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Review Article

A summary of reptile and anuran amphibian species from Brazilian sandy coastal plains: 31 years of sampling efforts of the "Laboratório de Ecologia de Vertebrados, Universidade do Estado do Rio de Janeiro"

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Abstract

Although currently there is already a set of studies regarding ecological aspects of some particular reptile and amphibian species living in Brazilian sandy coastal plains (including the so-called "restinga" and "campo nativo" habitats), there is comparatively few information on the species composition usually associated to these environments. During 31 years (1988-2019) of herpetological studies carried out in sandy coastal plains environments by our research team of the Laboratory of Vertebrate Ecology (Department of Ecology, Universidade do Estado do Rio de Janeiro, in Rio de Janeiro Brazil) we have surveyed reptile and amphibian communities and performed different studies with similar methods in 70 sites from 10 different states along the Brazilian coast. Our surveys resulted in records of 87 species of reptile (five turtles, two crocodylians, six amphisbaenians, 36 lizards and 39 snakes) from 24 families, and 77 species of anuran amphibians from nine families. We have studied multiple natural history topics for anurans and reptiles which resulted in the publication of some specific ecological studies, especially regarding some species, encompassing population and community ecology, foraging and feeding habits, species activity, thermoregulation, reproduction, use of microhabitats, and parasitism by ecto and endoparasites. Our results along these three decades have also contributed for the description of four new lizard species (*Ameivula nativo, Glaucomastix littoralis, G. abaetensis* and *G. itabaianensis*). Our studies constitute an important contribution to the knowledge of the ecology of anuran amphibians and reptiles in these ecosystems, as well as to the conservation of sandy coastal plains environment. The checklist presented in this study, based on our records of sandy coastal plains herpetofauna, provides for many localities along the Brazilian coast, the needed knowledge on species occurrence, including the presence of endemic and/or endangered species, which can be of value for many conservation actions.

Keywords: campo nativo, endemism, herpetofauna, restinga, threatened species.

Um resumo das espécies de répteis e anfíbios anuros das planícies costeiras arenosas brasileiras: 31 anos de esforços de amostragem do "Laboratório de Ecologia de Vertebrados da Universidade do Estado do Rio de Janeiro"

Resumo

Embora atualmente exista um conjunto de estudos sobre aspectos ecológicos de algumas espécies de répteis e de anfíbios que ocorrem nas planícies costeiras arenosas brasileiras (incluindo os chamados habitats de "restinga" e de "campo nativo"), há relativamente poucas informações sobre a composição de espécies geralmente associada a esses ambientes. Durante 31 anos (1988-2019) de estudos herpetológicos realizados em restingas por nossa equipe de pesquisa do Laboratório de Ecologia de Vertebrados (Departamento de Ecologia, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil) nós estudamos comunidades de répteis e de anfíbios e realizamos diferentes estudos com métodos semelhantes em 70 localidades de dez diferentes Estados ao longo da costa brasileira. Nossas pesquisas resultaram em registros de 87 espécies de répteis (cinco tartarugas, dois crocodilianos, seis anfisbênios, 36 lagartos e 39 serpentes) de 24 famílias, e 77 espécies de anfíbios anuros de nove famílias. Estudamos vários tópicos de história natural sobre anuros e répteis, que resultaram na publicação de alguns estudos ecológicos específicos, especialmente em relação a algumas espécies, abrangendo ecologia populacional e de comunidades, forrageamento e dieta, horário de atividade de espécies, termorregulação, reprodução, uso do microhabitat e parasitismo por ecto e endoparasitas. Nossos resultados ao longo dessas três décadas também contribuíram para a descrição de quatro novas espécies de lagartos (*Ameivula nativo*, *Glaucomastix littoralis*, *G. abaetensis* e *G. itabaianensis*). Nossos estudos constituem uma importante contribuição para o conhecimento da ecologia de répteis e de anfíbios anuros nesses ecossistemas, bem como para a conservação dos ecossistemas de restinga. A lista de espécies apresentada neste estudo, com base em nossos registros de herpetofauna das planícies costeiras arenosas, fornece para muitas localidades ao longo da costa brasileira o conhecimento necessário sobre a ocorrência de espécies, incluindo a presença de espécies endêmicas e/ou ameaçadas de extinção, que podem ser úteis para muitas ações de conservação.

Palavras-chave: campo nativo, endemismo, herpetofauna, restinga, espécies ameaçadas.

1. Introduction

The sandy coastal plains in Brazil are mostly open habitats dominated by herbaceous and shrubby vegetation, characterized by high rates of solar radiation and temperatures (Rocha, 1988; Rocha et al., 2000a), with limited availability of free water or freshwater (mostly accumulated inside tank bromeliads, or in permanent or temporary ponds or in lagoons; Araújo and Henriques, 1984; Enrich-Prast et al., 2004; Van Sluys et al., 2004). This type of environment favors the occurrence of reptiles due to their remarkable morpho-physiological capacity in minimizing water loss and ability to reabsorb water during excretion, as well as the capacity of some species to tolerate high solar radiation rates. Thus, sandy coastal plains are suitable environments for reptiles, as suggested by the relatively high presence of species endemism, particularly for lizards (e.g. Rocha et al., 1997; 2000b; Dias et al., 2002; Winck et al., 2014; Martins et al., 2017). On the other hand, the different sources of free water provide favorable conditions for many amphibian species, especially those having an aquatic larval stage (Carvalho-e-Silva et al., 2000; Van Sluys et al., 2004; Bastazini et al., 2007; Oliveira et al., 2017).

A few studies have presented preliminary checklists of reptiles (Araújo, 1991; Rocha and Bergallo, 1997; Teixeira, 2001; Rocha et al., 2004b; 2005; 2014; Carvalho et al., 2007; Oliveira et al., 2019) and amphibians (e.g. Carvalho-e-Silva et al., 2000; Rocha et al., 2004a; 2005; 2008b; Van Sluys et al., 2004; Bastazini et al., 2007; Silva et al., 2008; Wachlevski and Rocha, 2010; Telles et al., 2012; Oliveira et al., 2017, Oliveira et al., 2020) from several areas of Brazilian restinga. Most of the information on those studies was based on primary data, although some also included secondary data obtained from the literature (e.g. Carvalho-e-Silva et al., 2000; Oliveira and Rocha, 2015). However, considering the large extension of these environments along the Brazilian coast (more than 5,000 km of the 7,491 km of coast), the currently available published information can be considered introductory, suggesting that we still lack a comprehensive view on the reptile and amphibian species inhabiting these ecosystems.

The knowledge on the species composition of a particular locality or on the occurrence of some species in certain habitats is of value for conservation issues because they can provide the first step to allow conservation efforts on species, communities or environments. However, in many cases when conservation efforts are needed, the lack of local checklists or species occurrence records for a locality may constitute a limiting factor. Along the 31 years (1988-2019) of herpetological studies carried out by our research team of the Vertebrate Ecology Laboratory (Department of Ecology, Universidade do Estado do Rio de Janeiro, in Rio de Janeiro, Brazil), we have surveyed several reptile and amphibian communities and performed ecological and zoological studies in sandy coastal plains areas along the Brazilian coast. Here we present a checklist of amphibian and reptile species recorded during these studies through herpetofaunal surveys/inventories in Brazilian sandy coastal plains.

