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SHORT COMMUNICATION

What constitutes the menu of *Trachops cirrhosus* (Chiroptera)? A review of the species' diet

Em que consiste o menu de *Trachops cirrhosus* (Chiroptera)? Uma revisão da dieta da espécie

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Abstract

Few data are available on the predation of amphibians, reptiles, and mammals by the fringe-lipped bat *Trachops cirrhosus* (Chiroptera: Phyllostomidae: Phyllostominae), in particular in Brazil, where ecological studies of this species are still incipient. This study presents an overview of the data available in the literature on the composition of the diet of *T. cirrhosus*, including data from a semiarid region. The first records of the predation of the anurans *Corythomanthis greeningi* (Hylidae), *Pleurodema diplolister* (Leiuperidae), *Proceratophrys cristiceps* (Cycloramphidae), *Dermatonotus muelleri* (Microhylidae), *Pipa carvalhoi* (Pipidae), *Leptodactylus* sp. (Leptodactylidae), the lizards *Vanzosaura rubricauda* (Gymnophytalmidae), *Hemidactylus mabouia* (Gekknonidae), and a rodent of the family Cricetidae are reported. Insects (33%) constitute the principal component of the diet of *T. cirrhosus*, while anuran amphibians contributed 23% of the items recorded, followed by birds (14%), mammals (10%), lizards (8%), and invertebrates (8%). This diversity of prey is typical of a generalist predator, which is relatively unaffected by seasonal fluctuations in the availability of prey. This is especially important in the semi-arid Caatinga biome, which is subject to prolonged periods of drought that result in a shortage of feeding resources.

Keywords: fringe-lipped bat, herpetofauna, prey-predator relationship, rodents, seasonally dry tropical forest.

Resumo

Poucos dados estão disponíveis sobre a predação de anfíbios, répteis e mamíferos pelo morcego lábios-de-franja *Trachops cirrhosus* (Chiroptera: Phyllostomidae: Phyllostominae), em particular no Brasil, onde os estudos ecológicos dessa espécie ainda são incipientes. Este estudo apresenta uma visão geral dos dados disponíveis na literatura sobre a composição da dieta de *T. cirrhosus*, além de dados registrados em região semiárida. Os primeiros registros da predação dos anuros *Corythomanthis greeningi* (Hylidae), *Pleurodema diplolister* (Leiuperidae), *Proceratophrys cristiceps* (Cycloramphidae), *Dermatonotus muelleri* (Microhylidae), *Pipa carvalhoi* (Pipidae), *Leptodactylus* sp. (Leptodactylidae), dos lagartos *Vanzosaura rubricauda* (Gymnophytalmidae), *Hemidactylus mabouia* (Gekknonidae) e de um roedor da família Cricetidae são reportados. Insetos (33%) constituem o principal componente da dieta de *T. cirrhosus*, enquanto anfíbios contribuíram com 23% dos itens registrados, seguidos por aves (14%), mamíferos (10%), lagartos (8%) e invertebrados (8%). Essa diversidade de presas é típica de um predador generalista, que é relativamente pouco afetado pelas flutuações sazonais na disponibilidade de presas. Isso é especialmente importante no bioma da Caatinga semiárida, que está sujeita a períodos prolongados de seca que resultam em escassez de recursos alimentares.

Palavras-chave: floresta tropical sazonalmente seca, herpetofauna, roedores, morcego de lábios de franja, relação predador presa.

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The subfamily Phyllostominae comprises 16 genera, including the monotypic *Trachops* (Gardner, 2008). *Trachops cirrhosus* (Spix, 1823) is a medium-sized (28-45g) Neotropical bat (Emmons and Feer, 1999), found in Mexico, Guyana, French Guiana, Suriname, Colombia, Venezuela, Peru, Trinidad and Tobago, Ecuador, Bolivia, and Brazil (Gardner, 2008; Peracchi *et al.*, 2011). The type locality of the species is Belém, in the northern Brazilian state of Pará (Gardner, 2008).

