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Composition and natural history of snakes from Zona da Mata in Rondônia, southwestern Brazilian Amazon

Luiz Carlos Batista Turci

Universidade Federal de Rondônia, Departamento de Engenharia de Pesca, Rua da Paz, 4376, Lino Alves Teixeira, 76916-000, Presidente Médici, Rondônia, Brazil, luiz.carlos@unir.br

Paulo Sérgio Bernarde

Universidade Federal do Acre, Laboratório de Herpetologia, Rua. Estrada da Canela fina, Km 12, Gleba Formoso, São Francisco, 69980-000, Cruzeiro do Sul, Acre, Brazil.

Abstract: This study presents an account on the snake assemblage and its natural history in the state of Rondônia. Data collection was carried out between January and December 2018. The surveys were done through time constrained searches, pitfall traps, and occasional encounters. A total of 155 snakes corresponding to 60 species were recorded, of which 12 species were registered for the first time in the Zona da Mata region, including new records for the state of Rondônia (*Lygophis meridionalis* and *Atractus pantostictus*). The most abundant species was the Common Lancehead (*Bothrops atrox*). Active snakes were most frequently observed on the ground (63.22%). Lizards were the nost frequent prey consumed by snakes (45% of species). Snake richness can still be considered underestimated, highlighting the need of new studies.

Keywords: Squamata, herpetofauna, snakes, Rondônia.

Composição e história natural de serpentes da Zona da Mata, Rondônia, sudoeste da Amazônia brasileira

Resumo: Este estudo apresenta a composição de espécies e também aponta dados sobre a história natural de serpentes em Rondônia. As coletas de dados compreendeu o período entre janeiro e dezembro de 2018. Amostramos as serpentes usando o método de procura visual limitada pelo tempo, armadilhas de interceptação e queda e encontros ocasionais. Registramos 155 serpentes pertencentes a 60 espécies, com 12 espécies registradas pela primeira vez para região da zona da mata e dois novos registros para o Estado de Rondônia (*Lygophis meridionalis* e *Atractus pantostictus*). A espécie mais abundante foi a jaracaca-da-Amazônia (*Bothrops atrox*). As serpentes em atividade foram mais frequentemente observadas no chão (63,22%). As presas mais comuns registradas são lagartos (45% das espécies). A riqueza de serpentes ainda pode ser considerada subestimada, apontando a necessidades de novas pesquisas.

Palavras-chave: Squamata, herpetofauna, serpentes, Rondônia.

Introduction

The Amazon is the largest tropical forest worldwide, with the greatest biological diversity on the planet (Myers et al., 2000; Capobianco 2002). Its diversity is attributed to several ecological factors and environmental heterogeneity (Duellman 1978; Myers et al., 2000).

Currently, there are 430 species of snakes known from the Brazilian territory, of which approximately 235 occur in the Amazon (Costa et al., 2021).The studies on the Amazonian snake assemblies were carried out in the states of Amazonas (Zimmerman & Rodrigues 1990; Martins & Oliveira 1998; Ávila-Pires et al., 2009; Prudente et al., 2010; Masseli et al., 2019), Rondônia (Jorge-da-Silva Jr. 1993; Bernarde & Abe, 2006, 2010; Ávila-Pires et al., 2009), and Pará (Nascimento et al., 1987, Cunha & Nascimento, 1993; Frota, 2004; Frota et al., 2005; Avila-Pires et al., 2009; Santos-Costa et al., 2015; Rodrigues et al., 2015).

In the last decade, there was an increase in the number of studies on Amazonian snakes (Prudente et al., 2010; Fraga et al., 2011; Waldez et al., 2013; Rodrigues et al., 2015; Vaz-Silva et al., 2015; França et al., 2017; Freitas et al., 2017; Fraga et al., 2017). However, there is still a lack of information on the natural history of most of these species (Santos-Costa et al., 2015; França et al., 2017), and several locations are either under sampled or not sampled at all (Avila-Pires et al., 2007). The great territorial extension of the Amazon is one of the main factors that contributes to this situation (Avila-Pires et al., 2010). Furthermore, new snake species are frequently discovered in this biome (Bernarde et al., 2018), along with new records of geographic distribution (Turci et al., 2019).

In Rondônia, at the southwestern part of the Brazilian Amazon pioneer studies with reptiles (snakes) were associated to major human constructions of this developing state, principally the national route BR-364 (Amaral, 1948; Vanzolini, 1986; Nascimento et al., 1988) and the filling of the lake of the Samuel Hydroelectric Dam in Candeias do Jamari (Jorge-da-Silva, 1993). In addition, rapid ecological inventories were carried out in Pimenta Bueno by Yuki et al. (1999) and in Costa Marques by Brandão (2002). Bernarde & Abe (2006) presented a study on the snake assembly in the municipality of Espigão do Oeste. Besides, Turci & Bernarde (2008) made an herpetological survey in the municipality of Cacoal. Avila-Pires et al. (2009) elaborated a list of reptiles with collection points in Guajará-Mirim, and more recently Ferrão et al. (2012) presented a list of reptiles for Alto Alegre dos Parecis municipality. Currently, a total of 120 species of snakes are known for the state of Rondônia (Bernarde et al., 2012; Bernarde et al., 2018; Turci et al., 2019).

