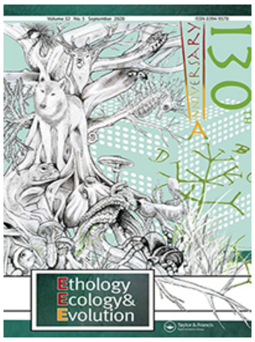

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Illuminating the nightlife of two Neotropical nightjars: vocal behavior over a year and monitoring recommendations

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The ecology of tropical wildlife remains unknown for most nocturnal species owing to difficulties in performing night surveys. To improve our understanding of the ecology of nocturnal tropical birds, we monitored the calling activity of two Neotropical nightjars, the Little nightjar (*Setopagis parvula*) and the Common pauraque (*Nyctidromus albicollis*), over an annual cycle at four sites in the Brazilian Pantanal. The calling activity of both species was restricted to the nocturnal period and showed peaks of activity just before dawn and just after dusk. The Little nightjar was detected from early June to late January owing to the migratory habits of the species, while the Pauraque was detected throughout the year. Our results suggest that the breeding season of both species starts in August, and the nesting phase probably takes place in September at the end of the dry season. This might be related to the typical increase in arthropod abundance after the first rains in tropical habitats with seasonal rainfall. Future surveys of these species should be performed in the last fortnight of August at 5 am, a period during which the calling activity of both nightjars was maximum. Autonomous sound recorders should be left in the field for a minimum of 9 days to record a reliable vocal activity rate. Acoustic monitoring, coupled with automated signal recognition, has proven to be a useful tool for monitoring tropical nightjars and may be useful to increase our knowledge about the ecology of other nocturnal tropical species.

KEY WORDS: acoustic monitoring, Brazil, Caprimulgiformes, *Nyctidromus*, Pantanal, *Setopagis*, autonomous sound recorder.

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INTRODUCTION

Monitoring nocturnal species is a challenging task due to the absence of visual cues while surveying and because these species are usually cryptic and show secretive behavior (Bibby et al. 2000). The difficulty of monitoring nocturnal wildlife can be enhanced in tropical areas where the dominant vegetation is usually high and dense and logistics (e.g., access to field sites) is difficult. These reasons may partly explain why our current knowledge about the natural history of nocturnal tropical species is very restricted (but see Richards 1989; Nascimento & Tannure-Nascimento 2005; Goyette et al. 2011). However, there is a need to improve our understanding of the ecology of nocturnal tropical wildlife and to develop effective monitoring programs to assess the current status and propose effective conservation actions (Brandes 2008; Potamitis et al. 2014).

In recent years, the development of noninvasive monitoring techniques has prompted scientists to monitor the ecology of nocturnal wildlife in the tropics, such as DNA fecal analyses (Bobrowiec et al. 2015) or the use of camera traps (Leuchtenberger et al. 2018). Among noninvasive monitoring techniques, autonomous sound recorders have proven to be an effective tool for monitoring tropical species and habitats (e.g., Obrist et al. 2010; Deichmann et al. 2017; Jahn et al. 2017; Burivalova et al. 2019). Birds are the wildlife group most commonly surveyed using autonomous sound recorders (see review in Sugai et al. 2019), including their use for monitoring nocturnal tropical birds (Farnsworth & Russell 2007; Goyette et al. 2011).

Nightjars (Caprimulgiformes) are nocturnal aerial insectivores represented by approximately 90 species worldwide with cryptic plumage. These characteristics make them a group of birds understudied, difficult to observe and for which most of the available information about their ecology is very limited or based on incidental observations (Cleere 2010). In Brazil, up to 30 nightjar species are of normal occurrence (van Perlo 2009), including the Little nightjar (*Setopagis parvula*) and the Common pauraque (*Nyctidromus albicollis*) (Pauraque hereafter). The status of both species in the IUCN Red List is Least Concern (BirdLife International 2016a, 2016b).

