

**Temporal distribution of five bat species (Chiroptera, Phyllostomidae) from Panga Reserve, south-eastern Brazil**

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**ABSTRACT.** Temporal distribution of five bat species from Panga Reserve, south-eastern Brazil (Chiroptera, Phyllostomidae). Data about activity patterns, hourly and monthly, on five phyllostomid bats, *Glossophaga soricina* (Pallas, 1766), *Anoura caudifer* (E. Geoffroy, 1818), *Carollia perspicillata* (Linnaeus, 1758), *Sturnira lilium* (E. Geoffroy, 1810) and *Platyrrhinus lineatus* (E. Geoffroy, 1810), studied over a one year period at the Panga Ecological Reserve, Uberlandia, Minas Gerais state, south-eastern Brazil, are reported and discussed.

**KEY WORDS.** Chiroptera, Phyllostomidae, temporal activity, ecological niche, migration

Some studies in ecology link differences in temporal activity patterns with niche shifts between species that are similar in ecology and morphometrics (ZARET & RAND 1971; KUNZ 1973; PIANKA 1973; MARSHALL & MCWILLIAM 1982). Other studies point out relationships between temporal activity, hourly and monthly, with food availability in phyllostomid bats (SAZIMA & SAZIMA 1978; SAZIMA *et al.* 1982; LEMKE 1984; MARINHO-FILHO & SAZIMA 1989; FISCHER 1992; FISCHER *et al.* 1992).

Herein, data about activity patterns, hourly and monthly, on five phyllostomid bats – *Glossophaga soricina* (Pallas, 1766), *Anoura caudifer* (E. Geoffroy, 1818), *Carollia perspicillata* (Linnaeus, 1758), *Sturnira lilium* (E. Geoffroy, 1810) and *Platyrrhinus lineatus* (E. Geoffroy, 1810) – studied over a one year period at the Panga Ecological Reserve, a 404 ha area South of Uberlândia, Minas Gerais State (ca. 19°09' -19°11'S; 48°23' -48°24'W), ca. 800 m altitude, are reported and discussed. The regional climate is seasonal with a five-month dry-cool season (from May to September) and a seven-month rainy hot season. The vegetation consists of 50% cerrado native scrub woodland interspersed with mesofitic forest, xeromorphic forest and grasslands.

Bats were sampled monthly with mist nets opened at sunset and closed at sunrise. Nets were checked for bats every 15 minutes. The sunset and sunrise times corresponded to data obtained from the Observatório Nacional do Rio de Janeiro, Brazil (1990, 1991). A total of 46 nights of collecting were made between June 1990 and May 1991 (ca. 552 h of netting). More detailed information about the collecting methods and materials are available in PEDRO & TADDEI (1997).

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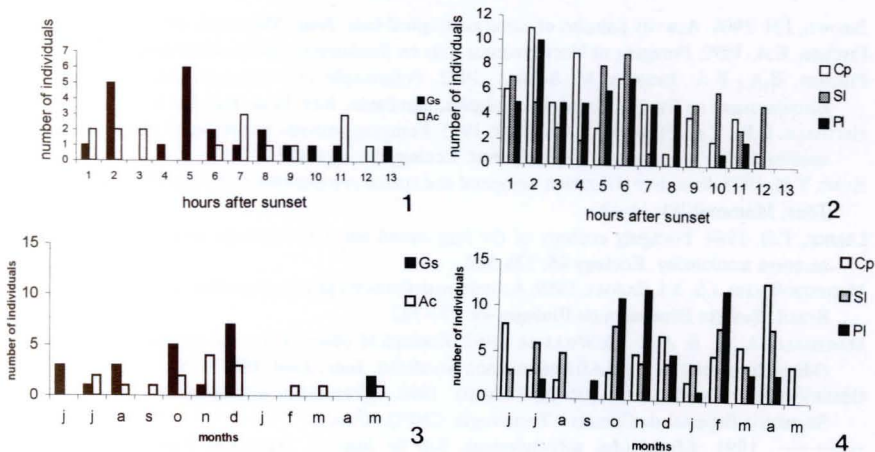
Statistical analysis followed ZAR (1984), including Kolmogorov-Smirnov test, to compare the distribution of hourly activity for different species.