Associated with environments in the vicinity of bodies of water, such as springs, streams, lakes, and reservoirs (Fleming *et al*., 1972), *T. cirrhosus* is often observed foraging near the ground (Kalko *et al*., 1999), and is commonly captured in the lower levels of mist nets.

The fringe-lipped bat roosts in hollow trees, caves, rock crevices, storm drains, and abandoned buildings, and may form small groups, containing no more than six individuals of either sex, although there are some records of colonies of up to 50 individuals (Cramer *et al*., 2001; Peracchi *et al*., 2011). This species usually forages in the understory (Cramer *et al*., 2001; Peracchi *et al*., 2011) and shares roosts with a number of other bats, including *Desmodus rotundus* (E. Geoffroy 1810), *Diphylla ecaudata* (Spix 1823), *Lophostoma brasiliense* (Peters 1866), *Micronycteris megalotis* (Gray 1842), *Glossophaga soricina* (Pallas 1766), *Phyllostomus hastatus* (Pallas, 1767) and *Anoura geoffroyi* (Gray 1838) (Peracchi *et al.*, 2011; Lima *et al.*, 2017).

Trachops cirrhosus occurs in all Brazilian biomes, i.e., the Amazon Forest, Cerrado, Atlantic Forest, Pantanal, Caatinga, and Pampas (Marinho-Filho and Sazima, 1998; Nogueira *et al*., 2007; Passos *et al*., 2010; Paglia *et al*., 2012). In northern Brazil, there are records of its occurrence in the states of Acre, Amapá, Amazonas, Pará, Rondônia and Roraima (Carvalho, 1962; Handley, 1967; Mok *et al*., 1982; Reis and Guillaumet, 1983; Marques, 1989; Nogueira *et al*., 1999). In northeastern Brazil, the species was found in Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Piauí and Sergipe (Vieira, 1955; Mares *et al*., 1981; Araújo *et al*., 1998; Sousa *et al*., 2004; Miretzki, 2005; Faria, 2006; Feijó and Nunes, 2010). In Central Brazil, there are records of the species in Distrito Federal, Goiás, Mato Grosso and Mato Grosso do Sul (Bredt and Uieda, 1996; Esberard *et al*., 2005; Cunha *et al.*, 2011; Sousa *et al*., 2013). In southeastern Brazil, *T. cirrhosus* was recorded in São Paulo, Minas Gerais, Espírito Santo and Rio de Janeiro (Lima, 1926; Vieira, 1955; Ruschi, 1953; Peracchi *et al*., 1982). In addition, the species was also recorded in the south Brazilian state of Paraná (Passos *et al*., 2010).

The species is classified as "Least Concern" by the International Union for Conservation of Nature (IUCN) (Miller *et al*., 2015), and is not included in the Brazilian Red List of endangered fauna (Machado *et al*., 2008; ICMBio, 2014).

Although the ability of this bat to prey on small amphibians in the wild is well documented, most of the data on the feeding behavior of the fringe-lipped bat are derived from the analysis of stomach contents or experimental provisioning with live prey in captivity, with few cases being observed directly in the field (Cramer *et al.*, 2001). These bats are able to differentiate palatable species from toxic ones based on their vocalizations, as well as small-bodied individuals from those that are too large to be captured (Tuttle and Ryan, 1981).

Items recorded in the diet of *T. cirrhosus* include insects (Ruschi, 1953; Fleming *et al*., 1972; Holwell and Burch, 1974; Humphrey *et al*., 1983; Reis and Peracchi, 1987; Cramer *et al*., 2001), spiders (Bonato *et al*., 2004), gastropods (Bonato *et al*., 2004), and small vertebrates, such as amphibians (Barclay *et al*., 1981; Tuttle and Ryan, 1981; Rocha *et al*., 2012), lizards (Ruschi, 1953; Goodwin and Greenhall, 1961; Valdez and Laval, 1971; Walker, 1974), birds (Rodrigues *et al*., 2004), and mammals, including rodents (Peracchi *et al*., 1982), marsupials (Ferrer *et al*., 2000), and other bats (Holwell and Burch, 1974; Arias *et al*., 1999; Bonato and Facure, 2000, Rodrigues *et al*., 2004). Fruit is also consumed occasionally (Ruschi, 1953; Whitaker and Findley, 1980), when abundant (Bonaccorso, 1979). Cramer *et al.* (2001) also report the exploitation of seeds by *T. cirrhosus*.

