REPTILES & AMPHIBIANS

Anurans in Forest Fragments along the Upper Glória River, Minas Gerais, Brazil

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Abstract.—The Brazilian Atlantic Forest is a biodiversity hotspot, harboring many endemic species threatened by anthropogenic actions. Although less than 15% of the natural vegetation remains, this biome currently supports more than 600 amphibian species, representing more than half of Brazilian amphibian diversity. However, a notable lack of information regarding the richness and distribution of this taxonomic group in this biome persists. To fill in some gaps in our knowledge, we provide a checklist of anurans from a highly fragmented unprotected area of the Atlantic Forest in southeastern Brazil. Through fieldwork and bibliographic review, we recorded 44 species in the area, a noteworthy assemblage, especially when compared with the nearest protected area, which harbors 58 species. Additionally, we provide novel data about the critically endangered Garcia's Small Frog (*Ischnocnema garciai*), discuss potential impacts related to the presence of American Bullfrogs (*Aquarana catesbeiana*) in the area, and document amphibian mortality due to electric fences. In summary, we show that even fragmented and unprotected areas of the Atlantic Forest still harbor substantial anuran diversity.

Resumo.—A Mata Atlântica brasileira é considerada um hotspot de biodiversidade, abrigando muitas espécies endêmicas e sendo extremamente ameaçada por ações antrópicas. Apesar de possuir menos de 15% de vegetação natural remanescente, esse bioma abriga atualmente mais de 600 espécies de anfíbios, representando mais da metade de toda a diversidade de anfíbios brasileiros. No entanto, ainda hoje há carência de informações sobre a riqueza e distribuição desse grupo nesse bioma. Buscando diminuir esse déficit, fornecemos uma lista de anfíbios anuros de uma área de Mata Atlântica profundamente fragmentada e desprotegida no sudeste do Brasil. Através de trabalhos de campo e dados bibliográficos, registramos 44 espécies de anfíbios, uma riqueza relevante se comparada com área protegida mais próxima, que detém 58 espécies. Além disso, trazemos informações sobre a espécie criticamente ameaçada *Ischnocnema garciai*. Constatamos ainda potenciais impactos na área devido a presença da rã-touro-americana, *Aquarana catesbeiana,* e da mortandade de anfíbios em cercas elétricas. Por fim, nossos dados revelam que, mesmo em áreas fragmentadas e desprotegidas, a Mata Atlântica ainda abriga uma relevante diversidade de anfíbios.

Although more than two million species have been named to date (Bánki et al. 2022), our knowledge of biodiversity is still limited (Hortal et al. 2015), including a lack of basic ecological data (Etard et al. 2020) as well as a poor understanding of the geographic distribution of most described species (Lomolino 2004). These issues can interact with each other and impair the implementation of efficient, data-driven conservation strategies (Baranzelli et al. 2023; Diniz-Filho et al. 2023). In this sense, species checklists can provide information that can help to fill gaps in our knowledge and contribute to the identification of areas of conservation priority (e.g., Jenkins et al. 2013; Peixoto et al. 2020), as well as for the conservation of specific taxonomic groups (see Guedes et al. 2014; E.T. Silva et al. 2018). Despite the importance of species checklists, studies involving biodiversity surveys have been widely neglected by research institutions (Wilson 2017), precisely at a time when current extinction rates associated with human-driven global changes are 100–1,000 times higher than in the past (Lamkin and Miller 2016). Consequently, pervasive knowledge gaps remain, particularly in tropical countries (Hopkins 2007; Oliveira et al. 2017; Moura and Jetz 2021), representing a major barrier to the conservation of species in these regions (Collen et al. 2008).

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Amphibians are among the most diverse groups of vertebrates, with over 8,800 described species (Frost 2024). Of these, 8,009 (91%) species have been assessed by the International Union for the Conservation of Nature, with about 36% considered threatened with extinction and 11% with insufficient data (IUCN 2024). Moreover, the distributions of a substantial portion of threatened and data-deficient amphibians fail to or barely overlap with protected areas (Nori et al. 2015). This is alarming because outside protected areas these species are even more vulnerable to population declines due to habitat loss and fragmentation (Becker et al. 2010; J. Ribeiro et al. 2020), disease outbreaks (Ruggeri et al. 2019; Scheele et al. 2019), climate change (Miller et al. 2018), and other threats. Indeed, amphibians are likely the vertebrates most threatened with extinctions (Hoffmann et al. 2010; Ceballos et al. 2020), and the scarcity of basic natural history data and knowledge of geographic distributions represent major impediments to their conservation (Howard and Bickford 2014; Nori et al. 2018).

With nearly 1,200 species, Brazil stands out for its diversity of amphibians, many of which have been described only recently (Magalhães et al. 2020; L.A. Silva et al. 2020; Segalla et al. 2021). In the Atlantic Forest, a biodiversity hotspot for species conservation (Mittermeier et al. 2011), the total number of amphibian species exceeds 600 (Rossa-Feres et al. 2017). The Brazilian Atlantic Forest is by far the most degraded biome in the country; due to human pressures during the past two centuries, its original forest cover has been reduced to only 11.4–16.0% of its original extent, most of which is distributed in small, isolated fragments (Ribeiro et al. 2009). Nonetheless, the Atlantic Forest continues to stand out in terms of its biodiversity. For example, the Serra da Mantiqueira, a mountainous area in southeastern Brazil, has more than 230 anuran species, 37% of which are endemic, making this region one of the most relevant biogeographic units for amphibian conservation in this biome (E.T. Silva et al. 2018; Peixoto et al. 2020). However, protected area networks do not cover the principal centers of anuran species richness and endemism in the Serra da Mantiqueira, rendering this group particularly vulnerable to habitat loss and degradation in the near future (Peixoto et al. 2020).

In this context, we provide a list of anuran species found in an unprotected area in the northern part of the Serra da Mantiqueira. Additionally, we compare our data on species richness with those from an adjacent protected area, provide new data on a species of conservation concern (i.e., threatened by extinction), and draw attention to potential anthropogenic impacts on the local anuran fauna.

Material and Methods

Study site.—We conducted this study in the upper Glória River region in the municipalities of Fervedouro and São Francisco do Glória, in the "Zona da Mata" of Minas Gerais in southeastern Brazil (Fig. 1A-B). The area is drained by the Glória River, a tributary of the Muriaé River, which is part of the Paraíba do Sul River Basin. The climate is classified as Cwb (humid subtropical with dry winters and temperate summers) in the Köppen system, with average annual temperature and precipitation of 18.8 °C and 1,339 mm, respectively (Alvares et al. 2013). The rainy season extends from October to April, and the dry season from May to September (Júnior et al. 2012). The region is part of the Atlantic Forest biome and is in the northern portion of the Serra da Mantiqueira (E.T. Silva et al. 2018), which was originally covered by tropical and subtropical moist broadleaf forests (Dinerstein et al. 2017). It currently supports only small native forest remnants near populated areas (M.C. Ribeiro et al. 2011), with a landscape matrix of pastures and small plantations. Furthermore, the study area is close (about 15 km) to the Serra do Brigadeiro State Park (PESB), an Atlantic Forest remnant with a rich herpetofauna (Moura et al. 2012a) and considered an important area for amphibian conservation in the Atlantic Forest biome (Peixoto et al. 2020).

