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Daily Activity of Neotropical Dipsadid Snakes

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Abstract. The daily activity of nine dipsadid snakes from southeastern Brazil was characterized using captive specimens monitored by a digital video system. Six species (*Apostolepis assimilis, Erythrolamprus aesculapii, Liophis miliaris, Philodryas patagoniensis, Thamnodynastes strigatus,* and *Tomodon dorsatus*) were diurnal and three species (*Atractus pantostictus, Oxyrhopus guibei* and *Sibynomorphus mikanii*) were nocturnal. The daily activity pattern was highly variable among species. However, intra-specific variation in both period and activity pattern was observed in some of the studied species. Although activity period is usually conservative within lineages, our results indicate that activity pattern might be strongly influenced by biotic or abiotic factors.

Keywords. Activity period; Activity pattern; Diurnal; Nocturnal; Phylogeny; Prey; Southeastern Brazil.

Resumo. A atividade diária de nove espécies de dipsadídeos do sudeste do Brasil foi caracterizada utilizando espécimes em cativeiro, monitorados por um sistema de vídeo digital. Seis espécies (*Apostolepis assimilis, Erythrolamprus aesculapii, Liophis miliaris, Philodryas patagoniensis, Thamnodynastes strigatus* e *Tomodon dorsatus*) apresentaram atividade diurna e três espécies (*Atractus pantostictus, Oxyrhopus guibei* e *Sibynomorphus mikanii*) apresentaram atividade noturna. O padrão de atividade diária foi altamente variável entre as espécies. No entanto, foi observada variação intra-específica tanto no período quanto no padrão de atividade em algumas espécies estudadas. Embora o período de atividade seja uma característica conservada em cada linhagem, nossos dados indicam que o padrão de atividade é fortemente influenciado por fatores bióticos ou abióticos.

INTRODUCTION

Biological rhythms are innate, adaptive, and modulated by a broad range of cyclic factors (Val, 1997). Abiotic and biotic factors such as temperature, luminosity, prey availability, presence of predators, and reproductive conditions may influence the daily activity of snakes (Gannon and Secoy, 1985; Gibbons and Semlitsch, 1987; Oishi et al., 2004; DeGregorio et al., 2015). Data on daily activity of Neotropical snakes is scarce and usually inferred from few specimens observed in the field (Martins and Oliveira, 1998; Bernarde and Abe, 2006; Sawaya et al., 2008). Due to the insufficient data available, it is difficult to identify reliably the daily activity pattern of most Neotropical snakes, and to understand the factors that influence it. Dipsadidae Bonaparte, 1838 is the most speciose family of snakes in the Neotropical region, with about 700 species in 18 lineages (Grazziotin et al., 2012). Due to their great ecological diversity, it is expected that different activity periods and patterns should occur in these snakes.

Here we describe the period and pattern of daily activity of nine dipsadid snakes from southeastern Brazil based on observations in captivity using a remote digital video system. We intended to (1) test whether the activity patterns inferred from scarce field work observations are confirmed by detailed observations in captivity, (2) evaluate how activity patterns vary among species and lineages of Xenodontinae Bonaparte, 1845, and (3) explore potential factors that can modulate the activity of each species.

MATERIALS AND METHODS

All specimens used were received by Instituto Butantan. A total of nine species were monitored (Table 1). The studied specimens were obtained from São Paulo municipality and surroundings areas situated in the Atlantic Forest at altitudes above 500 m above seal level, except for two specimens of *Liophis miliaris* (Linnaeus, 1758) collected at sea level (Appendix). We chose these species (Table 1) because they are commonly sent to Instituto Butantan (Barbo et al., 2011). Only adult snakes were used in this study (cf. Marques 1996; Pizzatto and Marques, 2002; Bizerra et al., 2005; Pizzatto and Marques 2006; López and Giraudo, 2008; Pizzatto et al., 2008; Bellini et al., 2014; Resende and Nascimento, 2015). Pregnant females or with oviductal eggs, detected by palpation, were discarded. Each specimen was individually placed in a terrarium measuring 50 × 25 × 35 cm or 70 × 30 × 45 cm, with soil substrate (on which water was sprayed every other day) and a water bowl. Snakes were housed in an isolated room at Laboratório de Ecologia e Evolução, Instituto Butantan and exposed to natural climatic conditions (including photoperiod), with food deprivation during the experiments. Thus, both light and temperature varied throughout the day (Figs. 1, 2). Temperature inside the terrarium was on average 24.7 ± 1.0°C and 3°C higher than that in the external environment. The hourly temperature data used herein were obtained from a meteorological station located at the Instituto de Astronomia, Geofísica e Ciências