Trachops cirrhosus ranges over relatively large areas (456 ha) and travels long distances (>1.5 km) between roosts and feeding areas (Bernard and Fenton, 2003), typically leaving the roost approximately 30 minutes after sunset (Kalko *et al*., 1999). As a predatory species, the fringe-lipped bat may require larger foraging areas than most other bats (Nogueira *et al*., 2007), which suggests that it may be a good indicator of habitat quality, due to the need for a healthy community of prey species to support a viable population.

The present study provides an overview of the composition of the diet of the genus *Trachops*, including new records on the predation of anuran, lacertilian, and rodent species in an area of the Brazilian Caatinga biome.

Fazenda Tamanduá is a private property located primarily in the municipality of Santa Terezinha, part of the Patos microregion, in the state of Paraíba, northeastern Brazil (7º01'31.23''S; 37º23'31.04''W) (Lyra-Neves and Telino-Júnior, 2010; Passos Filho *et al.*, 2015). This property covers a total area of 3073 hectares and includes the largest protected area (approximately 1000 ha) found in the Caatinga scrublands of the state of Paraíba, and one of the largest in northeastern Brazil. This area includes a legal reserve of 614 hectares and a Private Natural Heritage Reserve known as the RPPN Tamanduá (IBAMA-PB decree 110/98-N), with an area of 350 hectares. The site is located 18 km from the town of Patos (Neves *et al*., 1999; Lyra-Neves and Telino-Júnior, 2010; Passos Filho *et al.,* 2015).

The local landscape is dominated by gallery forests and the presence of 18 natural ponds (Figure 1), five of which are permanent and 13 seasonal. These ponds provide feeding and breeding grounds for a unique faunal community (Lyra-Neves and Telino-Júnior, 2010; Passos Filho *et al.,* 2015).

Mean annual rainfall, which has been recorded continuously by the local meteorological station since 1913, is 801.94 mm. This precipitation is concentrated within a relatively short rainy season, generally of two to four months' duration, which is followed by a prolonged dry season (Fazenda Tamanduá, 2011).

Regular field excursions were conducted to the Fazenda Tamanduá in 2011 and 2012, with two roosts being monitored, one within the area of the fazenda (roost A), and the other in an area outside the farm limits (roost B), in the municipality of Patos. *Trachops cirrhosus* was observed during these visits, and food debris was found regularly below the perches. A specimen of *T. cirrhosus* was captured at each site. One was captured at roost A with a hand net at 23h16 on March 15th 2011 (Male; body

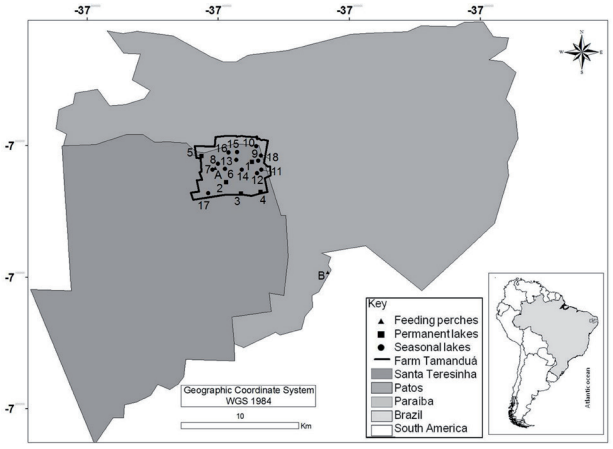

Figure 1. Location of the Fazenda Tamanduá (outlined in black) and the municipalities of Santa Terezinha (dark gray) and Patos (light gray) in Paraíba, northeastern Brazil. 1–5: permanent ponds; 6–18: seasonal ponds. Two feeding perches, the Packing House (A) and Cruz (B), were monitored between August, 2011 and September, 2012.