Data collection.—Between September 2018 and May 2020, we conducted six campaigns, each spanning four consecutive days. Four of these campaigns occurred during the rainy season (September, October, December, and January) and two during the dry season (May and July). We conducted active searches at 19 sites, including swamps, artificial and natural ponds, streams, leaf litter, and ornamental fish-breeding ponds (Table 1; Fig. 1B). During each campaign, sampling was conducted by two people from 1700 h to 2200 h for a total sampling effort of 240 person-hours. We employed visual encounter surveys and audio strip transects (Heyer et al. 1994) to identify species in the region. In addition to collecting specimens, we made audio recordings to assist with subsequent species identifications. The collected specimens (License ICMBio 10504-1) were deposited in the herpetological collection of the Museu de Zoologia João Moojen at the Federal University of Viçosa (MZUFV), Viçosa, Minas Gerais, Brasil (Appendix I). We supplemented our species inventory with additional data in Moura et al. (2012b), E.T. Silva et al. (2018), and Macedo et al. (2021).

Our nomenclature follows that in Frost (2024) and we identified species using available literature, seeking assistance from experts, and by comparing collected animals with preserved specimens previously identified and deposited at the MZUFV. We followed Rossa-Feres et al. (2017) and E.T. Silva et al. (2018) to identify endemics of the Atlantic Forest biome. We recorded the conservation status of each species nationally and globally based on the threatened species lists of Brazil (Ministério do Meio Ambiente 2022) and the IUCN Red List (IUCN 2024), respectively.

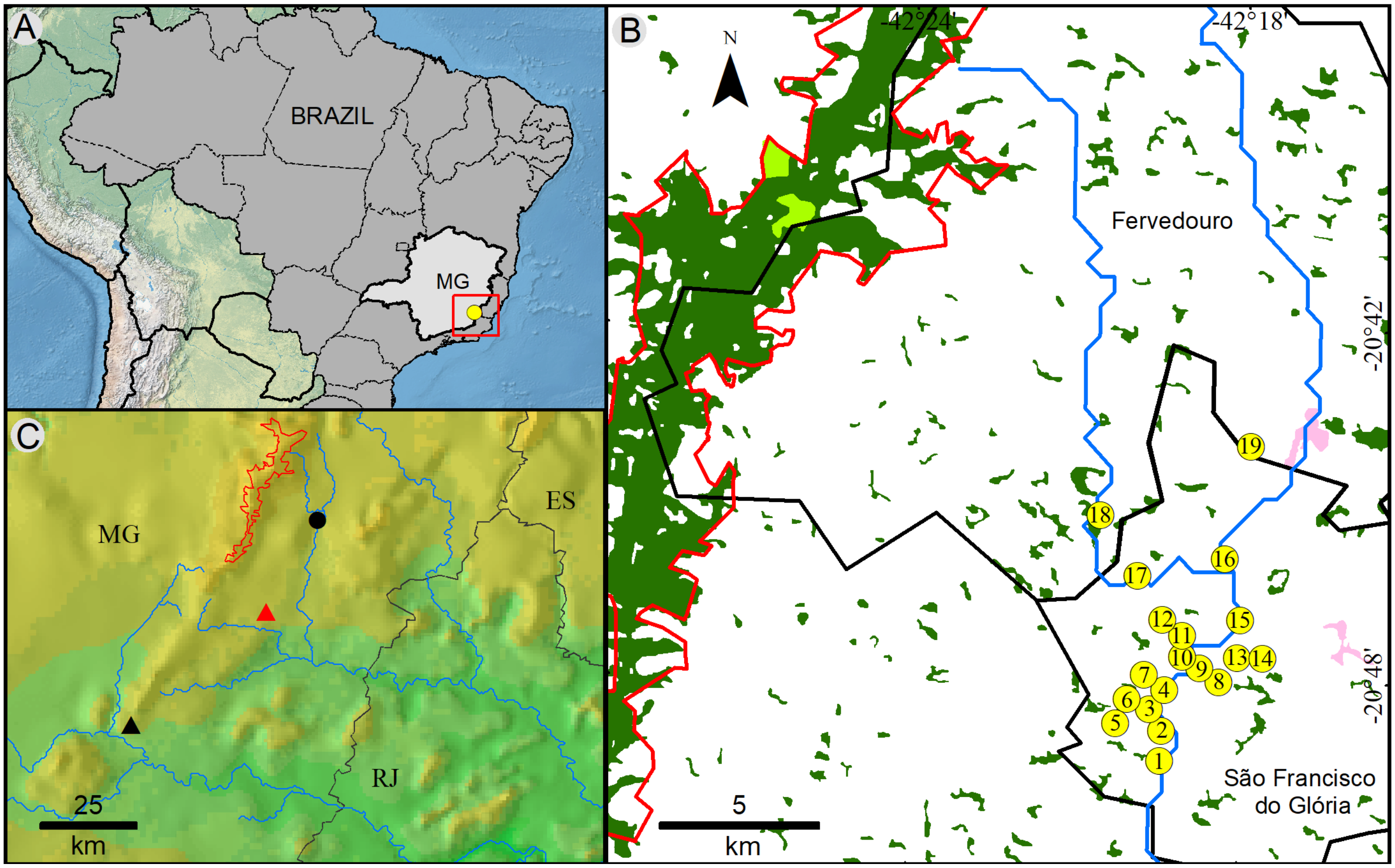

Figure 1. Map showing the location of the study area in Minas Gerais, southeastern Brazil (A). Sampling sites (yellow dots, see Table 1) along the upper Glória River (B): the Glória River is marked by blue lines, the boundary of the Parque Estadual da Serra do Brigadeiro (PESB) by red lines, the borders of municipalities by black lines, dark green shading indicates remnants of native forests per SOS Mata Atlântica and Instituto Nacional de Pesquisas Espaciais (INPA), and pink shading marks urban areas. The distribution of Garcia's Little Frog (*Ischnocnema garciai*) (C): type locality (red triangle), previous record in Cataguases Municipality (black triangle), and the site of the current study (black dot). MG = Minas Gerais, RJ = Rio de Janeiro, ES = Espírito Santo.

Table 1. Sampling sites in the upper Glória River region, Minas Gerais, southeastern Brazil. Coordinates in datum WGS84.

Point	Coordinates	Habitat
1	-20.8195, -42.3233	Fish-breeding ponds in open area
2	-20.8116, -42.3241	Bank of the Glória River with a narrow strip of riparian forest
3	-20.8090, -42.3262	Bank of the Glória River with a narrow strip of riparian forest
4	-20.8059, -42.3263	Swamp and ornamental fish-breeding ponds on the forest edge
5	-20.8087, -42.3352	Stream on the forest edge
6	-20.8056, -42.3323	Ornamental fish-breeding ponds in open area
7	-20.7980, -42.3288	Swamp in an open area
8	-20.7961, -42.3119	Swamp on the edge of a riparian forest
9	-20.7954, -42.3144	Riparian forest on the banks of the Glória River
10	-20.7931, -42.3162	Riparian forest on the banks of the Glória River
11	-20.7887, -42.3145	Marginal pond in an open area
12	-20.7866, -42.3187	Marginal pond in an open area
13	-20.7929, -42.3006	Marginal pond in an open area
14	-20.7931, -42.2941	Ornamental fish-breeding ponds on the forest edge
15	-20.7823, -42.2999	Marginal pond in an open area
16	-20.7650, -42.3048	Marginal pond in an open area
17	-20.7700, -42.3313	Artificial pond on the edge of riparian forest
18	-20.7531, -42.3427	Artificial pond on the edge of riparian forest
19	-20.7328, -42.2976	Swamp and artificial pond on the forest edge

