

# The amphibians of the state of Rio de Janeiro, Brazil: an updated and commented list

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**Abstract.** The amphibian fauna of the state of Rio de Janeiro, in southeastern Brazil, is characterized by high species richness and rates of endemism, and is still insufficiently known. A first list of amphibian species with occurrence in the state was published in 2004 and reported 166 taxa, but since then many new records, descriptions of new taxa, and revalidations and synonymizations of species have consistently improved the knowledge about the state's amphibian biodiversity. Thus, a review and update of that list was deemed necessary. We herein present an updated and commented list of amphibian species occurring in the state of Rio de Janeiro based on a survey of the literature. We recorded the occurrence of a total of 201 species of amphibians (197 anurans and four caecilians) in Rio de Janeiro, with 54 of them (*ca.* 27%) considered to be endemic of the state. Our study presents an increase in species richness of 21% since the publication of the previous list, indicating a consistent advance in knowledge of the composition of the amphibian fauna in the state. In spite of its relatively small territorial extension (total area *ca.* 43,800 km<sup>2</sup>), the state of Rio de Janeiro contains nearly 20% of the amphibian species known to occur in Brazil and around 40% of those occurring in the Atlantic Forest biome. Thus, that state constitutes an important reservoir of amphibian biodiversity in the Atlantic Forest biome and in Brazil, as a whole.

**Key-Words.** Anura; Atlantic Forest; Conservation; Gymnophiona; Species list.

## INTRODUCTION

The Brazilian Atlantic Forest is one of the world's most threatened biomes, with only *ca.* 12% of its original forest cover remaining nowadays (Ribeiro *et al.*, 2009), and is considered one of the world's 35 biodiversity *hotspots* (Mittermeier, 2005). The state of Rio de Janeiro, with around 43,800 km<sup>2</sup> of total area and situated between 20-24°S and 45-41°W, is the Brazilian state that preserves the greatest proportional percentage (20.3% of its territory) of Atlantic Forest remnants (Bergallo *et al.*, 2009). A combination of the state's geographic location with its heterogeneous landscape (ranging from sea-level to mountain peaks over 2,000 m high) favors the occurrence of multiple phytophysiognomies (mangroves, restingas, umbrophilous forests, semi-deciduous forests, high-altitude fields, and inselbergs). This, in turn, maintains high rates of biodiversity and endemism for different groups of the fauna and flora (Jenkins & Pimm, 2006; Nascimento & Campos, 2011).

Regarding its amphibian fauna, the state of Rio de Janeiro houses a remarkable diversity as well as a high number of species endemic to the state (Rocha *et al.*, 2005; Cruz & Feio, 2007; van Sluys

*et al.*, 2009; Nascimento & Campos, 2011). The first list of amphibians reported to occur in the state of Rio de Janeiro was published by Rocha *et al.* (2004), who listed 166 species. Since then, there has been an increase in species inventories performed throughout the state, improving the knowledge about the composition and distribution of the state's amphibian fauna (*e.g.*, Almeida-Gomes *et al.*, 2008, 2010, 2014; Carvalho-e-Silva *et al.*, 2008; Silva *et al.*, 2008; Siqueira *et al.*, 2011a, b; Salles *et al.*, 2009; Silva-Soares *et al.*, 2010; Vrcibradic *et al.*, 2011; Martins *et al.*, 2012, 2014; Telles *et al.*, 2012; Bittencourt-Silva & Silva, 2013; Pontes *et al.*, 2015). Additionally, several species have been added to the state's amphibian list, either through reports of new occurrence records (*e.g.*, Vrcibradic *et al.*, 2006; Silva-Soares *et al.*, 2009; Silveira *et al.*, 2010; Caram *et al.*, 2011; Pederassi *et al.*, 2015), or through descriptions, revalidations or reassessments of taxa (*e.g.*, Carvalho-e-Silva & Carvalho-e-Silva, 2005; Caramaschi & Pombal, 2006; Canedo & Pombal, 2007; Pombal *et al.*, 2008; Prado & Pombal, 2008; Silva & Alves-Silva, 2008; Carvalho-e-Silva *et al.*, 2009, 2010; Targino *et al.*, 2009; Pombal, 2010; Pombal & Izecksohn, 2011; Weber *et al.*, 2011; Silva & Alves-Silva, 2011; Nunes *et al.*, 2012; Silva &

Ouvernay, 2012; Dias *et al.*, 2013; Caramaschi *et al.*, 2013; Pimenta *et al.*, 2014; Hepp *et al.*, 2015).

Within the last twelve years or so there has been a considerable increase in studies with molecular phylogenetics of amphibians, resulting in extensive nomenclatural changes at the familial, subfamilial and generic levels (*e.g.*, Faivovich *et al.*, 2005; Frost *et al.*, 2006; Grant *et al.*, 2006; Hedges *et al.*, 2008; Guayasamin *et al.*, 2009; Wilkinson *et al.*, 2011; Padial *et al.*, 2014; Castroviejo-Fisher *et al.*, 2015). Considering such changes, together with the aforementioned increase in the amount of information regarding the amphibian fauna of Rio de Janeiro after more than a decade since the list of Rocha *et al.* (2004) came out, we think that list needs to be reevaluated and updated. Thus, we here present a revised and updated list of the amphibian species reported to occur in the state of Rio de Janeiro.