2. Material and Methods

2.1. Study sites

Throughout more than three decades of studies, we have sampled 70 sites along the Brazilian coast, in ten different states (Table 1). Those sites include "restinga" and "campo nativo" habitats, which are contained within the Atlantic Forest domain (Suguio and Tessler, 1984), one of the biodiversity "hotspots" on the planet (Mittermeier et al., 2011). Restingas are Quaternary sand dune habitats with deposits of marine origin and characterized by sparse, mostly xerophilous shrubby and herbaceous vegetation

Table 1. Checklist of localities on Brazilian sandy coastal plains sampled for reptiles and amphibians by the research team of the Vertebrate Ecology Laboratory (Department of Ecology, Universidade do Estado do Rio de Janeiro).

Localities	County	States	Latitude	Longitude
Parque Nacional dos Lençóis Maranhenses	Barreirinhas, Santo Amaro and Primeira Cruz	Maranhão	-2.5167	-43.0167
Genipabu	Extremoz	Rio Grande do Norte	-5.7167	-35.2167
Piaçabuçu	Piaçabuçu	Alagoas	-10.3500	-36.3000
Pacatuba	Pacatuba	Sergipe	-10.5637	-36.6211
Pirambu	Pirambu	Sergipe	-10.7264	-36.8547
Barra dos Coqueiros	Barra dos Coqueiros	Sergipe	-10.9000	-37.0333
Praia do Porto	Barra dos Coqueiros	Sergipe	-10.9333	-37.0167
Itaporanga D'Ajuda	Itaporanga D'Ajuda	Sergipe	-11.0786	-37.1378
Costa Azul	Jandaíra	Bahia	-11.6667	-37.4833
Baixio	Esplanada	Bahia	-12.1167	-37.7000
Guarajuba	Camaçari	Bahia	-12.6333	-38.0667
Abaeté	Salvador	Bahia	-12.9167	-38.3333
Salvador	Salvador	Bahia	-12.9667	-38.5000
Guaibim	Valença	Bahia	-13.2833	-38.9500
Boipeba	Cairú	Bahia	-13.6214	-38.354
Cassange	Maraú	Bahia	-13.6000	-38.9000
Ilha de Camamu (Ilha Grande)	Camamu	Bahia	-13.9167	-39.0000
Taipé	Trancoso	Bahia	-16.5167	-39.0833
Trancoso	Trancoso	Bahia	-16.6333	-39.1000
Prado	Prado	Bahia	-17.2810	-39.2216
Cumuruxatiba	Prado	Bahia	-17.6167	-39.5500
Caravelas	Caravelas	Bahia	-17.7098	-39.1713
Nova Viçosa	Nova Viçosa	Bahia	-17.9667	-39.4667
Parque Estadual de Itaúnas	Conceição da Barra	Espírito Santo	-18.4108	-39.6988
Praia de Conceição da Barra	Conceição da Barra	Espírito Santo	-18.5021	-39.7260
Ilha de Guriri	São Mateus	Espírito Santo	-18.7069	-39.7469
Reserva Natural Vale	Linhares	Espírito Santo	-19.0813	-39.8859
Pontal do Ipiranga	Linhares	Espírito Santo	-19.1667	-39.7500
Reserva Biológica de Comboios	Linhares and Aracruz	Espírito Santo	-19.6667	-39.8871
Barra do Sahy	Aracruz	Espírito Santo	-19.8742	-40.0816
Ilha de Vitória	Vitória	Espírito Santo	-20.3167	-40.3333
Ponta da Fruta	Vila Velha	Espírito Santo	-20.4997	-40.3637
Setiba	Guarapari	Espírito Santo	-20.6027	-40.4178
Marataízes	Marataízes	Espírito Santo	-21.0833	-40.8500
Praia das Neves	Presidente Kennedy	Espírito Santo	-21.2443	-40.9759
Grussaí	São João da Barra	Rio de Janeiro	-21.7358	-41.0311
Jurubatiba	Macaé	Rio de Janeiro	-22.2833	-41.6833
Itapebussus	Rio das Ostras	Rio de Janeiro	-22.4833	-41.8833
Peró	Cabo Frio	Rio de Janeiro	-22.8500	-41.9667
Praia do Forte	Cabo Frio	Rio de Janeiro	-22.8833	-42.0167
Praia das Conchas	Cabo Frio	Rio de Janeiro	-22.8833	-41.9667
Jacarepiá	Saquarema	Rio de Janeiro	-22.9167	-42.4500
Barra Nova	Saquarema	Rio de Janeiro	-22.9167	-42.5500

Table 1. Continued...

Localities	County	States	Latitude	Longitude
Jaconé	Maricá	Rio de Janeiro	-22.9333	-42.6667
Massambaba	Araruama	Rio de Janeiro	-22.9333	-42.2000
Pernambuca	Arraial do Cabo	Rio de Janeiro	-22.9333	-42.3167
Figueiras	Cabo Frio	Rio de Janeiro	-22.9333	-42.1667
Praia do Foguete	Cabo Frio	Rio de Janeiro	-22.9333	-42.0333
Araruama	Araruama	Rio de Janeiro	-22.9354	-42.3239
Saquarema	Saquarema	Rio de Janeiro	-22.9355	-42.4843
Barra de Maricá	Maricá	Rio de Janeiro	-22.9500	-43.8333
Ponta Negra	Maricá	Rio de Janeiro	-22.9500	-42.7167
Praia Grande	Mangaratiba	Rio de Janeiro	-22.9500	-42.0333
Itaipuaçu	Maricá	Rio de Janeiro	-22.9667	-42.9833
Sepetiba	Rio de Janeiro	Rio de Janeiro	-22.9700	-43.7127
Barra da Tijuca	Rio de Janeiro	Rio de Janeiro	-23.0000	-43.4000
Recreio	Rio de Janeiro	Rio de Janeiro	-23.0000	-43.3833
Praia da Macumba	Rio de Janeiro	Rio de Janeiro	-23.0167	-43.4833
Ilha de Pombeba	Rio de Janeiro	Rio de Janeiro	-23.0304	-43.8991
Prainha	Rio de Janeiro	Rio de Janeiro	-23.0407	-43.5053
Grumari	Rio de Janeiro	Rio de Janeiro	-23.0474	-43.5284
Ilha da Marambaia	Mangaratiba	Rio de Janeiro	-23.0729	-43.9268
Lopes Mendes (Ilha Grande)	Angra dos Reis	Rio de Janeiro	-23.1667	-44.1372
Praia do Sul (Ilha Grande)	Angra dos Reis	Rio de Janeiro	-23.1667	-44.2833
Caraguatatuba	Caraguatatuba	São Paulo	-23.6208	-45.3577
Restinga de Joaquina	Florianópolis	Santa Catarina	-27.5833	-48.5833
Parque Estadual da Serra do Tabuleiro	Florianópolis	Santa Catarina	-27.9176	-48.6059
Estação Ecologica do Taim	Rio Grande	Rio Grande do Sul	-32.5020	-52.3832

(Suguio and Tessler, 1984). They vary both floristically (Araújo and Henriques, 1984) and structurally along the Brazilian coast (Rocha and Bergallo, 1997). Campo nativo habitats are structurally similar to restingas, but originated during the Tertiary period, occurring as open-habitat enclaves within lowland rainforests in southern Bahia and northern Espírito Santo states, and differ from restinga habitats mainly due to the partially fluvial origin of the sandy deposits (Peixoto et al., 2008; Kierulff et al., 2014). The climate of the sandy coastal plains varies according to geographic regions and, in general, has dry and rainy seasons (Nimer, 1979). Mean annual temperature vary little among areas, usually averaging around 23° C and the mean annual rainfall usually ranges from 1000 to 1350 mm (Nimer, 1979).

