rio Grande do Norte. Conservation status: National (ICMBio 2018 and MMA 2022) and Global (IUCN 2024); EN= Endangered, NT= Near Threatened, LC= Least Concern, DD= Data Deficient, NE= Not Evaluated. Distribution: Pereira-Filho et al. (2023); EPEC= Endemic of PEC, EAF= Endemic of Atlantic Forest, DD= Disjunct distribution, LAD= Linked to adjacent biomes, WD= Wide distribution, *Distribution core area in the Caatinga, *Disjunct distribution between Amazonia/Cerrado and Atlantic Forest, *Disjunct distribution between Amazonia and Atlantic Forest, °Distribution related to the Cerrado and discontinuous occurrences in the Atlantic Forest.

Taxon	States				Conservation status		Distribution
	AL	PE	PB	RN	National	Global	
AMPHISBAENIA Gray, 1844							
Amphisbaenidae Gray, 1825							
Amphisbaeninae Gray, 1825							
<i>Amphisbaena alba</i> Linnaeus, 1758	.	.	.	.	LC	LC	WD
<i>Amphisbaena heathi</i> Schmidt, 1936				.	NT	NT	
<i>Amphisbaena littoralis</i> Roberto, Brito and Ávila, 2014				.	DD	DD	
<i>Amphisbaena carvalhoi</i> Gans, 1965			.		NT	EN	LAD*
<i>Amphisbaena pretrei</i> Duméril and Bibron, 1839	.	.	.	.	LC	LC	WD
<i>Amphisbaena vermicularis</i> Wagler in Spix, 1824	.	.	.	.	LC	LC	
<i>Leposternon polystegum</i> (Duméril in Duméril and Duméril, 1851)	.	.	.	.	LC	LC	WD
ANGUIFORMES Conrad, 2006							
Diploglossidae Cope, 1864							
Diploglossinae Cope, 1864							
<i>Diploglossus fasciatus</i> (Gray, 1831)	.				LC	LC	EAF
<i>Diploglossus lessonae</i> Peracca, 1890	.	.		.	LC	LC	WD
<i>Ophiodes striatus</i> (Spix, 1825)	.	.			DD	LC	LAD°
GEKKOTA Cuvier, 1817							
Gekkonidae Oppel, 1811							
<i>Hemidactylus agrius</i> Vanzolini, 1978				.	LC	LC	LAD*
<i>Hemidactylus brasiliensis</i> (Amaral, 1935)				.	LC	LC	LAD*
<i>Hemidactylus mabouia</i> (Moreau de Jonnès, 1818)	.	.	.	.	NE	LC	WD
<i>Lygodactylus klugei</i> (Smith, Martin and Swain, 1977)				.	LC	LC	LAD*
Phyllodactylidae Gamble, Bauer, Greenbaum, and Jackman, 2008							
<i>Gymnodactylus darwinii</i> (Gray, 1845)	.	.	.	.	LC	LC	EAF
<i>Gymnodactylus geckoides</i> Spix, 1825	.		.	.	LC	LC	LAD*
<i>Phyllopezus lutzae</i> (Loveridge, 1941)	.	.	.		LC	LC	EAF
<i>Phyllopezus pollicaris</i> (Spix, 1825)		.			LC	LC	LAD*
<i>Phyllopezus selmae</i> Dubeux, Gonçalves, Palmeira, Nunes, Cassimiro, Gamble, Werneck, Rodrigues and Mott, 2022	.				NE	NE	EPEC

Table I. Continuation.

Sphaerodactylidae Underwood, 1954							
<i>Coleodactylus elizae</i> Gonçalves, Torquato, Skuk, and Sena, 2012	•				DD	DD	EPEC
<i>Coleodactylus meridionalis</i> (Boulenger, 1888)	•	•	•	•	LC	LC	WD
<i>Coleodactylus natalensis</i> Freire, 1999				•	EN	EN	EPEC
IGUANIA Cuvier, 1817							
Dactyloidae Fitzinger, 1843							
Anolinae Cope, 1864							
<i>Norops fuscoauratus</i> (D'Orbigny, 1837 in Duméril and Bibron, 1837)	•	•	•	•	LC	LC	DD [▲]
<i>Norops ortonii</i> (Cope, 1868)	•	•	•		LC	LC	DD [*]
Dactyloinae Fitzinger, 1843							
<i>Dactyloa punctata</i> (Daudin, 1802)	•	•	•	•	LC	LC	DD [*]
Iguanidae Gray, 1827							
<i>Iguana iguana</i> (Linnaeus, 1758)	•	•	•	•	LC	LC	WD
Leiosauridae Frost, Etheridge, Janies, and Titus, 2001							
Enyaliinae Frost, Etheridge, Janies and Titus, 2001							
<i>Enyalius bibronii</i> Boulenger, 1885	•		•	•	LC	LC	WD
<i>Enyalius</i> sp.	•	•	•	•	NE	NE	EPEC
Polychrotidae Fitzinger, 1843							
<i>Polychrus acutirostris</i> Spix, 1825		•	•	•	LC	LC	WD
<i>Polychrus marmoratus</i> (Linnaeus, 1758)	•	•	•	•	LC	LC	DD [▲]
Tropiduridae Bell in Darwin, 1843							
<i>Strobilurus torquatus</i> Wiegmann, 1834	•	•	•	•	LC	LC	EAF
<i>Tropidurus cocorobensis</i> Rodrigues, 1987		•			LC	LC	
<i>Tropidurus hispidus</i> (Spix, 1825)	•	•	•	•	LC	LC	WD
<i>Tropidurus semitaeniatus</i> (Spix, 1825)	•	•	•	•	LC	LC	LAD [*]
LACERTIFORMES Estes, Queiroz and Gauthier in Estes and Pregill, 1988							
Gymnophthalmidae Fitzinger, 1826							
Cercosaurinae Gray, 1838							
<i>Cercosaura olivacea</i> (Gray, 1845)	•	•	•	•	LC	LC	LAD [°]
Ecpleopodini Fitzinger, 1843							
<i>Dryadosaura nordestina</i> Rodrigues, Freire, Pellegrino and Sites, 2005	•	•	•	•	LC	LC	EPEC
<i>Leposoma baturitensis</i> Rodrigues and Borges, 1997	•				EN	EN	DD
Gymnophthalminae Fitzinger, 1826							
<i>Acratosaura mentalis</i> (Amaral, 1933)	•	•		•	LC	LC	LAD [*]
<i>Micrablepharus maximiliani</i> (Reinhardt and Luetken, 1862)	•	•	•	•	LC	LC	WD
<i>Stenolepis ridleyi</i> Boulenger, 1887	•	•			LC	LC	EPEC

Table I. Continuation.

<i>Vanzosaura multiscutata</i> (Amaral, 1933)	.			.	LC	LC	LAD*
Teiidae Gray, 1827							
Teiinae Gray, 1827							
<i>Ameiva ameiva</i> (Linnaeus, 1758)	.	.	.	.	LC	LC	WD
<i>Ameivula ocellifera</i> (Spix, 1825)	.	.	.	.	LC	LC	WD
<i>Cnemidophorus cryptus</i> Cole and Dessauer, 1993				.	LC	LC	DD [▲]
<i>Kentropyx calcarata</i> Spix, 1825	.	.	.	.	LC	LC	DD [▲]
Tupinambinae Bonaparte, 1831							
<i>Salvator merianae</i> Duméril and Bibron, 1839	.	.	.	.	LC	LC	WD
SCINCIFORMATA Vidal and Hedges, 2005							
Scincidae Gray, 1825							
Mabuyinae Mittleman, 1952							
<i>Brasiliscincus heathi</i> (Schmidt and Inger, 1951)	.	.	.	.	LC	LC	WD
<i>Copeoglossum nigropunctatum</i> (Spix, 1825)	.	.	.		LC	LC	WD
<i>Psychosaura agmosticha</i> (Rodrigues, 2000)			.		LC	LC	LAD*
<i>Psychosaura macrorhyncha</i> (Hoge, 1947)	.	.	.	.	LC	LC	EAF

When comparing the results obtained here with the most recent list of species published for the region (Pereira-Filho et al. 2023), two species were added to the community. *Tropidurus cocorobensis* and *Lygodactylus klugei* have a core area of occurrence in the Caatinga biome, with the new records in peripheral transition areas between the Caatinga and the Atlantic Forest of the PEC. Additionally, the spatial mesh of richness distribution for amphisbaenians and lizards provided in Pereira-Filho et al. (2023) are significantly different from those obtained in the present study. This may be a reflection of the extensive refinement and volume of occurrence data used in the present study, providing a more accurate overview of the sampling gaps in the knowledge of species diversity for the region. On the other hand, although Guedes et al. (2023) also provide a list of reptiles, cataloging 14 species of amphisbaenians and 56 species of lizards for the states of Alagoas, Pernambuco, Paraíba and Rio Grande do Norte, the fact that they do not distinguish the areas of occurrence

of the species between the biomes of the region makes it impossible to carry out broader comparisons in relation to the present list, and it is likely that the difference in the number of species recorded is related to species recorded only in the Caatinga biome, as described by Uchôa et al. (2022).