Results

We recorded 44 anuran species, 16 genera and 10 families in the study area (Table 2; Figs. 2–3). Hylidae was the most diverse family (n = 20 species, 45% of the total), with almost twice as many species as in Leptodactylidae (n = 11; 25%), the second most diverse family. The other families were represented by similar numbers of species: Brachycephalidae (n =3), Bufonidae (n = 3), Microhylidae (n = 2), Craugastoridae

Figure 2. Anuran species recorded in the upper Glória River region, Minas Gerais, southeastern Brazil: (A) *Adenomera thomei*, (B) *Boana albomarginata*, (C) *B. albopunctata*, (D) *B. crepitans*, (E) *B. semilineata*, (F) *B. faber*, (G) *Dendropsophus pseudomeridianus*, (H) *D. minutus*, (I) *D. elegans*, (J) *Leptodactylus latrans*, (K) *L. cupreus*, (L) *L. fuscus*, (M) *L. barrioi*, (N) *Rhinella granulosa*, (O) *Rhinella* gr. *crucifer*.

Table 2. Anuran species recorded in the upper Glória River region, Minas Gerais, southeastern Brazil. * = Endemic to the Atlantic Forest biome (Rossa-Feres et al. 2017; Magalhães et al. 2020); ** = critically endangered (Bastos et al. 2023; IUCN SSC Amphibian Specialist Group & Instituto Boitatá de Etnobiologia e Conservação da Fauna 2023); *** = invasive species.

Family/Species	Source
Brachycephalidae	
Ischnocnema garciai Taucce, Canedo, and Haddad 2018 *, **	E.T. Silva et al. (2018)
Ischnocnema izecksohni (Caramaschi and Kisteumacher 1989) *	This study, E.T. Silva et al. (2018)
Bufonidae	
Rhinella gr. *crucifer*	This study, E.T. Silva et al. (2018)
Rhinella crucifer (Wied-Neuwied 1821) *	This study, E.T. Silva et al. (2018), Macedo et al. (2021)
Rhinella granulosa (Spix 1824)	This study
Craugastoridae	
Haddadus binotatus (Spix 1824) *	This study, E.T. Silva et al. (2018)
Odontophrynidae	
Proceratophrys boiei (Wied-Neuwied 1824) *	E.T. Silva et al. (2018)
Cycloramphidae	
Thoropa miliaris (Spix 1824) *	This study, E.T. Silva et al. (2018)
Hylidae	
Bokermannohyla caramaschii (Napoli 2005) *	E.T. Silva et al. (2018)
Dendropsophus elegans (Wied-Neuwied 1824) *	This study
Dendropsophus berthalutzae (Bokermann 1962) *	Moura et al. (2012)
Dendropsophus minutus (Peters 1872)	This study
Dendropsophus branneri (Cochran 1948) *	E.T. Silva et al. (2018)
Dendropsophus pseudomeridianus (Cruz, Caramaschi, and Dias 2000) *	This study
Boana albomarginata (Spix 1824) *	This study, E.T. Silva et al. (2018)
Boana albopunctata (Spix 1824) *	This study, E.T. Silva et al. (2018)
Boana crepitans (Wied-Neuwied 1824)	This study
Boana faber (Wied-Neuwied 1821)	This study, E.T. Silva et al. (2018)
Boana pardalis (Spix 1824) *	This study, E.T. Silva et al. (2018)
Boana polytaenia (Cope 1870) *	This study, E.T. Silva et al. (2018)
Boana semilineata (Spix 1824) *	This study, E.T. Silva et al. (2018)
Scinax argyreornatus (Miranda-Ribeiro 1926) *	E.T. Silva et al. (2018)
Scinax crospedospilus (A. Lutz 1925) *	This study, E.T. Silva et al. (2018)
Scinax alter (B. Lutz 1973) *	This study, E.T. Silva et al. (2018)
Scinax eurydice (Bokermann 1968) *	This study
Scinax fuscomarginatus (A. Lutz 1925)	This study
Scinax fuscovarius (A. Lutz 1925)	This study, E.T. Silva et al. (2018)
Scinax gr. *ruber*	This study
Leptodactylidade	
Adenomera marmorata Steindachner 1867 *	This study
Adenomera thomei (Almeida and Angulo 2006) *	This study
Leptodactylus barrioi Silva, Magalhães, Thomassen, Leite, Garda, Brandão, Haddad, Giaretta, and Carvalho 2020	This study
Leptodactylus cupreus Caramaschi, Feio, and São Pedro 2008 *	This study
Leptodactylus fuscus (Schneider 1799)	This study
Leptodactylus furnarius Sazima and Bokermann 1978	This study
Leptodactylus latrans (Steffen 1815) *	This study, E.T. Silva et al. (2018)
Leptodactylus mystacinus (Burmeister 1861)	This study
Physalaemus signifer (Girard 1853) *	E.T. Silva et al. (2018)
Physalaemus feioi Cassini, Cruz, and Caramaschi 2010 *	This study
Physalaemus cuvieri Fitzinger 1826	This study
Pseudopaludícola mystacalis (Cope 1887)	This study
Ranidae	
Aquarana catesbeiana (Shaw 1802) ***	This study
Microhylidae	
Chiasmocleis schubarti Bokermann 1952 *	E.T. Silva et al. (2018)
Elachistocleis cesarii (Miranda-Ribeiro 1920)	This study, E.T. Silva et al. (2018)
Phyllomedusidae	
Phyllomedusa burmeisteri Boulenger 1882 *	This study

Figure 3. Anuran species recorded in the upper Glória River region, Minas Gerais, southeastern Brazil: (A) *Scinax eurydice*, (B) *S. fuscovarius*, (C) *S. alter*, (D) *Elachistocleis cesarii*, (E) *Haddadus binotatus*, (F) *Aquarana catesbeiana*, (G) *Thoropa miliaris*, (H) *Physalaemus cuvieri,* (I) *P. feioi*.

(*n* = 1), Odontophrynidae (n = 1), Cycloramphidae (n = 1), Ranidae (n = 1), and Phyllomedusidae (n = 1).

Two-thirds of all recorded species (n = 29, 66%) are endemic to the Atlantic Forest biome (Rossa-Feres et al. 2017; Magalhães et al. 2020). Among them, Garcia's Little Frog (*Ischnocnema garciai*) is listed as critically endangered (CR) on both the Brazilian List of Endangered Species (Ministério do Meio Ambiente 2022) and the IUCN Red List (IUCN SSC Amphibian Specialist Group & Instituto Boitatá de Etnobiologia e Conservação da Fauna 2023). With regard to potential impacts on native anurans, we highlight the American Bullfrog (*Aquarana catesbeiana*), an exotic North American anuran species recorded in the study area. We also documented the deaths of native amphibians by electrocution due to electric fences used around fish-farming tanks (Fig. 4).