Regarding their natural history, snakes are an important group, being a valuable source of data for evolutionary and ecological studies (Greene, 1997). As predators, they are important for maintaining ecosystem balance due to their broad prey range (Greene, 1997; Martins & Oliveira, 1998; Santos-Costa et al., 2015). Since deforestation in the Amazon causes a decrease in the number of amphibians and lizards (Bernarde & Macedo, 2008; Macedo et al., 2008), snakes are likely to be affected as these groups constitute they their main prey items (Martins & Oliveira, 1998; Bernarde & Abe, 2006). In addition, highly specialized tree snakes are directly imperiled by forest destruction (Lillywhite & Henderson, 1993).

Forested areas are disappearing at an alarming rate, and the main causes are the expansion of livestock and monocultures such as soybean and corn, along with logging (Fearnside, 2006; Ferreira et al., 2005; Nolte et al., 2013). According to Vogt et al. (2001), due to the intensity of deforestation, the state of Rondônia has been identified as a priority region for studies on herpetofauna. Those focused on snakes are considered of great importance and may contribute to the development of conservation strategies (Martins & Oliveira, 1998). In this sense, the present study provides information on the assemblage of species and some aspects of their ecology (seasonality, diel activity, substrate use, and diet) based on sureys in the Zona da Mata region, southwestern Amazon, in the state of Rondônia, Brazil.

Material and methods

Study area

Field samplings were carried out at the Chapadão do Paraíso farm (12.2716°S, 61.4359°W), located in the municipality of Alto Alegre dos Parecis, southeastern region of Rondônia, with an area of 3,900 hectares (Fig. 1).

The altitude of the region varies around 405 m, with annual precipitation of approximately 1,700 mm. The rainy season occurs from November to April and the dry season from May to October, and the average annual temperature is 25.5 °C. The predominant vegetation is the open ombrophilous forest, transitional areas between tropical forest and savanna, fragments of secondary vegetation, and deforested areas (pasture)are present Ab'Saber, 1977; Vanzolini, 1986).

Data collection

The study comprised a period of 12 months, from January to December 2018. The sampling effort consisted of 10 field days each month, totaling 120 days of fieldwork for the snake records.

Time constrained searches and pitfall traps were implemented, and also occasional encounters were recorded simultaneously. The sampling effort on time constrained search consisted of 960 hours, of which 720 hours were at night (7 pm - 10 pm) and 240 hours during the day (7 am - 10 am). The traps were installed in