Sampling gaps

Despite more than three decades of surveys, the PEC presents broad sampling gaps, and more than 65% of the municipalities located within its boundaries do not have a single record of non-snake squamates housed in scientific collections. Our findings show that the information gap is mainly in southern Rio Grande do Norte, southwestern Paraíba, Pernambuco (except the northeastern region), and the north and west of Alagoas (see Figure 7). Even for the municipalities with records in scientific collections, species diversity is undoubtedly underestimated, represented by less than ten species. The sampling effort is not

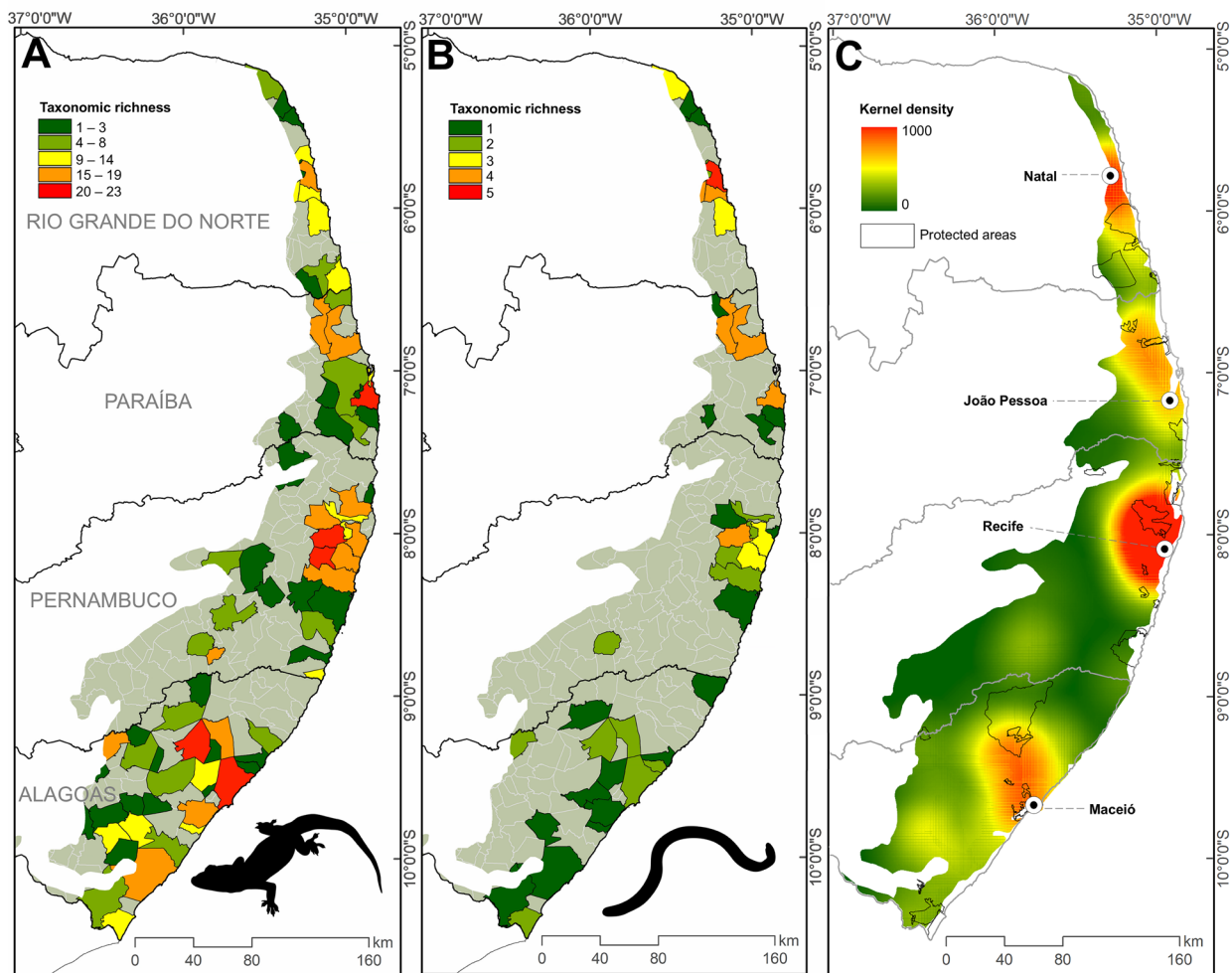


Figure 7. Species taxonomic representation by the municipality for lizards (a) and amphisbaenians (b) from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. c: Species richness mesh built from the Kernel non-parametric index for the complete dataset, highlighting the limits of protected areas and state capitals where the primary research centers are located.

homogeneously distributed in its territory, and the municipalities with the highest number of registered species are those where the leading Universities are present, and the scientific reference collections are geographically nearby. Our data corroborates the notion that the presence of research centers and regional experts such as universities, museums, and institutes influence sampling patterns (Moura et al. 2018). This influence is attributed to the logistical convenience of accessing regions that are close to these research centers. Some exceptions include a few protected areas where

scientific studies were conducted, with the support of NGOs or universities (e.g., Reserva Biológica de Pedra Talhada, municipality of Quebrangulo, Alagoas; Private Reserve of Natural Heritage Pedra D'Antas, municipality of Lagoa dos Gatos, Pernambuco, Guaribas Biological Reserve, municipalities of Mamanguape and Rio Tinto, Paraíba).

In fact, although significantly representative, PEC's zoological collections still present wide gaps in local diversity and certainly underestimate the species richness of the states. This fact can be reinforced by the vast

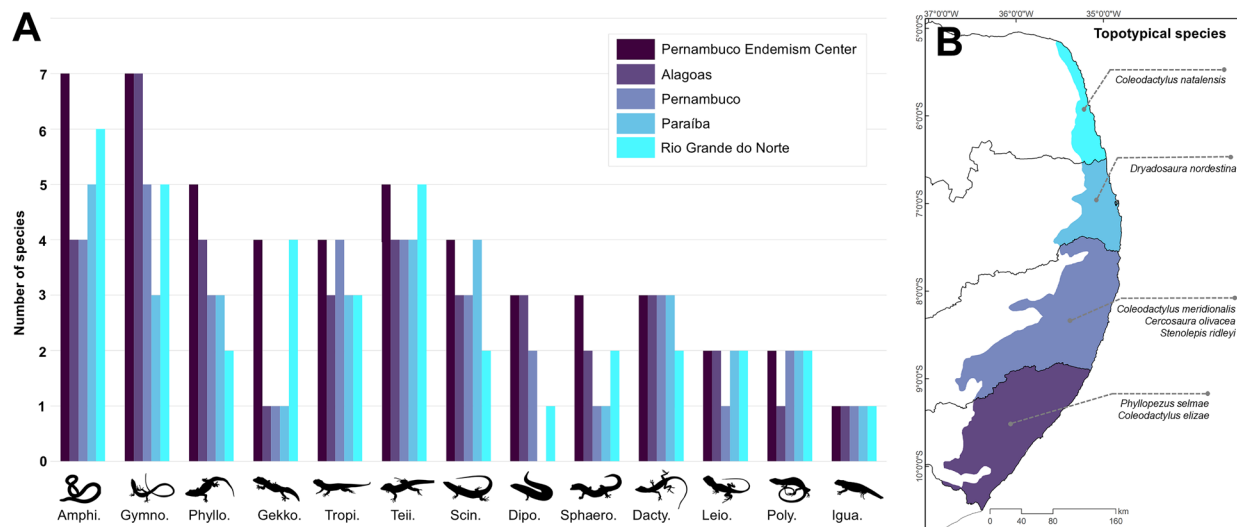


Figure 8. Species taxonomic representation by family (a) for Pernambuco Endemism Center (PEC) and by state covered by the northern Atlantic Forest, Northeastern Brazil. b - Brazilian states covered by PEC highlighting topotypical species. Abbreviations below the bars: Amphi. = Amphisbaenidae; Gymno. = Gymnophthalmidae; Phyllo. = Phyllodactylidae; Gekko. = Gekkonidae; Tropi. = Tropiduridae; Teii. = Teiidae; Scin. = Scincidae; Dipo. = Diploglossidae; Sphaero. = Sphaerodactylidae; Dacty. = Dactyloidae; Leio. = Leiosauridae; Poly. = Polychrotidae; Igua. = Iguanidae.

number of secondary records carried out in the PEC by specialist researchers but which do not contain an associated voucher. For example: *Gymnodactylus geckoides*, *Enyalius bibronii*, *Polychrus acutirostris*, (GJBM and MAF *personal observation*), and *Amphisbaenia carvalhoi* (MAF *personal observation*) for the state of Pernambuco; and *P. acutirostris* (MJMD and MAF *personal observation*) for the state of Alagoas.