Our surveys were carried out from the states of Maranhão to Rio Grande do Sul (Figure 1, Table 1), including remnants of natural habitats within legally protected areas (Public Conservation Units and Private Natural Heritage Reserves) and anthropically disturbed areas. Among these study sites, seven were located on coastal islands (Table 1). Our field data came from 19 projects, which included different studies and herpetofaunal surveys (Appendix 1).

We used a similar method in our studies: sampling along transects with time-constrained active search (Campbell and Christman, 1982), performed in different mesohabitats at each studied site. The sampling was carried out by a different number of researchers in different sampling periods. Transects were searched by observers moving along at a slow walking pace looking for reptiles and amphibians. In some surveys, samplings were carried out at different periods of the day. Some of these studies have been supplemented with pitfall traps (Crump and Scott Junior, 1994) installed in different sites and with variable number of buckets. At each site, we collected individuals to serve as voucher specimens and deposited them in Brazilian herpetological collections (Appendix 2). We considered records of all amphibian and reptile species on which studies have been published by our research team in indexed journals. We followed Costa and Bérnils (2018) and Segalla et al. (2019) for reptile and amphibian nomenclature, respectively. We used the global IUCN Red List (IUCN, 2019), the national red list from the Instituto Chico Mendes de Conservação da Biodiversidade/Brazilian Ministry of Environment (ICMBIO, 2018) and also state red lists, when available (Bahia: SEMA, 2017, Rio Grande do Sul: Marques et al. 2002, Espírito Santo: Passamani and Mendes, 2007, Rio de Janeiro: Bergallo et al., 2000, São Paulo: Marques et al., 2009, Santa Catarina: CONSEMA, 2011) to categorize the conservation status of each species. The classification of endemism was defined according to

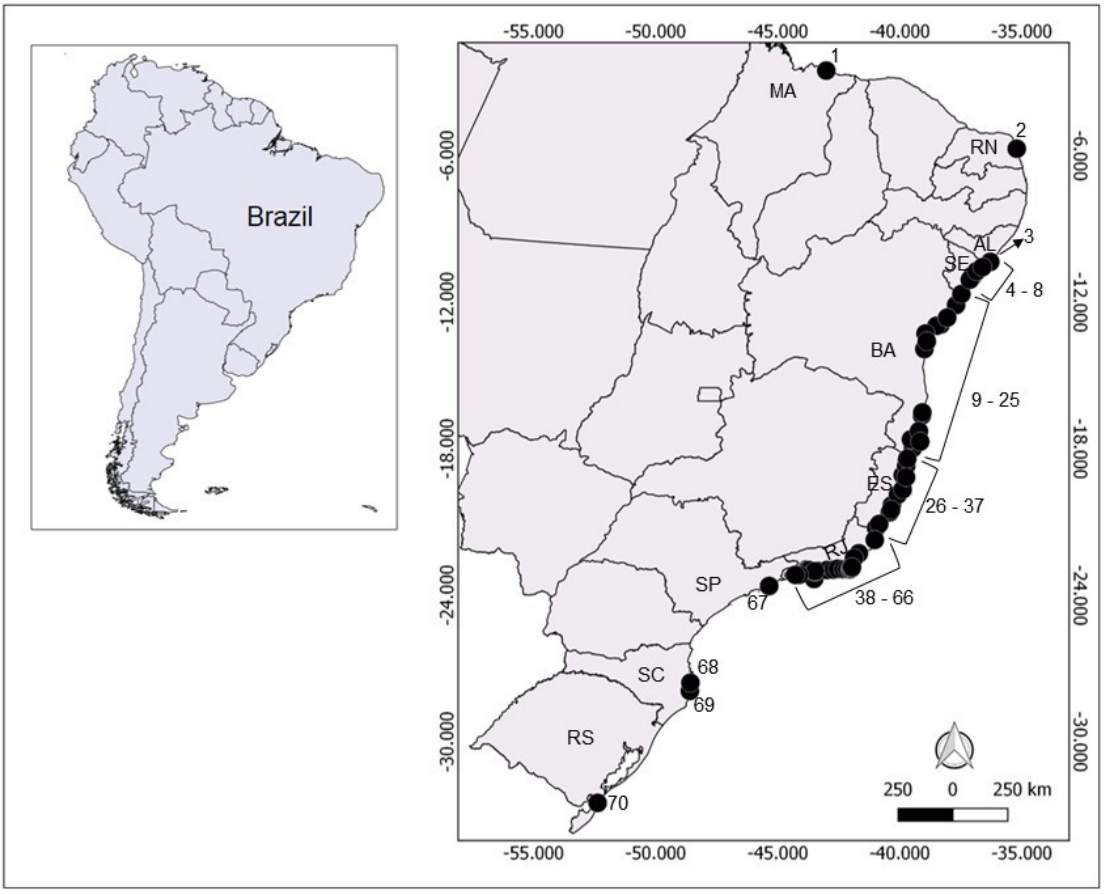

Figure 1. Localities sampled for Reptile and Amphibian records on Brazilian sandy coastal plains. (1) Parque Lençóis Maranhenses – Maranhão State; (2) Genipapu – Rio Grande do Norte state; (3) Piaçabuçu – Alagoas state; (4 – 8, Sergipe State) Pacatuba, Pirambu, Barra dos Coqueiros, Praia do Porto, Itaporanga D'Ajuda; (9 – 25, Bahia state) Costa Azul, Baixio, Guarajuba, Camaçari, Abaeté, Salvador, Guaibim, Boipeba, Cassange, Maraú, Ilha de Camamu (Ilha Grande), Taipé, Trancoso, Prado, Cumuruxatiba, Caravelas, Nova Viçosa; (26 – 37, Espírito Santo state) Parque Estadual de Itaúnas, Praia de Conceição da Barra, Ilha de Guriri, Reserva Natural Vale, Pontal do Ipiranga, Reserva Biológica de Comboios, Barra do Sahy, Ilha de Vitória, Ponta da Fruta, Setiba, Marataízes, Praia das Neves (38 – 66, Rio de Janeiro state) Grussaí, Jurubatiba, Itapebussus, Peró, Praia do Forte, Praia das Conchas, Jacarepiá, Barra Nova, Jaconé, Massambaba, Pernambuca, Figueiras, Praia do Foguete, Araruama, Saquarema, Barra de Maricá, Ponta Negra, Praia Grande, Itaipuaçu, Sepetiba, Barra da Tijuca, Recreio, Praia da Macumba, Ilha de Pombeba, Prainha, Grumari, Ilha da Marambaia, Lopes Mendes (Ilha Grande), Praia do Sul (Ilha Grande); (67, São Paulo state) Caraguatatuba; (68 – 69, Santa Catarina state), Restinga de Joaquina, Parque Estadual da Serra do Tabuleiro; (70, Rio Grande do Sul state) Estação Ecologica do Taim.

Rossa-Feres et al. (2017) for amphibians and Tozetti et al. (2017) for reptiles.

