Chapter 135

Ecological aspects of artibeus lituratus e artibeus planirostris (Chiroptera, Phyllostomidae) in Cerrado environments, Mato Grosso - Brazil

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ABSTRACT
The present study analyzed the ecological and biological aspects of Artibeus lituratus and Artibeus planirostris captured in the municipality of Nova Xavantina, Mato Grosso, Brazil. The samplings occurred from January/2010 to December/2010 and from August/2012 to July/2013, in three areas of Cerradão and three of Cerrado stricto sensu. A total of 286 specimens of Artibeus lituratus (183 females and 103 males) and 103 of Artibeus planirostris (59 females and 44 males) were captured. Among the environments, greater abundance was recorded in the Cerrado stricto sensu. For both species, there was a significant relationship when analyzing the abundance between seasons, and in the rainy season, there was greater abundance. There was also a correlation between the activity schedule of the individuals and the abundance that was verified by the Rayleigh test. The correlation test between temperature and abundance variations showed significant values. The forearm and weight measurements showed positive results with the performance of the correlation test. This work contributed to expanding the knowledge of bats in the eastern region of Mato Grosso itself, there is little information regarding the ecological and biological aspects of Artibeus lituratus and A. planirostris in the region.

Keywords: Seasons; Reproductive Stages; Activity hours; Bats; Temperature.

1 INTRODUCTION

The Subfamily Stenodermatinae is the most diverse subfamily of phyllostomids, being represented in this account by 14 genera and at least 60 species in South America (Gardner 2008). The genus *Artibeus* Leach, 1821 is composed of 22 species, occurring throughout the tropical and subtropical range of the New World, from Mexico to the southern coast of Argentina (Simmons, 2005). Plink minus 14 species are in South America and Brazil, five species are recorded (Nogueira et al. 2014, Pereira et al. 2017). *Artibeus species* have outstanding ecological importance due to the provision of ecosystem services due to seed dispersal. In addition, *Artibeus* is among the most abundant in the surveys of the fauna of quirópteros (Passos & Passamani 2003; Reis et al. 2013). *Artibeus lituratus* is the largest species and the largest of its kind and presents several divergent aspects in its characteristics (Miranda et al. 2009), such as body size, which ranges from 93.0 to 113.0 mm, forearm from 65.0 to 78.0 mm and weight from 65.0 to 82.0 g. The species has white and well-visible facial stripes, the ventral hairs do not have a clear end, and their coat is uniform (Reis et al. 2013; Pereira et al. 2017).

The Brazilian regions and biomes have records of *lituratus*, having already been cited by the states (Reis et al. 2013; Barros et al. 2017). The reproductive pattern of this species varies geographically, with

seasonal polystria being the most frequently observed, with two pregnancies per year. Usually, a puppy is born per pregnancy (Peracchi et al. 2010; Pereira et al. 2017).

Artibeus planirostris has a body size ranging from 75.0 to 110.0 mm, a forearm from 56.0 to 66.7 mm, and a weight from 40.0 to 69.0 g (Peracchi et al. 2010; Pereira et al. 2017). It features narrow and unpronounced facial stripes. The forearms are bare or recovers with short and rough hair (Reis et al. 2009). This species is also distributed by the different Brazilian biomes (Reis et al. 2013). The available reproductive data indicate seasonal polystria, with two pregnancies per year (Peracchi et al. 2010).

The taxonomic classification and Chiroptera, in specific of the *genus Artibeus*, widely analyzed morphological and metric characteristics, primarily measured of skull and body size, body size and weight, which hinders the identification of phylogenetic relationships (Reis et al. 2007; Bordignon et al. 2017). *Artibeus lituratus* and *A. planirostris* have wide overlaps in their distribution, being symbolic, phylogenetically close, and with great morphological similarity (Lim & Engstron 2001; Redondo et al. 2008). However, these species present dissimilarity in the functional morphology of the skull and diet, which may mean evidence of competitive exclusion (Amaral et al. 2016).

Considering the ecological importance of both species. We analyzed the bionomic aspects of *Artibeus lituratus* and *Artibeus planirostris* in two cerrado phytophysiognomies. Our goals include understanding (1) the variation in abundance between environments and seasons; (2) hourly activity patterns; (3) how temperature variation affects foraging; (4) comparing morphological aspects for forearm and weight measurements, (5) the reproductive stage according to the capture months.

2 MATERIAL AND METHODS

2.1 AREA AND ALL

The survey of the present study was conducted in Nova Xavantina, Mato Grosso. The municipality is located 635 km away from the capital Cuiabá and has a territorial extension of 903,357 km² (Ferreira 2001). The climate of the region is *Aw* type, according to the Köppen classification, with two well-defined seasons: drought (From April to September) and rain (From October to March). The annual precipitation ranges from 1,300 mm to 1,500 mm with maximum intensity from December to February, with an average monthly temperature of 25°C (Marimon et al. 2003). The captures were carried out in three areas of Cerradão 1: 14º38'14"S and 52º21'49"O, 2: 14º40'23"S and 52º19'31"O, e 3: 14°42'6"S and 052°21'5"O and in three areas of Cerrado *stricto sensu* 4: 14º40'12"S and 52º21'52"O, 5: 14º40'48"S and 52º19'31"O and 6: 14°42'5" S and 052° 21'0" O (Fig. 1).

TheMischieline C is a type of forest phytophysiognomy proper to the Brazilian Central Plateau, in which the treetops are close and the plant community denotes a closed appearance but has a spacing between the trees that allows the penetration of the sun. The average height of the trees ranges from 10 to 15 m (Rizzini 1997).

The wrong *C stricto sensu* is a sanamal phytophysiognomy and consists of more spaced, smaller, more twisted trees, which provide the appearance of grasses and rural subshrubs, prevailing the low vegetation (Rizzini 1997). These trees are usually 3 to 6 m high and can reach up to 10 m (Ribeiro & Walter 2008).

