

Herpetofauna of São João da Barra Hydroelectric Plant, state of Mato Grosso, Brazil

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ABSTRACT: This paper provides a checklist of the herpetofauna at the São João da Barra Hydroelectric Plant in the municipalities of Juara, Nova Monte Verde and Nova Bandeirantes in the northern portion of the state of Mato Grosso, Brazil. Representatives of 30 amphibian and 31 reptile species were obtained during an environmental impact study carried out in the study area. Three new state records and the distribution of six species are discussed, contributing to the knowledge on the poorly known transition zones between the Cerrado biome and Amazon forest in the state of Mato Grosso.

INTRODUCTION

The state of Mato Grosso encompasses a huge territory in central Brazil and is covered by three major biomes: Cerrado (savanna), *Pantanal* (wetlands) and the Amazon (rainforest). Knowledge on the herpetofauna of Mato Grosso is generally old and scarce (for a discussion on this issue, see Strüssmann and Carvalho 1998). Distribution lists regarding reptiles and amphibians from Mato Grosso are restricted to the *Pantanal* (Strüssmann and Sazima 1993) and Cerrado (Carvalho and Nogueira 1998; Strüssmann 2000, Santos *et al.* 2008, Valdujo *et al.* 2009) biomes. However, recent years have seen an increase in herpetological records from transition zones between the Cerrado and Amazon forest in the state, with lists of species (São Pedro *et al.* 2009), new state records (*e.g.*, Strüssmann and Carvalho 1998; Costa *et al.* 2008; Kawashita-Ribeiro and Ávila 2008; Cisneros-Heredia *et al.* 2010; Morais *et al.* 2010; Silva *et al.* 2010) and descriptions of new species (Maciel *et al.* 2009; Ávila *et al.* 2011).

The recent deforestation of the Amazon in Mato Grosso has affected more than 20% of the state territory and is caused mainly by the continuous need for electricity as well as agricultural expansion and cattle ranching, especially in the “arc of deforestation” located in the northern region of the state (Fearnside 2005). However, the implementation of environmental programs at hydroelectric plants has improved the assessment of several areas throughout the state and has contributed to the knowledge on the local herpetofauna.

This paper provides additional information on the herpetofauna in the transition zone between the Cerrado and Amazon forest in the northern portion of the state of Mato Grosso in areas under the influence of the São João da Barra Hydroelectric Plant (PCH São João da Barra).

MATERIALS AND METHODS

Fieldwork was carried out in August 2007 during the Environmental Impact Study for the PCH São João da

Barra (10°25'42" S, 57°38'04" W) in the municipalities of Juara, Nova Monte Verde and Nova Bandeirantes located in the northern portion of the state of Mato Grosso (Figure 1). The region is characterized by Am climate (Köppen classification), with mean temperature of 24 °C and annual precipitation between 1800 and 2000 mm. The climate is highly seasonal, with two well-defined seasons: dry (May to October) and rainy (November to April) (Martins *et al.* 2009).

The area is covered by varied vegetation, with areas of Cerrado (savanna), tropical rainforest and contact between these two biomes. The Cerrado is dominant in the extensive plateau dissected by streams that form the Juruena River basin and corresponds to herbaceous neotropical formations interspersed with gallery forests. The rainforest is semideciduous and comprises two distinct vegetation formations: alluvial forest and lowland forest. The region of contact between the Cerrado and Amazon has a mixed composition of species (see Silva 1998).

Specimens were captured using two main methods: pitfall traps with drift fences (PT) and time-constrained

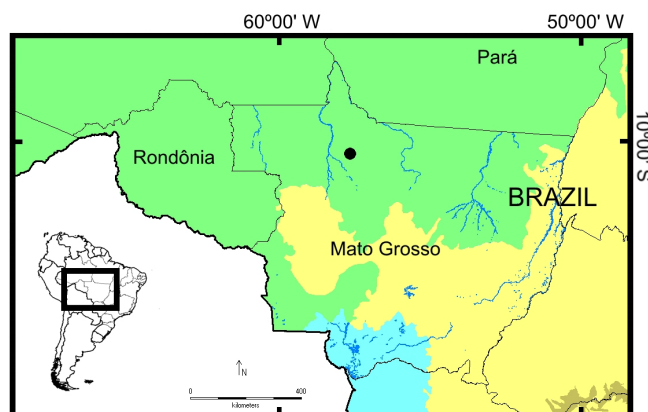


FIGURE 1. Schematic map showing location of the PCH São João da Barra, municipality of Juara (dot). Green = Amazon; Yellow = Cerrado; Blue = Pantanal.

