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A CHECKLIST OF SNAKES FROM AMAZONIAN SAVANNAS IN BRAZIL,
HOUSED IN THE COLEÇÃO HERPETOLÓGICA DA UNIVERSIDADE DE
BRASÍLIA, WITH NEW DISTRIBUTION RECORDS

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ABSTRACT

We present an annotated checklist of 48 snake species collected in Amazonian Savannas in the Brazilian states of Amapá, Amazonas, Pará, Rondônia, and Roraima, based on specimens deposited in the Coleção Herpetológica da Universidade de Brasília (CHUNB). For each species, we provide information on collector, voucher number, geographic distribution, and previous records. Of the 48 species, 25 have broad distributions and likely range throughout Amazonia. Four species are recorded for the first time in Amapá (*Eunectes deschauenseei*, *Mastigodryas bifossatus*, *Philodryas olfersii*, and *Phimophis guianensis*), three in Amazonas (*Oxyrhopus rhombifer*, *Phimophis guerini*, and *Taeniophallus occipitalis*), three in Pará (*Mastigodryas pleei*, *Phimophis guianensis*, and *Philodryas patagoniensis*), and three in Rondônia (*Drymoluber brazili*, *Liophis almadensis*, and *Liophis longiventris*). *Mastigodryas pleei* and *Phimophis guianensis* are recorded for the first time in Brazil and 14 species are recorded for the first time in Amazonian Savannas. Seventy-nine species of snakes are known to occur in Amazonian Savannas, and of these species, 22 are found exclusively in these open areas within Amazonia. We classified these species into 10 geographic categories. About 6.5% of the species are endemic to Amazonian Savannas, whereas 28% are restricted to open formations throughout South America. In summary, Amazonian Savanna enclaves harbor endemic species, are poorly known, are threatened by agricultural expansion, and are not protected in conservation units, highlighting the importance of their conservation.

Key words: Amazon savanna, Brazil, checklist, collections, conservation, distribution, snakes

Amazonian Savannas occur as “islands” dispersed within the rainforest, and cover approximately 150,000 km² (ca. 2%) of the Brazilian territory (Pires, 1973). Many Cerrado species dominate plant communities in Amazonian Savannas; however, overall diversity is low (Eiten, 1978). Reptile communities also have low diversity but high endemism (Ávila-Pires, 1995; Vitt and Carvalho, 1995; Colli, 1996). In addition, Amazonian Savannas are highly threatened by agricultural expansion, mining, cattle breeding, and fire (Colli, 1996). The “Pleistocene Refuge Hypothesis” postulates that during glacial periods, with reduced precipitation, great expanses of the Amazon were covered by savannas, restricting the forest to isolated patches (Eden, 1974; Ab'Sáber, 1982; Bigarella and Andrade-Lima, 1982; Huber, 1982). Under this view, Amazonian Savannas are relicts of a large savanna that extended from central Brazil to northern South America (Prance, 1978).

Despite the biogeographic importance of Amazonian Savanna enclaves, little is known about their snake fauna. Hoogmoed (1979; 1982) studied the herpetofauna of the Guianan region (Guyana, French Guiana, and Suriname) and part of Venezuela (Bolivar and Amazonas) and Brazil (Amapá, Roraima, Pará and Amazonas), presenting for the first time a comprehensive list of snake species from Amazonian Savannas. Additional snake records are available in regional lists (Cunha and Nascimento, 1980; Cunha et al., 1985; Cunha and Nascimento, 1993).

Checklists are important and under-used tools for ecologists and conservationists, providing information at local, regional, and continental scales useful for studies of population trends, community structure, species richness estimation, and biogeographic patterns (Droege et al., 1998). Herein, we present an annotated checklist of snakes from Amazonian Savannas in the Brazilian states of Amapá, Amazonas, Pará, Rondônia, and Roraima. All records are based on specimens deposited in Coleção Herpetológica da Universidade de Brasília (CHUNB). In addition, we review information previously published about snakes from Amazonian Savannas in Guiana and Venezuela.

METHODS

The records herein presented came from several herpetofaunal surveys conducted by the authors in Amazonian Savannas at the following localities. AMAPÁ: Amapá (01° 00' N, 51° 24' W),

Ferreira Gomes (01° 02' N, 51° 10' W), Macapá (0° 02' N, 51° 03' W), Tartarugalzinho (01° 30' N, 51° 00' W). AMAZONAS: Humaitá (07° 12' S, 62° 54' W). PARÁ: Parauapebas, Serra dos Carajás (06° 02' S, 50° 09' W); Santarém, Alter do Chão (03° 06' S, 55° 36' W); Novo Progresso, Serra do Cachimbo (08° 60' S, 55° 50' W); Monte Alegre (01° 12' S, 54° 24' W). RONDÔNIA: Guajará-Mirim (11° 42' S, 65° 10' W); Pimenta Bueno (12° 12' S, 61° 05' W); Vilhena (12° 55' S, 60° 24' W). RORAIMA: Boa Vista (03° 03' N, 60° 80' W) (Fig. 1). All snakes were collected by hand, with the aid of pitfall traps, with drift fences or with funnel traps. In the laboratory, snakes were humanely killed with an injection of Tiopental®, fixed with 10% formalin, preserved in 70% alcohol, and deposited in Coleção Herpetológica da Universidade de Brasília (CHUNB).

Below, we present information on site, collector, voucher number, geographic information, and previous records for Amazonian Savanna snakes. Also, we present geographic distribution information for 79 snake species that occur in Amazonian Savannas. We distinguish 10 patterns of distributions, partially following patterns previously described for Amazonian lizards (Ávila-Pires, 1995): (I) widespread in all South America; (II) widespread in Amazonia; (III) eastern Amazonia; (IV) northern Amazonia; (V) forested biomes in Amazonia and Atlantic Rainforest; (VI) southwestern Amazonia; (VII) peripheral in southern Amazonia (open vegetation forms, with distributional area mainly outside Amazonia), including (VIIa) only in southern Amazonia enclaves, (VIIb) both in northern and southern Amazonia enclaves, (VIIc) in southern Amazonia enclaves, Cerrado, and Atlantic Rainforest; (VIII) following the course of major rivers; (IX) restricted in Cerrado biome with disjunct distribution in some Amazonian Savannas; (IXa) disjunct distribution in Marajó island, Pará; (IXb) disjunct distribution in Roraima; (X) restricted to one or a few localities, including (Xa) Venezuela, (Xb) Marajó island, Pará, and (Xc) Carajás, Pará.