2.2 BAT SAMPLING

Data were obtained from samplings carried out between January and December 2010 and between August 2012 and July 2013. Four nights of captures per month were performed, totaling 96 nights, and 48 phytophysiognomy (Cerradão and Cerrado *stricto sensu*). The bats were captured with mist nets (9 × 3 m, 16 mm mesh) armed just before sunset (≅ 18:00h) and closed at dawn (≅ 06:00 h) in places with possible routes of bat flights, being inspected every 30 minutes. Five mist nets were set up per night, maintaining an average distance of twenty meters from each other. A total sampling effort of 118,832 m².h was performed, following the calculation proposed by Straube & Bianconi (2002).

The animals were recorded and identified in specific (Vizotto & Taddei 1973, Gardner 2008; Reis et al. 2013; Nogueira et al. 2014) still in the field and released at the same capture site after the closing of the nets. The information regarding the captured individuals (e.g., sex, body mass, reproductive stage, body measurements, capture time, temperature, and capture environment) was noted in field records. The animals not identified in the field as well as testimony specimens were deposited in the Scientific Collection of the Laboratory of Genetics of the University of the State of Mato Grosso, Nova Xavantina *campus*, with the following bat records (RM) and tipping numbers: *Artibeus lituratus* (RM: 30, 125, 259, 292, 293, 294, 299, 388, 390, 391, 473) and *Artibeus planirostris* (RM: 126, 199, 200, 258, 298, 301, 331). All field activities were authorized by IBAMA/SISBIO/MT (licença nº 18276-1).

2.3 DATA ANALYSIS

The Chi-Square statistical test (χ^2) was used to test the significance of the variation of abundance between the sexes of the specimens concerning the sampled environments. Posteriormente, the same test was performed to test the significance of the abundance variation among the studied phytophysiognomies. Student's Teste *t* was used to compare the abundance between the seasons and *the Rayleygh* circular correlation test was used to verify if there was a trend in bat activity time analyzing the relationship between time and abundance of individuals. In addition, the linear correlation test was applied to verify the relationships (i) between abundance and temperature and (ii) between body mass and forearm length.

3 FINDINGS

During the fieldwork, 286 individuals of *Artibeus lituratus*(183 females and 103 males) and 103 of *A were captured. planirostris* (59 females and 44 males). There was a difference in the capture rate of

males and females for *A. lituratus* (χ^2 = 3574. 443; gl = 285; p < 0. 001) and for *A. planirostris* (χ^2 = 2073. 779; gl = 102; p < 0. 001).

Hears significant variation in the abundances of *A. lituratus* (χ^2 = 3429. 722; gl = 285; p < 0. 005) and *A. planirostris* (χ^2 = 2105. 623; gl = 102p < 0. 005) among cerrado phytophysiognomies, being Cerrado *s. s*. which had the highest catch rate. In addition, a higher abundance of females of both species was observed in both phytophysiognomies (Fig.2).

A. lituratus was captured in all months during the collection periods and *A. planirostris* was not captured only in August (Fig. 3). In the rainy months, there was greater abundance in the catches of *A. lituratus* and *A. planirostris* (N = 216 and N = 92 respectively) when compared with the dry months (N = 70 for *A. lituratus* and N = 11 for *A. planisrostris*) (Table 1). When analyzing the rate of captures between the stations, *the t-test* revealed a significant difference for both species (t = 3936. 173; gl = 285; p < 0. 001) and (t = 3273. Forty-nine; gl = 102; p < 0. 05).

For *A. lituratus*, the activity schedule was good at 18:00 hours, although it is the time with the fewest records. Between 21:00 and 23:00 the highest abundances were recorded for the species. For *A. planirostris* the recorded activity time was from 19:00 hours. The highest abundances occurred between the hours of 20:00 and 23:00 hours. During the entire night time, individuals were captured, except for 4:00 a.m., where there was no capture *of A. planirostris. Rayleygh's* circular test showed significant results between the time and abundance of *A lituratus* (r = 0.9827; gl = 23; p < 0. 01) as well as for *A. planirostris* (r = 0. 6116; gl = 23; p < 0. 01) (Fig. 4).

During the capture nights, the temperature was between 14 and 29°C. The Mayr activity occurs between the temperatures of 20 to 26ºC *for A. lituratus* and between 21 and 25°C for *A. lanirostris p.* The correlations were positive between abundance and temperature for the two species (*A. lituratus*: r^2 = 0. 63380 gl = 16; p < 0. 05, *A. planirostris*: r^2 = 0. 4451; gl = 15; p < 0. 05) (Fig. 5).

About the breeding rate of *A. lituratus*, 21 pregnant females were captured, 13 in the Cerrado *stricto sensu* and eight in Cerradão. Among the captured females, 42 were lactating, 24 in the Cerrado *stricto sensu*, and 18 in Cerradão. Among the males, 13 scummed specimens were captured, seven collected in the wrong C *stricto sensu* and six in Cerradão. Of the 10 cubs captured, seven occurred in Cerradão and three in the Cerrado *stricto sensu*. The reproductive stages of the captured specimens varied according to the months of the year (Table 2).

For *A. planirostris*, two pregnant females were collected, one in each phytophysiognomy; nine lactating females were recorded, three in Cerradão and six in cerrado *stricto sensu*. The cub was captured in November in the Cerrado *stricto sensu.* Six sced males were recorded, four in the Cerrado *stricto sensu* and two in Cerradão (Table 2).