The Little nightjar is a small grayish-brown nightjar that inhabits open woodlands in the lowlands of central and eastern South America. It is apparently common to locally abundant in most of its distribution range, but surprisingly poorly known (Cleere 2010). The available information on the breeding biology of the species is very limited, and although it has been catagorised as migratory, the seasonality of the migrations of the species is not well known (Cleere 2010). According to Provost (2020), the seasonality of the occurrence of the Little nightjar "is a fundamental aspect of its natural history that merits much more attention". The Pauraque is a medium-sized, long-tailed brown and gray nightjar typical of open woodland and scrub habitats from southern Texas to the lower Paraná River region (Cleere 2010). Although it is a common and widespread species, much remains to be learned about its biology and ecology (but see Quesnel 1986, 1993; Thurber 2003). For example, while some authors have reported that the species is silent during several months following breeding (Quesnel 1993; Latta & Howell 2015), other researchers have stated that the species is vocally active throughout the year (Thurber 2003). Most of its populations are all-year residents, and the species has a negative population trend (BirdLife International 2016b). This highlights the need for testing effective monitoring programs aiming to assess the current status and population trend of the species. Both species are highly vocally active and have distinctive calls (Cleere 2010; Latta & Howell 2015), which suggest that the use of autonomous sound

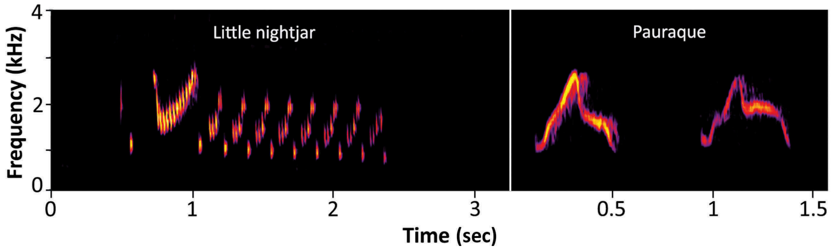

Fig. 1. — Sonogram of a typical call of the (A, left) Little nightjar and the (B, right) Pauraque recorded in the Pantanal Matogrossense (Brazil).

recorders might be a potential solution for monitoring these two species (Zwart et al. 2014). The call of the Little nightjar is unique and is composed of a repetition of 5–9 notes that descend in pitch ("Dop dro-dro-dro-dro-dro-dro", Cleere 2010; Fig. 1), while the song of the Pauraque, although variable, is composed of a variable number of short whistles ("Wheeeow", Sandoval & Escalante 2011; Fig. 1).

In this paper, we used autonomous sound recorders coupled with automated signal recognition to improve our understanding of the ecology of the Little nightjar and the Pauraque in the Brazilian Pantanal, the largest seasonally inundated wetland in the world (Por 1992). Our main objectives were to (1) evaluate the use of this technique as a tool for monitoring nocturnal tropical birds, (2) describe the diel and seasonal patterns of vocal activity of each species over a complete annual cycle, (3) determine the most effective sampling period for monitoring each species, and (4) estimate the minimum number of monitoring days needed to estimate a reliable vocal activity rate (VAR hereafter). The VAR is an index that is easy to estimate and has proven to be useful for estimating bird abundance around recorders and for monitoring changes in wildlife over time and space (Oppel et al. 2014; Pérez-Granados et al. 2019a).

METHODS

Study area

Our study was carried out in the Pantanal Matogrossense, in the northeastern part of the Brazilian Pantanal. The study area was located near the SESC Pantanal (Poconé municipality, Mato Grosso, Brazil; 16°29′58″S, 56°24′39″W, see Supplemental Fig. S1) within the floodplain of the Cuiabá River, one of the main tributaries of the Paraguay River within the Pantanal. This area is seasonally inundated from October to April due to the flooding of the Paraguay River (Junk et al. 2006) and shows a terrestrial phase from May to September. The vegetation is composed of a mosaic of forested and savanna areas, and the regional climate is tropical and humid (average annual rainfall of 1,000–1,500 mm and mean annual temperature of ~ 24 °C).