Figure 2. The fringe-lipped bat, *Trachops cirrhosus* from two areas in Paraíba, northeastern Brazil, and its discarded prey items. A: an adult male *T. cirrhosus*, being handled at Fazenda Tamanduá, in Santa Terezinha; B: discarded prey items found under the feeding perch on the Fazenda Tamanduá; C: adult male *T. cirrhosus* from an area of marshland named Cruz, in Patos; D: discarded items under a feeding perch at Cruz. Photographs by Paulo B. Passos-Filho.

Table 1. Vertebrate and invertebrate taxa known to be consumed by *Trachops cirrhosus*, including the records from the present study. In each case, the country or region in which the item was recorded is indicated. NI = not identified.

Taxon	Country or Region	Source
Gastropoda		
Pulmonata	N/NE Brazil	Bonato *et al.* (2004)
Arachnida		
Araneae	N/NE Brazil	Bonato *et al.* (2004)
Thelyphonida	Panama	Bonaccorso (1979)
Insecta		
NI	N/NE Brazil	Bonato *et al.* (2004); Fleming *et al.* (1972)
Blattidae		
Periplaneta americana (Linnaeus 1758)	SE Brazil	Peracchi *et al.* (1982)
Coleoptera		
NI	N/NE Brazil and Panama	Bonato *et al.* (2004); Whitaker and Findley (1980)
Geniates barbatus Kirby, 1818	SE Brazil	Peracchi *et al.* (1982)
Leucothyreus sp.	SE Brazil	Peracchi *et al.* (1982)
Pinnotus spp.	SE Brazil	Peracchi *et al.* (1982)
Orthoptera		
NI	N/NE Brazil	Bonato *et al.* (2004)
Tettigoniidae	SE Brazil	Peracchi *et al.* (1982)
Gryllidae	Panama	Whitaker and Findley (1980)
Lepidoptera		
NI	N/NE Brazil	Bonato *et al.* (2004)
Sphingidae	SE Brazil	Peracchi *et al.* (1982)
Saturniidae	SE Brazil	Peracchi *et al.* (1982)
Diptera		
NI	N/NE Brazil and Panama	Bonato *et al.* (2004); Whitaker and Findley (1980)
Hymenoptera		
NI	N/NE Brazil	Bonato *et al.* (2004)
Homoptera		
Cercopidae	Panama	Whitaker and Findley (1980)
Amphibia		
NI	N/NE Brazil	Bonato *et al.* (2004)
Leptodactylidae		
Engystomops pustulosus (Cope, 1874)	Panama	Barclay *et al.* (1981); Tuttle *et al*. (1982)
Leptodactylus sp.	NE Brazil	Present study
Hylidae		
Scinax cruetommus Duellman, 1972	N Brazil	Rocha *et al.* (2016)
Scinax cf. garbei (Miranda-Ribeiro, 1926)	N Brazil	Rocha *et al.* (2016)
Corythomanthis greeningi Boulenger, 1896	NE Brazil	Present study
Osteocephalus oophagus Jungfer and Schiesari, 1995	N Brazil	Rocha *et al.* (2012)
Leiuperidae		
Pleurodema diplolister (Peters, 1870)	NE Brazil	Present study
Cycloramphidae		
Proceratophrys cristiceps (Müller, 1884)	NE Brazil	Present study
Microhylidae		
Dermatonotus muelleri (Boettger, 1885)	NE Brazil	Present study
Pipidae		
Pipa carvalhoi (Miranda-Ribeiro, 1937)	NE Brazil	Present study
Sauropsida		
NI	Panama	Whitaker and Findley (1980)
Gymnophtalmidae		
Vanzosaura rubricauda (Boulenger, 1902)	NE Brazil	Present study
Gekkonidae		
Thecadactylus rapicauda (Houttuyn, 1782)	Panama	Goodwin and Greenhall (1961)

Table 1. Continuation.

