European Journal of Taxonomy 836: 96–130
https://doi.org/10.5852/ejt.2022.836.1919
ISSN 2118-9773
www.europeanjournaloftaxonomy.eu
2022 · Taucce P.P.G. *et al.*

Research article

urn:lsid:zoobank.org:pub:86496226-C36D-435C-B9ED-1CEE58132E66

Anurans (Amphibia: Anura) of the Brazilian state of Amapá, eastern Amazonia: species diversity and knowledge gaps

Pedro P.G. TAUCCE [1,*], Carlos Eduardo COSTA-CAMPOS [2], Thiago R. CARVALHO [3] & Fernanda MICHALSKI [4]

[1,4]Grupo de Pesquisa em Ecologia e Conservação de Vertebrados da Amazônia, Universidade Federal do Amapá, Macapá, Brazil.
[1,4]Programa de Pós-Graduação em Biodiversidade Tropical, Universidade Federal do Amapá, Macapá, Brazil.
[1]Current address: Coordenação de Biodiversidade, Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil.
[2]Laboratório de Herpetologia, Departamento de Ciências Biológicas e da Saúde, Universidade Federal do Amapá, Macapá, Brazil.
[3]Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil.
[4]Instituto Pró-Carnívoros, Atibaia, São Paulo, Brazil.

[*]Corresponding author: pedrotaucce@gmail.com
[2]Email: dudududeducampos@gmail.com
[3]Email: carvalho.thiagoribeiro@gmail.com
[4]Email: fmichalski@gmail.com

[1]urn:lsid:zoobank.org:author:BF8DF102-EF9C-4508-BC0C-377425F7B10A
[2]urn:lsid:zoobank.org:author:1FD9B941-088A-4D4D-9DA4-0C04956F94ED
[3]urn:lsid:zoobank.org:author:A1B4BF8D-81F9-4602-9AD0-48DE40E48A9C
[4]urn:lsid:zoobank.org:author:6F61085B-77DD-4545-9889-B373ED263320

Abstract. We herein present the first annotated anuran checklist for the Brazilian state of Amapá, eastern Amazonia, based on a thorough literature review. We recorded the occurrence of 111 species belonging to 13 anuran families distributed across 48 localities throughout Amapá, within two biomes. Among these species, 62.5% occur exclusively in the Tropical Moist Broadleaf Forest biome, ~8% occur exclusively in the Tropical Savanna biome, and ~29% occur in both. Two species were considered endemic to Amapá and were registered only in the central portion of the state. Regarding the conservation status, only one species (*Dendropsophus amicorum*) is classified as threatened, assigned to the "critically endangered" category. The other species are categorized as either "least concern" or "data deficient" (85 and 8, respectively), whereas 21 are not evaluated. The current annotated list contributes to the incipient knowledge on anuran species richness in Amapá and, despite the research regarding anuran taxonomy has considerably progressed over the past 20 years, there is still much to do. Our data highlight the need for trained taxonomists to develop research in the state.

Keywords. Diversity, Guiana Shield, herpetology, species list.

Taucce P.P.G., Costa-Campos C.E., Carvalho T.R. & Michalski F. 2022. Anurans (Amphibia: Anura) of the Brazilian state of Amapá, eastern Amazonia: species diversity and knowledge gaps. *European Journal of Taxonomy* 836: 96–130 https://doi.org/10.5852/ejt.2022.836.1919

Introduction

Amazonia spans more than 6 million square kilometers across eight South American countries and it is one of the most critical natural environments to sustain the biodiversity and regulate climate on a global scale (Davidson *et al.* 2012; Charity *et al.* 2016). In addition to its continental size, Amazonia holds remarkable environmental heterogeneity, having many vegetation types, from forested formations like 'Terra firme' (forests growing on the flood-free interfluves) and 'várzeas' (forests growing on the seasonally inundated floodplains, found along rivers carrying copious quantities of sediments and nutrients), to savannas sensu stricto (Oliveira-Filho *et al.* 2021). Such environmental heterogeneity affects the species diversity patterns in Amazonia, which has been divided into large geographic regions based on faunistic and floristic similarity since the nineteenth century (e.g., Wallace 1852). Authors have used many different taxa to define this biogeographic organization, or areas of endemism, from angiosperms (Prance 1982) to vertebrates (Ribas *et al.* 2012; Godinho & Silva 2018). The number of biogeographic regions vary depending on study, but some of them are frequently recovered with slightly different limits, such as the Guianan Biogeographic Region (Cracraft *et al.* 1988; Patton *et al.* 2000; Godinho & Silva 2018; Vacher *et al.* 2020). This region is in the eastern portion of the Guiana Shield and lays mostly below 400 m above sea level, encompassing Suriname, French Guiana, eastern Guyana, and part of the Brazilian states of Pará, Amazonas, and the entire state of Amapá.

The state of Amapá has a territory of about 143 000 square kilometers (slightly larger than Greece) and harbors three biomes (Olson *et al.* 2001): Tropical Moist Broadleaf Forests; Tropical Grasslands, Savannas, and Shrublands (known as the Cerrado of Amapá); and Mangroves. The great majority of the state's territory (almost 82%) is composed of forested formations (Souza *et al.* 2020), which harbor a variety of vegetation types like Terra firme and várzeas forests, coastal vegetation mosaics, savannas, and even rock outcrops (Oliveira-Filho *et al.* 2021). Such habitat heterogeneity provides a high biodiversity to the state and, despite the fact that there are some punctual biologic inventories (e.g., Silva *et al.* 1997 [birds]; Cáceres & Aptroot 2016 [lichens]; Melo *et al.* 2016 [fishes]; Benício & Lima 2017 [anurans]), and also some DNA-based exploration of the diversity of the region (e.g., Vacher *et al.* 2020 [anurans]), studies compiling the knowledge about large taxonomic groups in Amapá are scarce. Apart from mammals (Silva *et al.* 2013), no other vertebrate group has a compiled species list for the state of Amapá.

Herein, we present the first amphibian anuran checklist for the Brazilian state of Amapá based on an extensive literature review. We also summarize detailed geographic coordinates of each species occurrence, offer insights into their distribution, and reduce knowledge gaps. Moreover, anuran taxonomy has changed greatly during the 21st century, with large phylogenies and multidata integrative taxonomic reviews enabled by the molecular and digital revolutions (e.g., Frost *et al.* 2006; Peloso *et al.* 2014). Thus, to enhance the knowledge regarding the anurans of Amapá, we update and make comments on the taxonomy of several species.

Material and methods

We based our list mainly on literature records, through extensive searches on the 'Google Scholar' website (http://scholar.google.com) using the following combination of entries: "Amphibia* and Amapá", "Anura* and Amapá", and "Herpeto* and Amapá". Additionally, we searched for the keyword "Amapá" in the basic search engine of the website 'Amphibian Species of the World'

Table 1. Literature records used to complete the anuran checklist from the state of Amapá.

	Reference	Type	Subject
1	Araújo *et al.* (2014)	peer-reviewed article	checklist
2	Araújo *et al.* (2018)	peer-reviewed article	geographic distribution
3	Benício & Lima (2017)	peer-reviewed article	checklist
4	Corrêa *et al.* (2015)	peer-reviewed article	geographic distribution
5	Costa-Campos *et al.* (2016)	peer-reviewed article	geographic distribution
6	Costa-Campos & Carvalho (2018)	peer-reviewed article	taxonomy
7	Costa-Campos & Freire (2019)	peer-reviewed article	checklist
8	Costa-Campos *et al.* (2019)	peer-reviewed article	geographic distribution
9	Costa-Campos *et al.* (2020a)	peer-reviewed article	geographic distribution
10	Costa-Campos *et al.* (2020b)	peer-reviewed article	geographic distribution
11	Costa-Campos *et al.* (2020c)	peer-reviewed article	geographic distribution
12	Costa-Campos *et al.* (2021)	peer-reviewed article	geographic distribution
13	Dias-Souza *et al.* (2021)	peer-reviewed article	geographic distribution
14	Ferreira-Lima *et al.* (2017)	peer-reviewed article	checklist
15	Ferreira-Lima *et al.* (2019)	peer-reviewed article	geographic distribution
16	Figueiredo *et al.* (2020)	peer-reviewed article	geographic distribution
17	Figueiredo *et al.* (2021a)	peer-reviewed article	geographic distribution
18	Figueiredo *et al.* (2021b)	peer-reviewed article	geographic distribution
19	Fouquet *et al.* (2016)	peer-reviewed article	taxonomy
20	Fouquet *et al.* (2021a)	peer-reviewed article	taxonomy
21	Lima (2006a)	report	checklist
22	Lima (2006b)	report	checklist
23	Lima (2008)	report	checklist
24	Lima (2018)	report	checklist
25	Menin *et al.* (2020)	peer-reviewed article	Taxonomy
26	Missassi *et al.* (2017)	peer-reviewed article	geographic distribution
27	Pedroso-Santos *et al.* (2019)	peer-reviewed article	checklist
28	Peloso *et al.* (2014)	peer-reviewed article	taxonomy
29	Pereira-Júnior *et al.* (2013)	peer-reviewed article	checklist
30	Queiroz *et al.* (2011)	peer-reviewed article	checklist
31	Rojas *et al.* (2018)	peer-reviewed article	taxonomy
32	Silva-e-Silva & Costa-Campos	peer-reviewed article	checklist
33	Sousa *et al.* (2016)	peer-reviewed article	geographic distribution
34	Tavares-Pinheiro *et al.* (2021)	peer-reviewed article	geographic distribution
35	Vacher *et al.* (2020)	peer-reviewed article	molecular survey

(http://research.amnh.org/vz/herpetology/amphibia; Frost 2022). A remarkable amount of information on the fauna of Amapá is available in the gray literature, and we also used reports from governmental and non-governmental institutions in our compilation. We conducted the searches between June and September 2021. We based our records mainly on new species descriptions, species checklists, notes on geographic distribution, and DNA-based explorations of the diversity in anurans of the region, but we also used other papers such as call and tadpole descriptions. We only accounted the registries (i.e., one taxon at a specific place) once, reporting here only the most recent records. Concerning the localities,

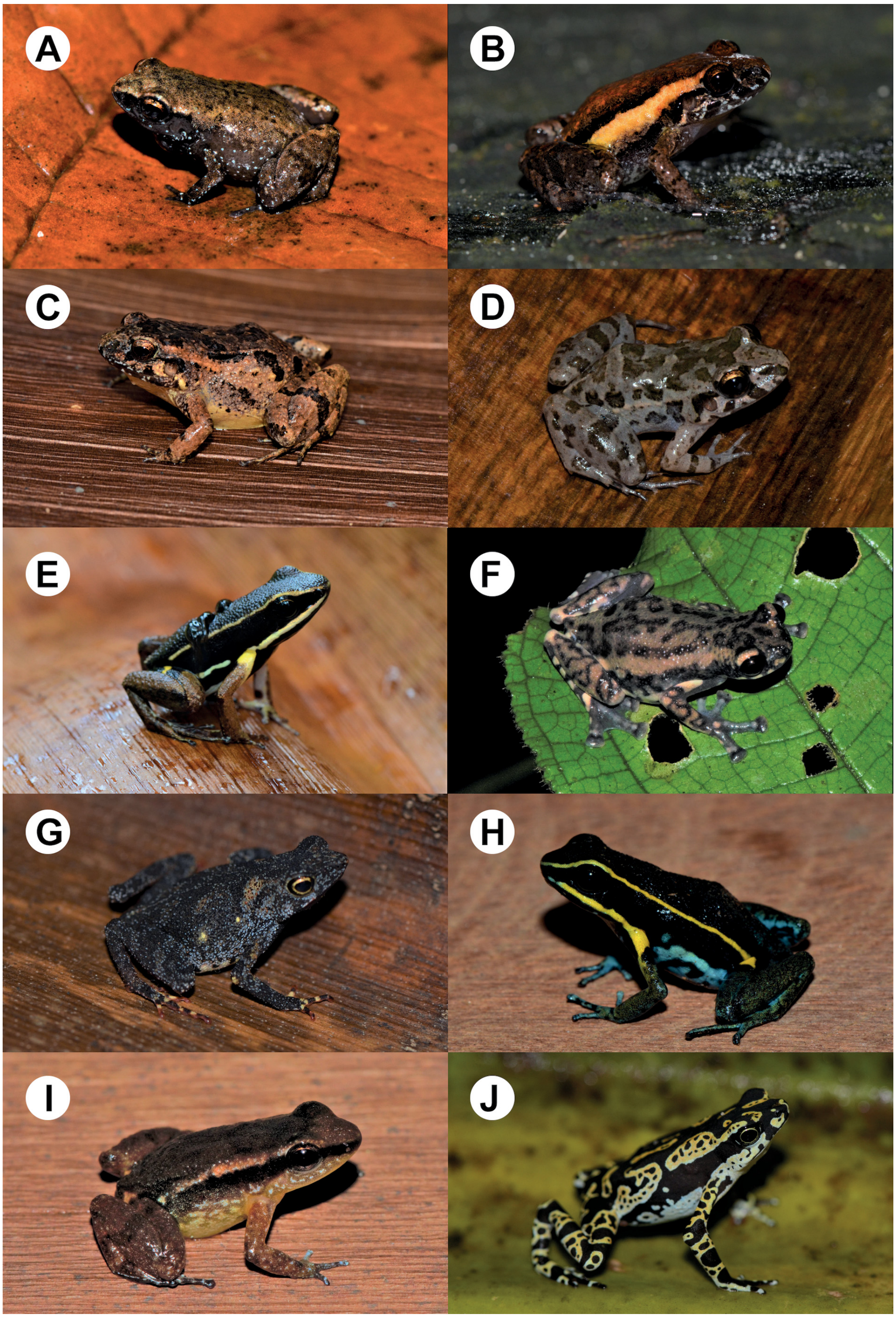

Fig. 1. Anuran species recorded in the state of Amapá. **A**. *Adelophryne amapaensis* Taucce, Costa-Campos, Haddad & Carvalho, 2020. **B**. *Adenomera andreae* Müller, 1923. **C**. *Adenomera heyeri* Boistel, Massary & Angulo, 2006. **D**. *Adenomera hylaedactyla* (Cope, 1868). **E**. *Allobates femoralis* Boulenger, 1884. **F**. *Allophryne ruthveni* Gaige, 1926. **G**. *Amazophrynella teko* Rojas, Fouquet, Ron, Hernández-Ruz, Melo-Sampaio, Chaparro, Vogt, Carvalho, Pinheiro, Ávila, Farias, Gordo & Hrbek, 2018. **H**. *Ameerega pulchripecta* (Silverstone, 1976). **I**. *Anomaloglossus baeobatrachus* (Boistel & Massary, 1999). **J**. *Atelopus hoogmoedi* Lescure, 1974. Photos: C.E. Costa-Campos.

we only reported them if they were at least 5 km apart from each other. We merged localities closer than 5 km to each other.

We applied the nomenclature for the taxa at the species, genus, and family levels following Frost (2022) and Segalla *et al.* (2021). In general, we did not include undescribed species or taxa not identified to the species level (i.e., records treated in the literature as “aff.”, “cf.”, and “sp.”), except in cases where we could confirm their taxonomic status using information available in the literature and / or our own data. We discuss all these cases in the “Taxonomic Comments” section within the Discussion below. To assess species conservation status, we used the categories of The IUCN Red List of Threatened Species (IUCN 2022).

Results

We used 12 local anuran checklists, 16 notes on distribution extension, six taxonomic studies, and a molecular survey study (35 studies in total; Table 1) to complete our list. We compiled a list of 111 species belonging to 13 anuran families (Figs 1–9, Table 2), distributed across 48 localities, within two biomes (Table 3, Fig. 10). The most representative families were Hylidae (41 species) and Leptodactylidae (21 species), representing together almost 56% of all species, whereas Allophrynidae, Ceratophryidae, Eleutherodactylidae, and Pipidae were represented by one species each. Among the 111 species, 69 (~62%) occur exclusively in the Tropical Moist Broadleaf Forest biome, nine (~8%) occur exclusively in the Tropical Savanna biome, and 33 (~30%) occur in both biome types. Seventeen (~15%) are known only from one locality and only three species (less than 3%) have their type localities within the state of Amapá: *Adelophryne amapaensis* Taucce, Costa-Campos, Haddad & Carvalho, 2020, *Boana dentei* (Bokermann, 1967), and *Ameerega pulchripecta* (Silverstone, 1976), all from the municipality of Serra do Navio (Bokermann 1967; Silverstone 1976; Taucce *et al.* 2020). Two of them, *Ad. amapaensis* and *Am. pulchripecta,* are endemic to the state of Amapá and were registered only in the central portion of the state, in the municipalities of Serra do Navio and Pedra Branca do Amapari, with *Am. pulchripecta* also occurring in Ferreira Gomes.

Conservation status

Regarding the conservation status, 81 (~73%) species are categorized as “least concern”, while eight (~7%) are categorized “data deficient” (IUCN 2022). Only one species, *Dendropsophus amicorum* (Mijares-Urrutia, 1998), is classified as threatened, assigned to the “critically endangered” category, and 21 (~19%) species are not evaluated to date (IUCN 2022). Most of the non-evaluated species were described between 2011 and 2022, except for three undescribed species, *Boana* aff. *semilineata*, *Leptodactylus* sp. and *Rhinella* aff. *castaneotica*, and six species recently revalidated or with a complex taxonomic history: *Atelopus hoogmoedi* Lescure, 1974*, Hyalinobatrachium cappellei* (Van Lidth de Jeude, 1904), *Leptodactylus intermedius* Lutz, 1930, *Leptodactylus macrosternum* Miranda-Ribeiro, 1926, *Pristimantis grandoculis* (van Lidth de Jeude, 1904), and *Rhinella major* (Müller & Hellmich, 1936).

Taxonomic comments

Class Amphibia Blainville, 1816
Order Anura Duméril, 1805
Family **Aromobatidae** Grant, Frost, Caldwell, Gagliardo, Haddad, Kok, Mittel, Noonan, Schargel & Wheeler, 2006

Anomaloglossus baeobatrachus (Boistel & Massary, 1999) is found throughout French Guiana and the state of Amapá, and may be a species complex (Fouquet *et al.* 2019a, 2019b). The specimens from Amapá are recovered in a different clade in comparison with the clade formed by specimens from the type locality (Saint Eugène, French Guiana). Moreover, what is called *An. baeobatrachus* in the literature has two markedly different phenotypes, one with endotrophic (as observed from topotypes) and the other one with exotrophic tadpoles, morphologically indistinguishable from each other (Fouquet *et al*. 2019a, 2019b). The populations with exotrophic tadpoles have signs of past hybridization and more investigation is necessary to clarify their taxonomic status (Fouquet *et al.* 2019a). Although both phenotypes occur in Amapá (Fouquet *et al.* 2019a), we chose to consider all the records under the name *An. baeobatrachus* until the situation is clarified.

