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Amphibians and reptiles from southeastern Goiás, Central Brazil

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Abstract: Even harboring a high diversity and many endemic species of amphibians and reptiles, the Cerrado biome has shown drastic changes due to the conversion of natural areas into pastures and plantations. Here, we present a checklist of amphibians and reptiles from southeastern state of Goiás, Central Brazil. This checklist was the result of collecting efforts of an inventory along the basin of the Piracanjuba and Peixe rivers carried out between September 2010 and January 2011. We recorded 39 amphibians and 40 reptiles. These results were also compared to other studies in the Cerrado biome. Our results showed that this region has a rich herpetofauna, despite the progress of anthropogenic activities in the region.

Introduction

Along with the neighboring domains of Caatinga and Chaco, the Cerrado forms a diagonal belt of dry open areas in South America (Vanzolini 1988; Dal Vechio *et al*. 2013). Cerrado is a world biodiversity hotspot (Myers *et al*. 2000), prospective studies are urgent because of the fast destruction of natural landscapes. It has faced strong anthropogenic pressures in recent years, with many areas being converted rapidly and disorderly into agriculture and grazing (Colli *et al*. 2002; Machado *et al*. 2004).

Valdujo *et al*. (2012) listed 209 species of amphibians (108 endemics) and Nogueira *et al*. (2011) reported 267 species of squamate reptiles, of which 103 (39%) are endemic to the biome. However, this richness is underestimated since recent descriptions of several new species have been published (*e.g*. Giugliano *et al*. 2013; Teixeira Jr *et al*. 2013; Roberto *et al*. 2013; Carvalho and Giaretta 2013). One of the main factors influencing high local and regional diversity in the Cerrado herpetofauna is the horizontal habitat stratification, with a wide range of different vegetation types (from forests to open grasslands) occurring side by side in the landscape, each one of them harboring a different set of species (Colli *et al*. 2002; Nogueira *et al*. 2009).

Nevertheless, habitat loss and fragmentation are among the greatest threats to populations of amphibian and reptiles in the Cerrado (Silvano and Segalla 2005; Nomura *et al*. 2012). One of the main causes of anthropogenic habitat loss is agricultural intensification, which has impacted negatively the species diversity and the abundance of amphibians (Pavan and Dixo 2004).

The economy of the southeastern region of the state of Goiás is based on the production of soybean and livestock. Such activities have been accelerating the degradation of natural environments. Regardless, the gathering of data about the herpetofauna of this region is still slow. This study provides a list of amphibians and reptiles found in 17 municipalities from the southeastern region of the state of Goiás, Brazil.

Materials and Methods

The region studied is located on the basin of the rivers Piracanjuba and Peixe in the state of Goiás, and includes the municipalities of Piracanjuba, Água Limpa, Morrinhos, Caldas Novas, Rio Quente, Bela Vista, Cristianópolis, Leopoldo de Bulhões, Luziânia, Palmelo, Orizona, Pires do Rio, Santa Cruz de Goiás, São Miguel do Passa Quatro, Silvânia, Vianópolis, and Buritizinho (Figure 1). The following physiognomies are found in the region: Riparian Forest, Cerrado *stricto sensu*, "Cerradão", Dry Forest, and "Veredas" (*sensu* Ribeiro and Walter 1998). However, the landscape is highly fragmented and remnants of natural vegetation are widely degraded by pastures and farm activities.

Fieldwork was conducted between September 2010 and January 2011, with a total of 96 days of sampling in the region. Specimen records were made in diurnal and nocturnal visual searches (Crump and Scott Jr 1994; Martins and Oliveira 1998), and by pitfall traps associated with drift-fences (Cechin and Martins 2000). Traps were installed in 30 sampling places. In each location three groups of pitfalls with drift-fences (8.0 x 0.5 m) and a container of 30 liters arranged in "Y" shape was installed. Active searches were made in 77 water bodies (Table 1).

Collected specimens were euthanized, as specified in Resolution n. 1.000/2012 of CFMV (Federal Council of Veterinary Medicine), fixed in 10% formalin and preserved in alcohol 70%. Tissue samples were taken. Voucher specimens are deposited at the Coleção Zoológica da Universidade Federal de Goiás (ZUFG), Goiânia, Goiás State, Brazil (Collection permit SEMARH 110/2011) (Appendix 1).

Nomenclature follows Frost (2014) for amphibians and Pyron *et al.* (2013) for reptiles.

Results

We recorded 80 species from 24 families. Forty amphibian species were recorded, comprising 17 genera and eight families. The most speciose families were Hylidae and Leptodactylidae, with 18 and eight species, respectively (Table 2; Figures 2–6). A total of 40 species of reptiles belonging to 17 families was observed. Lizards were represented by the families Gymnophthalmidae (four species), Teiidae, Tropiduridae and Scincidae (two species each), Polychrotidae, Dactyloidae and Anguidae (one species each). Two families of chelonians Testudinidae and Chelidae) and one of crocodilians (Alligatoridae) were found, with one species each. Snakes were represented by the following families: Colubridae (25 species), Viperidae (three species), Boidae (two species), Leptotyphlopidae and Typhlopidae (one species each). (Table 2; Figures 6–9).

The species accumulation curves did not stabilize, suggesting that the community was not sampled in their

Table 1. Sampling sites in southeastern Goiás, Brazil.