Taxon	Country or Region	Source
Anolis lemurinus (Cope, 1861)	Honduras	Valdez and La Val (1971)
Hemidactylus mabouia Moreau de Jonnès, 1818	NE Brazil	Present study
Aves		
Passeriformes		
NI	N/NE Brazil	Bonato *et al.* (2004)
Ceratopipra rubrocapilla Temminck, 1821	NE Brazil	Rodrigues *et al.* (2004)
Manacus manacus (Linnaeus, 1766)	NE Brazil	Rodrigues *et al.* (2004)
Pipridae		
Thryothorus sp.	NE Brazil	Rodrigues *et al.* (2004)
Hemitriccus sp.	NE Brazil	Rodrigues *et al.* (2004)
Tolmomyias sp.	NE Brazil	Rodrigues *et al.* (2004)
Picummnus sp.	NE Brazil	Rodrigues *et al.* (2004)
Didelphimorphia		
Didelphidae		
Marmosa robinsoni Bangs, 1898	Venezuela	Ferrer *et al.* (2000)
Chiroptera		
Phyllostomidae		
Artibeus planirostris (Spix, 1823)	Costa Rica	Arias *et al.* (1999)
Carollia perspicillata (Linnaeus, 1758)	NE Brazil	Rodrigues *et al.* (2004)
Furipteridae		
Furipterus horrens (F. Cuvier, 1828)	NE Brazil	Bonato and Facure (2000); Bonato *et al.* (2004)
Vespertilionidae		
Myotis nigricans (Schinz, 1821)	NE Brazil	Rodrigues *et al.* (2004)
Rodentia		
Cricetidae		
NI	NE Brazil	Present study
Muridae		
NI	N/NE Brazil	Bonato *et al.* (2004)
Mus musculus Linnaeus, 1758	SE Brazil	Peracchi *et al.* (1982)

weight: 42.6 g; forearm length: 63.6 mm – Figure 2A, B), and the other by mist-netting at 21h09 August 23rd 2012 (Roost B: Male; body mass: 39.7 g; forearm length: 56.4 mm – Figure 2C, D).

Neither specimen captured presented evidence of reproductive activity, and the epiphysis of the metacarpals and phalanges of the digits of the wings were ossified. No evidence of the presence of any other chiropterans was found at either roost, so it was assumed that all the debris found beneath the perches was derived from the foraging activities of *T. cirrhosus*. Guidelines for the handling of animals in research were followed as recommended by Sikes *et al.* (2011).

Records of prey items captured by *T. cirrhosus* were obtained from feeding perches at the two roosts during dry season (October-December). Roost A was located inside a toilet in a barn, denominated the Packing House (original name) here (7.017º S, 37.402º W, WGS 64, 287 m asl), near the VDB temporary pond. Roost B was approximately 13 km southeast of roost A (Figure 1), inside an abandoned house. This site is located in an area known as Cruz (7.096º S, 37.316º W, WGS 64, 254 m asl), an area of marshland, surrounded by grassland and shrubby scrub.

The debris found beneath the feeding perches was collected for analysis in the laboratory, after first being processed in the field. Initial processing consisted of the identification and extraction of animal remains (carcasses and body parts) from the substrate. These remains were placed in labeled plastic bags for transportation to the Laboratory for Herpetological and Paleoherpetological Studies (LEHP) at the Federal Rural University of Pernambuco (UFRPE), in Recife. The identified specimens were deposited as vouchers in the Herpetological and Paleoherpetological Collection - CHP at UFRPE.

In order to update the list of prey items consumed by *T. cirrhosus*, an extensive literature search was conducted of the data available in published scientific papers and book chapters. The search was run in databases available online, including Scientific Electronic Library Online - SciELO (www.scielo.org/php/index.php), Web of Science - WoS (http://portal.isiknowledge.com), and Google Scholar (http://scholar.google.com.br). The search was

Table 2. Carcasses and fragments of species of the orders Amphibia, Sauropsida, and Mammalia found in the debris under the *Trachops cirrhosus* feeding perches on Fazenda Tamanduá and Cruz, Paraíba, northeastern Brazil, between 2011-16-06 and 2012-19-08. CHP/UFRPE = specimen catalog number in the Herpetological and Paleoherpetological collection at UFRPE. NI = not identified.

