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Amphibians and reptiles of a Cerrado area in Primavera do Leste Municipality, Mato Grosso State, Central Brazil

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The Cerrado is the largest and richest savanna in the world (SILVA & BATES 2002) and the second largest vegetation domain in Brazil (RATTER et al. 1997). This biome is also considered a global hotspot due to its high biological diversity and anthropogenic pressure (MYERS et al. 2000).

In recent years, the Cerrado phytophysognomies have been greatly disturbed by the advance of the agricultural frontier and urban development (KLINK & MACHADO 2005), especially in the state of Mato Grosso. Intense deforestation results in environmental degradation and fragmentation, which may threaten species survival and may even cause extinctions (PRIMACK 2002).

Although the available data are not sufficient to know the total number of species in the biome, it is known that the Cerrado has a rich herpetofauna, with at least ten species of turtles, five crocodilians, 24 amphisbaenians, 68 lizards, 145 snakes, and 115 amphibians (COLLI et al. 2002, COSTA et al. 2007). Moreover, the herpetofauna of the Cerrado is considered poorly known, with extensive areas remaining unsampled (STRÜSSMANN 2000, COLLI et al. 2002). This is especially true for Mato Grosso state, where data are limited to a few localities, such as the Chapada dos Guimarães region (STRÜSSMANN 2000), Alto Araguaia (VALDUJO et al. 2009), Nobres (SANTOS et al. 2011), and Itiquira (SILVA JR et al. 2009).

In the past few years, data collected in environmental impact studies, faunal rescue operations, and monitoring programs relating to hydroelectric dams have substantially improved our knowledge of the Cerrado herpetofauna (e.g., VAZ-SILVA et al. 2007, SILVA JR et al. 2009, MENDES-PINTO & MIRANDA 2011, SANTOS et al. 2011).

Herein, we provide a checklist of amphibians and reptiles found in a highly impacted area of the Cerrado in Mato Grosso state that was obtained during an environmental impact study of the hydroelectric power plant in Primavera do Leste municipality.

This study was carried out at the Entre Rios Hydroelectric Power Plant (ERHP), located in the municipality of Primavera do Leste (15°13'17" S, 54°05'03" W), southeastern Mato Grosso state, central Brazil (Fig. 1). The area has been partially degraded through conversion into agricultural lands, and natural remnants consist of a wide diversity of Cerrado phytophysognomies (Tab. 1), along the banks of the Cumbuco and das Mortes Rivers, both tributaries of the Araguaia-Tocantins Rivers (Fig. 2).

Surveys were conducted at the ERHP from 24 March through 1 April 2008 and 8 through 15 July 2008. Specimens were obtained through 152.23 man hours of time-constrained search (TCS, see MARTINS & OLIVEIRA 1998) in both diurnal and nocturnal surveys. Pitfall traps with drift fences (CECHIN & MARTINS 2000) were employed

