

Preliminary assessment of amphibians and reptiles from Floresta Nacional do Trairão, with a new snake record for the Pará state, Brazilian Amazon

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Abstract. We present a list of amphibians and reptiles from Floresta Nacional do Trairão, located in the southwestern part of the state of Pará. This study is part of the results obtained during the preparation of the management plan of FLONA do Trairão, required by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), conducted during the rainy season, 05–24 September 2009. We use four different methods: time-constrained visual searching (TCVS), pitfall traps with drift fence (PT), occasional collecting (OC), and collections made by others (CMO). The study area covers 257,482 hectares and approximately 70% of it is covered by dense ombrophilous forest and 30% of open ombrophilous forest. We registered 94 species of amphibians and reptiles: Anura (35), Chelonia (4), Crocodylia (1) and Squamata (54: 23 lizards and 31 snakes). The snake *Drymobius rhombifer* was registered for the first time in the state of Pará. Although none of the recorded species is cited in the lists of endangered species in Brazil, FLONA do Trairão should be considered important for maintaining populations of central Amazonian herpetofauna.

Key words. Herpetofauna, distribution, Amazonia, southwestern Pará.

Introduction

Brazil ranks first among the countries with the greatest richness in amphibian species diversity, followed by Colombia and Ecuador, and in second place among the countries with the greatest richness in reptile species diversity, just behind Australia (which has 864 species recorded; WILSON & SWAN 2008), but surpassing India, Indonesia, Mexico, Colombia, China and Peru (RODRIGUEZ & DUELLMAN 1994, BÉRNILS 2011).

To date, there are 875 species of amphibians recognized in Brazil (847 Anura, 27 Gymnophiona and 1 Urodela), added to which are 721 reptile species (6 Crocodylia, 36 Testudines, 67 Anphisbaenidae, 241 Lacertilia and 371 Ophidia) (BÉRNILS 2011). However, studies of Amazon wildlife are still very incomplete, particularly for some groups of reptiles and amphibians (VOGT & BERNHARD 2003). The description of numerous new species every year suggests that this wealth is even greater than currently recognized (AZEVEDO-RAMOS & GALLATI 2001, AVILA-PIRES et al. 2007).

The state of Pará has been the target of several herpetofaunistic studies, but the major species inventories are concentrated in the eastern part of the state. CUNHA & NASCIMENTO (1978, 1993) presented data on snake diversity for Belém and surroundings, CUNHA et al. (1985) and NASCIMENTO et al. (1987) characterized the herpetofauna of the Carajás region, YUKI & SANTOS (1996) list-

ed the snake species of the Mexiana and Marajo islands, and AVILA-PIRES & HOOGMOED (1997) conducted a study similar to the aforementioned in the Caxiuanã region. Disregarding occasional records, intensive herpetofaunal studies have been conducted in the western parts of the state of Pará only recently. FROTA (2004) realized a snake survey in the Itaituba region, CALDWELL & ARAUJO (2005) inventoried the amphibian diversity of the Xingu and Curuá-Una Rivers, FROTA et al. (2005) conducted a review of snake species in western Pará, MESQUITA et al. (2006) studied an assembly of lizards from Monte Alegre, in the northwestern region of the State, and MENDES-PINTO & TELLO (2010) studied the squamate fauna in a transition area between savannah and forest in Santarém.

Being one of the herpetofaunistically lesser-known Amazon regions, the forests of the southwestern parts of the state of Pará have been under intense human pressures, largely due to the construction of federal highway BR-163 (Santarém-Cuiabá) (FEARNSIDE 2007). Aiming to fill this gap, we present the results of a herpetofaunal inventory conducted at Floresta Nacional do Trairão (FLONA do Trairão), located in the municipality of Trairão, southwestern Pará, adjacent to BR-163. This study is part of the results obtained during the preparation of the management plan of FLONA do Trairão, required by the Brazilian government environmental agency “Instituto Chico Mendes de Conservação da Biodiversidade” (ICMBio).