Taxon	Voucher specimen (CHP/UFRPE)	Site	N	Date (YYYY-MM-DD)
Amphibia				
Leptodactylidae				
Leptodactylus sp.	3041	Cruz (2)	1	2012-04-16
Hylidae				
	3042, 3043, 3044	Cruz (2)	3	2012-04-16
Corythomanthis greeningi Boulenger, 1896	3045, 3046, 3047, 3048	Cruz (2)	4	2012-07-18
	3049, 3050	Packing House (1)	2	2012-07-05
Cycloramphidae				
	3051, 3052, 3053, 3054	Packing House (1)	4	2012-07-05
	3055	Packing House (1)	1	2012-08-19
Proceratophrys cristiceps (Müller, 1884)	3056	Cruz (2)	1	2012-03-13
	3057, 3058, 3059	Cruz (2)	3	2012-04-16
	3060, 3061	Cruz (2)	2	2012-07-18
Leiuperidae				
Pleurodema diplolister (Müller, 1884 "1883")	3062, 3063	Cruz (2)	2	2012-04-16
Microhylidae				
Dermatonotus muelleri (Boettger, 1885)	3064	Cruz (2)	1	2012-08-19
Pipidae				
	3065, 3066	Cruz (2)	2	2012-07-18
Pipa carvalhoi (Miranda Ribeiro, 1937)	3067	Cruz (2)	1	2012-07-18
	3068, 3069, 3070	Packing House (1)	3	2012-08-19
Lepdossauria-Lacertidia				
Gymnophtalmidae				
Vanzosaura rubricauda (Boulenger, 1902)	3071	Cruz (2)	1	2012-07-18
Gekkonidae				
Hemidactylus mabouia Moreau de Jonnès, 1818	3072	Cruz (2)	1	2012-07-18
Mammalia				
Rodentia				
Cricetidae				
NI	3073	Packing House (1)	1	2012-05-07

based on different combination of the keywords "Chiroptera", "fringe-lipped bat", "Diet", "*Trachops cirrhosus*" and "Predation" (and their equivalents in Portuguese, where appropriate).

The published data on the composition of the diet of the Neotropical bat genus *Trachops* refer to the predation of 45 animal taxa (Table 1). The new items recorded in the present study bring this total to 54, which include six additional species of amphibians, two lizards, and one mammal (Table 2). Overall, the items consumed include arthropods (37%), amphibians (23%), mammals (16%), birds (14%), lizards (8%), and mollusks (2%) (Table 1). In Brazil, records are restricted to central Amazonia (northern Brazil), Pernambuco, in the northeast region of the country, and the state of Rio de Janeiro, in the southeast region.

Discarded items found under perches A (Figure 3) and B (Figure 4) represented 33 individuals, 30 (90.91%) of which were anurans (Table 1). The three other items were two lizards and a cricetid rodent. The anurans included species of the families Hylidae (*Corythomanthis greeningi* Boulenger 1896), Leiuperidae (*Pleurodema diplolister* Peters 1870), Cycloramphidae (*Proceratophrys cristiceps* (Müller 1884)), Microhylidae (*Dermatonotus muelleri* Boettger 1885), Leptodactylidae (*Leptodactylus* sp.), and Pipidae (*Pipa carvalhoi* Miranda-Ribeiro 1937). Most amphibians were cicloramphyds (33.67% of the total items), hylids (30.00%), and pipids (20.00%). The lizard species were *Vanzosaura rubricauda* (Boulenger 1902) and *Hemidactylus mabouia* (Moreau de Jonnès 1818), respectively, of the families Gymnophtalmidae and Gek-

