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Rapid inventory of anuran species in a national park of the Brazilian Amazon

Inventário rápido de espécies de anuros de um parque nacional da Amazônia Brasileira

Inventario rápido de especies de anuros de un parque nacional de la Amazonía Brasileña

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ABSTRACT
The present study conducted a rapid inventory of anuran fauna in the Montanhas do Tumucumaque National Park, in the Brazilian Amazon. The research was motivated by the need to expand knowledge about local biodiversity and support the development of conservation strategies. To achieve this, two sampling campaigns were carried out using the active/visual search method along four pre-established trails. Specimens were identified based on specialized

references, and the data were analyzed in terms of abundance, species richness, and spatial distribution patterns. A total of 30 species belonging to nine families were recorded, increasing the known number of species in the area to 66. The Hylidae family exhibited the highest richness and abundance. The spatial distribution of anurans revealed an aggregated pattern, suggesting that resource availability influences their distribution. Most species were recorded during the nighttime, corroborating patterns previously described for tropical anurans. The results indicate that PARNA Tumucumaque harbors a rich diversity of anurans, highlighting its importance for the conservation of Amazonian herpetofauna and biodiversity.

Keywords: Anurans, biodiversity, Amazon, conservation, rapid inventory.

RESUMO

O presente estudo realizou um inventário rápido da fauna de anuros no Parque Nacional Montanhas do Tumucumaque, na Amazônia Brasileira. A pesquisa foi motivada pela necessidade de ampliar o conhecimento sobre a biodiversidade local e auxiliar na formulação de estratégias de conservação. Para isso, foram conduzidas duas campanhas de coleta, utilizando o método de busca ativa/visual ao longo de quatro trilhas previamente estabelecidas. A identificação dos espécimes seguiu referências especializadas, e os dados foram analisados quanto à abundância, riqueza de espécies e padrões de distribuição espacial. Foram registradas 30 espécies pertencentes a nove famílias, aumentando para 66 o total conhecido na área. A família Hylidae apresentou a maior riqueza e abundância. A distribuição espacial dos anuros revelou um padrão agregado, sugerindo que a disponibilidade de recursos influencia sua distribuição. A maioria das espécies foi registrada durante o período noturno, corroborando padrões já descritos para anuros tropicais. Os resultados indicam que o PARNA Tumucumaque abriga uma rica diversidade de anuros, ressaltando sua importância para a conservação da herpetofauna e biodiversidade amazônica.

Palavras-chave: Anuros, biodiversidade, Amazônia, conservação, inventário rápido.

RESUMEN

El presente estudio realizó un inventario rápido de la fauna de anuros en el Parque Nacional Montañas do Tumucumaque, en la Amazonía brasileña. La investigación fue motivada por la necesidad de ampliar el conocimiento sobre la biodiversidad local y apoyar la formulación de estrategias de conservación. Para ello, se llevaron a cabo dos campañas de muestreo, utilizando el método de búsqueda activa/visual a lo largo de cuatro senderos previamente establecidos. La identificación de los especímenes se basó en referencias especializadas, y los datos fueron analizados en términos de abundancia, riqueza de especies y patrones de distribución espacial. Se registraron 30 especies pertenecientes a nueve familias, aumentando a 66 el total conocido en la zona. La familia Hylidae presentó la mayor riqueza y abundancia. La distribución espacial de los anuros reveló un patrón agregado, lo que sugiere que la disponibilidad de recursos influye en su distribución. La mayoría de las especies fueron registradas durante el período nocturno, corroborando patrones previamente descritos para anuros tropicales. Los resultados indican que el PARNA Tumucumaque alberga una rica diversidad de anuros, resaltando su importancia para la conservación de la herpetofauna y la biodiversidad amazónica.

Palabras clave: Anuros, biodiversidad, Amazonía, conservación, inventario rápido.

1 INTRODUCTION

The Amazon region houses the largest watershed and the largest tropical rainforest in the world, covering an estimated area between 6 and 8 million km², which corresponds to approximately 40% of the South American territory. It features a predominantly warm and humid climate, along with a wide variety of ecosystems, concentrating about 10% of the known species globally (Müller, 2020).