Two problematic species appeared among the records, namely *Anomaloglossus beebei* (Noble, 1923) and *Allobates marchesianus* (Melin, 1941). *Anomaloglossus beebei* is an endangered species with a restricted distribution, known only from the Pakaraima region, western Guyana (Cole *et al.* 2013; IUCN 2022). There are records of *An. beebei* from seven localities in central and northeastern Amapá (localities 5, 7–8, 11–12, 14–15; Lima 2006a, 2006b, 2008; Queiroz *et al.* 2011). *Allobates marchesianus* is probably a species complex distributed in Colombia, Peru, Venezuela, and the Brazilian state of Amazonas (Caldwell *et al.* 2002). There are also records of *Al. marchesianus* from central and northeastern Amapá, from five localities (6–8, 14–15; Lima 2006a, 2006b, 2008). According to recent thorough molecular surveys (Fouquet *et al.* 2019b; Rejaud *et al.* 2020; Vacher *et al.* 2020) none of these species occur in the state of Amapá. Besides, we did not have access to any of the vouchers and, due to the complex taxonomic history of the two species (see Caldwell *et al.* 2002; Kok *et al.* 2006), we cannot assign these records undoubtedly to a single species and we chose to remove the records from the list. Nonetheless, it is important to note that *An. beebei* has long been mistaken for *Allobates granti* Kok, MacCulloch, Gaucher, Poelman, Bourne, Lathrop & Lenglet, 2006 (Kok *et al.* 2006) and, although there is no record of *Al. granti* in Amapá, the species is known to inhabit several localities throughout the western border of French Guiana. Thus, at least some of the records of *An. beebei* may actually correspond to *Al. granti*.

Family **Bufonidae** Gray, 1825

A recent study revealed high levels of species diversity within the bufonid genus *Amazophrynella* (Rojas *et al.* 2018), and described a new species for Suriname, French Guiana, and Amapá: *Amazophrynella teko* Rojas, Fouquet, Ron, Hernández-Ruz, Melo-Sampaio, Chaparro, Vogt, Carvalho, Pinheiro, Ávila, Farias, Gordo & Hrbek, 2018. According to their study, it is the only species distributed in Amapá. Vacher *et al.* (2020) also found only one species of *Amazophrynella* in their molecular survey, but they identified it as *A. manaos* Rojas-Zamora, Carvalho, Gordo, Ávila, Farias & Hrbek, 2014 or *A.* aff. *manaos*. We assume that the entries *A. manaos* and *A.* aff. *manaos* in their supplemental material is likely an inconsistent nomenclatural update throughout their species list. Both applied names (*A. manaos* and *A.* aff. *manaos*) of Vacher *et al.* (2020) are undoubtedly conspecific with *A. teko*. In this context, we treated the records of *A. minuta* and *Amazophrynella* sp. 1 from the Amapá National Forest as conspecific with *A. teko* as well.

For more than 30 years, *Atelopus hoogmoedi* was considered a subspecies of *Atelopus pulcher* (Boulenger, 1882) (Lescure 1974, 1976) or *Atelopus spumarius* Cope, 1871 (Lescure *et al.* 1980; Lescure & Marty 2000; Lötters *et al.* 2002). However, Lötters & Schulte (2005) elevated the taxon to full species level and Noonan & Gaucher (2005) provided molecular support for their decision. The populations from Brazil distributed north of the Amazon River, including Amapá, are currently assigned to *A. hoogmoedi* (Costa-Campos & Carvalho 2018; Jorge *et al.* 2020; Silva *et al.* 2020). Thus, we considered the records of *Atelopus barbotini* Lescure, 1981 from Lima (2006a, 2006b) and *A. spumarius* from Queiroz *et al.* (2011) and Lima (2018) as *A. hoogmoedi.* According to Vacher *et al.* (2020), *Atelopus flavescens* Duméril & Bibron, 1841 is also expected to occur in Amapá. However, since the taxonomic status of the populations from Amapá remains partly ambiguous, we adopted only one of the names in our list

Table 2. List of the anuran species of the state of Amapá. Reference numbers are according to Table 1 and locality numbers are from Table 3 and Figure 1. IUCN is the conservation status of the species according to the IUCN Red List of Threatened Species. Abbreviations: DD = data deficient; CR = critically endangered; LC = least concern; NE = not evaluated.

	Taxon	Biome	IUCN	Reference	Locality
	Allophrynidae Savage, 1973				
1	*Allophryne ruthveni* Gaige, 1926	For	LC	3, 23, 32	2, 5–8, 10
	Aromobatidae Grant, Frost, Caldwell, Gagliardo, Haddad, Kok, Mittel, Noonan, Schargel & Wheeler, 2006				
2	*Allobates femoralis* (Boulanger, 1884)	For, Sav	LC	3, 21–24, 27, 29–30	2, 4, 6–11, 13–18
3	*Allobates tapajos* Lima, Simões & Kaefer, 2015	For	NE	35	28
4	*Anomaloglossus baeobatrachus* (Boistel & Massary, 1999)	For	DD	32, 35	2, 6, 10, 28, 38–39, 41, 43
	Bufonidae Gray, 1825				
5	*Amazophrynella teko* Rojas-Zamora, Fouquet, Ron, Hernández-Ruz, Melo-Sampaio, Chaparro, Vogt, Carvalho, Pinheiro, Ávila, Farias, Gordo & Hrbek, 2018	For	NE	3, 21–23, 25, 30–31	2, 5–9, 10, 11, 14, 15, 44
6	*Atelopus hoogmoedi* Lescure, 1974	For	NE	3, 6, 23–24, 27, 30, 32	2, 4–5, 7–17, 45
7	*Rhaebo guttatus* (Schneider, 1799)	For	LC	3, 21–24, 27, 32	2, 4–17
8	*Rhinella* aff. *castaneotica*	For	NE	3, 24	2, 17
9	*Rhinella dapsilis* (Myers and Carvalho, 1945)	For, Sav	LC	3, 21–22, 29–30	2, 8, 11, 17–18
10	*Rhinella lescurei* Fouquet, Gaucher, Blanc & Vélez-Rodriguez, 2007	For	LC	9	9
11	*Rhinella major* (Müller & Hellmich, 1936)	For, Sav	NE	7, 14, 22, 24, 29	1, 3, 12, 17–18
12	*Rhinella margaritifera* (Laurenti, 1768)	For	LC	27, 32	9–10
13	*Rhinella marina* (Linnaeus, 1758)	For, Sav	LC	1, 7, 14, 21–24, 27, 30, 32	1, 3–12, 14–19
	Centrolenidae Taylor, 1951				
14	*Cochranella resplendens* (Lynch & Duellman, 1973)	For	LC	11	10
15	*Hyalinobatrachium capellei* (van Lidth de Jeude, 1904)	For	NE	16	21
16	*Hyalinobatrachium iaspidiense* (Ayarzagüena, 1992)	For	DD	27, 32	9–10
17	*Hyalinobatrachium mondolfii* Señaris & Ayargüena, 2001	For	LC	16	10, 22
18	*Hyalinobatrachium taylori* (Goin, 1968)	For	LC	3, 12, 21–23	2, 8–9, 13, 16
19	*Hyalinobatrachium tricolor* Castroviejo-Fisher, Vilà, Ayarzagüena, Blanc & Ernst, 2011	For	LC	12	10
20	*Teratohyla midas* (Lynch & Duellmann, 1973)	For	LC		
21	*Vitreorana ritae* (Lutz, 1952)	For	DD	3, 10, 23	2, 8–9, 28
	Ceratophryidae Tschudi, 1838				
22	*Ceratophrys cornuta* (Linnaeus, 1758)	For	LC	3, 21, 23	2, 8, 16
	Craugastoridae Hedges, Duellman & Heinicke, 2008				
23	*Pristimantis chiastonotus* (Lynch & Hoogmoed, 1977)	For	LC	3, 21–24, 27, 30, 32	2, 4–17
24	*Pristimantis crepitaculus* Fouquet, Peloso, Jairam, Lima, Mônico, Ernst & Kok, 2022	For	NE	3, 23–24, 30, 32	2, 8, 10–11, 17
25	*Pristimantis espedeus* Fouquet, Martinez, Courtois, Dewynter, Pineau, Gaucher, Blanc, Marty & Kok, 2013	For	NE	35	39
26	*Pristimantis grandoculis* (van Lidth de Jeude, 1904)	For	NE	32	10

Table 2. Continued.

	Taxon	Biome	IUCN	Reference	Locality
27	*Pristimantis gutturalis* (Hoogmoed, Lynch, & Lescure, 1977)	For	LC	23	4–8
28	*Pristimantis inguinalis* (Parker, 1940)	For	LC	23	7–8
29	*Pristimantis zeuctotylus* (Lynch & Hoogmoed, 1977)	For	LC	3, 23–24, 27, 32	2, 6, 8–10, 17
30	*Pristimantis zimmermanae* (Heyer & Hardy, 1991)	For	LC	32	10
	Dendrobatidae Cope, 1865				
31	*Ameerega hahneli* (Boulenger, 1884)	For	LC	21–23, 30	4, 5, 7–8, 11–16
32	*Ameerega pulchripecta* (Silverstone, 1976)	For	DD	3, 27, 32	2, 9–10
33	*Dendrobates tinctorius* (Cuvier, 1797)	For	LC	3, 23, 27, 32	2, 6, 8–10
34	*Ranitomeya variabilis* (Zimmermann & Zimmermann, 1988)	For	DD	21, 22, 24, 30	11, 13–15, 17
	Eleutherodactylidae Lutz, 1954				
35	*Adelophryne amapaensis* Taucce, Costa-Campos, Haddad, & Carvalho, 2020	For	NE	27, 32	9–10
	Hylidae Rafinesque, 1815				
36	*Boana* aff. *semilineata*	For	NE	19	10, 38, 43
37	*Boana boans* (Linnaeus, 1758)	For, Sav	LC	1, 3, 10, 14, 21–23, 27, 32	1, 2, 4–10, 12–16, 19, 29
38	*Boana calcarata* (Troschel, 1848)	For	LC	3, 21–23, 27, 32	2, 5, 7–10, 1, 14–15
39	*Boana cinerascens* (Spix, 1824)	For	LC	3, 21–22, 24, 30, 32	2, 10–11, 14–17
40	*Boana courtoisae* Fouquet, Marinho, Réjaud, Carvalho, Caminer, Jansen, Rainha, Rodrigues, Werneck, Lima, Hrbek, Giaretta, Venegas, Chávez & Ron, 2021	For	NE	3, 23, 27, 32	2, 5, 8–10
41	*Boana dentei* (Bokermann, 1967)	For	LC	3, 21–23, 32	2, 6, 8, 10, 13, 16
42	*Boana diabolica* (Fouquet, Martinez, Zeidler, Courtois, Gaucher, Blanc, Lima, Souza, Rodrigues & Kok, 2016)	For	NE	16	9, 39–42
43	*Boana lanciformis* (Cope, 1871)	For	LC	10	29
44	*Boana multifasciata* (Günther, 1859)	For, Sav	LC	7, 14, 21, 24, 26, 29–30, 32, 35	1, 3, 10–11, 16–18, 30, 38
45	*Boana ornatissima* (Noble, 1923)	For	LC	21, 23	8, 15
46	*Boana punctata* (Schneider, 1799)	Sav	LC	7, 10, 14, 26	1, 3, 29–30
47	*Boana raniceps* (Cope, 1862)	Sav	LC	1, 3, 14, 29	1, 3, 18–19
48	*Dendropsophus amicorum* (Mijares-Urrutia, 1998)	For	CR	3, 21, 32	2, 10, 16
49	*Dendropsophus counani* Fouquet, Orrico, Ernst, Blanc, Martinez, Vacher, Rodrigues, Ouboter, Jairam & Ron, 2015	For	NE	3, 32	2, 10
50	*Dendropsophus haraldschultzi* (Bokermann, 1962)	Sav	LC	26	29, 30–31
51	*Dendropsophus leucophyllatus* (Beireis, 1783)	For, Sav	LC	3, 21, 23, 26, 32	2, 8, 10, 16, 30
52	*Dendropsophus minusculus* (Rivero, 1971)	For, Sav	LC	3, 23, 30	2, 8, 11
53	*Dendropsophus walfordi* (Bokermann, 1962)	For, Sav	LC	3, 7, 14, 21, 30	1–3, 11, 16
54	*Lysapsus bolivianus* Gallardo, 1961	For, Sav	DD	1, 14	1, 19
55	*Osteocephalus cabrerai* (Cochran & Goin, 1970)	For	LC	22–23, 27, 30	4*, 8*, 9*, 11, 13*
56	*Osteocephalus helenae* (Ruthven, 1919)	For	DD	22–23, 30	4*, 8*–9*, 13*
57	*Osteocephalus leprieurii* (Duméril & Bibron, 1841)	For	LC	3, 18, 21, 23–24, 30	2, 5, 7, 8, 11, 16–17, 22

Table 2. Continued.

	Taxon	Biome	IUCN	Reference	Locality
58	*Osteocephalus oophagus* Jungfer & Schiesari, 1995	For	LC	1, 3, 23–24, 27, 30, 32	2, 5, 7, 9–11, 17, 19
59	*Osteocephalus taurinus* Steindachner, 1862	For, Sav	LC	1, 3, 7, 14, 21–24, 29–30, 32	1–8, 10–19
60	*Pseudis paradoxa* (Linnaeus, 1758)	For, Sav	LC	1, 14, 29	1, 18–19
61	*Scarthyla goinorum* (Bokermann, 1962)	For, Sav	LC	26, 33	30, 32–35
62	*Scinax boesemani* (Goin, 1966)	For, Sav	LC	10, 14, 21, 23, 32	1, 8, 10, 16, 29
63	*Scinax* cf. *cruentomma* (Duellman, 1972)	For	LC	35	10
64	*Scinax fuscomarginatus* (Lutz, 1925)	Sav	LC	7, 14	1, 3
65	*Scinax jolyi* Lescure & Marty, 2000	For, Sav	DD	14, 24, 32, 35	1, 10, 17, 40
66	*Scinax nebulosus* (Spix, 1824)	For, Sav	LC	7, 14, 29, 32	1, 3, 10, 18
67	*Scinax proboscideus* (Brongersma, 1933)	For	LC	21–23	8, 12, 15
68	*Scinax ruber* (Laurenti, 1768)	For, Sav	LC	1, 7, 14, 24, 29–30, 32	1, 3, 10–11, 17–19
69	*Scinax ruberoculatus* Ferrão, Fraga, Moravec, Kaefer & Lima, 2018	For, Sav	NE	17	20, 36–37
70	*Scinax x-signatus* (Spix, 1824)	For, Sav	LC	7, 22, 24, 29	3, 12, 17–18
71	*Sphaenorhynchus carneus* (Cope, 1868)	Sav	LC	4, 14	1, 31
72	*Sphaenorhynchus lacteus* (Daudin, 1800)	Sav	LC	14, 26	1, 30
73	*Trachycephalus coriaceus* (Peters, 1867)	For	LC	3	2
74	*Trachycephalus hadroceps* (Duellman & Hoogmoed, 1992)	For	LC	22	12–14
75	*Trachycephalus resinifictrix* (Goeldi, 1907)	For	LC	3, 23–24, 27, 30, 32	2, 4–11, 17
76	*Trachycephalus typhonius* (Linnaeus, 1758)	For, Sav	LC	1, 3, 7, 21, 29	2, 3, 16, 18–19
	Leptodactylidae Werner, 1896				
77	*Adenomera andreae* (Müller, 1923)	For, Sav	LC	3, 21–23, 27, 29, 32	2, 4–12, 14–16, 18
78	*Adenomera heyeri* Boystel, Massari & Angulo, 2006	For	LC	35	38
79	*Adenomera hylaedactyla* (Cope, 1868)	For, Sav	LC	3, 7, 10, 21–23, 27, 29–30, 32	2–12, 14–16, 18, 29
80	*Engystomops petersi* Jiménez de la Espada, 1872	For	LC	23	4, 7
81	*Hydrolaetare schmidti* (Cochran & Goin, 1959)	For, Sav	LC	14–15, 23–24	1, 5, 8, 17, 23–27
82	*Leptodactylus* sp.	For	NE	Carvalho *et al.* (unpublished)	10, 40, 46–47
83	*Leptodactylus fuscus* (Schneider, 1799)	For, Sav	LC	3, 7, 14, 21, 24, 29	1–3, 16–18
84	*Leptodactylus guianensis* Heyer & de Sá, 2011	For	NE	22	12
85	*Leptodactylus intermedius* Lutz, 1930	For, Sav	NE	1, 7, 21, 24, 29	3, 15, 17–19
86	*Leptodactylus knudseni* Heyer, 1972	For	LC	3, 21–24, 30, 32	2, 6–8, 10–11, 13, 16–17
87	*Leptodactylus leptodactyloides* (Anderson, 1945)	Sav	LC	Carvalho *et al.* (unpublished)	31
88	*Leptodactylus longirostris* Boulenger, 1882	For, Sav	LC	14, 22, 32	1, 10, 14
89	*Leptodactylus macrosternum* Miranda-Ribeiro 1926	For, Sav	NE	1, 7, 14, 26, 29	1, 3, 18–19, 30
90	*Leptodactylus myersi* Heyer, 1995	For	LC	21, 23, 30	6, 11, 15

Table 2. Continued.