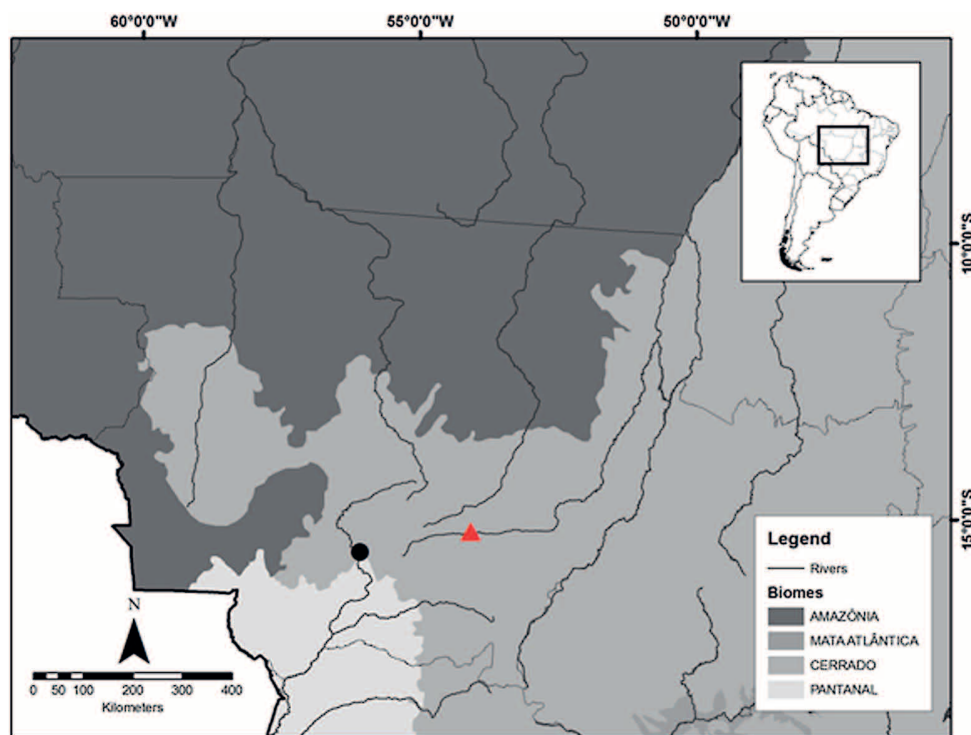


Figure 1. Schematic map showing the municipalities of Primavera do Leste, (red triangle: 15°13'17" S, 54°05'03" W) and Cuiabá (black circle), Mato Grosso state, Brazil.



Figure 2. Das Mortes River margins, tributaries of the Araguaia-Tocantins Rivers.

during the 8–15 July 2008 survey and consisted of three sampling units with five buckets (240 pitfall traps/day) in three physiognomies: Cerrado sensu stricto, grasslands, and gallery forests. Opportunistic encounters were also considered.

Another method used was traps (funnel traps) to capture aquatic turtles. Six traps were installed on the banks of the River of Death (riparian vegetation) and left for seven days, totalling 1008 hours.

To evaluate the similarity between the composition of amphibian and reptile communities in the Cerrado of Brazil, we compared our data with findings in the literature. We then performed a cluster analysis based on the Jaccard similarity coefficient, using PAST version 2.17 software. (HAMMER et al. 2001).

Voucher specimens (IBAMA permit number: 059/2008/SUSPES/MT) were deposited at the Coleção de Vertebrados da Universidade Federal de Mato Grosso (UFMT) and are listed in the appendix.

A total of 49 species were found: 25 anurans (6 families) and 24 reptiles (12 families). The reptiles collected consisted of one turtle, 12 lizards and 11 snakes (Tab. 1; Figs 3–4).

Our list includes species typical of the Cerrado, such as the anuran *Dendropsophus anataliasiasi* and the lizard *Colobosaura modesta* (STRÜSSMANN 2000, VALDUJO 2001). Some species have a widespread distribution, occurring in different biomes, such as the lizard *Ameiva ameiva* (MENDES-PINTO & MIRANDA 2011) and rattlesnake *Crotalus durissus* (FROTA et al. 2005). However, many species have as yet been reported from only a few localities in Mato Grosso state, such as the anurans *Dendropsophus anataliasiasi*, *D. tritaeniatatus*, and *Pristimantis dundeei*, the lizards *Stenocercus sinesaccus* and *Kentropyx vanzoi*, and the snakes *Micrurus surinamensis* and *Dipsas bucephala*.

The herpetofauna of the Cerrado is extremely diverse, with many endemic species (NOGUEIRA et al. 2011). Currently, 209 amphibians and 282 reptiles (267 squamates, 10 turtles and 5 crocodilians) are known for the biome

Table 1. Amphibians and reptiles recorded from the Primavera do Leste municipality, Mato Grosso state, Brazil. Habitat classification according to RIBEIRO & WALTER (1998): CE – Cerrado sensu stricto, SF – Semideciduous forest, GF – Gallery forests, WG – Wet grassland, AT – Anthropogenic areas, OF – occasional finds, BR – Bibliographic records.