SITE	GEOGRAPHIC COORDINATES	ENVIRONMENT	SAMPLING TECHNIQUE
1	17°31′51″ S, 48°30′13″ W	Riparian Forestand Gallery Forest	Pit-fall traps
2	17°29′46″ S, 48°35′56″ W	Dry Forest	Pit-fall traps
3	17°27′25″ S, 48°30′55″ W	Dry Forest	Pit-fall traps
4	17°21′1″ S, 48°33′52″ W	Riparian Forestand Gallery Forest	Pit-fall traps
5	17°21′17″ S, 48°32′20″ W	*''Cerrado sensu stricto''*	Pit-fall traps
6	17°14′36″ S, 48°37′17″ W	Dry Forest	Pit-fall traps
7	17°11′27″ S, 48°37′0″ W	Dry Forest	Pit-fall traps
8	17° 7′36″ S, 48°34′16″ W	Dry Forest	Pit-fall traps
9	17° 5′0″ S, 48°34′52″ W	Riparian Forestand Gallery Forest	Pit-fall traps
10	17° 2′17″ S, 48°32′49″ W	Riparian Forestand Gallery Forest	Pit-fall traps
11	17°13′21″ S, 48°9′12″ W	Riparian Forestand Gallery Forest	Pit-fall traps
12	17°10′25″ S, 48°8′45″ W	Riparian Forestand Gallery Forest	Pit-fall traps
13	17° 8′30″ S, 48° 9′15″ W	Riparian Forestand Gallery Forest	Pit-fall traps
14	17° 6′31″ S, 48°8′30″ W	Dry Forest	Pit-fall traps
15	17° 3′14″ S, 48° 6′11″ W	Riparian Forestand Gallery Forest	Pit-fall traps
16	17° 1′15″ S, 48° 5′49″ W	Dry Forest	Pit-fall traps
17	16°55′55″ S, 48°4′5″ W	Riparian Forestand Gallery Forest	Pit-fall traps
18	16°52′37″ S, 48°4′35″ W	Dry Forest	Pit-fall traps
19	16°49′00″ S, 48°4′47″ W	Dry Forest	Pit-fall traps
20	16°44′22″ S, 48°8′58″ W	Riparian Forestand Gallery Forest)	Pit-fall traps
21	18°1′48″ S, 48°54′8″ W	Dry Forest	Pit-fall traps
22	17°55′33″ S, 48°53′50″ W	Dry Forest	Pit-fall traps
23	17°53′30″ S, 48°49′18″ W	Dry Forest	Pit-fall traps
24	17°49′17″ S, 48°48′15″ W	Dry Forest	Pit-fall traps
25	17°43′29″ S, 48°50′54″ W	''Campo Sujo''	Pit-fall traps
26	17°39′52″ S, 48°50′36″ W	''Campo Sujo''	Pit-fall traps
27	17°38′26″ S, 48°53′32″ W	Riparian Forestand Gallery Forest	Pit-fall traps
28	17°34′5″ S, 48°53′57″ W	''Cerradão''	Pit-fall traps
29	17°25′44″ S, 48°55′12″ W	''Cerradão''	Pit-fall traps
30	17°22′30″ S, 48°54′51″ W	''Campo Sujo''	Pit-fall traps
31	17°33′28″ S, 48°29′44″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
32	17°28′47″ S, 48°31′26″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
33	17°20′49″ S, 48°32′28″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
34	17°20′44″ S, 48°33′31″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
35	17°11′23″ S, 48°37′14″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
36	17° 2′38″ S, 48°36′25″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
37	17°32′45″ S, 48°29′43″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
38	17°32′26″ S, 48°29′31″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
39	17°31′39″ S, 48°29′27″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
40	17°31′35″ S, 48°29′27″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
41	17°31′46″ S, 48°30′3″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
42	17°29′12″ S, 48°30′58″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
43	17°29′21″ S, 48°30′47″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
44	17°20′45″ S, 48°33′0″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
45	17°20′45″ S, 48°33′3″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
46	17° 6′30″ S, 48°34′43″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
47	17° 5′36″ S, 48°35′1″ W	Aquatic environment near the pasture	Active searches

Table 1. *Continued.*

SITE	GEOGRAPHIC COORDINATES	ENVIRONMENT	SAMPLING TECHNIQUE
48	17°33′4″ S, 48°29′43″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
49	17°31′27″ S, 48°29′34″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
50	17°31′29″ S, 48°29′40″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
51	17°11′43″ S, 48°36′50″ W	Aquatic environment near the pasture	Active searches
52	17° 4′24″ S, 48°37′1″ W	Aquatic environment near the pasture	Active searches
53	17° 4′33″ S, 48°36′56″ W	Aquatic environment near the pasture	Active searches
54	17° 4′38″ S, 48°36′52″ W	Aquatic environment near the pasture	Active searches
55	17° 4′40″ S, 48°36′51″ W	Aquatic environment near the pasture	Active searches
56	17° 4′47″ S, 48°36′44″ W	Aquatic environment near the pasture	Active searches
57	17° 3′2″ S, 48°37′9″ W	Aquatic environment near the pasture	Active searches
58	17° 3′0″ S, 48°34′22″ W	Aquatic environment near the pasture	Active searches
59	17° 3′7″ S, 48°33′55″ W	Aquatic environment near the pasture	Active searches
60	17°20′8″ S, 48°33′19″ W	Aquatic environment near the pasture	Active searches
61	17°14′33″ S, 48°37′10″ W	Aquatic environment near the pasture	Active searches
62	17° 2′32″ S, 48°32′46″ W	Aquatic environment near the pasture	Active searches
63	17° 3′45″ S, 48° 6′10″ W	Aquatic environment near the pasture	Active searches
64	17° 3′16″ S, 48° 5′54″ W	Aquatic environment near the pasture	Active searches
65	17° 5′56″ S, 48° 4′38″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
66	16°51′55″ S, 48° 2′55″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
67	16°49′37″ S, 48° 6′25″ W	Aquatic environment near the pasture	Active searches
68	16°49′20″ S, 48° 6′25″ W	Aquatic environment near the pasture	Active searches
69	16°44′53″ S, 48° 9′51″ W	Aquatic environment near the pasture	Active searches
70	16°45′0″ S, 48°10′6″ W	Aquatic environment near the pasture	Active searches
71	17° 9′30″ S, 48° 9′47″ W	Aquatic environment near the pasture	Active searches
72	17° 7′38″ S, 48° 9′59″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
73	17° 8′19″ S, 48° 9′38″ W	Aquatic environment near the pasture	Active searches
74	17°11′26″ S, 48° 7′48″ W	Aquatic environment near the pasture	Active searches
75	17°11′27″ S, 48°10′28″ W	Aquatic environment near the pasture	Active searches
76	17°59′59″ S, 48°53′1″ W	Aquatic environment near the pasture	Active searches
77	18° 0′56″ S, 48°52′39″ W	Aquatic environment near the pasture	Active searches
78	18° 0′59″ S, 48°52′32″ W	Aquatic environment near the pasture	Active searches
79	18° 0′59″ S, 48°52′29″ W	Aquatic environment near the pasture	Active searches
80	18° 1′0″ S, 48°52′19″ W	Aquatic environment near the pasture	Active searches
81	18° 1′17″ S, 48°51′49″ W	Aquatic environment near the pasture	Active searches
82	18° 1′54″ S, 48°52′0″ W	Aquatic environment near the pasture	Active searches
83	18° 0′9″ S, 48°52′50″ W	Aquatic environment near the pasture	Active searches
84	18° 0′2.21″ S, 48°52′42″ W	Aquatic environment near the pasture	Active searches
85	17°59′29″ S, 48°52′9″ W	Aquatic environment near the pasture	Active searches
86	18° 4′23″ S, 48°53′48″ W	Aquatic environment near the pasture	Active searches
87	17°55′35″ S, 48°53′49″ W	Aquatic environment near the pasture	Active searches
88	17°53′30″ S, 48°49′21″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
89	17°52′48″ S, 48°47′46″ W	Aquatic environment near the pasture	Active searches
90	17°49′19″ S, 48°48′15″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
91	17°49′51″ S, 48°49′49″ W	Aquatic environment near the pasture	Active searches
92	17°49′20″ S, 48°48′21″ W	Aquatic environment near the pasture	Active searches
93	17°51′53″ S, 48°51′45″ W	Aquatic environment near the pasture	Active searches
94	17°52′41″ S, 48°51′42″ W	Aquatic environment near the pasture	Active searches
95	17°40′25″ S, 48°51′20″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
96	17°43′49″ S, 48°50′41″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
97	17°40′25″ S, 48°51′20″ W	Aquatic environment near the pasture	Active searches
98	17°38′27″ S, 48°53′32″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
99	17°38′34″ S, 48°53′9″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
100	17°34′4″ S, 48°54′23″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
101	17°34′17″ S, 48°52′49″ W	Aquatic environment near the pasture	Active searches
102	17°34′19″ S, 48°54′15″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
103	17°25′37″ S, 48°54′50″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
104	17°25′1″ S, 48°54′57″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
105	17°22′26″ S, 48°55′7″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
106	17°21′42″ S, 48°56′50″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches
107	17°22′12″ S, 48°56′34″ W	Arbustive vegetation on margin of ponds and aquatic environment	Active searches