Acoustic recording

We performed acoustic monitoring at four stations separated by 890–2,750 m (Supplemental Fig. S1) from 8 June 2015 to 31 May 2016 and surveyed an annual cycle at each station. One Song Meter SM2 recorder (Wildlife Acoustics, USA) was active at each site and programmed to record (in stereo and .wav format) the first 15 min of each hour in 24/7 mode. The recorders were configured with the local winter time (UTC – 4), a sampling rate of 48 kHz and a resolution of 16 bits per sample. A total of 32,970 15-min recordings were collected (8,423 Station A, 8,203 Station B, 7,938 Station C, and 8,406 Station D).

Acoustic data analyses

The left channel recordings were analyzed using Kaleidoscope Pro 5.1.8, an automated signal recognition software provided by Wildlife Acoustics (Wildlife Acoustics, USA). Kaleidoscope looks for target signals according to the signal parameters of the desired sounds for detection. To introduce the most adequate signal parameters, we characterized the calls of the Little nightjar and the Pauraque in the study area (Fig. 1 and see Supplemental Table S1) and introduced the following signal parameters in Kaleidoscope:

(1) Little nightjar: minimum and maximum frequency range: 600 and 2,700 Hz, respectively; minimum and maximum detection length: 0.8 and 3 sec, respectively; maximum intersyllable gap: 0.2 sec; distance from the cluster center: 2.0.

(2) Pauraque: minimum and maximum frequency range: 600 and 2,700 Hz, respectively; minimum and maximum detection length: 0.3 and 0.8 sec, respectively; maximum intersyllable gap: 0.2 sec; distance from the cluster center: 2.0.

A quantitative analysis of the number of bird calls detected employing variable values of the parameter distance from the cluster center in Kaleidoscope can be found in Pérez-Granados et al. (2020). Signals detected by Kaleidoscope are automatically grouped into clusters of data by similarity, and signals within each cluster are sorted by similarity (i.e., the first songs of each cluster are the most representative of each group). Kaleidoscope allows researchers to build classifiers, which might be useful to reduce the number of false positives (undesired signals) when performing long-term monitoring programs. We created a classifier using a training dataset that consisted of 1,825 15-min recordings made between May 2015 and February 2016 (randomly selected from our dataset). The training recordings were analyzed once for each species according to species-specific signal parameters. Each cluster created by Kaleidoscope was manually reviewed and labeled “Little nightjar”, “Pauraque” or “other sounds” according to whether a call of the desired species was found within the first 50 events of each cluster. The classifier for the Little nightjar was created after labelling 8,748 calls and 55,490 undesired sounds, while for the Pauraque, the numbers of calls and undesired sounds were 14,367 and 124,874, respectively. The final classifier contained a statistical representation of the desired and undesired sounds in the environment and was used to sort our original dataset based on the labeled training recordings. Finally, each event automatically classified as potential “Little nightjar” or “Pauraque” in the original dataset was visually and/or acoustically checked, always by the same observer, to remove incorrect detections (false positives), while the undesired sound were not checked to eventually find false negatives.

Statistical analyses

To identify the hours with significantly high calling activity of each of the monitored species, we fitted a generalized linear model (GLM, Gaussian error structure) for each nightjar using the percentage of calls detected per hour during each month at each site as the response variable and the recording hour as the categorical fixed effect. We used the percentage of calls detected per hour during each month at each site to control for calling variation between hours in different months owing to seasonality. Similarly, a GLM was fitted to identify the months with the highest calling activity of each study species. To do this, we used the number of calls detected on each monitored day as a response variable in the GLM, and the month was introduced as a predictor. When a predictor was found to be significant, Tukey’s post hoc test was performed to test for differences among levels. This analysis was restricted to the period June-January for the Little nightjar since the species was not detected outside this period (see Results), while we considered the whole annual cycle for the Pauraque. We also estimated the minimum number of monitoring days required for estimating a reliable VAR by creating curves of the coefficient of variation (Reed et al. 2002) (CV hereafter) of the average VAR as a function of accumulated monitoring days (Pérez-Granados et al. 2019b). This analysis was performed by considering all possible combinations of monitoring days during the last fortnight of August, the fortnight with the highest calling activity of each species. We considered a reliable VAR to be when the CV was lower than 20% (Pérez-Granados et al. 2019b). All statistical analyses were performed by R 3.4.1 (R Development Core Team 2017). We used the packages "multcomp" (Hothorn et al. 2008) for post hoc comparison tests and "gtools" (Warnes et al. 2018) to obtain the possible combinations from one to 15 monitoring days. The level of significance was $P < 0.05$.