Conservation status

The PEC forest presents a diverse and distinct community of non-snake squamates in an intensely fragmented landscape. The remaining fragments are embedded in a matrix of sugarcane plantations and urban areas, which harbor millions of people. Recent data show that PEC forests represent 2.7% of the Atlantic Forest. However, this percentage is distributed across 63,048 forest fragments; of these, only 896 fragments are larger than 100 ha, representing 1.42% of the total number (Almeida & Souza 2023). This scenario is aggravated by the fact that

of the 747,926.73 ha remaining in this portion of the Atlantic Forest, only 439,718 ha are protected by Conservation Units and of these only 37,562 ha are covered by areas of integral protection (CNUC/MMA 2024).

These characteristics pose a considerable challenge to increasing the small network of protected areas, as the smallest fragments allied to the fertile lands, population, and urban expansion, drive up conservation costs significantly. Nevertheless, even small fragments can harbor important and representative communities of non-snake squamates, highlighting their conservation value (Lion et al. 2016). Climate change and extreme climatic events will disproportionately affect northeastern Brazil (Marengo et al. 2017). For ectotherms, a decrease in the distribution of many species is predicted due to climate change (Lourenço-de-Moraes et al. 2019), making conservation challenges for the region even harder. This imminent threat underscores the importance of the long-term monitoring of populations in

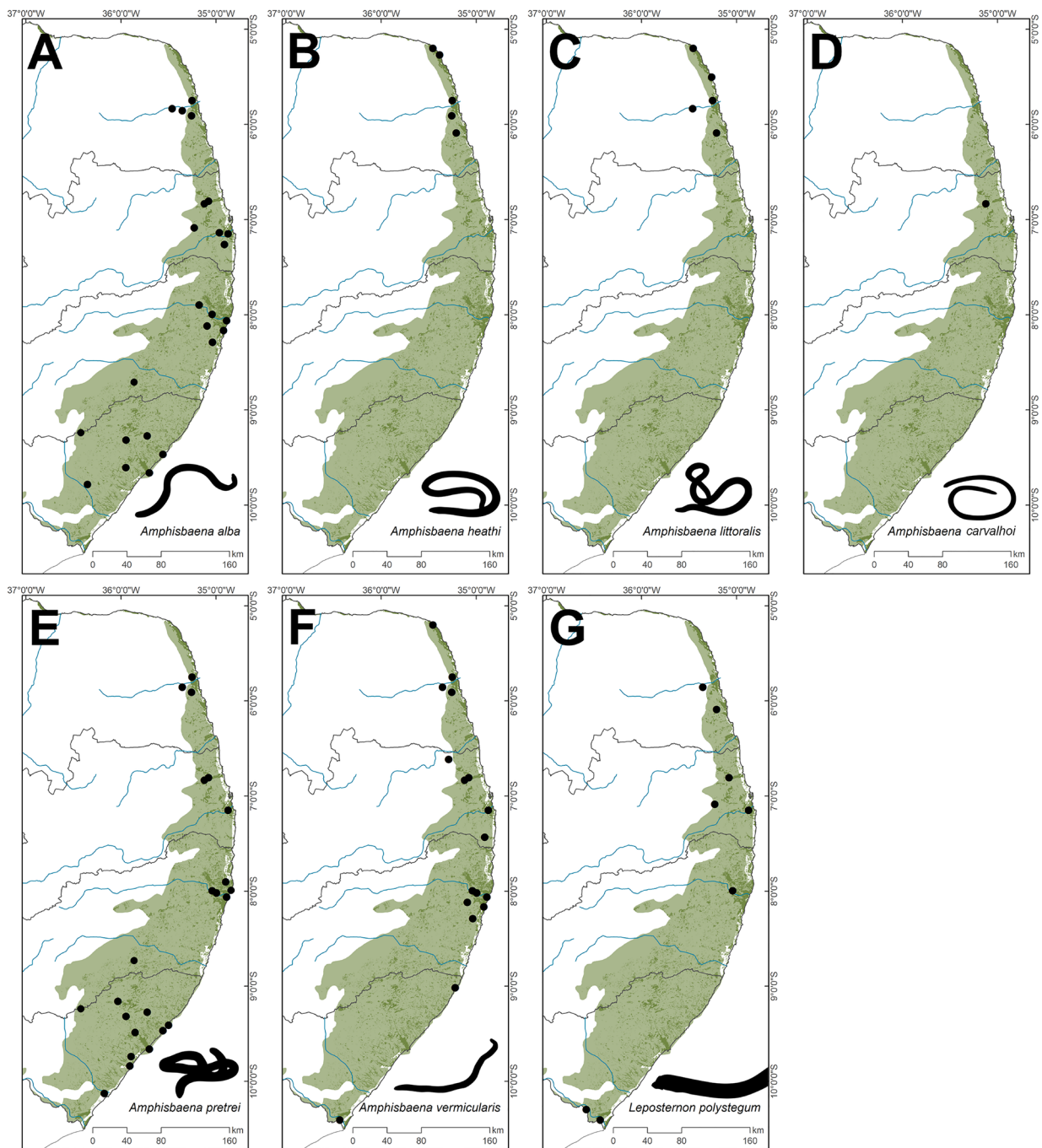


Figure 9. Voucher records for amphisbaenians from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. a - *Amphisbaena alba*; b - *A. heathi*; c - *A. littoralis*; d - *A. carvalhoi*; e - *A. pretrei*; f - *A. vermicularis*; g - *Leposternon polystegum*.

the region, but few such initiatives are underway in the PEC. Establishing partnerships with local communities, governments, and sugarcane companies (the main crop in the region) could

help, not only to establish the conditions and infrastructure for long-term monitoring, but also to mitigate deforestation, climate change, and