	Taxon	Biome	IUCN	Reference	Locality
91	*Leptodactylus mystaceus* (Spix, 1824)	For, Sav	LC	3, 14, 21–24, 32	1, 2, 4–5, 7–8, 10,12, 14, 16–17
92	*Leptodactylus pentadactylus* (Laurenti, 1768)	For, Sav	LC	7, 21–24, 30, 32	3–8, 10–17
93	*Leptodactylus petersii* (Steindachner, 1864)	For, Sav	LC	1, 14, 21–24, 26–27, 32	1, 4–10, 13, 16–17, 19, 30
94	*Leptodactylus rhodomystax* Boulenger, 1884	For	LC	3, 21–24, 30, 32	2, 4, 8, 10–11, 13–14, 16–17
95	*Leptodactylus stenodema* Jiménez de la Espada, 1875	For	LC	3, 21, 23–24, 30, 32	2, 4–5, 10–11, 15–17
96	*Lithodytes lineatus* (Scheneider, 1799)	For	LC	13, 21–24, 30	8, 10–11, 13, 16–17, 20
97	*Pseudopaludicola boliviana* Parker, 1927	Sav	LC	5, 7, 14	1, 3, 31
	Microhylidae Günther, 1858				
98	*Chiasmocleis haddadi* Peloso, Sturaro, Forlani, Gaucher, Motta & Wheeler, 2014	For	NE	28	8, 16
99	*Chiasmocleis hudsoni* Parker, 1940	For	LC	8	10
100	*Chiasmocleis shudikarensis* Dunn, 1949	For	LC	28	16
101	*Ctenophryne geayi* Mocquard, 1904	For	LC	34	21
102	*Elachistocleis helianneae* Caramaschi, 2010	Sav	LC	7, 29	3, 18
103	*Hamptophryne boliviana* (Parker, 1927)	For, Sav	LC	14, 21, 23	1, 8, 16
104	*Otophryne* cf. *robusta* Boulenger, 1900	For	LC	3, 21–23, 30	2, 7–8, 11, 13, 15–16
105	*Synapturanus mirandaribeiroi* Nelson & Lescure, 1975	For	LC	23	5–7
106	*Synapturanus zombie* Fouquet, Leblanc, Fabre, Rodrigues, Menin, Courtois, Dewynter, Hölting, Ernst, Peloso & Kok, 2021	For	NE	20	32, 46
	Phyllomedusidae Günther, 1858				
107	*Callimedusa tomopterna* (Cope, 1868)	For	LC	21, 23	8, 16
108	*Phyllomedusa bicolor* (Boddaert, 1772)	For	LC	3, 21–23, 27, 32	2, 5, 8–10, 14–16
109	*Phyllomedusa vaillanti* Boulenger, 1882	For	LC	3, 21–22, 27, 30, 32	2, 9–11, 13, 16
110	*Pithecopus hypochondrialis* (Daudin, 1800)	For, Sav	LC	3, 7, 14, 21, 30, 32	1–3, 10–11, 16
	Pipidae Gray, 1825				
111	*Pipa pipa* (Linnaeus, 1758)	For, Sav	LC	1, 21–24, 29, 32	8, 10, 12, 16–19

*Since we could not check voucher material, these records of *O. helenae* and *O. cabrerai* could be associated to either species or to both.

(*A. hoogmoedi*). Although it is probable that *A. flavescens* occurs indeed in the state of Amapá, further taxonomic studies should clarify this matter.

Regarding the genus *Rhinella*, there are two species of the group of *R. granulosa* registered in Amapá: *Rhinella granulosa* (Spix, 1824) (Pereira-Júnior *et al.* 2013; Ferreira-Lima *et al.* 2017; Missassi *et al.* 2017; Lima 2018) and *R. major* (Costa-Campos & Freire 2019). However, Amapá is contained only within the distribution range of *R. major*, thus we considered records of *R. granulosa* to be *R. major*. Within the group of *R. margaritifera*, *Rhinella martyi* Fouquet, Gaucher, Blanc & Vélez-Rodriguez, 2007 is currently considered a junior synonym of *Rhinella margaritifera* (Laurenti, 1768) (Pereyra *et al.* 2021), and we considered the records of *R. martyi* (Silva-e-Silva & Costa-Campos 2018;

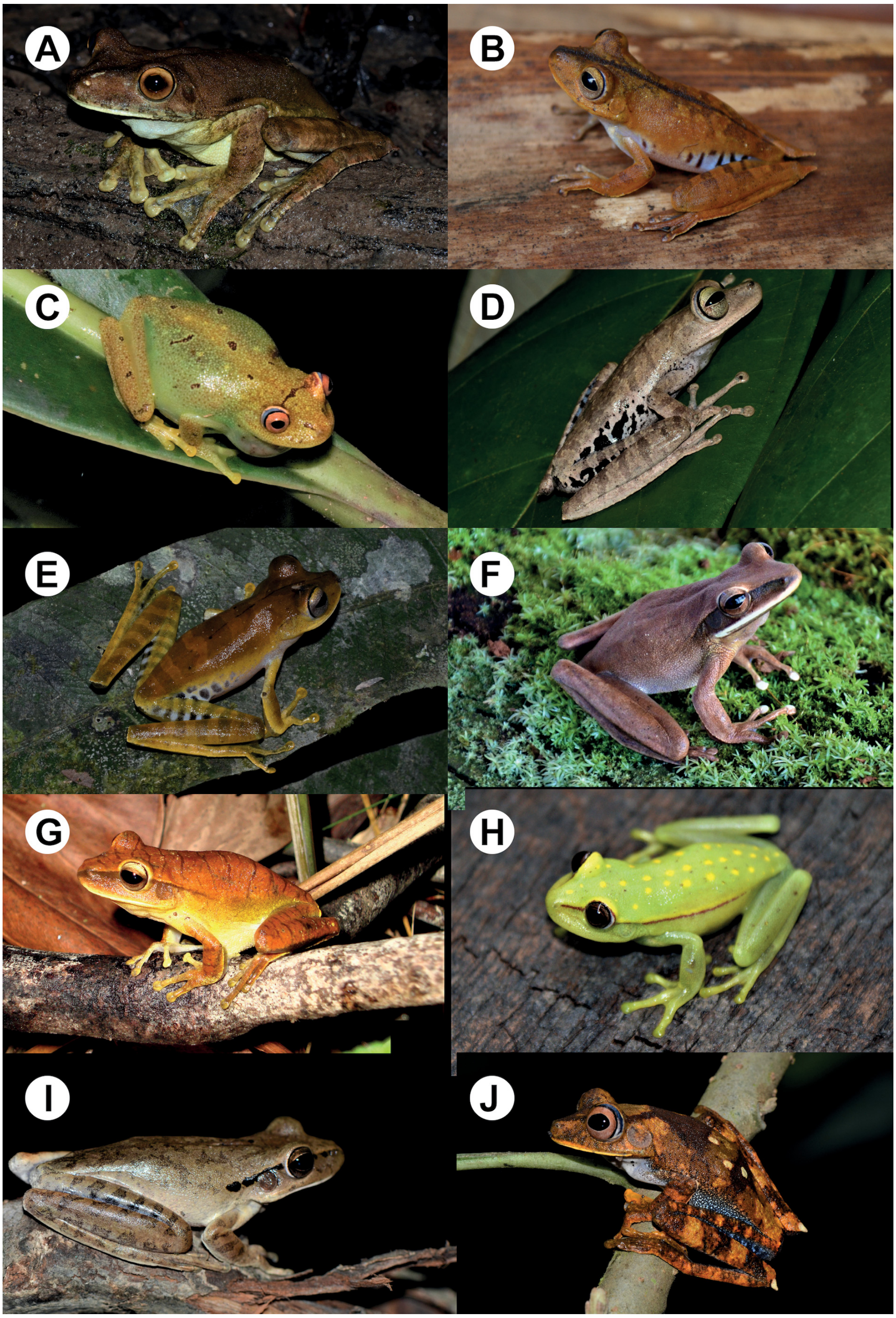

Fig. 2. Anuran species recorded in the state of Amapá. **A**. *Boana boans* (Linnaeus, 1758). **B**. *Boana calcarata* (Troschel, 1848). **C**. *Boana cinerascens* (Spix, 1824). **D**. *Boana courtoisae* Fouquet, Marinho, Réjaud, Carvalho, Caminer, Jansen, Rainha, Rodrigues, Werneck, Lima, Hrbek, Giaretta, Venegas, Chávez & Ron, 2021. **E**. *Boana dentei* (Bokermann, 1967). **F**. *Boana lanciformis* (Cope, 1871). **G**. *Boana multifasciata* (Günther, 1859). **H**. *Boana punctata* (Schneider, 1799). **I**. *Boana raniceps* (Cope, 1862). **J**. *Boana* aff. *semilineata*. Photos: C.E. Costa-Campos.

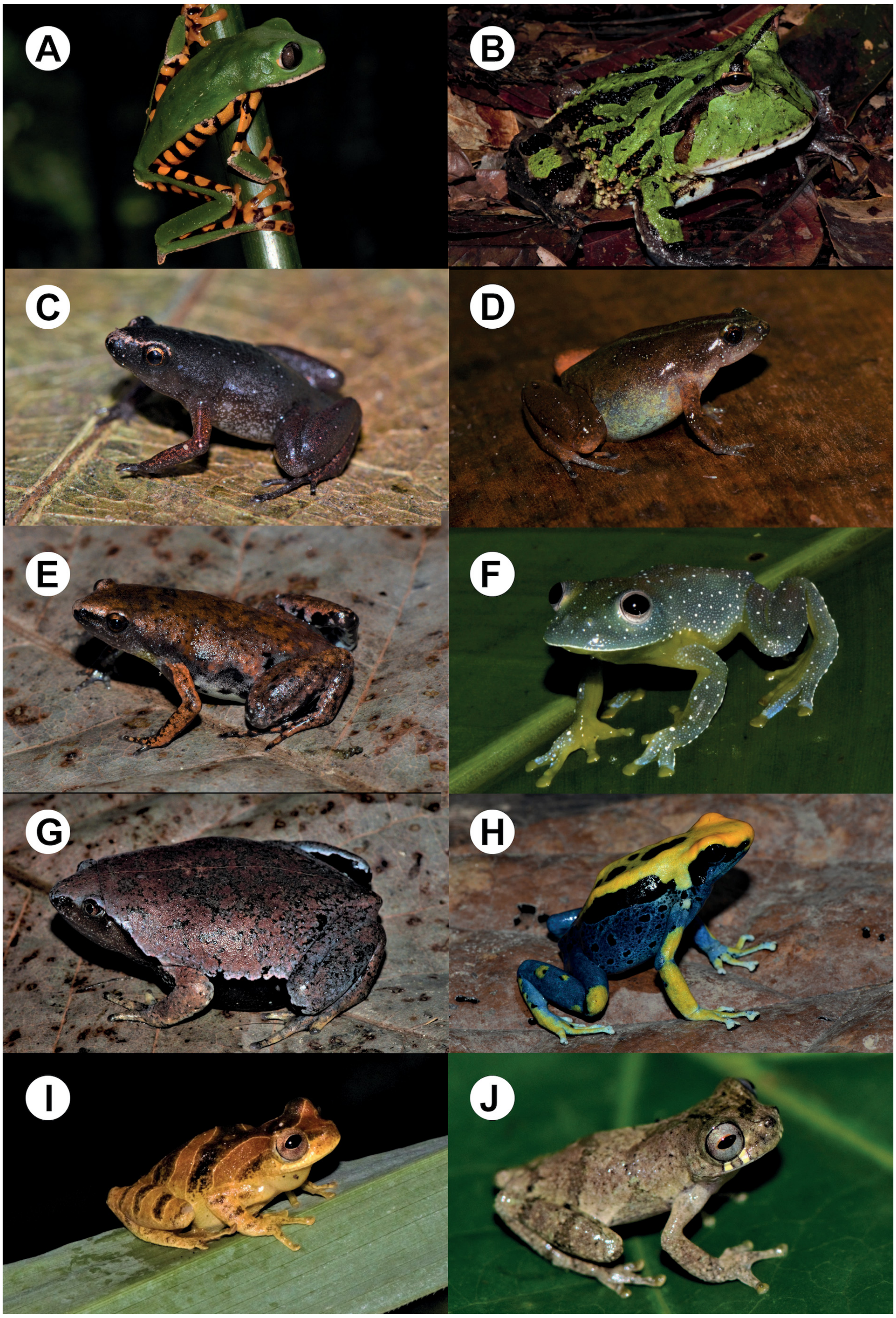

Fig. 3. Anuran species recorded in the state of Amapá. **A**. *Callimedusa tomopterna* (Cope, 1868). **B**. *Ceratophrys cornuta* (Linnaeus, 1758). **C**. *Chiasmocleis haddadi* Peloso, Sturaro, Forlani, Gaucher, Motta & Wheeler, 2014. **D**. *Chiasmocleis hudsoni* Parker, 1940. **E**. *Chiasmocleis shudikarensis* (Dunn, 1949). **F**. *Cochranella resplendens* (Lynch & Duellman, 1973). **G**. *Ctenophryne geayi* Mocquard, 1904. **H**. *Dendrobates tinctorius* (Cuvier, 1797). **I**. *Dendropsophus amicorum* (Mijares-Urrutia, 1998). **J**. *Dendropsophus counani* Fouquet, Orrico, Ernst, Blanc, Martinez, Vacher, Rodrigues, Ouboter, Jairam & Ron, 2015. Photos: C.E. Costa-Campos.

Pedroso-Santos *et al.* 2019) as *R. margaritifera.* We then considered the records of *R. margaritifera* as *Rhinella dapsilis* (Myers & Carvalho, 1945), following the same study. Pereyra *et al.* (2021) recovered *Rhinella castaneotica* (Caldwell, 1991) paraphyletic, with the specimen from French Guiana more related to *Rhinella proboscidea* Spix, 1824 than to the probable *R. castaneotica* sensu stricto from the Brazilian state of Pará. Ferrão *et al.* (2022) analyzed specimens from both French Guiana and Amapá, recovering them monophyletic and as the sister group of *R. castaneotica* and *Rhinella teotoniensis* Ferrão, Souza, Hanken & Lima, 2022. We agree with their conclusions and consider the species from Amapá an unnamed species, which we treat as *R.* aff. *castaneotica*.

Family **Centrolenidae** Taylor, 1951

Vitreorana ritae (Lutz, 1952) is currently a senior synonym of *V. oyampiensis* (Lescure, 1975) (Cisneros-Heredita 2013). Despite some authors state that this synonymy remains dubious due to the lack of acoustic and molecular data from the type locality (headwaters of the Caiwama River, Amazonas, Colombia) (Fouquet *et al.* 2019c), we consider the records of *V. oyampiensis* (as *Cochranella oyampiensis*; Lima 2006b; 2008) equivalent to *V. ritae.*

Family **Craugastoridae** Hedges, Duellman & Heinicke, 2008

Pristimantis marmoratus (Boulenger, 1900) is currently distributed in the western portion of the Guiana Shield, through Venezuela and Guyana, and its sister clade has a more eastern distribution, occurring in French Guiana and Amapá (Kok *et al.* 2018). Fouquet *et al.* (2022b) recently described this clade as *Pristimantis crepitaculus* Fouquet, Peloso, Jairam, Lima, Mônico, Ernst & Kok, 2022. We considered four out of our five records of *P. marmoratus* (Lima 2008; 2018; Queiroz *et al.* 2011; Benício & Lima 2017) as *P. crepitaculus*. *Pristimantis ockendeni* (Boulenger 1912) was once thought to occur all over the upper Amazon basin, from southern Peru to Colombia, but it is currently thought to be a species complex with the nominal *P. ockendeni* currently known only from the type locality, in Peru (Elmer *et al.* 2007; Elmer & Canatella 2008). Silva e Silva & Costa-Campos (2018) recorded a species with overall morphology similar to *P. ockendeni* which they identified as *P.* cf. *ockendeni,* but they also recorded *P. marmoratus*. Besides *P. crepitaculus,* Fouquet *et al.* (2022b) also mention *P. grandoculis* from the state of Amapá, a species they revalidated in their study. The main morphological difference between these two species is the tympanum, which is present in the first species and absent in the latter. Thus, we consider the records of Silva e Silva & Costa-Campos (2018) as *P. crepitaculus* (their *P.* cf. *ockendeni*) and *P. grandoculis* (their *P. marmoratus*).

Family **Dendrobatidae** Cope, 1865

Ranitomeya populations in Amapá have been registered with two different names, *Ranitomeya amazonica* (Schulte, 1999) (Lima 2018) and *Ranitomeya ventrimaculata* (Shreve, 1935) (Lima 2006a, 2006b; Queiroz *et al.* 2011). However, *R. amazonica* is a species known for decades prior to its description, and has been erroneously identified as several other species, including *R. ventrimaculata* (for a complete taxonomic history see Brown *et al.* 2011). Currently, *R. ventrimaculata* is restricted to Colombia, Ecuador, Peru, and the western portion of the Brazilian state of Amazonas, and until recently the populations of *Ranitomeya* from eastern Amazonia were assigned to *R. amazonica* (Brown *et al.* 2011). Nevertheless, Muell *et al.* (2022) recovered *R. amazonica* nested within *R. variabilis* (Zimmermann & Zimmermann, 1988) and specifically populations from eastern Amazonia were recovered as *R. variabilis*. Thus, we agree with them and consider Amapá records to be *R. variabilis.*

Table 3. Localities sampled in this study.