searches (TC). Ten sets of pitfall traps were used, each consisting of 10 62 liters buckets arranged in linear design, with a distance of 10 m between buckets. The sampling effort was of 760 pitfall trap-days. Time-constrained searches consisted of four observers for at least three hours during the day and at night, carried out at the same sites at which the pitfall traps were installed. Total effort of the time-constrained searches was 65.96 hours.

Voucher specimens were deposited at the Coleção de Vertebrados da Universidade Federal de Mato Grosso (Brazil). All specimens were collected with permits from the Brazilian environmental agency (Instituto Brasileiro de Meio Ambiente e Recursos Naturais Renováveis; IBAMA nº 36/2007 – SUPES/MT).

The taxonomic nomenclature follows Faivovich *et al.* (2005), Frost *et al.* (2006), Grant *et al.* (2006) and Hedges *et al.* (2008) for amphibian species and Conrad (2008), Gamble *et al.* (2008), Vidal *et al.* (2008), Brochu (2009), and Turtle Taxonomy Working Group (2010) for reptile species.

RESULTS AND DISCUSSION

Thirty amphibian species representing one order (Anura), 10 families and 17 genera were recorded at the PCH São João da Barra (Table 2). The majority of the species (86.6%) were captured in time constrained searches, whereas only two species (6.7%) were captured

exclusively in pitfall-traps and two were captured in both methods (Table 2). The open ombrophilous forest at Site 1 had the most diverse anuran fauna, with 14 species, followed by the Site 3 (gallery forest) and Site 2 (open ombrophilous forest), with nine and eight species, respectively (Table 1). Twelve organisms (40%) were not properly identified, mainly due to taxonomic confusion in different species groups, such as the *Rhinella margaritifera* group (see Ávila *et al.* 2010) and the *Scinax ruber* group (Fouquet *et al.* 2007). Moreover, some species are probably undescribed, such as *Dendropsophus* aff. *microcephalus*, *Pristimantis* sp., *Allobates* sp., *Pseudopaludicola* sp. and *Osteocephalus* sp.

One frog species, *Engystomops freibergeri* (Donoso-Barros, 1969) (Figure 2B) is recorded for the first time in the state of Mato Grosso. Until recently, the leiuperid frog *E. freibergeri* has been treated as *E. petersi* (see Cannatella *et al.* 1998), but in a comprehensive study using morphology and the calls of these two species, Funk *et al.* (2008) differentiated the two forms and pointed out that the distribution of *E. freibergeri* encompasses localities south of the Amazon River, including the states of Acre, Pará and Rondônia. This new record of *E. freibergeri* at the PCH São João da Barra represents an increase in its known geographical distribution of approximately 620 km east of the municipality of Alto Paraíso in the state of Rondônia.

TABLE 1. Sites sampled during the environmental impact study of PCH São João da Barra, state of Mato Grosso, Brazil, and their herpetofaunal species richness.

SITE	GEOGRAPHIC COORDINATES	MUNICIPALITY	VEGETATION TYPE	AMPHIBIAN SPECIES	REPTILE SPECIES
1	10°25'42" S, 57°38'04" W	Nova Monte Verde	Open forest	14	8
2	10°25'46" S, 57°38'16" W	Juara	Open ombrophilous forest	8	2
3	10°20'48" S, 57°41'21" W	Nova Bandeirantes	Gallery forest	9	4
4	10°20'48" S, 57°41'21" W	Nova Bandeirantes	Gallery forest	3	7
5	10°20'48" S, 57°41'21" W	Nova Bandeirantes	Alluvial forest	5	3
6	10°19'21" S, 57°40'43" W	Nova Monte Verde	Seasonal semideciduous forest/ Savanna woodland	3	0
7	10°20'42" S, 57°40'20" W	Juara	Open ombrophilous forest	6	7
8	10°21'13" S, 57°39'33" W	Juara	Open ombrophilous forest	1	5
9	10°20'55" S, 57°39'33" W	Juara	Alluvial forest	1	5
10	10°19'56" S, 57°39'02" W	Nova Monte Verde	Savanna woodland	2	7