Material and methods

Study site

The FLONA do Trairão is located in the southwestern state of Pará (55°24'14.67"W 4°34'33.67"S) and covers, mainly, part of the municipality of Trairão and small parts of the Itaituba and Rurópolis municipalities (Figure 1). The study area has 257,482 hectares and approximately 70% of dense ombrophilous forest and 30% of open ombrophilous forest. The climate is hot and humid with an annual temperature varying from 25–28°C. The dry season, June through November, has higher temperatures. The rainy season, December through May, has the highest precipitation. The annual rainfall is around 2,000 mm, and the average altitude is 51 m (FROTA et al. 2005).

Data collection

We mainly sampled two sites in FLONA do Trairão, referred to here as “Ramal do Bravo” (4.61834° S, 55.47779° W) and “Ramal do Km 80” (4.49777° S, 55.22666° W). “Ramal do Bravo” was sampled from 5–14 September 2009 and “Ramal do Km 80” from 15–24 September 2009, totalling 20 days of surveying. Several occasional collections were made between these two main sites. These points are shown in figure 1. We used four different methods to sample the herpetofauna: time-constrained visual searching (TCVS), pitfall traps with drift fence (PT), occasional collecting (OC), and collections made by others (CMO).

Time-constrained visual searching (sensu CAMPBELL & CHRISTMAN 1982, SCOTT et al. 1989, MARTINS & OLIVEIRA 1998) entails the walking on trails in search of amphibians and reptiles under and on logs, tree branches, shrubs,

and leaf litter. During the search, we tried to cover all microhabitats commonly occupied by herpetofauna. Time-constrained visual searching was done between 7:00 and 10:30 h, and 18:00 and 21:30 h by two collectors (TJMP and SMS), with a total sampling effort of 280 hours.

The pitfall traps (sensu CECHIN & MARTINS 2000, RIBEIRO-JUNIOR et al. 2008) consisted of a line of eleven buried drums of 65 litre in volume each that were eight metres distant from each other and connected by a fence guide about one metre in height. A total of 77 buckets were buried per sampling site. Pitfall traps were active for 15,384 hours/bucket on the site “Ramal do Bravo” and for 13,992 hours/bucket on the site “Ramal do Km 80”.

Occasional collections were made during inspection activities and when traps and camps were relocated (SAWAYA et al. 2008). Collections made by others (CUNHA & NASCIMENTO 1978) refer to specimens collected by local residents, field assistants and other researchers. Voucher specimens were identified using species descriptions and dichotomous keys besides being compared with material deposited in the Collection of Amphibians and Reptiles of the Instituto Nacional de Pesquisas da Amazônia (INPA-H). Vouchers were euthanized with an overdose of anaesthetic (Lidocaine hydrochloride 2%), preserved in 10% formalin, and later stored in 70% ethanol. Tissue samples were taken prior to voucher fixation with formalin and stored in 100% ethanol in cryotubes.

Results and discussion

Species richness

We registered 94 species of amphibians and reptiles: Anura (35), Chelonia (4), Crocodylia (1) and Squamata (54: 23 liz-