Taxon	Species	Habitat
Amphibia		
Anura		
Bufonidae	<i>Rhinella schneideri</i> (WERNER, 1894)	SF, CE, AT
Strabomantidae	<i>Pristimantis dundeei</i> (HEYER & MUÑOZ, 1999)	GF
Hylidae	<i>Dendropsophus</i> aff. <i>microcephalus</i> (COPE, 1886)	AT, CE
	<i>Dendropsophus anataliasiasi</i> (BOKERMANN, 1972)	AT
	<i>Dendropsophus tritaeniatus</i> (BOKERMANN, 1965)	WG
	<i>Dendropsophus minutus</i> (PETERS, 1872)	CE, SF, GF, AT
	<i>Dendropsophus nanus</i> (BOULENGER, 1889)	GF
	<i>Hypsiboas albopunctatus</i> (SPIX, 1824)	CE, GF, AT
	<i>Hypsiboas raniceps</i> COPE, 1862	CE, GF, SF, AT
	<i>Osteocephalus taurinus</i> STEINDACHNER, 1862	SF, GF
	<i>Phyllomedusa hypochondrialis</i> (Daudin, 1800)	GF
	<i>Scinax fuscomarginatus</i> (A. LUTZ, 1925)	WG, GF, AT
	<i>Scinax fuscovarius</i> (A. LUTZ, 1925)	GF, CE
	<i>Scinax</i> cf. <i>ruber</i> (LAURENTI, 1768)	SF, GF, WG
	<i>Trachycephalus typhonius</i> (LAURENTI, 1768)	WG
Leiuperidae	<i>Eupemphix nattereri</i> (STEINDACHNER, 1863)	GF
	<i>Physalaemus centralis</i> (BOKERMANN, 1962)	GF, CE
	<i>Physalaemus cuvieri</i> (FITZINGER, 1826)	GF, AT
	<i>Pseudopaludicola</i> cf. <i>saltica</i> (COPE, 1887)	WG
Leptodactylidae	<i>Leptodactylus</i> cf. <i>andreae</i> (MÜLLER, 1923)	SF, GF
	<i>Leptodactylus chaquensis</i> (CEI, 1950)	SF, GF, AT
	<i>Leptodactylus labyrinthicus</i> (SPIX, 1824)	AT
	<i>Leptodactylus mystaceus</i> (SPIX, 1824)	GF
	<i>Leptodactylus petersii</i> (STEINDACHNER, 1864)	CE
Microhylidae	<i>Elachistocleis cesarii</i> (MIRANDA-RIBEIRO, 1920)	GF, AT
Reptilia		
Chelonia		
Chelidae	<i>Phrynops geoffroanus</i> (SCHWEIGGER, 1812)	GF
Squamata		
Diploglossidae	<i>Ophiodes striatus</i> (SPIX, 1824)	CE
Gekkonidae	<i>Hemidactylus mabouia</i> (MOREAU DE JONNÈS, 1818)	SF, AT
Gymnophthalmidae	<i>Cercosaura ocellata</i> (WAGLER, 1830)	CE
	<i>Colobosaura modesta</i> (REINHARDT & LUETKEN, 1862)	CE
Polychrotidae	<i>Polychrus acutirostris</i> (SPIX, 1825)	GF, CE
Tropiduridae	<i>Tropidurus torquatus</i> (WIED, 1820)	SF
	<i>Stenocercus sinesaccus</i> (TORRES-CARVAJAL, 2005)	CE
Mabuyidae	<i>Copeoglossum nigropunctatum</i> (SPIX, 1825)	GF, SF, CE
Teiidae	<i>Ameiva ameiva</i> (LINNAEUS, 1758)	CE, SF, AT
	<i>Kentropyx vanzoi</i> (GALLAGHER & DIXON, 1980)	SF, CE
	<i>Tupinambis quadrilineatus</i> (MANZANI & ABE)	BR
	<i>Tupinambis teguixin</i> (LINNAEUS, 1758)	CE
Colubridae	<i>Chironius flavolineatus</i> (JAN, 1863)	WG, CE
Dipsadidae	<i>Apostolepis assimilis</i> (REINHARDT, 1861)	OF
	<i>Dipsas bucephala</i> (SHAW, 1802)	GF
	<i>Erythrolamprus aesculapii</i> (LINNAEUS, 1766)	AT
	<i>Helicops</i> cf. <i>leopardinus</i> (SCHLEGEL, 1837)	AT
	<i>Leptodeira annulata</i> (LINNAEUS, 1758)	GF, CE
	<i>Sibynomorphus mikanii</i> (SCHLEGEL, 1837)	CE
	<i>Xenodon merremii</i> (WAGLER, 1824)	OF
Elapidae	<i>Micrurus surinamensis</i> (CUVIER, 1817)	GF
Viperidae	<i>Bothrops moojeni</i> (HOGE, 1966)	CE, GF
	<i>Crotalus durissus</i> (LINNAEUS, 1758)	CE

(COLLI et al. 2002, NOGUEIRA et al. 2011, VALDUJO et al. 2012). The local richness of Cerrado sites averages about 25 lizards, 50 snakes, two amphisbaenians and 45 anurans (COLLI et al. 2002).