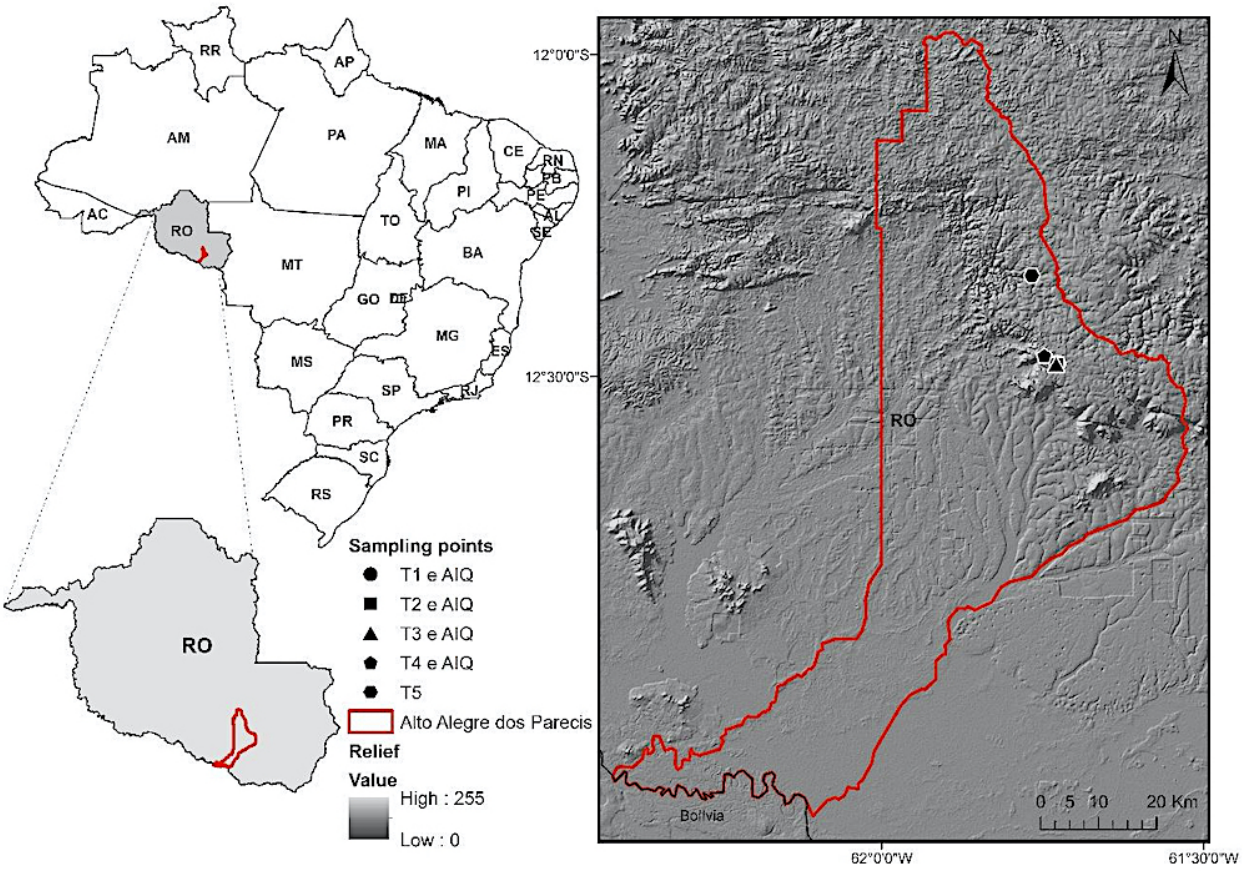

Fig. 1. Location of the study area. T = main trails; PTWDF (pitfall traps with drift fences), municipality of Alto Alegre dos Parecis, state of Rondônia, Brazil.

the forest, in firm ground, at least 100 meters apart. Ten lines of traps were used, each containing four 100-liter buckets, ten meters apart, interconnected by a one-meter-high black canvas, which remained open for 120 days, 10 days in each month of fieldwork. The sampling effort covered all visually accessible microenvironments, with two people performing the activities each month.

The collected specimens (SISBIO license n. 12178-14) were deposited in the Federal University of Rondônia (UNIR), located in the municipality of Presidente Médici, Rondônia.

For snake diet information, collected specimens were dissected through an incision in the ventral region. Food items were identified to the lowest possible taxonomic rank using taxonomic keys, identification guides, specimens deposited in scientific collections and consultation with experts. We are not aware whether the prey could be ingested by the snake in the pit fall trap (Cechin & Martins, 2000), but items that are not considered in the usual diet were not included in the analyses. Additional snake diet informations was based on published available data (Cunha & Nascimento, 1993; Martins & Oliveira, 1998; Bernarde & Abe, 2010; Rodrigues et al., 2015; Santos-Costa et al., 2015).

A Spearman correlation was performed to test a possible relation between the occurrence of snakes and rainfall. The collector curve was calculated to assess whether the assemblage was well sampled.

Results

A total of 155 specimens corresponding to 60 species were registered. They belong to eight families: Leptotyphlopidae (1), Typhlopidae (1), Aniliidae (1), Boidae (4), Colubridae (12), Dipsadidae (32), Elapidae (5), and Viperidae (4) (Fig.2 a 5). *Bothrops atrox* (Linnaeus, 1758) was the most commonly recorded species (9.67%), followed by *Leptodeira annulata* (Linnaeus, 1758) (5.16%), *Atractus albuquerquei* (Cunha e Nascimento, 1983) (5.16%), *Corallus hortulana* (Linnaeus, 1758) (4.51%), *Imantodes cenchoa* Linnaeus, 1758) (3.87%), *Chironius scurrulus* (Wagler, 1824) (3.22%), *Oxyrhopus petolarius* (Linnaeus, 1758) (3.22%), and *Spilotes pullatus* (Linnaeus, 1758) (3.22%). The ma-

jority of snakes (87 specimens) were recorded during time constrained search, followed by opportunistic encounters (49 specimens), and pitfall traps (19 specimens) (Tab. 1).

Through the time constrained search, we recorded the largest number of species (42), totalizing up to 70% of the richness. The encounter rate was 0.09 snake per man-hour (one snake every 11 hours of search). The highest encounter rate corresponded to the night period, with 0.097 snakes per man-hour (one snake every 10 hours and 20 min), followed by 0.070 du-

Fig. 2. Pictures of the snakes in this study. A. *Epictia albifrons*. B. *Amerotyphlops reticulatus*. C. *Anilius scytale*. D. *Boa constrictor*. E. *Corallus hortulana*. F. *Eunectes murinus*. G. *Chironius scurrulus*. H. *Drymarchon corais*. I. *Drymoluber dichrous*. J. *Drymoluber dichrous* (juvenile). K. *Leptophis ahaetulla*. L. *Mastigodryas boddaerti*.

ring daytime (one snake at every 14 h and 11 min).

A total of 17 species [*C. hortulana*, *Epicrates cenchria* (Linnaeus, 1758), *Drymoluber dichrous* (Peters, 1863), *Oxybelis aeneus* (Wagler in Spix, 1824), *Dipsas catesbyi* (Sentezen, 1796), *D. indica* (Laurenti, 1768), *Erythrolamprus taeniogaster* (Jan, 1863), *Erythrolamprus typhlus* (Linnaeus, 1758), *Helicops angulatus* (Linnaeus, 1758), *H. leopardinus* (Schlegel, 1837), *Imantodes lentiferus* (Cope, 1894),

Fig. 3. Pictures of the snakes in this study. A. *Phrynonax polylepis*. B. *Spilotes pullatus*. C. *Tantilla melanocephala*. D. *Atractus albuquerquei*. E. *Atractus latifrons*. F. *Atractus pantostictus*. G. *Atractus* sp. H. *Clelia clelia*. I. *Dipsas catesbyi*. J. *Dipsas indica*. K. *Drepanoides anomalus*. L. *Erythrolamprus almadensis*.