3. Results

Along the 31 years of surveys and studies in sandy coastal plains in the 70 sites studied, we recorded 87 species of reptiles (five Testudines, two Crocodylians, six amphisbaenians, 36 lizards, 39 snakes) from 24 families (Table 2, Figure 2) and 77 species of anuran amphibians from nine families (Table 3, Figure 3). We produced specific ecological studies on several of them, especially regarding population and community ecology, foraging and feeding habits, activity, thermoregulation, reproduction, use of habitats, ecto- and endoparasites associated, and effects of climate changes. Our data gathered from studies along these decades contributed for the discovery and formal description of four lizard species [*Ameivula nativo* (Rocha et al., 1997), *Glaucomastix littoralis* (Rocha et al., 2000b), *G. abaetensis* (Dias et al., 2002), and *G. itabaianensis* (Rosário et al., 2019)]. Seven reptile species and six anuran species recorded during our projects are endemic of sandy coastal plains ecosystems (Tables 2 and 3).

Regarding conservation status, two species of reptiles in our list are categorized in the IUCN Red List as Endangered (EN) [*Chelonia mydas* (Linnaeus, 1758), and *Trachemys adiutrix* Vanzolini, 1995] and three species as Vulnerable (VU) [*Dermochelys coriacea* (Vandelli,

Table 2. Reptile species studied along Brazilian sandy coastal plains, their conservation *status* determined by The IUCN (2019), Instituto Chico Mendes de Conservação da Biodiversidade – ICMBio (2018) and state lists, and endemism.

TAXON	Conservation Status			Endemism
	IUCN (2019)	ICMBio (2018)	State lists	
TESTUDINES				
Cheloniidae				
Chelonia mydas (Linnaeus, 1758)	EN	VU	BA: VU / SP: EN / RJ: VU / ES: VU / SC: VU	-
Dermochelyidae				
Dermochelys coriacea (Vandelli, 1761)	VU	CR	ES: CR	-
Emydidae				
Trachemys dorbignyi (Duméril & Bibron, 1835)	-	NT		-
Trachemys adiutrix Vanzolini, 1995	EN	NT		-
Geoemydidae				
Rhinoclemmys sp. nov.	-	-		-
CROCODYLIA				
Alligatoridae				
Caiman crocodilus (Linnaeus, 1758)	LC	LC		-
Caiman latirostris (Daudin, 1802)			RJ: EN / SP: VU	
Amphisbaenidae				
Amphisbaena alba Linnaeus, 1758	-	LC		-
Amphisbaena ibijara Rodrigues, Andrade & Lima, 2003	-	LC		-
Amphisbaena nigricauda Gans, 1966	-	EN	BA: EN	E
Amphisbaena pretrei Duméril & Bibron, 1839	-	LC		-
Amphisbaena vermicularis Wagler in Spix, 1824	-	LC		-
Leposternon microcephalum Wagler in Spix, 1824	-	LC		-
SQUAMATA (lizards)				
Anguidae				
Ophiodes cf. *striatus* (Spix, 1825)	-	-		-
Polychrotidae				
Polychrus marmoratus (Linnaeus, 1758)	-	-		-
Polychrus acutirostris Spix, 1825	-	-		-
Teiidae				
Ameivula ocellifera (Spix, 1825)	-	-		-
Ameivula nativo (Rocha et al., 1997)	-	EN	BA: EN / ES: VU	E
Ameiva ameiva (Linnaeus, 1758)	-	—		-
Contomastix lacertoides (Duméril & Bibron, 1839)	-	—	SC: EN	-
Glaucomastix abaetensis (Dias et al., 2002)	-	EN		E

E: species endemic to Brazilian sandy coastal plains, CR: Critically Endangered, EN: Endangered, VU: Vulnerable, NT: Near Threatened, DD: Data Deficient, LC: Least Concern. *: non-indigenous species. BA: Bahia state, SP: São Paulo state, RJ: Rio de Janeiro state, ES: Espírito Santo state, RS: Rio Grande do Sul state, SC: Santa Catarina state.

Table 2. Continued...

TAXON	Conservation Status			Endemism
	IUCN (2019)	ICMBio (2018)	State lists	
Glaucomastix littoralis (Rocha, Araújo, Vrcibradic & Costa, 2000)	-	EN		E
Kentropyx calcarata Spix, 1825	-	-		-
Salvator merianae Duméril & Bibron, 1839	-	-		-
Tupinambis teguixin (Linnaeus, 1758)	-	-		-
Mabuyidae				
Aspronema dorsivittatum (Cope, 1862)	-	-	BA: EN	-
Brasiliscincus agilis (Raddi, 1823)	-	-		-
Brasiliscincus caissara (Rebouças-Spieker, 1974)	-	EN	SP: VU	E
Brasiliscincus heathi (Schmidt & Inger, 1951)	-	-		-
Psychosaura macrorhyncha (Hoge, 1947)	-	-		-
Psychosaura agmosticha (Rodrigues, 2000)	-	-		-
Varzea bistriata (Spix, 1825)	-	LC		-
Tropiduridae				
Tropidurus hispidus (Spix, 1825)	-	-		-
Tropidurus hygomi Reinhardt & Luetken, 1861	-	-	BA: VU	E
Tropidurus torquatus (Wied, 1820)	-	-		-
Sphaerodactylidae				
Coleodactylus meridionalis (Boulenger, 1888)	-	-		-
Gonatodes humeralis (Guichenot, 1855)	-	-		-
Gymnophthalmidae				
Colobosaura modesta (Reinhardt & Luetken, 1862)	-	-		-
Dryadosaura nordestina Rodrigues, Freire, Pellegrino & Sites, 2005	LC	-	BA: VU	-
Ecpleopus gaudichaudii Duméril & Bibron, 1839	-	-		-
Leposoma annectans Ruibal, 1952	-	-	BA: VU	-
Micrablepharus maximiliani (Reinhardt & Luetken, 1862)	-	-		-
Gekkonidae				
Hemidactylus mabouia (Moreau de Jonnès, 1818)*	-	-		-
Phyllodactylidae				
Gymnodactylus darwinii (Gray, 1845)	-	-		-
Phyllopezus lutzae (Loveridge, 1941)	-	-		-
Iguanidae				
Iguana iguana (Linnaeus, 1758)	-	-		-
Leiosauridae				
Enyalius bibronii Boulenger, 1885	LC	-		-

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Table 2. Continued...