RESULTS

The Little nightjar classifier grouped 1,057,585 events into the "other sounds" cluster and 88,694 detections as "Little nightjar", of which a total of 64,233 (72.4% of the total) were identified as Little nightjar calls and used in subsequent analyses. The species was detected at three of the four monitoring stations with a variable number of calls per station between 13,963 and 30,698. A total of 133,939 Pauraque calls were identified from the 173,356 events automatically classified as "Pauraque" (77.3% accuracy), while 2,375,147 events were classified as "other sounds". The Pauraque was detected at all monitoring stations, and the number of calls detected per station ranged between 2,655 and 105,919. A summary table of the calling activity of each species over the monitored annual cycle can be found in Table 1.

Diel pattern

The diel calling activity pattern of each species was concentrated at night, with both species being vocally inactive between 6 am and 4 pm (Fig. 2). The Little nightjar started calling at low rate after dusk (at 6 am and 7 pm) and then showed a relatively constant vocal activity between 8 pm and 4 am. (Fig. 2) (see Supplemental Table S2 for the hourly call production at each station). The calling activity of the Little nightjar peaked at 5 am (21.5% of the calls detected), which also coincided with the recording time with the significantly highest calling activity (Table 2) (see Supplemental Fig. S2 for Tukey's post hoc comparison). The daily activity pattern of the Pauraque was also restricted to the night period but differed slightly from the diel pattern of the Little nightjar. The Pauraque showed a more constant vocal activity during the night, and the maximum number of calls was detected at 9 pm (12.1% of the total) (see Supplemental Table S3 for the hourly call production at each site). However, according to the Tukey test, the peaks of calling activity were significantly higher at 6 pm and 5 am, with no significant differences between these two recording times (Table 2) (Supplemental Fig. S2).

Table 1.

Summary of vocal activity of the Little nightjar and the Pauraque over an annual cycle in the Pantanal Matogrossense (Brazil). Calling activity was monitored using autonomous sound recorders from 8 June 2015 to 31 May 2016 at four acoustic monitoring stations. Hours are expressed as UTC (– 4).

Species	Recording site	First song	Last song	Most active day	Most active hour	Most active month	Days detected
Little nightjar*	B	10 June	30 January	1 September	5 am	August	201
	C	9 June	27 January	29 August	5 am	August	195
	D	8 June	13 January	28 August	5 am	September	210
Pauraque	A	8 June	26 October	30 August	6 pm	August	101
	B	8 June	31 January	25 September	9 pm	September	186
	C	9 June	31 May	30 August	11 pm	August	236
	D	8 June	31 May	29 August	9 pm	August	339

*The species was not detected at Station A.