Number	Latitude	Longitude	Locality
1	0.166679° N	51.033351° W	Rio Curiaú Environmental Protection Area, Macapá
2	0.924722° N	51.595833° W	Amapá National Forest
3	0.384722° N	51.033889° W	Experimental Field of the EMBRAPA, Macapá
4	1.601389° N	52.490278° W	Tumucumaque Mountains National Park
5	2.193333° N	54.587500° W	Tumucumaque Mountains National Park
6	3.216111° N	52.101944° W	Tumucumaque Mountains National Park
7	1.386944° N	51.927500° W	Tumucumaque Mountains National Park
8	1.844722° N	52.741111° W	Tumucumaque Mountains National Park
9	0.791833° N	51.978361° W	Beija-Flor-Brilho-de-Fogo Extrativist Reserve, Pedra Branca do Amapari
10	0.913285° N	52.006800° W	Cancão Municipal Natural Park, Serra do Navio
11	0.583333° S	52.250000° W	Rio Cajari Extrativist Reserve
12	0.290000° N	53.100000° W	Rio Iratapuru Sustainable Development Reserve
13	0.280000° S	52.400000° W	Rio Iratapuru Sustainable Development Reserve
14	0.600000° N	52.300000° W	Rio Iratapuru Sustainable Development Reserve
15	1.308056° N	51.587780° W	Amapá National Forest
16	1.101111° N	51.893330° W	Amapá National Forest
17	0.849475° N	51.291266° W	Ferreira Gomes
18	0.009822° S	51.083714° W	Federal University of Amapá, Macapá
19	0.8848883° N	49.993328° W	Parazinho Biological Reserve, Macapá
20	0.429765° S	52.647894° W	Rio Iratapuru Sustainable Development Reserve
21	0.579° S	52.628° W	Rio Iratapuru Sustainable Development Reserve
22	0.535° S	52.542° W	Rio Iratapuru Sustainable Development Reserve
23	1.69° N	50.19° W	Lago Pirituba Biological Reserve
24	0.97° N	51.02° W	Tracajuba River, Tartarugalzinho
25	0.49° N	51.25° W	Ferreira Gomes
26	0.02° N	51.1° W	Porto Grande
27	0.03° S	51.15° W	Santana
28	0.6679° S	52.5289° W	Laranjal do Jari
29	0.08° S	51.182222° W	Santana
30	0.304306° N	50.872556° W	Macapá
31	0.297369° N	51.130969° W	Macapá
32	0.0363° N	51.1625° W	Santana
33	1.3239° N	50.2779° W	Tartarugalzinho
34	1.6624° N	50.3215° W	Amapá (municipality)
35	0.6171° S	52.5204° W	Laranjal do Jari
36	0.715° N	51.4718° W	Porto Grande
37	0.7851° N	51.2368° W	Ferreira Gomes
38	2.3215556° N	51.6108611° W	Lourenço, Calçoene
39	0.909122° N	53.228479° W	Tumucumaque Mountains National Park
40	3.904047° N	51.77227° W	Oiapoque
41	2.62764° N	52.54195° W	Tumucumaque Mountains National Park
42	0.449335° N	52.02214° W	Amapá State Forest
43	0.024167° S	51.897222° W	Mazagão
44	0.23° N	51.86° W	Amapá State Forest
45	0.826527° N	52.189333° W	Amapá State Forest
46	0.299306° N	51.129889° W	Comunidade Ariri, Macapá
47	0.979331° N	51.614895° W	Amapá State Forest
48	0.576976° S	52.077805° W	Vitória do Jari

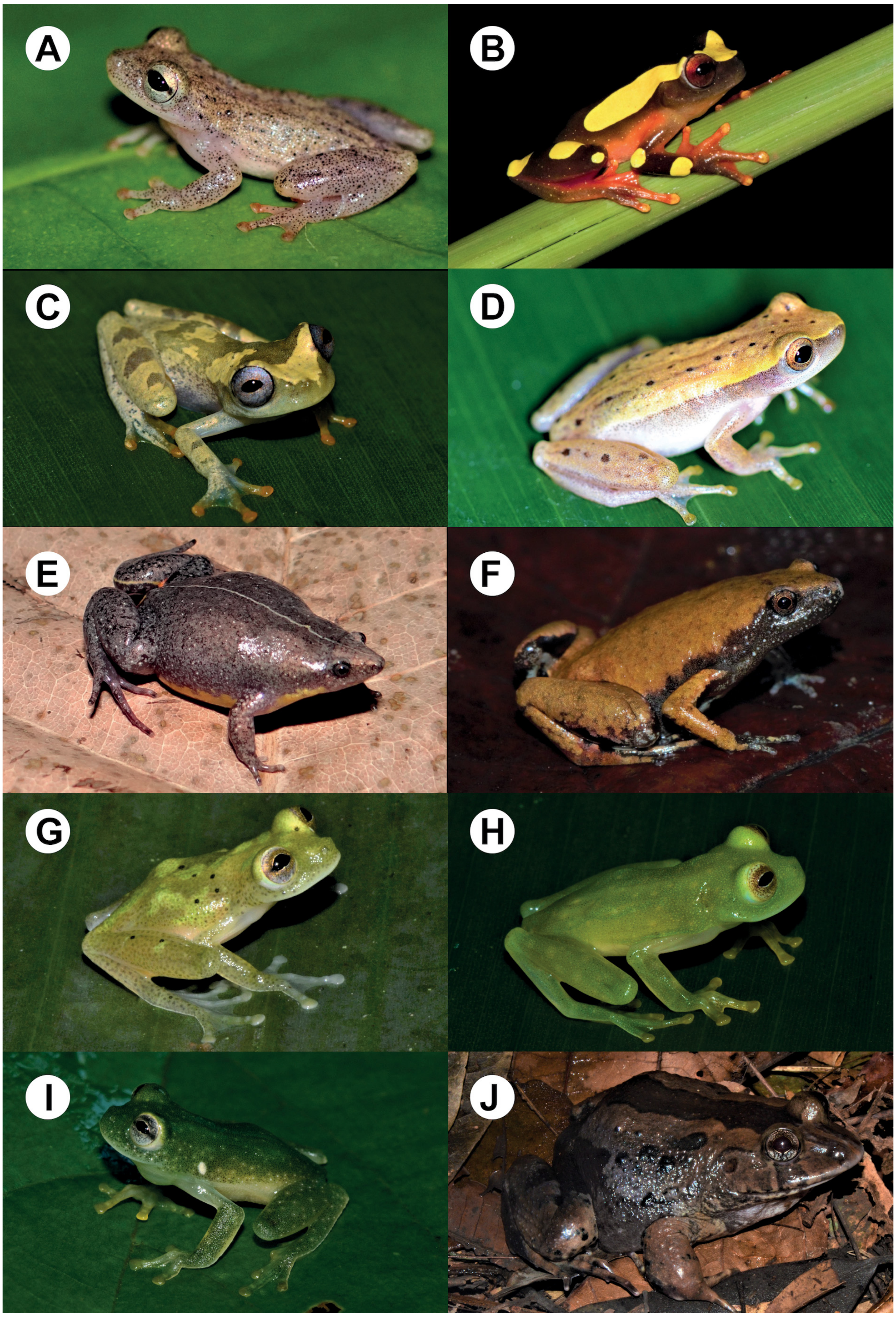

Fig. 4. Anuran species recorded in the state of Amapá. **A**. *Dendropsophus haraldschultzi* (Bokermann, 1962). **B**. *Dendropsophus leucophyllatus* (Beireis, 1783). **C**. *Dendropsophus minusculus* (Rivero, 1971). **D**. *Dendropsophus walfordi* (Bokermann, 1962). **E**. *Elachistocleis helianna*e Caramaschi, 2010. **F**. *Hamptophryne boliviana* Parker, 1927. **G**. *Hyalinobatrachium iaspidiense* (Ayarzagüena, 1992). **H**. *Hyalinobatrachium mondolfii* Señaris & Ayarzagüena, 2001. **I**. *Hyalinobatrachium taylori* (Goin, 1968). **J**. *Hydrolaetare schmidti* (Cochran & Goin, 1959). Photos: C.E. Costa-Campos.

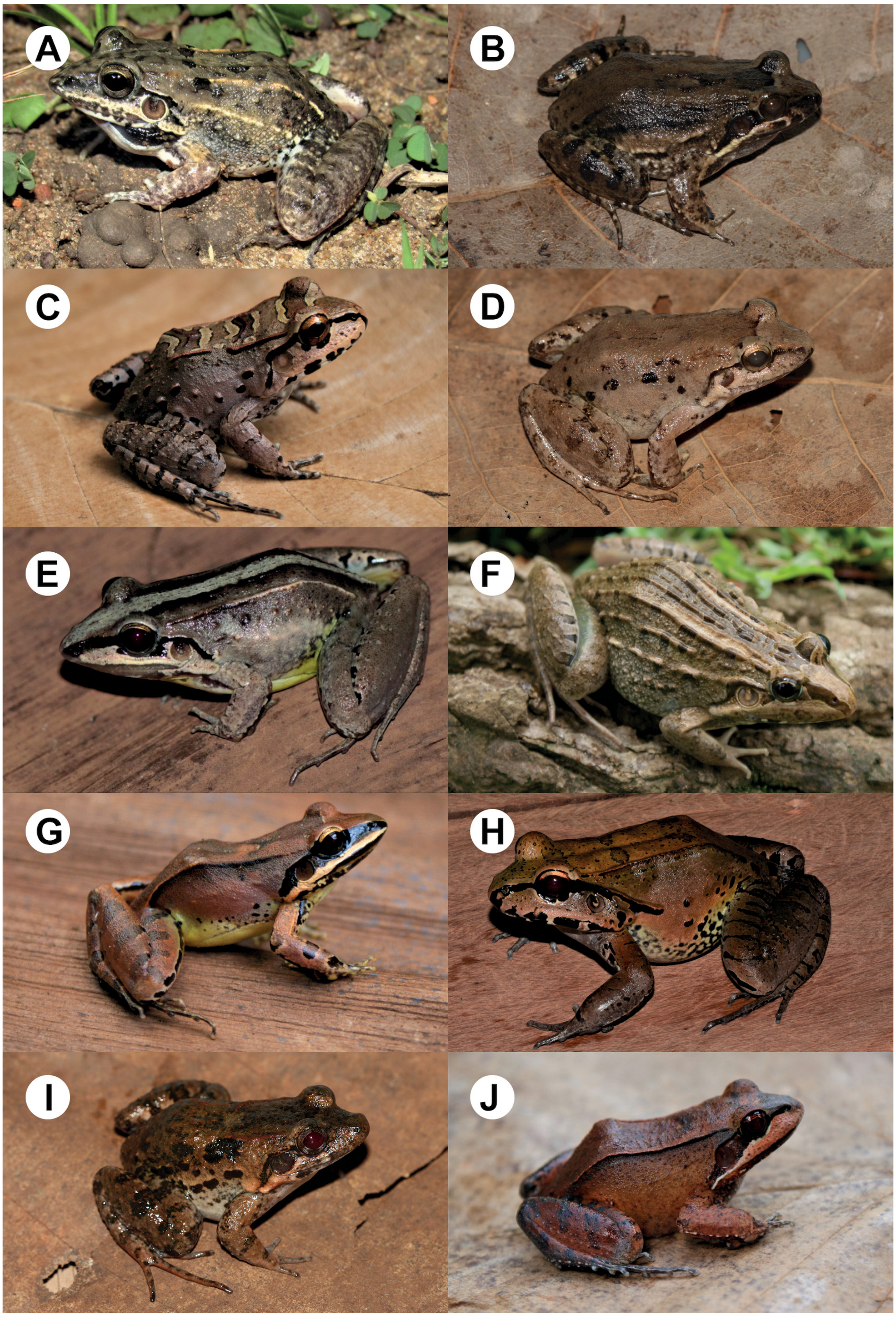

Fig. 5. Anuran species recorded in the state of Amapá. **A**. *Leptodactylus fuscus* (Schneider, 1799). **B**. *Leptodactylus intermedius* Lutz, 1930. **C**. *Leptodactylus knudseni* Heyer, 1972. **D**. *Leptodactylus leptodactyloides* (Andersson, 1945). **E**. *Leptodactylus longirostris* Boulenger, 1882. **F**. *Leptodactylus macrosternum* Miranda-Ribeiro, 1926. **G**. *Leptodactylus mystaceus* (Spix, 1824). **H**. *Leptodactylus pentadactylus* (Laurenti, 1768). **I**. *Leptodactylus petersii* (Steindachner, 1864). **J**. *Leptodactylus rhodomystax* Boulenger, 1884. Photos: C.E. Costa-Campos (A, C, E–H, J) and T.R. Carvalho (B, D, I).

Family **Eleutherodactylidae** Lutz, 1954

Silva e Silva & Costa-Campos (2018) and Pedroso-Santos *et al.* (2019) recorded *Adelophryne gutturosa* Hoogmoed & Lescure, 1984 at Cancão Municipal Natural Park, municipality of Serra do Navio, and Reserva Extrativista Beija-Flor-Brilho-de-Fogo, municipality of Pedra Branca do Amapari, respectively. These records belong to the recently described *A. amapaensis*.

Family **Hylidae** Rafinesque, 1815

The population previously identified as *Boana multifasciata* (Günther, 1859) from the Guiana Shield is currently known to be an unnamed candidate species, inhabiting the Guianas and the Brazilian states of Roraima, Pará and Amapá (Fouquet *et al.* 2021c) based only on molecular data. We added the molecular-based records from Vacher *et al.* (2020) and Fouquet *et al.* (2021c) corresponding to this taxon, as well as the literature records with overall morphology more similar to *B. multifasciata*. We decided to keep using this name for Amapá populations until more studies clarify their taxonomic status. In the species group of *B. semilineata*, two species are known to occur in Amapá, *Boana diabolica* Fouquet, Martinez, Zeidler, Courtois, Gaucher, Blanc, Lima, Souza, Rodrigues & Kok, 2016 and an unnamed species, *B.* aff. *semilineata* (Fouquet *et al.* 2016). Besides these two names, records in Amapá have also been identified as *Boana geographica* (Spix, 1824) (Lima 2008; Pereira-Júnior *et al.* 2013; Benício & Lima 2017; Ferreira-Lima *et al.* 2017) and *B.* aff. *geographica* (Lima 2006b). These records could belong either to *B. diabolica* or *B.* aff. *semilineata*, so we chose to consider in our list only the molecular confirmed records (Fouquet *et al.* 2016; Vacher *et al.* 2020).

Dendropsophus counani Fouquet, Orrico, Ernst, Blanc, Martinez, Vacher, Rodrigues, Ouboter, Jairam & Ron, 2015 has long been confused with *Dendropsophus brevifrons* (Duellman & Crump, 1974) (Fouquet *et al.* 2015), and we consider the record of *D. brevifrons* (Benício & Lima 2017) to be *D. counani*. *Dendropsophus minusculus* (Rivero, 1971) is morphologically similar to *Dendropsophus branneri* (Cochran, 1948), with which *D. minusculus* has been historically confused (Zina *et al.* 2014). *Dendropsophus minusculus* is distributed in northern Brazil and the Guiana Shield, mainly within Amazonia, with some sparse records in northeastern Brazil in the states of Maranhão, Piauí, Ceará, and an isolated record from Bahia, whereas *D. branneri* inhabits the Atlantic Forest of southeastern and northeastern Brazil (Zina *et al.* 2014; Frost 2022). Both species seem to have a contact zone in northeastern Brazil, but the state of Amapá is within the distribution range of *D. minusculus*. Thus, we consider the records of *D. branneri* (Lima 2006a, 2006b) to be *D. minusculus*. Orrico *et al.* (2021) has recently defined the populations with the overall morphology like *D. minutus* (Peters, 1872) in the Guiana Shield as *D. amicorum*, and we agreed with them regarding the records of Amapá. It is important to note that, even though the IUCN status of the species is Critically Endangered (CR, IUCN 2022), it was evaluated when it was known only from the type localiy, and the conservation status of *D. amicorum* is likely to change during next evaluations. *Dendropsophus walfordi* (Bokermann, 1962) and *Dendropsophus nanus* (Boulenger, 1889) are also very similar to each other, being even considered as representing a single species (Lutz 1973). Despite being currently considered as separate species (Langone & Basso 1987), these are morphologically and genetically closely related to each other, with *D. walfordi* being frequently recovered within *D. nanus*, leaving it paraphyletic (Fouquet *et al.* 2011; Medeiros *et al.* 2013; Orrico *et al.* 2021). Recently, Seger *et al*. (2021) evaluated the *D. nanus*-*D. walfordi* complex with a broad molecular study and defined that *D. nanus* is the lineage inhabiting Paraguay, northeastern Argentina, and southern Brazil, whereas *D. walfordi* is the single lineage inhabiting Amazonia. Thus, we decided to adopt the name *D. walfordi* to records from both species within the state of Amapá. Benício & Lima (2017) recorded *Dendropsophus microcephalus* (Cope, 1886) and *Dendropsophus parviceps* (Boulanger, 1882) in the Amapá National Forest. The first species is distributed from southern Mexico to northern South America (Frost 2022) but, although the specimens east of Venezuela have been called

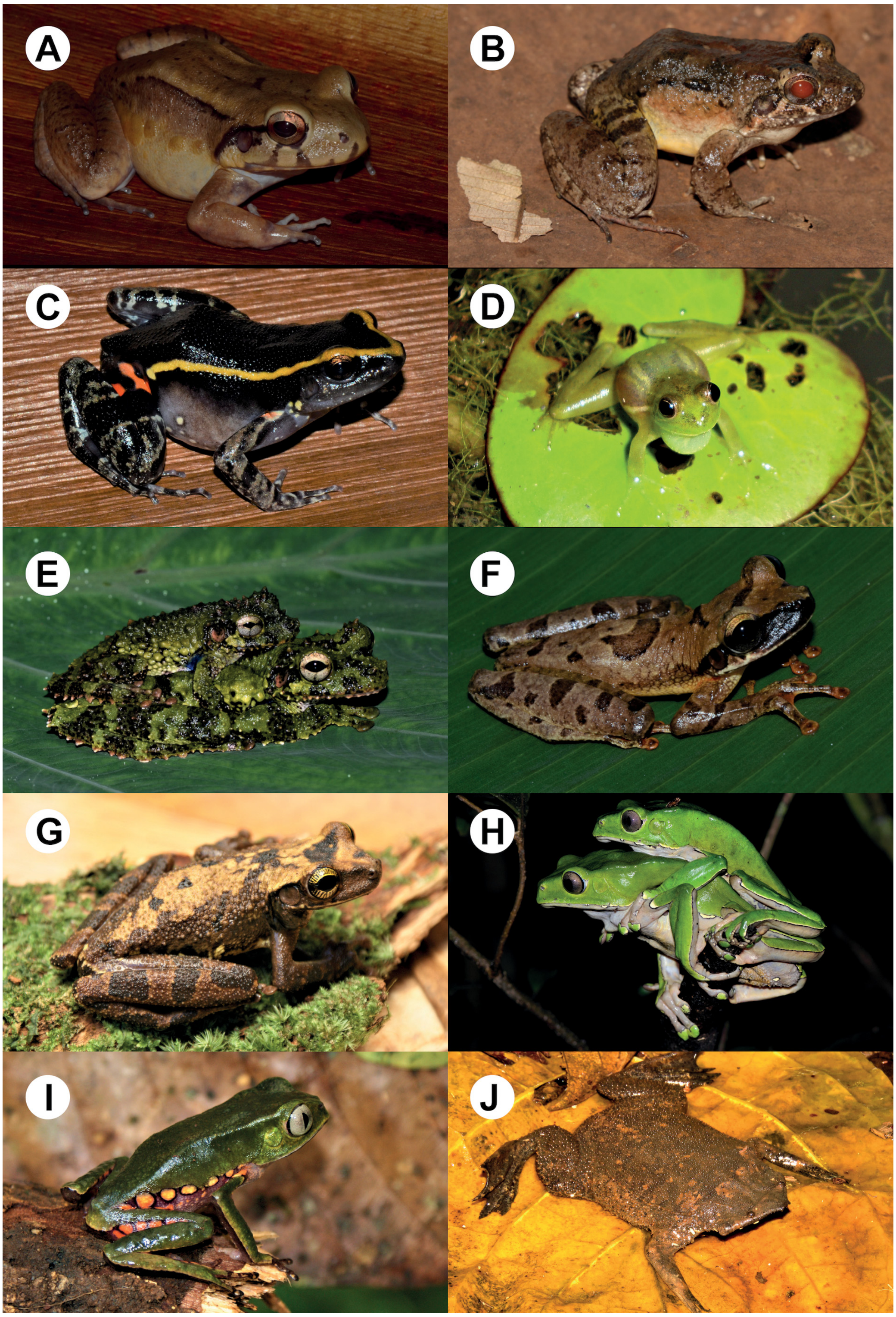

Fig. 6. Anuran species recorded in the state of Amapá. **A**. *Leptodactylus stenoderma* Jiménez de la Espada, 1875. **B**. *Leptodactylus* sp. **C**. *Lithodytes lineatus* (Schneider, 1799). **D**. *Lysapsus bolivianus* (Gallardo, 1961). **E**. *Osteocephalus cabrerai* (Cochran & Goin, 1970). **F**. *Osteocephalus leprieurii* (Duméril & Bibron, 1841). **G**. *Osteocephalus taurinus* (Steindachner, 1862). **H**. *Phyllomedusa bicolor* (Boddaert, 1772). **I**. *Phyllomedusa vaillanti* Boulenger, 1882. **J**. *Pipa pipa* (Linnaeus, 1758). Photos: C.E. Costa-Campos (A, C–J) and T. R. Carvalho (B).