Thirty one reptile species were recorded (Table 1), representing three orders, six families and 27 genera. Nineteen species (61.3%) were captured only in time constrained search (Table 2), whereas 32.3% (10 species) were captured exclusively in pitfall-traps and the remaining two species (6.4%) were captured in both methods. As expected (see Cechin and Martins 2000), time constrained searches were more efficient for arboreal and aquatic species, while pitfall-traps were effective in capturing fossorial and semifossorial reptiles (*e.g.* lizards in the family Gymnophthalmidae). Two snake species represent new records for the state of Mato Grosso: *Imantodes lentiferus* (Cope, 1894) (Figure 2A) and *Drepanoides anomalus* (Peracca, 1896) (Figure 2C).

As noted for anuran diversity, more reptile species were recorded in the open ombrophilous forest at Site 1 (8 species), followed by the Sites 4, 7 and 10 (gallery forest, open ombrophilous forest and savanna woodland, respectively), with seven reptile species each. Both

differences in anuran and reptile diversity across the sites cannot be attributed to some special reason, due to low sampling effort in each collect site.

The blunt-headed snake *I. lentiferus* is distributed in northern South America in Ecuador, Surinam, Colombia, Peru and Venezuela (Myers 1982; Donnelly and Myers 1991) as well as in the Brazilian states of Amazonas, Pará and Rondônia (Silva Jr. 1993; Cunha and Nascimento 1993). This new record of *I. lentiferus* at the PCH São João da Barra represents an increase in its known geographical distribution of approximately 680 km east of the Samuel Hydroelectric Plant in the municipality of Candeias do Jamari, state of Rondônia.

Drepanoides anomalus is widely distributed throughout the Amazon and cited in the Brazilian states of Pará (França *et al.* 2006), Rondônia (Bernarde and Abe 2006) and Amazonas (Martins and Oliveira 1998). This new record of *D. anomalus* at the PCH São João da Barra represents an increase in its known geographical distribution of

approximately 380 km northeast of the municipality of Espigão d'Oeste in the state of Rondônia.

The present studies also broadens the geographic distribution of two lizard species, two anuran species and two snake species that are poorly known in Mato Grosso:

Micrablepharus atticolus Rodrigues, 1996 (Figure 3A) - previously known in the states of Goiás and Rondônia and the Federal District as well as municipalities in the eastern and mid-western portions of the state of Mato Grosso (Colli *et al.* 2002; Gainsbury and Colli 2003).

Tropidurus itambere Rodrigues, 1987 (Figure 3B) - a widespread Brazilian species distributed in the eastern, mid-western and southwestern regions of the state of Mato Grosso (Rodrigues 1987).

Chiasmocleis avilapiresae Peloso and Sturaro, 2008 (Figure 3C) - previously known in the northern portion of Mato Grosso in the municipality of Aripuanã (*ca.* 357

km northwest from PCH São João da Barra) (Peloso and Sturaro 2008).