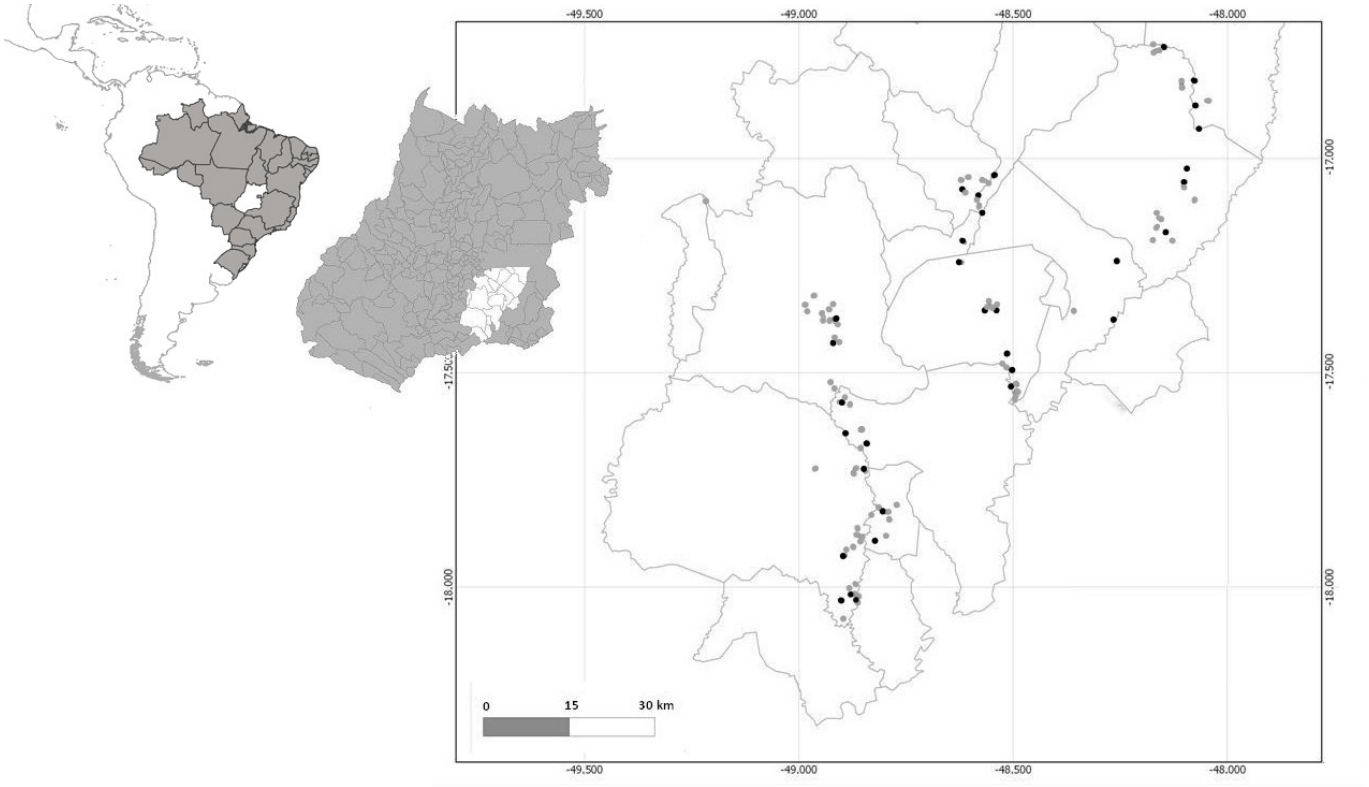

Figure 1. Sites sampled in southeastern Goiás, Brazil. Black circles represent sites sampled with pitfall trap, and gray circles represent sites sampled with active searches.

entirety. However, the cumulative curves of observed and estimated species for amphibians showed a tendency to stabilization, Jackknife 1 estimator calculated 43.96 ± 3.87 species for the area (Figure 10). The estimated richness for reptiles was 55.86 ± 7.18 species (Figure 11).

Discussion

Amphibians

The richness were compared with other Cerrado localities, exceeding other studies conducted in the biome (28 species at Itirapina, state of São Paulo - Brasileiro *et al*. 2005; 38 species at Serra da Bodoquena National Park, state of Mato Grosso do Sul - Uetanabaro *et al*. 2007; 32 species at Aporé, state of Goiás - Vaz-Silva *et al*. 2007; 32 species at São Desiderio, state of Bahia - Valdujo *et al*. 2009; 36 species at Jalapão, state of Tocantins - Valdujo *et al*. 2011; 32 species at Silvânia- Morais et al, 2011; 36 species Southwest of Goiás state - Morais *et al*. 2011; 36 species Aruanã, state of Goiás - Melo *et al*. 2013). The higher number of hylids followed by family Leptodactylidae and the distribution of species among families are similar to other studies. This was also found in other neotropical environments (Duellman 1999; Ribeiro-Júnior and Bertoluci 2008).

None of the species was found in all environments, indicating the relevance of the different physiognomies of Cerrado for the diversity of amphibians. Most of the species documented in this study presents a wide distribution, occurring in other Brazilian biomes and in neighboring countries, and 14 of them are endemic to the Cerrado. Among them, some species as *Ameerega flavopicta*, endemic to the Cerrado biome, were observed only in areas of Cerrado *stricto sensu*. *A. flavopicta* occupy open physiognomies of the Cerrado ecosystem, with males calling mainly from rock crevices (Toledo *et al*. 2004; Costa *et al*. 2006; Magrini *et al*. 2010; Martins and Giaretta 2012). The species is considered to be of "Least Concern" by the International Union for Conservation of Nature (IUCN, 2013). However, Eterovick *et al*. 2005, reported the decline of some local populations surrounding Serra do Cipó National Park, at a region that is suffering from increasing human occupancy and unplanned growth of tourism (Lima and Eterovick 2013).

Other Cerrado endemic species, such as *Rhinella ocellata*, *Odontophrynus cultripes, Proceratophrys goyana* and *Barycholos ternetzi* were found exclusively in forested habitats. The modification of habitats exerts selective pressure on specialist species while those with higher plasticity have survival rates (Grandinetti and Jacobi 2005). Considering that amphibians inhabiting forests tend to be impacted by the effects of habitat loss and fragmentation due to greater exposure to predation, dehydration and other factors resulting from changes in the structure and composition of vegetation, the results suggest that these species may be more sensitive to changes in their environment and they can show a low degree of tolerance to human impacts (Dixo and Martins 2008).