Located in the eastern portion of the Amazon, the Tumucumaque Mountains National Park (PARNA Tumucumaque) is the largest tropical rainforest park in the world, covering 3.8 million hectares and approximately 2,000 kilometers of perimeter. Created in 2002, its main objective is the preservation of natural resources and biodiversity, as well as promoting scientific research, environmental education, recreation, and ecological tourism. The park is part of the Amapá Biodiversity Corridor, enhancing connectivity between ecosystems and maintaining the genetic flows essential for the conservation of Amazonian fauna and flora (ICMBio, 2009).

Brazil has the largest amphibian diversity in the world, with 1,232 recorded species, of which approximately 600 occur in the Amazon basin (Lima *et al*., 2006; Segalla *et al*., 2021; Frost, 2025). In the state of Amapá, 111 species are cataloged (Taucce *et al*., 2022), while the PARNA Tumucumaque has records of 54 species, considering only those identified with precision (Lima *et al*., 2008).

Anurans are sensitive bioindicators of environmental changes and face threats such as habitat loss, agricultural activities, climate change, and emerging diseases. These factors contribute to sharp population declines, making the group one of the most vulnerable among vertebrates. In this context, understanding the diversity and distribution of these organisms is essential for planning conservation strategies (Dela-Torre; Nuneza, 2021; Kabanze *et al*., 2023; Tripathi *et al*., 2024).

Rapid biological inventory are essential tools for diagnosing biodiversity, especially in megadiverse and underexplored regions such as the Amazon. Limited access, low population density, logistical barriers, and environmental protection are some of the factors that restrict scientific exploration in this region. These studies enable efficient species recording in short periods, contributing to the characterization of local fauna, identification of distribution patterns, and estimation of species richness (Patrick *et al*., 2014; Barbosa *et al*., 2023).

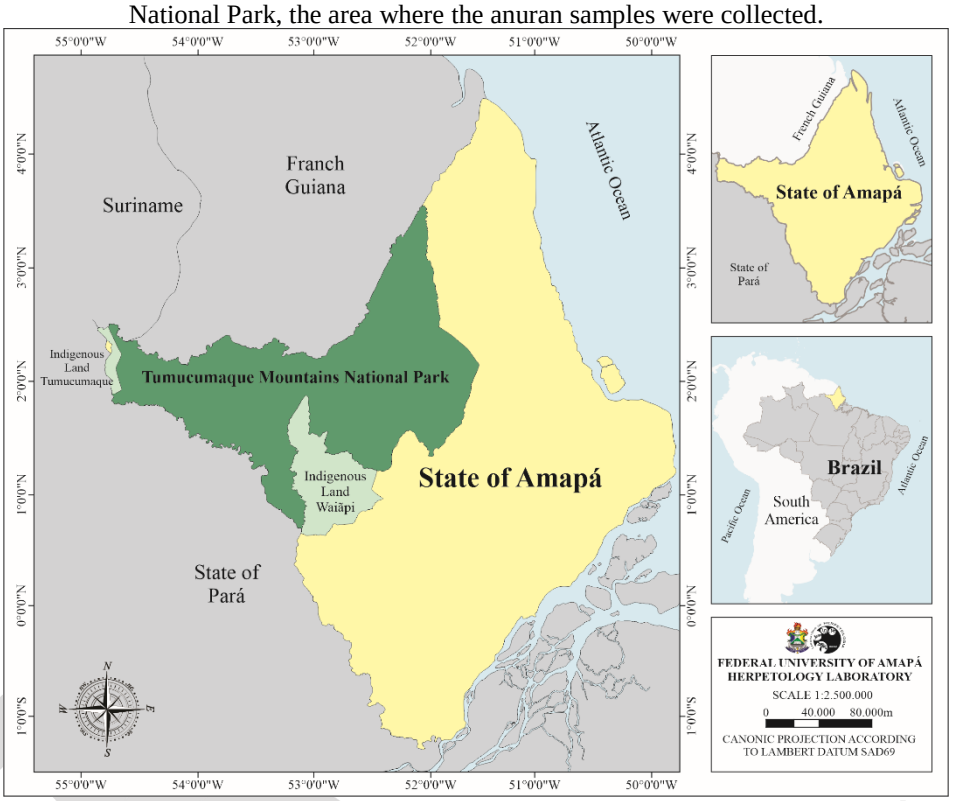
Anurans, a group sensitive to environmental changes, are important indicators of ecosystem health. In PARNA Tumucumaque, where the anuran fauna is poorly documented due to the park's size and difficult access, this study aims to expand knowledge about these species, fill gaps in understanding, and emphasize the importance of Amazonian biodiversity. Although its focus is on documenting the park's anuran fauna, the results may contribute to the formulation of conservation strategies for these species.