TAXON	Conservation Status			Endemism
	IUCN (2019)	ICMBio (2018)	State lists	
Liolaemidae			RJ: VU	
Liolaemus lutzae Mertens, 1938	VU	CR		E
Liolaemus occipitalis Boulenger, 1885	VU	VU	RS: VU/ SC: VU	-
SQUAMATA (snakes)				
Boidae				
Boa constrictor constrictor (Linnaeus, 1758)	-	-		-
Eunectes murinus (Linnaeus, 1758)	-	-		-
Dipsadidae				
Cercophis auratus (Schlegel, 1837)	-	-	BA: VU / RS: EN / ES: DD	-
Dipsas neuwiedi (Ihering, 1911)	-	-		-
Erythrolamprus miliaris merremi (Wied, 1821)				
Erythrolamprus poecilogyrus poecilogyrus (Wied, 1824)	-	-		-
Helicops angulatus (Linnaeus, 1758)	-	-		-
Hydrodynastes gigas (Duméril, Bibron & Duméril, 1854)	-	-	RS: VU	-
Leptodeira annulata annulata (Linnaeus, 1758)	-	-		-
Leptophis ahaetulla ahaetulla (Linnaeus, 1758)	-	-		-
Leptophis ahaetulla liocercus (Wied, 1824)	-	-		-
Lygophis meridionalis (Schenkel, 1901)	-	-		-
Oxyrhopus petolarius (Linnaeus, 1758)				
Oxyrhopus rhombifer rhombifer Duméril, Bibron & Duméril, 1854	-	-	BA: EN	-
Oxyrhopus trigeminus Duméril, Bibron & Duméril, 1854	-	-		-
Philodryas nattereri Steindachner, 1870	-	-		-
Philodryas olfersii (Liechtenstein, 1823)	-	-		-
Philodryas patagoniensis (Girard, 1858)	-	-		-
Phimophis guerini (Duméril, Bibron & Duméril, 1854)	-	-		-
Pseudoboa nigra (Duméril, Bibron & Duméril, 1854)	-	-		-
Psomophis joberti (Sauvage, 1884)	-	-		-
Taeniophallus occipitalis (Jan, 1863)	-	-		-
Thamnodynastes hypoconia (Cope, 1860)	-	-		-
Thamnodynastes sp.				
Xenodon merremii (Wagler in Spix, 1824)	-	-		-
Colubridae				
Chironius bicarinatus (Wied, 1820)	-	-		-
Chironius exoletus (Linnaeus, 1758)	-	-		-
Chironius flavolineatus (Jan, 1863)	-	-		-
Drymarchon corais (Boie, 1827)	-	-		-

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Table 2. Continued...

TAXON	Conservation Status			Endemism
	IUCN (2019)	ICMBio (2018)	State lists	
Mastigodryas bifossatus (Raddi, 1820)	-	-		-
Oxybelis aeneus (Wagler in Spix, 1824)	-	-		-
Oxybelis fulgidus (Daudin, 1803)	-	-		-
Spilotes pullatus pullatus (Linnaeus, 1758)	-	-		-
Tantilla melanocephala (Linnaeus, 1758)	-	-		-
Typhlopidae				
Amerotyphlops brongersmianus (Vanzolini, 1976)	-	-		-
Elapidae				
Micrurus corallinus (Merrem, 1820)	-	-		-
Micrurus aff. *ibiboboca* (Merrem, 1820)	-	DD		-
Micrurus lemniscatus carvalhoi Roze, 1967	-	-		-
Viperidae				
Bothrops leucurus Wagler in Spix, 1824	-	-		-

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1761), *Liolaemus lutzae* Mertens, 1938, and *L. occipitalis* Boulenger, 1885]. Regarding the national red list, two reptile species are listed as Critically Endangered (CR), five as Endangered (EN), three as Vulnerable (VU), two as Near Threatened (NT) and one as Deficient Data (DD). Eleven reptile species are listed in the state lists (Table 2). The species of Crocodylia in our list, *Caiman crocodilus* (Linnaeus, 1758) and *Caiman latirostris* (Daudin, 1802), are currently categorized as Least Concern (LC) in the national red list, while in the state lists *C. latirostris*, for example, is evaluated as "Endangered" in Rio de Janeiro state. Regarding Testudines, only *Rhinoclemmys* sp. nov., a new species from a restinga habitat in Linhares municipality, Espírito Santo state (Oliveira et al., 2018), whose formal description is in course (U. Caramaschi, *pers. comm.*) has not had its status of conservation evaluated yet. The other five species of Testudines are classified as Endangered, Vulnerable, Critically Endangered, and Near Threatened (Table 2). The reptile list includes one non-indigenous lizard species, the gecko *Hemidactylus mabouia* (Moreau de Jonnès, 1818). Amphibian species include one classified as Critically Endangered (CR) in the national red list (*Melanophryniscus setiba* Peloso, Faivovich, Grant, Gasparini & Haddad, 2012) and two as Endangered (EN) [*Chiasmocleis lacrimae* Peloso, Sturaro, Forlani, Gaucher, Motta & Wheeler, 2014 and *Xenohyla truncata* (Izecksohn, 1959)]. The latter is listed in the IUCN Red List as Near Threatened (NT). Four anuran species are listed as Data Deficient (DD), and all the others as Least Concern (LC) (Table 3).

4. Discussion

Our studies throughout the 31-year period at the sandy coastal plains of Brazil involved 29% of all reptile species reported to occur in the Atlantic Forest biome (about 300 species - Tozetti et al., 2017). Regarding the anuran fauna, our studies involved 13% of all amphibian species known to occur in the Atlantic Forest (about 600 species - Rossa-Feres et al., 2017).

Our studies contributed significantly to the knowledge of the herpetofauna of the coastal plains (e.g. Rocha et al., 1997; Rocha, 2000a; Rocha et al., 2000a; Dias et al., 2002; Rocha and Van Sluys, 2007; Rosário et al., 2019). For example, our data on lizard thermal ecology allowed conducing a global collaborative study aiming to understand the effects of climate change on the thermal niche of lizards around the world and to assess its role on the extinction of populations and species of lizards worldwide (Sinervo et al., 2010). We have also investigated feeding and foraging habits of different components of herpetofauna in restinga which allowed us to understand the trophic relationships among sympatric lizard species, frogs and other local vertebrates and invertebrates as prey and predators to produce an approximation to a trophic net among species in a restinga area in the state of Rio de Janeiro (Rocha and Vrcibradic, 1998), and to assess how adult lizards may constitute a mortality source for juvenile lizards in their own communities (Siqueira and Rocha, 2008). Our investigations have also dealt with reproductive rates of species (e.g. clutch size and clutch number in lizards and amphibians)

Figure 2. Some anuran species recorded in sandy coastal plains of Brazil during 31 years of sampling efforts by the research team of the Laboratory of Vertebrate Ecology (Universidade do Estado do Rio de Janeiro). (A) *Aparasphenodon brunoi*; (B) *Arcovomer passarelli*; (C) *Melanophryniscus setiba*; (D) *Physalaemus marmoratus*; (E) *Ololygon agilis*; (F) *Trachycephalus nigromaculatus*. Photos **A, B, D, F**: JCFO; **C**: Pedro Peloso; **E**: JPR.

in an attempt to assess life history traits. Most of the data published by us concerning the reproductive strategies showed that some species are cyclic in reproduction and tend to have multiple clutches [e.g. *Tropidurus torquatus* (Wied, 1820) - Van Sluys et al., 2010; *Liolaemus lutzae* - Rocha, 1992] while others have extended reproductive seasons and tend to reproduce once or twice throughout the year (e.g. *Ameivula nativo* - Menezes et al., 2004; *Ameiva ameiva* - Rocha, 2008). An important issue is some differences in age at maturity among populations of the same species and a general trend of an effect of female body size on clutch size, egg volume and/or on relative clutch mass (Rocha and Vrcibradic, 1999; Vrcibradic and Rocha, 2011; Winck and Rocha, 2012; Menezes and Rocha, 2014). Further studies on reproductive traits of many sandy coastal plain's species are still needed to better understand general patterns for families along its geographical distribution.