Discussion

The amphibian species richness recorded in the study area represents approximately 18% of the known anuran diversity in the Serra da Mantiqueira (234 species; E.T. Silva et al. 2018). Although this figure appears modest, it takes on greater significance within a regional context. When compared to the anuran diversity in the Serra do Brigadeiro State Park (PESB), the species richness we found in the upper Glória River region accounts for 75% of the diversity in the PESB (58 species; Moura et al. 2012a), which, in addition to being a protected area, is perhaps the most-studied area in the Serra da Mantiqueira. Furthermore, 13 species found in the upper Glória River region are absent from the PESB, including forest-dependent anurans such as Garcia's Little Frog (*Ischnocnema garciai*), Marbled Tropical Frog (*Adenomera marmorata*), and Schubart's Humming Frog (*Chiasmocleis schubarti*). Considering that 29 species on our list are endemic to the Atlantic Forest biome (Rossa-Feres et al. 2017), these findings highlight the importance of anuran inventories even in human-impacted areas. Despite lacking legal protection, these areas are essential for safeguarding the taxonomic diversity and evolutionary history of Atlantic Forest anurans (E.T. Silva et al. 2018).

The discovery of Garcia's Little Frog (*Ischnocnema garciai*), listed as critically endangered (CR) in both the red lists of Brazil (Ministério do Meio Ambiente 2022) and the IUCN (IUCN SSC Amphibian Specialist Group & Instituto Boitatá de Etnobiologia e Conservação da Fauna 2023) in the study area provides crucial information for its conservation. The species was described by Taucce et al. (2018) from specimens collected in a small forest fragment in Usina da Fumaça, Municipality of Muriaé, Minas Gerais, Brazil. The critically endangered listing is primarily attributable to the species' limited extent of occurrence (4 km^2) and area of occupancy (4–5 km^2) when the species was thought to be restricted to its type locality (Bastos et al. 2023; IUCN SSC Amphibian Specialist Group & Instituto Boitatá de Etnobiologia e Conservação da Fauna 2023). However, our results extend the known range of this species (Fig. 1C) with records in a forest fragment in our study area and another in the Municipality of Cataguases (Silva et al. 2018). In light of IUCN criteria (IUCN 2024), these records could lower the species' threat level to endangered (EN) due to the increase in its extent of occurrence (360 km^2) and area of occupancy (12 km^2), although those calculations assume continuous occupancy. Furthermore, this finding underscores the importance of even small forest fragments for sustaining anuran populations in landscapes altered by humans (see also Almeida-Gomes et al. 2008, Lisboa et al. 2021).

Regarding the potential impacts on anurans in our study area, we note the presence of American Bullfrogs (*Aquarana catesbeiana*). This invasive species was commonly found reproducing in artificial ponds, such as ornamental fish-breeding tanks (Fig. 4A), where we observed attempts by fish farmers to control this frog by killing the tadpoles (Fig. 4B), which compete with ornamental fish for food. However, we did not observe any form of control for populations of this invasive species in artificial ponds not used for fish-farming. The voracious American Bullfrog is primarily distributed in southern and southeastern regions of Brazil (Jorgewich-Cohen et al. 2022; J. Ribeiro and Toledo 2022), where its diet includes other anurans (E.T. Silva et al. 2011; Leivas et al. 2012). Besides acting as a predator, the American Bullfrog can indirectly impact native anurans by triggering, for example, changes in habitat use (Silveira and Guimarães 2021) and vocalization behavior (Medeiros et al. 2017). However, perhaps the most dangerous impact is a result of its potential as a reservoir of the fungus *Batrachochytrium dendrobatidis* (Schloegel et al. 2010), a major cause of amphibian declines worldwide (Scheele et al. 2019). The presence of this invasive species poses many risks to local native species, especially to the critically endangered Garcia's Little Frog, particularly in light of the risk of the American Bullfrog expanding its distribution to the nearby PESB (Moura et al. 2012a).

We recorded for the first time in Brazil the death of anurans by electrocution due to electric fences. In our study area, several properties have small ornamental fish-breeding ponds (Fig. 4A). Many of these ponds are fully enclosed by electric fences to deter predators such as otters. On a rainy night, we observed about 20 dead anurans electrocuted in a single pond of approximately 18 m^2. The electrocuted species included Semi-lined Treefrogs (*Boana semilineata*) (Fig. 4C–E), Common Snouted Treefrogs (*Scinax* gr. *ruber*) (Fig. 4F), Maracas Snouted Treefrogs (*S. eurydice*), and Elegant Forest Treefrogs (*Dendropsophus elegans*). We found freshly killed anurans as well as some in advanced stages of decomposition, indicating this to be a recurring event, possibly since the implementation of the electric fences. Deadly interac-

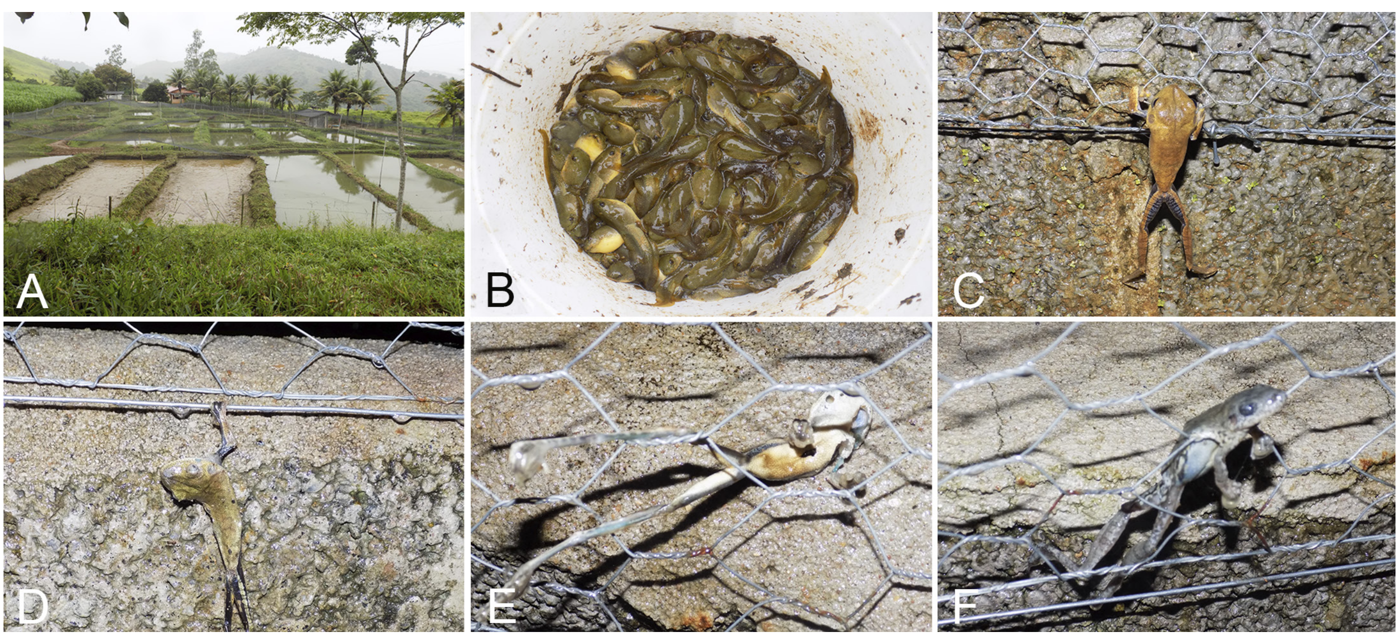

Figure 4. Negative anthropogenic effects on anurans in the upper Glória River region, Minas Gerais, southeastern Brazil: (A) Ornamental fish-farming ponds and (B) American Bullfrog (*Aquarana catesbeiana*) tadpoles captured in these ponds; anurans electrocuted by electric fences surrounding fish-farming ponds: (C–E) *Boana semilineata* and (F) *Scinax* gr. *ruber*.

tions of amphibians with electric fences are correlated with body mass (Pietersen 2022), wherein smaller animals can pass through the fences without making contact with the energized wire (Holt et al. 2021). However, in our case, the electric fences were constructed using a metallic mesh with about 2-cm gaps, through which even small animals could not pass without contacting the energized wires. This issue might be exacerbated on rainy days, as wetter soil could increase conductivity and decrease survivorship of electrocuted animals. Although our data are limited, electric fences could negatively impact population dynamics of anurans, especially larger-scale projects or ponds in areas with threatened species.