In the present study, the richness found is similar to that of some other studies of Cerrado anurans (ODA et al. 2009,

ARAÚJO et al. 2009, MELO et al. 2013, MAFFEI et al. 2011, ARAÚJO & SANTOS 2011) and reptiles (UETANABARO et al. 2007, SANTOS et al. 2008), while many studies have reported lower richness compared to our results (WERNECK & COLLI 2006, RIBEIRO-JÚNIOR & BERTOLUCI 2009, MOREIRA et al. 2009, MENDES-PINTO & MIRANDA 2011). On the other

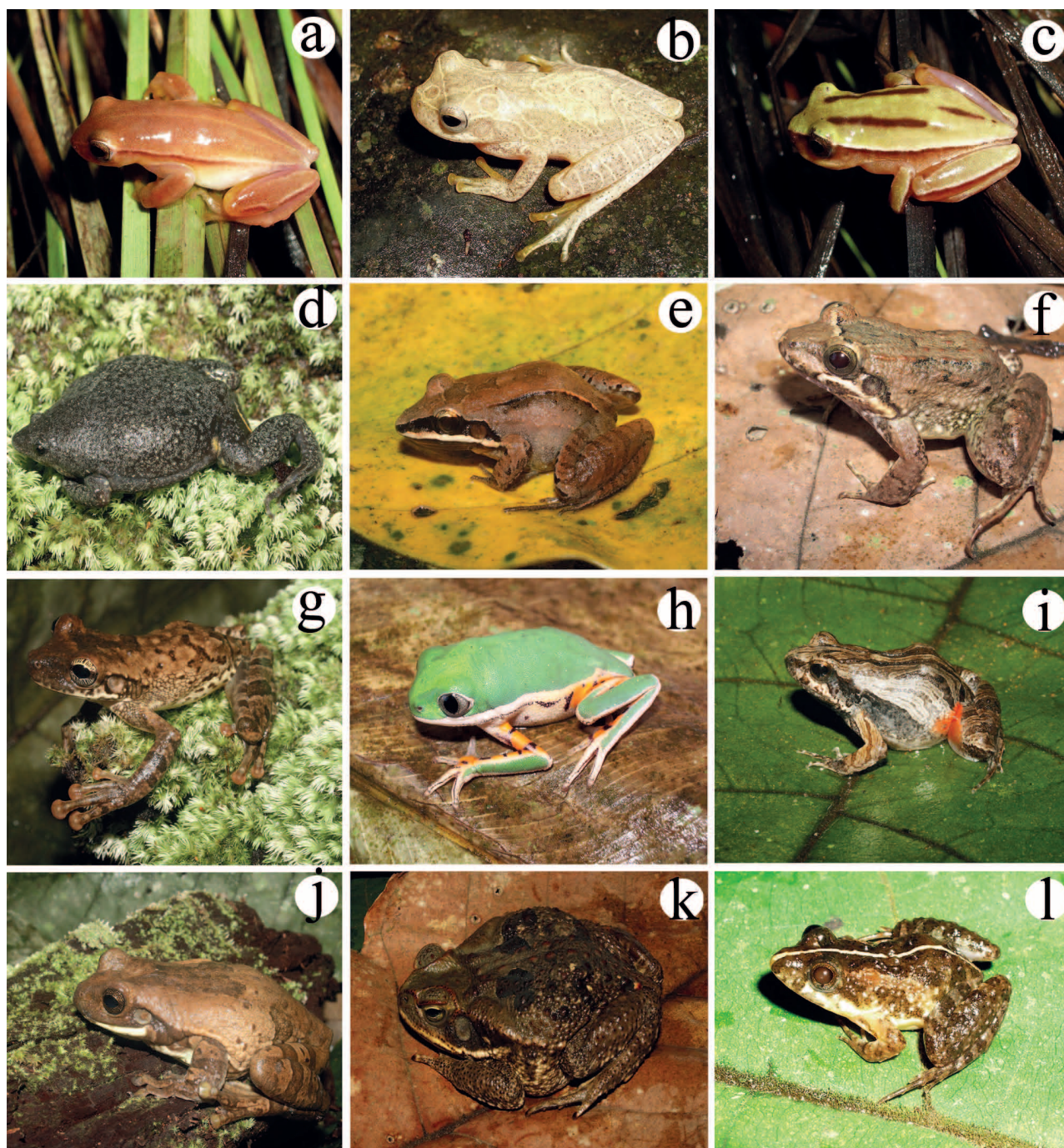


Figure 3. Representatives of amphibians recorded at the Entre Rios Hydroelectric Power Plant (ERHP), municipality of Primavera do Leste, state of Mato Grosso, Brazil. A) *Dendropsophus anataliasiasi*; B) *Dendropsophus minutus*; C) *Dendropsophus tritaeniatu*; D) *Elachistocleis cesarii*; E) *Leptodactylus mystaceus*; F) *Leptodactylus petersii*; G) *Osteocephalus taurinus*; H) *Phyllomedusa hypochondrialis*; I) *Physalaemus cuvieri*; J) *Trachycephalus typhonius*; K) *Rhinella schneideri*; L) *Pseudopaludicola* cf. *saltica*.

hand, some localities have a considerably higher richness (VAZ-SILVA et al. 2007, RECODER & NOGUEIRA 2007, VALDUJO et al. 2009, SILVA JR et al. 2009, SOUSA et al. 2010, SANTOS et al. 2011, MORAIS et al. 2011, MORAIS et al. 2012, NOVELLI et al. 2012), and these differences may be related to the size of areas sampled or the quality of the sampling effort.

Our comparisons between localities previously studied in the Cerrado using cluster analysis shows that the amphibian and reptile composition at Primavera do Leste is most similar to that of Nobres municipality, which can be explained by the geographical proximity (Fig. 5). However, other nearby areas, such as Sonora and Alto Araguaia,