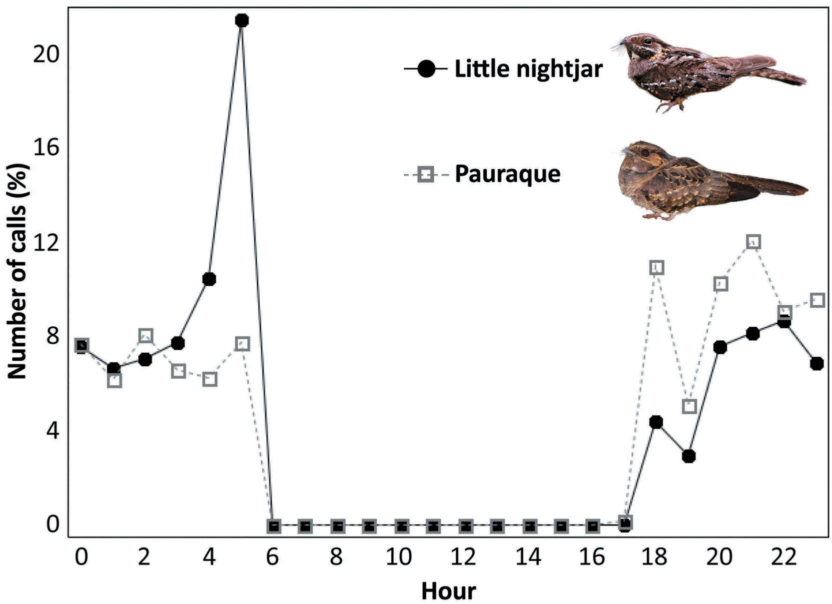

Fig. 2. — Diel calling activity pattern of the Little nightjar (black filled circles) and the Pauraque (gray empty squares) in the Pantanal Matogrossense (Brazil). Calling activity was monitored using autonomous sound recorders from 8 June 2015 to 31 May 2016 at four acoustic monitoring stations. The diel pattern of each species refers to the mean percentage of calls detected during each recording time per station. Hours are expressed in local winter time (UTC – 4). The diel pattern of the Little nightjar is based on the average values of three acoustic monitoring stations since the species was not detected at one of the stations.

Table 2.

Summary table of type-III partitioning of variances testing the effects of recording time and month on the calling activity of the Little nightjar and the Pauraque in the Pantanal Matogrossense (Brazil). The effects of recording time and month on the calling activity of each species were fitted using independent generalized linear models for each variable. Calling activity was monitored using autonomous sound recorders from 8 June 2015 to 31 May 2016 at four acoustic monitoring stations. Analyses for the Little nightjar are based on three acoustic monitoring stations since the species was not detected at one of the stations.

Species	Variable	df	Dev. Resid.	df Resid.	Dev.	F	*P*
Little nightjar	Hour	23	26,235	552	21,188	29.72	< 0.001
	Month	7	878,237	706	27,860,874	31.79	< 0.001
Pauraque	Hour	23	26,970	864	42,801	23.67	< 0.001
	Month	11	18,744,336	1382	117,256,135	20.08	< 0.001

Seasonal pattern

The annual pattern of the calling activity of the Little nightjar showed a clear seasonality, with most of the calls being detected between August and September

(76.7% of the total calls detected) and a somewhat smaller amount in October (16.4%) (Fig. 3). A low number of calls were detected during June-July (5.3%), and very few calls were detected from October onwards (Fig. 3) (see Supplemental Table S4 for the monthly call production at each station). Indeed, only 1.7% of the calls were detected during the period November-January, and the species was not detected later than late January at any station. According to the GLM, the calling activity of the Little nightjar varied between months (Table 2), with a significant higher vocal activity during the months of August and September (see Supplemental Fig. S3 for Tukey's post hoc comparison). The Pauraque showed a similar calling seasonality as the Little nightjar, but its calling activity extended over a longer period and it was vocally active throughout the year (Fig. 3) (see Supplemental Table S5 for the monthly call production at each site). However, at one of the monitoring stations, the species was not detected later than late October, while at another station, the last call was detected in late January (Table 1). The peak of calling activity occurred in the months of August and September, a period during which 55.7% of the calls were detected, and there was also high calling activity during the preceding (July, 13.3%) and following months (October, 16.1%). From November to May, there was a strong reduction in calling activity (Fig. 3). Calling production significantly varied between months (Table 2), with August having the largest calling production (Supplemental Fig. S3).