RESULTS

About 79 species of snakes are known to occur in Amazonian Savannas of South America (Table 1). The best-represented families are Colubridae, with 61 species, followed by Viperidae and Boidae, with seven and five species, respectively (Table 1). Below, we present an annotated checklist of 48 species collected in Amazonian Savannas of Amapá, Amazonas, Pará, Rondônia, and

Roraima, based on specimens housed in the Coleção Herpetológica da Universidade de Brasília (CHUNB).

Family Typhlopidae

Typhlops reticulatus (Cobra-cega). AMAPÁ: Amapá, 27.vii.1997 (CHUNB 03813). RONDÔNIA: Pimenta Bueno, 9.viii.2000 (CHUNB 18346). This species occurs in Amazonian forest in French Guiana, Venezuela, and Brazil (Gasc and Rodrigues, 1980; Peters and Orejas-Miranda, 1986; Cunha and Nascimento, 1993). We present the first record in Amazonian Savannas.

Family Boidae

Boa constrictor (Jibóia). AMAPÁ: Tartarugalzinho, 01.iv.1997 (CHUNB 00458). PARÁ: Monte Alegre, 29.xi.2002 (CHUNB 33930). RONDÔNIA: Pimenta Bueno, 6 and 18.viii.2000 (CHUNB

21011-12); Vilhena, 9.xi.1998 and 13.ix.1999 (CHUNB 09663 and 11498). This species is widely distributed in Central and South America (McDiarmid et al., 1999). Hoogmoed (1982) recorded this species in open formations, in forest, and in edge-situations of savannas and forests of the Guianan region.

Epicrates cenchria (Jibóia arco-íris). AMAPÁ: Amapá, 03.vi.1997 (CHUNB 05468). AMAZONAS: Humaitá, 29.vii.2003 (CHUNB 33929). This species is widely distributed in Central and South America (McDiarmid et al., 1999). Previous records for the Amazonian Savannas are in Pará (Cunha and Nascimento, 1993) and the Guianan region (Hoogmoed, 1982).

Eunectes deschauenseei (Sucuri). AMAPÁ: Amapá, 18.iii.2000 (CHUNB 15211). This species is known only from Marajó Island and Santarém, both in Pará, and in eastern French Guiana

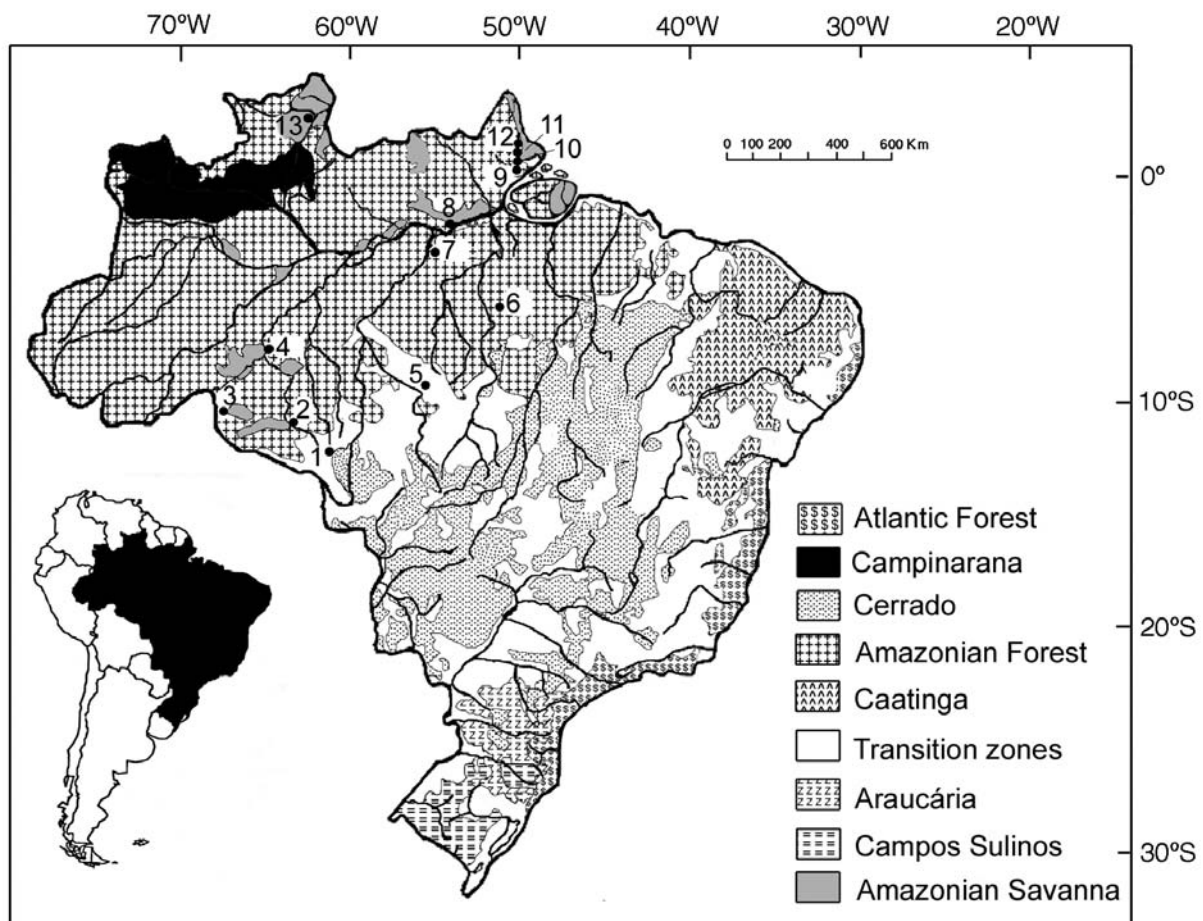


Figure 1. Municipalities of collecting localities in Amazonian savannas of Brazil. 1—Vilhena - RO, 2—Pimenta Bueno - RO, 3—Gujará - Mirim - RO, 4—Humaitá - AM, 5—Cachimbo - PA, 6—Parauapebas - PA, 7—Alter do Chão - PA, 8—Monte Alegre - PA, 9—Macapá - AP, 10—Ferreira Gomes - AP, 11—Tartarugalzinho - AP, 12—Amapá - AP, and 13—Boa Vista. Adapted from “Mapa de Vegetação do Brasil” by Instituto Brasileiro de Geografia e Estatística (IBGE).