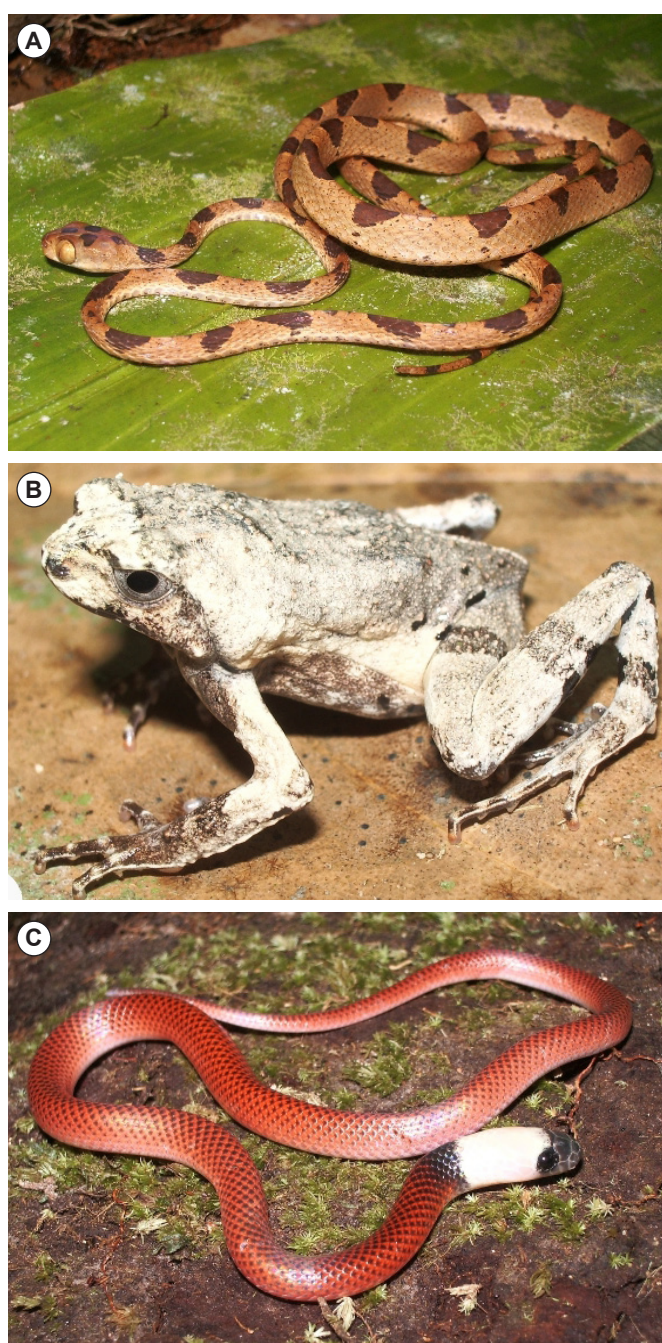


FIGURE 2. New distribution records from state of Mato Grosso, Brazil: A) *Imantodes lentiferus*, B) *Engystomops freibergi*, C) *Drepanoides anomalus*.