Another negative stressor impacting amphibian populations in the study area is the construction of small hydroelectric power plants (PCHs) and hydroelectric generating stations (CGHs). The course of the Glória River in the study area involves considerable elevational relief, including waterfalls, making it eminently suitable for the installation of such hydro projects. While their territorial scope and impact are much smaller than those of large hydroelectric plants (Perius and Carregaro 2012), the construction of PCHs and CGHs can lead to changes or even the elimination of ideal habitats for amphibian reproduction. Several species, such as Barrio's Mustache Frog (*Leptodactylus barrioi*), Copper Frog (*L. cupreus*), and Schubart's Humming Frog (*C. schubarti*), were recorded in temporary pools in riparian forests along the Glória River where a CGH was later constructed (ETS, pers. obs.). The restoration of native forest vegetation along the Glória River's banks, such as through environmental compensation programs by companies that impact the local environment, is an important measure for the persistence of amphibians in the region, particularly if restoration is implemented in flooded ephemeral habitats.

In conclusion, our results demonstrate that, despite negative human impacts, the upper Glória River region harbors remarkable amphibian diversity. Among the species recorded in the area, we highlight the presence of a critically endangered native species and an invasive species, of which the potential negative impacts on native species likely are already in place. On a broader scale, our findings underline the importance of the studied area for the conservation of Atlantic Forest anurans in the Serra da Mantiqueira and highlight the potential of the region for additional scientific investigations of this group.

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Literature Cited

Almeida-Gomes, M., D. Vrcibradic, C.C. Siqueira, M.C. Kiefer, T. Klaion, P. Almeida-Santos, D. Nascimento, C.V. Ariani, V.N.T. Borges-Junior, R.F. Freitas-Filho, M.V. Sluys, and C.F. Rocha. 2008. Herpetofauna of an Atlantic rainforest area (Morro São João) in Rio de Janeiro State, Brazil. *Anais da Academia Brasileira de Ciências* 80: 291–300. https://doi.org/10.1590/S0001-37652008000200007.

Alvares, C.A., J.L. Stape, P.C. Sentelhas, J.D.M. Gonçalves, and G. Sparovek. 2013. Köppen's climate classification map for Brazil. *Meteorologische Zeitschrift* 22: 711–728. https://doi.org/10.1127/0941-2948/2013/0507.

Bánki, O., Y. Roskov, M. Döring, G. Ower, D.R. Hernández Robles, C.A. Plata Corredor, T. Stjernegaard Jeppesen, A. Örn, L. Vandepitte, D. Hobern, P. Schalk, R.E. DeWalt, K. M, J. Miller, T. Orrell, R. Aalbu, J. Abbott, R. Adlard, C. Aedo, et al. 2024. *Catalogue of Life Checklist (Version 2024-04-26)*. Catalogue of Life, Amsterdam, The Netherlands. https://doi.org/10.48580/dg4lg. <https://www.catalogueoflife.org>.

Baranzelli, M.C., F. Villalobos, J.M. Cordier, and J. Nori. 2023. Knowledge shortfalls' interactions shadow our perception of species' exposure to human threats. *Biological Conservation* 282: 110069. https://doi.org/10.1016/j.biocon.2023.110069.

Bastos, R.P., M.R. Martins, C.E. Guidorizzi, S.P. Andrade, Y.S.L. Bataus, R.V.G. Júnior, G.V. Andrade, R.W. Ávila, P. Colombo, I.R. Dias, M.N.C. Kokubum, D.C. Lima, R. Lingnau, B.S. Lisboa, D. Loebmann, E. Lucas, I.F. Machado, A.M. Júnior, M.B. Martins, G.J.B. Moura, M.F. Napoli, S.N. Oliveira, L.F. Ribeiro, M.S. Tinôco, and C. Zank. 2023. *Ischnocnema garciai* Taucce, Canedo and Haddad, 2018. Sistema de Avaliação do Risco de Extinção da Biodiversidade - SALVE, Instituto Chico Mendes de Conservação da Biodiversidade, Brasília. https://doi.org/10.37002/salve.ficha.20277.

Becker, C.G., C.R. Fonseca, C.F. Haddad, and P.I. Prado. 2010. Habitat split as a cause of local population declines of amphibians with aquatic larvae. *Conservation Biology* 24: 287–294. https://doi.org/10.1111/j.1523-1739.2009.01324.x.

Ceballos, G., P.R. Ehrlich, and P.H. Raven. 2020. Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction. *Proceedings of the National Academy of Sciences of the United States of America* 117: 13596–13602. https://doi.org/10.1073/pnas.1922686117.

Collen, B., M. Ram, T. Zamin, and L. McRae. 2008. The tropical biodiversity data gap: addressing disparity in global monitoring. *Tropical Conservation Science* 1: 75–88. https://doi.org/10.1177/194008290800100202.

Dinerstein, E., D. Olson, A. Joshi, C. Vynne, N.D. Burgess, E. Wikramanayake, N. Hahn, S. Palminteri, P. Hedao, R. Noss, M. Hansen, H. Locke, E.C. Ellis, B. Jones, C.V. Barber, R. Hayes, C. Kormos, V. Martin, E. Crist, W. Sechrest, L. Price, J.E.M. Baillie, D. Weeden, K. Suckling, C. Davis, N. Sizer, R. Moore, D. Thau, T. Birch, P. Potapov, S. Turubanova, A. Tyukavina, N. De Souza, L. Pintea, J.C. Brito, O.A. Llewellyn, A.G. Miller, A. Patzelt, S.A. Ghazanfar, J. Timberlake, H. Klöser, Y. Shennan-Farpón, R. Kindt, J.P.B. Lilleso, P. Van Breugel, L. Graudal, M. Voge, K.F. Al-Shammari, and M. Saleem. 2017. An ecoregion-based approach to protecting half the terrestrial realm. *BioScience* 67: 534–545. https://doi.org/10.1093/biosci/bix014.

Diniz Filho, J.A.F., L. Jardim, J.J. Guedes, L. Meyer, J. Stropp, L.E. Frateles, R.B. Pinto, L.G. Lohmann, G. Tessarolo, C.J.B. Carvalho, R.J. Ladle, and J. Hortal. 2023. Macroecological links between the Linnean, Wallacean, and Darwinian shortfalls. *Frontiers of Biogeography* 15: 1–11. https://doi.org/10.21425/F5FBG59566.

Etard, A., S. Morrill, and T. Newbold. 2020. Global gaps in trait data for terrestrial vertebrates. *Global Ecology and Biogeography* 29: 2143–2158. https://doi.org/10.1111/geb.13184.