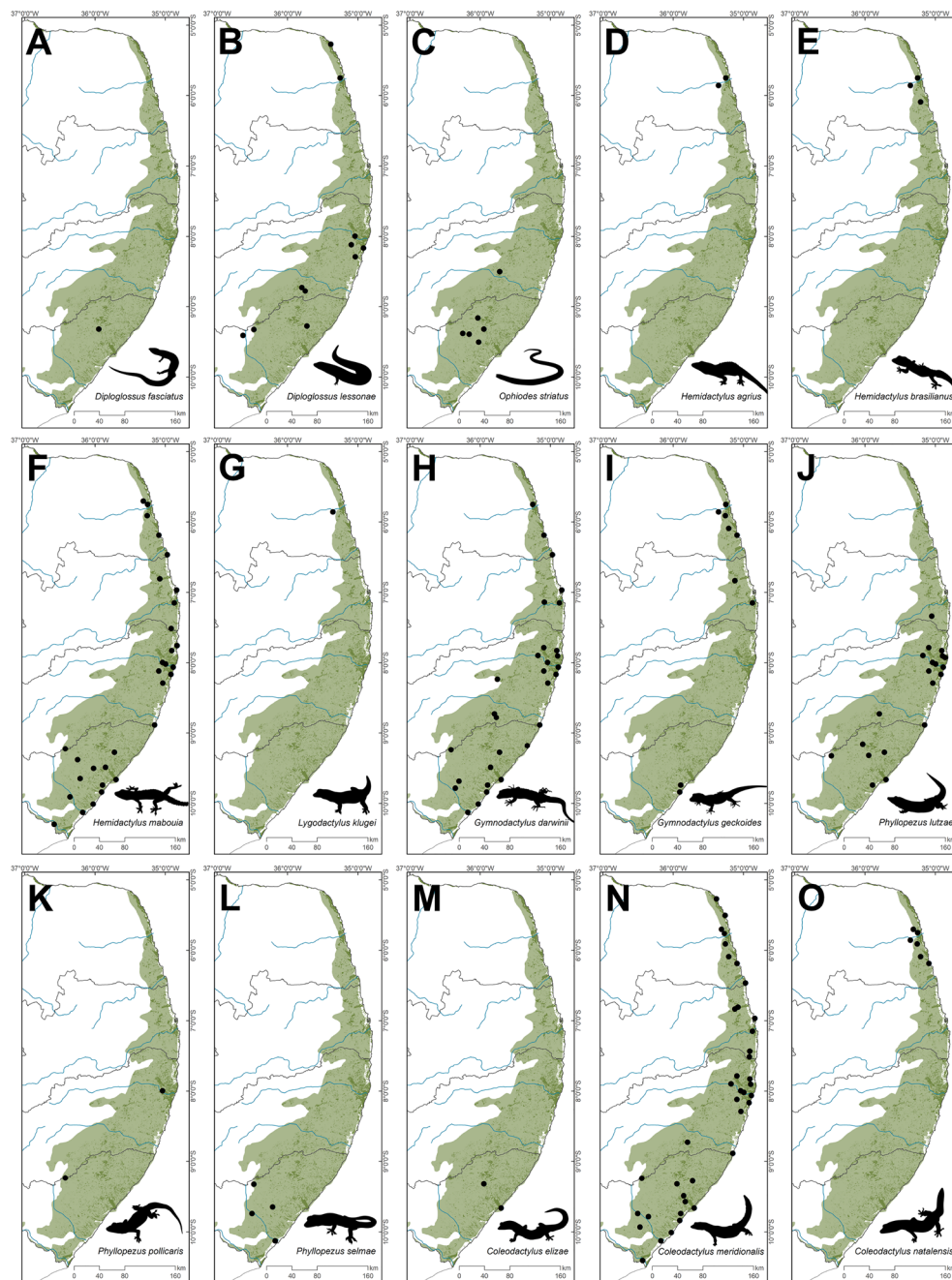


Figure 10. Voucher records for lizards from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. a - *Diploglossus fasciatus*; b - *D. lessonae*; c - *Ophiodes striatus*; d - *Hemidactylus agrius*; e - *H. brasiliensis*; f - *H. mabouia*; g - *Lygodactylus klugei*; h - *Gymnodactylus darwini*; i - *G. geckoides*; j - *Phylllopezus lutzae*; k - *P. pollicaris*; l - *P. selmae*; m - *Coleodactylus elizae*; n - *C. meridionalis*; o - *C. natalensis*.

ultimately help curtail the shortfall of protected areas in the region.

The PEC is considered an important refuge for reptile species (Lourenço-de-Moraes et al. 2019), harboring 143 species. This important portion of the biome is one of the central regions of the Atlantic Forest and is considered a priority for the establishment of new protected areas

(Campos et al. 2017, Lourenço-de-Moraes et al. 2021a, 2023, Pereira-Filho et al. 2023). Preserving the PEC's biodiversity will demand a large-scale plan, considering costs and opportunities, using state-of-the-art methods such as systematic conservation planning to create connections among protected areas and the creation of new ones. Private protected areas will be vital

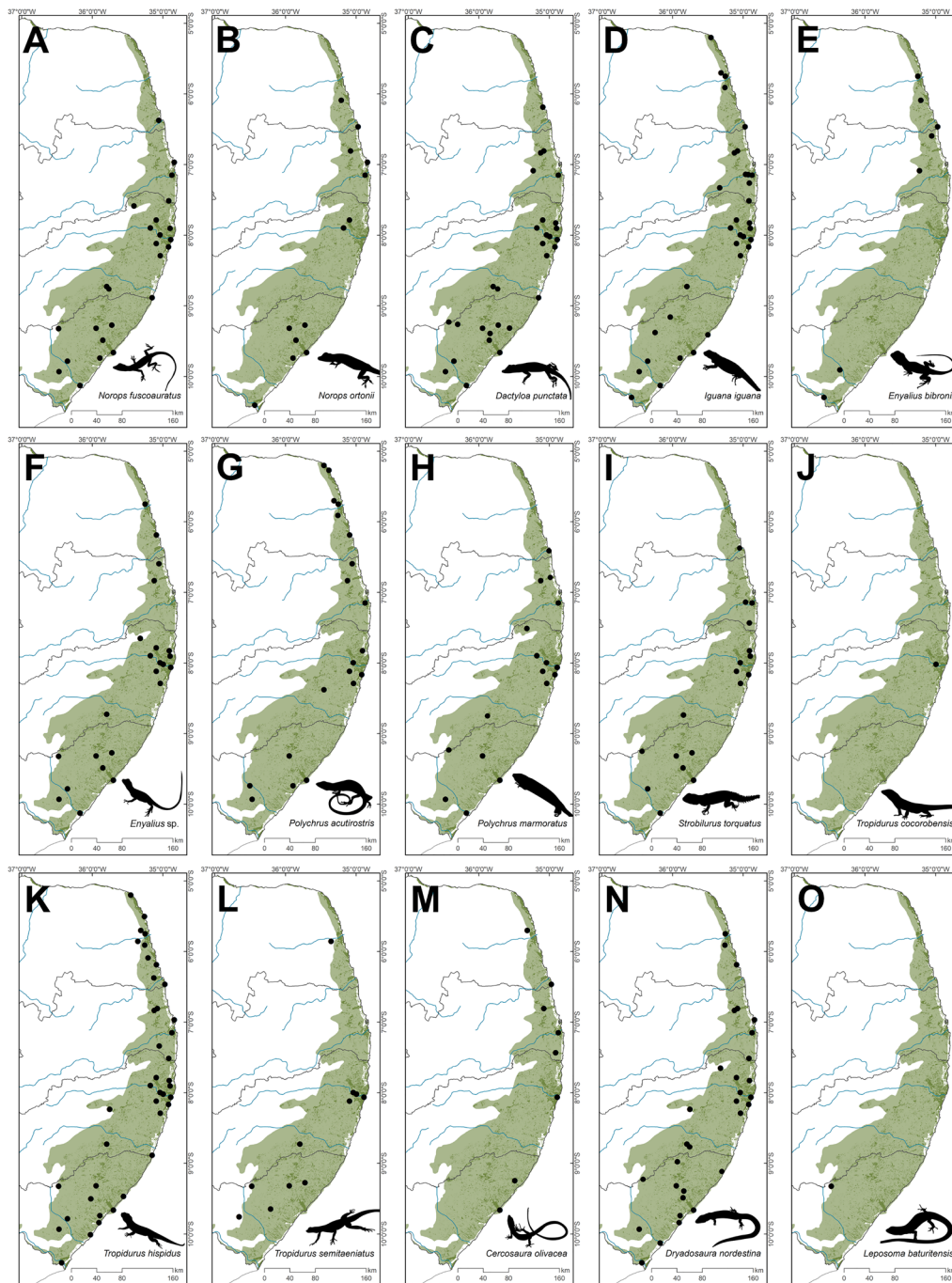


Figure 11. Voucher records for lizards from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. a - *Norops fuscoauratus*; b - *N. ortonii*; c - *Dactyloa punctata*; d - *Iguana iguana*; e - *Enyalius bibronii*; f - *Enyalius* sp.; g - *Polychrus acutirostris*; h - *P. marmoratus*; i - *Strobilurus torquatus*; j - *Tropidurus cocorobensis*; k - *T. hispidus*; l - *T. semitaeniatus*; m - *Cercosaura olivacea*; n - *Dryadosaura nordestina*; o - *Leposoma baturitensis*.

for increasing and connecting the network of preserved natural areas and forest restoration projects. Such goals will need to run in parallel with continuous efforts to map the PEC's

biodiversity (accessing new areas), along with long-term monitoring sites that can help predict and keep track of the effects of changes in land use and climate expected for the future.