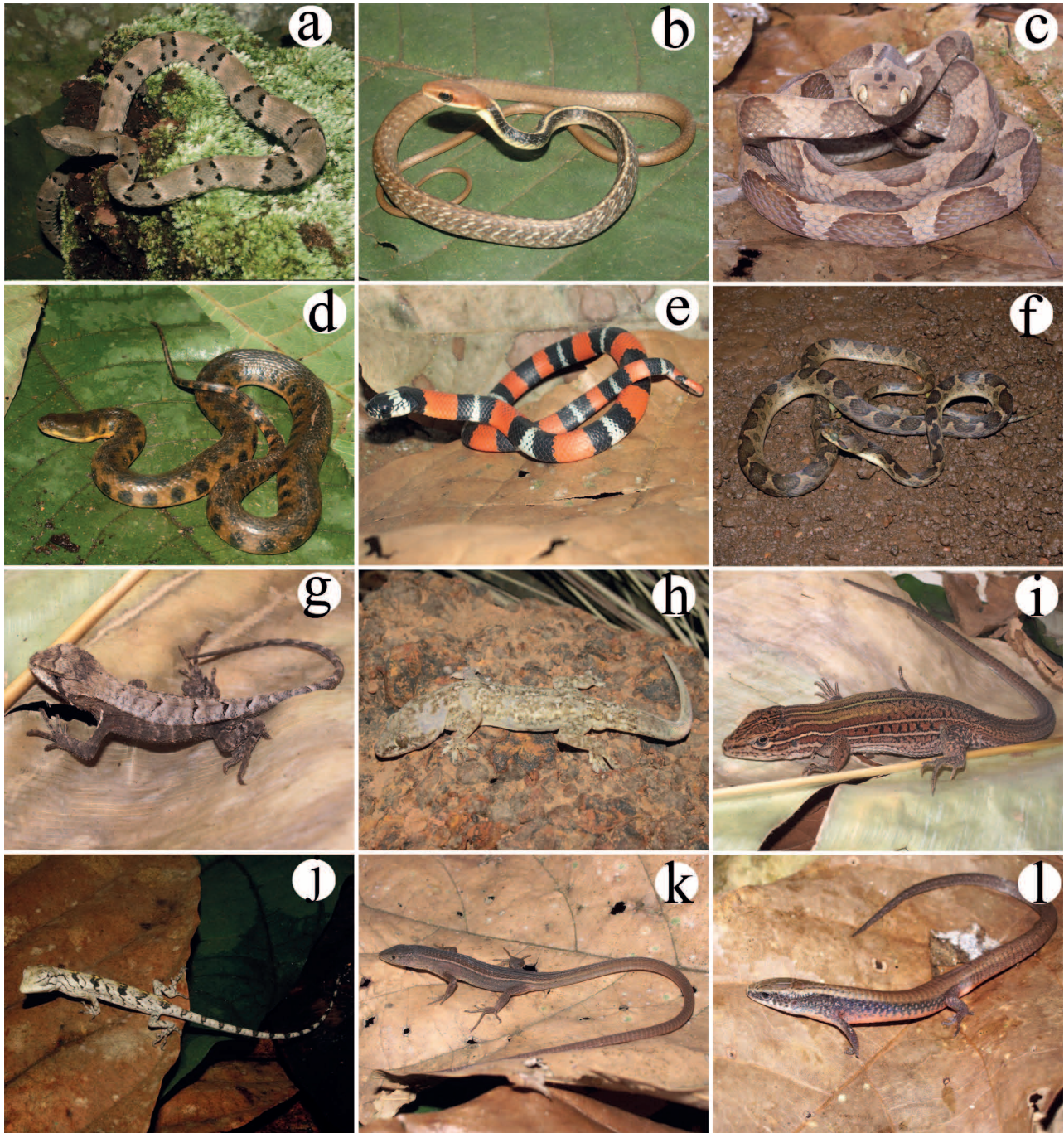


Figure 4. Representatives of reptiles recorded at the Entre Rios Hydroelectric Power Plant (ERHP), municipality of Primavera do Leste, state of Mato Grosso, Brazil. A) *Bothrops moojeni*; B) *Chironius flavolineatus*; C) *Dipsas bucephala*; D) *Helicops