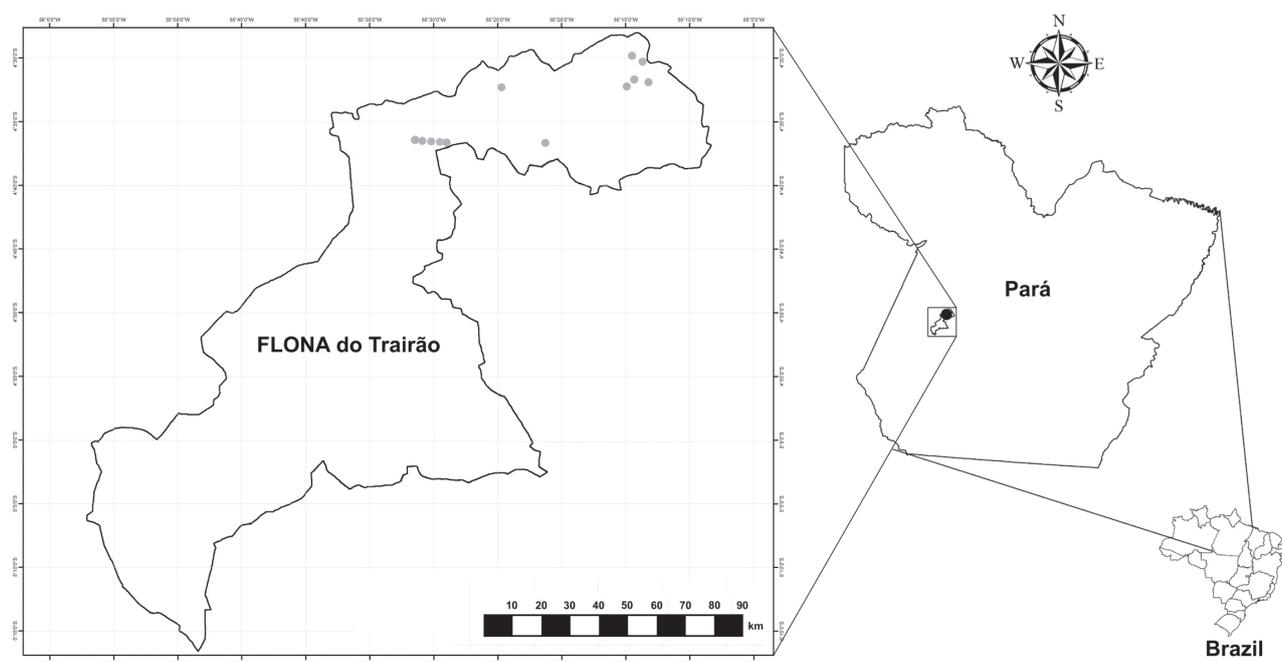


Figure 1. Geographic location of the Floresta Nacional do Trairão, in the southwestern state of Pará, Brazil. Grey dots indicate that at least one type of methodology was used to capture animals.

ards and 31 snakes). The 35 species of amphibians represent 20 genera and 11 families (Table 1 and Figure 2). The highest number of species were encountered in the family Hyliidae (10), representing 28.5% of all anurans in this study, which is generally common in the Neotropics (DUELLMAN 1978). The second most common species were members of the families Leptodactylidae (14.2%) and Bufonidae (14.2%). Other families represented were the Aromobatidae, Strabomantidae and Microhylidae (8.5% each), Leiuperidae (5.7%), and Allophrynidae, Ceratophrynidae, Dendrobatidae and Pipidae (2.8% each).

It is difficult to compare the encountered amphibian species composition to other areas in the Amazon region, mainly because of the differences in sampling effort. In places where the sampling effort was similar to our study (from 10 to 20 days in duration), the number of amphibian species ranged between 25 and 54 (AZEVEDO-RAMOS & GALATTI 2001).

The 23 species of lizards found in our surveys represent 18 genera and six families (Tab. 2, Fig. 3). The Gymnophthalmidae was the most diverse family with 43.4% of the total number of species recorded. It was followed by Polychrotidae (17.3%), Teiidae (13%) and Tropiduridae (13%), Sphaerodactylidae (8.6%) and Scincidae (4.3%). Snakes comprised 31 species, 26 genera and 8 families (Table 2 and Figure 4), of which Dipsadidae was the largest (54.8% of all species), followed by Colubridae (12.9%), Viperidae (9.6%), Elapidae (6.4%), and Boidae, Aniliidae, Anomalepididae, Leptotyphlopidae with 3.2% each. We recorded four species of chelonians belonging to three different genera and

three families (Fig. 3). Only one species of Crocodylia was registered.

Some species were recorded by applying only one type of methodology, underlining the importance of using more than one method in herpetofaunal surveys (CECHIN & MARTINS 2000, GARDNER et al. 2007). Among the 95 species of amphibians and reptiles recorded in this study, 19 were exclusively captured by pitfall traps.