Oxyrhopus melanogenys (Tschudi, 1845), *O. vanidicus* (Lynch, 2009), *Philodryas argentea* (Daudin, 1803), *Siphlophis compressus* (Daudin, 1803), *Micrurus lemniscatus* (Linnaeus, 1758), and *M. surinamensis* (Cuvier, 1817)] were recorded exclusively by the time constrained searches. Opportunistic encounters accounted for 37 species (61.6% of total richness), 11 of

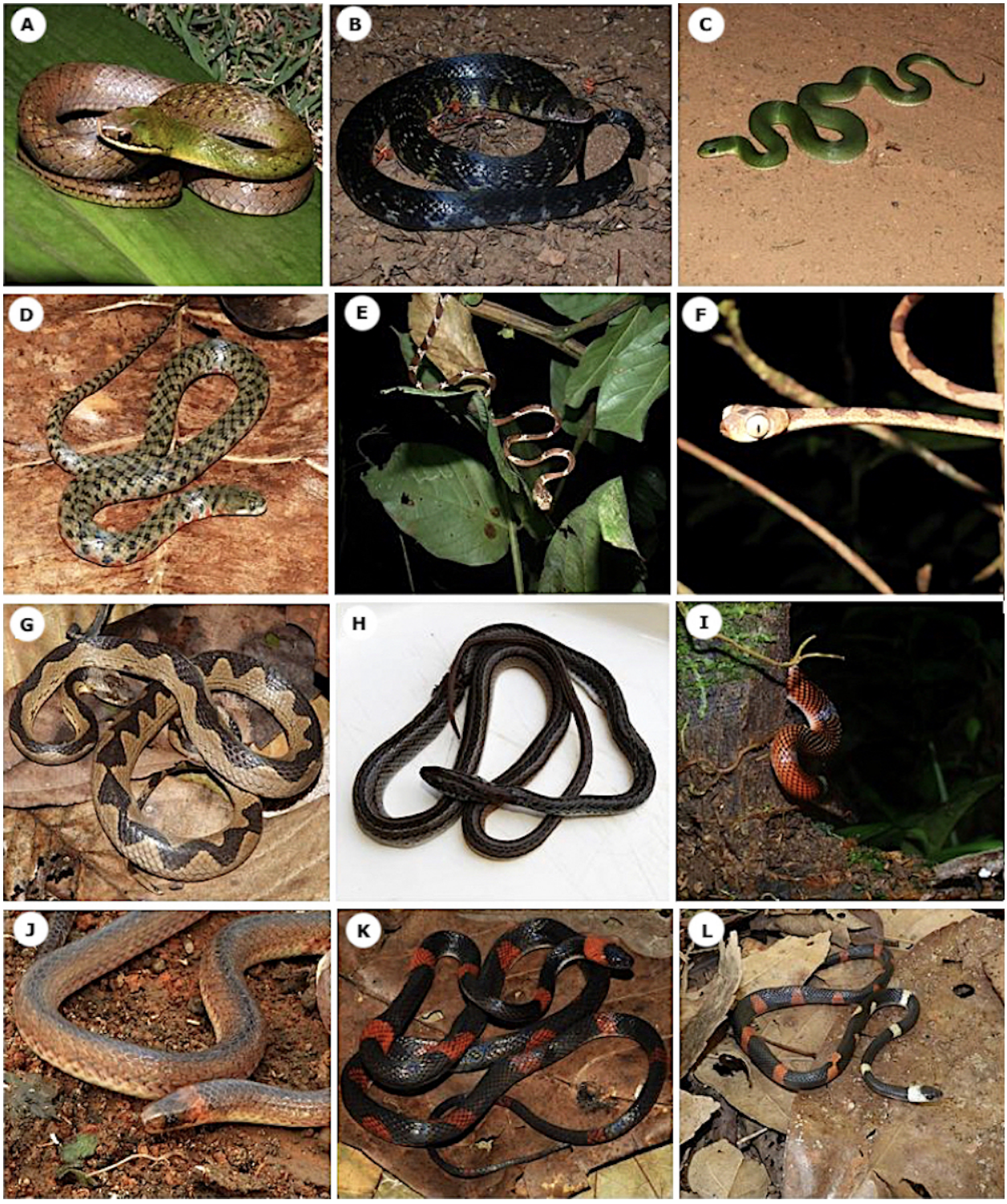

Fig. 4. Pictures of the snakes in this study. A. *Erythrolamprus reginae*. B. *Erythrolamprus taeniogaster*. C. *Erythrolamprus typhlus*. D. *Helicops leopardinus*. E. *Imantodes cenchoa*. F. *Imantodes lentiferus*. G. *Leptodeira annulata*. H. *Lygophis meridionalis*. I. *Oxyrhopus melanogenys.* J. *Oxyrhopus formosus*. K. *Oxyrhopus petolarius*. L. *O. petolarius* (juvenile).