Table 1. Species reported for Amazonian Savannas of South America. Numbers indicate sources of information.

Snake species	Amapá	Amazonas	Pará	Rondônia	Roraima	Guianan Region	Distribution
Leptotyphlopidae (2)							
<i>Leptotyphlops dimidiatus</i>						2	IV
<i>Leptotyphlops signatus</i>						2	IV
Typhlopidae (1)							
<i>Typhlops reticulatus</i>	1			1			I
Boidae (5)							
<i>Boa constrictor</i>	1		1,9	1		2	I
<i>Corallus hortulanus</i>						2	I
<i>Epicrates cenchria</i>	1	1	4,9			2	I
<i>Eunectes deschauenseei</i>	1		1			2	III
<i>Eunectes murinus</i>	1				12	2	I
Viperidae (7)							
<i>Bothriopsis medusa</i>						2	Xa
<i>Bothrops atrox</i>						2	II
<i>Bothrops brazili</i>			1				II
<i>Bothrops castelnaudi</i>						2	II
<i>Bothrops mattogrossensis</i> *		1		1			VIIa
<i>Bothrops marajoensis</i> *			5				Xb
<i>Crotalus durissus</i> *	1		8	1	1,3,12	2	I
Elapidae (3)							
<i>Micrurus lemniscatus</i>			9		3	2	I
<i>Micrurus surinamensis</i>						2	II
<i>Micrurus spixii</i> *			1,9				II
Colubridae (61)							
<i>Apostolepis quinquelineata</i>			9				II
<i>Atractus riveroi</i> *						2	Xa
<i>Atractus trilineatus</i>					3		IV
<i>Chironius carinatus</i>					3,12		V
<i>Chironius flavolineatus</i> *	1,6	1,6	9				VIIIb
<i>Chironius fuscus</i>						2	V
<i>Chironius quadricarinatus</i> *					12		IXb
<i>Chironius scurrulus</i>						2	II
<i>Clelia clelia</i>		1				2	II
<i>Clelia plumbea</i>				1			I
<i>Dipsas catesbyi</i>				1			II
<i>Drepanoides anomalus</i>			1				II
<i>Drymarchon corais</i>	1		9	1,11	3,12		I
<i>Drymoluber brazili</i> *				1			VIIa
<i>Drymoluber dichrous</i>			1				V
<i>Helicops angulatus</i>			1	1	12		I
<i>Helicops leopardinus</i>	1					2	VIII
<i>Helicops polylepis</i>	1						VIII
<i>Hydrodynastes bicinctus</i>						2	II
<i>Hydrodynastes gigas</i>	1					2	I
<i>Hydrops triangularis</i>						2	VIII
<i>Imantodes cenchoa</i>			9				I
<i>Leptodeira annulata</i>	1	1	1,9	1	3,12	2	I

Table 1 (continued).

Snake species	Amapá	Amazonas	Pará	Rondônia	Roraima	Guianan Region	Distribution
<i>Leptophis ahaetulla</i>	1				3	2	I
<i>Liophis almadensis</i> *				1			VIIc
<i>Liophis carajasensis</i> *			1,9				Xc
<i>Liophis cobellus</i>	1,4		4			2	II
<i>Liophis longiventris</i> *				1			VI
<i>Liophis lineatus</i>					3,12	2	IV
<i>Liophis melanotus</i>						2	IV
<i>Liophis meridionalis</i> *			1				VIIa
<i>Liophis poecilogyrus</i>	1				3,12		I
<i>Liophis reginae</i>			1			2	I
<i>Masticophis mentovarius</i>						2	IV
<i>Mastigodryas bifossatus</i>	1				12	2	I
<i>Mastigodryas boddaerti</i>		1	1,4,9		12	2	II
<i>Mastigodryas pleei</i>			1			2	IV
<i>Oxybelis aeneus</i>			9	1	3,12	2	I
<i>Oxyrhopus melanogenys</i>			4	1			II
<i>Oxyrhopus rhombifer</i> *		1					VI
<i>Oxyrhopus trigeminus</i>						2	VIIIb
<i>Philodryas olfersii</i> *	1		1,7	1	12	2	VIIIb
<i>Philodryas patagoniensis</i> *			1				VIIa
<i>Phimophis guerini</i> *		1				2	VIIIb
<i>Phimophis guianensis</i> *	1		1			2	IV
<i>Pseudoboa coronata</i>					12		II
<i>Pseudoboa neuwiedii</i>						2	IV
<i>Pseudoboa nigra</i> *			9	1			VIIa
<i>Pseudoeryx plicatilis</i>						2	I
<i>Psomophis joberti</i> *			1				IXa
<i>Rhinobothrium lentiginosum</i>				1			II
<i>Sibon nebulata</i>					3		IV
<i>Spilotes pullatus</i>			9		12		I
<i>Taeniophallus occipitalis</i>		1	1	1			VIIa
<i>Tantilla melanocephala</i>	1		1	1		2	I
<i>Thamnodynastes chimanta</i> *						2	Xa
<i>Thamnodynastes pallidus</i>	1					2	II
<i>Tripanurgos compressus</i>			9				II
<i>Waglerophis merremii</i>			1,13				VIIa
<i>Xenodon rabdocephalus</i>	1		4,9	1			II
<i>Xenopholis undulatus</i> *			9				VIIa

1. This work; 2. Hoogmoed, 1982; 3. Cunha and Nascimento, 1980; 4. Cunha and Nascimento, 1993; 5. Nascimento et al., 1991; 6. Colli and Pères Jr., 1997; 7. Thomas, 1976; 8. Vanzolini and Calleffo, 2002; 9. Cunha et al., 1985; 10. Zaher, 1996; 11. Vanzolini, 1986; 12. Vitt, L. J. Personal communication; 13. Cunha and Nascimento, 1978. *Restricted in Amazonia to savanna enclaves. See text for legend of geographic distributions.