Measurements of forearm length and body mass varied for the two species, tanto for *A. lituratus* as for *A. planirostris*. F-emes presented mean forearm length and body mass higher than males (Table 3). The correlation applied to verify the magnitude and meaning of the association that exists between the weight

value and the variation obtained in forearm measurements showed a high correlation in *A. lituratus* (r^2 = 0.5107; gl = 284; p = < 0.001), and *in A. planirostris* (r^2 = 0.4602; gl = 102; p = < 0.001) (Fig 6)

4 DISCUSSION

In a survey conducted in the municipality of Nova Xavantina, Silva & Anacleto (2011) observed *that A. planirostris* and *A. lituratus* were the most abundant. Similar results were found in Cerrado environments in Mato Grosso do Sul, by Ferreira et al. (2010) and Martins et al. (2014).

In studies conducted in different localities in Brazil *A. lituratus* is the most abundant (Trajan 1984; Passos & Passamani 2003; Passos & Graciolli 2004; Bianconi et al. 2006; Brusco & Tozato 2009; Araújo & Langguth 2010; Luz et al. 2011; Bernardi & Steps 2012; Sato et al .2015). *A. planirostris* is considered a common species and maybe the dominant species in some localities (Gregorin et al. 2011; Alho et al. 2011; Martins et al. 2011; Castro & Michalski 2015; Barros et al. 2017).

In Cerrado environments, some authors mention that a greater abundance of females is found (Ferreira et al. 2010; Cunha et al. 2011). The data of the present study follows these studies. In general, the variation in sex ratio can be expected, with a predominance of females in long-term systematized surveys. This finding can be explained by the fact that there is a tendency for males to form harems and, with this, the colonies have higher numbers of females (Mello & FernanDez 2000; Costa et al. 2010).

The high abundance of *A. lituratus and A. planirostris* is also expected, as they are frugivorous species. Passos & Passamani (2003)states that the abundance of frugivorous species in bat survey is higher due to the large number of plant species that produce fruit at different times of the year. Thus, the high abundance of bats occurs due to the great availability of food found in the areas of forests or natural vegetation. Meanwhile, Ferreira et al. (2010), in a study conducted in urban areas, point out that the difference in the high abundance of both studied species can be explained by urban expansion and environmental degradation since both species are generalists and occur in environments with different levels of preservation.

The Cerrado Biome has been suffering from urban sprawl and one of its main characteristics is the spacing between its trees. This attribute can influence occupation and *A. Lituratus* and *A. planirostris*, due to the ease of flight and the adaptability of the species s regarding the use of habitat (Silveira et al. 2012). Araújo & Langguth (2010), describe *that A. lituratus* was the only species that occurred in all 12 sampling points surveyed by them, 10 in the Cerrado *stricto sensu* and two in Mata de Galeria. The data of the present study show the influence of the vegetation characteristics of Cerradão and Cerrado *stricto sensu* on the abundance of the two studied species.

The time of activity can also influence the abundance of the species, and the results of the present study corroborate with studies previously conducted by Marques (1985), Reis & Peracchi (1987), Sipinski & Reis (1995), Zanon & Reis (2007) and Silva & Anacleto (2011), who observed peak activity in the first hours of capture followed by a decrease in activity in the following hours. Oliveira et al. (2010) observed

similar results reporting that *A. lituratus* and *A. planirostris* were the most active species in the first three hours after sunset, a period in which both species are most active.

Abundance is directly related to temperature, as it is one of the environmental factors that can influence bat activity. At temperatures below 21ºC bats tend to reduce their activities (O'Donnel 2002; Filho et al. 2007) and, according to Fleming et al. (1972), bats have a preference for intermediate temperatures. In the present study, the highest abundances *of A. lituratus and A. planirostris* occurred between 21 and 25ºC, with a positive correlation between abundance and temperature. Navarro & Leon-Paniagua (1995),Patterson et al. (1996), Diaz et al. (2002), and McCain (2007) obtained similar results, reporting that at low temperatures bat activity tends to decrease.

Studies conducted by Passos & Passamani (2003), Ortêncio-Filho et al. (2007), and Martins et al. (2006) believe that seasonality influences the number of catches. This is due to the availability of resources during the rainy season (Passos & Graciolli 2004; Brusco & Tozato 2009).

Zortéa et al. (2010) and Sato et al. (2015) observed a high abundance of *the species of A. lituratus* and *A. planirostris* at the end of the dry season and the beginning of the rainy season, being observed for this period of females' in lactation and pregnancy. Bordignon (2006), Ortêncio-Filho et al. (2007), and Castillo-Navarro et al. (2017) recorded the occurrence *of females of A. lituratus* lactating only in the rainy season. Ortêncio-Filho et al. (2007), Sato et al. (2015), and Castillo-Navarro et al. (2017) state that the reproductive period suffers a decline at the end of the rainy season, demonstrating that the wet season favors the reproduction of the species.

In the studies conducted by Passos & Passamani (2003), Menezes et al. (2008), Miranda et al. (2009), and Reis et al. (2009), the forearm means and weight of *A. lituratus* and *A. planirostris* recorded were concordant with the data of the present study in which there was a positive correlation between weight and forearm for both species.

When analyzed together, it is noted that there is a separation of the species in two groups of individuals, revealing a low occurrence of overlap between weight and forearm for both. Rui et al. (1999) highlight that even if there is variation between species, there are no significant differences in external morphometry between males and females to characterize sexual dimorphism for *A. lituratus* and *A. planirostris*.

5 CONCLUSIONS

The data presented expands the knowledge about bats in the eastern region of Mato Grosso, as well as the knowledge about the biology of the genus *Artibeus*. Also possible is better knowledge about the abundance of the species that vary in the face of seasonality with higher frequency in the rainy months. As for the time of activity, peaks were recorded in the first hours after sunset. In addition, the rainy season is the preferred period for the reproductive activity of the species.

BIBLIOGRAPHIC

ALHO, C. J. R., G. CAMARGO, & E. FISCHER. 2011. Terrestrial and aquatic mammals of the Pantanal. Brazilian Journal Biology 71:297-310

AMARAL, T. S., L. M. MACÁRIO, & L. M. S. AGUIAR. 2016. Testing the coexistence of *Artibeus lituratus* and *A. planirostris* in Neotropical Savana. Acta Chiropterologica, 18: 441-449.