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Table 1. Species studied, including information on sample, recording periods, and body size of specimens examined. SVL = snout–vent length, SD = standard deviation (mm).

Species	*n* males, females	Recording period	SVL Mean ± SD (range)
Dipsadinae			
Atractus pantostictus	1 M; 2 F	Dec, May, Feb	345 ± 22,61 (330-371)
Sibynomorphus mikanii	5 F	Jan, Apr	507,8 ± 60,4 (418-583)
Xenodontinae			
Apostolepis assimilis	3 M; 3 F	Oct, Nov, Dec	508,17 ± 65,06 (400-591)
Erythrolamprus aesculapii	3 M; 2 F	Feb, Mar, Apr, Oct, Dec	644,4 ± 163,76 (457-895)
Liophis miliaris	3 M; 3 F	Feb, Mar, Apr, Dec	584,17 ± 45,76 (510-650)
Oxyrhopus guibei	2 M; 4 F	Jan, Apr, Oct, Nov	755,6 ± 144,3 (633-955)
Philodryas patagoniensis	3 M; 3 F	Jan, Mar, Nov, Dec	738,67 ± 108,7 (576-865)
Thamnodynstes strigatus	2 M; 3 F	Feb, Apr, Nov, Dec	531,6 ± 91,52 (372-600)
Tomodon dorsatus	3 M; 4 F	Mar, Apr, Sep, Nov, Dec	466,29 ± 56,3 (389-548)