## MATERIALS AND METHODS

The current knowledge about the composition and species richness of amphibians occurring in the state of Rio de Janeiro, in southeast Brazil, was evaluated based on a survey of the literature. Extensive searches were carried out on the websites *Web of Science* of the *Institute for Scientific Information* (<http://apps.isiknowledge.com>) and *Google Scholar* (<http://scholar.google.com.br>) using the following combinations of key words: “Anura\* and Rio de Janeiro”, “amphibia\* and Rio de Janeiro”, “herpeto\* and Rio de Janeiro”, “new and anura and Rio de Janeiro”. Additionally, databases of the sites Amphibian Species of the World (<http://research.amnh.org/vz/herpetology/amphibia>) and IUCN (*International Union for Conservation of Nature*: [www.iucnredlist.org](http://www.iucnredlist.org)), as well as issues of the journal *Herpetological Review* were also mined for records. All the above sources were searched between June 2014 and December 2015, and searches were directed towards works published from 2004 onwards. We avoided including undescribed species or taxa of uncertain taxonomic status (*i.e.*, treated in the literature as “sp.”, “aff.” or “cf.”) in our list, except in a few particular cases (see Results and Discussion). Scientific nomenclature used throughout the present work follows Frost (2017), unless stated otherwise (see below).

Duellman *et al.* (2016) recently reviewed the systematics of the speciose family Hylidae and proposed a number of taxonomic changes. These include the elevation of the three recognized hylid subfamilies to family level, adoption of the unranked name Arboranae for the clade formerly known as Hylidae, new subfamilial arrangements, and partitioning of some genera (including *Phyllomedusa* and *Scinax*). As those proposed changes are still too recent and are potentially controversial (due to the splitting of monophyletic taxa; see Vences *et al.*, 2013), we prefer not to adopt them here, since we are not sure if they will be widely accepted.

Concerning their conservation status (*sensu* IUCN), the species under some level of threat were classified as data deficient (DD), near threatened (NT), endangered

(EN), vulnerable (VU), critically endangered (CR), or extinct (EX). Classification of species in these categories at both the global and national levels followed IUCN (2016) and the Official National List of Species of the Fauna Threatened with Extinction (issued in 2014 by the Brazilian Ministry of Environment – MMA), respectively.

## RESULTS AND DISCUSSION

Based on our literature survey and on the previous list of Rocha *et al.* (2004), we compiled a list of 201 species of amphibians (197 belonging to the Order Anura and four to the Order Gymnophiona) reported to occur in the state of Rio de Janeiro, of which 54 (26.9%) are considered endemic to the state (Table 1). A total of 40 species were added to the amphibian list of Rocha *et al.* (2004), whereas five (*Allobates carioca*, *Bokermannohyla clepsydra*, *Cycloramphus lutzorum*, *Ischnocnema gr. lactea*, and *I. nigriventris*; see below) were removed from the list based on our revision. The present updated list thus represents an increase of 21% in the number of species reported for the state of Rio de Janeiro after thirteen years. This evidences a consistent improvement in knowledge of the composition and richness of the amphibian fauna of the state, driven by an increase in local faunal inventories and in systematic studies during the last decade. The description of 26 new amphibian species known to occur in the state of Rio de Janeiro within the 2004–2015 period, as well as the discovery of species that still remain to be formally described (*e.g.*, Siqueira *et al.*, 2011a, b; Bittencourt-Silva & Silva, 2013) reinforce the notion that many amphibian species inhabiting the Atlantic Forest remain unknown (Pimm *et al.*, 2010).

Most of the new records added herein to the previous list of Rocha *et al.* (2004) represent descriptions of new species or revalidations of taxa previously in synonymy, as well as new occurrence records for the state. However, two of the new additions to the list represent “old” (pre-2004) records that have been apparently overlooked by Rocha *et al.* (2004): *Scinax angrensis* (as noted by Carvalho-e-Silva *et al.*, 2008), a species that is actually endemic to the state, and *Brachycephalus hermogenesi*, whose occurrence in the municipality of Paraty had been reported in the original description (Giaretta & Sawaya, 1998).

*Scinax x-signatus* (Spix, 1824) is a problematic taxon, as its imprecise type locality, succinct description by Spix (1824) and presumably lost holotype preclude this name from being confidently applied to any existing population of treefrogs at present (Pombal *et al.*, 1995; Sturaro & Peloso, 2014). *Scinax x-signatus* was not included by Rocha *et al.* (2004) in their list of the state’s amphibians, despite Izecksohn & Carvalho-e-Silva (2001) having included this taxon among the amphibian species occurring in the municipality of Rio de Janeiro. Additionally, several recent studies have reported frogs identified as *Scinax x-signatus*, *Scinax* aff. *x-signatus*, or *Scinax* cf. *x-signatus* from various localities throughout the state (*e.g.*, Abrunhosa *et al.*, 2006; Silva *et al.*, 2008; Salles *et al.*, 2009;

**Table 1.** List of species of amphibians reported from the state of Rio de Janeiro, southeastern Brazil. Species considered endemic to the state are marked with an 'X'. Categories of threat are given at both global and national levels, as follows: data deficient (DD), near threatened (NT), endangered (EN), vulnerable (VU), critically endangered (CR) and extinct (EX). (\*) species added to the list of Rocha et al. (2004); (\*\*) species present on the list of Rocha et al. (2004) that had since undergone nomenclatural change or re-identification.