ARAÚJO, P., & A. LANGGUTH. 2010. Caracteres distintivos das quatro espécies de grandes Artibeus (Phyllostomidae) de Paraíba e Pernambuco, Brasil. Revista Chiroptera Neotropical 16:715-722.

BARROS, M. A. S., C. M. G. MORAIS, B. M. B. FIGUEIREDO, G. B. MOURA-JÚNIOR, F. F. S. RIBEIRO, D. M. A. PESSOA, F. ITO, & E. BERNARD. 2017. Bats (Mammalia, Chiroptera) from the Nísia Floresta National Forest, with new records for the state of Rio Grande do Norte, northeastern Brazil. Biota Neotropica 17:1-8.

BERNARDI, I. P., & F. C. PASSOS. 2012. Estrutura de comunidade de morcegos em relictos de Floresta Estacional Decidual no sul do Brasil. Mastozoología Neotropical 19:1-12.

BIANCONI, G. V., S. B. MIKICH, & W. A. PEDRO. 2006. Movements of bats (Mammalia, Chiroptera) in Atlantic Forest remnants in southern Brazil. Revista Brasileira de Zoologia 23:1199-1206.

BORDIGNON, M. O. 2006. Diversidade de morcegos (Mammalia, Chiroptera) do Complexo Aporé-Sucuriú, Mato Grosso do Sul, Brasil. Revista Brasileira de Zoologia 23:1002-1009.

BORDIGNON, M. O., N. R. REIS, A. L. PERACCHI, & C. B. BATISTA. 2017. Sobre os morcegos brasileiros. História natural dos morcegos brasileiros: Chave de identificação de Espécies (N. R. Reis, A. L. Peracchi, C. B. Batista, I. P. Lima & AD Pereira, eds.) Tecknical Books, Rio de Janeiro.

BRUSCO, A. R., & H. C. TOZATO. 2009. Frugivoria na dieta de *A. lituratus* Olfrs, 1808 (Chiroptera, Phyllostomatidae) no parque do Ingá, Maringá/PR. Revista F@pciência 3:19-29.

CASTILLO-NAVARRO, Y., V. H. SERRANO-CARDOZO, & M. P. RAMÍREZ-PINILLA. 2017. Biología reproductiva de Artibeus lituratus y Artibeus jamaicensis (phyllostomidae: stenodermatinae) en un área urbana en colombia. Mastozoología Neotropical, 24:69-84.

CASTRO, I. J., & F. MICHALSKI. 2015. Bats of a varzea forest in the estuary of the Amazon River, state of Amapá Northern Brazil. Biota Neotropica 15:1-8.

COSTA, L. M., E. C. LOURENÇO, C. E. ESBÉRARD, & R. M. SILVA. 2010. Colony size, sex ratio and cohabitation in roosts of *Phyllostomus hastatus* (Pallas) (Chiroptera: Phyllostomidae). Revista Brasileira de Biologia 70:1047-1053.

CUNHA, N. L., E. FISCHER, & C. F. SANTOS. 2011. Bat assemblage in savanna remnants of Sonora, central-western Brazil. Biota Neotropica 11:197-205.

DIAZ, I. A., C. SARMIENTO, & L. ULLOA. 2002. Vertebrados terrestres de la Reserva Nacional Río Clarillo, Chile Central: representatividad y conservación. Revista Chilena de História Natural 75:433-448.

FERREIRA, J. C. V. 2001. Mato Grosso e seus municípios. Editora Buriti, Cuiabá.

FERREIRA, C. M. M., E. FISCHER, & A. PULCHÉRIO-LEITE. 2010. Fauna de morcegos em remanescentes urbanos de Cerrado em Campo Grande, Mato Grosso do Sul. Biota Neotropica 10:155-160.

FLEMING, T. H., E. T. HOOPER, & D. E WILSON. 1972. Three Central American Bat Communities: Structure, Reproductive Cycles and Movement Patterns. Ecology 53:556-569.

GARDNER, A. L. 2008. Mammals of South America. Volume 1. Marsupials, xenarthrans, shrews, and bats. The University of Chicago Press, Chicago.

GREGORIN, R., E. GONÇALVES, C. C. AIRES, & A. P. CARMIGNOTTO. 2011. Morcegos (Mammalia: Chiroptera) da Estação Ecológica Serra Geral do Tocantins: composição específica e considerações taxonômicas. Biota Neotropica 11:299-311.

LIM, B. K., & M. D. ENGSTROM. 2001. Bat community structure at Iwokrama Forest, Guyana. Journal of Tropical Ecology, 17: 647–665.

LUZ, J. L., R. MANGOLIN, C. E. L. ESBÉRARD, & H. G. BERGALLO. 2011. Morcegos (Chiroptera) capturados em lagoas do Parque Nacional da Restinga de Jurubatiba, Rio de Janeiro, Brasil. Biota Neotropica 11:161-168

MARIMON, B. S., M. J. FELFILI, E. S. LIMA, & J. PINHEIRO-NETO. 2003. Padrões de distribuição de espécies na mata de galeria do córrego bacaba, Nova Xavantina, Mato Grosso, em relação a fatores ambientais. Brasília, DF. Boletim do Herbário Ezechias Paulo Heringer 12:1-10.

MARQUES, A. S. 1985. Novos registros de morcegos do Parque Nacional da Amazônia (Tapajós), com observações do período de atividade noturna e reprodução. Boletim do Museu Paraense Emílio Goeldi Serie Zoologia 2:71-83.

MARTINS, A. C. M., E. BERNARD, & R. GREGORIN. 2006. Inventários biológicos rápidos de morcegos (Mammalia, Chiroptera) em três unidades de conservação do Amapá, Brasil. Revista Brasileira de Zoologia 23:1175–1184.