We have produced many data about lizards from those environments, especially regarding the species endemic to sandy coastal plain habitats: *Liolaemus lutzae* (Liolaemidae), *Ameivula nativo*, *Glaucomastix littoralis*, *G. abaetensis* and *G. itabaianensis* (Teiidae). For *L. lutzae*, we evaluated several aspects of its natural history, including thermal ecology (e.g. Rocha, 1995; Maia-Carneiro et al., 2012; Almeida-Santos et al., 2015), activity patterns and spatial distribution (e.g. Rocha, 1988, 1991, 1999), feeding habits (e.g. Rocha, 1989, 1996, 2000b), behavior (e.g. Rocha, 1993; Maia-Carneiro and Rocha, 2013), and reproduction (e.g. Rocha, 1990, 1992). We have also estimated the

Figure 3. Some reptile species recorded in sandy coastal plains of Brazil during 31 years of sampling efforts by the research team of the Laboratory of Vertebrate Ecology (Universidade do Estado do Rio de Janeiro). (G) *Micrablepharus maximiliani*; (H) *Brasiliscincus agilis*; (I) *Glaucomastix abaetensis*; (J) *Oxybelis aeneus*; (K) *Leptodeira annulata*; (L) *Rhinoclemmys* sp. nov. Photos **G**: JPR; **H, J, K, L:** JCFO; **I:** Moacir Tinoco.

geographic distribution and local populational densities (Rocha and Bergallo, 1992; Rocha et al., 2009a), as well as the suitability of habitat for this species at a geographical scale (Winck et al., 2014). Furthermore, we have assessed the genetic diversity of existing populations of *L. lutzae* in order to propose management and conservation measures for the species (Ariani et al., 2013). Our data for the nine species of Teiidae from the studied areas contributed for the discovery and formal description of four new lizard species (*A. nativo* – Rocha et al., 1997; *G. abaetensis* – Dias et al., 2002, *G. littoralis* – Rocha et al., 2000b; *G. itabaianensis* – Rosário et al., 2019). We also studied the ecology of three of these species (*A. nativo*, *G. littoralis*, and *G. abaetensis*) in their community (e.g. Ribas et al., 1995; Rocha and Bergallo, 1997; Hatano et al., 2001; Rocha et al., 2005; Dias and Rocha, 2014; Winck et al., 2016; Oliveira et al., 2019) and populational ecology perspectives (e.g. Teixeira-Filho et al., 2003; Dias and Rocha, 2004; 2007; Menezes et al., 2004, 2006, 2008; Cosendey et al., 2016; Oliveira et al., in press). The effects of habitat structure on the occurrence of *G. littoralis* was evaluated in the restinga of Grussaí, in the state of Rio de Janeiro, and it was demonstrated that habitat destruction and alteration negatively affect its populations, considerably reducing the density and abundance of individuals (Cosendey et al., 2016; Oliveira et al., in press). We also studied the reproductive biology of *A. ocellifera*, *A. nativo, G. abaetensis, G. littoralis* and *Contomastix lacertoides* (Duméril & Bibron, 1839) from 16 populations from different sandy coastal plains along the Brazilian coast and

Table 3. Anuran species studied along Brazilian sandy coastal plains, their conservation *status* determined by The IUCN (2019), Instituto Chico Mendes de Conservação da Biodiversidade – ICMBIO (2018) and state lists, and endemism.

TAXON	Conservation Status			Endemism
	IUCN (2019)	ICMBIO (2018)	State lists	
Anura				
Brachycephalidae				
Ischnocnema parva (Girard, 1853)	LC	-		-
Bufonidae				
Melanophryniscus setiba Peloso, Faivovich, Grant, Gasparini & Haddad 2012	-	CR		E
Rhinella abei (Baldissera-Jr, Caramaschi & Haddad, 2004)	LC	-		-
Rhinella crucifer (Wied-Neuwied, 1821)	LC	-		-
Rhinella icterica (Spix, 1824)	LC	-		-
Rhinella ornata (Spix, 1824)	LC	-		-
Rhinella pygmaea (Myers & Carvalho, 1952)	LC	-		-
Rhinella schneideri (Werner, 1894)	LC	-		-
Craugastoridae (Craugastorinae)				
Haddadus binotatus (Spix, 1824)	LC	-	RS: VU	-
Craugastoridae (Holoadeninae)				
Euparkerella brasiliensis (Parker, 1926)	LC	-		-
Hemiphractidae				
Gastrotheca fissipes (Boulenger, 1888)	LC	-	ES: DD	-
Gastrotheca megacephala Izecksohn, Carvalho-e-Silva & Peixoto, 2009	-	-		-
Hylidae				
Aparasphenodon brunoi Miranda-Ribeiro, 1920	LC	-		-
Boana albomarginata (Spix, 1824)	LC	-		-
Boana albopunctata (Spix, 1824)	LC	-		-
Boana faber (Wied-Neuwied, 1821)	LC	-		-
Boana raniceps Cope, 1862	LC	-		-
Boana semilineata (Spix, 1824)	LC	-		-
Dendropsophus anceps (A. Lutz, 1929)	LC	-		-
Dendropsophus bipunctatus (Spix, 1824)	LC	-		-
Dendropsophus branneri (Cochran, 1948)	LC	-		-
Dendropsophus decipiens (A. Lutz, 1925)	LC	-		-
Dendropsophus elegans (Wied-Neuwied, 1824)	LC	-		-
Dendropsophus meridianus (B. Lutz, 1954)	LC	-		-
Dendropsophus minutus (Peters, 1872)	LC	-		-
Dendropsophus nanus (Boulenger, 1889)	LC	-		-
Dendropsophus oliveirai (Bokermann, 1963)	LC	-		-
Dendropsophus pseudomeridianus (Cruz, Caramaschi & Dias 2000)	LC	-		-
Dendropsophus seniculus (Cope, 1868)	LC	-		-
Dendropsophus werneri (Cochran, 1952)	LC	-		-
Itapotihyla langsdorffii (Duméril & Bibron, 1841)	LC	-		-
Ololygon agilis (Cruz & Peixoto, 1983)	LC	-		E

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Table 3. Continued...