(Hoogmoed, 1982; Nascimento et al., 1991; Dirksen and Henderson, 2002), always in open areas. This is the first record for the state of Amapá.

Eunectes murinus (Sucuri). AMAPÁ: Tartarugalzinho, 28.iii.2000 (CHUNB 21920). This species has a wide distribution in South America (Peters and Orejas-Miranda, 1986). Previous records for Amazonian Savannas are in the Guianan region (Hoogmoed, 1982).

Family Viperidae

Bothrops brazili (Jararaca). PARÁ: Novo Progresso: Serra do Cachimbo, 31.xi.2004 (CHUNB 40087). This species has a wide distribution in Amazonia (Campbell and Lamar, 2004). We present the first record for Amazonian Savannas.

Bothrops mattogrossensis (Jararaca-pintada). AMAZONAS: Humaitá, 29.vii.2003 (CHUNB 33912). RONDÔNIA: Pimenta Bueno, 4, 24 and 28.vii.2000 (CHUNB 17477-81). This species was recently described by Silva (2004) and belongs to the *Bothrops neuwiedi* complex. This species ranges throughout open landscapes in central Brazil, Paraguay, and Bolivia, with a single record in Peru (Silva, 2004). Previous records for the Amazonian Savanna habitat are in Amazonas by Yuki (1997). The populations of *B. mattogrossensis* in Humaitá and Pimenta Bueno are considerably isolated from the central Brazilian populations by dense forest regions, even though Silva (2004) depicted the Rondônia populations as being continuous with the latter. In addition, Silva (2004) also depicted, in error, populations from Tocantins and Goiás as isolated from the main distribution of the species, even though no obvious geographic barrier is present.

Crotalus durissus (Cascavel). AMAPÁ: Amapá, 03.vi.1997 (CHUNB 05454). RONDÔNIA: Vilhena, 13.ix.1999 (CHUNB 15216 and 15218). RORAIMA: Boa Vista, 10.ix.1992 (CHUNB 05435). This species ranges throughout open areas of Central and South America (Vanzolini and Callefo, 2002; Campbell and Lamar, 2004). Previous records for Amazonian Savannas are in Pará and Roraima (Cunha and Nascimento, 1980; Vanzolini and Callefo, 2002) and in the Guianan region (Hoogmoed, 1982).

Family Elapidae

Micrurus spixii (Cobra-coral-amazônica). PARÁ: Novo Progresso: Serra do Cachimbo, 30.vi.2002 (CHUNB 35062). This species is distributed in the Amazon and Orinoco Basins, except for the Guianan region (Campbell and Lamar, 2004). Previous records for Amazonian

Savannas are in Carajás, Pará (Cunha et al., 1985). Three other species of *Micrurus* occur in Amazonian Savannas of Pará, Roraima, and the Guianan region: *M. lemniscatus*, *M. surinamensis*, and a disjunct Amazonian population of *M. ibiboboca* (Cunha and Nascimento, 1980; Hoogmoed, 1982; Cunha et al., 1985; Cunha and Nascimento, 1993; Campbell and Lamar, 2004).

Family Colubridae

Chironius flavolineatus (Cobra-cipó). AMAZONAS: Humaitá, 09.xi.1991 (CHUNB 00217). AMAPÁ: Ferreira Gomes, 17.iv.1997 (CHUNB 00219). PARÁ: Novo Progresso: Serra do Cachimbo, 24.xi.2004 (CHUNB 40091). This species is distributed in northeastern and central Brazil, northeastern Paraguay, and central Bolivia (Dixon et al., 1993). Previous records for Amazonian Savannas are in Colli and Péres Jr. (1997) and Dixon (1993).

Clelia clelia (Mussurana). AMAZONAS: Humaitá, 05.xi.1991 (CHUNB 05782). This species ranges throughout Amazonia and Pantanal (Cunha and Nascimento, 1993; Strüssmann and Sazima, 1993). Previous records for Amazonian Savannas are in the Guianan region (Hoogmoed, 1982).

Clelia plumbea (Mussurana). RONDÔNIA: Vilhena, 1.xi.1998 (CHUNB 09673). This species is widely distributed in Amazonia, through open formations of central Brazil and Atlantic rainforest of southeastern and southern Brazil (Zaher, 1996). Previous records for Amazonian Savannas are in Marajó Island, Pará (Zaher, 1996).

Dipsas catesbyi (Dormideira). RONDÔNIA: Vilhena, 4.xi.1998 (CHUNB 09658). This species has a wide distribution in Amazonia (Peters and Orejas-Miranda, 1986; Cunha and Nascimento, 1993). We present the first record in Amazonian Savannas.

Drepanoides anomalous (Falsa-coral). PARÁ: Novo Progresso: Serra do Cachimbo, 29.xi.2004 (CHUNB 40090). This species is distributed throughout Amazonia (Bailey, 1986b; Cunha and Nascimento, 1993). We present the first record in Amazonian Savannas.

Drymarchon corais (Papa-pinto). AMAPÁ: Amapá, 03.vi.1997 (CHUNB 05599). RONDÔNIA: Pimenta Bueno, 17.vii.2000 and 18.viii.2000 (CHUNB 17497-99). This species ranges from the United States to northern Argentina (Peters and Orejas-Miranda, 1986). Previous records for Amazonian Savannas are in Roraima by Cunha and Nascimento (1980).