The frequency of capture for five Phyllostomidae species during the night are shown in figures 1 and 2. Except for the 3<sup>rd</sup> and 12<sup>th</sup> hour after sunset for *G. soricina*, all five species were caught throughout the night with some differences of intensity. In order of decreasing frequency, *C. perspicillata* was captured the most frequent followed by *S. lilium*, *P. lineatus*, *G. soricina* and with *A. caudifer* the least captured. All five species had their highest rate of capture during the 1<sup>st</sup> and 2<sup>nd</sup> hours after sunset with a second frequency peak during the 5<sup>th</sup> or 6<sup>th</sup> hour, and then a slight final increase in activity during the 12<sup>th</sup> hour just before sunrise. In general, all five species exhibited a noticeable reduction in activity during the last third of the evening from the 8<sup>th</sup> hour to sunrise. In comparison of the two nectarivorous species (Fig. 1), *Glossophaga soricina* showed two activity peaks during the 1<sup>st</sup> half of the night, and *A. caudifer* showed two activity peaks during the 2<sup>nd</sup> half of the night. *Glossophaga soricina* was the only species not to exhibit a slight increase in capture during the 11<sup>th</sup> hour after sunset (Fig. 1). The three frugivorous species (Fig. 2), *Carollia perspicillata*, *S. lilium*, and *P. lineatus* showed some similarity in hourly activity, but the primary difference was the absence of a second activity peak during the 6<sup>th</sup> hour after sunset for *C. perspicillata*.

HEITHAUS *et al.* (1975) were the first to suggest that temporal differences in foraging might reduce competition between some frugivorous bats, but only in the case of competition by direct interference during foraging because the fruits eaten in the beginning of the night are not replaced later in the night. Thus, frugivorous bats feeding in the beginning of the night might have a competitive advantage. Although our data show slight differences in activity patterns for the frugivorous bats, there were no obvious shifts in frequency peaks to support the idea that there was direct competition for the same food resources. The observed differences in hourly activity of frugivorous *C. perspicillata*, *S. lilium* and *P. lineatus* may be related to specific aspects of the biology of these species, or reflect the differences of diet as discussed in PEDRO & TADDEI (1997): *Carollia perspicillata* feeds mainly on *Piper*, *S. lilium* on *Solanum*, and *P. lineatus* on *Cecropia*, at the Panga Ecological Reserve.

It was also suggested by HEITHAUS *et al.* (1975), that temporal differences in foraging may be important to the nectarivorous bats that exploit resources that are more readily renewable. MARINHO-FILHO & SAZIMA (1989) extended this assumption to the insectivorous bats and a few studies support the hypothesis of temporal segregation in insectivorous and nectarivorous bat species (BROWN 1968; KUNZ 1973; MARSHALL & MCWILLIAM 1982). The results presented here, although not statistically significant, show some differences in the hourly activity patterns in the nectarivorous pair-wise group of *G. soricina*-*A. caudifer*. However, there was no evidence from our data to suggest this because there were no obvious differences in activity patterns between the two species of nectarivorous bats.

In general the nectarivorous pair-wise species had their highest rate of capture in the beginning of the rainy season from October to December with negligible captures in the last half of the rainy season (Fig. 3). The frugivorous



Figs 1-4. Hourly activity of *Glossophaga soricina* and *Anoura caudifer* (1) and *Carollia perspicillata*, *Sturnira lilium* and *Platyrrhinus lineatus* (2); and frequency of captures on mist nets of *Glossophaga soricina* and *Anoura caudifer* (3) and *Carollia perspicillata*, *Sturnira lilium* and *Platyrrhinus lineatus* (4) in the Panga Reserve.

species also exhibited their highest rates of capture in the 1<sup>st</sup> half of the rainy season with a dramatic decrease in January before a return to higher frequencies for the last three months of the rainy season (Fig. 4). They also have a modest increase in activity near the middle of the dry season around June. There was no significant difference for the nectarivorous pair-wise species *Glossophaga soricina*-*Anoura caudifer* throughout the year (Kolmogorov-Smirnov test,  $D = 0,154$ ;  $p > 0,05$ ), or for the frugivorous pair-wise species *Carollia perspicillata*-*Sturnira lilium* (in the dry season Kolmogorov-Smirnov test,  $D = 0,154$ ;  $p > 0,05$ ; in the rainy season Kolmogorov-Smirnov test,  $D = 0,077$ ;  $p > 0,05$ ; and throughout the year Kolmogorov-Smirnov test,  $D = 0,077$ ;  $p > 0,05$ ).

The monthly activity patterns of these five Phyllostomidae species showed an increase in the rainy months when there was more food availability which bring out the opportunistic character of the foraging behavior of these bats. Monthly temporal segregation was not supported by the present data (Figs 3 and 4). The frequency of capture of frugivorous bats was, in general, highest during the rainy season (Fig. 4) suggesting the possibility of migration for at least portions of these populations in the study area, and their associations to the availability of food resources, notably *Cecropia pachystachya* Trec. fruits for *P. lineatus*.

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