Most of the recorded species are typical inhabitants of tropical rainforests. The conversion of rainforests into pastures is likely to prevent the perpetuation of most of the species recorded. These species require a humid microclimate to survive and maintain populations. Considering the continued expansion of agriculture in the state of Pará and the consequent destruction of the forests, species of amphibians and reptiles restricted to tropical rainforest areas tend to become extinct locally (PRIMACK & RODRIGUES 2001, RODRIGUES 2005).

Drymobius rhombifer (Colubridae) was recorded for the first time in the state of Pará. The specimen is deposited in the collection of amphibians and reptiles of INPA (*Drymobius rhombifer* INPA-H 26235).

The distribution of *Drymobius rhombifer* has until now been known from the following Amazonian locations: Santa Cecilia, Ecuador (DUELLMAN 1978), Iquitos (DIXON & SOINI 1986) and Cuzco, Peru (DUELLMAN & SALAS 1991) and from Venezuela (PÉFAUR & RIVEIRO 2000). As far as Brazil is concerned, *Drymobius rhombifer* was previously recorded from the state of Rondônia (VANZOLINI 1986, O'SHEA & STIMSON 1993, BERNARDE & ABE 2006).

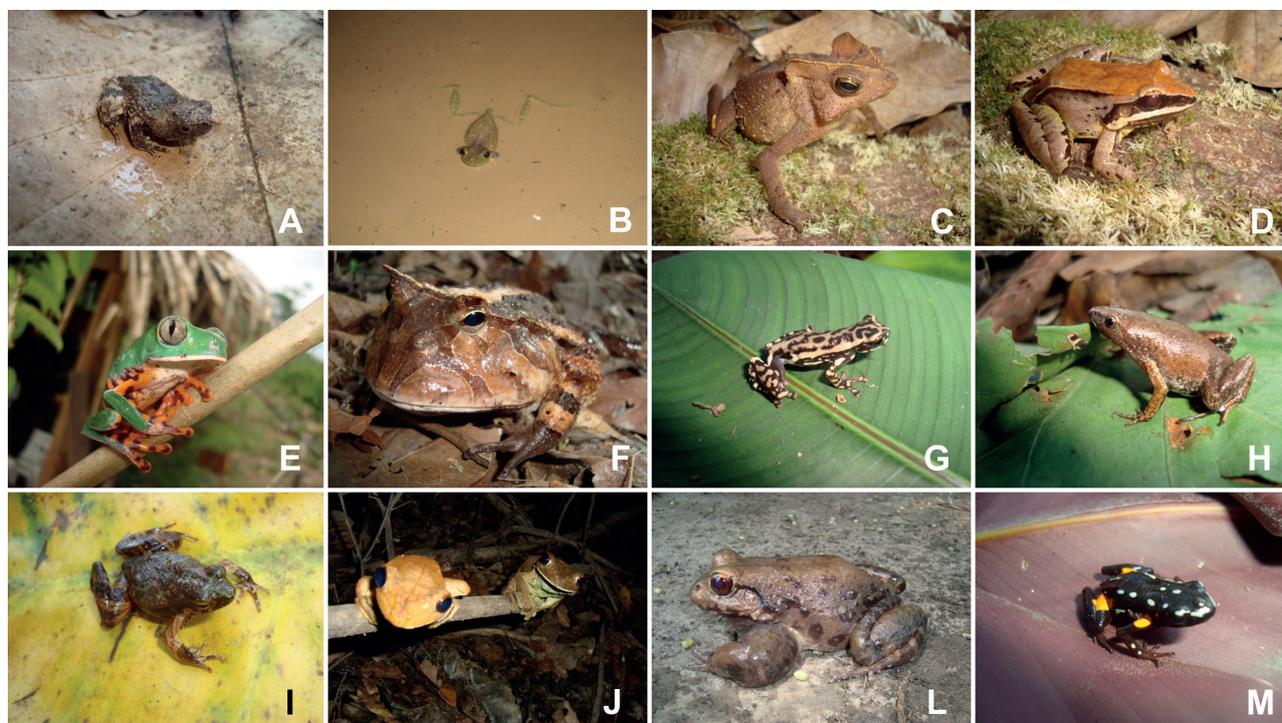


Figure 2. Anurans recorded in the Floresta Nacional do Trairão. (A) *Engystomops freibergeri*, (B) *Trachycephalus venulosus*, (C) *Rhinella margaritifera*, (D) *Leptodactylus mystaceus*, (E) *Phyllomedusa tomatopterna*, (F) *Ceratophrys cornuta*, (G) *Allophryne ruthveni*, (H) *Chiastrocleis avilapiresae*, (I) *Physalaemus* gr. *ephippifer*, (J) *Hypsiboas boans*, (L) *Dendropsophus marmoratus*, (M) *Adelphobates castaneoticus*.

Table 1. Anuran species recorded in the Floresta Nacional do Trairão with different capture methods: time-constrained visual searching (TCVS), pitfall traps with drift fence (PT), collections made by others (CMO), occasional collecting (OC).

Order / Family / Species	Methods