which [*Epictia albifrons* (Wagler, 1824), *Amerotyphlops reticulatus* (Linnaeus, 1758), *Boa constrictor* (Linnaeus, 1758), *Eunectes murinus* (Linnaeus, 1758), *Oxybelis fulgidus* (Daudin, 1803), *Lygophis meridionalis* (Schenkel, 1901), *Siphlophis cervinus* (Laurenti, 1768), *Xenodon severus* (Linnaeus, 1758), *Micrurus spixii* (Wagler in Spix, 1824), *Bothrops brazili* (Hoge, 1954), and *Lachesis muta* (Linnaeus, 1766)] were registered exclusively by this method.

Fig. 5. Pictures of the snakes in this study. A. *Rhinobothryum lentiginosum*. B. *Siphlophis compressus*. C. *Taeniophallus occipitalis*. D. *Xenodon rabdocephalus rabdocephalus*. E. *Xenopholis scalaris*. F. *Micrurus boicora*. G. *Micrurus lemniscatus*. H. *Micrurus paraensis*. I. *Micrurus spixii*. J. *Micrurus surinamensis*. K. *Bothrops atrox* (juvenile). L. *B. atrox*.

Tab. 1. Snake species recorded in this study by each sampling method. Caption: NS: number of specimens; VSLT: time constrained search; PTWDF: pitfall traps with drift fences, and OE: occasional encounter.

Family / Species	NS	VSLT	PTWDF	OE
Leptotyphlopidae				
Epictia albifrons (Wagler, 1824)	1			1
Typhlopidae				
Amerotyphlops reticulatus (Linnaeus, 1758)	1			1
Aniliidae				
Anilius scytale (Linnaeus, 1758)	2	1		1
Boidae				
Boa constrictor (Linnaeus, 1758)	2			2
Corallus hortulana (Linnaeus, 1758)	7	7		
Eunectes murinus (Linnaeus, 1758)	2			2
Epicrates cenchria (Linnaeus, 1758)	2	1		1
Colubridae				
Chironius scurrulus (Wagler, 1824)	5	2		3
Chironius multiventris (Schmidt e Walker, 1943)	1	1		
Drymarchon corais (Boie, 1827)	2	1		1
Drymoluber dichrous (Peters, 1863)	2	1		1
Leptophis ahaetulla (Linnaeus, 1758)	2	1		1
Mastigodryas boddaerti (Sentzen, 1796)	2	1		1
Oxybelis aeneus (Wagler *in* Spix, 1824)	1	1		
Oxybelis fulgidus (Daudin, 1803)	1			1
Phrynonax polylepis (Peters, 1867)	1	1		
Rhinobothryum lentiginosum(Scopoli, 1785)	3	2	1	
Spilotes pullatus (Linnaeus, 1758)	5	3		2
Tantilla melanocephala (Linnaeus, 1758)	3		3	
Dipsadidae				
Atractus albuquerquei (Cunha e Nascimento, 1983)	8	5	2	1
Atractus latifrons (Günther, 1868)	4	1	2	1
Atractus pantostictus (Fernandes e Puorto, 1994)	1		1	
Atractus sp.	1		1	
Clelia clelia (Daudin, 1803)	3	2		1
Dipsas catesbyi (Sentezen, 1796)	2	2		
Dipsas indica (Laurenti, 1768)	2	2		
Drepanoides anomalus (Jan, 1863)	2		2	
Erythrolamprus almadensis (Wagler *in* Spix, 1824)	4	2	1	1
Erythrolamprus reginae (Linnaeus, 1758)	3	2		1
Erythrolamprus taeniogaster (Jan, 1863)	1	1		
Erythrolamprus typhlus (Linnaeus, 1758)	2	2		
Helicops angulatus (Linnaeus, 1758)	2	2		

Tab. 1 continuation...

Helicops leopardinus (Schlegel, 1837)	1	1		
Imantodes cenchoa (Linnaeus, 1758)	6	4		2
Imantodes lentiferus (Cope, 1894)	1	1		
Leptodeira annulata (Linnaeus, 1758)	8	6		2
Lygophis meridionalis (Schenkel, 1901)	1			1
Oxyrhopus melanogenys (Tschudi, 1845)	1	1		
Oxyrhopus formosus (Wied, 1820)	2		1	1
Oxyrhopus petolarius (Linnaeus, 1758)	5	3	1	1
Oxyrhopus vanidicus (Lynch, 2009)	2	2		
Philodryas argentea (Daudin, 1803)	2	2		
Philodryas olfersii (Liechtenstein, 1823)	2	1		1
Philodryas viridissima (Linnaeus, 1758)	2	1		1
Pseudoeryx plicatilis plicatilis (Linnaeus, 1758)	2	1		1
Siphlophis cervinus (Laurenti, 1768)	1			1
Siphlophis compressus (Daudin, 1803)	1	1		
Taeniophallus occipitalis (Jan, 1863)	2		2	
Xenodon rabdocephalus rabdocephalus (Wied, 1824)	3	1		2
Xenodon severus (Linnaeus, 1758)	1			1
Xenopholis scalaris (Wucherer, 1861)	3	2	1	
Elapidae				
Micrurus boicora (Bernarde, Turci, Abegg e Franco, 2018)	2		1	1
Micrurus lemniscatus (Linnaeus, 1758)	2	2		
*Micrurus paraensis (*Cunha e Nascimento, 1973)	2	1		1
*Micrurus spixii (*Wagler *in* Spix, 1824)	3			3
Micrurus surinamensis (Cuvier, 1817)	1	1		
Viperidae				
Bothrops atrox (Linnaeus, 1758)	15	11	1	3
Bothrops brazili (Hoge, 1954)	1			1
Bothrops mattogrossensis (Amaral, 1925)	2	1		1
Lachesis muta (Linnaeus, 1766)	1			1
Total of Richness	**60**	**42**	**13**	**37**
Total specimens	**155**	**87**	**19**	**49**