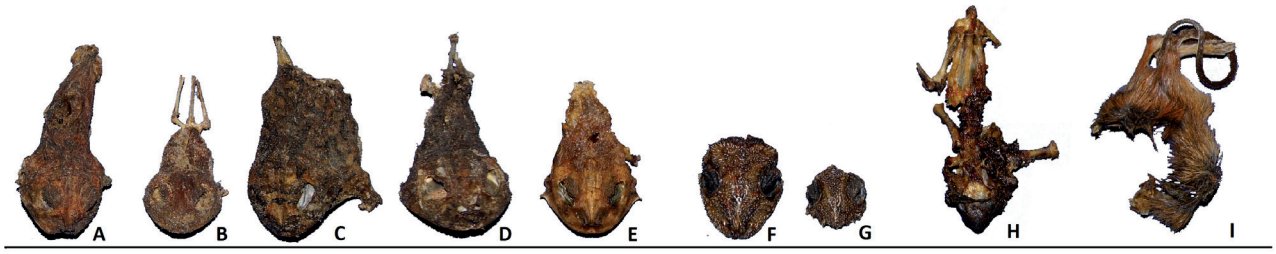

Figure 3. Body parts found in the debris under feeding perch A on the Fazenda Tamanduá in Santa Terezinha, Paraíba, northeastern Brazil: A, B, C, D, E = *P. cristiceps* (Cycloramphidae); F, G = *C. greeningi* (Hylidae); H = *D. muelleri* (Boettger, 1885) (Microhylidae); I = Cricetidae. Photographs: Leonardo da S. Chaves.

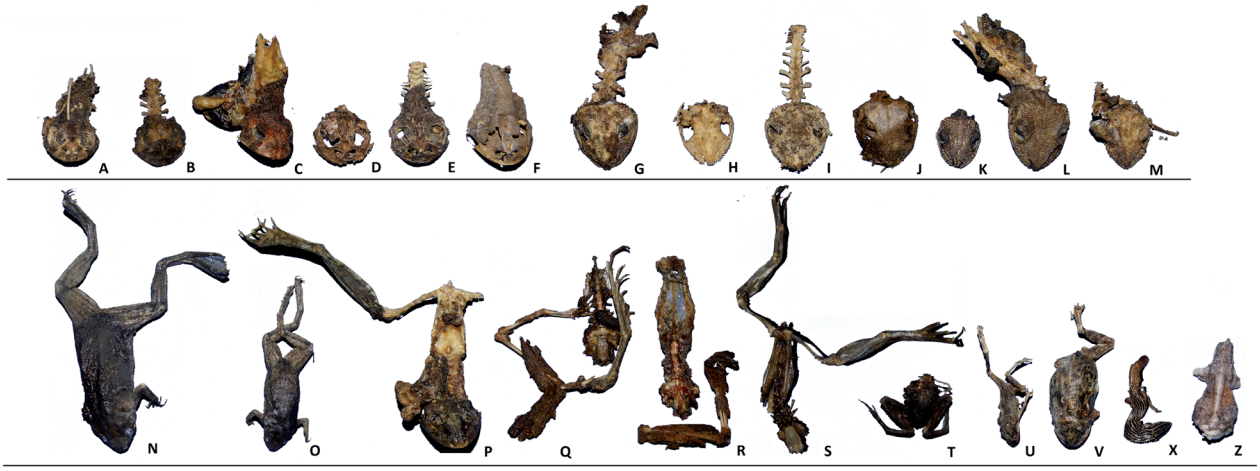

Figure 4. Body parts of amphibians (order Anura) and sauropsids (order Lacertilia) found in the debris under feeding roost B at Cruz in Patos, Paraíba, northeastern Brazil: A, B, C, D, E, F = *P. cristiceps* (Cycloramphidae); G, H, I, J, K, L, M = *C. greeningi* (Hylidae); N, O, P, Q, R, S = *P. carvalhoi* (Pipidae); T = *Leptodactylus* sp.(Leptodactylidae); U, V = *P. diplolister* (Leiuperidae); X = *V. rubricauda* (Gymnophtalmidae), and Z = *H. mabouia* (Gekkonidae). Photographs by Leonardo da S. Chaves.