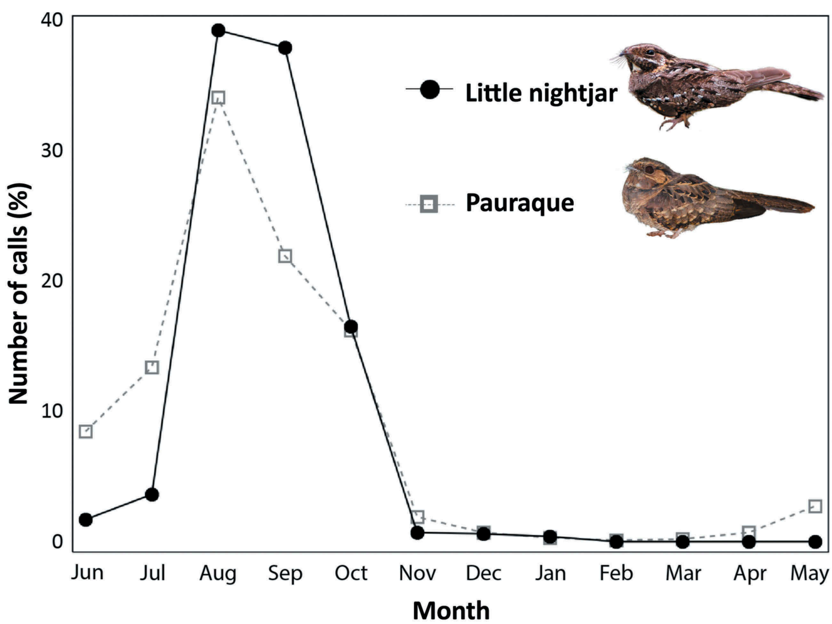

Fig. 3. — Seasonal calling activity pattern of the Little nightjar (black filled circles) and the Pauraque (gray empty squares) in the Pantanal Matogrossense (Brazil). Calling activity was monitored using autonomous sound recorders from 8 June 2015 to 31 May 2016 at four acoustic monitoring stations. The seasonal pattern is expressed as the mean percentage of calls detected at all stations per month. The seasonal pattern of the Little nightjar is based on the average values of three acoustic monitoring stations since the species was not detected at one of the stations.

Monitoring days

The CV of the VAR of both species decreased greatly with the number of monitoring days (Fig. 4). All monitoring sites showed similar decreasing patterns, although the variation in the vocal activity of the species was different among stations (Fig. 4). We estimated that minimum numbers of 8 and 9 monitoring days were required to obtain a reliable VAR (< 20%) for the Little nightjar and for the Pauraque, respectively (Fig. 4 and see Supplemental Table S6 for the average results). However, the CV of both species can decrease to lower than 10% when performing acoustic monitoring over 13 days (Fig. 4) (see Supplemental Table S6 for the average CV as a function of monitored days for each species).

DISCUSSION

In this study, we describe and analyze the calling activity of the Little nightjar and the Pauraque over a complete annual cycle in the Brazilian Pantanal. The use of autonomous sound recorders has proven to be a useful tool for monitoring changes in vocal activity for both nightjars. This finding is in agreement with previous studies that successfully employed bioacoustics for monitoring temperate (Zwart et al. 2014) and tropical nightjars (Chang et al. 2018). The calling activity of the Little nightjar and the