MARTINS, A. C. M., E. BERNARD, R. GREGORIN, & W. A. S. SILVA. 2011. Filling data gaps on the diversity and distribution of Amazonian bats (Chiroptera): The case of Amapá, eastern most Brazil. Zoologia 28:177-185.

MARTINS, M. P. V., J. M. TORRES, & E. A. C. ANJOS. 2014. Dieta de morcegos filostomídeos (Mammalia, Chiroptera, Phyllostomidae) em fragmento urbano do Instituto São Vicente, Campo Grande, Mato Grosso do Sul. Papéis Avulsos Zoologia 54:299-305.

MCCAIN, C. M. 2007. Could temperature and water availability drive elevational species richness patterns? A global case study for bats. Global Ecology and Biogeography 16:1-13.

MELLO, M. A. R., & F. A. S. FERNANDEZ. 2000. Reproductive ecology of the bats *Carollia perspicillata* (Chiroptera: Phyllostomidae) in a fragment of the Brazilian Atlantic coastal forest. Zeitschrift fur Saugetierkunde 65:340-349.

MENEZES-JR, L. F., A. C. DUARTE, R. L. M. NOVAES, A. C. FAÇANHA, A. L. PERACCHI, L. M. COSTA, A. F. P. D. FERNANDES, & C. E. L. ESBÉRARD. 2008. Deslocamento de *Artibeus lituratus* (Olfers, 1818) (Mammalia, Chiroptera) entre ilha e continente no Estado do Rio de Janeiro, Brasil. Revista Biota Neotropica 8:243-245.

MIRANDA, J. M. D., R. F. M. RIOS, J. E. S. PEREIRA, & F. C. PASSOS (EDS.). 2009. Mamíferos da Serra de São Luiz do Purunà, Paraná, Brasil. 12.ed. USEB, Pelotas.

NAVARRO, D. L., & Y. L. LEON-PANIAGUA. 1995. Community structure of bats along an altitudinal gradient in tropical eastern Mexico. Revista Mexicana de Maztozoología 1:9-21.

NOGUEIRA, M. R., I. P. LIMA, R. MORATELLI, V. C. TAVARES, R. GREGORIN, & A. L. PERACCHI. 2014. Checklist of Brazilian bats, with comments on original records**.** Check List 10:808–821.

O´DONNELL, C. F. J. 2002. Influence of sex and reproductive status on nocturnal activity of Long-Tailed Bats (*Chalinolobus tuberculatus*). Journal of Mammalogy 83:794-803.

OLIVEIRA, R. L., L. C. PRAES, J. C. NOGUEIRA, A. B. MAHECHA, & C. A. OLIVEIRA. 2010. Alterações morfológicas dos ductos eferentes e epidídimos ocorridas durante o ciclo reprodutivo anual do morcego-das-frutas *Artibeus lituratus*. Revista Chiroptera Neotropical 16:1-168.

ORTÊNCIO-FILHO, H., N. R. REIS, D.E. PINTO, & C. VIEIRA. 2007. Aspectos reprodutivos de *Artibeus lituratus* (Phyllostomidae) em fragmentos florestais na região de Porto Rico, Paraná, Brasil. Chiroptera Neotropical 13:313-318.

PASSOS, F. C., & G. GRACIOLLI. 2004. Observações da dieta de *Artibeus lituratus* (Olfers) (Chiroptera, Phyllostomidae) em duas áreas do sul do Brasil. Revista Brasileira de Zoologia 21:487–489.

PASSOS, J. G., & M. PASSAMANI. 2003. *Artibeus lituratus* (Chiroptera, Phyllostomidae): biologia e dispersão de sementes no Parque do Museu de Biologia Pro. Mello Leitão Santa Teresa (ES). Revista Natureza On Line 1:1-6.

PATTERSON, B. D., V. PACHECO, & S. SOLARI. 1996. Distributions of bats along an elevational gradient in the Andes of south-eastern Peru. Journal of Zoology 240:637-658.

PERACCHI, A. L., P. H. GALLO, D. DIAS, I. P. LIMA, & N. R. REIS. 2010. Ordem Chiroptera. Mamíferos do Brasil: Guia de identidicação **(**N. R. Reis, A. L. Peracchi, M. N. Fregonezi & B. K. Rossaneis, eds.). Tecknical Books, Rio de Janeiro.

PEREIRA, A. D., M. O. BORDIGNON, & V. C. TAVARES. 2017. Subfamília Stenodermatinae: Gervais, 1856. História natural dos morcegos brasileiros: Chave de identificação de Espécies (N. R. Reis, A. L. Peracchi, C. B. Batista, I. P. Lima, A. D. Pereira, eds.). Tecknical Books, Rio de Janeiro.

REDONDO, R. A. F., L. P. S. BRINA, R. F. SILVA, A. DITCH-FIELD, & F. R. SANTOS. 2008. Molecular systematics of the genus *Artibeus* (Chiroptera: Phyllostomidae). Molecular Phylogenetics and Evolution 49:44–58.

REIS, N. R., M. N. FRGONEZI, & A. L. PERACCHI. 2013. Sobre a identificação de morcegos em campo. Morcegos do Brasil: guia de campo (N. R. Reis, M. N. Fregonezi, A. L. Peracchi & O. A. Shibatta, eds.). Tecknical Books, Rio de Janeiro.

REIS, N. R., & A. L. PERACCHI. 1987. Quirópteros da região de Manaus, Amazonas, Brasil (Mammalia, Chiroptera). Boletim do Museu Paraense Emílio Goeldi, Série Zoologia 3:161-182.

REIS, N. R., A. L. PERACCHI, M. N. FREGONEZI, & B. K. ROSSANEIS (EDS.). 2009. Guia ilustrativo mamíferos do Paraná – Brasil. 1.ed. USEB, Pelotas.