Taxa	Endemic	Category of threat		Taxa	Endemic	Category of threat	
		global	national			global	national
<b>ANURA</b>							
<b>Aromobatidae</b>							
<i>Allobates ocellifer</i> (Lutz, 1925)		VU	VU	<i>Cycloramphus brasiliensis</i> (Steindachner, 1864)	X		NT
<b>Brachycephalidae</b>				<i>Cycloramphus carvalhoi</i> Heyer, 1983			DD
<i>Brachycephalus bufonoides</i> Miranda-Ribeiro, 1920*	X			<i>Cycloramphus eleutherodactylus</i> (Miranda-Ribeiro, 1920)			DD
<i>Brachycephalus didactylus</i> (Izecksohn, 1971)				<i>Cycloramphus fuliginosus</i> Tschudi, 1838			
<i>Brachycephalus ephippium</i> (Spix, 1824)				<i>Cycloramphus granulatus</i> Lutz, 1929			DD
<i>Brachycephalus garbeanus</i> Miranda-Ribeiro, 1920*	X			<i>Cycloramphus lithomimeticus</i> Silva & Oüvernay, 2012*	X		
<i>Brachycephalus hermogenesi</i> (Giaretta & Sawaya, 1998)*				<i>Cycloramphus ohausi</i> (Wandolleck, 1907)	X		EN
<i>Brachycephalus margaritatus</i> Pombal & Izecksohn, 2011*	X			<i>Cycloramphus organensis</i> Weber, Verdade, Salles, Fouquet & Carvalho-e-Silva, 2011*	X		DD
<i>Brachycephalus vertebralis</i> Pombal, 2001	X	DD		<i>Cycloramphus stejnegeri</i> (Noble, 1924)	X		DD
<i>Ischnocnema bolbodactyla</i> (Lutz, 1925)	X			<i>Thoropa lutzi</i> Cochran, 1938			EN
<i>Ischnocnema concolor</i> Targino, Costa & Carvalho-e-Silva, 2009*	X			<i>Thoropa miliaris</i> (Spix, 1824)			
<i>Ischnocnema erythromera</i> (Heyer, 1984)	X	DD		<i>Thoropa petropolitana</i> (Wandolleck, 1907)	X	VU	EN
<i>Ischnocnema gualteri</i> (Lutz, 1974)	X			<i>Zachaeus parvulus</i> (Girard, 1853)			
<i>Ischnocnema guentheri</i> (Steindachner, 1864)	X			<b>Hemiphractidae</b>			
<i>Ischnocnema holti</i> (Cochran, 1948)	X	DD		<i>Fritziana fissilis</i> (Miranda-Ribeiro, 1920)			
<i>Ischnocnema melanopygia</i> Targino, Costa & Carvalho-e-Silva, 2009*	X			<i>Fritziana goeldii</i> (Boulenger, 1895)			
<i>Ischnocnema nanahallux</i> Brusquetti, Thomé, Canedo, Condez, & Haddad, 2013*	X			<i>Fritziana ohausi</i> (Wandolleck, 1907)			
<i>Ischnocnema nasuta</i> (Lutz, 1925)				<i>Fritziana ulei</i> (Miranda-Ribeiro, 1926)*			
<i>Ischnocnema octavioi</i> (Bokermann, 1965)				<i>Gastrotheca albolineata</i> (Lutz & Lutz, 1939)			
<i>Ischnocnema oea</i> (Heyer, 1984)*		NT		<i>Gastrotheca ernestoi</i> Miranda-Ribeiro, 1920			DD
<i>Ischnocnema parva</i> (Girard, 1853)				<i>Gastrotheca fulvorufa</i> (Andersson, 1911)			DD
<i>Ischnocnema venancioi</i> (Lutz, 1958)				<b>Hylidae</b>			
<b>Bufo</b>				<i>Aparasphenodon bruno</i> i Miranda-Ribeiro, 1920			
<i>Dendrophryniscus brevipollicatus</i> Jiménez de la Espada, 1870				<i>Aplastodiscus albobrenatus</i> (Lutz, 1924)	X		
<i>Dendrophryniscus leucomystax</i> Izecksohn, 1968				<i>Aplastodiscus albosignatus</i> (Lutz & Lutz, 1938)**			
<i>Dendrophryniscus organensis</i> Carvalho-e-Silva, Mongin, Izecksohn & Carvalho-e-Silva, 2010*	X			<i>Aplastodiscus arildae</i> (Cruz & Peixoto, 1987)			
<i>Melanophryniscus moreirae</i> (Miranda-Ribeiro, 1920)		NT		<i>Aplastodiscus eugenioi</i> (Carvalho-e-Silva & Carvalho-e-Silva, 2005)*			NT
<i>Rhinella crucifer</i> (Wied-Neuwied, 1821)				<i>Aplastodiscus flumineus</i> (Cruz & Peixoto, 1985)	X		DD
<i>Rhinella hoogmoedi</i> Caramaschi & Pombal, 2006**				<i>Aplastodiscus leucopygius</i> (Cruz & Peixoto, 1985)			
<i>Rhinella icterica</i> (Spix, 1824)				<i>Aplastodiscus musicus</i> (Lutz, 1949)	X		DD
<i>Rhinella ornata</i> (Spix, 1824)*				<i>Boana albomarginata</i> (Spix, 1824)			
<i>Rhinella pygmaea</i> (Myers & Carvalho, 1952)				<i>Boana albopunctata</i> (Spix, 1824)			
<i>Rhinella schneideri</i> (Werner, 1894)				<i>Boana bandeirantes</i> (Caramaschi & Cruz, 2013)*			
<b>Centrolenidae</b>				<i>Boana faber</i> (Wied-Neuwied, 1821)			
<i>Vitreorana eurygnatha</i> (Lutz, 1925)				<i>Boana latistriata</i> (Caramaschi & Cruz, 2004)*			DD
<i>Vitreorana uranoscopa</i> (Müller, 1924)				<i>Boana pardalis</i> (Spix, 1824)			
<b>Ceratophryidae</b>				<i>Boana polytaenia</i> (Cope, 1870)			
<i>Ceratophrys aurita</i> (Raddi, 1823)				<i>Boana prasina</i> (Burmeister, 1856)			
<b>Craugastoridae</b>				<i>Boana secedens</i> (Lutz, 1963)	X		DD
<i>Euparkerella brasiliensis</i> (Parker, 1926)	X			<i>Boana semilineata</i> (Spix, 1824)			
<i>Euparkerella cochranae</i> Izecksohn, 1988	X			<i>Bokermannohyla astarteae</i> (Bokermann, 1967)			
<i>Euparkerella cryptica</i> Hepp, Carvalho-e-Silva, Carvalho-e-Silva & Folly, 2015*	X			<i>Bokermannohyla carvalhoi</i> (Peixoto, 1981)	X		
<i>Haddadus binotatus</i> (Spix, 1824)				<i>Bokermannohyla circumdata</i> (Cope, 1871)			
<i>Holoaden bradei</i> Lutz, 1958	X	CR	CR	<i>Bokermannohyla claresignata</i> (Lutz & Lutz, 1939)			DD
<i>Holoaden luederwaldti</i> Miranda-Ribeiro, 1920		DD	EN	<i>Bokermannohyla gouveai</i> (Peixoto & Cruz, 1992)	X		DD
<i>Holoaden pholeter</i> Pombal, Siqueira, Dorigo, Vrcibradic & Rocha, 2008*	X	DD		<i>Bokermannohyla hylax</i> (Heyer, 1985)			
<b>Cycloramphidae</b>				<i>Dendropsophus anceps</i> (Lutz, 1929)			
<i>Cycloramphus boraceiensis</i> Heyer, 1983				<i>Dendropsophus berthaltutzae</i> (Bokermann, 1962)			
				<i>Dendropsophus bipunctatus</i> (Spix, 1824)			
				<i>Dendropsophus branneri</i> (Cochran, 1948)			
				<i>Dendropsophus decipiens</i> (Lutz, 1925)			
				<i>Dendropsophus elegans</i> (Wied-Neuwied, 1824)			
				<i>Dendropsophus giesleri</i> (Mertens, 1950)			