Frost, D.R. 2024. *Amphibian Species of the World: An Online Reference*. Version 6.2. American Museum of Natural History, New York, New York, USA. https://doi.org/10.5531/db.vz.0001. <https://amphibiansoftheworld.amnh.org/index.php>.

Guedes, T.B., R.J. Sawaya, and C. Nogueira. 2014. Biogeography, vicariance and conservation of snakes of the neglected and endangered Caatinga region, north-eastern Brazil. *Journal of Biogeography* 41: 919–931. https://doi.org/10.1111/jbi.12272.

Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.A.C. Hayek, and S.M. Foster. 1994. *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Smithsonian Institution, Washington, D.C., USA.

Hoffmann, M., C.R. Hilton-Taylor, Â. Angulo, M. Böhm, T.M. Brooks, S.H.M. Butchart, K.E. Carpenter, J. Chanson, B. Collen, N.A. Cox, W.R.T. Darwall, N.K. Dulvy, L.R. Harrison, V. Katariya, C.M. Pollock, S. Quader, N.I. Richman, A.S.L. Rodrigues, M.F. Tognelli, J.C. Vié, J.M. Aguiar, D.J. Allen, G.R. Allen, G. Amori, N.B. Ananjeva, F. Andreone, P. Andrew, A.L.A. Ortiz, J.E.M. Baillie, R. Baldi, B.D. Bell, S.D. Biju, J.P. Bird, P. Black-Decima, J.J. Blanc, F. Bolaños, W. Bolivar-G, I.J. Burfield, J.A. Burton, D.R. Capper, F. Castro, G. Catullo, R.D. Cavanagh, A. Channing, N.L. Chao, A.M. Chenery, F. Chiozza, V. Clausnitzer, N.J. Collar, L.C. Collett, B.B. Collette, C.F. Cortez Fernandez, M.T. Craig, M.J. Crosby, N. Cumberlidge, A. Cuttelod, A.E. Derocher, A.C. Diesmos, J.S. Donaldson, J.W. Duckworth, G. Dutson, S.K. Dutta, R.H. Emslie, A. Farjon, S. Fowler, J. Freyhof, D.L. Garshelis, J. Gerlach, D.J. Gower, T.D. Grant, G.A. Hammerson, R.B. Harris, L.R. Heaney, S.B. Hedges, J.M. Hero, B. Hughes, S.A. Hussain, M.J. Icochea, R.F. Inger, N. Ishii, D.T. Iskandar, R.K.B. Jenkins, Y. Kaneko, M. Kottelat, K.M. Kovacs, S.L. Kuzmin, E. La Marca, J.F. Lamoreux, M.W.N. Lau, E.O. Lavilla, K. Leus, R.L. Lewison, G. Lichtenstein, S.R. Livingstone, V. Lukoschek, D.P. Mallon, P.J.K. McGowan, A. McIvor, P.D. Moehlman, S. Molur, A.M. Alonso, J.A. Musick, K. Nowell, R.A. Nussbaum, W. Olech, N.L. Orlov, T.J. Papenfuss, G. Parra-Olea, W.F. Perrin, B.A. Polidoro, M. Pourkazemi, P.A. Racey, J.S. Ragle, M. Ram, G. Rathbun, R.P. Reynolds, A.G.J. Rhodin, S.J. Richards, L.O. Rodríguez, S.R. Ron, C. Rondinini, A.B. Rylands, Y.S. De Mitcheson, J.C. Sanciangco, K.L. Sanders, G. Santos-Barrera, J. Schipper, C. Self-Sullivan, Y. Shi, A. Shoemaker, F.T. Short, C. Sillero-Zubiri, D.L. Silvano, K.G. Smith, A.T. Smith, J. Snoeks, A.J. Stattersfield, A.J. Symes, A.B. Taber, B.K. Talukdar, H.J. Temple, R. Timmins, J.A. Tobias, K. Tsytsulina, D. Tweddle, C. Ubeda, S.V. Valenti, P.P. Van Dijk, L.M. Veiga, A. Veloso, D.C. Wege, M. Wilkinson, E.A. Williamson, F. Xie, B.E. Young, H.R. Akçakaya, L. Bennun, T.M. Blackburn, L. Boitani, H.T. Dublin, G.A.B. Da Fonseca, C. Gascon, T.E. Lacher, G.M. Mace, S.A. Mainka, J.A. McNeely, R.A. Mittermeier, G.M. Reid, J.P. Rodriguez, A.A. Rosenberg, M.J. Samways, J. Smart, B.A. Stein, and S.N. Stuart. 2010. The impact of conservation on the status of the world's vertebrates. *Science* 330: 1503–1509. https://doi.org/10.1126/science.1194442.

Holt, S., L.K. Horwitz, B. Wilson, and D. Codron. 2021. Leopard tortoise *Stigmochelys pardalis* (Bell, 1928) mortality caused by electrified fences in central South Africa and its impact on tortoise demography. *African Journal of Herpetology* 70: 32–52. https://doi.org/10.1080/21564574.2020.1860140.

Hopkins, M.J.G. 2007. Modelling the known and unknown plant biodiversity of the Amazon Basin. *Journal of Biogeography* 34: 1400–1411. https://doi.org/10.1111/j.1365-2699.2007.01737.x.

Hortal, J., F. de Bello, J.A.F. Diniz-Filho, T.M. Lewinsohn, J.M. Lobo, and R.J. Ladle. 2015. Seven shortfalls that beset large-scale knowledge of biodiversity. *Annual Review of Ecology, Evolution, and Systematics* 46: 523–549. https://doi.org/10.1146/annurev-ecolsys-112414-054400.

Howard, S.D. and D.P. Bickford. 2014. Amphibians over the edge: silent extinction risk of data deficient species. *Diversity and Distributions* 20: 837–846. https://doi.org/10.1111/ddi.12218.

IUCN (International Union for Conservation of Nature and Natural Resouces). 2024. *The IUCN Red List of Threatened Species*. Version 2024–1. IUCN, Cambridge, UK. <https://www.iucnredlist.org>.

IUCN SSC Amphibian Specialist Group & Instituto Boitatá de Etnobiologia e Conservação da Fauna. 2023. *Ischnocnema garciai*. *The IUCN Red List of Threatened Species* 2023: eT154047620A154047903. https://doi.org/10.2305/IUCN.UK.2023-1.RLTS.T154047620A154047903.en.

Jenkins, C.N., S.L. Pimm, and L.N. Joppa. 2013. Global patterns of terrestrial vertebrate diversity and conservation. *Proceedings of the National Academy of Sciences of the United States of America* 110: E2602–E2610. https://doi.org/10.1073/pnas.1302251110.

Jorgewich-Cohen, G., L.F. Toledo, and T. Grant. 2022. Genetic structure of American bullfrog populations in Brazil. *Scientific Reports* 12: 1–10. https://doi.org/10.1038/s41598-022-13870-2.

Júnior, A.S., L.G. de Carvalho, F.F. Silva, and A.M. de Carvalho. 2012. Application of the Köppen classification for climatic zoning in the state of Minas Gerais, Brazil. *Theoretical and Applied Climatology* 108: 1–7. https://doi.org/10.1007/s00704-011-0507-8.

Lamkin, M. and A.I. Miller. 2016. On the challenge of comparing contemporary and deep-time biological-extinction rates. *BioScience* 66: 785–789. https://doi.org/10.1093/biosci/biw088.