ANURA	
Allophrynidae	
<i>Allophryne ruthveni</i> GAIGE, 1926	OC
Aromobatidae	
<i>Allobates femoralis</i> (BOULENGER, 1884 „1883“)	PT, OC
<i>Anomaloglossus stepheni</i> (MARTINS, 1989)	TCVS, PT
<i>Anomaloglossus</i> sp.	PT
Bufonidae	
<i>Dendrophryniscus minutus</i> (MELIN, 1941)	PT
<i>Rhaebo guttatus</i> (SCHNEIDER, 1799)	TCVS, CMO
<i>Rhinella margaritifera</i> (LAURENTI, 1768)	PT, OC
<i>Rhinella marina</i> (LINNAEUS, 1758)	OC
<i>Rhinella granulosa</i> (SPIX, 1824)	OC
Ceratophryidae	
<i>Ceratophrys cornuta</i> (LINNAEUS, 1758)	CMO
Dendrobatidae	
<i>Adelphobates castaneoticus</i> (CALDWELL & MYERS, 1990)	CMO
Hylidae	
<i>Dendropsophus marmoratus</i> (LAURENTI, 1768)	OC
<i>Hypsiboas boans</i> (LINNAEUS, 1758)	TCVS
<i>Hypsiboas calcaratus</i> (TROSCHER in SCHOMBURGK, 1848)	TCVS
<i>Hypsiboas geographicus</i> (SPIX, 1824)	TCVS
<i>Phyllomedusa tomopterna</i> (COPE 1868)	TCVS
<i>Phyllomedusa vaillantii</i> (BOULENGER, 1882)	CMO
<i>Scinax garbei</i> (MIRANDA-RIBEIRO, 1926)	TCVS
<i>Scinax ruber</i> (LAURENTI, 1768)	TCVS, OC
<i>Trachycephalus resinifictrix</i> (GOELDI, 1907)	CMO
<i>Trachycephalus venulosus</i> (LAURENTI, 1768)	TCVS
Leiuperidae	
<i>Engystomops freibergeri</i> (DONOSO-BARROS, 1969)	PT
<i>Physalaemus</i> gr. <i>ephippifer</i> (STEINDACHNER, 1864)	PT
Leptodactylidae	
<i>Leptodactylus andreae</i> MÜLLER, 1923	TCVS, PT, OC
<i>Leptodactylus mystaceus</i> (SPIX, 1824)	TCVS, PT
<i>Leptodactylus petersii</i> (STEINDACHNER, 1864)	TCVS
<i>Leptodactylus</i> sp.	TCVS
<i>Leptodactylus paraensis</i> HEYER, 2005	TCVS
Microhylidae	
<i>Chiasmocleis avilapiresae</i> (PELOSO & STURARO, 2008)	PT
<i>Chiasmocleis shudikarensis</i> DUNN, 1949	PT
<i>Ctenophryne geayi</i> (MOCQUARD, 1904)	PT
Pipidae	
<i>Pipa arrabali</i> (IZECKSOHN, 1976)	CMO
Strabomantidae	
<i>Pristimantis fenestratus</i> (STEINDACHNER, 1864)	TCVS, CMO
<i>Pristimantis martiae</i> (LYNCH, 1974)	TCVS, OC
<i>Pristimantis</i> sp.	TCVS