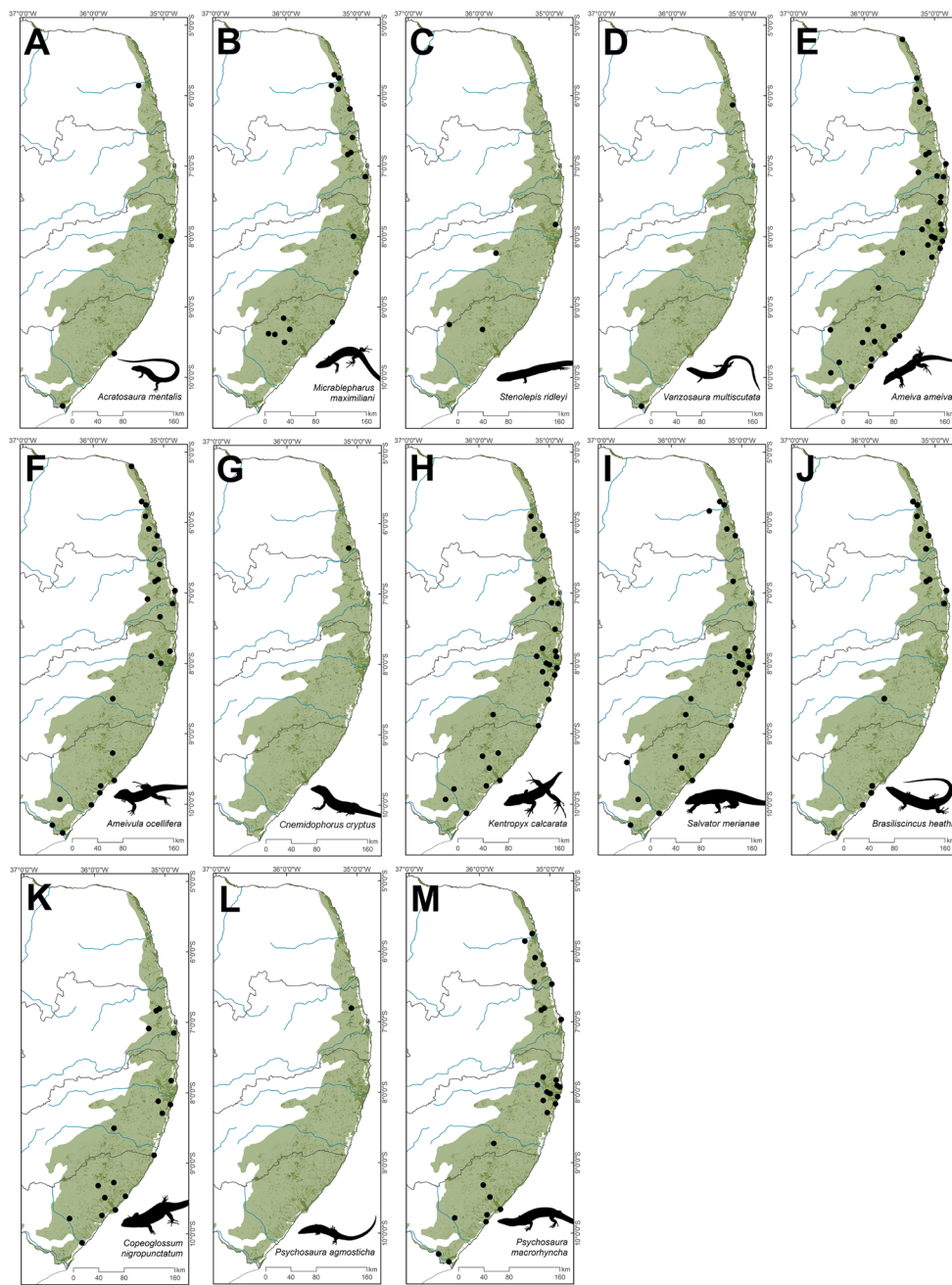


Figure 12. Voucher records for lizards from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. a - *Acratosaura mentalis*; b - *Microblepharus maximiliani*; c - *Stenolepis ridleyi*; d - *Vanzosaura multiscutata*; e - *Ameiva ameiva*; f - *Ameivula ocellifera*; g - *Cnemidophorus cryptus*; h - *Kentropyx calcarata*; i - *Salvator merianae*; j - *Brasiliscincus heathi*; k - *Copeoglossum nigropunctatum*; l - *Psychosaura agnosticha*; m - *P. macrorhyncha*.

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Appendix 1. Records of amphisbaenians and lizards from the Pernambuco Endemism Center (PEC), northern Atlantic Forest, Northeastern Brazil. The coordinates used in the geographic distribution maps were obtained from the centroid of the municipality available at <https://www.ibge.gov.br/geociencias/organizacao-do-territorio/estrutura-territorial>.

***Amphisbaena alba* - Alagoas:** Campo Alegre (MHNUFAL7334), Flexeiras (MHNUFAL1557), Maceió (MHNUFAL358), Murici (MHNUFAL1883), Paripueira (MHNUFAL11620), Pilar (MHNUFAL11890), Quebrangulo (UFC7733); **Paraíba:** Conde (CHUFPB11228), João Pessoa (CHUFPB5468), Mamanguape (CHUFPB8261), Rio Tinto (CHUFPB13277), Santa Rita (CHUFPB13286), Sapé (CHUFPB13275); **Pernambuco:** Cabo de Santo Agostinho (CHPUFRPE571), Lagoa dos Gatos (URCA6207), Paudalho (CHUFPE553); **Rio Grande do Norte:** Macaíba (UFRNCH2256), Natal (CHUFPB14128), Parnamirim (UFRNCH1492), São Gonçalo do Amarante (UFRNCH5863).

***Amphisbaena heathi* - Rio Grande do Norte:** Extremoz (UFRNCH6464), Natal (CHUFPB5795), Nísia Floresta (UFRNCH1509), Parnamirim (UFRNCH1414), Rio do Fogo (UFRNCH3167), Touros (UFRNCH5746), Tibau do Sul (UFRNCH6065).

***Amphisbaena littoralis* - Rio Grande do Norte:** Maxaranguape (UFRNCH2571), Nísia Floresta (UFRNCH4826), São Gonçalo do Amarante (UFRNCH5766), Touros (UFRNCH5742).

***Amphisbaena carvalhoi* - Paraíba:** Mamanguape (CHUFPB13292).

***Acratosaura mentalis* - Alagoas:** Maceió (MHNUFAL11886), Piacaçu (MHNUFAL14316);

Pernambuco: Cabo de Santo Agostinho (CHPUFRPE506), São Lourenço da Mata (CHPUFRPE464); **Rio Grande do Norte:** Macaíba (UFRNCH2657).

Amphisbaena pretrei* - Alagoas:** Barra de Santo Antônio (MHNUFAL13561), Barra de São Miguel (MHNUFAL13798), Coruripe (MHNUFAL10520), Flexeiras (MHNUFAL1763), Maceió (MHNUFAL1381), Marechal Deodoro (MHNUFAL13472), Murici (MHNUFAL1411), Paripueira (MHNUFAL10600), Quebrangulo (URCA3863), Rio Largo (MHNUFAL11791), União dos Palmares (MHNUFAL9056); ***Paraíba: João Pessoa (CHUFPB5446), Mamanguape (CHUFPB13302), Rio Tinto (CHUFPB13300); **Pernambuco:** Abreu e Lima (CHUFPE409), Camaragibe (CHUFPE599), Lagoa dos Gatos (URCA6209), Olinda (URCA13721), Recife (CHUFPE622); **Rio Grande do Norte:** Macaíba (UFRNCH2743), Natal (UFRNCH6923), Parnamirim (UFRNCH2744), Touros (UFRNCH5818).

Amphisbaena vermicularis* - Alagoas:** Maragogi (MHNUFAL15300), Piacabuçu (MHNUFAL254); ***Paraíba: Alhandra (CHUFPB12617), Jacaraú (CHUFPB13289), João Pessoa (CHUFPB5455), Mamanguape (CHUFPB13291), Rio Tinto (CHUFPB13293); **Pernambuco:** Cabo de Santo Agostinho (CHPUFRPE572), Camaragibe (CHUFPE419), Recife (CHUFPE416); **Rio Grande do Norte:** Macaíba (UFRNCH2231), Natal (UFRNCH1098), Parnamirim (UFRNCH1473), São Gonçalo do Amarante (UFRNCH6445), Touros (UFRNCH5741).

***Ameiva ameiva* - Alagoas:** Atalaia (MHNUFAL2463), Barra de Santo Antônio (MHNUFAL13565), Barra de São Miguel (MHNUFAL6097), Campo Alegre (MHNUFAL6711), Coruripe (MHNUFAL4835), Flexeiras (MHNUFAL1558), Junqueiro (CHPUFRPE907), Maceió (MHNUFAL4069), Marechal Deodoro (MHNUFAL13383), Murici (MHNUFAL1739), Paripueira (MHNUFAL11618), Piacabuçu (MHNUFAL73), Quebrangulo (MHNUFAL2292),

Rio Largo (MHNUFAL439); ***Paraíba:*** Alhandra (CHUFPB12614), Caaporã (CHUFPB15838), Cabedelo (CHUFPB2660), João Pessoa (CHUFPB2642), Mamanguape (CHUFPB2650), Rio Tinto (CHUFPB10313), Santa Rita (CHUFPB17453), Sapé (CHUFPB2665); **Pernambuco:** Cabo de Santo Agostinho (CHPUFRPE478), Gravata (UFC1227), Paulista (CHUFPE474), Paudalho (CHUFPE474), São Lourenço da Mata (CHPUFRPE437), Timbaúba (CHUFPB8541); **Rio Grande do Norte:** Extremoz (CHUFPB12615), Natal (CHUFPB2683), Nísia Floresta (UFRNCH1520), Parnamirim (UFRNCH2250), Tibau do Sul (UFRNCH2304), Touros (UFRNCH5738).