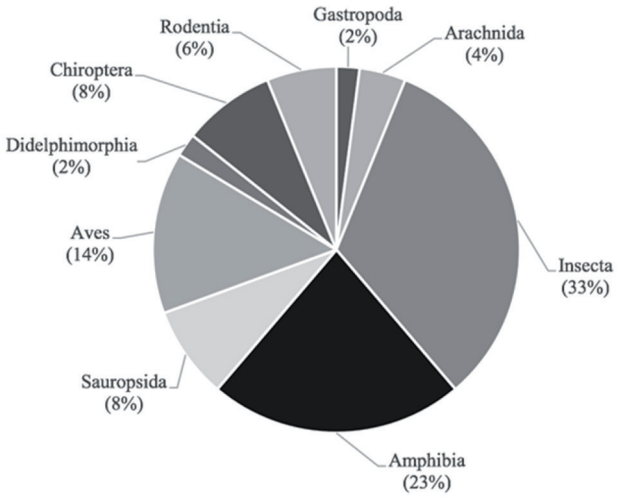

Figure 5. Relative contribution of different prey items to the diet of *Trachops cirrhosus*, based on published data and results of the present study.

konidae (Table 2). We found no evidence of the predation of birds or other mammalian taxa. Fragments of insects were found in the fecal pellets, but it was not possible to identify the taxa.

The data available in the literature, in addition to those from the present study, indicate that insects constitute the principal component of the diet of *T. cirrhosus*, as reported by Cramer *et al.* (2001), contributing 33% of the recorded prey items (Figure 5).

In the Brazilian Caatinga, Silva (2007) obtained fecal samples from 19 specimens of *T. cirrhosis* captured over a one-year period, recording a relative frequency of 72.7% for insects, 50.0% for partially digested fruit pulp, and 9.1% each for fruit and small vertebrates (unidentified tissue and bone fragments). While Silva (2007) recorded 32 species of fruits during the rainy season, only one – *Cecropia pachystachya* Trec. (Cecropiaceae) – was exploited by *T. cirrhosus*. This indicates that this bat exploits the most available resource

opportunistically during periods of abundance, as observed in previous studies (Ruschi, 1953; Bonaccorso, 1979; Whitaker and Findley, 1980).

Overall, anuran amphibians, which have long been considered to be the principal prey of *T. cirrhosus* (Brosset, 1966; Wilson, 1973), contributed 24% of the items recorded in the present study (Figure 5), followed by mammals (17%), birds (13%), and lizards (7%). The most common item was insects, however, which contributed 32% of the samples, corroborating the findings of Silva (2007). We could conclude, then, that *T. cirrhosus* has a diet much more alike in comparison to other larger Phyllostominae than expected.

As *T. cirrhosus* is able to locate frogs through their vocalizations (Tuttle and Ryan, 1981), the consumption of amphibian prey might be expected to be restricted to the rainy season, when most species reproduce and their vocal activity peaks (Duellman and Trueb, 1994; Bernarde and Machado, 2000). The identification of three additional anuran species in the diet of *T. cirrhosus*, which were all recorded during the dry season, indicates that these bats may have located the anurans through alternative means, such as visual cues, as observed in previous studies (Peracchi *et al*., 1982).

The diversity of prey items recorded for *T. cirrhosus*, which include arboreal, terrestrial, and even aquatic animals, is typical of a generalist predator such as most of the larger Phyllostominae, which is relatively unaffected by seasonal fluctuations in the availability of prey (MacArthur and Pianka, 1966). Fluctuations of this type are probably common in Caatinga habitats, where the prolonged dry season tends to result in a considerable reduction in the abundance of most anuran species (Navas *et al*., 2004). Data on the ecology and diet of *T. cirrhosus* in Brazil, in particular in the Caatinga scrublands, are still scarce, reinforcing the need for new records, such as those presented here.

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