leopardinus*; E) *Erythrolamprus aesculapii*; F) *Leptodeira annulata*; G) *Stenocercus sinesaccus*; H) *Hemidactylus mabouia*; I) *Kentropyx vanzoi*; J) *Polychrus acutirostris*; K) *Cercosaura ocellata*; L) *Colobosaura modesta*.

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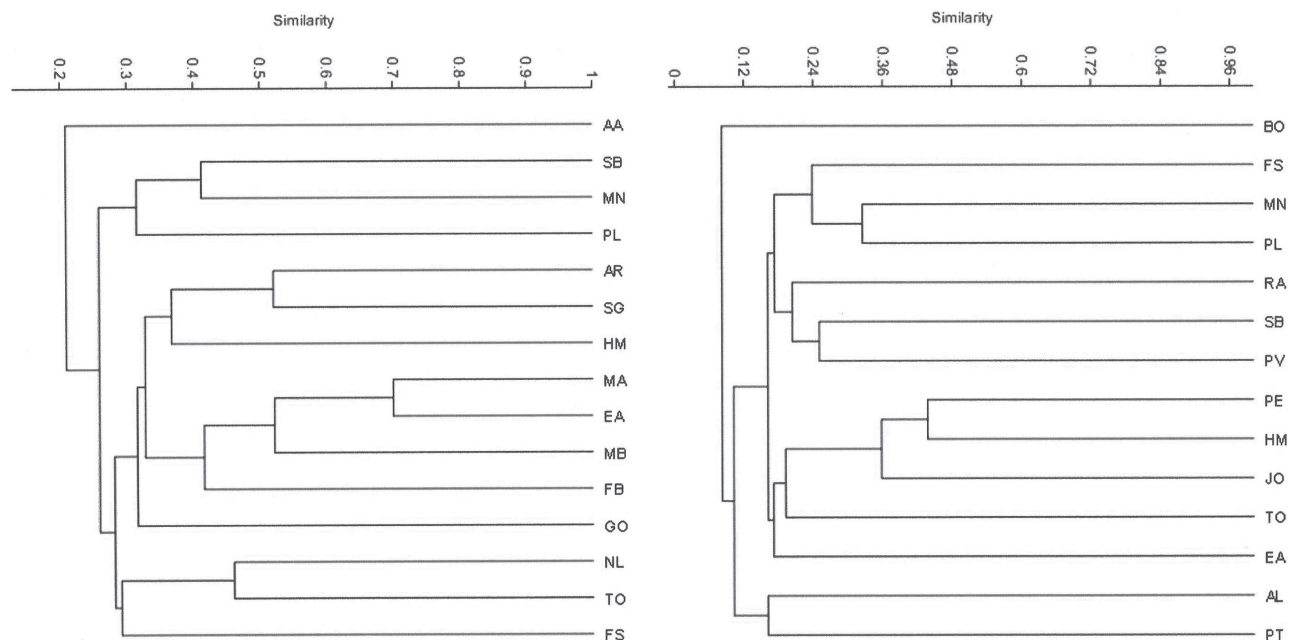