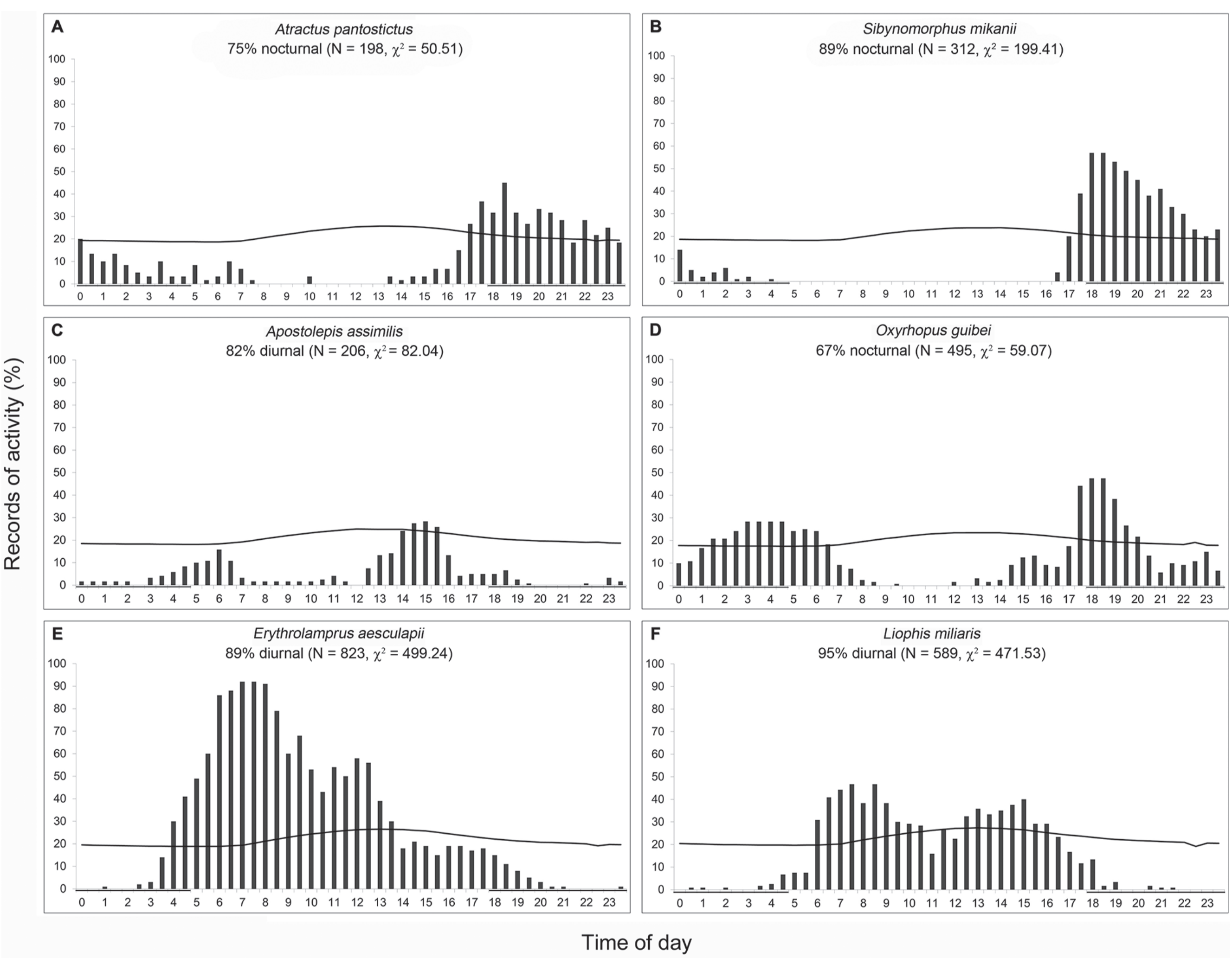

Figure 1. Daily activity patterns of dipsadid snakes from southeastern Brazil: **(A)** *Atractus pantostictus,* **(B)** *Sibynomorphus mikanii,* **(C)** *Apostolepis assimilis,* **(D)** *Oxyrhopus guibei,* **(E)** *Erythrolamprus aesculapii,* and **(F)** *Liophis miliaris.* For each species, the period of highest activity, its percentage, the number of activity records per half-hour interval (N), and the chi-square values for the comparison between diurnal and nocturnal activity records. The line corresponds to the temperature during the period when each species was video-recorded (source: Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo). The thicker portion of the horizontal axis represents the nocturnal period.