Drymoluber brazili (Cobra-cipó). RONDÔNIA: Vilhena, 21.ix.1999 (CHUNB 12791). This species is known only from southern, central, and northeastern Brazil (Peters and Orejas-Miranda, 1986; Nogueira, 2001; Argôlo, 2004). This is the first record for the state of Rondônia and the first in Amazonian Savannas.

Drymoluber dichrous (Cobra-cipó-cinza). PARÁ: Novo Progresso: Serra do Cachimbo, 30.vi.2002 (CHUNB 35062). This species is distributed in northern South America, in Amazonia, and northern Brazil in the Atlantic Forest (Peters and Orejas-Miranda, 1986; Cunha and Nascimento, 1993). Hoogmoed (1982), Cunha *et al.* (1985), and Cunha and Nascimento (1993) recorded this species only in forest or forest border for the Guianan region and Pará. We present the first record in Amazonian Savannas.

Helicops angulatus (Cobra-d'água). PARÁ: Monte Alegre, 29.xi.2002 (CHUNB 31186). RONDÔNIA: Pimenta Bueno, 3 and 21.vii.2000 (CHUNB 17482-84). This species has a wide distribution in South America (Rossman, 1986; Jorge da Silva and Sites, 1995). Hoogmoed (1982) recorded this species only in forested areas for the Guianan region. We present the first record in Amazonian Savannas.

Helicops leopardinus (Cobra-d'água). AMAPÁ: Tartarugalzinho, 21.iv.1997 (CHUNB 03758). This species is distributed throughout Amazonia (Rossman, 1986; Jorge da Silva and Sites, 1995). Previous records for Amazonian Savannas are in the Guianan region (Hoogmoed, 1982).

Helicops polylepis (Cobra-d'água). PARÁ: Monte Alegre, 29.xi.2002 (CHUNB 31178-84). This species is distributed throughout Amazonia (Rossman, 1986; Jorge da Silva and Sites, 1995). Hoogmoed (1982) recorded this species only in forested areas for the Guianan region. We present the first record in Amazonian Savannas.

Hydrodynastes gigas (Cobra d'água). AMAPÁ: Amapá, 17.iii.2000 (CHUNB 15159). This species has a wide distribution in South America (Cunha and Nascimento, 1993; Jorge da Silva and Sites, 1995). Previous records for Amazonian Savannas are in the Guianan region (Hoogmoed, 1982).

Leptodeira annulata (Dormideira). AMAPÁ: Tartarugalzinho, 01.iv.1997 (CHUNB 03719). AMAZONAS: Humaitá, 28.vii.2003 (CHUNB 33929). PARÁ: Monte Alegre, 06.xii.2002 (CHUNB 31170-77); Novo Progresso, Serra do Cachimbo, 19.ix.2003 (CHUNB 33924). RONDÔNIA: Pimenta Bueno, 9 and 29.viii.2000 (CHUNB 17488-89); Vilhena, 29.x.1998 and 2.xi.1999

(CHUNB 09657 and 09666). This species has a wide distribution in Mexico, and Central and South America (Peters and Orejas-Miranda, 1986). Previous records for Amazonian Savannas are in Roraima (Cunha and Nascimento, 1980) and the Guianan region (Hoogmoed, 1982).

Leptophis ahaetulla (Cobra-cipó). AMAPÁ: Amapá, 25.vii.1997 (CHUNB 22087). This species ranges from Mexico to Argentina (Cunha and Nascimento, 1980; Peters and Orejas-Miranda, 1986). Previous records for Amazonian Savannas are in Roraima (Cunha and Nascimento, 1980) and the Guianan region (Hoogmoed, 1982).

Liophis almadensis (Cobra-de-capim). RONDÔNIA: Pimenta Bueno, 21.vii.2000 and 8 and 19.viii.2000 (CHUNB 18347-50). This species ranges from the southern side of Rio Amazonas (Marajó Island) to Rio Grande do Sul in Brazil, and south of the Paraguayan Chaco (Dixon, 1991). This is the first record for the state of Rondônia. Previous records for Amazonian Savannas are in Marajó Island, Pará (Dixon, 1991).

Liophis carajasensis (Cobra-de-capim). PARÁ: Parauapebas: Serra dos Carajás, 12-13.vii.1992 (CHUNB 13802-5). This species is known only from the type locality, a rocky field in Serra Norte, Carajás, Pará (Cunha *et al.*, 1985; Dixon, 1989).

Liophis cobellus (Cobra-de-capim). AMAPÁ: Tartarugalzinho, 30.iv.1997 (CHUNB 03845). This species occurs from northern South America in Amazonia, to the Caatinga and northern portion of the Cerrado (Dixon, 1989; Cunha and Nascimento, 1993). Previous records for Amazonian Savannas are in Amapá and Pará (Cunha and Nascimento, 1993), and the Guianan region (Hoogmoed, 1982).

Liophis longiventris (Cobra-de-capim). RONDÔNIA: Pimenta Bueno, 28.vii.2000 (CHUNB 18363); Vilhena, 9.xi.1998 and 9.ix.1999 (CHUNB 12786). Known only from Rio Manjuro, Amazonas and an unknown locality in Mato Grosso (Dixon, 1989). The locality Rio Manjuro given by Dixon (1989) is probably in error. Dixon (1983) mentions Rió (sic) Manjuro in the species account (page 161) and also Rio Manjura in the Species Examined section (page 164). The correct locality is probably Rio Majuriã, a tributary of Rio Ituxi, Lábrea, Amazonas. This is the first record for the state of Rondônia and first in Amazonian Savannas.

Liophis meridionalis (Cobra-de-capim-listrada). PARÁ: Novo Progresso, Serra do Cachimbo, 4.vii.2002 (CHUNB 35061). This spe-

cies ranges from central Brazil and northern Bolivia southward to southern Paraguay, the northeastern tip of Argentina, and southeastern Brazil (Michaud and Dixon, 1987; Dixon, 1989). Previous records for Amazonian Savannas are in Bolivia (Michaud and Dixon, 1987).