Through pitfall traps, 13 species were recorded (21.6% of the total richness), five of them [*Atractus pantostictus* (Fernandes e Puorto, 1994), *Atractus* sp., *Drepanoides anomalus* (Jan, 1863), *Taeniophallus occipitalis* (Jan, 1863), and *Tantilla melanocephala* (Linnaeus, 1758)] exclusively detected by this method (Tab. 1).

The species richness was analyzed in all methods, clustered through the species accumulation curve, in which trend towards stability was not observed. Consequently, it is highly likely that new species occur in the region (Fig. 6).

In this assembly, 46.6% of snakes are predominantly active during the day, 43.4% at

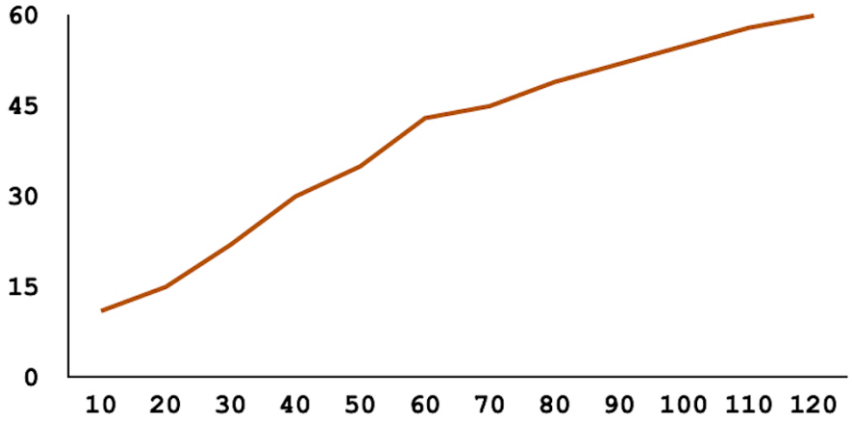

Fig. 6. Accumulated number of species by the three sampling methods: time constrained search, pitfall traps and records of opportunistic encounters.

night, and 10% in both periods. Active snakes were most frequently observed on the ground (63.22%) and in vegetation (27.09%). Seventeen snakes belonging to 12 species [*B. atrox*, *D. catesbyi*, *D. indica*, *D. dichrous*, *Erythrolamprus almadensis* (Wagler in Spix, 1824), *E. reginae* (Linnaeus, 1758), *E. typhlus*, *L. annulata*, *Leptophis ahaetulla* (Linnaeus, 1758), *O. aeneus*, *Philodryas viridissima* (Linnaeus, 1758), and *Rhinobothryum lentiginosum* (Scopoli, 1785)] were observed resting on the vegetation at night. Among the most abundant species, juveniles of *B. atrox* were observed in ambush hunting position on the vegetation (n = 4), and adult individuals were observed in ambush hunting foraging mode on the ground (n = 8). Seven specimens of *L. annulata* and five of Atractus albuquerquei were observed active on the ground during the night. Adult individuals of Chironius scurrulus (n = 5) were observed moving on the ground during the day, close to aquatic environments. The species *I. cenchoa*, *D. catesbyi*, and D. indica were observed moving over the vegetation at night. Regarding the habitat use, 63% of the snakes in this study were found on the ground, 31.6% presented arboreal activity, 15% fossorial and cryptic habits, and 11.6% were frequently observed associated with aquatic environments.

Twenty individuals of 15 species were observed to have stomach content. The most frequent prey observed were rodents (35%), followed by frogs (25%), and snakes (10%) (Tab. 2).

The frequency of prey (frogs, lizards, and small mammals) caught in the pitfall traps during the year, was higher in the rainy season (64%) in comparison to the dry season (36%) (Tab. 3).

Regarding the frequency of snake detection and the total rainfall in each month during the year, there was a positive correlation ($r_{spear-man}$= 0.636; t= 0.2016; p= 0.8443), in which it is possible to observe a higher number of snakes in periods of greater rainfall (Fig. 4).