2 METHODOLOGY

2.1 STUDY AREA

PARNA Tumucumaque (Figure 1) is predominantly located in the state of Amapá (98.8%), with a small portion (1.2%) in the municipality of Almeirim, state of Pará. The park is characterized by vast areas of upland forests, with gently undulating to hilly terrain, interspersed with mountain ranges and rocky outcrops. The climate is equatorial, hot, and humid, with an average annual precipitation exceeding 2,500 mm. The fauna is highly diverse, housing endemic and threatened species (Bernard, 2008; ICMBio, 2009).

Figure 1 - Map of Brazil highlighting the state of Amapá and the location of the Tumucumaque Mountains National Park, the area where the anuran samples were collected.



Source: prepared by the authors.

2.2 SAMPLING

Two collection campaigns were conducted in the study area: the first in August 2022 and the second in May 2023. The anuran sampling followed the limit of 10 individuals per species and per campaign, as established by SISBIO license no. 83254-1, due to the area being located within a Strict Protection Conservation Unit. The specimens were manually captured using the active/visual search method along four pre-existing trails in the PARNA Tumucumaque (Trail I: 1°11.308'N/52°22.601'W; Trail II: 1°11.594'N/52°22.707'W; Trail III: 1°13.408'N/52°22.867'W; Trail IV: 1°15.574'N/52°26.761'W). After identification, based on specialized literature, the specimens were fixed and deposited in the teaching collection of the Herpetology Laboratory at the Federal University of Amapá.

Each trail was surveyed by three researchers over three kilometers, with searches conducted for three hours during the day and three hours at night, totaling 12 hours of sampling per trail in both campaigns. The sampling effort (SE) was calculated based on the total number of samples (NS), the duration of each sample (H), and the number of collectors per sample (C),

according to the equation: SE = NS × H × C. The capture index was determined by the ratio between the number of anurans collected and the standardized sampling effort across the sampled trails.

2.3 DATA ANALYSIS

The ecological attributes of the anuran amphibian community were analyzed based on absolute abundance (N) and species richness (S'). Species were categorized according to their habitat (arboreal or terrestrial) and activity period (diurnal or nocturnal) based on the observations recorded at the time of capture. The potential species richness was estimated using the rarefaction curve (Krebs, 1989) and the Jackknife 1 estimator (Heltshe; Forrester, 1983).

The variation in abundance among the four sampled trails was tested using the Kruskal-Wallis's variance analysis, with a significance level of 0.05 (Zar, 2010). This non-parametric test was chosen due to the nature of the data, which did not meet the assumptions of normality and homogeneity. The analysis was performed using Past 4.03 software (Hammer; Harper; Ryan, 2001).

To evaluate the spatial distribution pattern of species, the Dispersion Index (DI) was calculated. When equal to one, it indicates random distribution. Values lower than one suggest regular or uniform spatial arrangement, while values greater than one indicate aggregated distribution (Krebs, 1989). Additionally, the Green Index (GI) was used, which ranges from zero, indicating random distribution, to one, representing maximum aggregation (Green, 1966). This index allows for the evaluation of species aggregation intensity and comparison of distribution patterns among the sampled trails.

3 RESULTS AND DISCUSSIONS

The rapid biological survey of anurans in PARNA Tumucumaque was conducted with a sampling effort of 72 hours per collector. The number of captured individuals ranged from 28 (Trail II) to 56 (Trail IV), with the highest capture rates recorded on Trails III (0.72) and IV (0.78). Species richness was highest on Trail III, with 20 species, while the other trails had

between 12 and 13 species. The relationship between species counts and sampling effort followed the same pattern, with the highest value observed on Trail III (0.28) (Table 1).