Taxa	Endemic	Category of threat		Taxa	Endemic	Category of threat	
		global	national			global	national
<i>Dendropsophus meridianus</i> (Lutz, 1954)	X			<i>Hylodes glaber</i> (Miranda-Ribeiro, 1926)			DD
<i>Dendropsophus microps</i> (Peters, 1872)				<i>Hylodes lateristrigatus</i> (Baumann, 1912)			
<i>Dendropsophus minutus</i> (Peters, 1872)				<i>Hylodes nasus</i> (Lichtenstein, 1823)			
<i>Dendropsophus pseudomeridianus</i> (Cruz, Caramaschi & Dias, 2000)				<i>Hylodes ornatus</i> (Bokermann, 1967)			
<i>Dendropsophus seniculus</i> (Cope, 1868)				<i>Hylodes phyllodes</i> Heyer & Cocroft, 1986			
<i>Itapotihyla langfsdorffii</i> (Duméril & Bibron, 1841)				<i>Hylodes pipilans</i> Canedo & Pombal, 2007*	X		DD
<i>Phasmahyla cochranæ</i> (Bokermann, 1966)				<i>Hylodes regius</i> Gouvêa, 1979			DD
<i>Phasmahyla cruzi</i> Carvalho-e-Silva, Silva & Carvalho-e-Silva, 2009*	X			<i>Hylodes sazimai</i> Haddad & Pombal, 1995			DD
<i>Phasmahyla guttata</i> (Lutz, 1924)				<i>Megaelosia goeldii</i> (Baumann, 1912)			
<i>Phrynomedusa marginata</i> (Izecksohn & Cruz, 1976)				<i>Megaelosia lutzae</i> Izecksohn & Gouvêa, 1987	X		DD
<i>Phrynomedusa vanzolinii</i> Cruz, 1991				Leptodactylidae			
<i>Phyllodytes luteolus</i> (Wied-Neuwied, 1824)*				<i>Adenomera marmorata</i> Steindachner, 1867			
<i>Phyllomedusa burmeisteri</i> Boulenger, 1882				<i>Adenomera thomei</i> (Almeida & Angulo, 2006)*			
<i>Phyllomedusa rohdei</i> Mertens, 1926				<i>Crossodactylodes pinto</i> Cochran, 1938	X		DD
<i>Scinax albicans</i> (Bokermann, 1967)	X			<i>Leptodactylus flavopictus</i> Lutz, 1926			
<i>Scinax alter</i> (Lutz, 1973)				<i>Leptodactylus fuscus</i> (Schneider, 1799)			
<i>Scinax angrensis</i> (Lutz, 1973)*	X			<i>Leptodactylus labyrinthicus</i> (Spix, 1824)			
<i>Scinax argyreornatus</i> (Miranda-Ribeiro, 1926)				<i>Leptodactylus latrans</i> (Steffen, 1815)**			
<i>Scinax ariadne</i> (Bokermann, 1967)			DD	<i>Leptodactylus marambaiae</i> Izecksohn, 1976		X	
<i>Scinax atratus</i> (Peixoto, 1989)			DD	<i>Leptodactylus mystacinus</i> (Burmeister, 1861)			
<i>Scinax cardosoi</i> (Carvalho-e-Silva & Peixoto, 1991)				<i>Leptodactylus natalensis</i> Lutz, 1930			
<i>Scinax crospedospilus</i> (Lutz, 1925)				<i>Leptodactylus spixii</i> Heyer, 1983			
<i>Scinax cuspidatus</i> (Lutz, 1925)				<i>Paratelmatobius lutzii</i> Lutz & Carvalho, 1958			DD CR
<i>Scinax dolloi</i> (Werner, 1903)*	X			<i>Paratelmatobius mantiqueira</i> Pombal & Haddad, 1999*			DD
<i>Scinax duartei</i> (Lutz, 1951)			VU	<i>Physalaemus angrensis</i> Weber, Gonzaga & Carvalho-e-Silva, 2006*	X		DD
<i>Scinax eurydice</i> (Bokermann, 1968)				<i>Physalaemus cuvieri</i> Fitzinger, 1826			
<i>Scinax flavoguttatus</i> (Lutz & Lutz, 1939)				<i>Physalaemus maculiventris</i> (Lutz, 1925)			
<i>Scinax fuscovarius</i> (Lutz, 1925)				<i>Physalaemus marmoratus</i> (Reinhardt & Lütken, 1862)**			