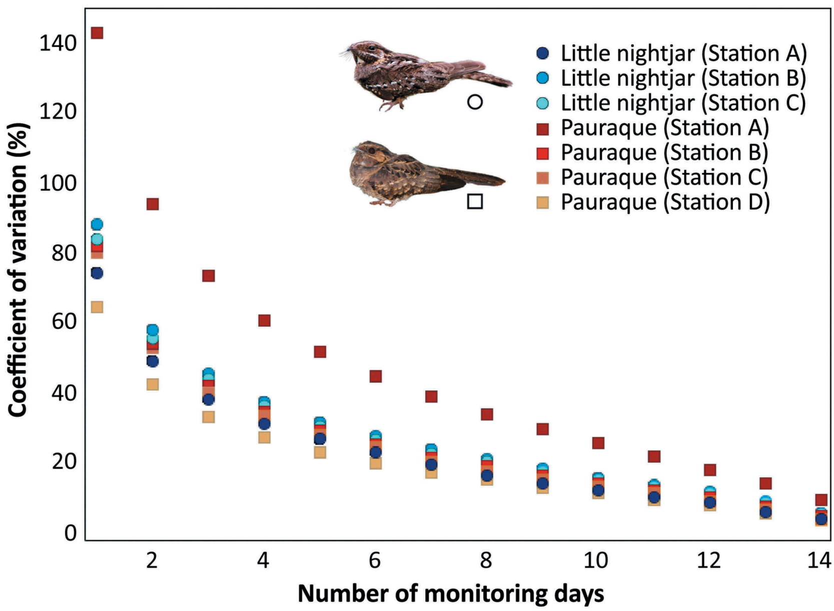

Fig. 4. — Coefficient of variation (%) of the calling activity of the Little nightjar (circles) and the Pauraque (squares) as a function of monitoring days. Calling activity was monitored by acoustic monitoring at three (Little nightjar) and four (Pauraque) acoustic recording stations during the last fortnight of August in the Pantanal Matogrossense (Brazil). The coefficient of variation of the calling activity at each acoustic monitoring station is represented by a different symbol.

Pauraque was restricted to the nocturnal period, and both were most active just before dawn or just after dusk. This follows the same pattern as that found for other nightjars (Cadbury 1981; Quesnel 1986; Jetz et al. 2003; Zwart et al. 2014; Reino et al. 2015) and suggests that this behavior might be common for the group. We also found that the days with the maximum calling activity of both species at each site took place during nights when the percentage of the moon illuminated was at least 90%. This result indicates that the vocal activity of the Little nightjar and the Pauraque is positively affected by moonlight, a phenomenon described for a large number of temperate (Reino et al. 2015) and tropical nightjars (Cleere 2010).

The Little nightjar and the Pauraque showed a marked calling seasonality. The peaks of calling activity of both species occurred at the end of the dry season during the months of August and September. Arthropod abundance is usually low during the dry season in tropical habitats with seasonal rainfall (Janzen & Schoener 1968; Wolda 1978), but not so in our Pantanal study area where arthropod abundance is normally very high during August-September, as shown by Carneiro et al. (2016). Tropical insect abundance increases with the first rainfalls after the dry season (Wolda 1978; Jetz et al. 2003), which usually occur between late August and early September in the Brazilian Pantanal (Junk et al. 2006). Indeed, during the monitored year, there was only one rainfall event during August (2.25 mm), but the first heavy rains took place between 7 and 9 September (32 mm in total). Therefore, the first rains in September may have caused an increase in arthropod availability. This corresponds with the results found by Jetz et al. (2003) in Guinea for the Standard-winged nightjar (*Macrodipteryx longipenni*). Jetz et al. (2003) found that courtship displays of the Standard-winged nightjar began approximately 6 weeks before the first short rains gave signs of the forthcoming wet season, a period during which aerial insect biomass was maximum. Therefore, the hatching date of the Standard-winged nightjar occurred during the time in which prey availability was maximum (Jetz et al. 2003). The same phenomenon may explain the calling activity of the monitored species in the Brazilian Pantanal, although further research including measurements of arthropod availability is needed. According to our results, the period of nesting activity of the Little nightjar and the Pauraque in the Brazilian Pantanal during the monitored year occurred between early September and early October, a period that corresponds with the nesting season proposed for both species in other Cerrado areas in central Brazil (Marini et al. 2012).