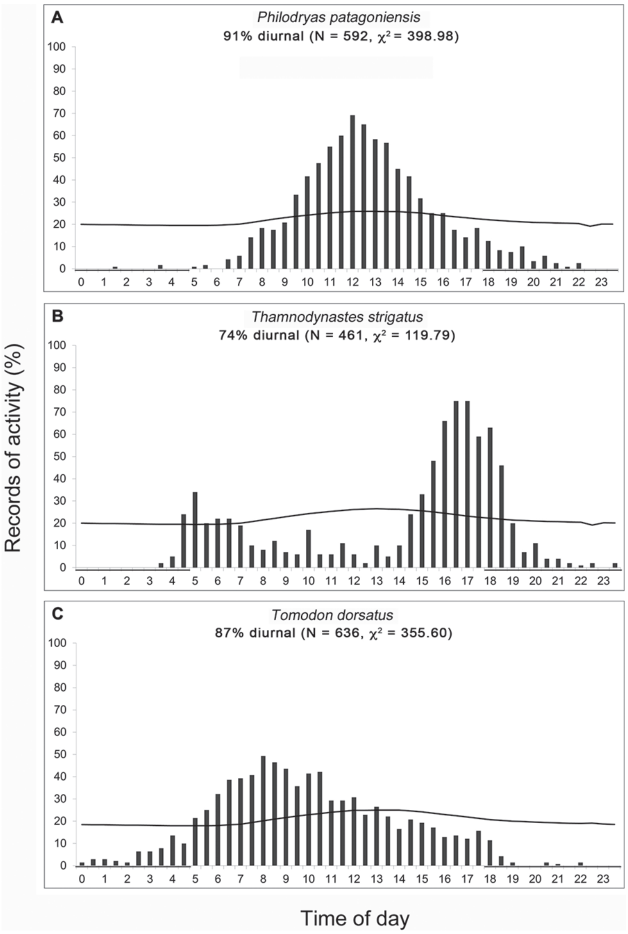

Figure 2. Daily activity patterns of dipsadid snakes from southeastern Brazil: **(A)** *Philodryas patagoniensis,* **(B)** *Thamnodynastes strigatus,* and **(C)** *Tomodon dorsatus*. For each species, it is shown the period of higher activity, its percentage, the number of activity records per half-hour interval (N), and the chi-square values for the comparison between diurnal and nocturnal activity records. The line corresponds to the temperature during the period when each species was video-recorded (source: Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo). The thicker portion of the horizontal axis represents the nocturnal period.

Atmosféricas, Universidade de São Paulo, located 1.5 km from the laboratory where the study was conducted. To minimize possible effects of seasonal variation on daily activity, snakes were kept in captivity from September–April, which coincides with the rainy season (IAG/USP, 2013). The only exception was one specimen of *Atractus pantostictus* Fernandes and Puorto, 1993, which was recorded in May (onset of the dry season). The month in which each individual was observed can be found in Appendix 1.

The activity of snakes (i.e., movements of snakes within the terraria) was recorded by a digital video system, equipped with infrared light for night vision operations (Parpinelli and Marques, 2008; Torello-Viera et al., 2012). Snakes were acclimated in terrariums for two days before filming started. Each snake was monitored 24 h per day, for 10 d. For analysis, films were divided into smaller videos with 5 min intervals (resulting in six videos per 30 min). We watched each 5 min video and recorded whether individuals showed: (i) intense activity, when movement was continuous throughout the terraria (ranked as 1), (ii) moderate activity, when movement was intermittent and short (ranked as 0.5), or (iii) inactivity, when no movement was observed (ranked as 0). We classified the individuals as active for each 30 min interval when the sum of values was > 3 (i.e., > 50% of the period; cf. Torello-Viera et al., 2012). Only snakes moving on the substrate were considered active because it was not possible to observe their movements when they were underground. Records from 05:00–17:59 h and 18:00–04:59 h were considered diurnal and nocturnal, respectively. Daily activity patterns of each species were characterized by the sum of the activity records of all individuals of that species.

We used X^2 tests to compare the frequency of activity at each period (nocturnal and diurnal). Results were considered significant when $p \leq 0.05$ (Zar, 1999).

RESULTS

Six species (*Apostolepis assimilis* [Reinhardt, 1861], *Erythrolamprus aesculapii* [Linnaeus, 1758], *Liophis miliaris, Philodryas patagoniensis* [Girard, 1858], *Thamnodynastes strigatus* [Günther, 1858], and *Tomodon dorsatus* Duméril et al. 1854) presented diurnal activity and three species (*Atractus pantostictus, Oxyrhopus guibei* Hoge and Romano, 1977, and *Sibynomorphus mikanii* [Schlegel, 1837]) presented nocturnal activity (Figs. 1, 2). Sample sizes are too small to evaluate intraspecific variation statistically; however, we found an apparent variation among individuals of the same species (Fig. S1). In the diurnal *Ap. assimilis,* individuals 3 and 6 were active during both day and night (Fig. S1C). A similar variation was observed in the nocturnal *O. guibei,* with three individuals (2, 3, and 6) being predominantly nocturnal and three others (1, 4, and 5) being both diurnal and nocturnal (Fig. S1D). In the diurnal *To. dorsatus,* individuals 1, 2, and 3 had activity at night in comparison to 4, 6, and 7 (Fig. S1I).