<i>Scinax hayii</i> (Barbour, 1909)				<i>Physalaemus olfersi</i> (Lichtenstein & Martens, 1856)			
<i>Scinax hiemalis</i> (Haddad & Pombal, 1987)*				<i>Physalaemus signifer</i> (Girard, 1853)			
<i>Scinax humilis</i> (Lutz & Lutz, 1954)	X			<i>Physalaemus soaresi</i> Izecksohn, 1965	X		EN CR
<i>Scinax insperatus</i> Silva & Alves-Silva, 2011*	X			<i>Pseudopaludicola</i> sp.**	?		
<i>Scinax littoreus</i> (Peixoto, 1988)	X			Microhylidae			
<i>Scinax melloi</i> (Peixoto, 1989)			DD	<i>Arcovomer passarellii</i> Carvalho, 1954			
<i>Scinax nasiscus</i> (Cope, 1862)*				<i>Chiasmocleis atlantica</i> Cruz, Caramaschi & Izecksohn, 1997			
<i>Scinax obtriangulatus</i> (Lutz, 1973)				<i>Chiasmocleis lacrimae</i> Peloso, Sturaro, Forlani, Gaucher, Motta, & Wheeler, 2014**			EN
<i>Scinax perpusillus</i> (Lutz & Lutz, 1939)				<i>Elachistocleis cesarii</i> (Miranda-Ribeiro, 1920)*			
<i>Scinax similis</i> (Cochran, 1952)				<i>Myersiella microps</i> (Duméril & Bibron, 1841)			
<i>Scinax trapicheiroi</i> (Lutz & Lutz, 1954)	X		NT	<i>Stereocyclops parkeri</i> (Wettstein, 1934)**			
<i>Scinax tupinamba</i> Silva & Alves-Silva, 2008*	X			Odontophrynidae			
<i>Scinax tymbamirim</i> Nunes, Kwet & Pombal, 2012*				<i>Odontophrynus americanus</i> (Duméril & Bibron, 1841)			
<i>Scinax v-signatus</i> (Lutz, 1968)				<i>Proceratophrys appendiculata</i> (Günther, 1873)	X		
<i>Scinax aff. x-signatus</i> (Spix, 1824)*	?			<i>Proceratophrys boiei</i> (Wied-Neuwied, 1824)			
<i>Sphaenorhynchus orophilus</i> (Lutz & Lutz, 1938)				<i>Proceratophrys izecksohni</i> Dias, Amaro, Carvalho-e-Silva & Rodrigues, 2013*	X		
<i>Sphaenorhynchus planicola</i> (Lutz & Lutz, 1938)				<i>Proceratophrys mantiqueira</i> Mângia, Santana, Cruz & Feio, 2014*			
<i>Trachycephalus imitatrix</i> (Miranda-Ribeiro, 1926)				<i>Proceratophrys melanopogon</i> (Miranda-Ribeiro, 1926)			
<i>Trachycephalus mesophaeus</i> (Hensel, 1867)				<i>Proceratophrys schirchi</i> (Miranda-Ribeiro, 1937)			
<i>Trachycephalus nigromaculatus</i> Tschudi, 1838				<i>Proceratophrys tupinamba</i> Prado & Pombal, 2008*	X		
<i>Xenohyla truncata</i> (Izecksohn, 1959)	X		NT EN	Ranidae			
Hylodidae				<i>Lithobates catesbeianus</i> (Shaw, 1802)			
<i>Crossodactylus aeneus</i> Müller, 1924	X		DD	<b>GYMNOPHIONA</b>			
<i>Crossodactylus boulengeri</i> (De Witte, 1930)*			DD	Siphonopidae			
<i>Crossodactylus dispar</i> Lutz, 1925			DD	<i>Mimosiphonops vermiculatus</i> Taylor, 1968	X		DD
<i>Crossodactylus gaudichaudii</i> Duméril & Bibron, 1841				<i>Siphonops annulatus</i> (Mikan, 1820)			
<i>Crossodactylus grandis</i> Lutz, 1951			DD	<i>Siphonops hardyi</i> Boulenger, 1888			
<i>Crossodactylus werneri</i> Pimenta, Cruz & Caramaschi, 2014*				Typhlonectidae			
<i>Hylodes asper</i> (Müller, 1924)				<i>Chthonerpeton braestrupi</i> Taylor, 1968*	?		DD
<i>Hylodes charadranaetes</i> Heyer & Cocroft, 1986	X		DD				
<i>Hylodes fredii</i> Canedo & Pombal, 2007*	X		DD				