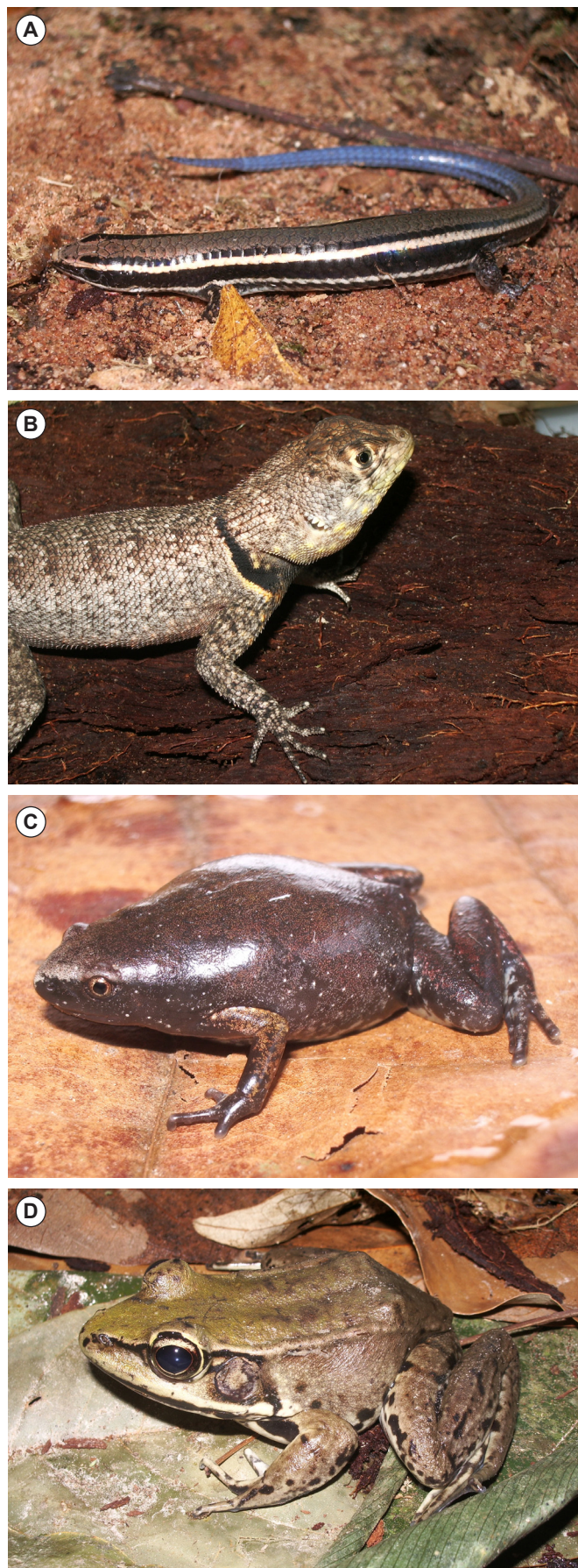


FIGURE 3. Some species whose geographic distribution was extended by present study: A) *Micrablepharus atticolus*; B) *Tropidurus itambere*; C) *Chiasmocleis avilapiresae*; D) *Lithobates palmipes*.

Lithobates palmipes (Spix, 1824) (Figure 3D) – the only published records from Mato Grosso include the municipalities of Tangará da Serra and Vila Bela da Santíssima Trindade (ca. 460 Km south from PCH São João da Barra) (see Strüssmann and Carvalho 1998)

Liophis miliaris amazonicus (Dunn, 1922) (Figure 4A) previously limited distribution in Mato Grosso to the eastern region of the state in the municipality of Ribeirão Cascalheira (cited as 12°51' S, 51°46' W by Dixon 1983). This record extends the known distribution in Mato Grosso ca. 690 km northwest.

Micrurus paraensis Cunha and Nascimento, 1973 (Figure 4B) – this coral snake is reported in the municipalities of Vale de São Domingos, Jauru and Araputanga in the western portion and Denise (ca. 480 km south from PCH São João da Barra) in the southwestern portion of the state of Mato Grosso (Feitosa *et al.* 2007).

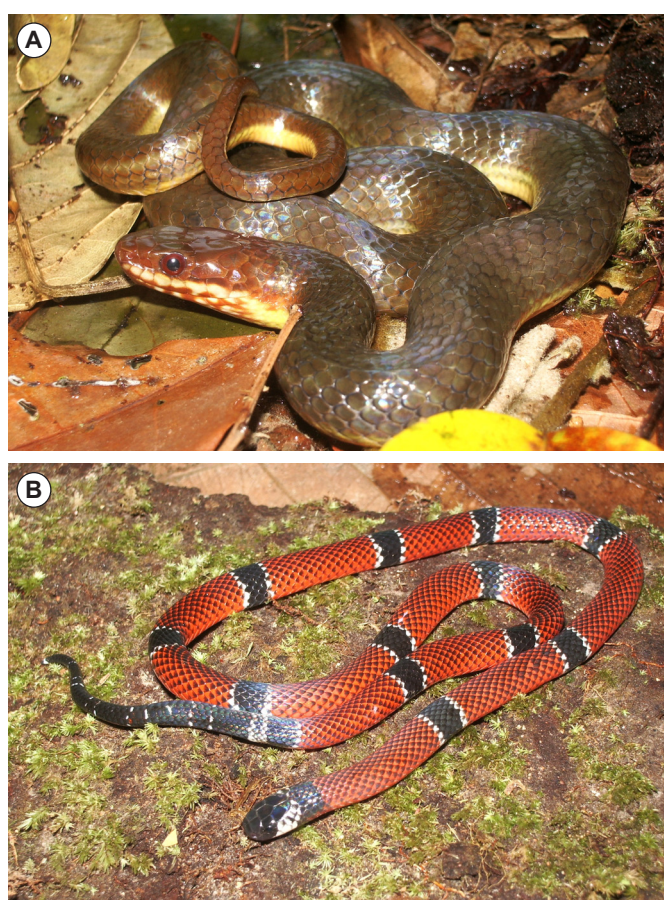


FIGURE 4. Some species whose geographic distribution was extended by present study: A) *Liophis miliaris amazonicus*; B) *Micrurus paraensis*.