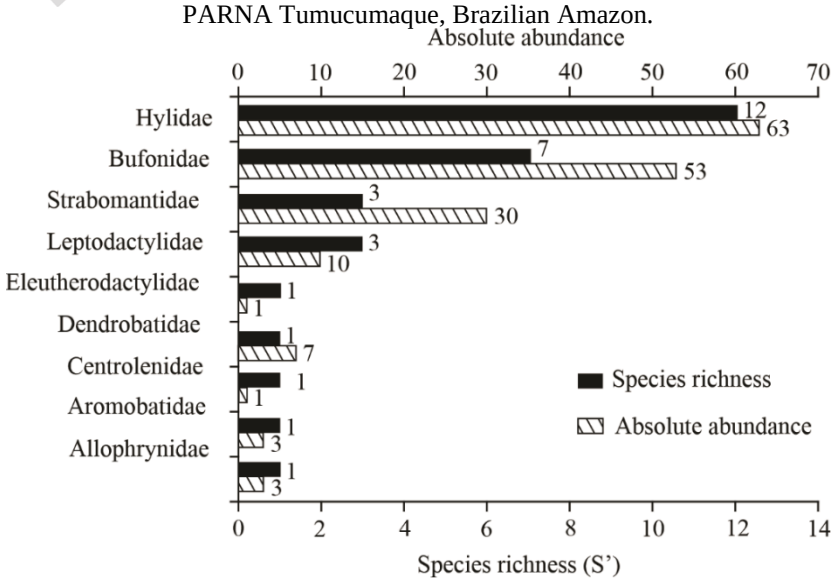
Table 1 - Sampling effort and capture indices of anurans recorded during two sampling campaigns of the rapid biological survey in PARNA Tumucumaque, Brazilian Amazon.

Sampling Effort	Locations			
	Trail I	Trail II	Trail III	Trail IV
Total campaigns	2	2	2	2
Total diurnal samplings	4	4	4	4
Total nocturnal samplings	4	4	4	4
Hours per sampling	3	3	3	3
Total hours per trail	24	24	24	24
Collectors per sampling	3	3	3	3
Distance travel per trail	3 km	3 km	3 km	3 km
Sampling effort (hours/collector)	72	72	72	72
Total captures (N)	35	28	52	56
Capture index	0.48	0.38	0.72	0.78
Species richness (S')	13	12	20	13
Species/effort	0.18	0.16	0.28	0.18

Source: prepared by the authors.

A total of 171 anuran specimens were collected, representing 30 species, nine families, and 17 genera. The family Hylidae exhibited the highest species richness and abundance, with 12 species (N=63), followed by Bufonidae with seven species (N=53), and Strabomantidae with three species (N=30). The distribution of species richness and family abundance is summarized in Figure 2.

Figure 2 - Species richness and absolute abundance by family of anurans from the rapid biological survey in PARNA Tumucumaque, Brazilian Amazon.



Source: prepared by the authors.

The most abundant species recorded in the study were *Osteocephalus oophagus* and *Rhinella lescurei*, both with 20 individuals collected (11.7%). Following them were *Pristimantis gutturalis* (N=15; 8.8%), *Atelopus hoogmoedi* (N=12; 7.0%), *Boana geographica* (N=11; 6.4%), and *Rhinella marina* (N=9; 5.3%). Only *Pristimantis gutturalis* and *Pristimantis zeuctotylus* were recorded in all sampled trails. None of the identified species are listed as being threatened by the IUCN (2025). Table 2 shows the list of species recorded in the rapid biological survey and their distribution across the sampled trails. The normality of the data was assessed and did not meet the assumptions of homoscedasticity. Therefore, the non-parametric Kruskal-Wallis test was applied, which indicated no significant differences between the trails (H=3.27; p=0.28).

Table 2 - List of anuran species collected in the rapid biological survey conducted in PARNA Tumucumaque, Brazilian Amazon. *Species recorded at all four sampling locations. Trail I: T-I; Trail II: T-II; Trail III: T-III; Trail IV: T-IV.