In this study, the distribution of species in different environments and substrates during frog calling activity was not uniform. Many of the species were sampled in open areas; they also did not show high specificity in the choice of breeding spots and have been considered habitat generalists (Brasileiro *et al*. 2005; Moraes *et al*. 2011). In this study, the genus *Scinax* showed wide variation in habitat use. *Scinax* sp. (*Scinax catharinae* clade) was found in riparian forest of streams and lentic environments near forest edges, in general these species are gallery forest dwellers that use marginal vegetation bordering streams

(Lutz 1973; Lourenço *et al*. 2009; Pombal *et al*. 2010; Leite *et al*. 2013). *Scinax fuscomarginatus* has been already found in temporary and permanent ponds near to forest edges and in open areas. Other species such as *Scinax* sp. (*Scinax ruber* clade) and *S. fuscovarius* were found in open areas and temporary ponds, and occurred in greater numbers in disturbed areas. This shows the great plasticity of the genus as to the habitat use and their success in colonizing anthropogenic environments.

Some species, such as *Eupemphix nattereri*, *Physalaemus cuvieri* and *Rhinella schneideri* were present in almost all areas sampled, including disturbed areas. These species are often seen in areas that have gone for anthropogenic changes (Conte and Rossa-Feres 2007).

Reptiles

The richness of reptiles was lower than other studies conducted in the biome. We recorded a total of 13 lizard and 21 snake species. Colli *et al.* (2002) and Nogueira *et al*. (2009) estimate that local communities in Cerrado may present 15 to 28 lizards (26 species at Lajeado, state of Tocantins - Pavan and Dixo 2004; 18 species at Aporé, state of Goiás - Vaz-Silva *et al*. 2007; 23 species at Itiquira, states of Mato Grosso and Mato Grosso do Sul - Silva-Jr. *et al*. 2009; 21 species at Estação Ecológica Serra Geral do Tocantins, states of Tocantins and Bahia - Recoder *et al*. 2011). The observed of snakes was also lower when compared to other sampled locations with local richness ranging from 21 to 70 snake species (44 species at Chapada dos Guimarães, state of Mato Grosso - Strüssmann 2000; 70 species at Lajeado, state of Tocantins - Pavan and Dixo 2004; 43 species at Aporé, state of Goiás - Vaz-Silva *et al*. 2007; 36 species at Itirapina, state of São Paulo - Sawaya *et al*. 2008; 47 species at Parque Nacional das Emas, states of Goiás and Mato Grosso do Sul - Valdujo *et al*. 2009; 21 species at EstaçãoEcológica Serra Geral do Tocantins, states of Tocantins and Bahia - Recoder *et al*. 2011; 36 species at Lucas do Rio Verde, state of Mato Grosso - Tavares *et al*. 2012).
It is expected that a larger sampling might add new records for the region.

As observed for amphibians, reptiles' assemblages documented for the study area are composed mostly by species with wide geographic distribution and typical for the Cerrado, with emphasis on *Amphisbaena anaemariae* and *Micrablepharus atticolus*, endemic species of the biome. Furthermore, the record of *A. anaemariae* is remarkable, because there are few data on its distribution (Nogueira 2001).

None of the species cataloged in this study are present in the Brazilian list of endangered species of reptiles (Martins and Molina 2008). In IUCN Red List of endangered fauna, only *Paleosuchus palpebrosus* was considered as Lower Risk (IUCN 2013), this species also is present in the Appendix II of CITES which contains species that are under pressure from illegal trade and can become endangered if commercial exploitation is not controlled (CITES, 2009). Besides these species, lizards of the genera *Tupinambis*, the boine snakes *Epicrates* and *Boa* are present in the Appendix II of CITES.

Lizards were observed and collected more easily in open areas through the day during foraging activity. *Tropidurus* spp. were recorded exploring the ground and trunks and *Ameiva ameiva* was commonly found on roads, and every time reports were made, it was always using open areas and forest edges; this species was not observed in areas of dense woods or shaded places. Other species such as *Micrablepharus atticolus*, *Colobosaura modesta* and *Cercosaura schreibersii* were observed only in the interior and edges of remaining primary vegetation, confirming their importance for the maintenance of some species.

Regarding the snakes, the species from the Colubridae family showed different uses for habitats and substrates, probably due to their various morphological patterns. Individuals of the species *Crotalus durissus* and *Bothrops moojeni,* representatives of the family Viperidae, had high abundance during sampling. *Crotalus durissus* was found in all sampled areas, except in the aquatic environments, with higher number of records in disturbed areas compared to forest environments. The same pattern was recorded to *Bothrops moojeni* that also demonstrated preference for disturbed areas and were not seen in remnants of Cerrado *sensu strictu*. Unlike *C. durissus*, *B. moojeni* was registered in activity at night, using aquatic environment next to forest fragments.

Recent studies indicate that the composition and spatial organization of herpetofaunal communities, both to amphibians (Menin *et al*. 2007), lizards (Nogueira *et al*. 2009) and snakes (Fraga *et al*. 2011) and corroborated by authors such as Pantoja and Fraga (2012) may be correlated with local features of the landscape. Variations in the richness and abundance of amphibians and reptiles in fragmented landscapes may also be related to environmental characteristics of remainings beyond the size and isolation (Vallan 2000). The vegetation structure, microclimate, availability of habitats and the presence of water bodies are also important characteristics for maintenance, abundance and species richness of these groups in the landscape (Dixo and Metzger 2008).

The regional landscape has submitted to an intense process of suppression and fragmentation of primary vegetation, and this may have influenced the composition of the local fauna. In response to the particular characteristics of natural history and ecology, species are affected differently by these modifications. Previous studies show that some more sensitive species demonstrated rapid decline, other species stayed stable, tolerating habitat disturbances, and others increased significantly in abundance (Conte and Rossa-Feres 2007; Faria *et al*. 2007; Laurence 2008). Thus, many habitat specialist species might have been eliminated during this process of vegetation suppression, resulting in an impoverishment of the specialized fauna in detriment of the permanence of generalist species or those resistant to environmental disturbances. Nevertheless the lack of information about habitat use by species contrasts with the huge and prompt reductions of areas.

The systematization and establishment of species distribution patterns in regions with high biodiversity is the first step towards understanding the relative importance of mechanisms by which these biotas are assembled (Valdujo *et al*. 2012), and one of the most important aspects in developing strategies for the conservation of ecosystems (MMA 2006).

Table 2. List of amphibians and reptiles of southeastern Goiás, Brazil. Legend: RF - Riparian forest and Gallery Forest; CE – Cerrado sensu stricto; CD – Cerradão; CS – Campo Sujo; DF – Dry forest; HO – Hygrophilous Environments in Open Areas; HF – Hygrophilous Environments next to forest fragments; VE – Vereda; DA – Disturbed area.