Table 2. Reptiles recorded in the Floresta Nacional do Trairão with different capture methods: time-constrained visual searching (TCVS), pitfall traps with drift fence (PT), collections made by others (CMO), occasional collecting (OC).

Order / Family / Species	Methods		
SQUAMATA		<i>Drymobius rhombifer</i> (GÜNTHER, 1860)	CMO
Lacertilia		<i>Leptophis ahaetulla</i> (LINNAEUS, 1758)	CMO
Gymnophthalmidae		<i>Spilotes pullatus</i> (LINNAEUS, 1758)	CMO
<i>Alopoglossus angulatus</i> (LINNAEUS, 1758)	PT	Dipsadidae	
<i>Arthrosaura reticulata</i> (O'SHAUGHNESSY, 1881)	PT	<i>Apostolepis pymi</i> BOULENGER, 1903	CMO
<i>Bachia flavescens</i> (BONNATERRE, 1789)	PT	<i>Atractus schach</i> (BOIE, 1827)	PT
<i>Cercosaura argulus</i> PETERS, 1863	PT	<i>Clelia clelia</i> (DAUDIN, 1803)	TCVS
<i>Cercosaura ocellata</i> WAGLER, 1830	PT, OC	<i>Dipsas catesbyi</i> (SENTZEN, 1796)	TCVS, CMO
<i>Iphisa elegans</i> GRAY, 1851	PT	<i>Dipsas indica</i> LAURENTI, 1768	TCVS
<i>Leposoma osvaldoi</i> ÁVILA-PIRES, 1995	PT	<i>Drepanoides anomalus</i> (JAN, 1863)	TCVS
<i>Leposoma percarinatum</i> (MÜLLER, 1923)	PT, OC	<i>Helicops angulatus</i> (LINNAEUS, 1758)	CMO
<i>Potamites ecleopus</i> (COPE, 1876)	TCVS	<i>Imantodes cenchoa</i> (LINNAEUS, 1758)	TCVS
<i>Ptychoglossus brevifrontalis</i> BOULENGER, 1912	PT	<i>Leptodeira annulata</i> (LINNAEUS, 1758)	TCVS
Polychrotidae		<i>Liophis poecilogyrus</i> (WIED, 1825)	OC
<i>Anolis trachyderma</i> COPE, 1876	PT, CMO, OC	<i>Liophis reginae</i> (LINNAEUS, 1758)	TCVS, OC
<i>Anolis punctatus</i> COPE, 1876	OC	<i>Oxyrhopus occipitalis</i> WAGLER in SPIX, 1824	TCVS
<i>Anolis fuscoauratus</i> D'ORBIGNY, 1837	PT, CMO, OC	<i>Oxyrhopus rhombifer</i>	TCVS, PT
<i>Anolis auratus</i> DAUDIN, 1802	PT	DUMÉRIL, BIBRON & DUMÉRIL, 1854	
Scincidae		<i>Oxyrhopus petola</i> (LINNAEUS, 1758)	OC
<i>Mabuya nigropunctata</i> (SPIX, 1825)	CMO, OC	<i>Sibon nebulata</i> (LINNAEUS, 1758)	TCVS
Sphaerodactylidae		<i>Siphlophis compressus</i> (DAUDIN, 1803)	CMO
<i>Coleodactylus amazonicus</i> (ANDERSSON, 1918)	PT, OC	<i>Xenopholis scalaris</i> (WUCHERER, 1861)	PT
<i>Gonatodes humeralis</i> (GUICHENOT, 1855)	OC	Elapidae	
Teiidae		<i>Micrurus paraensis</i>	PT
<i>Ameiva ameiva</i> (LINNAEUS, 1758)	OC	CUNHA & NASCIMENTO, 1973	
<i>Kentropyx calcarata</i> SPIX, 1825	PT, OC	<i>Micrurus spixii</i> WAGLER, 1824	OC
<i>Tupinambis teguixin</i> (LINNAEUS, 1758)	OC	Leptotyphlopidae	
Tropiduridae		<i>Tricheilostoma macrolepis</i> (PETERS, 1857)	PT
<i>Plica plica</i> (LINNAEUS, 1758)	OC	Viperidae	
<i>Plica umbra</i> (LINNAEUS, 1758)	TCVS, PT	<i>Bothriopsis taeniata</i> (WAGLER, 1824)	TCVS
<i>Uranoscodon superciliosus</i> (LINNAEUS, 1758)	CMO	<i>Bothrocophias hyoprora</i> (AMARAL, 1935)	CMO
Ophidia		<i>Bothrops atrox</i> (LINNAEUS, 1758)	TCVS, CMO
Aniliidae		TESTUDINES	
<i>Anilius scytale</i> (LINNAEUS, 1758)	OC	Chelidae	
Anomalepididae		<i>Platemys platycephala</i> (SCHNEIDER, 1792)	OC
<i>Typhlophis squamosus</i> (SCHLEGEL, 1839)	PT, OC	Testudinidae	
Boidae		<i>Chelonoidis carbonaria</i> (SPIX, 1824)	OC
<i>Boa constrictor</i> LINNAEUS, 1758	CMO	<i>Chelonoidis denticulata</i> (LINNAEUS, 1766)	OC
<i>Epicrates cenchria</i> (LINNAEUS, 1758)	OC	Geoemydidae	
Colubridae		<i>Rhinoclemmys punctularia</i> (DAUDIN, 1801)	TCVS, CMO
<i>Chironius multiventris</i>	OC	CROCODYLIA	
SCHMIDT & WALKER, 1943		Alligatoridae	
		<i>Paleosuchus trigonatus</i> (SCHNEIDER, 1801)	TCVS, OC