Taxa	Locations				Total	%
	T-I	T-II	T-III	T-IV		
Family Allophrynidae						
Allophryne ruthveni (Gaige, 1926)	3	–	–	–	3	1.8
Family Aromobatidae						
Allobates femoralis (Boulenger, 1884)	2	1	–	–	3	1.8
Family Bufonidae						
Amazophrynella teko (Rojas-Zamora *et al.*, 2018)	–	–	1	–	1	0.6
Atelopus hoogmoedi (Lescure, 1974)	–	–	2	10	12	7.0
Rhaebo guttatus (Schneider, 1799)	–	1	–	–	1	0.6
Rhinella castaneotica (Caldwell, 1991)	1	–	5	–	6	3.5
Rhinella lescurei (Fouquet, *et al*., 2007)	3	4	–	13	20	11.7
Rhinella margaritifera (Laurenti, 1768)	1	–	1	2	4	2.3
Rhinella marina (Linnaeus, 1758)	–	3	5	1	9	5.3
Family Centrolenidae						
Cochranella resplendens (Lynch & Duelaram, 1973)	–	–	1	–	1	0.6
Family Dendrobatidae						
Ameerega hahneli (Boulenger, 1884)	–	–	–	7	7	4.1
Family Eleutherodactylidae						
Adelophryne amapaensis (Taucce *et al*., 2020)	–	1	–	–	1	0.6
Family Hylidae						
Boana boans (Linnaeus, 1758)	–	–	4	–	4	2.3
Boana calcarata (Troschel, 1848)	1	–	4	–	5	2.9
Boana cinerascens (Spix, 1824)	–	1	1	–	2	1.2
Boana courtoisae (Fouquet *et al*., 2021)	–	–	1	1	2	1.2
Boana geographica (Spix, 1824)	3	–	8	–	11	6.4
Boana ornatissima (Noble, 1923)	–	–	1	–	1	0.6
Dendropsophus minusculus (Rivero, 1971)	–	–	–	3	3	1.8
Osteocephalus leprieurii (Duméril & Bibron, 1841)	4	–	1	3	8	4.7
Osteocephalus oophagus (Jungfer & Schiesari, 1995)	9	5	–	6	20	11.7
Osteocephalus taurinus (Steindachner, 1862)	3	–	1	–	4	2.3
Phyllomedusa vaillantii (Boulenger, 1882)	–	–	1	–	1	0.6
Trachycephalus resinifictrix (Goeldi, 1907)	–	1	1	–	2	1.2
Family Leptodactylidae						

Taxa	Locations				Total	%
	T-I	T-II	T-III	T-IV		
Adenomera andreae (Müller, 1923)	2	–	–	3	5	2.9
Leptodactylus pentadactylus (Laurenti, 1768)	–	3	1	–	4	2.3
Leptodactylus podicipinus (Cope, 1862)	–	–	–	1	1	0.6
Family Strabomantidae						
Pristimantis chiastonotus (Lynch & Hoogmoed, 1977)	0	2	6	0	8	4.7
Pristimantis gutturalis (Hoogmoed *et al*., 1977) *	2	4	4	5	15	8.8
Pristimantis zeuctotylus (Lynch & Hoogmoed, 1977) *	1	2	3	1	7	4.1

Source: prepared by the authors.

The standardized sampling effort of this study yielded a significant number compared to previous studies conducted in PARNA Tumucumaque. Lima (2008) recorded 54 species of anurans, but this total was obtained after five expeditions. On the other hand, Vasconcelos *et al*. (2022) identified 19 species in a single 11-day expedition. The combination of these surveys results in 59 species. The data presented in this study add seven different species to this list, bringing the total number of anurans recorded in the park to 66. The consolidated species list is summarized in Board 1.

Board 1 - List of anuran species recorded in PARNA Tumucumaque. The list includes species previously documented by Lima (2008) and Vasconcelos *et al*. (2022), as well as the new occurrences recorded in this study.