Ameivula ocellifera* - Alagoas:** Barra de São Miguel (MHNUFAL13789), Flexeiras (MHNUFAL1922), Jequiá da Praia (MHNUFAL13337), Junqueiro (CHPUFRPE908), Maceió (MHNUFAL4000), Marechal Deodoro (MHNUFAL5459), Penedo (MHNUFAL338), Piacabuçu (MHNUFAL88); ***Paraíba: Cabedelo (CHUFPB17286), João Pessoa (CHUFPB3719), Mamanguape (CHUFPB3761), Mataraca (CHUFPB12624), Pedras de Fogo (CHUFPB21044), Rio Tinto (CHUFPB8578), Sapé (CHUFPB3738); **Pernambuco:** Bonito (CHUFPB5931), Paudalho (CHUFPE562); **Rio Grande do Norte:** Canguaretama (CHUFPB11148), Extremoz (UFRNCH5914), Natal (CHUFPB3786), Nísia Floresta (UFRNCH5281), Parnamirim (UFRNCH1305), São Gonçalo do Amarante (UFRNCH6450), Tibau do Sul (UFRNCH2283), Touros (UFRNCH5739).

Brasiliscincus heathi* - Alagoas:** Barra de São Miguel (MHNUFAL13803), Jequiá da Praia (MHNUFAL13345), Marechal Deodoro (MHNUFAL13404), Piacabuçu (MHNUFAL70); ***Paraíba: Alhandra (CHUFPB9355), Cabedelo (CHUFPB17289), João Pessoa (CHUFPB3979), Mamanguape (CHUFPB3975), Rio Tinto (CHUFPB27166); **Pernambuco:** Bonito (CHUFPB75), Timbaúba (CHUFPB3974); **Rio Grande do Norte:** Canguaretama (CHUFPB12574), Extremoz

(UFRNCH5910), Natal (CHUFPB5501), Nísia Floresta (MHNUFAL31), Parnamirim (UFRNCH1341), Tibau do Sul (UFRNCH1788).

***Coleodactylus elizae* - Alagoas:** Maceió (MHNUFAL3252), Murici (MHNUFAL11417).

***Coleodactylus meridionalis* - Alagoas:** Barra de São Miguel (MHNUFAL13795), Campo Alegre (MHNUFAL4610), Coruripe (MHNUFAL4852), Flexeiras (MHNUFAL16444), Jequiá da Praia (MHNUFAL13335), Junqueiro (CHPUFRPE903), Limoeiro de Anadia (MHNUFAL12151), Maceió (MHNUFAL3662), Marechal Deodoro (MHNUFAL13381), Murici (MHNUFAL526), Piacabuçu (MHNUFAL289), Quebrangulo (URCA4808), Rio Largo (MHNUFAL522), Satuba (MHNUFAL15490); **Paraíba:** Alhandra (CHUFPB9357), Caaporã (CHUFPB15737), Cabedelo (CHUFPB3214), João Pessoa (CHUFPB3234), Mamanguape (CHUFPB12583), Rio Tinto (CHUFPB22885); **Pernambuco:** Abreu e Lima (CHUFPE232), Araçoiaba (CHUFPE320), Cabo de Santo Agostinho (MHNUFAL10648), Escada (CHUFPB5919), Ipojuca (CHUFPB197), Moreno (CHUFPE113), Parnamirim (MHNUFAL13), Paudalho (CHUFPE234), Recife (CHPUFRPE540), São José da Coroa Grande (MHNUFAL17918), São Lourenço da Mata (URCA3974), São Vicente Ferrer (CHUFPE977), Tamandaré (CHPUFRPE651); **Rio Grande do Norte:** Baía Formosa (MHNUFAL32), Ceará-Mirim (URCA3995), Extremoz (CHUFPB12628), Nísia Floresta (MHNUFAL30), Rio do Fogo (UFRNCH3166), Tibau do Sul (MHNUFAL53), Touros (UFRNCH6059).

***Coleodactylus natalensis* - Rio Grande do Norte:** Extremoz (UFRNCH3990), Macaíba (UFRNCH2164), Natal (CHUFPB3296), Nísia Floresta (UFRNCH2340), Parnamirim (UFRNCH1120), Tibau do Sul (UFRNCH2419).

***Copeoglossum nigropunctata* - Alagoas:** Campo Alegre (MHNUFAL6723), Coruripe (MHNUFAL6581), Flexeiras (MHNUFAL1392), Maceió (MHNUFAL1582),

Marechal Deodoro (MHNUFAL13425), Murici (MHNUFAL1579), Paripueira (MHNUFAL13424), Rio Largo (MHNUFAL443); **Paraíba:** João Pessoa (CHUFPB3926), Mamanguape (CHUFPB12586), Rio Tinto (CHUFPB11772), Sapé (CHUFPB3928); **Pernambuco:** Bonito (CHUFPB5932), Lagoa dos Gatos (URCA5066), Moreno (CHPUFRPE941), São José da Coroa Grande (MHNUFAL17902).

***Cercosaura olivacea* - Alagoas:** Maceió (MHNUFAL15488), Passo de Camaragibe (MHNUFAL12248); **Paraíba:** Alhandra (CHUFPB9358), João Pessoa (CHUFPB3668), Rio Tinto (CHUFPB11017); **Pernambuco:** **Rio Grande do Norte:** Baía Formosa (MHNUFAL13218), Extremoz (UFRNCH3984).

***Dipoglossus fasciatus* - Alagoas:** Murici (MHNUFAL1643).

***Dipoglossus lessonae* - Alagoas:** Flexeiras (MHNUFAL1403), Palmeira dos Índios (MHNUFAL10599), Quebrangulo (MHNUFAL15477); **Rio Grande do Norte:** Natal (UFRNCH3840), Parnamirim (UFRNCH6272), Rio do Fogo (UFRNCH5169), São José do Mipibu (UFRNCH5987).

***Dryadosaura nordestina* - Alagoas:** Barra de São Miguel (MHNUFAL13800), Coruripe (MHNUFAL4839), Ibateguara (MHNUFAL4749), Junqueiro (CHPUFRPE906), Maceió (MHNUFAL10806), Marechal Deodoro (MHNUFAL13403), Messias (MHNUFAL1543), Murici (MHNUFAL1540), Passo de Camaragibe (URCA443), Piacabuçu (MHNUFAL293), Quebrangulo (URCA4834), Rio Largo (MHNUFAL1534); **Paraíba:** Caaporã (CHUFPB15688), Cabedelo (CHUFPB3574), João Pessoa (CHUFPB3588), Mamanguape (CHUFPB12585), Rio Tinto (CHUFPB22891); **Pernambuco:** Araçoiaba (CHUFPE561), Cabo de Santo Agostinho (MHNUFAL10659), Escada (CHUFPB5924), Ipojuca (CHUFPB187), Jaboatão dos Guararapes (CHPUFRPE453), Lagoa dos Gatos (URCA5135), Recife (URCA178), Tamandaré (CHPUFRPE 5641), Vicência (CHUFPE963); **Rio Grande do Norte:** Natal (UFRNCH1236),

Parnamirim (UFRNCH1607), Tibau do Sul (UFRNCH2465).

***Dactyloa punctata* - Alagoas:** Campo Alegre (MHNUFAL4713), Chã Preta (MHNUFAL492), Coruripe (MHNUFAL6240), Flexeiras (MHNUFAL500), Maceió (MHNUFAL15480), Messias (MHNUFAL501), Murici (MHNUFAL1628), Quebrangulo (URCA4130), Rio Largo (MHNUFAL16241), São Luiz do Quitunde (MHNUFAL509); **Paraíba:** João Pessoa (CHUFPB8510), Mamanguape (CHUFPB3678), Rio Tinto (CHUFPB8393); **Pernambuco:** Abreu e Lima (CHUFPE556), Lagoa dos Gatos (URCA545), Recife (UFC7737), São José da Coroa Grande (MHNUFAL17859).

***Enyalius bibronii* - Alagoas:** Penedo (MHNUFAL433), Teotônio Vilela (MHNUFAL14359); **Paraíba:** Mataraca (CHUFPB2639), Sapé (CHUFPB2602); **Rio Grande do Norte:** Baía Formosa (MHNUFAL13205), Natal (MHNUFAL47), Nísia Floresta (UFRNCH6485).