TAXON	Conservation Status			Endemism
	IUCN (2019)	ICMBIO (2018)	State lists	
Ololygon argyreornata (Miranda-Ribeiro, 1926)	LC	-		-
Ololygon littorea Peixoto, 1988	LC	-		E
Ololygon melanodactyla (Lourenço, Luna, and Pombal, 2014)	-	-		E
Phyllodytes luteolus (Wied-Neuwied, 1824)	LC	-		-
Phyllodytes punctatus Caramaschi & Peixoto, 2004	DD	DD		-
Phyllodytes tuberculosus Bokermann, 1966	DD	-		-
Scinax alter (B. Lutz, 1973)	LC	-		-
Scinax cuspidatus (A. Lutz, 1925)	LC	-		-
Scinax fuscovarius (A. Lutz, 1925)	LC	-		-
Scinax granulatus (Peters, 1871)	LC	-		-
Scinax similis (Cochran, 1952)	LC	-		-
Scinax x-signatus (Spix, 1824)	LC	-		-
Sphaenorhynchus caramaschii Toledo, Garcia, Lingnau & Haddad, 2007	LC	-		-
Sphaenorhynchus planicola (A. Lutz & B. Lutz, 1938)	LC	-		-
Trachycephalus nigromaculatus Tschudi, 1838	LC	-		-
Xenohyla truncata (Izecksohn, 1959)	NT	EN		E
Leptodactylidae (Leiuperinae)				
Physalaemus aguirrei Bokermann, 1966	LC	-		-
Physalaemus cuvieri Fitzinger, 1826	LC	-		-
Physalaemus marmoratus (Reinhardt & Lütken, 1862 "1861")	LC	-		-
Physalaemus obtectus Bokermann, 1966	DD	-		-
Physalaemus signifer (Girard, 1853)	LC	-		-
Pleurodema diplolister (Peters, 1870)	LC	-		-
Pseudopaludicola restinga Cardozo, Baldo, Pupin, Gasparini & Haddad, 2018	-	-		-
Leptodactylidae (Leptodactylinae)				
Adenomera marmorata (Steindachner, 1867)	LC	-		-
Leptodactylus fuscus (Schneider, 1799)	LC	-		-
Leptodactylus gracilis (Duméril & Bibron, 1841)	LC	-		-
Leptodactylus latrans (Steffen, 1815)	LC	-		-
Leptodactylus macrosternum Miranda-Ribeiro, 1926	-	-		-
Leptodactylus marambaiae Izecksohn, 1976	LC	-		E
Leptodactylus mystaceus (Spix, 1824)	LC	-		-
Leptodactylus mystacinus (Burmeister, 1861)	LC	-		-
Leptodactylus natalensis A. Lutz, 1930	LC	-		-
Leptodactylus spixi Heyer, 1983	LC	-		-
Leptodactylus troglodytes A. Lutz, 1926	LC	-		-
Leptodactylus vastus A. Lutz, 1930	LC	-		-
Microhylidae (Gastrophryninae)				
Arcovomer passarellii Carvalho, 1954	LC	-		-
Chiasmocleis lacrimae Peloso, Sturaro, Forlani, Gaucher, Motta & Wheeler, 2014	EN	-		-

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Table 3. Continued...

TAXON	Conservation Status			Endemism
	IUCN (2019)	ICMBIO (2018)	State lists	
Dermatonotus muelleri (Boettger, 1885)	LC	-		-
Elachistocleis cesarii (Miranda-Ribeiro, 1920)	LC	-		-
Stereocyclops incrassatus Cope, 1870 "1869"	LC	-		-
Stereocyclops parkeri (Wettstein, 1934)	LC	-		-
Odontophrynidae				
Odontophrynus maisuma Rosset, 2008	-	-		-
Phyllomedusidae				
Phyllomedusa distincta A. Lutz in B. Lutz, 1950	LC	-		-
Pithecopus rohdei (Mertens, 1926)	LC	-		-
Pithecopus nordestinus (Caramaschi, 2006)	DD	-		-

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we observed that these five species (one parthenogenetic and four bisexual) are somewhat similar in their reproductive characteristics as, for example, clutch size (Menezes and Rocha, 2013).

Another important contribution of our studies regards the knowledge on the biology and ecology of skinks (Mabuyidae) in restingas: parasites (Cunha-Barros and Rocha, 1995; Vrcibradic et al., 2000, 2002a, 2002b), diet (Vrcibradic and Rocha, 1995, 1996, 2002b; Rocha et al., 2004c), microhabitat use (Vrcibradic and Rocha, 1996; Vrcibradic and Rocha, 2002b), thermal ecology (Rocha and Vrcibradic, 1996; Vrcibradic and Rocha, 2002a, 2004), and reproduction (Rocha and Vrcibradic, 1999; Rocha et al., 2002; Vrcibradic and Rocha, 2002b). Autoecological studies were also done on one of the commonest and widest-ranging species in the coastal sandy plains, the tropidurid *Tropidurus torquatus*, with studies addressing diet (Bergallo and Rocha, 1994; Fialho et al., 2000), thermal ecology and activity patterns (Bergallo and Rocha, 1993; Teixeira-Filho et al., 1996; Hatano et al., 2001), reproduction (Van Sluys et al., 2010), and parasitism by chigger mites (Cunha-Barros and Rocha, 2000; Cunha-Barros et al., 2003) and by helminths (Ribas et al., 1998; Vrcibradic et al., 2000). We also studied the ecological aspects of that species in a geographical context assessing how their populations may vary along its distributional range in the different restinga habitats regarding diet composition and degree of plant consumption (Dutra et al., 2011; Siqueira et al., 2011, 2013), thermal ecology (Kiefer et al., 2005, 2007), and reproductive traits (Kiefer et al., 2008).

We also recorded the non-indigenous gekkonid *Hemidactylus mabouia*, a species of African origin, as invasive in different restinga habitats (e.g. Hatano et al., 2001; Rocha and Bergallo, 2011; Telles et al., 2015; Oliveira et al., 2016; Winck et al., 2016). In one study we analyzed the lizard species in 16 restinga habitats encompassing three Brazilian states (Rio de Janeiro, Espírito Santo and Bahia) and along more than 1500 km of Brazilian coast, registering this invasive lizard in some of them (Rocha et al., 2014). In another study we reported that species in natural habitats in four sites in Espírito Santo state and evaluated the environmental factors at each site that presumably facilitate the invasion and the establishment of the species in natural environments (Oliveira et al., 2016). That study suggested that *H. mabouia* may be benefiting from human alterations in sandy dune habitats of Brazil, especially through vegetation removal. Regarding biotic interactions, Winck et al. (2017) showed that *H. mabouia* does not seem to have significant effects on native lizard populations, through niche evaluation. Our studies regarding this lizard as a component of several communities in natural habitats in Brazilian restingas (Hatano et al., 2001, Oliveira et al., 2016; Winck et al., 2016, 2017) suggested that it may be expanding its distribution in natural environments in Brazil in the last decades, and that invasion is favored in open habitats such as coastal sandy plain habitats in Brazil (Rocha and Bergallo, 2011). We also recorded an established invasive population of *Iguana iguana* (Linnaeus, 1758) in Vila Velha, in Espírito Santo state, whose occurrence was suggested as resulting from the release of pet individuals in natural areas (Oliveira and Castro, 2017).

Regarding Testudines, we evaluated the first-order effects of fire and of a prolonged drought on a semi-aquatic turtle species (*Rhinoclemmys* sp. nov.) on the "campo nativo" and in adjacent areas in Espírito Santo state, and our results provided important insights on the mortality of turtles caused by non-natural fires and droughts in southeastern Brazil (Oliveira et al., 2018).

Our studies also helped to fill important knowledge gaps on reptile communities of the sandy coastal plains of Brazil and significantly contributed with information for conservation of such environments. For example, we studied the effect of habitat structure on Squamata reptile

species in ten different sites in Bahia state (Dias and Rocha, 2014), and in five different sites in Espírito Santo state (Oliveira et al., 2019). Lizard communities on sandy coastal plains of Espírito Santo state tend to be similar regarding richness and abundance of species (Oliveira et al., 2019). In general, the highest lizard species richness is in shrubby vegetation and/or in open *Clusia* zones. The species from this ecosystem are specifically associated with some microhabitats and mesohabitats, for example, teiid lizards are associated with the presence of bromeliads on open habitats (Oliveira et al., 2019). We also explored the biotic relations among lizard species within communities in sandy coastal plains in Rio de Janeiro state, showing how the species partitioned meso and microhabitats and analyzing their realized niches, and revealed that the trophic axis is the most important niche element structuring those lizard communities (Winck et al., 2016, 2017). We also filled a gap of knowledge on Squamata species from Lençóis Maranhenses National Park, in Maranhão state, which led to the first reptile inventory for the area, resulting in the register of 42 species (Miranda et al., 2012). Additionally, a recent study with the lizard community on a "campo nativo" habitat from Linhares, Espírito Santo state, showed that this formation presented greater abundance of lizards when compared to the adjacent forest formations, and also harbored exclusive species, such as the endemic and endangered lizard *Ameivula nativo*.