REIS, N. R., O. A. SHIBATA, A. L. PERACCHI, W. A. PEDRO, & I. P. LIMA. 2007. Sobre morcegos Brasileiros. Morcegos do Brasil (N. R. Reis, A. L. Peracchi, W. A. Pedro & I. P. Lima, eds.). Nélio R. dos Reis, Londrina.

RIBEIRO, J. F., & B. M. T. WALTER. 2008. As principais fitofisionomias do bioma Cerrado. Cerrado: ecologia e flora (S. M. Sano, S. P. Almeida & J. F. Ribeiro, eds.). Embrapa, Brasília.

RIZZINI, C. T. 1997. Tratado de fitogeografia do Brasil: aspectos ecológicos, sociológicos e florísticos. Âmbito Cultural Edições Ltda, Rio de Janeiro.

RUI, A. M., M. E. FABIÁN, & J. O. MENEGHETI. 1999. Distribuição geográfica e análise morfológica de *Artibeus lituratus* Olfers e de *Artibeus fimbriatus* Gray (Chiroptera, Phyllostomidae) no Rio Grande do Sul, Brasil. Revista Brasileira de Zoologia 16:447-460.

SATO, T. M., M. C. CARVALHO-RICARDO, W. UIEDA, & F. C. PASSOS. 2015. Estrutura da comunidade de morcegos (Mammalia, Chiroptera) da Estação Experimental de Itirapina, estado de São Paulo, Brasil. Papeis Avulsos de Zoologia 55:1-11.

SILVA, S. G., & T. C. S. ANACLETO. 2011. Diversidade de morcegos entre áreas com diferente grau de alteração na área urbana do município de Nova Xavantina, MT. Chiroptera Neotropical 17:1003-1012.

SILVEIRA, M., W. M. TOMAS, & M. O. BORDIGNOM. 2012. Influência da estrutura da vegetação na ocupação de habitats por *Artibeus planirostris* (Chiroptera, Phyllostomidae) no Pantanal Sul, Brasil. Mastozoologia 12:165-168.

Simmons, N. B. 2005. Order Chiroptera. Mammal species of the World: a taxonomic and Geographic reference Volume 1 (D. E. Wilson, D. M Reeder, eds.). Third Edition, Johns Hopkins University Press.

SIPINSKI, E. A. B., & N. R. REIS. 1995. Dados ecológicos dos quirópteros da Reserva Volta Velha, Itapoá, Santa Catarina, Brasil. Revista Brasileira de Zoologia 12:519-528.

STRAUBE, F. C., & G. V. I. BIANCON. 2002. Sobre a grandeza e a unidade utilizada para estimar esforço de captura com utilização de redes-de-neblina. Chiroptera Neotropica 8:150-152.

TRAJANO, E. 1984. Ecologia de populações de morcegos cavernícolas em uma região cárstica do sudeste do Brasil. Revista Brasileira de Zoologia 2:255-320.

VIZOTTO, L. D., & V. A. TADDEI. 1973. Chave para determinação de quirópteros brasileiros. Revista da Faculdade de Filosofia. Boletim de Ciências 1:1-72.

ZANON, C. M. V., & N. R. REIS. 2007. Família Mormoopidae. Morcegos do Brasil (N. R. Reis, A. L. Peracchi, W. A. Pedro & I. P. Lima, eds.). Nélio R. dos Reis, Londrina.

ZORTÉA M., F. R. MELO, J. C. CARVALHO, & Z. D. ROCHA. 2010. Morcegos da Bacia do Rio Corumbá, Goiás. Chiroptera Neotropical 16:610-616.

Table 1: Number of bats caught in the rainy and dry periods, in the environments of Cerradão and Cerrado *stricto sensu.*

Species	**Cerradão**		***Cerrado stricto Sensu***		**Total**
	Rain	**Drought**	**Rain**	**Drought**	
Artibeus Lituratus	94	44	122	26	286
Gnares	34	6	58	5	103
Total	128	50	180	31	389

Table 2: Months of capture and abundance *of Artibeus lituratus and Artibeus planirostris* according to the reproductive stage of the captured individuals.

Speciess	Months											
Artibeus Lituratus	Jan	Feb	Sea	Apr	Mai	Jun	Jul	Aug	Set	Out	Nov	Ten
♀ Pregnant	1	-	-	-	-	-	-	3	5	5	4	3
♀ Lactating	1	4	2	-	-	-	-	-	1	17	12	5
♂ Scummed up	-	-	-	-	-	-	-	-	1	3	8	1
Puppies	-	-	-	-	-	1	-	-	-	-	5	4
Gnares												
♀ Pregnant	-	-	-	-	-	1	-	-	-	-	1	-
♀ Lactating	-	-	1	-	-	-	-	-	-	2	5	1
♂ Scummed up	-	-	-	-	-	-	-	-	-	2	4	-
Cub	-	-	-	-	-	-	-	-	-	-	1	-

Table 3: Mean (minimum and maximum) of forearm length, expressed in millimeters (mm) and body mass expressed in grams (g), for *the species Artibeus lituratus* and *Artibeus planirostris*, distinguishing females and males.

Measures	*A. Lituratus* ♀	*A. Lituratus* ♂	*A. planirostris* ♀	*A. planirostris* ♂
Length ofthe arm	Seventy-one. 5th (47. 5 - 77. 8)	Seventy of them. 9th (48. 0 - 81. 0)	Six-one. 0 (46. 4 - 74. 5)	Six of them. 9th (52. 6 - 72. 0)
Body mass	Seventy of them. 9th (20. 8 - 94. 8)	Seventy of them. 8th (27. 0 - 81. 4)	Forty-four. 0 (27. 1 - 77. 8)	Forty-two. 5th (31. 0 - 66. 0)

Figure 1: Municippio of Nova Xavantina, State of Mato Grosso. Points 1 , 2 and 3 indicate the areas of Cerradão and points 4, 5 and 6 indicate areas of Cerrado *stricto sensu*.