Conclusions

Our list of species of amphibians and reptiles of the FLO-NA do Trairão is certainly not complete. Lizards appear to be the group that has been sampled most completely in our inventory and few species are expected to be added, but, in general, the knowledge of amphibians and snakes in

FLO-NA do Trairão is probably still quite incomplete. Despite our short period of sampling and very limited geographic coverage, a surprisingly large number of species was recorded compared to other Amazon sites that have been sampled with a comparable effort. FLO-NA do Trairão is noteworthy for its great geomorphological heterogeneity as it is situated in a watershed divide that creates

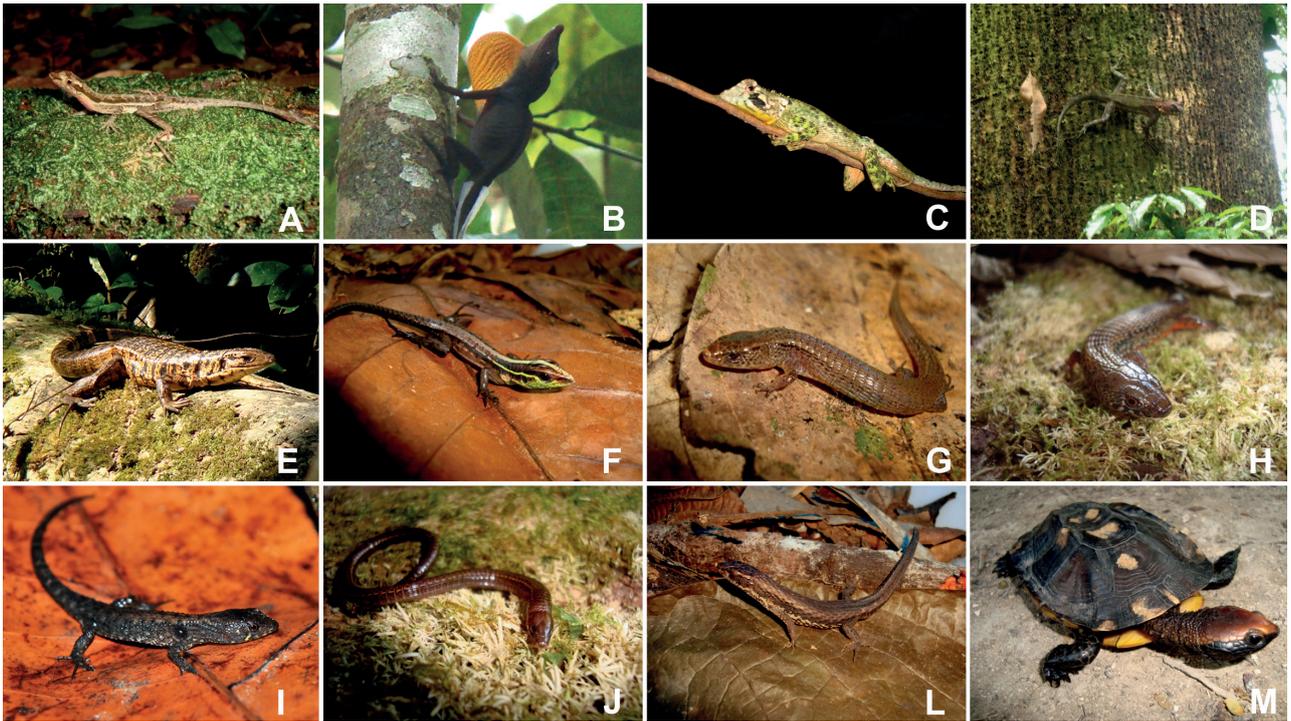


Figure 3. Lizards and a turtle recorded in the Floresta Nacional do Trairão. (A) *Anolis trachyderma*, (B) *Anolis punctatus*, (C) *Plica umbra*, (D) *Plica plica*, (E) *Tupinambis teguixin*, (F) *Kentropyx calcarata*, (G) *Ptychoglossus brevifrontalis*, (H) *Arthrosaura reticulata*, (I) *Potamites ecleopus*, (J) *Bachia flavescens*, (L) *Alopoglossus angulatus*, (M) *Platemys platycephala*. Photos by MARCONI CAMPOS (B, E), SERGIO M. SOUZA (I).