***Enyalius sp.* - Alagoas:** Campo Alegre (MHNUFAL6716), Coruripe (MHNUFAL6148), Flexeiras (MHNUFAL1391), Maceió (MHNUFAL16418), Murici (MHNUFAL11095), Quebrangulo (MHNUFAL2286), Rio Largo (MHNUFAL15428); **Paraíba:** Mamanguape (CHUFPB2640), Mataraca (CHUFPB12630); **Pernambuco:** São Vicente Ferrer (UFC7738), Timbaúba (CHUFPB6047), Vicência (CHUFPE733); **Rio Grande do Norte:** Natal (UFRNCH1032), Tibau do Sul (UFRNCH2749).

***Gymnodactylus darwinii* - Alagoas:** Anadia (MHNUFAL432), Barra de São Miguel (MHNUFAL14613), Campo Alegre (MHNUFAL7339), Coruripe (MHNUFAL6616), Flexeiras (MHNUFAL1393), Jequiá da Praia (MHNUFAL13343), Maceió (MHNUFAL5666), Marechal Deodoro (MHNUFAL13816), Passo de Camaragibe (URCA1321), Quebrangulo (UFC7735), Rio Largo (MHNUFAL1373); **Paraíba:** Caaporã (CHUFPB15667), Cabedelo (CHUFPB3470), Cruz do Espírito Santo (CHUFPB7297), João Pessoa (CHUFPB3466); **Pernambuco:** Bezerros (CHUFPB3457), Cabo de

Santo Agostinho (CHUFPE15), Lagoa dos Gatos (URCA4180), Moreno (CHPUFRPE501), São José da Coroa Grande (MHNUFAL18016), São Lourenço da Mata (CHPUFRPE457), Tamandaré (CHPUFRPE658), Timbaúba (CHUFPB6046); **Rio Grande do Norte:** Baía Formosa (MHNUFAL46), Natal (MHNUFAL54), Tibau do Sul (UFRNCH2322).

***Gymnodactylus geckoides* - Alagoas:** Barra de São Miguel (MHNUFAL13804), Marechal Deodoro (MHNUFAL15487); **Paraíba:** João Pessoa (CHUFPB3366), Mamanguape (CHUFPB3367); **Rio Grande do Norte:** Canguaretama (CHUFPB12576), Extremoz (UFRNCH6578), Macaíba (UFRNCH2203), Natal (UFRNCH1133), Nísia Floresta (UFRNCH15150), Parnamirim (UFRNCH1117), Tibau do Sul (UFRNCH1535), Touros (UFRNCH6081).

***Hemidactylus agrius* - Rio Grande do Norte:** Macaíba (UFRNCH2735), Natal (UFRNCH1866), Touros (UFRNCH7044).

***Hemidactylus brasiliensis* - Rio Grande do Norte:** Macaíba (UFRNCH2635), Natal (UFRNCH3780), Nísia Floresta (UFRNCH1518), Touros (UFRNCH6080).

***Hemidactylus mabouia* - Alagoas:** Atalaia (MHNUFAL4560), Barra de São Miguel (MHNUFAL13809), Boca da Mata (MHNUFAL10119), Coruripe (MHNUFAL4840), Flexeiras (MHNUFAL1562), Jequiá da Praia (MHNUFAL13342), Maceió (MHNUFAL16148), Marechal Deodoro (MHNUFAL13380), Penedo (MHNUFAL5868), Quebrangulo (URCA4100), Rio Largo (MHNUFAL1366), Teotônio Vilela (MHNUFAL12203), Viçosa (MHNUFAL12213); **Paraíba:** Caaporã (CHUFPB15782), Cabedelo (CHUFPB880), João Pessoa (CHUFPB888), Mamanguape (CHUFPB882), Rio Tinto (CHUFPB27209); **Pernambuco:** Abreu e Lima (CHUFPE574), Bonito (CHUFPB216), Cabo de Santo Agostinho (CHUFPE959), Camaragibe (CHUFPE958), Itamaraca (CHUFPB884), Moreno (CHPUFRPE489), Paudalho (CHUFPE569), São José da Coroa Grande (MHNUFAL17932), São Lourenço da Mata (CHPUFRPE451); **Rio Grande do**

Norte: Baía Formosa (MHNUFAL13202), Extremoz (UFRNCH3862), Natal (UFRNCH7031), Parnamirim (UFRNCH1191), Tibau do Sul (UFRNCH1759).

Iguana iguana - Alagoas: Barra de Santo Antônio (MHNUFAL13428), Campo Alegre (MHNUFAL6712), Coruripe (MHNUFAL6582), Maceió (MHNUFAL11626), Marechal Deodoro (MHNUFAL13421), Penedo (MHNUFAL5977), União dos Palmares (MHNUFAL16135), Viçosa (MHNUFAL13787); **Paraíba:** Bayeux (CHUFPB2706), Caaporã (CHUFPB15739), Conde (CHUFPB8871), Itabaiana (CHUFPB13208), João Pessoa (CHUFPB8559), Mamanguape (CHUFPB16150), Rio Tinto (CHUFPB27206); **Pernambuco:** Cabo de Santo Agostinho (CHPUFRPE444), Paudalho (CHUFPE592); **Rio Grande do Norte:** Baía Formosa (MHNUFAL13235), Extremoz (UFRNCH5829), Natal (UFRNCH1345), Parnamirim (UFRNCH1761), São Gonçalo do Amarante (UFRNCH6454), Touros (UFRNCH5805).

Kentropyx calcarata - Alagoas: Campo Alegre (MHNUFAL6710), Coruripe (MHNUFAL6167), Flexeiras (MHNUFAL1563), Maceió (MHNUFAL6088), Marechal Deodoro (MHNUFAL14307), Murici (MHNUFAL10921), Rio Largo (MHNUFAL16377); **Paraíba:** Caaporã (CHUFPB15844), João Pessoa (CHUFPB11775), Mamanguape (CHUFPB2555), Rio Tinto (CHUFPB27210), Santa Rita (CHUFPB15978), Sapé (CHUFPB2571); **Pernambuco:** Abreu e Lima (CHUFPE564), Cabo de Santo Agostinho (CHUFPE793), Ipojuca (CHUFPB208), Moreno (CHPUFRPE439), Paudalho (CHUFPE563), Recife (CHPUFRPE508), São José da Coroa Grande (MHNUFAL18095), São Lourenço da Mata (CHPUFRPE472), Tamandaré (CHPUFRPE639); **Rio Grande do Norte:** Parnamirim (UFRNCH1316), Tibau do Sul (UFRNCH2320).

Leposoma baturitensis - Alagoas: Quebrangulo (URCA4111).

Lygodactylus klugei - Rio Grande do Norte: Macaíba (UFRNCH2816).

Leposternum polystegum - Alagoas: Penedo (MHNUFAL1387), Piacabuçu (MHNUFAL14328); **Paraíba:** João Pessoa (CHUFPB5434), Rio Tinto (CHUFPB27173), Sapé (CHUFPB5435); **Pernambuco:** Cabo de Santo Agostinho (CHPUFRPE 570); **Rio Grande do Norte:** Macaíba (UFRNCH3891), Nísia Floresta (UFRNCH5641).

Micrablepharus maximiliani - Alagoas: Barra de Santo Antônio (MHNUFAL12097), Coruripe (MHNUFAL6293), Maceió (MHNUFAL 2283), Marechal Deodoro (MHNUFAL15582), Passo de Camaragibe (URCA445), Piaçabuçu (MHNUFAL301); **Paraíba:** João Pessoa (CHUFPB422), Mamanguape (CHUFPB419), Mataraca (CHUFPB12632), Rio Tinto (CHUFPB11016); **Pernambuco:** Ipojuca (CHUFPE475), **Rio Grande do Norte:** Extremoz (UFRNCH6462), Macaíba (UFRNCH2205), Natal (UFRNCH7042), Parnamirim (UFRNCH1340), Tibau do Sul (UFRNCH2317).

Norops fuscoauratus - Alagoas: Alegre (MHNUFAL7342), Coruripe (MHNUFAL6599), Flexeiras (MHNUFAL495), Maceió (MHNUFAL516), Marechal Deodoro (Campo MHNUFAL13817), Murici (MHNUFAL11581), Quebrangulo (MHNUFAL2290), Rio Largo (MHNUFAL16252); **Paraíba:** Caaporã (CHUFPB15747), Cabedelo (CHUFPB3895), João Pessoa (CHUFPB3910); **Pernambuco:** Abreu e Lima (CHUFPE176), Araçoiaba (CHUFPE187), Escada (CHUFPB5926), Lagoa dos Gatos (URCA546), Paudalho (CHUFPE180), São José da Coroa Grande (MHNUFAL18105), São Vicente Ferrer (UFC7736), Timbaúba (CHUFPB6049); **Rio Grande do Norte:** Baía Formosa (UFRNCH7038).