Leivas, P.T., F.W. Leivas, and M.O. Moura. 2012. Diet and trophic niche of *Lithobates catesbeianus* (Amphibia: Anura). *Zoologia* 29: 405–412. https://doi.org/10.1590/S1984-46702012000500003.

Lisboa, C.S., R.I. Vaz, L.R. Malagoli, F.E. Barbo, R.C. Venturini, and C.A. Brasileiro. 2021. Herpetofauna from an Atlantic Forest fragment in São Paulo, Brasil. *Herpetological Conservation and Biology* 16: 436–451.

Lomolino, M.V. 2004. Conservation biogeography, pp. 293–96. In: M.V. Lomolino and L. Heaney (eds.), *Frontiers of Biogeography: New Directions in the Geography of Nature*. Sinauer, Sunderland, Massachusetts, USA.

Macedo, K.F., C.L. Assis, C.M. Oliveira, and R.N. Feio. 2021. Predation of *Rhinella crucifer* (Wied-Neuwied, 1821) (Anura: Bufonidae) by giant water bug *Lethocerus grandis* (Linnaeus, 1758) (Hemiptera: Belostomatidae). *Graellsia* 77: e151. https://doi.org/10.3989/graellsia.2021.v77.318.

Magalhães, F.M., M.L. Lyra, T.C. Carvalho, D.B. Baldo, F. Brusquetti, P. Burella, G.R. Colli, M.C. Gehara, A.A. Giaretta, C.F.B. Haddad, J.A. Langone, J.A. Lopez, M.F. Napoli, D.J. Santana, R.O. Sa, and A.A. Garda. 2020. Taxonomic review of South American Butter Frogs: phylogeny, biogeographic patterns, and species delimitation in the *Leptodactylus latrans* species group (Anura: Leptodactylidae). *Herpetological Monograph* 34: 131–177. https://doi.org/10.1655/0733-1347-31.4.131.

Medeiros, C.I., C. Both, T. Grant, and S.M. Hartz. 2017. Invasion of the acoustic niche: variable responses by native species to invasive American bullfrog calls. *Biological Invasions* 19: 675–690. https://doi.org/10.1007/s10530-016-1327-7.

Miller, D.A.W., E.H.C. Grant, E. Muths, S.M. Amburgey, M.J. Adams, M.B. Joseph, J.H. Waddle, P.T.J. Johnson, M.E. Ryan, B.R. Schmidt, D.L. Calhoun, C.L. Davis, R.N. Fisher, D.M. Green, B.R. Hossack, T.A.G. Rittenhouse, S.C. Walls, L.L. Bailey, S.S. Cruickshank, G.M. Fellers, T.A. Gorman, C.A. Haas, W. Hughson, D.S. Pilliod, S.J. Price, A.M. Ray, W. Sadinski, D. Saenz, W.J. Barichivich, A. Brand, C.S. Brehme, R. Dagit, K.S. Delaney, B.M. Glorioso, L.B. Kats, P.M. Kleeman, C.A. Pearl, C.J. Rochester, S.P.D. Riley, M. Roth, and B.H. Sigafus. 2018. Quantifying climate sensitivity and climate-driven change in North American amphibian communities. *Nature Communications* 9: 1–15. https://doi.org/10.1038/s41467-018-06157-6.

Ministério do Meio Ambiente. 2022. Portaria MMA Nº 148, de 7 de Junho de 2022. Anexo. Lista Nacional de Espécies Ameaçadas de Extinção. Diário Oficial da União, Ministério do Meio Ambiente, Brasília, Brasil. <https://www.in.gov.br/en/web/dou/-/portaria-mma-n-148-de-7-de-junho-de-2022-406272733>.

Mittermeier, R.A., W.R. Turner, F.W. Larsen, T.M. Brooks, and C. Gascon. 2011. Global biodiversity conservation: the critical role of hotspots, pp. 3–22. In: F.E. Zachos and J.C. Habel (eds.), *Biodiversity Hotspots*. Springer, Berlin and Heidelberg, Germany.

Moura, M.R. and W. Jetz. 2021. Shortfalls and opportunities in terrestrial vertebrate species discovery. *Nature Ecology & Evolution* 5: 631–639. https://doi.org/10.1038/s41559-021-01411-5.

Moura, M.R., A.P. Motta, V.D. Fernandes, and R.N. Feio. 2012a. Herpetofauna da Serra do Brigadeiro, um remanescente de Mata Atlântica em Minas Gerais, sudeste do Brasil. *Biota Neotropica* 12: 209–235. https://doi.org/10.1590/S1676-06032012000100017.

Moura, M.R., J.V.A. Lacerda, and R.N. Feio. 2012b. Advertisement call and distribution of *Dendropsophus berthalutzae* (Anura: Hylidae). *Salamandra* 48: 177–180.

Nori, J., P. Lemes, N. Urbina-Cardona, D. Baldo, J. Lescano, and R. Loyola. 2015. Amphibian conservation, land-use changes and protected areas: A global overview. *Biological Conservation* 191: 367–374. https://doi.org/10.1016/j.biocon.2015.07.028.

Nori, J., F. Villalobos, and R. Loyola. 2018. Global priority areas for amphibian research. *Journal of Biogeography* 45: 2588–2594. https://doi.org/10.1111/jbi.13435.

Oliveira, U., B.S. Soares-Filho, A.P. Paglia, A.D. Brescovit, C.J. Carvalho, D.P. Silva, D.T. Rezende, F.S.F. Leite, J.A.N. Batista, J.P.P.P. Barbosa, J.R. Stehmann, J.S. Ascher, M.F. Vasconcelos, P. Marco, P. Löwenberg-Neto, V.G. Ferro, and A.J. Santos. 2017. Biodiversity conservation gaps in the Brazilian protected areas. *Scientific Reports* 7: 1–9. https://doi.org/10.1038/s41598-017-08707-2.

Peixoto, M.A., T.B. Guedes, E.T. Silva, R.N. Feio, and P.S.R. Romano. 2020. Biogeographic tools help to assess the effectiveness of protected areas for the conservation of anurans in the Mantiqueira Mountain Range, southeastern Brazil. *Journal for Nature Conservation* 54: 125799. https://doi.org/10.1016/j.jnc.2020.125799.

Perius, M.R. and J.B. Carregaro. 2012. Pequenas centrais hidrelétricas como forma de redução de impactos ambientais e crises energéticas. *Ensaios e Ciência: Ciências Biológicas, Agrárias e da Saúde* 16: 135–150.

Pietersen, D.W. 2022. Body size, defensive behaviour, and season influence mortality probability in wildlife interactions with electrified fences. *African Journal of Wildlife Research* 52: 1–9. https://doi.org/10.3957/056.052.0172.

Ribeiro, J., G.R. Colli, and A.M. Soares. 2020. The anurofauna of a vanishing savanna: the case of the Brazilian Cerrado. *Biodiversity and Conservation* 29: 1993–2015. https://doi.org/10.1007/s10531-017-1468-8.

Ribeiro, L.P. and L.F. Toledo. 2022. An overview of the Brazilian frog farming. *Aquaculture* 548: 737623. https://doi.org/10.1016/j.aquaculture.2021.737623.

Ribeiro, M.C., J.P. Metzger, A.C. Martensen, F.J. Ponzoni, and M.M. Hirota. 2009. The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for conservation. *Biological Conservation* 142: 1141–1153. https://doi.org/10.1016/j.biocon.2009.02.021.