Regarding anuran amphibians, our studies focused mainly on species composition of communities. For example, a survey of anurans from the Restinga de Maciambu, in Santa Catarina state, southern Brazil, recorded 15 species during fieldwork (Wachlevski and Rocha, 2010). A study on community structure of anurans in five sites along sandy coastal plains of Espírito Santo recorded 32 species and suggested that frog species composition was not related to habitat structure in general, but rather to the availability of spawning sites (sources of freestanding water), which appears to be the most important ecological factor structuring those communities (Oliveira et al., 2017). In the "campo nativo" habitat in Linhares, Espírito Santo, the studies that evaluated the seasonal variation and the pattern of anuran activity indicated that the abundance of individuals in this formation remains relatively stable during the dry and rainy seasons, probably due to the amount of free water deposited inside tank-bromeliads (Pereira-Ribeiro et al., 2020). Another study evaluated frog species richness, community composition and β-diversity in ten sites along the coasts of Rio de Janeiro, Espírito Santo and Bahia states, showing that beta-diversity of frogs change along the coast and that the rate of species turnover was partially affected by the geographical distance among areas (Rocha et al., 2008d). We also produced data regarding the important effects of fire on local anuran fauna in some areas: Rocha et al. (2008a) estimated the impact of a fire on *Scinax tymbamirim* (= *S.* cf. *alter*; see Nunes et al., 2012) at Dunas da Joaquina, in Santa Catarina state, by comparing data on the density and diet composition of the frogs in the area affected by the fire and in an adjacent area that had not been burned. The authors concluded that fire affected negatively the local population of *S. tymbamirim* through the charring of their main shelters (i.e. bromeliads) or indirectly by depleting its main food source (i.e. invertebrates). The effects of fire were also estimated for the anuran community of Parque Estadual Paulo César Vinha, at Setiba, Espírito Santo. Data collected two years before and two years after the fire demonstrated the negative effect of fire mainly by eliminating microhabitats of the different species. Additionally, we reviewed data on anuran species living in restinga habitats, resulting in a checklist of the species' occurrences and endemisms based on the current knowledge of frog species living on these ecosystems (Oliveira and Rocha, 2015). That review showed that the relative lack of studies on the anurofauna and the high rate of habitat degradation are negative factors that can lead to frog population extirpations or extinctions in these environments before we can even begin to understand the patterns and processes that act on local anuran communities.

The degree of habitat loss and the risk of disappearance of sandy coastal plains remnants have been evaluated by our team based on satellite images and data from fieldwork and the record of factors that might cause environmental degradation (Rocha et al., 2007). That study showed that all sites evaluated had disturbed portions under strong pressure due to human activities. To sum up, the herpetofaunal studies of the Laboratório de Ecologia de Vertebrados along the last 31 years constitute not only a contribution for the understanding of different aspects of the ecology of anuran amphibian and reptile species in coastal ecosystems, but also provide valuable information for their conservation in those habitats (e.g. Dias and Rocha, 2005; Rocha et al., 2003, 2005, 2008b, 2008c, 2008e, 2008f, 2009b). The present checklist of our records of Brazilian sandy coastal plains' herpetofauna provides, for many localities along the Brazilian coast, the needed knowledge on the species' occurrence in certain localities, local species composition, and presence of endemics or of endangered species, which is of potential value for many conservation actions.

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Appendix 1. List of the main projects developed between 1988 and 2019 in the Laboratory of Vertebrate Ecology (Universidade do Estado do Rio de Janeiro) that yielded information on herpetofauna from Brazilian sandy coastal plains.

Project	Years
Comunidade de répteis da restinga da Barra de Maricá, Rio de Janeiro	1988-1995
Comunidade de répteis da Reserva Natural Vale, Linhares	1987-1992
Variação nas comunidades de lagartos ao longo das costas dos estados do Rio de Janeiro, Espírito Santo e Bahia	1995- 1997
Lagartos em três restingas e três ilhas do Arquipélago dos Abrolhos na Bahia	2000
Diversidade, Ecologia e composição dos répteis da restinga de Jurubatiba (PELD/CNPq/ Jurubatiba)	1996-2006
Projeto Expedição Restingas Brasileiras	1997- 1999
Ecologia e conservação das comunidades de répteis em restingas da costa do Estado da Bahia	1999-2006
Comunidades de lagartos nos remanescentes de restinga do Estado do Rio de Janeiro	2008-2012
Os anfíbios da restinga de Grumari, RJ, Brasil	2008-2011
A anurofauna da Reserva Biológica Estadual da Praia do Sul	2010-2015
As comunidades de anfíbios e lagartos dos remanescentes de restinga do Estado do Espírito Santo	2011-2015
Os efeitos do fogo sobre a comunidade de anfíbios em uma restinga no sudeste do Brasil	2014-2016
Ecologia e conservação da comunidade de anfíbios e répteis do Parque Nacional dos Lençóis Maranhenses	2004-2007
Anfíbios anuros do Parque Estadual da Serra do Tabuleiro: composição, distribuição e conservação	2007-2011
Mapeamento da ocorrência, distribuição, status de conservação de répteis endêmicos e ameaçados em restingas da porção baiana do Corredor de Biodiversidade Central da Mata Atlântica	2003-2005
Ecologia e conservação das populações remanescentes do lagarto-branco-da-praia *Liolaemus lutzae* no litoral do Estado do Rio de Janeiro	2009-2014
Risco de extinção de lagartos ameaçados na costa leste do Brasil: ligando mudanças climáticas globais, ecologia térmica, metais pesados e a genética para a conservação das espécies	2012 - present
As comunidades de anfíbios e répteis em uma área de Floresta de Tabuleiro na Mata Atlântica do Espírito Santo: fatores influenciando na estruturação das comunidades	2015 - present

Appendix 2. Voucher specimens of taxa recorded during field samplings in restingas by the research team of the Laboratory of Vertebrate Ecology (Universidade do Estado do Rio de Janeiro) that have not yet figured in articles published by the team. Legend: LABEVA: Laboratório de Biologia e Ecologia de Vertebrados of the Universidade Federal de Sergipe, Sergipe State; MBML: Museu de Biologia Professor Melo Leitão, Espírito Santo state.

Taxa	Voucher
ANURA	
Boana raniceps	LABEVA 127-129, 1114-1115
Dendropsophus nanus	LABEVA 51-54, 283-286
Dermatonotus muelleri	LABEVA 59, 639
Elachistocleis cesarii	LABEVA 36, 1106,1118
Gastrotheca fissipes	LABEVA 1057
Leptodactylus macrosternum	LABEVA 39-41
Leptodactylus mystaceus	LABEVA 69
Leptodactylus natalensis	LABEVA 62-63
Leptodactylus troglodytes	LABEVA 466, 603, 753
Leptodactylus vastus	LABEVA 49, 68, 191
Phyllodytes punctatus	LABEVA 1134-1135
Pithecopus nordestinus	LABEVA 624, 751
Pleurodema diplolister	LABEVA 123-124, 146-147
SQUAMATA (snakes)	
Cercophis auratus	MBML 4033