D. microcephalus due to morphological similarities, they probably correspond to other species, such as *D. minusculus* or even *Dendropsophus gaucheri* (Lescure & Marty, 2000) (V.G.D. Orrico, pers. comm.). Although Benício & Lima (2017) cited both *D. minusculus* and *D. microcephalus*, there are no voucher specimens cited in their study. Thus, we decided to remove the record of *D. microcephalus* from the list until more data from the Amapá National Forest is available to help clarifying the taxonomic status of this population. Moreover, we considered the record of *D. microcephalus* from Queiroz *et al.* (2011) as *D. minusculus*. *Dendropsophus parviceps* is currently known from Ecuador, Colombia, and the Brazilian state of Amazonas, with related populations from Brazilian states of Acre and Rondônia being recently described as *Dendropsophus kamagarini* Rivadeneira, Venegas & Ron, 2018 (Rivadeneira *et al.* 2018). Besides *D.* parviceps, Benício & Lima (2017) found another species from the group of *D. parviceps* (sensu Orrico *et al.* 2021) in the Amapá National Forest, *D. brevifrons* (that we consider *D. counani*, see above). As in the previous case concerning *D. microcephalus* and *D. minusculus*, we also decided to remove *D. parviceps* from our list and consider the record as *D. counani* until additional data is available. The record of *Lysapsus laevis* (Parker, 1935) from Araújo & Costa-Campos (2015) (as *Pseudis laevis*) is actually *Lysapsus bolivianus* (Gallardo, 1961) (Costa-Campos, pers. comm.).

There are two species of the group of *Osteocephalus buckleyi* (sensu Jüngfer *et al.* 2013) cited for Amapá, *O. buckleyi* (Boulenger, 1882) (Lima 2008; Queiroz *et al.* 2011) and *O. cabrerai* (Cochran & Goin, 1970) (Lima 2006b, 2008; Pedroso-Santos *et al.* 2019). Dewynter *et al.* (2019) also found two species of the group of *O. buckleyi* in French Guiana, both reaching the border with Amapá: *O. cabrerai* and *Osteocephalus helenae* (Ruthven, 1919). Vacher *et al.* (2020) also adopted these two species names in their molecular survey for populations of *Osteocephalus* from Amapá and French Guiana. Even though the two species were recovered as a single taxonomic entity in their species delimitation analysis, they applied both names to the clade formed by two lineages of *Osteocephalus* that appear to be morphologically diagnosable to each other and coexist in the Eastern Guiana Shield (see Dewynter *et al.* 2016). Thus, we consider both *O. cabrerai* and *O. helenae* in our list. We did not have access to the voucher specimens of most studies and most of the known previous records do not provide photographs of species of *Osteocephalus*. As such, we could not be precise about the locations where each of the two species occurs in Amapá. One exception is at Reserva Extrativista Municipal Beija-Flor-Brilho-de-Fogo, central part of Amapá, from where Pedroso-Santos *et al.* provided a picture of what they identified as *O. cabrerai* (Pedroso-Santos *et al.* 2019: 801, fig. 1.11) and it corresponds to the same morphotype Dewynter *et al.* (2016) consider *O. cabrerai*.

Scinax garbei (Miranda-Ribeiro, 1926) is a widespread species of the group of *S. rostratus* distributed throughout the middle and upper Amazon Basin in Venezuela, Ecuador, Colombia, Peru, Bolivia and Brazil (Faivovich *et al.* 2005; Frost 2022). Although there are records of *S. garbei* from Amapá (Ferreira-Lima *et al.* 2017; Lima 2018; Silva e Silva & Costa-Campos 2018), there is molecular evidence of only *Scinax jolyi* Lescure & Marty, 2000 inhabiting Amapá (Vacher *et al.* 2020). Due to the taxonomic complexity of *S. garbei* (Ron *et al.* 2018) and the overall morphological similarity between the two species, we consider more plausible that the records of *S. garbei* in Amapá are indeed *S. jolyi*. *Scinax cruentomma* (Duelmann, 1972) is mainly distributed in western Amazonia, but there are a few additional records in other Amazonian regions (Carvalho *et al.* 2015: fig. 3). Those authors conducted acoustic comparisons between populations from the type locality (Santa Cecilia, Ecuador), the upper Negro River (Amazonas, Brazil), and French Guiana (data derived from Lescure & Marty 2000) and found that the high variation in some of the analyzed call traits indicate that the French Guiana population could represent another, potentially unnamed, species. Therefore, we provisionally assign the Amapá population to *S.* cf. *cruentomma* until the taxonomic status of the populations of *Scinax* bearing a horizontal red streak on the iris from the Eastern Guiana Shield is addressed.

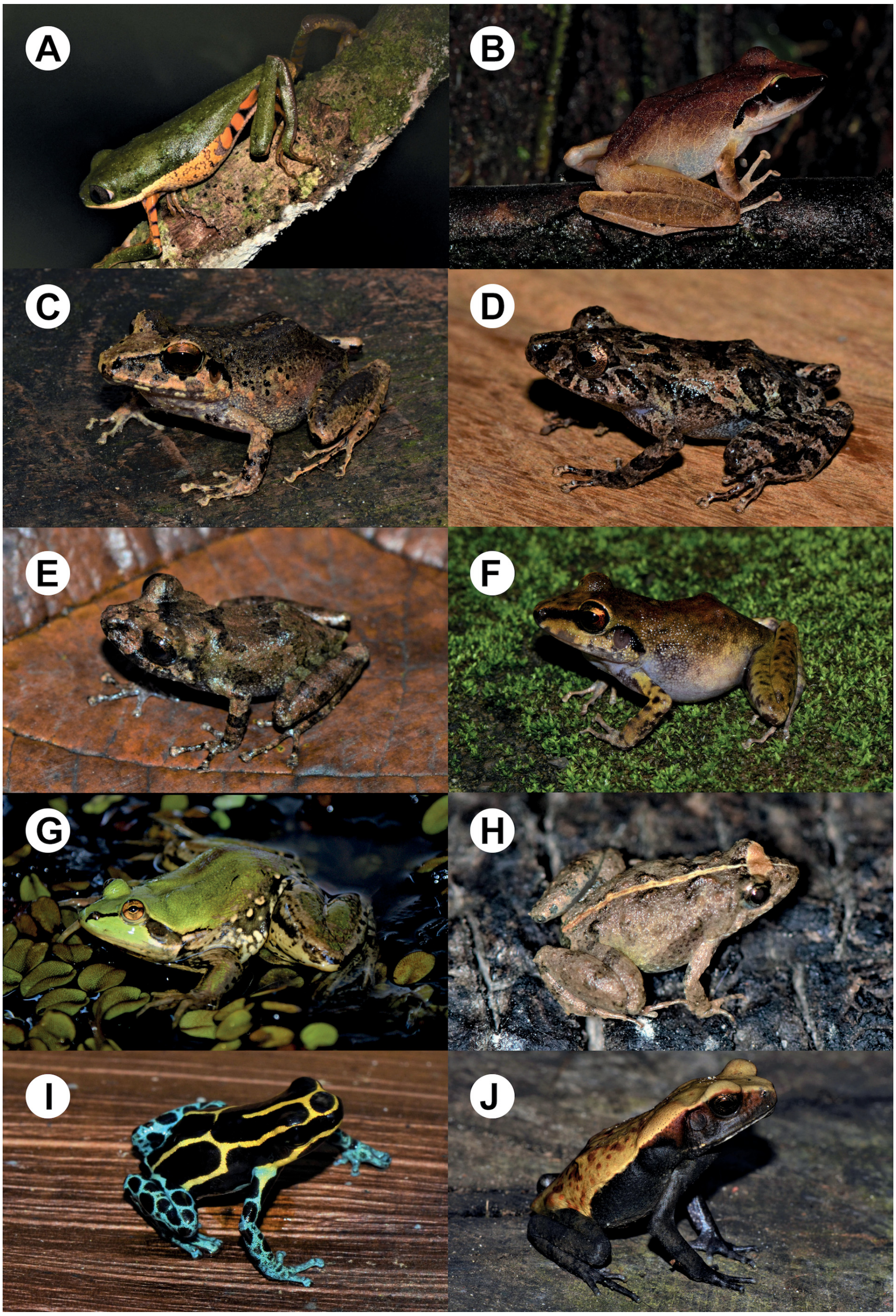

Fig. 7. Anuran species recorded in the state of Amapá. **A**. *Pithecopus hypochondrialis* (Daudin, 1800). **B**. *Pristimantis chiastonotus* (Lynch & Hoogmoed, 1977). **C**. *Pristimantis gutturalis* (Hoogmoed, Lynch & Lescure, 1977). **D**. *Pristimantis inguinalis* (Parker, 1940). **E**. *Pristimantis crepitaculus* Fouquet, Peloso, Jairam, Lima, Mônico, Ernst & Kok, 2022. **F**. *Pristimantis zeuctotylus* (Lynch & Hoogmoed, 1977). **G**. *Pseudis paradoxa* (Linnaeus, 1758). **H**. *Pseudopaludicola boliviana* Parker, 1927. **I**. *Ranitomeya variabilis* Zimmermann & Zimmermann, 1988. **J**. *Rhaebo guttatus* (Schneider, 1799). Photos: C.E. Costa-Campos.

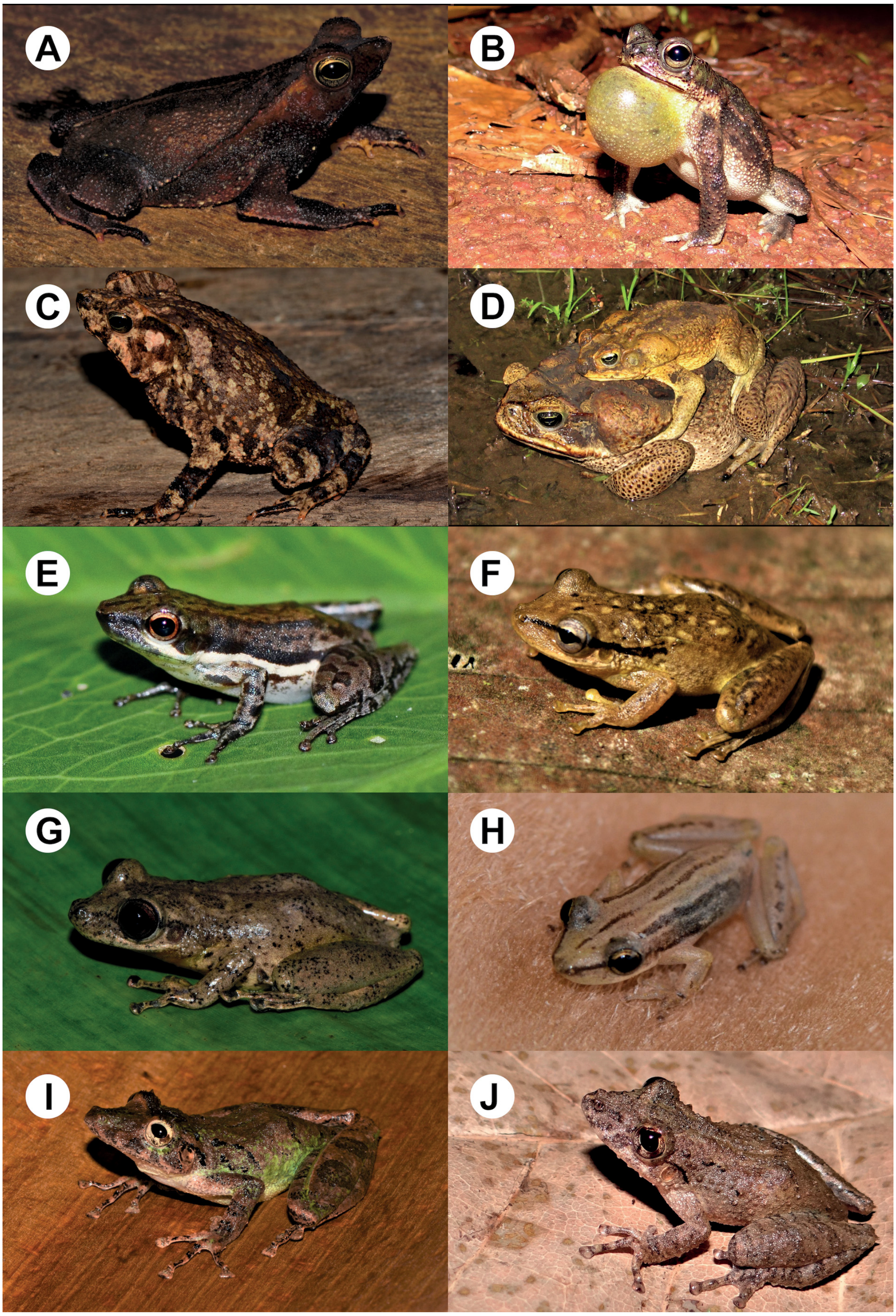

Fig. 8. Anuran species recorded in the state of Amapá. **A**. *Rhinella* aff. *castaneotica*. **B**. *Rhinella major* (Müller & Hellmich, 1936). **C**. *Rhinella margaritifera* (Laurenti, 1768). **D**. *Rhinella marina* (Linnaeus, 1758). **E**. *Scarthyla goinorum* (Bokermann, 1962). **F**. *Scinax boesemani* (Goin, 1966). **G**. *Scinax cruentomma* (Duellmann, 1972). **H**. *Scinax fuscomarginatus* (A. Lutz, 1925). **I**. *Scinax jolyi* Lescure & Marty, 2001. **J**. *Scinax nebulosus* (Spix, 1824). Photos: C.E. Costa-Campos.

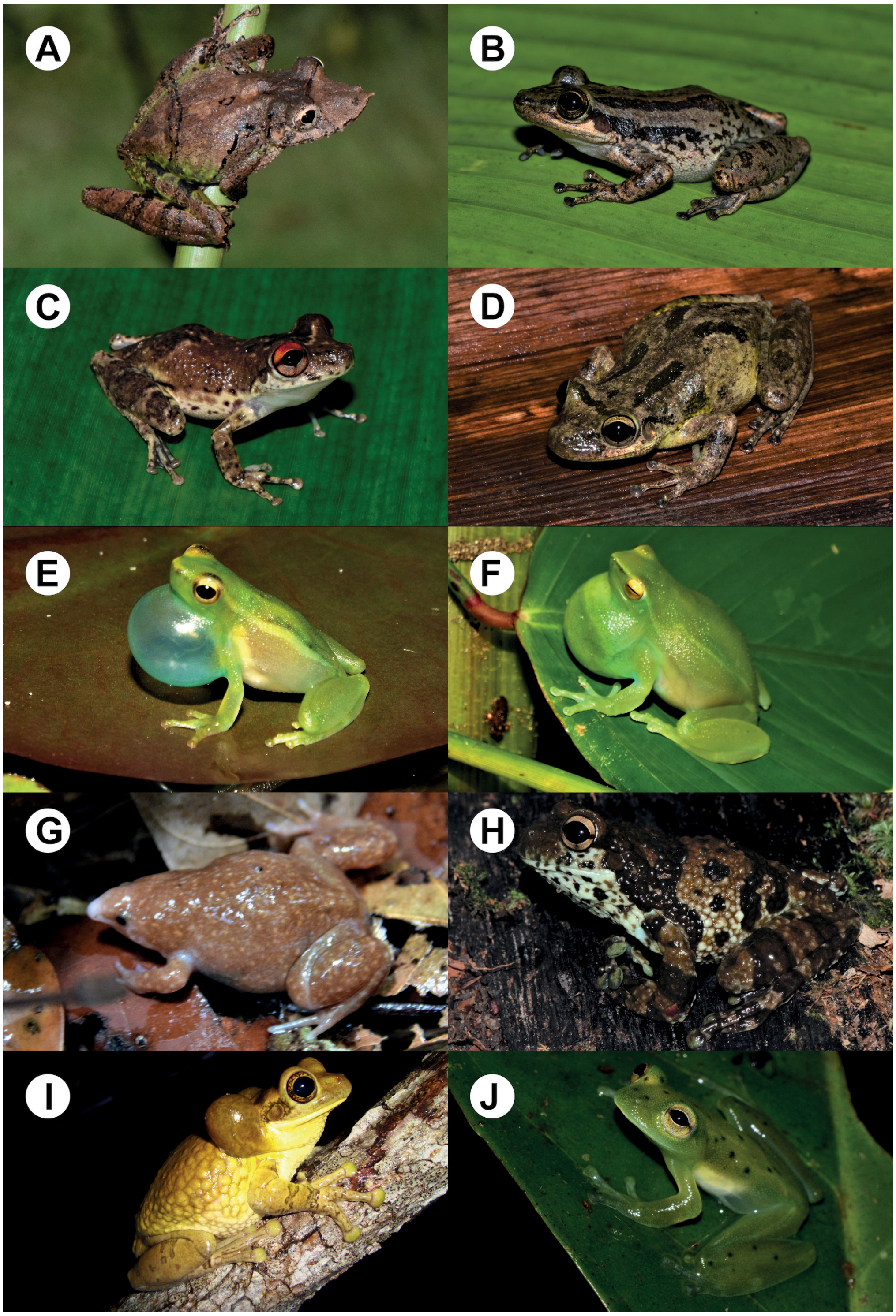

Fig. 9. Anuran species recorded in the state of Amapá. **A**. *Scinax proboscideus* (Brongersma, 1933). **B**. *Scinax ruber* (Laurenti, 1768). **C**. *Scinax ruberoculatus* (Ferrão, Fraga, Moravec, Kaefer & Lima, 2018). **D**. *Scinax x-signatus* (Spix, 1824). **E**. *Sphaenorhynchus carneus* (Cope, 1868). **F**. *Sphaenorhynchus lacteus* (Daudin, 1800). **G**. *Synapturanus zombie* Fouquet, Leblanc, Fabre, Rodrigues, Menin, Courtois, Dewynter, Hölting, Ernst, Peloso & Kok, 2021. **H**. *Trachycephalus hadroceps* (Duellman & Hoogmoed, 1992). **I**. *Trachycephalus typhonius* (Linnaeus, 1758). **J**. *Vitreorana ritae* (Lutz, 1952). Photos: C.E. Costa-Campos.