TAXON	RF	CE	CD	CS	DF	HO	HF	VE	DA
AMPHIBIA									
ANURA									
Bufonidae									
Rhinella cerradensis Maciel, Brandão, Campos & Sebben, 2007							X		
Rhinella ocellata (Günther, 1859 "1858")	X	X	X						
Rhinella schneideri (Werner, 1894)	X	X	X		X	X		X	
Odontophrynidae									
Odontophrynus cultripes Reinhardt & Lütken, 1861"1862"	X	X	X	X	X				
Proceratophrys goyana (Miranda-Ribeiro, 1937)	X	X	X						
Dendrobatidae									
Ameerega flavopicta (A. Lutz, 1925)		X							
Hylidae									
Dendropsophus cruzi (Pombal & Bastos, 1998)	X					X	X		
Dendropsophus melanargyreus (Cope, 1887)						X	X		
Dendropsophus minutus (Peters, 1872)						X	X	X	
Dendropsophus nanus (Boulenger, 1889)						X	X		
Dendropsophus rubicundulus (Reinhardt & Lütken, 1862"1861")						X	X		
Dendropsophus soaresi (Caramaschi & Jim, 1983)						X	X		
Hypsiboas albopunctatus (Spix, 1824)						X	X	X	
Hypsiboas lundii (Burmeister, 1856)	X					X	X		
Hypsiboas paranaiba Carvalho & Giaretta, 2010							X		
Hypsiboas raniceps Cope, 1862	X					X	X	X	
Phyllomedusa azurea Cope, 1862						X	X	X	
Pseudis bolbodactyla A. Lutz, 1925						X	X	X	
Scinax aff. *x-signatus* (Spix, 1824)							X		
Scinax fuscomarginatus (A. Lutz, 1925)						X	X		
Scinax fuscovarius (A. Lutz, 1925)						X	X		X
Scinax sp. (*S. catharinae* clade)							X		
Scinax sp. (*S. ruber* clade)						X	X		
Trachycephalus typhonius (Linnaeus, 1758)	X					X			
Leptodactylidae									
Adenomera aff. *hylaedactylus* (Cope, 1868)	X								
Eupemphix nattereri Steindachner, 1863									
Leptodactylus aff. *latrans* (Steffen, 1815)	X				X	X	X		
Leptodactylus fuscus (Schneider, 1799)	X		X			X	X		X
Leptodactylus labyrinthicus (Spix, 1824)						X	X	X	
Leptodactylus mystaceus (Spix, 1824)	X							X	
Leptodactylus mystacinus (Burmeister, 1861)	X				X	X			
Leptodactylus podicipinus (Cope, 1862)	X					X	X	X	
Leptodactylus syphax Bokermann, 1969		X							
Physalaemus centralis Bokermann, 1962							X		
Physalaemus cuvieri Fitzinger, 1826	X	X			X	X	X		
Pseudopaludicola cf. *saltica* (Cope, 1887)	X						X		
Pseudopaludicola mystacalis (Cope, 1887)							X		
Microhylidae									
Chiasmocleis albopunctata (Boettger, 1885)		X	X						
Elachistocleis cesarii (Miranda-Ribeiro, 1920)							X		
Craugastoridae									
Barycholos ternetzi (Miranda-Ribeiro, 1937)	X				X		X		
REPTILIA									
SQUAMATA									
Amphisbaenidae									
Amphisbaena alba Linnaeus, 1758	X								X
Amphisbaena anaemariae Vanzolini, 1997					X				X
Amphisbaena vermicularis Wagler, 1824		X							
Anguidae									
Ophiodes aff. *striatus* (Spix, 1825)									X

Table 2. ***Continued.***

TAXON	RF	CE	CD	CS	DF	HO	HF	VE	DA
Teiidae									
Ameiva ameiva (Linnaeus, 1758)	X	X	X		X				X
Tupinambis merianae (Duméril & Bibron, 1839)	X	X				X			X
Gymnophthalmidae									
Cercosaura schreibersii Wiegmann, 1834					X				
Colobosaura modesta (Reinhardt & Luetken, 1862)	X	X			X				
Micrablepharus atticolus Rodrigues, 1996				X					
Micrablepharus maximiliani (Reinhardt & Luetken, 1862)				X	X				
Dactyloidae									
Anolis brasiliensis (Vanzolini & Williams, 1970)	X	X		X					
Polychrotidae									
Polychrus acutirostris Spix, 1825	X			X					
Tropiduridae									
Tropidurus oreadicus Rodrigues, 1987	X	X							X
Tropidurus torquatus (Wied, 1820)					X				
Scincidae									
Mabuya nigropunctata (Spix, 1825)		X		X					X
Mabuya frenata (Cope, 1862)	X	X			X				X
Boidae									
Boa constrictor Linnaeus, 1758	X			X					
Epicrates crassus Cope, 1862					X				
Colubridae									
Apostolepis assimilis (Reinhardt, 1861)					X				
Chironius flavolineatus (Boettger, 1885)						X			X
Chironius quadricarinatus (Boie, 1827)									
Erythrolamprus poecilogyrus (Wied, 1825)						X			
Helicops angulatus (Linnaeus, 1758)							X		
Helicops modestus Günther, 1861							X		
Oxyrhopus guibei Hoge & Romano, 1978					X	X			X
Oxyrhopus trigeminus Duméril, Bibron & Duméril, 1854					X	X			X
Oxyrhopus petolarius Reuss, 1834									X
Philodryas nattereri Steindachner, 1870									X
Philodryas olfersii (Lichtenstein, 1823)	X								
Phimophis guerini (Duméril, Bibron & Duméril, 1854)									X
Sibynomorphus mikanii (Schlegel, 1837)		X							X
Tantilla melanocephala (Linnaeus, 1758)				X					
Leptotyphlopidae									
Trilepida koppesi (Amaral, 1955)		X			X				
Typhlopidae									
Typhlops brongersmianus Vanzolini, 1976					X				
Viperidae									
Bothrops moojeni Hoge, 1966		X			X	X	X		X
Bothrops pauloensis (Amaral, 1925)									X
Crotalus durissus (Linnaeus, 1758)									X
TESTUDINES									
Chelidae									
Phrynops geoffroanus (Schweigger, 1812)	X					X	X		
Testudinidae									
Chelonoidis carbonaria (Spix, 1824)							X		
CROCODYLIA									
Alligatoridae									
Paleosuchus palpebrosus (Cuvier, 1807)	X								