A unimodal pattern was observed in five species (*Atractus pantostictus, Sibynomorphus mikanii, Erythrolamprus aesculapii, Philodryas patagoniensis,* and *Tomodon dorsatus*), whereas a bimodal pattern was recorded for the remaining species (*Apostolepis assimilis, Oxyrhopus guibei, Liophis miliaris,* and *Thamnodynastes strigatus;* Figs. 1, 2). Although the pattern of *L. miliaris* was classified as bimodal (Fig. 1F), two individuals (4 and 5) showed a unimodal pattern (Fig. S1F). All nocturnal species exhibited maximum activity at the beginning of the night whereas peak activity was quite variable among diurnal species (Figs. 1, 2).

DISCUSSION

Our results regarding activity period support previous findings based on field records on the following species: *Atractus pantostictus, Sibynomorphus mikanii,* and *Oxyrhopus guibei,* which are referred to as nocturnal, *Erythrolamprus aesculapii, Philodryas patagoniensis,* and *Tomodon dorsatus,* which are referred to as diurnal, and in part to *Liophis miliaris,* which was observed in nocturnal and diurnal activity in nature (Sazima and Haddad, 1992; Martins, 1993; Marques et al., 2004; Hartmann and Marques, 2005; Sawaya et al., 2008). In contrast, our results do not support previous information on the activity of *Thamnodynastes strigatus,* which belongs to a genus usually referred to as nocturnal (Bellini et al., 2013). The activity of *Apostolepis assimilis* and related species (tribe Elapomorphini Jan, 1865) is poorly known. Thus, the data shown here is the first accurate description of the activity of an elapomorphine.

Atractus pantostictus and *Sibynomorphus mikanii* are goo-eaters (i.e., the consume earthworms and slugs; Greene, 1997) and are part of the dipsadine clade (Grazziotin et al., 2012), which includes typically nocturnal species (e.g., Martins and Oliveira, 1998). Slugs are usually active at night and earthworms emerge from the soil and move on the ground at night as well (Dainton, 1954; Duriez et al., 2006). Therefore, the nocturnal habits of goo-eaters might reflect the activity period of their prey. However, dipsadines that are frog and lizard-eaters (e.g., *Imantodes* Duméril, 1853, *Leptodeira* Fitzinger, 1843, *Hypsiglena* Cope, 1860) are also usually observed in activity at night searching for diurnal prey (Greene, 1997). Thus, nocturnal activity may be a conservative trait in the dipsadine clade. The high levels of rods in the retina of *A. pantostictus* and *S. mikanii* are also indicative of the period of activity of these snakes (Hauzman, 2014), since these cells are responsible for scotopic vision. Hauzman (2014) found an increase in the percentage of retinal rod in the following species: *Atractus reticulatus* (Boulenger, 1885): 73.5%; *Sibynomorphus mikanii:* 88%; and *Dipsas bucephala* (Shaw, 1802): 94%. Interestingly, it was observed that the density of rods is similar to the percentage of nocturnal activity in the same species or genus (i.e., *Atractus pantostictus:* 75%; *Sibynomorphus mikanii:* 89%; *Dipsas bucephala:* 99%; Torello-Viera et al., 2012; this study).

The tribe Pseudoboni is the most nocturnal of all Xenodontinae (Marques et al., 2004; Gaiarsa et al., 2013), and *Oxyrhopus guibei* also followed this pattern, but to a lesser extent. Some individuals can be found in nature exposed to the sun during the day (Sazima and Abe, 1991; Sawaya et al., 2008; Barbo et al., 2011; Gaiarsa et al., 2013). Therefore, it is possible that in captivity the locomotion of *O. guibei* during the day is related to attempts to find warmer sites to increase body temperature. Moreover, considering the eight species of snakes of five different tribes of Xenodontidae studied by Hauzman (2014), *O. guibei* is the only species with rods in the retina, confirming its nocturnal habits.