Family **Leptodactylidae** Werner, 1896

Leptodactylus bolivianus Boulenger, 1898 is distributed in the western and central portions of the Amazon Basin in Bolivia, Brazil, Colombia, Peru and Venezuela (Heyer & de Sá 2011), whereas *Leptodactylus guianensis* Heyer & de Sá, 2011 is distributed across the Guiana Shield. These two species are morphologically quite similar to each other and, before the description of *L. guianensis* in 2011, it was commonly confused with *L. bolivianus* in the literature (Heyer & de Sá 2011). We consider the record of *L.* cf. *bolivianus* from Lima (2006b) to be *L. guianensis.* Gazoni *et al.* (2021) recently revisited the systematics of the group of *L. melanonotus* using an integrative approach. One of the taxonomic results was the revalidation of *L. intermedius*, previously a junior synonym of *Leptodactylus petersii* Steindachner, 1864. Besides *L. petersii,* there are records of two other species of the group of *L. melanonotus* in Amapá: *L. wagneri* (Lima 2006) and *Leptodactylus podicipinus* Cope, 1862 (Pereira-Júnior *et al.* 2013; Araújo & Costa 2015; Lima 2018; Costa-Campos & Freire 2019). All records previously associated with *L. podicipinus* in Amapá should be assigned to *L. intermedius*. *Leptodactylus wagneri* is distributed in western Amazonia and the records in eastern Amazonia correspond either to *L. intermedius* (see Gazoni *et al.* 2021) or to unnamed species, treated here as *Leptodactylus* sp., endemic to the Eastern Guiana Shield (Carvalho *et al.* in press). *Leptodactylus leptodactyloides* (Andersson, 1945) is widely distributed in Amazonia but reported in Amapá for the first time in this study. The species was confirmed to occur at one location (Comunidade Ariri), within the municipality of Macapá, based on DNA-barcoded individuals (Carvalho *et al.* in press).

Family **Microhylidae** Günther, 1858

The only species of the genus *Elachistocleis* known to occur in the state of Amapá is *Elachistocleis helianneae* Caramaschi, 2010 (Jowers *et al.* 2021). We considered the record of *Elachistocleis* sp. from Pereira-Júnior *et al.* (2013) to be *E. helianneae* based on the distribution and the overall morphology of the specimens (Costa-Campos, pers. obs.) and calls (Marinho *et al.* 2018).

Fouquet *et al.* (2021b) showed in their integrative study that *Otophryne pyburni* is probably restricted to the western portion of the Guiana Shield, and that the populations of *Otophryne* inhabiting French Guiana and the Brazilian states of Amapá and Pará belong to an unconfirmed candidate species related to *Otophryne robusta* Boulenger, 1900. Therefore, we chose to consider the records of *O. pyburni* in Amapá as *O.* cf. *robusta* until more studies arise to evaluate its taxonomic status, confirming or contradicting this candidate species.

Synapturanus zombie Fouquet, Leblanc, Fabre, Rodrigues, Menin, Courtois, Dewynter, Hölting, Ernst, Peloso & Kok, 2021 was recently described from French Guiana with one population recorded in the municipality of Oiapoque, northern Amapá (locality 46, Fig. 10) and a second potential population in the upper Rio Calçoene (2.3734° N, 51.3782° W; Fouquet *et al.* 2021a). We did not add this locality to the map because of the uncertainty on the population identity according to the original publication. We have found records of *Synapturanus mirandaribeiroi* Nelson & Lescure, 1975 from three localities in the Tumucumaque Mountains National Park (localities 5–7; Lima 2008). The two species have previously been confused with each other and have close distribution ranges, with one of the records from Tumucumaque (locality 5) very close to the Mitaraka massif, French Guiana, one of the localities with known populations of *S. mirandaribeiroi* (Fouquet *et al.* 2021). We then consider the records from the Tumucumaque Park (Lima 2008) as *S. mirandaribeiroi*, but we are aware that some of these records may actually be *S. zombie* Fouquet, Leblanc, Fabre, Rodrigues, Menin, Courtois, Dewynter, Hölting, Ernst, Peloso & Kok, 2021. Finally, we have an unvouchered record of *S. zombie* from the municipality of Serra do Navio, with only a picture (Fig. 9G). Although the picture is slightly out of focus, it is possible to see one important diagnostic character distinguishing this species from *S. mirandaribeiroi*: the dorsum with numerous orange spots and blotches (dorsum with diffuse mottled pattern in *S. mirandaribeiroi*). Therefore, we consider the photograph-based record of *S. zombie* in Serra do Navio, extending the distribution of this species to the central portion of Amapá, more than 250 km southeast from its type locality (Itoupé, French Guiana; 3.0230° N, 53.0955° W).

Discussion

The great majority of the localities sampled in this study are concentrated in the central part of Amapá (Fig. 10), which is also the region with most of the checklist localities (9 out of 19). There are two other important sampling regions within the state: the savannas in the southern portion of Amapá, mainly in the municipalities of Macapá and Santana, and southernmost part of the municipality of Laranjal do Jari, southwestern Amapá. These three regions correspond to 36 out of the total 48 sampling localities and 14 out of the 19 checklist localities (75% and about 73%, respectively). The regions that most need

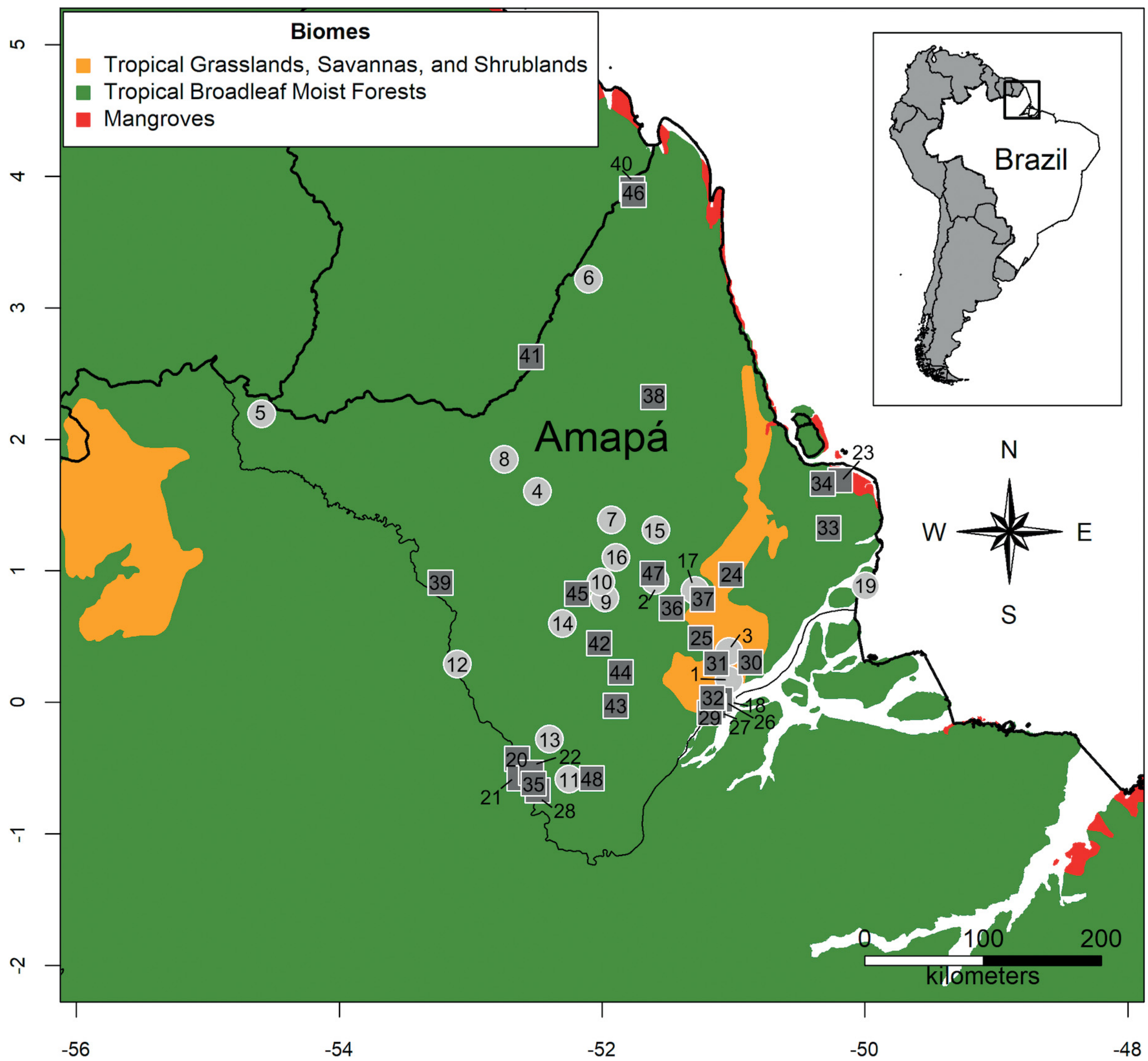

Fig. 10. Localities showing distribution records of anuran species through the biomes within the state of Amapá. Localities 1 to 19 are from species checklists (light gray circles), whereas the remaining ones (20 to 48, dark gray squares) represent punctual records.

studies in Amapá are the mangroves along the coastline, the northern portion of the Cerrado of Amapá, the forests east of the Cerrado of Amapá and in northern Amapá. Studies concerning anurans in these regions should be prioritized.

The Tropical Moist Broadleaf Forest biome was the most diverse with almost 92% of the species, about 62% being exclusive, and we identified three diversity 'hotspots' within it: Parque Natural Municipal do Cancão, municipality of Serra do Navio (Locality 10; 0.913285° N, 52.006800° W) with 51 species; the Amapá National Forest, municipality of Ferreira Gomes (Locality 2; 0.924722° N, 51.595833° W); and one site at Tumucumaque Mountains National Park, municipality of Pedra Branca do Amapari (Locality 8; 1.844722° N, 52.741111° W), both with 42 species. The municipality of Serra do Navio has been a study site for herpetologists, focused especially on anurans, since the late 1960s (Bokermann 1967), and the checklist by Silva-e-Silva & Costa-Campos (2018) was made based on monthly expeditions during one year. Also, Benício & Lima (2017) sampled the Amapá National Forest during the period coinciding with the most intense rains in the region, spending 56 days of sampling divided in three expeditions in two different years, 2012 and 2014. Conversely, Lima (2008) sampled the site at the Tumucumaque National Park during only 20 days in February and March 2006, during a Rapid Biological Inventory (RAP). Even so, according to our study, he registered 42 species. Due to the high levels of species richness, several records not identified to the species level, and insufficient number of species inventories, these three areas in Amapá hold the potential to harbor many more anuran species. We expect that more expeditions to these localities, allied to integrative studies gathering molecular, acoustic, and morphological data will increase the species account in these localities, as well as the number of species occurring Amapá as a whole. By way of comparison, similar study sites in southern French Guiana, close to the border with Amapá, can harbor up to 56 anuran species, such as the Mitaraka Massif (Fouquet *et al.* 2019c). This number is even higher than the 51 species found at Serra do Navio. Although similar sites in the same region had less species, the numbers are also remarkable, with 31 anuran species inhabiting Haute Wanapi (Gaucher & de Massary 2005), 34 inhabiting Pic Coudreau du sud (Blanc 2016), and 41 inhabiting Borne nº 4 (Dewynter & Chaline 2016). The number of species found in these sites in southern French Guiana are concordant with most forested sites sampled in Amapá but, because of the lack of mid to long term studies, their species richness may also be underestimated.

On the other hand, the Cerrado of Amapá houses almost 38% of the anuran species in the state and, although less diverse than the surrounding forests, it is an exclusive habitat to about 8% of these species. The region is a knowledge gap in the state, especially its northern portion, with 3 out of the 19 checklist localities and 12 out of the 48 total study sites. Nonetheless, only 9.2% of its total area is legally protected and less than 0.5% is strictly protected. The Cerrado of Amapá is extremely threatened and it is subject to high human pressure by urbanization, highway networks, and agriculture (Mustin *et al.* 2017). In addition to the total number of species housed, savanna enclaves within the Amazon Forest in Amapá and other regions in northern South America are important study sites for evolutionary biologists and phylogeographers. Natural populations in these savanna areas are isolated from each other and from adjacent forests and can inform us about species diversification in the Neotropics (e.g., Buzatti *et al.* 2018; Els *et al.* 2020). For instance, there are some species occurring in the open formations of Amapá but nowhere else in the Guiana Shield, such as *Dendropsophus haraldschultzi* (Bokermann, 1962), *E. heliannae*, *Pseudopaludicola boliviana* (Parker, 1927), *R. major, Scinax fuscomarginatus* (Lutz, 1925), and *Sphaenorhynchus carneus* (Cope, 1868). This is a striking pattern, and these species certainly bear invaluable genetic information and can shed light on anuran diversification, as well as the historical biogeography and the landscape dynamics in Amazonia. Moreover, genetic studies involving anurans in the Cerrado of Amapá will highly increase our knowledge of South American phylogeography and the conservation of the savanna enclaves within the Amazon Forest.

Although we have found 111 anuran species, a remarkable number for a territory the size of Amapá, we predict this number to grow fast as research in the state continues. Aside from undescribed species, there are many species that are known to occur in bordering territories, but their distribution limits coincide with the border with Amapá. For instance, French Guiana is a territory to the northwest, about 60% of the size of Amapá. With the exception of the unique Cerrado of Amapá, both territories are environmentally very similar, comprising part of the eastern portion of the Guiana Shield, lying east of the Branco and Esequibo rivers (Fouquet *et al.* 2012). Because of this, it is expected that most species occurring in French Guiana also occur in Amapá. Many anuran species are known to occur in French Guiana, with some occurrence records reported almost on the border with Amapá, such as *Allobates granti* (Réjaud *et al.* 2020), *Anomaloglossus mitaraka* Fouquet, Vacher, Courtois, Deschamps, Ouboter, Jairam, Gaucher, Dubois & Kok, 2019 (Fouquet *et al.* 2019b), *Anomaloglossus surinamensis* Ouboter & Jairam, 2012, *Cochranella geijskesi* (Goin, 1966), *Hyalinobatrachium kawense* Castroviejo-Fisher, Vilà, Ayarzagüena, Blanc & Ernst, 2011(Fouquet *et al.* 2019c), *Boana xerophylla* (Duméril & Bibron, 1841), and *Pipa aspera* Müller, 1924 (Dewynter & Chaline 2016; Blanc 2016; Fouquet *et al.* 2022a). We predict that most or even all these species also occur in Amapá and will be found as a natural consequence of the advance in research in the state.

The current annotated list greatly contributes to the incipient knowledge on anuran species richness in the Brazilian state of Amapá. The first anuran local checklists in Amapá are less than 20 years old (Lima 2006a, 2006b) and many of these show a large proportion of taxa not identified to the species level. We could identify a few of them based on information retrieved from the literature only (see "Taxonomic Comments" section above), but for the vast majority an integrative approach is still required, linking voucher specimens to bioacoustic and/or molecular data for more accurate species identifications. Many of these non-identified species may be new to science, such as the three undescribed frog species we recorded in our study (*Boana* aff. *semilineata*, *Leptodactylus* sp., and *Rhinella* aff. *castaneotica*). Of 111 anuran species included in our list, only three (less than 3%) have their type locality within the state of Amapá, being two of them endemic to the state. As much as the knowledge regarding amphibian taxonomy in the state has developed over the past 20 years, describing new species is not a trivial task and the high species diversity and the very low number of anuran species described with material from Amapá highlight the need for trained taxonomists to develop research in the state.

Acknowledgements

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001 (PPGT postdoctoral fellowship). PPGT currently receives a postdoctoral fellowship from the National Council for Scientific and Technological Development (CNPq – process #163594/2020-1). FM receives a productivity scholarship from CNPq (process #302806/2018-0). TRC was recipient of a postdoctoral fellowship from CNPq (process #163918/2020-1). We are grateful to T. Robillard, A. Miralles and E.-M. Levermann (EJT) for the great editorial process and to an anonymous reviewer for their invaluable comments, which greatly improved the manuscript.

References

Araújo A.S. & Costa-Campos C.E. 2014. Anurans of the Reserva Biológica do Parazinho, Municipality of Macapá, state of Amapá, eastern Amazon. *Check List* 10 (6): 1414–1419. https://doi.org/10.15560/10.6.1414

Araújo K.C., Pansonato A., Oliveira R.H., Morais D.H., Carvalho V.T. & Ávila R.W. 2018. Advertisement call and new distribution records from Brazil of *Teratohyla midas* (Lynch & Duellman, 1973) (Anura, Centrolenidae). *Check List* 14 (2): 303–308. https://doi.org/10.15560/14.2.303

Benício R.A. & Lima J.D. 2017. Anurans of Amapá National Forest, Eastern Amazonia, Brazil. *Herpetology Notes* 10: 627–633.

Blanc M. 2016. Inventaire herpétologique du Pic Coudreau du Sud. *Les Cahiers scientifiques du Parc amazonien de Guyane* 2 (1): 327–339.

Bokermann W.C.A. 1967. Nova espécie de *Hyla* do Amapá. *Revista Brasileira de Biologia* 27: 109–111.

Brown J.L., Twomey E., Amézquita A., Souza M.B., Caldwell J.P., Lötters S., von May R., Melo-Sampaio P.R., Mejía-Vargas D., Perez-Peña P., Pepper M., Poelman E.H., Sanchez-Rodriguez M. & Summers K. 2011. A taxonomic revision of the Neotropical poison frog genus *Ranitomeya* (Amphibia: Dendrobatidae). *Zootaxa* 3083 (1): 1–120. https://doi.org/10.11646/zootaxa.3083.1.1

Buzatti R.S. de O., Pfeilsticker T.R., Magalhães R.F., Bueno M.L., Lemos-Filho J.P. & Lovato M.B. 2018. Genetic and historical colonization analyses of an endemic savanna tree, *Qualea grandiflora*, reveal ancient connections between Amazonian savannas and Cerrado core. *Frontiers in Plant Science* 9: 1–16. https://doi.org/10.3389/fpls.2018.00981

Cáceres M.E. da S. & Aptroot A. 2016. First inventory of lichens from the Brazilian Amazon in Amapá State. *The Bryologist* 119 (3): 250–265.

Caldwell J.P., Lima A.P. & Keller C. 2002. Redescription of *Colostethus marchesianus* from its type locality. *Copeia* 2002: 157–165.