Ribeiro, M.C., A.C. Martensen, J.P. Metzger, M. Tabarelli, F. Scarano, and M.J. Fortin. 2011. The Brazilian Atlantic Forest: a shrinking biodiversity hotspot, pp. 405–434. In: F.E. Zachos and J.C. Habel (eds.), *Biodiversity Hotspots*. Springer, Berlin and Heidelberg, Germany.

Rossa-Feres, D.D.C., M.V. Garey, U. Caramaschi, M.F. Napoli, F. Nomura, A.A. Bispo, C.A. Brasileiro, M.T.C. Thomé, R.J. Sawaya, C.E. Conte, C.A.G. Cruz, L.B. Nascimento, J.L. Gasparini, A.P. Almeida, and C.F.B. Haddad. 2017. Anfíbios da Mata Atlântica: lista de espécies, histórico dos estudos, biologia e conservação, pp. 237–314. In: E.L.A. Monteiro-Filho and C.E. Conte (eds.), *Revisões em Zoologia: Mata Atlântica*. Editora UFPR, Curitiba, Brasil.

Ruggeri, J., L.P. Ribeiro, M.R. Pontes, C. Toffolo, M. Candido, M.M. Carriero, N. Zanella, R.L.M. Sousa, and L.F. Toledo. 2019. First case of wild amphibians infected with *Ranavirus* in Brazil. *Journal of Wildlife Diseases* 55: 1–9. https://doi.org/10.7589/2018-09-224.

Scheele, B.C., P. Frank, L.F. Skerratt, L. Berger, A. Martel, W. Beukema, A.A. Acevedo, P.A. Burrowes, T. Carvalho, A. Catenazzi, I.D. la Riva, M.C. Fisher, S.V. Flechas, C.N. Foster, P. Frías-Álvarez, T.W.J. Garner, B. Gratwicke, J.M. Guayasamin, M. Hirschfeld, J.E. Kolby, T.A. Kosch, E.La Marca, D.B. Lindenmayer, K.R. Lips, A.V. Longo, R. Maneyro, C.A. McDonald, J. Mendelson, P. Palacios-Rodriguez, G. Parra-Olea, C.L. Richards-Zawacki, M-O Rödel, S.M. Rovito, C. Soto-Azat, L.F. Toledo, J. Voyles, C. Weldon, S.M. Whitfield, M. Wilkinson, K.R. Zamudio, and S. Canessa. 2019. Amphibian fungal panzootic causes catastrophic and ongoing loss of biodiversity. *Science* 363: 1459–1463. https://doi.org/10.1126/science.aav0379.

Schloegel, L.M., C.M. Ferreira, T.Y. James, M. Hipolito, J.E. Longcore, A.D. Hyatt, H.M. Yabsley, A.M.C.R.P.F. Martins, M.R. Mazzoni, and P. Daszak. 2010. The North American bullfrog as a reservoir for the spread of *Batrachochytrium dendrobatidis* in Brazil. *Animal Conservation* 13: 53–61. https://doi.org/10.1111/j.1469-1795.2009.00307.x.

Segalla, M.V., B. Berneck, C. Canedo, U. Caramaschi, C.A.G. Cruz, P.C.A. Garcia, T. Grant, C.F.B. Haddad, A.C.C. Lourenço, S. Mângia, T. Mott, L.B. Nascimento, L.F. Toledo, F.P. Werneck, and J.A. Langone. 2021. List of Brazilian amphibians. *Herpetologia Brasileira* 10: 121–217. https://doi.org/10.5281/zenodo.4716176.

Silva, E.T., O.P. Ribeiro Filho, and R.N. Feio. 2011. Predation of native anurans by invasive bullfrogs in southeastern Brazil: spatial variation and effect of microhabitat use by prey. *South American Journal of Herpetology* 6: 1–10. https://doi.org/10.2994/057.006.0101.

Silva, E.T., M.A.A. Peixoto, F.S. Leite, R.N. Feio, and P.C. Garcia. 2018. Anuran distribution in a highly diverse region of the Atlantic Forest: The Mantiqueira mountain range in southeastern Brazil. *Herpetologica* 74: 294–305. https://doi.org/10.1655/0018-0831.294.

Silva, L.A., F.M. Magalhães, H. Thomassen, F.S.F. Leite, A.A. Garda, R.A. Brandão, C.F.B. Haddad, A.A. Giaretta, and T.R. Carvalho. 2020. Unraveling the species diversity and relationships in the *Leptodactylus mystaceus* complex (Anura: *Leptodactylidae*), with the description of three new Brazilian species. *Zootaxa* 4779: 151–189. https://doi.org/10.11646/zootaxa.4779.2.1.

Silveira, S.D.S. and M. Guimarães. 2021. The enemy within: consequences of the invasive *bullfrog* on native anuran populations. *Biological Invasions* 23: 373–378. https://doi.org/10.1007/s10530-020-02385-4.

Taucce, P.P., C. Canedo, and C.F. Haddad. 2018. Two new species of *Ischnocnema* (Anura: *Brachycephalidae*) from southeastern Brazil and their phylogenetic position within the *I. guentheri* series. *Herpetological Monographs* 32: 1–21. https://doi.org/10.1655/HERPMONOGRAPHS-D-16-00014.1.

Wilson, E.O. 2017. Biodiversity research requires more boots on the ground. *Nature Ecology and Evolution* 1: 1590–1591. https://doi.org/10.1038/s41559-017-0360-y.

Appendix I. List of specimens collected in the upper Glória River region: **Municipality of Fervedouro, Minas Gerais, Brazil:** *Chiasmocleis schubarti* (MZUFV 19322-326), *Leptodactylus cupreus* (MZUFV 19719). **Municipality of São Francisco do Glória, Minas Gerais, Brazil:** *Adenomera marmorata* (MZUFV 19663), *Boana albomarginata* (MZUFV 19652), *Boana albopunctata* (MZUFV 19653, 20042, 20264-65), *Boana crepitans* (MZUFV 19519-23), *Boana faber* (MZUFV 19493), *Boana semilineata* (MZUFV 19692-93, 19696, 19700), *Dendropsophus elegans* (MZUFV 19662, 20044), *D. minutus* (MZUFV 20267), *D. pseudomeridianus* (MZUFV 19710-12), *Elachistocleis cesarii* (MZUFV 19646-47, 19657-58), *Haddadus binotatus* (MZUFV 19491-92), *Leptodactylus barrioi* (MZUFV 20043, 20276), *Leptodactylus fuscus* (MZUFV 19651), *Leptodactylus latrans* (MZUFV 19494), *Aquarana catesbeiana* (MZUFV 19517-18, 20268), *Phyllomedusa burmeisteri* (MZUFV 19655, 20263), *Physalaemus cuvieri* (MZUFV 20274-75, 20279), *Rhinella* gr. *crucifer* (MZUFV 19512, 19514-16, 19559), *Rhinella crucifer* (MZUFV 19511), *Rhinella granulosa* (MZUFV 19513, 19648), *Scinax alter* (MZUFV 19702), *Scinax eurydice* (MZUFV 19716, 20277-78, 20455), *Scinax fuscovarius* (MZUFV 19654, 19664, 20040-41, 20269), *Scinax* gr. *ruber* (MZUFV 19650), *Thoropa miliaris* (MZUFV 19649, 20266), *Pseudopaludicola mystacalis* (MZUFV 20456)