Contrary previous studies (Bernarde et al., 2000; Marques et al., 2004), we recorded predominantly diurnal activity in *Thamnodynastes strigatus*. Nocturnal activity has also been reported for other species of *Thamnodynastes* Wagler, 1830 (Vitt and Vangilder, 1983; Strüssmann and Sazima, 1993; Sawaya et al., 2008; Bellini et al., 2013). Species of this genus feed on anurans, which tend to be more abundant at night (Vitt and Vangilder, 1983; Strüssmann and Sazima, 1993; Bernarde et al., 2000; Ruffato et al., 2003; Wells, 2007; Bellini et al., 2013). Locomotion of *Th. strigatus* in nature was mainly observed at the onset of the night (Bernarde et al., 2000). Another species, *Th. hypoconia,* showed a similar pattern of activity (cf. Bellini et al., 2013). In the present study, when snakes in captivity were not fed, the activity was concentrated at the end of the day. Apparently, the availability of prey causes a small displacement of the activity peak to the beginning of the night in nature. The other tachymenine studied, *Tomodon dorsatus,* also showed diurnal activity in captivity, peaking at the onset of the morning, which corresponds to what was observed in nature (Marques and Sazima, 2004). This activity peak could be related to the search for slugs of the genus *Sarasinula* (the main prey of *To. dorsatus;* see Bizerra et al., 2005), which is more active during the night and the first hours of the day (Junqueira et al., 2004). The activity period of other thachymenines is poorly described, but *Tachymenis chilensis* (Schlegel, 1837) and *T. peruviana* Wiegmann, 1834 also showed diurnal activity (Jaksic et al., 1981; Greene and Jaksic, 1992). In contrast, nocturnal activity has been observed in *Gomesophis brasiliensis* (Gomes, 1918), which is an earthworm-eater (Oliveira et al., 2003; Marques et al., 2004; Fortes et al., 2010). Histological features of the retina of *Th. strigatus,* including the presence of cones and the absence of rods (Hauzman, 2014), reinforce the idea that this snake has intrinsically diurnal activity. The retina of *To. dorsatus* has a similar structure (Hauzman, 2014). Therefore, diurnal activity may be an intrinsic trait in the tribe Thachymenini. However, this trait is plastic, and so it can vary according to environmental conditions, as described for *Thamnodynastes* (frog-eaters) and *Gomesophis* Hoge and Mertens, 1959 (earthworm-eater).

The most diurnal species, with approximately 90% of activity during the day, include two xenodontines (*Erythrolamprus aesculapii* and *Liophis miliaris*), one philodryadine (*Philodryas patagoniensis*), and one tachymenine (*Tomodon dorsatus*). Histological analysis of the eyes of all these species revealed the presence of cones and the absence of rods in the retina (Hauzman, 2014; Hauzman et al., 2014). This type of retina may be related to the pronounced diurnal habit of most of these snakes. However, there are consistent observations of nocturnal activity of *L. miliaris* in nature, including predatory events at night (Martins, 1993; Marques et al., 2004). Once again, food availability may be the cause of the differences between the activity observed in captivity (this work) and the activity observed in nature. *Liophis miliaris* is specialized in foraging in water bodies (Marques and Souza, 1993), but has a generalist and opportunistic diet, and is able to take advantage in some situations of potential prey aggregation (Marques and Souza, 1993; Martins, 1993; Hartmann et al., 2009). Frog aggregations in water bodies at night are frequent in the Atlantic forest (where *L. miliaris* occurs) and are therefore a possible drive of nocturnal activity in this species in nature.