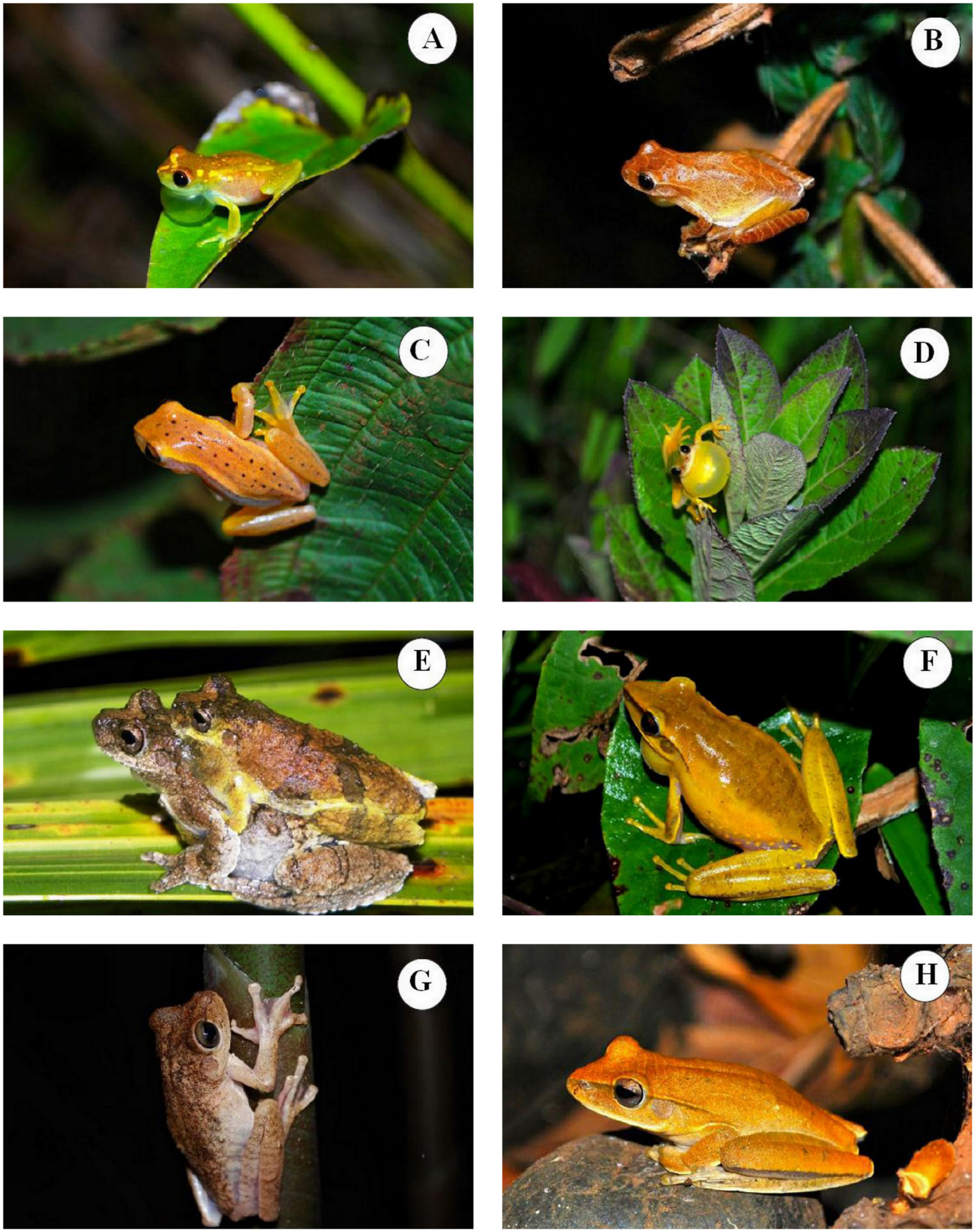

Figure 2. Some species recorded during survey in southeastern Goiás: A) *Dendropsophus cruzi*; B) *Dendropsophus minutus*; C) *Dendropsophus nanus*; D) *Dendropsophus rubicundulus*; E) *Dendropsophus melanargyreus*; F) *Hypsiboas albopunctatus*; G) *Hypsiboas lundii*; H) *Hypsiboas paranaiba*. Photos by Sheila P. Andrade.

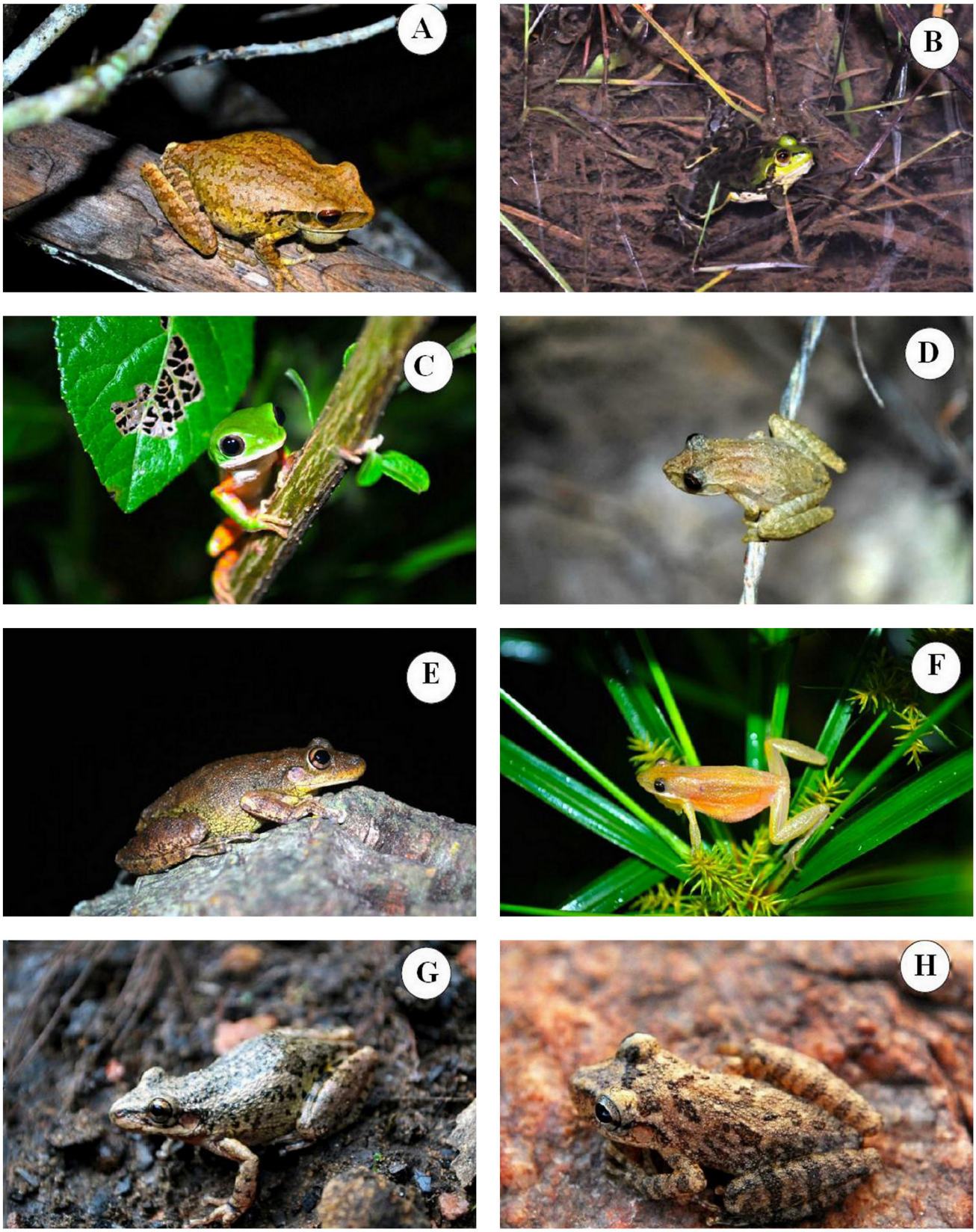

Figure 3. Some species recorded during survey in southeastern Goiás: A) *Hypsiboas raniceps*; B) *Pseudis bolbodactyla*; C) *Phyllomedusa azurea*; D) *Scinax* sp. (*S. catharinae* clade); E) *Scinax fuscovarius*; F) *Scinax fuscomarginatus*; G) *Scinax* sp. (*S. ruber* clade); H) *Scinax* aff. *x-signatus*. Photos by Sheila P. Andrade.