Martins *et al.*, 2012; Telles *et al.*, 2012; Bittencourt-Silva & Silva, 2013). Pending resolution of the taxonomic problems regarding the name *Scinax x-signatus* and determination of the status of species of this complex occurring in the state of Rio de Janeiro, we add *Scinax* aff. *x-signatus* to the list.

Regarding the Gymnophiona, only one species, *Chthonerpeton braestrupi*, has been added herein to the previous list, raising to four the number of species in this group with records for the state of Rio de Janeiro. That caecilian species was originally described based on a single specimen (now presumably lost) with an imprecise provenance ("Brazil") (Taylor, 1968). Almeida-Gomes *et al.* (2014) recorded a specimen identified as *C. braestrupi* in a forest fragment in the municipality of Cachoeiras de Macacu, which thus became the second known example of that taxon. Rocha *et al.* (2004) did not include any species of *Chthonerpeton* in their list, but commented that a presumably undescribed species of that genus has been recorded at the municipality of Paracambi (some 100 km west of Cachoeiras de Macacu). More recently, Martins *et al.* (2012) reported *Chthonerpeton* sp. for the municipality of Iguaba Grande (some 70 km southeast of Cachoeiras de Macacu) and presumed it might be the same taxon as the one cited by Rocha *et al.* (2004). In both cases above, a careful examination of these specimens may reveal them to be *C. braestrupi* or other, possibly undescribed taxa. In any case, it is likely that more species of that genus will eventually be found to occur in the state of Rio de Janeiro.

Mott *et al.* (2016) recently reviewed the distribution range of *Siphonops paulensis* Boettger, 1892 and included a record from Teresópolis, state of Rio de Janeiro, in their range map, quoting Sawaya's (1937) revision of the genus *Siphonops* as its source. This could mean another new caecilian record for the state, as *S. paulensis* is not on the list of Rocha *et al.* (2004). However, Sawaya (1937) explicitly stated that all specimens of *Siphonops* that he examined from Teresópolis were from the species *S. annulatus*. He also mentioned that all of the *S. paulensis* individuals he examined (including, by implication, those of his proposed new "variety" *S. paulensis* var. *maculatus*) were old museum specimens that had been collected in the surroundings of São Paulo city. Thus, *Siphonops paulensis* must remain out of the amphibian list of Rio de Janeiro state. Mott *et al.* (2016) were likely misled by Dunn (1942) who erroneously stated that Sawaya (1937) had reported *S. paulensis* from Teresópolis.

Like the case mentioned above, we found other instances in which species not listed by Rocha *et al.* (2004) have been reported or suggested to occur in Rio de Janeiro by other authors. We investigated these potential new records and found that none of them were reliable. One of them concerns *Boana bischoffi* (Boulenger, 1887), whose range is given by Frost (2017) as "from Rio de Janeiro to Rio Grande do Sul", without citing sources. Nevertheless, according to Marcelino *et al.* (2009), who analyzed morphological variation of *B. bischoffi* across its geographic distribution range, this species does not extend northwards beyond the northern coast of São Paulo

state. Thus, we opted for keeping this taxon off the list due to lack of solid evidence of its occurrence in the state of Rio de Janeiro.

There is also the case of *Phyllomedusa megacephala* (Miranda-Ribeiro, 1926), a species whose occurrence in Rio de Janeiro has been considered probable (Brandão, 2002). It was described (as *Bradymedusa megacephala*) based on a single specimen of uncertain provenance [given as "Rio de Janeiro?" by Miranda-Ribeiro (1926)]. After comparing the holotype of *P. megacephala* with other specimens collected more recently, Caramaschi (2006) concluded that the type did not come from Rio de Janeiro and that the species occurs only in the Espinhaço mountain range in the state of Minas Gerais. Therefore, we do not include this taxon on the list.

Finally, *Adenomera bokermanni* (Heyer, 1973) was reported by Almeida-Gomes *et al.* (2014) from the municipality of Cachoeiras de Macacu. However, according to Fouquet *et al.*, (2014) 'true' *A. bokermanni* has a relatively restricted distribution limited to coastal forests in the states of Paraná and northern Santa Catarina, in southern Brazil. They mention that many individuals of *Adenomera* from other localities that have been previously attributed to *A. bokermanni* (including most of the original type series) are in fact referable to the recently described *A. thomei*. This latter species, originally described from a lowland site in the state of Espírito Santo (Almeida & Angulo, 2006), was found by Fouquet *et al.* (2014) to have a relatively broad distribution, encompassing much of the states of Espírito Santo and Rio de Janeiro, as well as southeast São Paulo and southern Minas Gerais. The occurrence of *A. thomei* in the state of Rio de Janeiro has also been reported by Martins *et al.* (2014), who recorded the species in the municipality of Saquarema. Thus, we believe that the species reported by Almeida-Gomes *et al.* (2014) was in fact *A. thomei* and thus we do not add *A. bokermanni* to the list.

Our addition or removal of some species from the previous list of Rocha *et al.* (2004) result from taxonomic revisions (synonymizations/revalidations), re-evaluations of their occurrence records, or nomenclatural changes to the species' epithets that have been published since 2004. We list and comment those cases below.

### Family Aromobatidae

*Allobates carioca* (Bokermann, 1967) was synonymized with *Allobates offersioides* by Verdade & Rodrigues (2007), being thus excluded from the list.

### Family Brachycephalidae

*Brachycephalus bufonoides* and *B. garbeanus* were resurrected from synonymy with *B. ephippium* and validated as full species (Pombal, 2010).

The species listed as "*Eleutherodactylus* gr. *lacteus* (Miranda-Ribeiro, 1923)" by Rocha *et al.* (2004) is probably meant to be *Ischnocnema lactea*. This species is prob-

lematic, however, and needs to be reviewed in order to define its actual status and geographic distribution (T. Silva-Soares, *pers. comm.*). As *I. lactea* was described from a site in the state of São Paulo and attribution of this name to other populations at present is considered problematic, we exclude this species from the list pending resolution of its taxonomic status.