Taxa	Lima (2008)	Vasconcelos *et al*. (2022)	Estudo atual
Family Allophrynidae			
Allophryne ruthveni	X	X	X
Family Aromobatidae			
Allobates femoralis	X		X
Allobates marchesianus	X		
Anomaloglossus beebei	X		
Family Bufonidae			
Amazophrynella minuta	X		
Amazophrynella teko			X
Atelopus hoogmoedi		X	X
Atelopus spumarius	X		
Rhaebo guttatus	X	X	X
Rhinella castaneotica			X
Rhinella lescurei		X	X
Rhinella margaritifera	X	X	X
Rhinella marina	X		X
Family Centrolenidae			
Cochranella resplendens			X
Hyalinobatrachium taylori	X		
Vitreorana ritae	X		
Family Ceratophryidae			
Ceratophrys cornuta	X		
Family Dendrobatidae			
Ameerega hahneli	X		X
Dendrobates tinctorius	X		

Taxa	Lima (2008)	Vasconcelos *et al.* (2022)	Estudo atual
Family Eleutherodactylidae			
Adelophryne amapaensis		X	X
Family Hylidae			
Boana boans	X	X	X
Boana calcarata	X		X
Boana cinerascens			X
Boana courtoisae			X
Boana dentei	X		
Boana fasciata	X		
Boana geographica	X		X
Boana ornatissima	X		X
Callimedusa tomopterna	X		
Dendropsophus leucophyllatus	X		
Dendropsophus minusculus	X		X
Hylomantis granulosa	X		
Osteocephalus buckleyi	X		
Osteocephalus cabrerai	X		
Osteocephalus leprieurii	X	X	X
Osteocephalus oophagus	X		X
Osteocephalus taurinus	X	X	X
Phyllomedusa bicolor	X		
Phyllomedusa vaillantii			X
Scinax boesemani	X		
Scinax nebulosus		X	
Scinax proboscideus	X		
Scinax ruber		X	
Trachycephalus resinifictrix	X	X	X
Family Leptodactylidae			
Adenomera andreae	X	X	X
Adenomera hylaedactyla	X		
Engystomops petersi	X		
Hydrolaetare schmidti	X		
Leptodactylus knudseni	X	X	
Leptodactylus myersi	X		
Leptodactylus mystaceus	X	X	
Leptodactylus pentadactylus	X		X
Leptodactylus petersi	X		
Leptodactylus podicipinus			X
Leptodactylus rhodomysta	X	X	
Leptodactylus stenodema	X		
Lithodytes lineatus	X		
Family Microhylidae			
Hamptophryne boliviana	X		
Otophryne pyburni	X		
Synapturanus mirandaribeiro	X		
Family Pipidae			
Pipa pipa	X		
Family Strabomantidae			
Pristimantis chiastonotus	X	X	X
Pristimantis gutturalis	X	X	X
Pristimantis inguinalis	X		
Pristimantis marmoratus	X		
Pristimantis zeuctotylus	X	X	X

Source: prepared by the authors.

The family Hylidae exhibits the highest species richness and abundance, followed by Bufonidae. Penhacek *et al*. (2024), analyzing over 160,000 amphibian records in the Amazon, identified 947 species, of which 901 belong to the order Anura. In their study, Hylidae and Bufonidae ranked second and third in species richness in the region, behind only Craugastoridae. However, in the present study, no species from the latter family were recorded.

Penhacek *et al*. (2024) also summarized the ten most frequently recorded species in the Amazon: *Rhinella marina*, *Osteocephalus taurinus*, *Rhinella margaritifera*, *Scinax ruber*, *Adenomera andreae*, *Pristimantis fenestratus*, *Boana boans*, *Trachycephalus typhonius*, *Allobates femoralis*, and *Leptodactylus petersi*. Of these, only *Scinax ruber*, *Pristimantis fenestratus*, and *Leptodactylus petersi* were not recorded in the present study.

The values of the Dispersion Index (ID) indicated an aggregated distribution pattern of species across all sampled trails, with values ranging from 2.29 (Trail 2) to 5.72 (Trail 4). The Green Index (IG) was used to assess the intensity of this aggregation, with values ranging from 0.09 (Trail 3) to 0.36 (Trail 4). Trail 4 stood out, showing the highest indices for both ID and IG, as summarized in Table 3.

Table 3 - Dispersion Index (ID) and Green Index (IG) for the sampled trails in the rapid biological survey conducted in PARNA Tumucumaque, Brazilian Amazon.

Locais	S'	DI	GI	Classification (DI/GI)
Trilha 1	13	3.20	0.18	Aggregate dispersion/Low aggregation
Trilha 2	12	2.29	0.12	Aggregate dispersion/Low aggregation
Trilha 3	20	2.62	0.09	Aggregate dispersion/Low aggregation
Trilha 4	13	5.72	0.36	Aggregate dispersion/Moderate aggregation

Source: prepared by the authors.