Carvalho T.R., Fouquet A., Lyra M.L., Giaretta A.A., Costa-Campos C.E., Rodrigues M.T., Haddad C.F.B. & Ron S.R. In Press. Species diversity and systematics of the *Leptodactylus melanonotus* group (Anura, Leptodactylidae): review of diagnostic traits and a new species from the Eastern Guiana Shield. *Systematics and Biodiversity*. https://doi.org/10.1080/14772000.2022.2089269

Carvalho T.R., Teixeira B.F.V., Duellman W.E. & Giaretta A.A. 2015. *Scinax cruentommus* (Anura: Hylidae) in the upper Rio Negro drainage, Amazonas state, Brazil, with the redescription of its advertisement call. *Phyllomedusa* 14 (2): 139–146. https://doi.org/10.11606/issn.2316-9079.v14i2p139-146

Charity S., Dudley N., Oliveira D. & Stolton S. 2016. *Living Amazon Report 2016: A Regional Approach to Conservation in the Amazon*. WWF Living Amazon Initiative, Brasilia, Quito.

Cisneros-Heredia D.F. 2013. *Centrolene ritae* Lutz es un sinónimo senior de *Cochranella oyampiensis* Lescure y *Cochranella ametarsia* Flores (Anura: Centrolenidae). *ACI Avances en Ciencias e Ingenierías* 5 (2). https://doi.org/10.18272/aci.v5i2.132

Cole C.J., Townsend C.R., Reynolds R.P., MacCulloch R.D. & Lathrop A. 2013. Amphibians and reptiles of Guyana, South America: illustrated keys, annotated species accounts, and a biogeographic synopsis. *Proceedings of the Biological Society of Washington* 125: 317–578.

Corrêa J.G., Souza J.C., França P.F. & Costa-Campos C.E. 2015. *Sphaenorhynchus carneus* (Cope, 1868) (Amphibia: Anura: Hylidae): distribution extension, geographic distribution map and new state record. *Check List* 11 (4): 1725. https://doi.org/10.15560/11.4.1725

Costa-Campos C.E., Bang D.L., de Figueiredo V.A.M.B., Tavares-Pinheiro R. & Fouquet A. 2021. New records and distribution extensions of the glassfrogs *Hyalinobatrachium taylori* (Goin, 1968) and *H. tricolor* Castroviejo-Fisher, Vilà, Ayarzagüena, Blanc & Ernst, 2011 (Anura, Centrolenidae) in Amapá, Brazil. *Check List* 17 (2): 637–642. https://doi.org/10.15560/17.2.637

Costa-Campos C.E. & Carvalho T.R. 2018. The advertisement call of the Hoogmoed's harlequin toad *Atelopus hoogmoedi* Lescure, 1974 from northern Brazil (Anura, Bufonidae). *Zootaxa* 4521 (1): 141–144. https://doi.org/10.11646/zootaxa.4521.1.11

Costa-Campos C.E., Carvalho T.R. & Freire E.M.X. 2016. First record of *Pseudopaludicola boliviana* Parker, 1927 (Anura, Leptodactylidae, Leiuperinae) in the Brazilian state of Amapá, with comments on its advertisement call and distribution. *Check List* 12 (6): 1991. https://doi.org/10.15560/12.6.1991

Costa-Campos C.E., Figueiredo V.A.M.B., Jairam R. & Fouquet A. 2020. Distribution extension of *Rhinella lescurei* (Bufonidae) in the state of Amapá, Brazil. *Herpetology Notes* 13: 801–804.

Costa-Campos C.E., Figueiredo V.A.M.B., Lima J.R.F.L. & Lima J.D. 2020. New record and distribution map of the glassfrog *Vitreorana ritae* (Lutz, 1952) (Anura: Centrolenidae) from Amapá state, Eastern Amazon. *Herpetology Notes* 13: 733–737.

Costa-Campos C.E. & Freire E.M.X. 2019. Richness and composition of anuran assemblages from an Amazonian savanna. *ZooKeys* 2019 (843): 149–169. https://doi.org/10.3897/zookeys.843.33365

Costa-Campos C.E., Pinheiro R.T. & Castroviejo-Fisher S. 2020. Amphibia, Anura, Centrolenidae, *Cochranella resplendens* (Lynch & Duellman, 1973): first record from Brazil and updated map of the geographic distribution. *Check List* 16 (4): 847–851. https://doi.org/10.15560/16.4.847

Costa-Campos C.E., Sousa J.C. & Menin M. 2019. *Chiasmocleis hudsoni* Parker, 1940 (Anura, Microhylidae): a new record for Amapá State, Brazil. *Herpetology Notes* 12: 405–408.

Cracraft J. 1988. Deep-History Biogeography: Retrieving the Historical Pattern of Evolving Continental Biotas. *Systematic Zoology* 37 (3): 221. https://doi.org/10.2307/2992369

Davidson E.A., de Araüjo A.C., Artaxo P., Balch J.K., Brown I.F., Mercedes M.M., Coe M.T., Defries R.S., Keller M., Longo M., Munger J.W., Schroeder W., Soares-Filho B.S., Souza C.M. & Wofsy S.C. 2012. The Amazon basin in transition. *Nature* 481 (7381): 321–328. https://doi.org/10.1038/nature10717

Dewynter M. & Chaline O. 2016. Inventaire herpétologique de la Borne n° 4. *Les Cahiers scientifiques du Parc amazonien de Guyane* 2 (1): 281–302.

Dias-Souza M.R., de Figueiredo V.A.M.B., Tavares-Pinheiro R. & Costa-Campos C.E. 2021. Filling gap and new state record of *Lithodytes lineatus* (Schneider, 1799) (Anura, Leptodactylidae) from the eastern Brazilian Amazon. *Check List* 17 (1): 95–101. https://doi.org/10.15560/17.1.95

Elmer K.R. & Cannatella D.C. 2008. Three new species of leaflitter frogs from the upper Amazon forests: cryptic diversity within *Pristimantis "ockendeni"* (Anura: Strabomantidae) in Ecuador. *Zootaxa* 1784: 11–38.

Elmer K.R., Dávila J.A. & Lougheed S.C. 2007 Cryptic diversity and deep divergence in an upper Amazonian leaflitter frog, *Eleutherodactylus ockendeni*. *BMC Evolutionary Biology* 7: 247. https://doi.org/10.1186/1471-2148-7-247

Els P. van, Zarza E., Rocha Moreira L., Gómez-Bahamón V., Santana A., Aleixo A., Ribas C.C., do Rêgo P.S., Santos M.P.D., Zyskowski K., Prum R.O. & Berv J. 2021. Recent divergence and lack of shared phylogeographic history characterize the diversification of Neotropical savanna birds. *Journal of Biogeography* 48 (5): 1124–1137. https://doi.org/10.1111/jbi.14065

Faivovich J., Haddad C.F.B., Garcia P.C.A., Frost D.R., Campbell J.A. & Wheeler W.C. 2005. Systematic review of the frog family Hylidae, with special reference to Hylinae: phylogenetic analysis and taxonomic revision. *Bulletin of the American Museum of Natural History* 294: 1–240.

Ferrão M., de Souza R.A., Colatreli O.P., Hanken J. & Lima A.P. 2022. Hidden in the litter: cryptic diversity of the leaf-litter toad *Rhinella castaneotica-proboscidea* complex revealed through integrative taxonomy, with description of a new species from south-western Amazonia. *Systematics and Biodiversity* 20: 1–24. https://doi.org/10.1080/14772000.2022.2039317

Ferreira-Lima J.R., Lima J.D., Lima S.D., Silva R.B.L. & Andrade G.V. 2017. Amphibians found in the Amazonian Savanna of the Rio Curiaú Environmental. *Biota Neotropica,* Inventory 17 (2): e20160252. https://doi.org/10.1590/1676-0611-BN-2016-0252

Ferreira-Lima J.R., Lima J.D., Sousa J.C., de Oliveira S.H. & Costa-Campos C.E. 2019. *Hydrolaetare schmidti* (Cochran & Goin, 1959): New records for Amapá state, eastern Amazon and a geographic distribution map. *Check List* 15 (5): 815–819. https://doi.org/10.15560/15.5.815

Figueiredo V.A.M.B., Tavares-Pinheiro R., de Freitas A.P., Dias-Souza M.R. & Costa-Campos C.E. 2020. First records of the glass frogs *Hyalinobatrachium cappellei* (Van Lidth de Jeude, 1904) and *H. mondolfii* Señaris & Ayarzagüena, 2001 (Anura, Centrolenidae) in the state of Amapá, Brazil. *Check List* 16 (5): 1369–1374. https://doi.org/10.15560/16.5.1369

Figueiredo V.A.M.B., Tavares-Pinheiro R., Lopes A.G., Pedroso-Santos F., Sanches P.R., Sousa J.C., dos Santos J.P., Lima J.D., Lima J.R.F. & Costa-Campos C.E. 2021. First records of *Scinax ruberoculatus* Ferrão, Fraga, Moravec, Kaefer & Lima, 2018 (Anura, Hylidae) in the state of Amapá, eastern Amazon, Brazil, with comments on its vocalization and distribution. *Check List* 17 (4): 1123–1130. https://doi.org/10.15560/17.4.1123

Figueiredo V.A.M.B., Tavares-pinheiro R., Pinheiro-Freitas A. & Costa-Campos C.E. 2021. New geographic record for *Osteocephalus leprieurii* (Duméril & Bibron, 1841) (Anura, Hylidae) from Amapá State, northern Brazil. *Herpetology Notes* 14 (May): 827–831.

Fouquet A., Noonan B.P., Michel Blanc & Dill Orrico V.G. 2011. Phylogenetic position of *Dendropsophus gaucheri* (Lescure & Marty, 2000) highlights the need for an in-depth investigation of the phylogenetic relationships of *Dendropsophus* (Anura: Hylidae). *Zootaxa* 3035: 59–67. https://doi.org/10.11646/zootaxa.3035.1.3

Fouquet A., Noonan B.P., Rodrigues M.T., Pech N., Gilles A. & Gemmell N.J. 2012. Multiple Quaternary refugia in the Eastern Guiana Shield revealed by comparative phylogeography of 12 frog species. *Systematic Biology* 61: 461–489. https://doi.org/10.1093/sysbio/syr130

Fouquet A., Martinez Q., Zeidler L., Courtois E.A., Gaucher P., Blanc M., Lima J.D., Souza S.M., Rodrigues M.T. & Kok P.J.R. 2016. Cryptic diversity in the *Hypsiboas semilineatus* species group (Amphibia, Anura) with the description of a new species from the eastern Guiana Shield. *Zootaxa* 4084 (1): 79–104. https://doi.org/10.11646/zootaxa.4084.1.3

Fouquet A., Ferrier B., Salmona J., Tirera S., Vacher J.-P., Courtois E.A., Gaucher P., Lima J.D., Nunes P.M.S., De Souza S.M., Rodrigues M.T., Noonan B. & De Thoisy B. 2019a. Phenotypic and life-history diversification in Amazonian frogs despite past introgressions. *Molecular Phylogenetics and Evolution* 130: 169–180. https://doi.org/10.1016/j.ympev.2018.09.010

Fouquet A., Vacher J.-P., Courtois E.A., Deschamps C., Ouboter P., Jairam R., Gaucher P., Dubois A. & Kok P.J.R. 2019b. A new species of *Anomaloglossus* (Anura: Aromobatidae) of the stepheni group with the redescription of *A. baeobatrachus* (Boistel and de Massary, 1999), and an amended definition of *A. leopardus* Ouboter and Jairam, 2012. *Zootaxa* 4576: 439–460. https://doi.org/10.11646/zootaxa.4576.3.2

Fouquet A., Vidal N. & Dewynter M. 2019c. The amphibians of the Mitaraka massif, French Guiana. *Zoosystema* 41 (sp1): 359–374. https://doi.org/10.5252/zoosystema2019v41a19

Fouquet A., Leblanc K., Fabre A.C., Rodrigues M.T., Menin M., Courtois E.A., Dewynter M., Hölting M., Ernst R., Peloso P. & Kok P.J.R. 2021a. Comparative osteology of the fossorial frogs of the genus *Synapturanus* (Anura, Microhylidae) with the description of three new species from the Eastern Guiana Shield. *Zoologischer Anzeiger* 293: 46–73. https://doi.org/10.1016/j.jcz.2021.05.003

Fouquet A., Leblanc K., Framit M., Réjaud A., Rodrigues M.T., Castroviejo-Fisher S., Pelos P.L.V., Prates I., Manzi S., Suescun U., Baroni S., Moraes L.J.C.L., Recoder R., Souza S.M., Dal Vecchio F., Camacho A., Ghellere J.M., Rojas-Runjaic F.J.M., Gagliardi-Urrutia G., De Carvalho V.T., Gordo M., Menin M., Kok P.J.R., Hrbek T., Werneck F.P., Crawford A.J., Ron S.R., Mueses-Cisneros J.J., Rojas Zamora R.R., Pavan D., Ivo Simões P., Ernst R. & Fabre A.-C. 2021b. Species diversity and biogeography of an ancient frog clade from the Guiana Shield (Anura: Microhylidae: *Adelastes, Otophryne*, *Synapturanus*) exhibiting spectacular phenotypic diversification. *Biological Journal of the Linnean Society* 132: 233–256. https://doi.org/10.1093/biolinnean/blaa204

Fouquet A., Marinho P., Réjaud A., Carvalho T.R., Caminer M.A., Jansen M., Rainha R.N., Rodrigues M.T., Werneck F.P., Lima A.P., Hrbek T., Giaretta A.A., Venegas P.J., Chávez G. & Ron S. 2021c. Systematics and biogeography of the *Boana albopunctata* species group (Anura, Hylidae), with the description of two new species from Amazonia. *Systematics and Biodiversity* 19 (4): 375–399. https://doi.org/10.1080/14772000.2021.1873869

Fouquet A., Cornuault J., Rodrigues M.T., Werneck F.P., Hrbek T., Acosta-Galvis A.R., Massemin D., Kok P.J.R. & Ernst R. 2022a. Diversity, biogeography, and reproductive evolution in the genus *Pipa* (Amphibia: Anura: Pipidae). *Molecular Phylogenetics and Evolution* 170: 107442. https://doi.org/10.1016/j.ympev.2022.107442

Fouquet A., Peloso P., Jairam R., Lima A.P., Mônico A.T., Ernst R. & Kok P.J.R. 2022b. Back from the deaf: integrative taxonomy revalidates an earless and mute species, *Hylodes grandoculis* van Lidth de Jeude, 1904, and confirms a new species of *Pristimantis* Jiménez de la Espada, 1870 (Anura: Strabomantidae) from the Eastern Guiana Shield. *Organisms Diversity & Evolution* (early access) https://doi.org/10.1007/s13127-022-00564-w.

Frost D.R. 2022. Amphibian Species of the World: an Online Reference. Available from http://research.amnh.org/herpetology/amphibia/index.html [accessed 11 Apr. 2022].

Frost D.R., Grant T., Faivovich J., Bain R.H., Haas A., Haddad C.F.B., de Sá R.O., Channing A., Wilkinson M., Donnellan S.C., Raxworthy C.J., Campbell J.A., Blotto B.L., Moler P., Drewes R.C., Nussbaum R.A., Lynch J.D., Green D.M. & Wheeler W.C. 2006. The Amphibian Tree of Life. *Bulletin of the American Museum of Natural History* 297 (297): 1–291. https://doi.org/10.1206/0003-0090(2006)297[0001:TATOL]2.0.CO;2

Gaucher P. & de Massary J.-C. 2005. Haute Wanapi. Étude de la faune. *In*: Gasc J.P. (ed.). *Le Faciès Savane-roche des Inselberg et sa Participation à la Biodiversité des Éosystèmes Guyanais*: 205–213. Rapport ECOFOR.

Gazoni T., Lyra M.L., Ron S.R., Strüssmann C., Baldo D., Narimatsu H., Pansonato A., Schneider R.G., Giaretta A.A., Haddad C.F.B., Parise-Maltempi P.P. & Carvalho T.R. 2021. Revisiting the systematics of the *Leptodactylus melanonotus* group (Anura: Leptodactylidae): Redescription of *L. petersii* and revalidation of its junior synonyms. *Zoologischer Anzeiger* 290: 117–134. https://doi.org/10.1016/j.jcz.2020.12.002

Godinho M.B. de C. & da Silva F.R. 2018. The influence of riverine barriers, climate, and topography on the biogeographic regionalization of Amazonian anurans. *Scientific Reports* 8 (1): 3427. https://doi.org/10.1038/s41598-018-21879-9

Heyer W.R. & de Sá R.O. 2011. Variation, Systematics, and Relationships of the Leptodactylus bolivianus Complex (Amphibia: Anura: Leptodactylidae). *Smithsonian Contributions to Zoology* 635: 1–58. https://doi.org/10.5479/si.00810282.635.1

IUCN 2022. The IUCN red list of threatened species. Available from https://www.iucnredlist.org [accessed 1 Sep. 2022].

Jorge R.F., Ferrão M. & Lima A.P. 2020. Out of bound: A new threatened Harlequin toad (Bufonidae, *Atelopus*) from the outer borders of the Guiana shield in Central Amazonia described through integrative taxonomy. *Diversity* 12 (8). https://doi.org/10.3390/D12080310

Jowers M.J., Othman S.N., Borzée A., Rivas G.A., Sánchez-Ramírez S., Auguste R.J., Downie J.R., Read M. & Murphy J.C. 2021. Unraveling unique island colonization events in *Elachistocleis* frogs: phylogeography, cryptic divergence, and taxonomical implications. *Organisms Diversity and Evolution* 21 (1): 189–206. https://doi.org/10.1007/s13127-021-00487-y

Jungfer K.-H., Faivovich J., Padial J.M., Castroviejo-Fisher S., Lyra M.L., Berneck B. von M., Iglesias P.P., Kok P.J.R., MacCulloch R.D., Rodrigues M.T., Verdade V.K., Torres-Gastello C.P., Chaparro J.C., Valdujo P.H., Reichle S., Moravec J., Gvoždík V., Gagliardi-Urrutia L.A.G., Ernst R., De la Riva I., Means D.B., Lima A.P., Señaris J.C., Wheeler W.C., and Haddad C.F.B. 2013. Systematics of spiny-backed treefrogs (Hylidae: *Osteocephalus*): an Amazonian puzzle. *Zoologica Scripta* 42: 351–380.