Discussion

The species richness of snakes (60) presented in this study corresponds to approximately 25% of the species known in the Brazilian Amazon (Costa et al., 2021). This richness is within the expected range of snake assemblages according to other studies carried out in this biome (Martins & Oliveira, 1998; Cunha & Nascimento, 1993; Jorge-Silva Jr., 1993; Frota et al., 2005; Fraga et al., 2013). However, the accumulation curve indicates that more species could occur in this region. Similar to other studies in the Amazon (Duellman, 1978; Bernarde & Abe, 2006; Avila-Pires et al., 2009, França et al., 2017), our results also point out that long-term research is necessary for a better understanding of snake communities in a given locality.

Considering the snake diversity (120 spp.) in Rondônia, the data in the present study represents 50% of the richness cataloged for this state (Bernarde et al., 2012, 2018; Turci et al., 2019). The Zona da Mata region along with other municipalities, compose the Cacoal microregion in the state of Rondônia. In this microregion, 63 species of snakes are known (Bernarde et al., 2012). However, the records in the present study added 12 species to it (*O. aeneus*, *A. pantostictus*, *Clelia clelia* (Daudin, 1803), *Helicops leopardinus* (Schlegel, 1837), *I. lentiferus*, *L. meridionalis*, *Oxyrhopus formosus* (Wied, 1820), *P. viridissima*, *S. cervinus*, *Micrurus paraensis* (Cunha e Nascimento, 1973), *B. brazili*, and B. mattogrossensis). The occurrence of *A. pantostictus* represents a new record for the

Tab. 2. Stomach contents found in snakes (n = 100) in this study. Caption: N = amount of content recorded; Re = Regurgitation; (*): = Predation events observed.

Family / Species	N	Stomach content
Aniliidae		
Anilius scytale	1	Snake (*Atractus pantostictus*)
Boidae		
Boa constrictor	1	Mammal (*Dasyprocta aguti*) (*)
Eunectes murinus	1	Bird (*Numida meleagris*) (*)
Epicrates cenchria	1	Mammal (rodent)
Colubridae		
Chironius scurrulus	1	Frog(*Leptodactylus pentadactylus*)
Chironius scurrulus	1	Frog (*Leptodactylus* sp.)
Chironius scurrulus	1	Mammal (hair)
Dipsadidae		
Atractus latifrons	1	Earthworm
Dipsas catesbyi	1	Mollusk (snail)
Imantodes cenchoa	1	Lizard (*Norops fuscoauratus*)
Erythrolamprus taeniogaster	1	Frog (*Leptodactylus* sp.)
Erythrolamprus reginae	1	Frog (*Leptodactylus andreae*)
Oxyrhopus petolarius	1	Mammal (rodent)
Xenodon rabdocephalus	1	Toad (*Rhinella* sp.)
Elapidae		
Micrurus lemniscatus	1	Fish (*Synbranchus*)
Micrurus spixii	1	Snake (*Erythrolamprus almadensis*)
Viperidae		
Bothrops atrox	1	Mammal (rodent)
Bothrops atrox	1	Mammal (rodent)
Bothrops atrox	1	Mammal (rodent)
Bothrops atrox	2	Mammal (rodent)

Tab. 3. Number of potential prey (frogs, lizards, and small mammals) caught in pitfall traps during the dry and rainy season.

Prey↓ Season→	Dry season (331 mm)	Rainy season (1747 mm)
Anurans	223	469
Lizards	41	60
Small mammals	174	237
Total number	**438**	**766**

state of Rondônia. This new finding represents an extension of approximately 1,650 km of previous distribution record in the Jalapão region, state of Tocantins (Recoder et al., 2011).

Three registered snakes (*E. almadensis*, *L. meridionalis*, and Bothrops mattogrossensis), are species associated with savanna patches in the Amazon (França et al., 2006), suggesting that the region would be a ecotone between the Amazon rainforest and the Cerrado.

When compared to other studies with snakes carried out in the state, the present study showed a greater number of species. For instance, 56 species were found in the snake assembly of Espigão do Oeste by Bernarde & Abe (2006), 23 species studies conducted in Cacoal region by Turci & Bernarde (2008), and 26 species in Alto Alegre dos Parecis by Ferrão et al. (2012). This richness comprises 85.7% of the 70 species cataloged during faunal rescue work at the Samuel Hydroelectric Dam in Porto Velho by Jorge-Silva Jr. (1993).

Among the most frequent species detected by us, three (*B. atrox*, *L. annulata* and *I. cenchoa*) were also the most abundant snakes in other studies, corresponding to taxa with wide distribution in the Amazon region (Jorge-Silva Jr., 1993; Martins & Oliveira, 1998; Bernarde & Abe, 2006; Bernarde et al., 2011). The Common Lancehead (B. atrox) was the most abundant in the present study, as generally observed in works on Amazonian snakes (Martins & Oliveira, 1998; Oliveira & Martins, 2001; Bernarde & Abe, 2006; Turci et al., 2009). Also, it is the main responsible for human snakebites in the region (Roriz et al., 2018; Mota-da-Silva et al., 2019).