Figure 4. Some species recorded during survey in southeastern Goiás: A) *Trachycephalus typhonius*; B) *Barycholos ternetzi*; C) *Ameerega flavopicta*; D) *Eupemphix nattereri*; E) *Physalaemus cuvieri*; F) *Physalaemus centralis*; G) *Pseudopaludicola mystacalis*; H) *Pseudopaludicola saltica*. Photos A, B, D, E, F, G and H, by Sheila P. Andrade; photo C by Danusy Lopes.

Figure 5. Some species recorded during survey in southeastern Goiás: A) *Rhinella schneideri*; B) *Rhinella ocellata*; C) *Odontophrynus cultripes*; D) *Proceratophrys goyana*; E) *Adenomera* aff. *hylaedactyla*; F) *Leptodactylus labyrinthicus*; G) *Leptodactylus* aff. *latrans*; H) *Leptodactylus mystaceus*. Photos by Sheila P. Andrade.

Figure 6. Some species recorded during survey in southeastern Goiás: A) *Leptodactylus fuscus*; B) *Leptodactylus mystacinus*; C) *Leptodactylus podicipinus*; D) *Leptodactylus syphax*; E) *Chiasmocleis albopunctata*; F) *Elachistocleis cesarii*; G) *Paleosuchus palpebrosus*; H) *Chelonoides carbonaria*. Photos A, B, C, D, E, F, H by Sheila P. Andrade; photo G by Danusy Lopes.

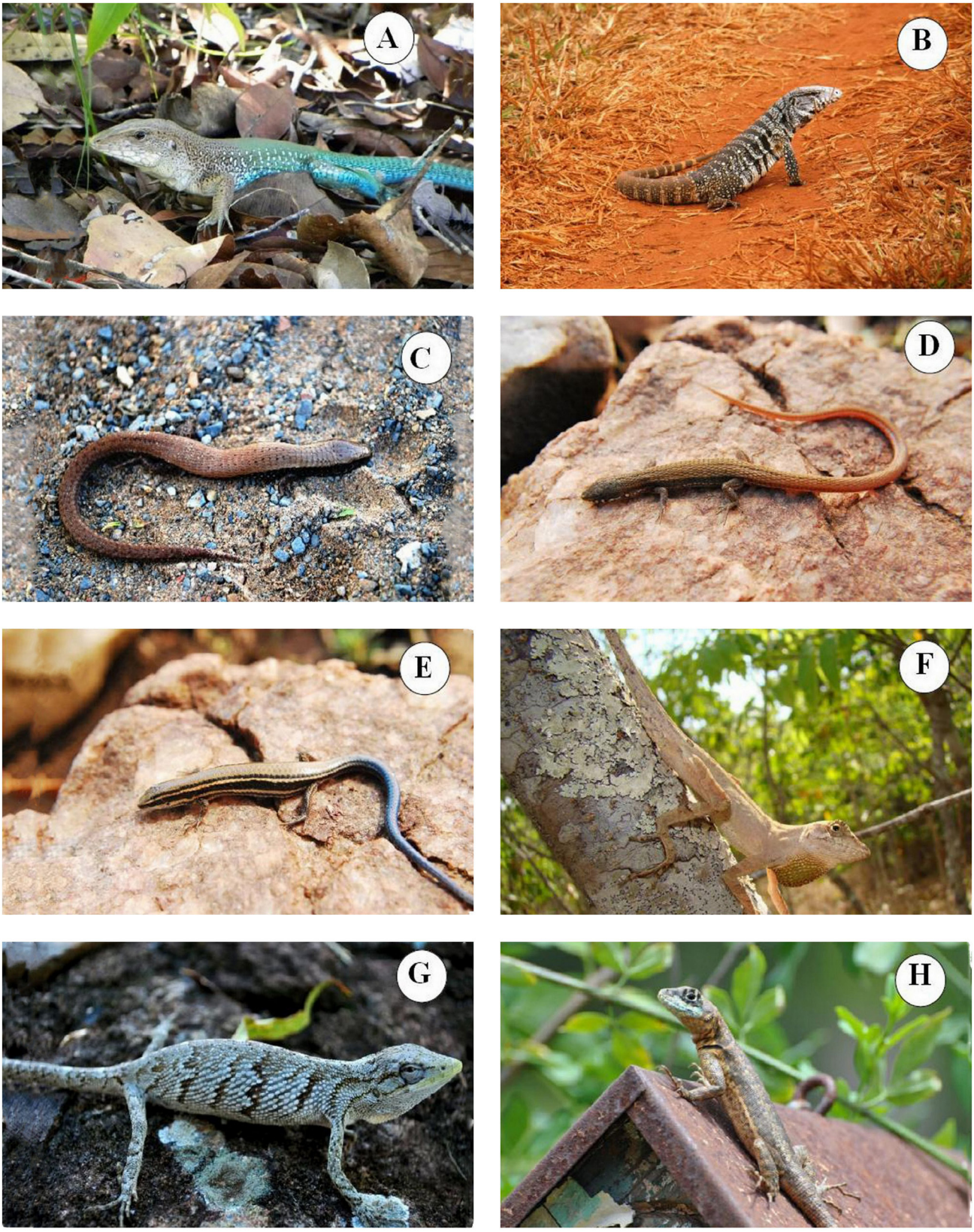

Figure 7. Some species recorded during survey in southeastern Goiás: A) *Ameiva ameiva*; B) *Tupinambis merianae*; C) *Colobosaura modesta*; D) *Cercosaura schreibersii*; E) *Micrablepharus atticolus*; F) *Anolis brasiliensis*; G) *Polychrus acutirostris*; H) *Tropidurus oreadicus*. Photos A and H by Edmar P. Victor; photo B by Rhuana T. Nascimento; photos C, D, E and G by Sheila P. Andrade; photo F by Paulo R. Gomes.

Figure 8. Some species recorded during survey in southeastern Goiás: A) *Tropidurus torquatus*; B) *Mabuya frenata*; C) *Mabuya nigropunctata*; D) *Ophiodes* aff. *striatus*; E) *Trilepida koppesi*; F) *Typhlops brongersmianus*; G) *Helicops angulatus*; H) *Helicops modestus*. Photos by Sheila P. Andrade.

Figure 9. Some species recorded during survey in southeastern Goiás: A) *Boa constrictor*; B) *Sibynomorphus mikanii*; C) *Tantila melanocephala*; D) *Erythrolamprus poecilogyrus*; E) *Oxyrhopus guibei*; F) *Oxyrhopus petolarius*; G) *Bothrops moojeni*; H) *Crotalus durissus*. Photos A, G and H by Edmar P. Victor; photos B, C, D, E and F by Sheila P. Andrade.