The results indicate that the anuran populations in the sampled trails exhibit an aggregated spatial distribution pattern, with Trail IV standing out for its highest dispersion values. This pattern supports the idea that species distribution is strongly influenced by habitat heterogeneity and the availability of essential resources for survival, such as temporary and permanent water bodies, as well as suitable vegetation cover (Ricklefs, 2001).

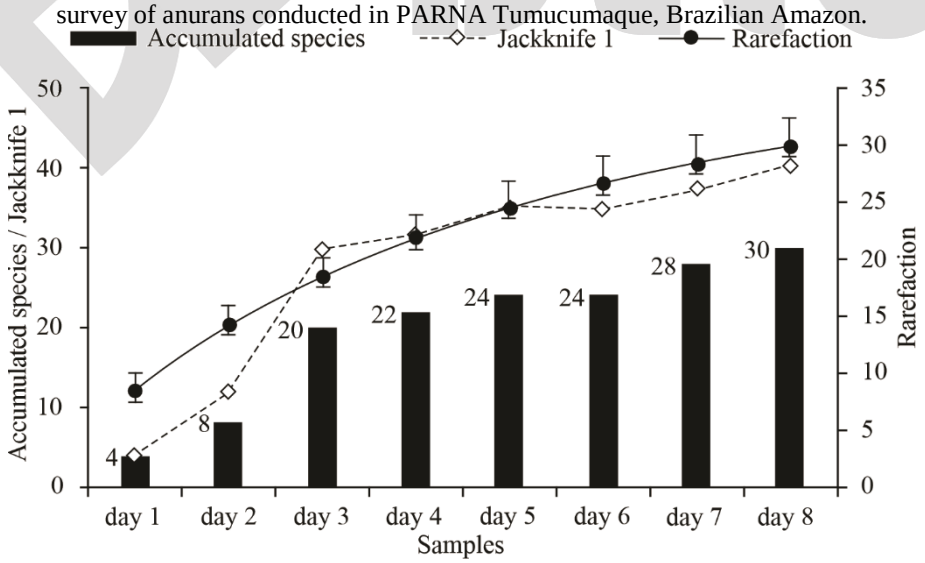
According to Krebs (1989), aggregated distribution often occurs in situations where individuals tend to group due to the presence of essential resources or favorable environmental conditions. For anurans, the availability of suitable breeding habitats may explain the observed

aggregation. Trail IV, with the highest dispersion indices and aggregation intensity, offers favorable breeding conditions, such as permanent water bodies, which facilitate the concentration of individuals.

Additionally, the Green Index (IG) revealed an aggregation of low to moderate intensity, suggesting that, while aggregation occurs in some areas, spatial distribution is still influenced by variable environmental factors, such as the quantity and quality of available resources. This aggregation pattern is common among anurans, especially during reproduction, when individuals concentrate in specific areas of the habitat to optimize their chances of breeding.

The inventory conducted in PARNA Tumucumaque revealed a progressive increase in species richness over the eight days of sampling, from four species on the first day to 30 on the last. The species richness estimate using the Jackknife 1 method followed this trend, suggesting the possible presence of unrecorded species, with values ranging from 4 to 40.5 throughout the period. The rarefaction curve also reflected this pattern, indicating that as sampling effort increased, the estimated richness approached the observed values. The data regarding the variation in observed and estimated species richness, as well as the rarefaction curve, are shown in Figure 3.

Figure 3 - Species accumulation, Jackknife 1 richness estimator, and rarefaction curve from the rapid biological survey of anurans conducted in PARNA Tumucumaque, Brazilian Amazon.



Source: prepared by the authors.

The rarefaction curve indicates that the inventory covers a large portion of the local diversity, as suggested by the Jackknife 1 richness estimator. However, the average estimate,

which is higher than the number of recorded species, points to an even greater richness, which can be confirmed through additional sampling during different seasonal periods. The Amazon biome is recognized for housing the planet's greatest biodiversity; however, less charismatic taxonomic groups, such as amphibians, still lack in-depth studies on their species richness and spatial distribution in the region (Penhacek *et al*., 2024).