Liophis poecilogyrus (Cobra-de-capim). AMAPÁ: Tartarugalzinho, 30.iv.1997 (CHUNB 21924). This species occurs from western Guyana and southern Venezuela to Bolivia, Brazil, Argentina, and Uruguay (Dixon and Markezich, 1992). Hoogmoed (1982) reported this species only in forested areas of the Guianan region. Previous records for Amazonian Savannas are in Roraima (Cunha and Nascimento, 1980).

Liophis reginae (Cobra-de-capim-verde). PARÁ: Novo Progresso: Serra do Cachimbo, 24.vi.2002 (CHUNB 35065). This species is restricted to cis-Andean South America, where it occurs in all countries except Chile and Uruguay. Its distribution extends from southern Brazil and northern Argentina to Trinidad and Venezuela (Dixon, 1983, 1989). Previous records for Amazonian Savannas are in the Guianan region (Hoogmoed, 1982).

Mastigodryas bifossatus (Jararacuçu-dobrejo). AMAPÁ: Amapá, 12.vii.1997 (CHUNB 03813). This species has a wide distribution in South America (Peters and Orejas-Miranda, 1986; Cunha and Nascimento, 1993). Previous records for Amazonian Savannas are in the Guianan region (Hoogmoed, 1982). This is the first record for the state of Amapá.

Mastigodryas boddaerti (Cobra-cipó). AMAZONAS: Humaitá, 24.vii.2003 (CHUNB 33929). PARÁ: Novo Progresso: Serra do Cachimbo, 4.vii.2002 (CHUNB 35063), 21.ix.2003 (CHUNB 33923). This species has a wide distribution in Amazonia and the northern portion of the Cerrado (Peters and Orejas-Miranda, 1986; Cunha and Nascimento, 1993). Previous records for Amazonian Savannas are in Pará (Cunha and Nascimento, 1993) and the Guianan region (Hoogmoed, 1982).

Mastigodryas pleei (Cobra-cipó). PARÁ: Monte Alegre, 30.xi.2002 (CHUNB 31188). This species is distributed in arid parts of Panama, Colombia, Venezuela, and Margarita and Testigos Islands (Peters and Orejas-Miranda, 1986). Ours are the first records for Brazil.

Oxybelis aeneus (Cobra-cipó-bicuda). RONDÔNIA: Vilhena, 21.viii.1999 (CHUNB 12790). RORAIMA: Boa Vista, 18.ix.1992 (CHUNB 06649). This species has a wide distribution in

Mexico, and Central and South America (Peters and Orejas-Miranda, 1986). Previous records for Amazonian Savannas are in Roraima (Cunha and Nascimento, 1980) and the Guianan region (Hoogmoed, 1982).

Oxyrhopus melanogenys (Falsa-coral). RONDÔNIA: Guajará-Mirim, 10.i.2001 (CHUNB 22000); Pimenta Bueno, 5.vii.2000 (CHUNB 18364). This species has a wide distribution in Amazonia (Bailey, 1986a). Previous records for Amazonian Savannas are in Pará (Cunha and Nascimento, 1993).

Oxyrhopus rhombifer (Falsa-coral). AMAZONAS: Humaitá, 05.xi.1991 (CHUNB 05777-9). The species ranges from the Amazon River southward, in the state of Pará, Brazil, to central Argentina (Bailey, 1986a). These records are the first for the state of Amazonas and the first in Amazonian Savannas.

Philodryas olfersii (Cobra-cipó-verde). AMAPÁ: Amapá, 22.vi.1997 (CHUNB 03750); Ferreira Gomes, 05.iv.1997 (CHUNB 03626); Macapá, 22.ix.1991 (CHUNB 12797); Tartarugalzinho, 01.iv.1997 (CHUNB 03625). PARÁ: Novo Progresso: Serra do Cachimbo, 01.iii.1995 (CHUNB 09696). RONDÔNIA: Vilhena, 6 and 10.xi.1998 and 15.ix.1999 (CHUNB 09660, 09665, and 12788). This species is widely distributed in South America (Thomas, 1976; Peters and Orejas-Miranda, 1986). Previous records for the Amazonian drainage are in Santarém, Pará (Thomas, 1976) and French Guiana (Gasc and Rodrigues, 1980; Hoogmoed, 1982). The present records are the first for the state of Amapá.

Philodryas patagoniensis (Corre-campo). PARÁ: Santarém: Alter do Chão, 23.viii.1992 (CHUNB 06665). This species ranges from central Brazil to Argentina (Thomas, 1976; Nogueira, 2001). We present the first record in Amazonian Savannas and for the state of Pará, extending the range 1251 km NW of the nearest reported locality, Jalapão State Park, Tocantins (Vitt et al., 2002; Vitt et al., 2005).

Phimophis guerini (Nariguda). AMAZONAS: Humaitá, 28.vii.2003 (CHUNB 33929). This species occurs from northeastern Brazil to Argentina (Bailey, 1986d). This record is the first for Amazonas, and extends the range 1131 km N of the nearest reported locality, Cuiabá, Mato Grosso (Carvalho and Nogueira, 1998).

Phimophis guianensis (Nariguda). AMAPÁ: Amapá, 22.vii.1997 (CHUNB 03824-5); Tartarugalzinho, 02.v.1997 (CHUNB 03826). PARÁ: Monte Alegre, 29.xi.2002 (CHUNB 33929). Pre-

vious records in South America in French Guiana, Guyana, Suriname, and Venezuela (Dunn, 1944; Gasc and Rodrigues, 1980; Hoogmoed, 1982; Bailey, 1986d; Gorzula and Señaris, 1998). Our records agree with Gasc and Rodrigues (1980) that this species is restricted to Amazonian Savannas. The record from Monte Alegre extends the range 850 km S of Pirara Savanna in Guyana (Gorzula and Señaris, 1998). Ours are the first records for Brazil.