The higher frequency of encounters at night was also observed in most studies of snake assemblies in the Amazon (Martins & Oliveira, 1998; Bernarde & Abe, 2006; França & Venâncio, 2010; Waldez et al., 2013). However, the search effort of these studies was greater at night. This bias could be explained by the high probability of finding daytime snakes resting at night (Martins, 1993; Martins & Oliveira, 1998), the great number of cryptic species that are difficult to visualize during the day, and also the easier detection at night of species that present contrasting colors (Martins et al., 2008).

As expected, snakes caught by us in the pitfall traps (13 species), have predominantly fossorial, cryptozoic, or terrestrial habits, which confirm the particularity of this method in sampling species that move on the ground (Cechin & Martins, 2000; Ribeiro-Júnior et al., 2008). Five of these species (*T. melanocephala*, *A. pantostictus*, *Atractus* sp., *D. anomalus* and *T. occipitalis*) were caught exclusively by this method. The differential registration of some species by one technique highlights the importance of applying complementary methods when conducting studies on a snake assembly (Cechin & Martins, 2000; Martins & Oliveira, 1998; Ribeiro-Júnior et al., 2008; Waldez et al., 2013).

The studies conducted in the state of Rondônia at the Jaburi farm in Espigão do Oeste and at the Samuel Hydroelectric Dam in Candeias do Jamari presented great similarity with the present study, may be related to the greater proximity of these areas (Martins & Oliveira, 1998; Bernarde & Abe, 2006).

The use of substrates and the foraging activity of snakes in the present study were similar to that of other with Amazonian snakes (Martins & Oliveira, 1998; Bernarde & Abe, 2006). The observed tendency of active juveniles of *B. atrox* to use vegetation and adults to use the ground may be related to the availability of food (anurans) and the pressure of terrestrial predators (Oliveira & Martins, 2001; Turci et al., 2009). In the present study, 17 snakes from the families Colubridae, Dipsadidae, and Viperidae were observed resting in the vegetation at night, which can be interpreted as a strategy to avoid terrestrial predators (Martins, 1993; Martins & Oliveira, 1998; Bernarde & Abe, 2006).

Amazonian snakes show a tendency to feed on frogs and lizards, followed by mammals, birds, and other snakes (Martins & Oliveira, 1998; Bernarde & Abe, 2010; Rodrigues et al., 2015; Santos-Costa et al., 2015), as observed in this study.

Predation of *B. constrictor* on an agouti (*Dasyprocta aguti*, Linnaeus, 1766), was previously reported by Fraga et al. (2013) in the Manaus region. Rodents are among the main prey items in the diet of this generalist snake (Cunha & Nascimento, 1993; Martins & Oliveira, 1998; Bernarde & Abe, 2010; Rodrigues et al., 2015; Santos-Costa et al., 2015). A Green Anaconda (*E. murinus*) observed preying on a domestic bird (*Numida meleagris*, Linnaeus, 1758) is consistent with the diet of the species (Martins & Oliveira, 1998). Domestic animals, such as cattle and dogs in rural areas, can eventually be preyed upon by this snake (Bernarde & Abe, 2010).

In three specimens of *Chironius scurrulus*, two frogs (*Leptodactylus pentadactylus*) and rodent hair were observed in the stomach contents. Amphibians are known as prey for this species (Martins & Oliveira, 1998), and rodent hair was also observed for another species of the genus, *C. carinatus* by Silva et al. (2010). Anurans of the genus *Leptodactylus* observed in stomach contents of the species *Erythrolamprus taeniogaster* and *E. reginae*, and anurans of the genus *Rhinella* (frog) in *Xenodon rabdocephalus* (Wied, 1824) correspond to main items in the

diet of these species (Martins & Oliveira, 1998; Bernarde & Abe, 2010; Rodrigues et al., 2015). The specimen of *A. pantostictus* recorded in the stomach content of *Anilius scytale* (Linnaeus, 1758) corresponds to a new food item for this ophiophagous species (Martins & Oliveira, 1998; Turci & Bernarde, 2008). Rodents were observed in the stomachs of *E. cenchria* (juvenile), *O. petolarius* and *B. atrox* (n = 3 specimens), being these species well known small mammal predators (Martins & Oliveira, 1998; Bernarde & Machado, 2000; Bernarde & Abe, 2010). Rodents are among the main items in the diet of adults of B. atrox (Martins & Oliveira, 1998; Ferreira-Bisneto & Kaefer, 2019).

Studies on snakes in the Amazon showed a higher frequency of encounters during periods of greater rainfall (Henderson et al., 1978; Martins & Oliveira, 1998; Oliveira & Martins, 2001; Bernarde & Abe, 2006). We observed this trend, coincident with a period in which a greater abundance of potential prey was recorded, corroborating the idea that the high richness of snakes in the Amazon is probably related to high rainfall, air humidity, and availability of some prey like anurans and lizards (Henderson et al., 1978; Vitt, 1987; Martins & Oliveira, 1998; Oliveira & Martins, 2001; Bernarde & Abe, 2006).

Conclusion

The Zona da Mata region in the state of Rondônia presented a rich snake fauna, similar to previous studies. Our contribution added twelve new records for the region and two new for the state. The information presented on the natural history of the observed snakes can be used in the evaluation of their conservation strategies and also future ecological studies.

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