Table 4 presents the categorization of species based on their habits (arboreal or terrestrial) and collection period (diurnal or nocturnal). The highest richness was recorded among arboreal species (S'=18; 60.0%), followed by terrestrial species (S'=12; 40.0%). Regarding activity periods, most arboreal species were recorded at night (S'=15; 83.3%), while the rest were observed during the day (S'=3; 16.7%). Among terrestrial species, most were also recorded at night (S'=7; 58.3%), with two collected during the day (S'=2; 16.7%) and three occurring in both periods (S'=3; 25.0%). This pattern was also reflected in the abundance of anurans.

Table 4 - Categorization of anuran species collected in the rapid biological survey of PARNA Tumucumaque based on habit and capture period.

Species	Arboreal		Terricolous	
	Diurnal	Nocturnal	Diurnal	Nocturnal
Adelophryne amapaensis	–	–	–	1
Adenomera andreae	–	–	2	3
Allobates femoralis	–	–	3	–
Allophryne ruthveni	–	3	–	–
Amazophrynella teko	–	–	1	–
Ameerega hahneli	7	–	–	–
Atelopus hoogmoedi	–	12	–	–
Boana boans	–	4	–	–
Boana calcarata	–	5	–	–
Boana cinerascens	–	2	–	–
Boana courtoisae	–	2	–	–
Boana geographica	–	11	–	–
Boana ornatissima	–	1	–	–
Cochranella resplendens	–	1	–	–
Dendropsophus minusculus	–	3	–	–
Leptodactylus pentadactylus	–	–	–	4
Leptodactylus podicipinus	–	–	–	1
Osteocephalus leprieurii	–	8	–	–
Osteocephalus oophagus	–	20	–	–
Osteocephalus taurinus	–	4	–	–
Phyllomedusa vaillantii	–	1	–	–
Pristimantis chiastonotus	–	–	–	8
Pristimantis gutturalis	15	–	–	–
Pristimantis zeuctotylus	–	–	–	7
Rhaebo guttatus	–	–	–	1
Rhinella castaneotica	–	–	–	6
Rhinella lescurei	20	–	–	–
Rhinella margaritifera	–	–	1	3

Species	Arboreal		Terricolous	
	Diurnal	Nocturnal	Diurnal	Nocturnal
Rhinella marina	–	–	8	1
Trachycephalus resinifictrix	–	2	–	–
Absolute abundance	**42**	**79**	**15**	**35**

Source: prepared by the authors.

The study results indicate that the richness and abundance of anurans are higher during the night. This pattern is consistent with the findings of Pereira-Ribeiro *et al*. (2019), who recorded anurans with predominantly nocturnal activity in the Atlantic Forest. Similarly, Menin, Waldez and Lima (2008) observed this behavior in the Adolpho Ducke Forest Reserve. Nocturnal activity may be associated with higher humidity and reduced predation and dehydration, factors that favor locomotion and reproductive behavior.

Some species exhibit both diurnal and nocturnal activity, suggesting ecological plasticity. Nocturnal sampling is crucial in herpetofaunistic surveys and is prioritized in various studies, such as those by Juncá (2006), Moraes, Sawaya and Barrella (2007), and Knispel and Barros (2009), where diurnal collections are not performed. However, the importance of including diurnal sampling should not be overlooked, as some species may exhibit greater activity during the day or be more easily detected in daylight. The inclusion of different sampling periods enhances the representativeness of surveys and contributes to a more comprehensive estimate of anuran diversity in each area.

4 CONCLUSIONS

The rapid biological inventory conducted in the PARNA Tumucumaque recorded 30 species of anurans, increasing the total number of species known in the area to 66. The results indicate an aggregated spatial distribution pattern, influenced by habitat heterogeneity and the availability of resources. Most species were recorded during the night, reinforcing patterns already described for tropical anurans. The rarefaction curve suggests that the local diversity was sampled in a representative way, although new species may still be identified with additional efforts. These findings highlight the importance of the park for the conservation of Amazonian herpetofauna and emphasize the need for continuous monitoring.

The current environmental permit limits the capture to 10 individuals per species per campaign, reducing data variation and hindering the detection of real differences, especially for

more abundant species. Future studies may improve this characterization.

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