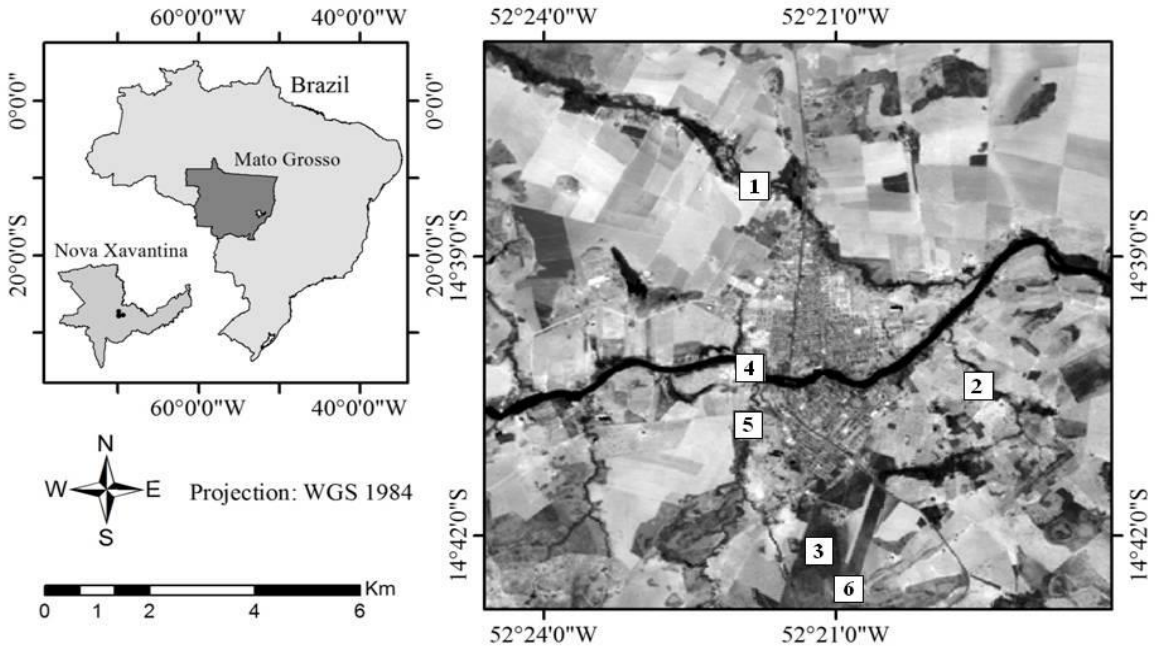

Figure 2: Abundance of ■ Females and ■ *Males of Artibeus lituratus and Artibeus planirostris* captured during field work (January/2010 and December/2010 and between August/2012 and July/2013) in cerrado *stricto sensu* and Cerradão environments.

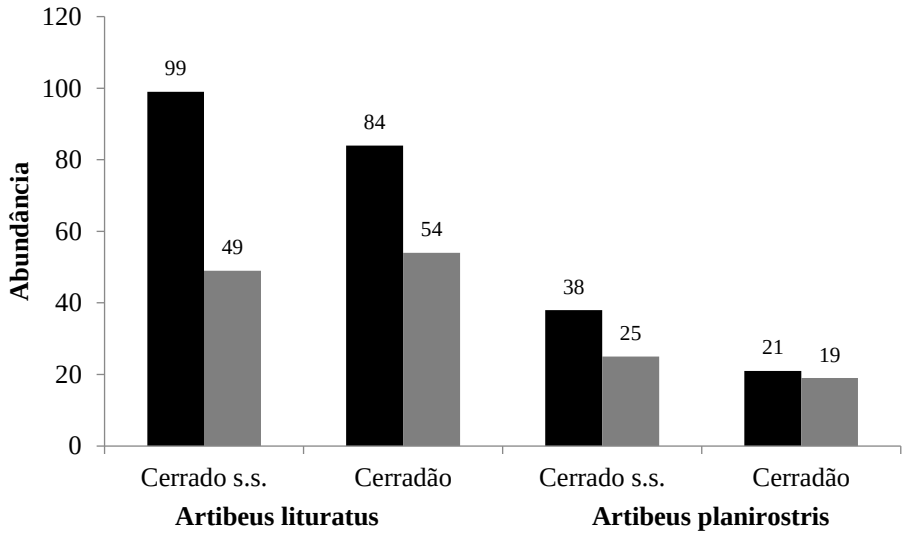

Figure 3: Number of bat catches of the species ■ *A. lituratus* and ■ *A. planirostris* to longthe período from January/2010 to December/2010 and between August/2012 and July/2013.