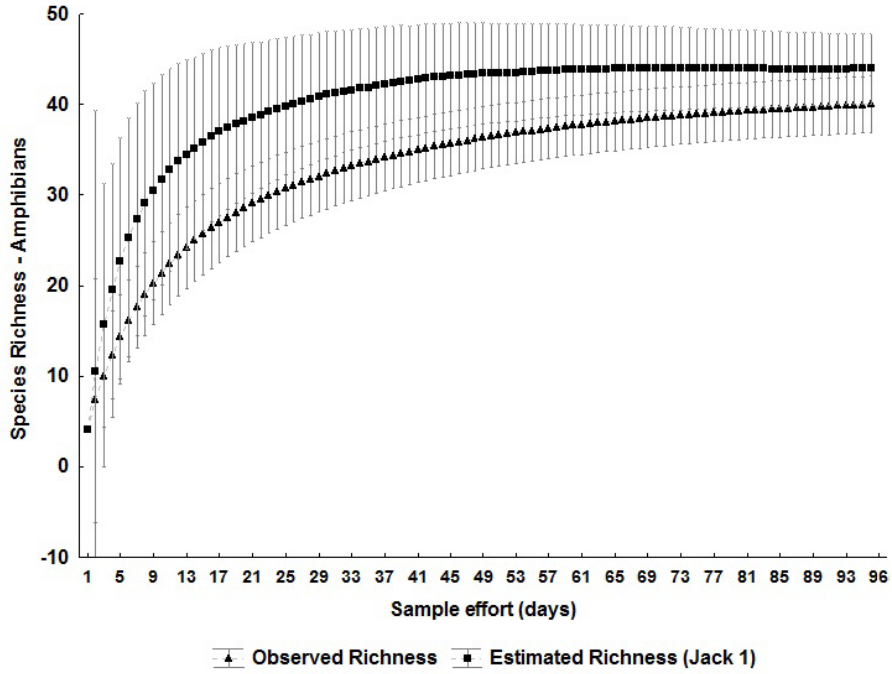

Figure 10. Accumulation curve for amphibian species (observed and estimated - Jackknife 1). Vertical bars denote the threshold of the 95% confidence intervals.

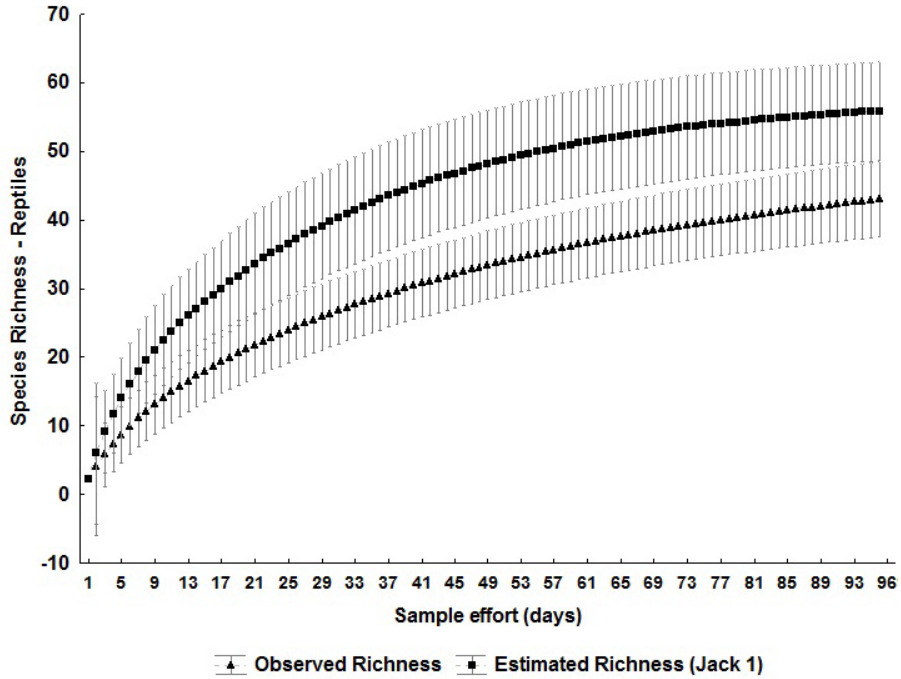

Figure 11. Accumulation curve for reptile species (observed and estimated - Jackknife 1). Vertical bars denote the threshold of the 95% confidence intervals.

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Appendix 1. Voucher list.
Amphibians – *Adenomera* aff. *hylaedactylus*: ZUFG-6648; ZUFG-6649. *Barycholos ternetzi*: ZFUG-6635; ZUFG-6636; ZUFG-6637. *Dendropsophus minutus*: ZUFG-6746; ZUFG-6747; ZUFG-6748; ZUFG-6749; ZUFG-6750. *Dendropshopus soaresi*: ZUFG-6654. *Dendropsophus melanargyreus*: ZUFG-7633; ZUFG-7634; ZUFG-7635. *Eupemphix nattereri*: ZUFG-6607; ZUFG-6608; ZUFG-6609. *Hypsiboas albopunctatus*: ZUFG-6651. *Hypsiboas lundii*: ZUFG-6655; ZUFG-6656. *Leptodactylus labyrinthicus*: ZUFG-6661; *Leptodactylus mystacinus*: ZUFG-6634; *Odonthoprynus cultripes*: ZUFG-6633. *Physalaemus cuvieri*: ZUFG-6640; ZUFG-6641. *Phyllomedusa azurea*: ZUFG-6717; ZUFG-6718; ZUFG-6719; ZUFG-6020; ZUFG-6721; ZUFG-6722. *Procerathropys goyana*: ZUFG-6629; ZUFG-6630; ZUFG-6631. *Pseudis bolbodactyla*: ZUFG-6852; ZUFG-6853; ZUFG-6854; ZUFG-6854; ZUFG-6855; ZUFG-6856. *Rhinella ocellata*: ZUFG-6625; ZUFG-6626. *Rhinella schneideri*: ZUFG 6663; ZUFG-6664. *Scinax* aff. *x-signatus*: ZUFG-6652; ZUFG-6653. **Reptiles** – *Ameiva ameiva*: ZUFG-764; ZUFG-765. *Anolis brasiliensis*: ZUFG-710; ZUFG-711; ZUFG-716. *Boa constrictor*: ZUFG-779; *Bothrops moojeni*: ZUFG-778; *Chironius flavolineatus*: ZUFG-705; *Crotalus durissus*: ZUFG-706; *Colobosaura modesta*: ZUFG 726; ZUFG-767; ZUFG-768. *Helicops modestus*: ZUFG-701; ZUFG-707. *Mabuya nigropunctata*: ZUFG-756; ZUFG-758; ZUFG-760. *Mabuya frenata*: ZUFG-757; ZUFG-759; ZUFG-763. *Ophiodes aff. striatus*: ZUFG-708. *Oxyrhopus guibei*: ZUFG-713; *Oxyrhopus trigerminus*: ZUFG-782. *Phimophis guerini*: ZUFG-703. *Philodryas nattereri*: ZUFG-777.