Norops ortonii - Alagoas: Flexeiras (MHNUFAL1617), Maceió (MHNUFAL5202), Marechal Deodoro (MHNUFAL13419), Murici (MHNUFAL12204), Piacabuçu (MHNUFAL307), Rio Largo (MHNUFAL490); **Paraíba:** Cabedelo (CHUFPB3885), João Pessoa (CHUFPB3890), Rio Tinto (CHUFPB27155), Sapé (CHUFPB3892); **Pernambuco:** Araçoiaba (CHUFPE566), Paudalho

(CHUFPE568); **Rio Grande do Norte:** Baía Formosa (MHNUFAL62), Tibau do Sul (UFRNCH2661).

Ophiodes striatus - **Alagoas:** Atalaia (MHNUFAL2456), Cajueiro (MHNUFAL4184), Murici (MHNUFAL12271), União dos Palmares (MHNUFAL2210), Viçosa (MHNUFAL342); **Pernambuco:** Bonito (CHUFPB9354).

Polychrus acutirostris - **Alagoas:** Limoeiro de Anadia (MHNUFAL12264), Maceió (MHNUFAL339), Marechal Deodoro (MHNUFAL13712), Murici (MHNUFAL1592); **Paraíba:** João Pessoa (CHUFPB2597), Mamanguape (CHUFPB2595), Mataraca (CHUFPB12634), Rio Tinto (URCA2318); **Pernambuco:** Amaraji (CHUFPE2), Parnamirim (UFRNCH1861), Timbaúba (CHUFPE945); **Rio Grande do Norte:** Extremoz (UFRNCH6567), Natal (UFRNCH2162), Rio do Fogo (UFRNCH5166), Tibau do Sul (UFRNCH2306).

Polychrus marmoratus - **Alagoas:** Coruripe (MHNUFAL14358), Maceió (MHNUFAL3542), Murici (MHNUFAL12216), Quebrangulo (URCA9516); **Paraíba:** João Pessoa (CHUFPB2586), Mamanguape (CHUFPB2590); **Pernambuco:** Lagoa dos Gatos (URCA4137), Paudalho (CHUFPE554), Timbaúba (CHUFPE937).

Psychosaura agmosticha - **Paraíba:** Rio Tinto (CHUFPB26795).

Psychosaura macrorhyncha - **Alagoas:** Barra de São Miguel (MHNUFAL13791), Campo Alegre (MHNUFAL6724), Maceió (MHNUFAL1580), Marechal Deodoro (MHNUFAL13490), Murici (MHNUFAL1588), Penedo (MHNUFAL5818), Piacabuçu (MHNUFAL14318), Quebrangulo (URCA4804), Rio Largo (MHNUFAL335); **Paraíba:** Cabedelo (CHUFPB3968), Mamanguape (CHUFPB8269), Rio Tinto (CHUFPB11000); **Pernambuco:** Cabo de Santo Agostinho (URCA3612); **Rio Grande do Norte:** Baía Formosa (UFRNCH4738), Macaíba (UFRNCH1723), Natal (CHUFPB3969), Nísia Floresta (MHNUFAL27), Tibau do Sul (UFRNCH2746).

Phyllopezus lutzae - **Alagoas:** Flexeiras (MHNUFAL1398), Maceió (MHNUFAL6357), Marechal Deodoro (MHNUFAL13402), Murici (MHNUFAL10923), Quebrangulo (MHNUFAL2295), União dos Palmares (MHNUFAL2836); **Paraíba:** Pedras de Fogo (CHUFPB19517); **Pernambuco:** Paudalho (CHUFPE560), São José da Coroa Grande (MHNUFAL17867).

Phyllopezus pollicaris - **Alagoas:** Quebrangulo (URCA4817).

Phyllopezus selmae - **Alagoas:** Boca da Mata (MHNUFAL13481), Coruripe (MHNUFAL12128), Limoeiro de Anadia (MHNUFAL12396), Quebrangulo (MHNUFAL12401).

Salvator merianae - **Alagoas:** Coruripe (MHNUFAL16260), Maceió (MHNUFAL10610), Murici (MHNUFAL16323), Palmeira dos Índios (MHNUFAL12070), Penedo (MHNUFAL5819), Rio Largo (MHNUFAL15440), São Luiz do Quitunde (MHNUFAL15510); **Paraíba:** João Pessoa (CHUFPB8873), Mamanguape (CHUFPB16155); **Pernambuco:** Bonito (CHUFPB204), Cabo de Santo Agostinho (CHPUFRPE435), São Lourenço da Mata (CHPUFRPE436); **Rio Grande do Norte:** Natal (UFRNCH1379), Nísia Floresta (UFRNCH1510), São Gonçalo do Amarante (UFRNCH5767), Tibau do Sul (UFRNCH2463).

Stenolepis ridleyi - **Alagoas:** Murici (MHNUFAL11686), Quebrangulo (URCA4099); **Pernambuco:** Bezerros (CHUFPB3640).

Strobilurus torquatus - **Alagoas:** Campo Alegre (MHNUFAL6722), Coruripe (MHNUFAL6226), Flexeiras (MHNUFAL1918), Maceió (MHNUFAL5410), Murici (MHNUFAL10834), Quebrangulo (URCA4827), Rio Largo (MHNUFAL16242); **Paraíba:** Alhandra (CHUFPB15854), João Pessoa (CHUFPB10761), Santa Rita (CHUFPB15787); **Pernambuco:** Cabo de Santo Agostinho (URCA3613); **Rio Grande do Norte:** Baía Formosa (UFRNCH6964).

Tropidurus cocorobensis - **Pernambuco:** Bezerros (CHUFPB17266).

***Tropidurus hispidus* - Alagoas:** Atalaia (MHNUFAL4829), Barra de São Miguel (MHNUFAL13790), Campo Alegre (MHNUFAL6718), Jequiá da Praia (MHNUFAL13348), Japaratinga (CHUFPB8652), Maceió (MHNUFAL4695), Marechal Deodoro (MHNUFAL13358), Murici (MHNUFAL10945), Paripueira (MHNUFAL16137), Piacabuçu (MHNUFAL66), Quebrangulo (MHNUFAL2291); **Paraíba:** Caaporã (CHUFPB15683), Cabedelo (CHUFPB2797), João Pessoa (CHUFPB2789), Mamanguape (CHUFPB12223), Pedras de Fogo (CHUFPB17450), Rio Tinto (CHUFPB27183); **Pernambuco:** Bezerros (CHUFPB2793), Cabo de Santo Agostinho (CHUFPE792), Lagoa dos Gatos (URCA6215), Moreno (CHPUFRPE494), Paudalho (CHUFPE543), São José da Coroa Grande (MHNUFAL18029), São Lourenço da Mata (CHPUFRPE440), Timbaúba (CHUFPB6050), Tamandaré (CHPUFRPE640); **Rio Grande do Norte:** Baía Formosa (MHNUFAL13230), Canguaretama (CHUFPB129), Extremoz (UFRNCH6486), Macaíba (UFRNCH3698), Maxaranguape (UFRNCH4915), Natal (UFRNCH1006), Nísia Floresta (UFRNCH1513), Parnamirim (UFRNCH3804), Tibau do Sul (UFRNCH1767), Touros (UFRNCH5764).

***Tropidurus semitaeniatus* - Alagoas:** Boca da Mata (MHNUFAL10117), Flexeiras (MHNUFAL1564), Murici (MHNUFAL10944), Quebrangulo (MHNUFAL2296); **Pernambuco:** Bezerros (CHUFPB2743), Lagoa dos Gatos (URCA5070), São Lourenço da Mata (CHPUFRPE1771); **Rio Grande do Norte:** Macaíba (UFRNCH2734).

***Vanzosaura mustiscutata* - Alagoas:** Piacabuçu (MHNUFAL297); **Rio Grande do Norte:** Macaíba (UFRNCH2664).

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Author contributions

Marcos Jorge Matias Dubeux designed the study, participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript, designed and constructed the figures, and contributed to funding acquisition. Ubiratã Ferreira Souza participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Ricardo Lourenço-de-Moraes participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Gentil Alves Pereira-Filho participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Raul Fernandes Dantas Sales participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Fagner Ribeiro Delfim participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Frederico Gustavo Rodrigues França participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Marco Antônio de Freitas participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Robson Waldemar Ávila participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Marília Bruzzi Lion participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Eliza Maria Xavier Freire participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Selma Torquato participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Geraldo Jorge Barbosa de Moura participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Adrian Antonio Garda participated in the sampling and analysis of samples, data acquisition and curation, methodology, results analysis, wrote the original draft and final version of the manuscript. Daniel Oliveira Mesquita participated in the sampling and analysis of samples, data acquisition and

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