Pseudoboa nigra (Mussurana). RONDÔNIA: Guajará-Mirim, 14.i.2001 (CHUNB 22030). PARÁ: Novo Progresso: Serra do Cachimbo, 22.xi.2004 (CHUNB 40096). This species ranges in northeastern and central Brazil, and in northern Argentina (Bailey, 1986c). A previous record for Amazonian Savannas is from Carajás, Pará (Cunha et al., 1985).

Psomophis joberti (Cobra-de-capim). PARÁ: Parauapebas: Carajás. 29.vii.1992 (CHUNB 13766). This species is distributed in central and northeastern Brazil, with a disjunct population in Marajó Island, Pará (Myers and Cadle, 1994).

Rhinobothrium lentiginosum (Falsa-coral). RONDÔNIA: Vilhena, 21.viii.1999 (CHUNB 12790). This species has a wide distribution in Amazonia (Peters and Orejas-Miranda, 1986; Cunha and Nascimento, 1993). We present the first record in open areas of Amazonian Savannas.

Taeniophallus occipitalis (Cobra-corredeira). AMAZONAS: Humaitá, 28–30.vii.2003 (CHUNB 33916; 339117). PARÁ: Novo Progresso: Serra do Cachimbo, 23.ix.2003 (CHUNB 33920). RONDÔNIA: Pimenta Bueno, 9 and 19.vii.2000 (CHUNB 17485-487). This species ranges throughout the lowlands of South America in Peru, Bolivia, Argentina, Uruguay, and Brazil (Di-Bernardo, 1992; Cunha and Nascimento, 1993; Myers and Cadle, 1994). We present the first record in Amazonian Savannas and the first record for the state of Amazonas, which extends the range 260 km N of the nearest locality in Amazonia, Porto Velho, Rondônia (Jorge da Silva and Sites, 1995).

Tantilla melanocephala (Falsa-coral). AMAPÁ: Tartarugalzinho, 30.iv.1997 (CHUNB 03885, 03900). PARÁ: Monte Alegre, 04.xii.2002 (CHUNB 31187). RONDÔNIA: Vilhena, 28.x.1998, 3 and 10.xi.1998 and 1.ix.1999 (CHUNB 09659, 09661, 09664, and 12787). This species is widely distributed in Central and South America (Peters and Orejas-Miranda, 1986; Cunha and Nascimento, 1993). Previous records for Amazonian Savannas are in the Guianan region (Hoogmoed, 1982).

Thamnodynastes pallidus (Cobra-do-mato). AMAPÁ: Ferreira Gomes, 01.iv.1997 (CHUNB 03860). This species is distributed in eastern Amazonia and Costal Guiana (Franco and Ferreira, 2002). Previous records for Amazonian Savannas are in the Guianan region (Hoogmoed, 1982).

Waglerophis merremii (Boipeva). PARÁ: Parauapebas: Serra dos Carajás, 08.vii.1986 (CHUNB 05886). This species is distributed in central and southern South America and the Guianan region, excluding Amazonia (Hoogmoed, 1982; Peters and Orejas-Miranda, 1986). Hoogmoed (1982) recorded this species only in the forested areas of the Guianan region. We present the first record in Amazonian Savannas.

Xenodon rabdocephalus (Falsa-jararaca). AMAPÁ: Tartarugalzinho, 25–27.iv.1997 (CHUNB 03918, 03936). RONDÔNIA: Guajará-Mirim, 21.i.2001 (CHUNB 22033). This species is widely distributed in Central America and northern South America (Peters and Orejas-Miranda, 1986; Cunha and Nascimento, 1993). Previous records for Amazonian Savannas are in Pará (Cunha and Nascimento, 1993).

DISCUSSION

Literature data and our records indicate that at least 79 species of snakes occur in Amazonian Savanna enclaves. Among them, 21 species (26.6%) are widely distributed in Brazil, and 19 (24.1%) occur throughout Amazonia. Fifteen species (18.9%) occur in other Brazilian open biomes, like the Caatinga and Cerrado, with disjunct populations in Amazonian Savannas: *Bothrops mattogrossensis*, *Chironius flavolineatus*, *C. quadricarinatus*, *Crotalus durissus*, *Drymoluber brazili*, *Helicops leopardinus*, *Liophis meridionalis*, *M. spixii*, *Oxyrhopus rhombifer*, *Philodryas olfersii*, *P. patagoniensis*, *Phimophis guerini*, *Pseudoboa nigra*, *Psomophis joberti*, and *Xenopholis undulatus*. Another five species (6.3%) are restricted to Amazonian Savanna enclaves: *Atractus riveroi*, *Bothrops marajoensis*, *Liophis carajasensis*, *Phimophis guianensis*, and *Thamnodynastes chimanta*. The level of endemism in Amazonian Savannas, considering only species restricted to these habitats, is comparable to the Cerrado, which reaches 10% (Colli et al., 2002), but considering species from other open formations of South America, with disjunct populations in Amazonian Savannas, endemism can reach 28%. We present a checklist of 48 snake species belonging to three families collected in

Amazonian Savannas and housed in the CHUNB. Among them, 25 species have wide distributions and likely range throughout Amazonia. Four species represent the first record in Amapá (*Eunectes deschauenseei*, *Mastigodryas bifossatus*, *Philodryas olfersii*, and *Phimophis guianensis*), three in Amazonas (*Oxyrhopus rhombifer*, *Phimophis guerini*, and *Taeniophallus occipitalis*), three in Pará (*Mastigodryas pleei*, *Phimophis guianensis*, and *Philodryas patagoniensis*), and three in Rondônia (*Drymoluber brazili*, *Liophis almadensis* and *Liophis longiventris*). *Mastigodryas pleei* and *Phimophis guianensis* are recorded for the first time in Brazil. We present the first record in Amazonian Savannas for 13 species (*Typhlops reticulatus*, *Bothrops brazili*, *Dipsas catesbyi*, *Drymoluber brazili*, *D. dichrous*, *Helicops angulatus*, *H. polyleps*, *Liophis longiventris*, *Oxyrhopus rhombifer*, *Philodryas patagoniensis*, *Rhinobothrium lentiginosum*, *Taeniophallus occipitalis*, and *Waglerophis merremii*). Some species that have been recognized as strictly forest dwellers, like *Bothrops brazili*, *Dipsas catesbyi*, and *Rhinobothrium lentiginosum*, were found in open areas of Amazonian Savannas. This indicates that these species tolerate and occasionally use these open habitats.