The predominantly diurnal activity of *Apostolepis assimilis* was previously unknown, perhaps because of the typical low frequency of encounters of this species in nature (França et al., 2008). This snake belongs to the tribe Elapomorphini, and the available data on other species of this lineage indicates that this group is diurnal (Marques et al., 2004). However, diurnal and nocturnal activity has been observed in certain species like *Apostolepis* spp., *Phalotris lativittatus* Ferrarezzi, 1993, and *P. mertensi* (Hoge, 1955) (França et al., 2008; Sawaya et al., 2008). In our study, both diurnal and nocturnal activity was observed in two individuals of *A. assimilis*. Perhaps individual variation in daily activity is a result of behavioral plasticity in the burrowing elapomorphine snakes. Additional information is necessary to confirm individual variability in activity in other members of this tribe.

Activity patterns can be influenced by climatic variations throughout the day (Gibbons and Semlitsch, 1987). The activity peak of *Philodryas patagoniensis* coincides with the warmer hours of the day, suggesting that this species is more active under higher temperatures. Additionally, some nocturnal species (e.g., *Apostolepis pantostictus* and *Sibynomorphus mikanii*) are more active in early night, when the temperatures tend to be higher. In contrast, the bimodal activity observed in most diurnal species (*A. assimilis, Liophis miliaris,* and *Thamnodynastes strigatus*) may be related to a decrease in activity in the warmer hours of the day. Similarly, peak activity of *Erythrolamprus aesculapii* and *Tomodon dorsatus* occurred in less warm periods of the day. These results indicate the importance of temperature for snake activity (Oishi et al., 2004) and that each species can respond differently to thermal variation (Peterson, 1987).

Activity period seems to be a conservative trait within lineages, and the present study suggests that activity pattern may be influenced by other factors, such as prey availability and temperature. However, other factors might also be important, and additional detailed studies are necessary to better assess some of the hypotheses proposed here.

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ONLINE SUPPORTING INFORMATION

The following Supporting Information is available for this article online:

Figure S1. Daily activity records for all individuals of each species: **(A)** *Atractus pantostictus,* **(B)** *Sibynomorphus mikanii,* **(C)** *Apostolepis assimilis,* **(D)** *Oxyrhopus guibei,* **(E)** *Erythrolamprus aesculapii,* **(F)** *Liophis miliaris,* **(G)** *Philodryas patagoniensis,* **(H)** *Thamnodynastes strigatus,* and **(I)** *Tomodon dorsatus*. Each dark cell represents an activity record (locomotion). Time of the day (uppermost row) in grey indicates nocturnal period. Each row represents a day and the individuals are numbered in the left column.

APPENDIX

Identification of specimens of each species studied (all from Brazil), showing the specimen identification number, sex, locality, snout–vent length + tail length, mass, and recording period.

Atractus pantostictus. (1) male, Guarulhos, SP, 334 + 43 mm, 9 g, 22 December 2012–01 January 2013; (2) female, Itupeva, SP, 330 + 26 mm, 10 g, 17–26 May 2012; (3) female, Ibiúna, SP, 371 + 46 mm, 12 g, 06–15 February 2013. *Sibynomorphus mikanii:* (1) female, Itapecerica da Serra, SP, 585 + 103 mm, 47 g, 17–26 April 2013; (2) female, Itapecerica da Serra, SP, 532 + 97 mm, 41 g, 20–29 April 2013; (3) female, São Paulo, SP, 418 + 70 mm, 27 g, 10–19 January 2013; (4) female, Jandira, SP, 492 + 92 mm, 27 g, 03–12 January 2013; (5) female, São Paulo, SP, 514 + 96 mm, 35 g, 03–12 January 2013.

Apostolepis assimilis. (1) male, Araçariguama, SP, 400 + 40 mm, 7 g, 15–24 November 2012; (2) male, Cajamar, SP, 483 + 41 mm, 8 g, 17–26 November 2012; (3) male, São Paulo, SP, 498 + 42 mm, 10 g, 24 October–02 November 2012; (4) female, Itapevi, SP, 535 + 11 + x mm, 20 g, 26 October–04 November 2012; (5) female, Barueri, SP, 542 + 40 mm, 16 g, 14–23 November 2012; (6) female, Osasco, SP, 591 + 47 mm, 21 g, 01/–10 December 2012.