*Ischnocnema nigriventris* (Lutz, 1925) was originally described based on specimens from "Serra de Cubatão" (state of São Paulo) and "Itatiaia" (state of Rio de Janeiro) (Lutz, 1925). Presumably based on the latter record, the species was included in the list of Rocha *et al.* (2004). Since then, Berneck *et al.* (2013) have reviewed the species based on the existing syntypes and on newly collected material, concluding that *I. nigriventris* occurs only in the state of São Paulo. Berneck *et al.* (2013) argue that the record from Itatiaia was based on a specimen that is presently lost, and apparently not conspecific with the remaining syntypes (as previously suggested by Heyer, 1985). Thus, we herein remove this species from the list of amphibians occurring in the state of Rio de Janeiro.

#### Family Bufonidae

Baldissera *et al.* (2004) reviewed the *Bufo crucifer* (now *Rhinella crucifer*) group and resurrected *Bufo ornatus* Spix, 1824 (now *Rhinella ornata*). According to that work, all records of *R. crucifer* from the state of Rio de Janeiro should be attributed to *R. ornata*. However, *R. crucifer* (*sensu* Baldissera *et al.*, 2004) was subsequently reported from different localities in Rio de Janeiro (Marques *et al.*, 2006; Silveira *et al.*, 2009; Almeida-Gomes *et al.*, 2010), confirming the presence of both species in the state. Additionally, Silveira *et al.* (2009) presented the first records of another member of the *R. crucifer* complex, *R. pombali* (Baldissera, Caramaschi & Haddad, 2004), for the state of Rio de Janeiro. However, recent molecular studies have found no support for the validity of *R. pombali* (Thomé *et al.*, 2010, 2012), and it was concluded that this taxon was based on *R. crucifer* × *R. ornata* hybrids (Thomé *et al.*, 2012). As *R. pombali* is currently an invalid taxon, it is not included herein in the list.

The species listed in Rocha *et al.* (2004) as "*Bufo* gr. *margaritifera* Laurenti, 1768" is, most probably, *Rhinella hoogmoedi* Caramaschi & Pombal, 2006, which is currently the only species of the *R. margaritifera* group known to occur in the state (Frost, 2017). Therefore, we substituted the former name by the latter.

#### Family Cycloramphidae

Lima *et al.* (2010) considered Heyer's (1983) record of *Cycloramphus lutzorum* Heyer, 1983 for the state of Rio de Janeiro as dubious, and implicitly restricted the species (which they rediscovered after nearly two decades without records) to the states of São Paulo and Paraná. Therefore, we remove *C. lutzorum* from the list of amphibians of Rio de Janeiro.

#### Family Hemiphractidae

*Fritziana ulei* was resurrected from synonymy with *Fritziana fissilis* by Folly *et al.* (2014).

#### Family Hylidae

*Aplastodiscus callipygius* (Cruz & Peixoto, 1985) was synonymized with *A. albosignatus* (a species absent from the list of Rocha *et al.*, 2004) by Berneck *et al.* (2016). Thus, we substituted the former name by the latter in our list.

*Bokermannohyla clepsydra* (Lutz, 1925) is known only from its type locality in the state of São Paulo (Frost, 2017) and is thus herein removed from the list.

*Scinax dolloi* (Werner, 1903) is a problematic taxon, as this name is not currently associated to any known frog population (Frost, 2017). Nevertheless, Caramaschi *et al.* (2013) concluded that its type locality (not given in the original description of Werner, 1903) is Maringá, in the Municipality of Itatiaia, and thus we included this species on the list.

#### Family Hylodidae

*Crossodactylus boulengeri* was resurrected from synonymy with *C. dispar* (Pimenta *et al.*, 2014).

#### Family Leptodactylidae

The species formerly known as *Leptodactylus ocellatus* (Linnaeus, 1758) is currently called *L. latrans*. According to Lavilla *et al.* (2010), the name *Rana ocellata* Linnaeus, 1758 does not represent a leptodactylid, but the Jamaican hylid *Osteopilus brunneus* (Gosse, 1851), and the oldest available name for the taxon then known as *Leptodactylus ocellatus* is *Rana latrans* Steffen, 1815.

Nascimento *et al.* (2006) has shown that the correct name of the species to which the name *Physalaemus fuscomaculatus* (Steindachner, 1864) used to be formerly applied is *P. marmoratus*. Currently, *Eupemphix fuscomaculatus* Steindachner, 1864 is considered a junior synonym of *Physalaemus biligonigerus* Cope, 1861 (see Kolenc *et al.*, 2011), a species that does not occur in Rio de Janeiro (Frost, 2017).

Langone *et al.* (2015) reviewed the distribution range of *Pseudopaludicola falcipes* (Hensel, 1867) and concluded that this species is restricted to northern Argentina, Uruguay, and the extreme south of Brazil, with all previous Brazilian records outside that range (including those from Rio de Janeiro state) representing misidentifications. Therefore, we remove *P. falcipes* from the list of amphibians of Rio de Janeiro, observing that the identity of the *Pseudopaludicola* species occurring in the state is presently unknown, which we acknowledge by listing it as *Pseudopaludicola* sp.

### Family Microhylidae

Peloso et al. (2014) synonymized the genus *Syncope* Walker, 1973 with *Chiasmocleis* M  hely, 1904, thus creating an instance of homonymy between *Chiasmocleis carvalhoi* (Nelson, 1975) (formerly in the genus *Syncope*) and *Chiasmocleis carvalhoi* Cruz, Caramaschi & Izecksohn, 1997. To solve the problem Peloso et al. (2014) renamed the latter species (i.e., the junior homonym) as *C. lacrimae*.