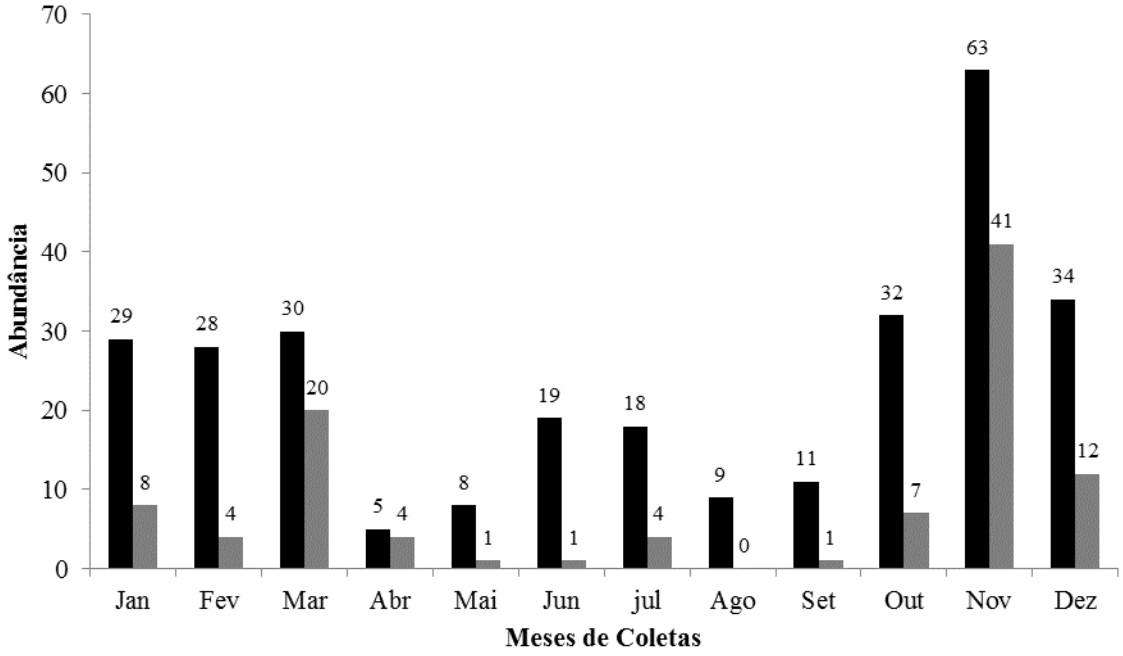

Figure 4: Abundance *of A. lituratus* and *A. planirostris* (respectively) for each capture time, the arc indicates the preferred trend by the times between 21:00 and 23:00 *hours for A. lituratus* and the preferred trend by the times between 20:00 and 23:00 hours for *A. planirostris*

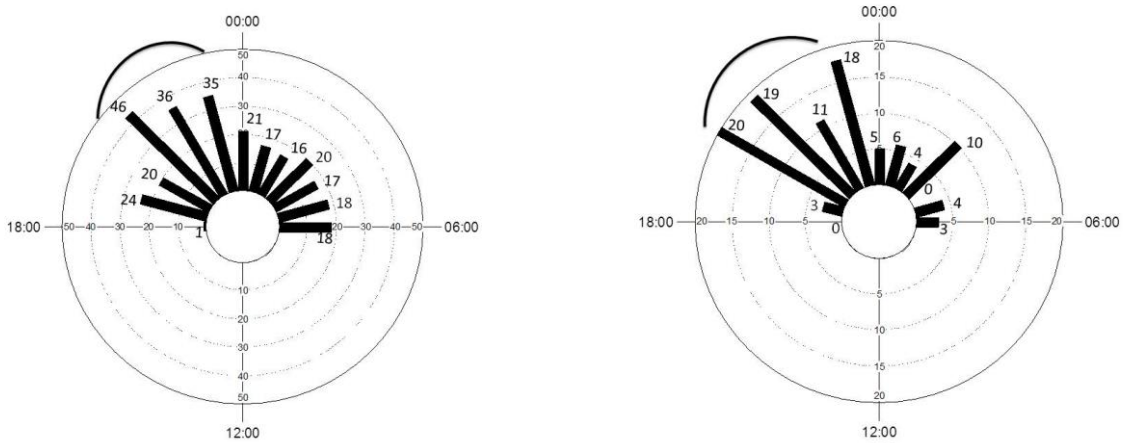

Figure 5: Plenty of ■ *A. lituratus* and ■ *A. planirostris* for each of the temperatures recorded in the capture period (janeiro/2010 and December/2010 and between August/2012 and July/2013).

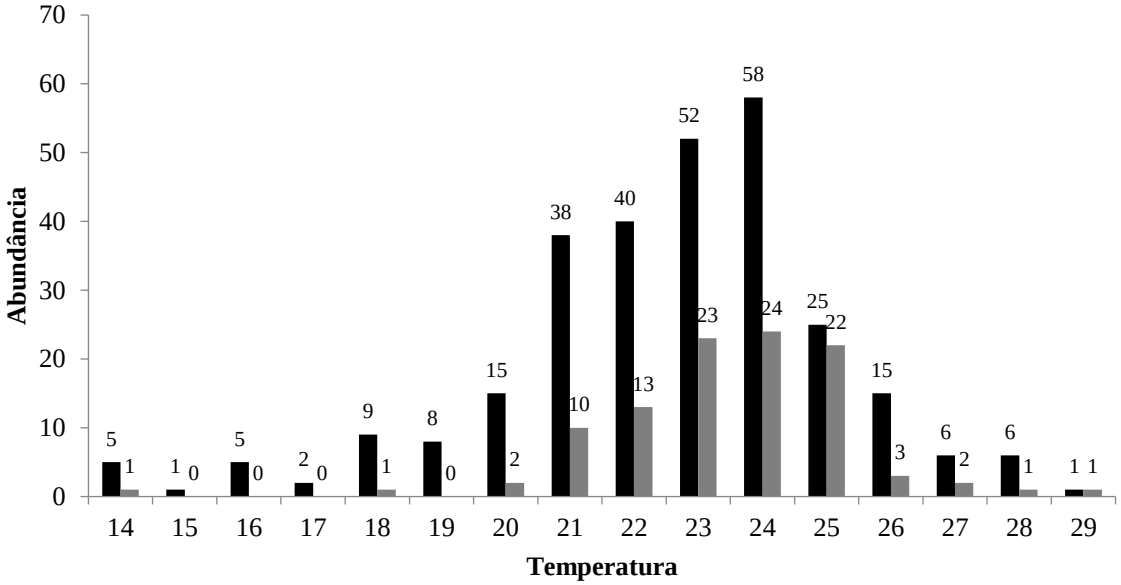

Figure 6: Correlation between forearm length and mass corporal *of A. lituratus* ○ and *A. planirostris* ■ in the Municipality of Nova Xavantina, Mato Grosso, Brazil.