Figure 5. Dendrogram of cluster analysis using Jaccard's Similarity Index between amphibian (left; Cophenetic Correlation Coefficient = 0.882) and reptile (right; Cophenetic Correlation Coefficient = 0.84) communities in the Cerrado of Brazil: PL – Primavera do Leste/MT (present study); NL – Niquelândia/GO (ODA et al. 2009); AR – Aruanã/GO (MELO et al. 2013); SB – Parque Nacional da Serra da Bodoquena/MS (UETANABARO et al. 2007); PT – Paranã-Tocantis/TO (WERNEEK & COLLI 2006); AA – Alto Araguaia/MT (MENDES-PINTO & MIRANDA 2011); FS – Floresta Nacional de Silvânia (MORAES et al. 2012) MA – Esec de Assis and Município de Assis/GO (ARAUJO & ALMEIDA-SANTOS 2011); PE – Parque Nacional das Emas-GO (VALDUJO et al. 2009); EA – Esec and Floresta Estadual de Assis/GO (RIBEIRO-JÚNIOR & BERTOLUCI 2009); FB – Fuma do Bom Jesus/SP (ARAUJO et al. 2009); MB – Município de Borebi/SP (MAFFEI et al. 2011); TO – Alto Rio Tocantins/GO (MOREIRA et al. 2009); MN – Município de Nobres/MT (SANTOS et al. 2011); GO – Goiás (VAZ-SILVA et al. 2007); RA – Rio Araguaia (SANTOS et al. 2008); SG – Região Sudoeste do estado de Goiás (MORAIS et al. 2011); BO – Reserva Biológica Unilavras-Boqueirão/ MG (NOVELLI 2012); PNSV – Parque Nacional Sertão Veredas (RECORDER & NOGUEIRA 2007); SMV – Município de Sonora/MS (SILVA JR et al. 2009).

present less similarity than more distant areas, such as Serra da Bodoquena National Park (for amphibians) and Niquelândia (for reptiles), probably as a result of the sampling effort in those areas.

Despite our small sample size, the results presented here are important to better understand the distribution of herpetofaunal species. Furthermore, amphibian and reptile inventories for the central-eastern region of Mato Grosso state are scarce, and this is one of the regions most affected by agricultural expansion (RATTER et al. 1997, CAVALCANTI & JOLY 2002, NOGUEIRA et al. 2011).

The main economic activities of the Primavera do Leste municipality are related to agriculture, and high levels of water contamination by herbicides have been noted in this region (DORES et al. 2006, 2008). The creation of new conservation units and the effective protection of adjacent units, such as the Parque Nacional da Chapada dos Guimarães, would be crucial for maintaining the local herpetofauna.

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Viperidae: *Bothrops moojeni* UFMT–R 7747, 8599, *Crotalus durissus* UFMT–R 7612.

Appendix

Voucher specimens of amphibians and reptiles from Primavera do Leste municipality, Mato Grosso, central Brazil.