Silveira et al. (2010) reported the first record of *Elachistocleis ovalis* (Schneider, 1799), and also of the genus *Elachistocleis* Parker, 1927, for the state of Rio de Janeiro, based on a specimen from the municipality of Itaperuna. Caramaschi (2010) considered *E. ovalis* a *nomen dubium*, and identified all specimens of *Elachistocleis* examined by him from the state of Rio de Janeiro (including the specimen reported by Silveira et al., 2010) as *E. cesarii*, a species that had just been revalidated by Toledo et al. (2010) for specimens from the state of S  o Paulo. Thus, the species of *Elachistocleis* occurring in Rio de Janeiro is currently referred to *E. cesarii*.

The records of *Stereocyclops incrassatus* Cope, 1870 in the state of Rio de Janeiro are currently considered to represent *S. parkeri* (see Frost, 2017). Previously in the synonymy of *S. incrassatus* (see Carvalho, 1948), *S. parkeri* was treated as a valid taxon by Bokermann (1966) without comment, and this has been followed by most subsequent authors since then (e.g., Izecksohn & Carvalho-e-Silva, 2001; Haddad et al., 2013).

### Conservation remarks

Fifty-four amphibian species are presently considered endemic of the state of Rio de Janeiro, corresponding to 27% of the state's amphibian richness (Table 1). These include *Ischnocnema guentheri* (*sensu stricto*), which was recently considered a microendemic species and is now restricted to the municipality of Rio de Janeiro, with records from elsewhere representing *I. henselii* and four undescribed cryptic species (Gehara et al., 2013). Also, 16 species (8% of the state's amphibians) are currently considered to be under some level of threat (excluding those categorized as DD) at either the global or national level, or both (Table 1). Some of these, and even a few that are classified as DD, have not been recorded for decades and are possibly extinct, as is the case of *Aplastodiscus musicus*, *Holoaden bradei* and *Thoropa petropolitana*. Although conservation strategies tend to prioritize threatened species, IUCN has recommended to give similar attention to the species considered as "data deficient" (DD), though this is still not being properly done (Pimenta et al. 2005; Siqueira et al. 2013). Species labeled as "DD" currently represent 19% (N = 38) of the amphibian fauna of Rio de Janeiro (Table 1) and, considering that the threat status of several recently described species have not yet been evaluated by the IUCN (2016), this number tends to increase.

Exotic invasive species constitute the second greatest threat to biodiversity, after habitat destruction (Rocha

et al., 2011). In the state of Rio de Janeiro, the American bullfrog, *Lithobates catesbeianus*, remains the only known exotic amphibian occurring in natural habitats. Since 2004, there have been a number of new records of occurrence of the American bullfrog in different parts of the state (Salles et al., 2009; Almeida-Gomes et al., 2014; Pontes et al., 2015). This anuran, native to the eastern and central regions of the United States, is believed to be expanding its distribution in the state of Rio de Janeiro (Rocha et al., 2004; van Sluys et al., 2009), which points to the necessity of monitoring of its populations and of management programs for removal of individuals from natural habitats.

*Scinax nasicus*, a species typical of open habitats such as Cerrados, has been recently reported from the municipality of Porto Real, representing the easternmost record of the species and the one closest to the coast (Pederassi et al., 2015). The finding of this species in an area that is currently practically devoid of forest remnants suggests that deforestation may be favoring the colonization and/or range expansion of open-habitat anuran species in the state, as previously reported for the viperid snake *Crotalus durissus* Linnaeus, 1758 (Bastos et al., 2005).

Recently, a total of 1,080 species of amphibians were reported to occur in Brazil (Segalla et al., 2016) and 543 species were reported for the Atlantic Forest biome (Haddad et al., 2013). Thus, the state of Rio de Janeiro, in spite of its relatively small territorial extension, contains approximately 19% of the amphibian species known to occur in Brazil and nearly 40% of the Atlantic Forest amphibian species. Nevertheless, the list reported herein for Rio de Janeiro is likely still far from exhaustive, judging by the numerous recent reports of undescribed species from throughout the state, including members of genera such as *Brachycephalus* (Siqueira et al., 2011a, b, 2013), *Ischnocnema* (Siqueira et al., 2011b; Gehara et al., 2013), *Euparkerella* (Fusinatto et al., 2013), *Adenomera* (Fouquet et al., 2014), *Fritziana* (Siqueira et al., 2011b; Castroviejo-Fisher et al., 2015), *Aplastodiscus* (Berneck et al., 2016), and *Scinax* (Bittencourt-Silva & Silva, 2013). This indicates that the current amphibian richness recorded for the state is still an underestimate, and is likely to increase in the years to come following the intensification of taxonomic studies and of local herpetofaunal surveys. The state of Rio de Janeiro thus constitutes an important reservoir of amphibian (and, especially, anuran) biodiversity in the Atlantic Forest biome and of Brazil, as a whole.

### ACKNOWLEDGEMENTS

This study is portion of the results of both the "Programa de Pesquisas em Biodiversidade do Estado do Rio de Janeiro – BIOTA Rio supported by Funda  o Carlos Chagas Filho de Amparo    Pesquisa do Estado do Rio de Janeiro – FAPERJ (Process No. E-26\_010.001639\_2014) to C.F.D. Rocha and of the "Programa de Pesquisas em Biodiversidade da Mata Atl  ntica (PPBio Mata Atl  ntica Program)" of Minist  rio do Meio Ambiente do Brasil (MMA) supported by Conselho Nacional de Desenvolvimento Cient  fico e Tecnol  gico (CNPq)

(Process No. 457458/212-7). The authors benefitted from grants provided to C.F.D. Rocha (304791/2010-5; 470265/2010-8; 302974/2015-6) from Conselho Nacional do Desenvolvimento Científico e Tecnológico (CNPq) and through "Cientistas do Nosso Estado" Program from FAPERJ (process No. E-26/102.765.2012 E-26/202.920.2015). T.A. Dorigo received PhD fellowship from Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES).

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