Moreover, some species have recently been reported in the state of Mato Grosso, such as *Osteocephalus leprieurii* (Santana *et al.* 2008) and *Cochranella adenocheira* (Toledo *et al.* 2009), which underscores the need for further studies on the distribution and systematics of amphibians and reptiles in this state. The lack of knowledge can be noticed even for species such as *Helicops angulatus*, which is widely distributed in South America (Rossmann, 1986) and has several records in the Coleção de Vertebrados da Universidade Federal de Mato Grosso (personal observation). However, Roberto *et al.* (2008) did not cite records for this snake for the state of Mato Grosso. Nevertheless, São Pedro *et al.* (2009) reported it from

Aripuanã (at northern region) and Silva Jr. *et al.* (2009) recorded this snake from Itiquira, at southern region.

The region of the present study is considered to be of high biological importance and high priority for the creation of conservation units (MMA 2007). However, only two federal and one state conservation units have been created thus far in the region (Juruena National Park, Iquê Ecological Station and Igarapés do Juruena State Park), about 180 km from the study site.

The present study offers an important contribution to knowledge on the herpetofauna in the state of Mato Grosso and enhances the understanding of the contact zones between the Cerrado and Amazon Rainforest in western Brazil.

TABLE 2. Herpetofauna recorded during the Environmental Impact Study of the São João da Barra Hydroelectric Plant, of Mato Grosso, Brazil. For habitat descriptions see Table 1. PT = pitfall traps; TC = time constrained searches.

TAXON	HABITAT	METHOD
AMPHIBIA		
ANURA		
Strabomantidae		
<i>Pristimantis</i> sp.1	1, 2, 3, 6	TC
<i>Pristimantis</i> sp.2	1, 2, 3, 4	TC
Bufo		
<i>Rhaebo guttatus</i> (Schneider, 1799)	1, 10	TC
<i>Rhinella marina</i> (Linnaeus, 1758)	1, 7	PT, TC
<i>Rhinella</i> aff. <i>margaritifera</i> (Laurenti, 1768)	1, 2, 3, 6, 7	PT, TC
Centrolenidae		
<i>Cochranella adenocheira</i> Harvey and Noonan, 2005	2	TC
Aromobatidae		
<i>Allobates</i> sp.	1, 2, 3, 7, 8, 9	PT
Dendrobatidae		
<i>Ameerega picta</i> (Tschudi, 1838)	5	TC
Hylidae		
<i>Dendropsophus</i> aff. <i>microcephalus</i> 1 (Cope, 1886)	3	TC
<i>Dendropsophus</i> aff. <i>microcephalus</i> 2 (Cope, 1886)	10	TC
<i>Dendropsophus minutus</i> (Peters, 1872)	4	TC
<i>Hypsiboas boans</i> (Linnaeus, 1758)	1	TC
<i>Hypsiboas geographicus</i> (Spix, 1824)	1	TC
<i>Hypsiboas albopunctatus</i> (Spix, 1824)	3, 4, 7	TC
<i>Hypsiboas fasciatus</i> (Günther, 1858)	2	TC
<i>Osteocephalus leprieurii</i> (Duméril and Bibron, 1841)	5	TC
<i>Osteocephalus</i> sp.	1	TC
<i>Osteocephalus taurinus</i> Steindachner, 1862	2, 3, 7	TC
<i>Phyllomedusa vaillanti</i> Boulenger, 1882	7	TC
<i>Scinax</i> aff. <i>ruber</i> (Laurenti, 1768)	1	TC
<i>Scinax</i> cf. <i>nebulosus</i> (Spix, 1824)	1, 6	TC
Microhylidae		
<i>Chiasmocleis avilapiresae</i> Peloso and Sturaro, 2008	1	PT
Leiuperidae		
<i>Engystomops freibergeri</i> (Donoso-Barros, 1969)	7	TC
<i>Pseudopaludicola</i> sp.	3, 5	TC
Leptodactylidae		
<i>Leptodactylus andreae</i> Muller, 1923	5	TC
<i>Leptodactylus didymus</i> Heyer <i>et al.</i> , 1996	5	TC
<i>Leptodactylus</i> cf. <i>leptodactyloides</i> (Anderson, 1945)	2	TC
<i>Leptodactylus</i> cf. <i>pentadactylus</i> (Laurenti, 1768)	1	TC
<i>Leptodactylus labyrinthicus</i> (Spix, 1824)	3	TC
Ranidae		
<i>Lithobates palmipes</i> (Spix, 1824)	1	TC