Figure 4. Snakes recorded in the Floresta Nacional do Trairão. (A) *Tricheilostoma macrolepis*, (B) *Boa constrictor*, (C) *Oxyrhopus rhombifer*, (D) *Atractus schach*, (E) *Drymobius rhombifer* (INPA-H 26235), (F) *Oxyrhopus petola*, (G) *Helicops angulatus*, (H) *Bothrops atrox*, (I) *Bothrocophias hyoprora*, (J) *Bothriopsis taeniata*, (L) *Micrurus spixii*, (M) *Micrurus paraensis*. Photo by ANDRÉ RAVETTA (B).

great habitat and microhabitat heterogeneity. Some representatives of the local herpetofauna are restricted to certain microhabitats, such as small waterfalls in the highlands (*Anomaloglossus* sp. and *Potamites epleopus*), flooded forests, known as igapós (*Chiasmocleis avilapiresae* and *Chiasmocleis shudikarensis*) and forests near water bodies (*Arthrosaura reticulata*). The taxonomic status of some of the recorded species is doubtful, as is the case in *Physalaemus* gr. *ephippifer*, *Pristimantis* sp. and *Anomaloglossus* sp. Only future studies will show if they represent named or new species. National Forests (FLONA) are conservation units that permit timber extraction. We recommend a monitoring plan for the herpetofauna to be set up in order to gain a better understanding of the micro-distribution of species, delimitate areas inside the FLONA without forest management, and assess the impact of timber extraction on the existing populations of amphibians and reptiles.

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