Kok P.J.R., Macculloch R.D., Gaucher P., Poelman E.H., Bourne G.R., Lathrop A. & Lenglet G.L. (2006). A new species of *Colostethus* (Anura, Dendrobatidae) from French Guiana with a redescription of *Colostethus beebei* (Noble, 1923) from its type locality. *Phyllomedusa: Journal of Herpetology* 5: 43–66. https://doi.org/10.11606/issn.2316-9079.v5i1p43-66

Kok P.J.R., Dezfoulian R., Means D.B., Fouquet A. & Barrio-Amorós C.L. 2018. Amended diagnosis and redescription of *Pristimantis marmoratus* (Boulenger, 1900) (Amphibia: Craugastoridae), with a description of its advertisement call and notes on its breeding ecology and phylogenetic relationships. *European Journal of Taxonomy* 397: 1–30. https://doi.org/10.5852/ejt.2018.397

Langone J.A. & Basso N.G. 1987. Distribución geografica y sinonimía de *Hyla nana* Boulenger, 1889 y de *Hyla sanborni* Schmidt, 1944 (Anura, Hylidae) y observaciones sobre formas afines. *Comunicaciones Zoológicas del Museo de Historia Natural de Montevideo* 11: 1–17.

Lescure J. 1974. Presence d'une sous-espèce d'*Atelopus pulcher* (Amphibien, Anoure) dans les Guyanes: *Atelopus pulcher hoogmoedi*. *Bulletin du Muséum national d'histoire naturelle, Paris. Serie 3, Zoologie* 144: 997–1005.

Lescure J. 1976. Contribution à l'étude des amphibiens de Guyane Française. VI. Liste préliminaire des anoures. *Bulletin du Muséum national d'histoire naturelle, Paris. Serie 3, Zoologie* 377: 475–524.

Lescure J., Grenand F. & Grenand P. 1980. Les Amphibiens dans l'univers wayàpi. *Journal d'Agriculture traditionnelle et de Botanique appliquée* 27 (3): 247–261. https://doi.org/10.3406/jatba.1980.3826

Lescure J. & Marty C. 2000. *Atlas des amphibiens de Guyane*. Muséum national d'histoire naturelle, Paris.

Lima J.D. 2006a. *Projeto de Pesquisa para Inventários da Fauna e Plantas Superiores da Reserva de Desenvolvimento Sustentável – Rio Iratapuru, Amapá*. Macapá, Amapá.

Lima J.D. 2006b. Inventários Biológicos da Herpetofauna na Floresta Nacional do Amapá – Expedições I e II. *In*: Bernard E. (ed.) *Inventários Biológicos na Floresta Nacional do Amapá – Expedições I e II*: 57–77. Macapá, Amapá.

Lima J.D. 2008. A herpetofauna do Parque Nacional do Montanhas do Tumucumaque, Amapá, Brasil, Expedições I a V. *In*: Bernhard E. (ed.) *Inventários Biológicos Rápidos no Parque Nacional Montanhas do Tumucumaque, Amapá, Brasil.*: 38–50.

Lima J.D. 2018. Relatório final do programa de monitoramento de herpetofauna da área de influência da UHE Cachoeira Caldeirão.

Lötters S., Haas W., Schick S. & Böhme W. 2002. On the systematics of the harlequin frogs (Amphibia: Bufonidae: *Atelopus*) from Amazonia. II: Redescription of *Atelopus pulcher* (Boulenger, 1882) from the eastern Andean versant in Peru. *Salamandra* 38 (3): 165–184.

Lötters S. & Schulte R. 2005. *Atelopus pulcher*. *In*: Rueda-Almonacid J.V., Rodriguez-Machecha J.V., Lötters S., la Marca E., Kahn T.R. & Angulo A. (eds) *Ranas Arlequines*: 104. Conservación Internacional, Bogotá.

Lutz B. 1973. *Brazilian species of Hyla*. University of Texas Press, Austin.

Marinho P., Carvalho T.R., Bang D.L., Teixeira B.F.V., Azarak P.A., Costa-Campos C.E. & Giaretta A.A. 2018. Advertisement calls, intraspecific variation and species diagnosis of six Brazilian species of *Elachistocleis* (Anura: Microhylidae: Gastrophryninae). *Zootaxa* 4521 (3): 357–375. https://doi.org/10.11646/zootaxa.4521.3.3

Medeiros L.R., Lourenço L.B., Rossa-Feres D.C., Lima A.P., Andrade G.V., Giaretta A.A., Egito G.T.B.T. & Recco-Pimentel S.M. 2013. Comparative cytogenetic analysis of some species of the *Dendropsophus microcephalus* group (Anura, Hylidae) in the light of phylogenetic inferences. *BMC Genetics* 14. https://doi.org/10.1186/1471-2156-14-59

Melo B.F., Benine R.C., Britzke R., Gama C.S. & Oliveira C. 2016. An inventory of coastal freshwater fishes from Amapá highlighting the occurrence of eight new records for Brazil. *ZooKeys* 606: 127–140. https://doi.org/10.3897/zookeys.606.9297

Menin M., Dias-Souza M.R. & Costa-Campos C.E. 2020. The tadpole of *Amazophrynella teko* (Anura: Bufonidae) from the eastern Amazon, Brazil. *Zootaxa* 4830 (3): 592–596. https://doi.org/10.11646/zootaxa.4830.3.7

Missassi A.F.R., Costa-Campos C.E., Lima J.D. & Lambertini C. 2017. Range extension of the poorly know tree frog *Dendropsophus haraldschultzi* (Bokermann, 1962) (Amphibia, Anura, Hylidae): first records for two Brazilian Amazon states. *Herpetology Notes* 10: 703–707.

Muell M.R., Chávez G., Prates I., Guillory W.X., Kahn T.R., Twomey E.M., Rodrigues M.T. & Brown J.L. 2022. Phylogenomic analysis of evolutionary relationships in *Ranitomeya* poison frogs (Family Dendrobatidae) using ultraconserved elements. *Molecular Phylogenetics and Evolution* 168: 107389. https://doi.org/10.1016/j.ympev.2022.107389

Mustin K., Carvalho W.D., Hilário R.R., Costa-Neto S.V., Silva C.R., Vasconcelos I.M., Castro I.J., Eilers V., Kauano É.E., Mendes R.N.G., Funi C., Fearnside P.M., Silva J.M.C., Euler A.M.C. & Toledo J.J. 2017. Biodiversity, threats and conservation challenges in the Cerrado of Amapá, an Amazonian savanna. *Nature Conservation* 22 (October): 107–127. https://doi.org/10.3897/natureconservation.22.13823

Noonan B.P. & Gaucher P. 2005. Phylogeography and demography of Guianan harlequin toads (*Atelopus*): Diversification within a refuge. *Molecular Ecology* 14 (10): 3017–3031. https://doi.org/10.1111/j.1365-294X.2005.02624.x

Oliveira-Filho A.T., Dexter K.G., Pennington R.T., Simon M.F., Bueno M.L. & Neves D.M. 2021. On the floristic identity of Amazonian vegetation types. *Biotropica*: btp.12932. https://doi.org/10.1111/btp.12932

Olson D.M., Dinerstein E., Wikramanayake E.D., Burgess N.D., Powell G.V.N., Underwood E.C., D'Amico J.A., Itoua I., Strand H.E., Morrison J.C., Loucks C.J., Allnutt T.F., Ricketts T.H., Kura Y., Lamoreux J.F., Wettengel W.W., Hedao P. & Kassem K.R. 2001. Terrestrial ecoregions of the world: A new map of life on Earth. *BioScience* 51 (11): 933–938. https://doi.org/10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2

Orrico V.G.D., Grant T., Faivovich J., Rivera-Correa M., Rada M.A., Lyra M.L., Cassini C.S., Valdujo P.H., Schargel W.E., Machado D.J., Wheeler W.C., Barrio-Amorós C., Loebmann D., Moravec J., Zina J., Solé M., Sturaro M.J., Peloso P.L.V., Suarez P. & Haddad C.F.B. 2021. The phylogeny of Dendropsophini (Anura: Hylidae: Hylinae). *Cladistics* 37 (1): 73–105. https://doi.org/10.1111/cla.12429

Patton J.L., Silva M.N.F. & Malcom J.R. 2000. Mammals of the Rio Juruá and the evolutionary and ecological diversification of Amazonia. *Bulletin of the American Museum of Natural History* 244 (1): 1–306. https://doi.org/10.1206/0003-0090(2000)244<0001:MOTRJA>2.0.CO;2

Pedroso-Santos F., Sanches P.R. & Costa-Campos C.E. 2019. Anurans and reptiles of the Reserva Extrativista Beija-Flor Brilho de Fogo, Amapá State, Eastern Amazon. *Herpetology Notes* 12 (July): 799–807.

Peloso P., Sturaro M. & Forlani M. 2014. Taxonomic revision, and character evolution of the genera *Chiasmocleis* and *Syncope* (Anura, Microhylidae) in Amazonia, with descriptions of three new species. *Bulletin of the American Museum of Natural History* 386: 1–96. https://doi.org/10.1206/834.1

Pereira Júnior A.P., Campos C.E.C. & Araújo A.S. 2013. Composição e diversidade de anfíbios anuros do Campus da Universidade Federal do Amapá. *Biota Amazônia* 3 (1): 13–21. https://doi.org/10.18561/2179-5746/biotaamazonia.v3n1p13-21

Pereyra M.O., Blotto B.L., Baldo D., Chaparro J.C., Ron S.R., Elias-Costa A.J., Iglesias P.P., Venegas P.J., Maria M.T., Ospina-Sarria J.J., Maciel N.M., Rada M., Kolenc F., Borteiro C., Rivera-Correa M., Rojas-Runjaic F.J.M., Moravec J., de La Riva I., Wheeler W.C., Castroviejo-Fisher S., Grant T., Haddad C.F.B. & Faivovich J. 2021. Evolution in the Genus *Rhinella*: A total evidence phylogenetic analysis of Neotropical true toads (Anura: Bufonidae). *Bulletin of the American Museum of Natural History* 447 (1): 1–156. https://doi.org/10.1206/0003-0090.447.1.1

Peters W.C.H. 1862. Eine neue Gattung von Laubfröschen Plectromantis, aus Ecuador. *Monatsberichte der Königlichen Preussische Akademie der Wissenschaften zu Berlin* 1862: 232–233.

Prance G.T. 1982. Forest refuges: evidence form woody angiosperms. *In*: Prance G.T. (ed.) *Biological Diversification in the Tropics*: 137–158. Columbia University Press, New York.

Queiroz S.S., Silva A.R., Reis F.M., Lima J.D. & Lima J.R.F. 2011. Anfíbios de uma área de castanhal da Reserva Extrativista do Rio Cajari, Amapá. *Biota Amazônia* 1 (1): 1–18. https://doi.org/10.18561/2179-5746/biotaamazonia.v1n1p1-18

Ribas C.C., Aleixo A., Nogueira A.C.R., Miyaki C.Y. & Cracraft J. 2012. A palaeobiogeographic model for biotic diversification within Amazonia over the past three million years. *Proceedings of the Royal Society B: Biological Sciences* 279 (1729): 681–689. https://doi.org/10.1098/rspb.2011.1120

Rivadeneira D., Venegas P. & Ron S.R. 2018. Species limits within the widespread Amazonian treefrog *Dendropsophus parviceps* with descriptions of two new species (Anura, Hylidae). *ZooKeys* 726: 25–77. https://doi.org/10.3897/zookeys.726.13864

Rojas R.R., Fouquet A., Ron S.R., Hernández-Ruz E.J., Melo-Sampaio P.R., Chaparro J.C., Vogt R.C., Carvalho V.T. de, Pinheiro L.C., Avila R.W., Farias I.P., Gordo M. & Hrbek T. 2018. A Pan-Amazonian species delimitation: High species diversity within the genus *Amazophrynella* (Anura: Bufonidae). *PeerJ* 2018 (7). https://doi.org/10.7717/peerj.4941

Ron S.R., Duellman W.E., Caminer M.A. & Pazmiño D. 2018. Advertisement calls and DNA sequences reveal a new species of *Scinax* (Anura: Hylidae) on the Pacific lowlands of Ecuador. *PLoS ONE* 13: e0203169. https://doi.org/10.1371/journal.pone.0203169

Segalla M.V., Berneck B.V.M., Canedo C., Caramaschi U., Cruz C.A.G., Garcia P.C.A., Grant T., Haddad C.F.B., Lourenço, Ana Carolina C., Mângia S., Mott T., Nascimento L.B., Toledo L.F., Werneck F.P. & Langone J.A. 2021. List of Brazilian Amphibians. *Herpetologia Brasileira* 10 (1): 121–216. https://doi.org/10.5281/zenodo.4716176

Seger K.R., Teixeira B.F.V., Annibale F.S., Rossa-Feres D.D.C., Lima A.P., Andrade G.V., Giaretta A.A. & Lourenço L.B. 2021. Five independent lineages revealed by integrative taxonomy in the *Dendropsophus nanus–Dendropsophus walfordi* species complex. *Diversity* 13 (11): 522. https://doi.org/10.3390/d13110522

Shreve B. 1935. On a new teiid and Amphibia from Panama, Ecuador, and Paraguay. *Occasional papers of the Boston Society of Natural History* 8: 209–218.

Silva C.R. da, Martins A.C.M., de Castro I.J., Bernard E., Cardoso E.M., dos Santos Lima D., Gregorin R., Rossi R.V., Percequillo A.R. & da Cruz Castro K. 2013. Mammals of Amapá State, Eastern Brazilian Amazonia: A revised taxonomic list with comments on species distributions. *Mammalia* 77 (4): 409–424. https://doi.org/10.1515/mammalia-2012-0121

Silva e Silva Y.B. & Costa-Campos C.E. 2018. Anuran species composition of Cancão municipal natural park, municipality of Serra do Navio, Amapá state, Brazil. *ZooKeys* 2018 (762): 131–148. https://doi.org/10.3897/zookeys.762.22634

Silva G.W.B., Cornélio G.S., de Oliveira E.A., Trindade N.G.P., França I. & Ruz E.J.H. 2020. A candidate species currently classified as *Atelopus hoogmoedi* (Anura: Bufonidae) in the Eastern Amazon, Pará, Brazil. *Genetics and Molecular Research* 19 (1): 1–10. https://doi.org/10.4238/GMR18392

Silva J.M.C., Oren D.C., Roma J.C. & Henriques L.M.P. 1997. Composition and distribution patterns of the avifauna of an Amazonian Upland Savanna, Amapá, Brazil. *Ornithological Monographs* 48: 743–762. https://doi.org/10.2307/40157565

Sousa J.C., Corrêa J.G., Franca P.F., Costa-Campos C.E., Lima J.R.F. & Lima J.D. 2016. Geographic distribution. *Scarthyla goinorum* (Tarauaca Snouted Treefrog). Brazil: Amapá. *Heretological Review* 47: 421.

Souza C.M., Z. Shimbo J., Rosa M.R., Parente L.L., Alencar A.A., Rudorff B.F.T., Hasenack H., Matsumoto M., Ferreira L.G., Souza-Filho P.W.M., de Oliveira S.W., Rocha W.F., Fonseca A.V., Marques C.B., Diniz C.G., Costa D., Monteiro D., Rosa E.R., Vélez-Martin E., Weber E.J., Lenti F.E.B., Paternost F.F., Pareyn F.G.C., Siqueira J.V., Viera J.L. Neto L.C.F., Saraiva M.M., Sales M.H., Salgado M.P.G., Vasconcelos R., Galano S., Mesquita V.V. & Azevedo T. 2020. Reconstructing three decades of land use and land cover changes in Brazilian biomes with landsat archive and earth engine. *Remote Sensing* 12: 2735. https://doi.org/10.3390/rs12172735

Taucce P.P.G., Costa-Campos C.E., Haddad C.F.B. & Carvalho T.R. 2020. A new Amazonian species of the diminutive frog genus *Adelophryne* (Anura: Brachycephaloidea: Eleutherodactylidae) from the state of Amapá, northern Brazil. *Copeia* 108 (4): 746–757. https://doi.org/10.1643/CH-19-254

Tavares-Pinheiro R., Figueiredo V.A.M.B. & Costa-Campos C.E. 2021. New state record for *Ctenophryne geayi* Mocquard, 1904 (Anura, Microhylidae), with an update distribution map. *Herpetology Notes* 14 (June): 883–886.

Vacher J.P., Chave J., Ficetola F.G., Sommeria-Klein G., Tao S., Thébaud C., Blanc M., Camacho A., Cassimiro J., Colston T.J., Dewynter M., Ernst R., Gaucher P., Gomes J.O., Jairam R., Kok P.J.R., Lima J.D., Martinez Q., Marty C., Noonan B.P., Nunes P.M.S., Ouboter P., Recoder R., Rodrigues M.T., Snyder A., Marques-Souza S. & Fouquet A. 2020. Large-scale DNA-based survey of frogs in Amazonia suggests a vast underestimation of species richness and endemism. *Journal of Biogeography* 47 (8): 1781–1791. https://doi.org/10.1111/jbi.13847

Wallace A.R. 1852. On the Monkeys of the Amazon. *Journal of Natural History Series 2* 14 (84): 451–454. https://doi.org/10.1080/037454809494374

Zina J., Silva G.R., Loebmann D. & Orrico V.G.D. 2014. The recognition of *Dendropsophus minusculus* (Rivero, 1971) (Hylidae, Dendropsophini) as a highly polymorphic, multi-domain distributed species. *Brazilian Journal of Biology* 74 (3): 146–153. https://doi.org/10.1590/1519-6984.22912

Manuscript received: 26 October 2021
Manuscript accepted: 4 August 2022
Published on: 8 September 2022
Topic editor: Tony Robillard
Section editor: Aurélien Miralles
Desk editor: Eva-Maria Levermann

Printed versions of all papers are also deposited in the libraries of the institutes that are members of the *EJT* consortium: Muséum national d'histoire naturelle, Paris, France; Meise Botanic Garden, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Royal Belgian Institute of Natural Sciences, Brussels, Belgium; Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Leibniz Institute for the Analysis of Biodiversity Change, Bonn – Hamburg, Germany; National Museum, Prague, Czech Republic.

Note added in proof

Carvalho *et al*. (2022) recently published a systematic review of the *Leptodactylus melanonotus* group, with the description of a new species for the state of Amapá. Thus, all our records of *Leptodactylus* sp. correspond to *Leptodactylus fremitus* Carvalho, Fouquet, Lyra, Giaretta, Costa-Campos, Rodrigues, Haddad & Ron, 2022.

Carvalho T.R., Fouquet A., Lyra M.L., Giaretta A.A., Costa-Campos C.A., Rodrigues M.T., Haddad C.F.B. & Ron S.R. 2022. Species diversity and systematics of the *Leptodactylus melanonotus* group (Anura, Leptodactylidae): review of diagnostic traits and a new species from the Eastern Guiana Shield. Systematics and Biodiversity 20: 1–31. https://doi.org/10.1080/14772000.2022.2089269