TABLE 2. CONTINUED.

TAXON	HABITAT	METHOD
REPTILIA		
TESTUDINES		
Chelidae		
<i>Phrynops geoffroanus</i> (Schweigger, 1812)	5	TC
CROCODYLIA		
Alligatoridae		
<i>Caiman crocodilus</i> (Linnaeus, 1758)	1	TC
<i>Paleosuchus trigonatus</i> (Cuvier, 1807)	4	TC
SQUAMATA		
Tropiduridae		
<i>Tropidurus itambere</i> Rodrigues, 1987	5, 10	PT, TC
<i>Uranoscodon superciliosus</i> (Linnaeus, 1758)	4, 7	TC
Gekkonidae		
<i>Hemidactylus mabouia</i> (Moreau de Jonnes, 1818)	1	TC
Sphaerodactylidae		
<i>Coleodactylus amazonicus</i> (Andersson, 1918)	1	TC
Teiidae		
<i>Ameiva ameiva</i> (Linnaeus, 1758)	4, 7, 8, 10	PT
<i>Kentropyx calcarata</i> Spix, 1825	1, 3, 4, 7, 8, 9	PT
Gymnophthalmidae		
<i>Cercosaura eigenmanni</i> (Griffin, 1917)	8	PT
<i>Iphisa elegans</i> Gray, 1851	3, 4, 7, 8, 9	PT
<i>Leposoma osvaldoi</i> Avila-Pires, 1995	9	PT
<i>Micrablepharus atticulus</i> Rodrigues, 1996	10	PT
Scincidae		
<i>Mabuya frenata</i> (Cope, 1862)	10	PT
<i>Mabuya nigropunctata</i> (Spix, 1825)	9	PT
Typhlopidae		
<i>Typhlops reticulatus</i> (Linnaeus, 1758)	3	TC
Elapidae		
<i>Micrurus paraensis</i> Cunha and Nascimento, 1973	7	TC
<i>Micrurus surinamensis</i> (Cuvier, 1817)	1	TC
Colubridae		
<i>Chironius fuscus</i> (Linnaeus, 1758)	7	TC
<i>Mastigodryas boddaerti</i> (Santzen, 1796)	4	TC
<i>Oxybelis aeneus</i> (Wagler, 1824)	1, 10	TC
Dipsadidae		
<i>Drepanoides anomalus</i> (Peracca, 1896)	7	PT
<i>Helicops angulatus</i> (Linnaeus, 1758)	2, 3, 4	PT, TC
<i>Imantodes lentiferus</i> (Cope, 1894)	2	TC
<i>Leptodeira annulata</i> (Linnaeus, 1758)	5	TC
<i>Liophis miliaris amazonicus</i> (Dunn, 1922)	8	PT
<i>Oxyrhopus melanogenys</i> (Tschudi, 1845)	1	TC
<i>Oxyrhopus petola</i> (Linnaeus, 1758)	10	TC
<i>Philodryas argentea</i> (Daudin, 1803)	1	TC
<i>Philodryas olfersii</i> Lichtenstein, 1823	10	TC
<i>Siphlophis compressus</i> Daudin, 1803	9	TC

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