Oxyrhopus guibei. (1) male, Itapevi, SP, 650 + 185 mm, 60 g, 06–15 November 2012; (2) male, Itapecerica da Serra, SP, 633 + 177 mm, 55 g, 21–30 November 2013; (3) female, Itapevi, SP, 678 + 166 mm, 60 g, 10–19 January 2013; (4) female, Santana de Parnaíba, SP, 955 + 202 mm, 260 g, 11–20/04/2013; (5) female, São Paulo, SP, 862 + 190 mm, 155 g, 02–11 October 2013; (6) female, Cotia, SP, 850 + 192 mm, 120 g, 23/10–01 November 2013.

Erythrolamprus aesculapii. (1) male, Itú, SP, 680 + 66 mm, 80 g, 29 January–07 February 2012; (2) male, Barueri, SP, 635 + 105 mm, 60 g, 02–11 October 2012; (3) male, Itapecerica da Serra, SP, 555 + 57 mm, 50 g, 21–30 April 2013; (4) female, Natividade da Serra, SP, 895 + 114 mm, 130 g, 15–24 December 2012; (5) female, Santana de Parnaíba, SP, 457 + 62 mm, 20 g, 12–21 March 2012. *Liophis miliaris:* (1) male, Juquitiba, SP, 590 + 113 mm, 90 g, 21 February–02 March 2012; (2) male, São Paulo, SP, 510 + 115 mm, 46 g, 12–21 March 2012; (3) male, Taboão da Serra, SP, 595 + 150 mm, 140 g, 16–25 April 2012; (4) female, Juréia, SP, 565 + 140 mm, 90 g, 16–25 December 2012; (5) female, Bertioga, SP, 595 + 150 mm, 60 g, 11–20 February 2012; (6) female, Cotia, SP, 650 + 65 mm, 110 g, 16–25 February 2012.

Philodryas patagoniensis. (1) male, São Paulo, SP, 576 + 234 mm, 60 g, 08–17 December 2012; (2) male, São Paulo, SP, 715 + 290 mm, 100 g, 22–31 December 2012; (3) male, Santana de Parnaíba, SP, 776 + 333 mm, 150 g, 12–21 March 2013; (4) female, Itapevi, SP, 665 + 273 mm, 80 g, 08–17/03/2012; (5) female, Suzano, SP, 865 + 295 mm, 210 g, 05–14/11/2012; (6) female, Suzano, SP, 835 + 267 mm, 160 g, 09–18 January 2013.

Thamnodynastes strigatus. (1) male, São Paulo, SP, 600 + 182 mm, 130 g, 02–11 February 2013; (2) male, Santana de Parnaíba, SP, 560 + 138 mm, 100 g, 03–12 April 2012; (3) female, Suzano, SP, 372 + 109 mm, 30 g, 21–30 December 2012; (4) female, Santana de Parnaíba, SP, 546 + 138 mm, 120 g, 17–26 February 2013; (5) female, Bragança Paulista, SP, 580 + 148 mm, 115 g, 06–15 November 2013.

Tomodon dorsatus. (1) male, Cotia, SP, 408 + 125 mm, 30 g, 10–19 April 2012; (2) male, São Bernardo do Campo, SP, 466 + 158 mm, 40 g, 07–16 November 2012; (3) male, São Bernardo do Campo, SP, 473 + 159 mm, 40 g, 07–16 November 2012; (4) female, Embu das Artes, SP, 520 + 159 mm, 110 g, 18–27 September 2012; (5) female, Mairinque, SP, 460 + 129 mm, 50 g, 04–13 March 2012; (6) female, Embu das Artes, SP, 389 + 105 mm, 20 g, 02–11 November 2012; (7) female, São Paulo, SP, 548 + 168 mm, 30 g, 27 November, 06 December 2012.