Ten species occur only in northern Amazonia and are found mainly in savannas of the Guianan region (Hoogmoed, 1982), with the exception of *Sibon nebulata*, which is found in the Brazilian savannas of Roraima, and *Phimophis guianensis*, which is found in Amapá and Pará. The colubines *Chironius carinatus*, *C. fuscus*, *Drymoluber dichrous*, and *Pseudoboa coronata* are forest dwellers that range through Amazonia and in the Atlantic Rainforest. The water snakes *Helicops leopardinus*, *H. polyleps*, and *Hydrops triangularis* are ecologically restricted to the courses of main rivers in the Amazon basin. The colubrid *Psomophis joberti* and *Chironius quadricarinatus* are widely distributed in Cerrado, with isolated populations in Marajó Island and Roraima, respectively (Vitt, L. J., pers. comm.; Nascimento et al., 1991). Five other species are known from only one or a few localities and/or specimens. These species occur in three places: Venezuela in the Guianan region (*Bothriopsis medusa*, *Atractus riveroi*, and *Thamnodynastes chimanta*), Marajó Island (*Bothrops marajoensis*), and Carajás (*Liophis carajasensis*).

Of the 40 species recorded by Hoogmoed (1982) for the Guianan savannas, 19 also occur in Brazilian Amazonian Savannas. We recorded six

species in Amazonian Savannas that Hoogmoed (1982) considered strictly forest species: *Typhlops reticulatus*, *Bothrops brazili*, *Helicops angulatus*, *H. polylepis*, *Liophis poecilogyrus*, and *Xenodon rabdocephalus*. In addition, we recorded seven species in Amazonian Savannas previously reported only from forest habitats in Carajás (Cunha et al., 1985): *Bothrops brazili*, *Dipsas catesbyi*, *Leptophis ahaetulla*, *Liophis reginae*, *Mastigodryas bifossatus*, *Rhinobothrium lentiginosum*, and *Taeniophallus occipitalis*.

Not considering widespread species, aquatic species that follow courses of main rivers, and species with unique distributions, there are two major groups of Amazonian Savanna snakes, those occurring only in southern Amazonia enclaves (35.3% of 34 savanna snake species) and those from northern Amazonia (38.2%). This dichotomy was also found in lizards that inhabit these open formations (Ávila-Pires, 1995). This pattern does not support the hypothesis that savannas spread throughout the entire Amazonian region in recent times (Whitmore and Prance, 1987). Probably the southern enclaves from Amazonas, Pará, and Rondônia have been recently connected to the core area of the Cerrado, as indicated by the many species shared among these areas.

Amazonian Savanna enclaves are still poorly known but harbor a rich snake fauna, including several endemic species. Because our study is preliminary, additional sampling efforts will likely expand our list and reveal more endemics. With the expansion of soybean agriculture in Amazonia (Carvalho, 1999), many of these areas are rapidly disappearing. The most protected Amazonian Savannas in the Brazilian territory are in Amapá, but less than 2% of these areas are protected in conservation units in the state (Cavalcanti, 1995) and less than 3% are protected in the whole country (Albernaz, 2004). Our results highlight their biological significance and the urgency of their preservation.

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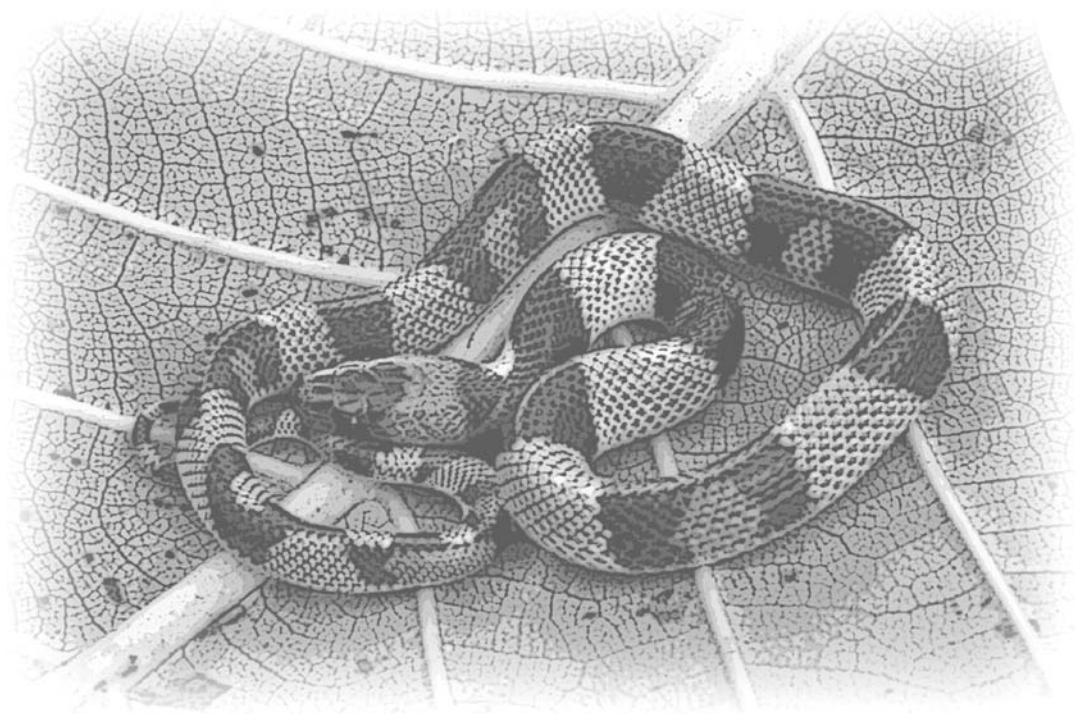
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