Anurans: **Bufo**nidae: *Rhinella schneideri* UFMT–A 8809–8810, **Hylidae:** *Dendropsophus* aff. *microcephalus* UFMT–A 8771–8772, 8776, 8793, 8802, 8827, 8829, 8930, 8942, 8951, 9012, 9014, 9033, 9041, 9042, 9062, *Dendropsophus anataliasiasi* UFMT–A 8805, 8833, 8925, 8936, 8944, 8949, 8955, 8956, 9027, 9032, 9035, 9037, *Dendropsophus tritaeniatatus* UFMT–A 8954, 9009–9010, *Dendropsophus minutus* UFMT–A 8773, 8777, 8803, 8828, 8915, 8924, 8934, 8958, 8962, 9005, 9023, 9059, *Hypsiboas albopunctatus* UFMT–A 8762, 8764–8765, 8796, 8800, 8807, 8813, *Hypsiboas raniceps* UFMT–A 8763, 8780–8781, 8786, 8920, 8932, *Osteocephalus taurinus* UFMT–A 8753, 8782, *Phyllomedusa hypochondrialis* UFMT–A 8817, *Scinax fuscomarginatus* UFMT–A 8766–8768, 8787, 8811–8812, 8820, 8826, 8918–8919, 8937, 8943, 8948, 8950, 8952, 8960, 9011, 9015, 9021, 9057, *Scinax fuscovarius* UFMT–A 8798, 8819, 8961, *Scinax* cf. *ruber* UFMT–A 8774–8775, 8784, 8790–8792, 8797, 8815, 8818, 8823, 8929, 8938, 8941, 8945, 8947, 8953, 8963, 9024, 9039, *Trachycephalus typhonius* UFMT–A 8752, 8755–8756, 8759–8760, 8789, 8794, **Leiuperidae:** *Eupemphix nattereri* UFMT–A 8778, 8928, 8935, 8939, 9004, *Physalaemus centralis* UFMT–A 8926–8927, 9013, 9016, 9030, 9060, *Pseudopaludicola* cf. *saltica* UFMT–A 8957, 8959, 9006–9007, 9019–9020, 9022, 9026, 9028–9029, 9056, 9058, 9061, **Leptodactylidae:** *Leptodactylus* cf. *andreae* UFMT–A 8804, 8832, 8921, 8931, 8946, *Leptodactylus chaquensis* UFMT–A 8757–8758, 8783, 8785, 8788, 8824, 8933, *Leptodactylus mystaceus* UFMT–A 8769, 8923, 8940, *Leptodactylus petersii* UFMT–A 8795, 8801, 8922, **Microhylidae:** *Elachistocleis cesarii* UFMT–A 8830, 9018, 9031, **Reptiles:** **Chelonians:** **Chelidae:** *Phrynops geoffroanus* UFMT–R 7919–7921, **Lizards:** **Anguidae:** *Ophiodes striatus* UFMT–R 7749, **Gekkoonidae:** *Hemidactylus mabouia* UFMT–R 7614, 7621, 7723, 7726–7727, 7752, **Gymnophthalmidae:** *Cercosaura ocellata* UFMT–R 7751, *Colobosaura modesta* UFMT–R 7619, **Polychrotidae:** *Polychrus acutirostris* UFMT–R 6756, 6757, 7750, 7753, **Tropiduridae:** *Stenocercus sinesaccus* UFMT–R 7748, **Mabuyidae:** *Copeoglossum nigropunctatum* UFMT–R 7618, 7725, **Teiidae:** *Ameiva ameiva* UFMT–R 7613, 7615, 7617, 7620, 7623, *Kentropyx vanzoi* UFMT–R 7157–7158, 7724, **Snakes:** **Colubridae:** *Chironius flavolineatus* UFMT–R 7608, **Dipsadidae:** *Apostolepis assimilis* UFMT–R 7729, *Dipsas bucephala* UFMT–R 7609–7610, *Erythrolamprus aesculapii* UFMT–R 7728, *Helicops* cf. *leopardinus* UFMT–R 7611, *Leptodeira annulata* UFMT–R 7155, 7616, *Sibynomorphus mikanii* UFMT–R 7156, *Xenodon merremii* UFMT–R 7622, 7624,