Our study highlights that the Little nightjar is a migratory species in the Brazilian Pantanal that inhabits the study area between early June and late January. There are no specific studies about the migration of the species in other areas, and therefore, our results can only be compared with anecdotal observations. The period of residency described for the Brazilian Pantanal was much longer than those proposed for southernmost Brazil (21 October–13 February; Belton 1984) and Paraguay (the species arrived in mid-September; Wetmore 1926). This difference might be partly due to the use of autonomous sound recorders in our study, which would have allowed us to detect the species' presence outside the breeding period when the calling rate of the species was very low (see Supplemental Table S4). Likewise, the study area was located northernmost of the compared sites, and therefore, the species may have a longer stay in the study area. We are aware that our results are based on a single-year study and that the presence of the Little nightjar in the Brazilian Pantanal may differ slightly among years according to changes in rainfall regimes and arthropod abundance.

The Pauraque is a resident species in the Brazilian Pantanal whose breeding season, estimated according to calling seasonality, seems to occur mainly between August and October. This period is relatively similar to those proposed for the species in other populations located in southern latitudes (e.g., September-January in south-eastern Brazil and October-November in Paraguay) but differs greatly from the breeding season estimated for populations in northern latitudes (March-July in Texas, Cleere 2010). The species was not detected in two of the acoustic monitoring stations after late October and late January, respectively, which suggests that the Pauraque may perform local movements after the breeding season. According to our results obtained at two of the four monitoring stations, we could have defined the species as migratory or vocally inactive owing to the disappearance of the species after late January. However, we are able to confirm that the species was vocally active (and present) throughout the monitored year, although the vocal activity of the species was very low during the non-breeding season (only 2% of the calls were detected between December and April). The calling seasonality of the Pauraque extended over a longer period than the seasonal pattern of the Little nightjar, likely because the reproduction of the Little nightjar is temporally constrained by the migratory behavior of the species.

Our results can be used to provide monitoring recommendations for managers and scientists who aim to detect the presence and perform long-term monitoring programs of the Little nightjar and the Pauraque. To improve the efficiency of future surveys based on acoustic monitoring or traditional field surveys, monitoring surveys should be carried out during the last fortnight of August at 5 am (~ 1 hr before sunrise), a period during which the calling activity of both species was maximum. Considering the recordings made in the 5 am, the Little nightjar was detected on 91.1% of the monitored days during the last fortnight of August, while the Pauraque was detected in 73.3% of the cases. According to our results, the probability of detection of both species can be increased when performing monitoring surveys during full moon nights since calling activity was maximum under these circumstances. This is in agreement with guidelines provided for other temperate nightjars (Reino et al. 2015). According to our results and methodology (e.g., recording 15 min per hour in 24/7 mode), future monitoring programs based on acoustic monitoring should leave the recorders in the field for a minimum number of 9 days. In this way, the CV of the VAR of both species will be less than 20%; therefore, the VAR will have a low-error estimate, which is needed to infer population abundance and to detect changes in abundance between years or sites (Oppel et al. 2014; Pérez-Granados et al. 2019b). A reliable VAR might be useful for monitoring yearly changes in nightjar abundance according to variable flood pulses in the study area, a large seasonally inundated wetland (Por 1992).

In this study, we demonstrated that acoustic monitoring coupled with automated signal recognition software is a useful tool for monitoring the vocal behavior of two nocturnal tropical nightjars, and this approach is likely helpful for most nightjars and other vocally active taxa. This technique allowed us to monitor the presence and seasonal changes in the calling activity of both species and to detect the presence of the species when vocalizing at very low rates. Our study highlights the importance of performing monitoring surveys of different subpopulations before making any generalizations about the migratory or resident status of any species as well as about whether it vocalizes throughout the year. Future studies should evaluate the use of autonomous sound recorders for monitoring other nocturnal tropical wildlife species to improve our knowledge about the ecology of other night-active species.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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AUTHOR CONTRIBUTION

1. Conceived the idea, design, experiment (supervised research, formulated question or hypothesis): C. Pérez-Granados, K.-L. Schuchmann. 2. Performed the experiments (collected data, conducted the research): K.-L. Schuchmann. 3. Wrote the paper (or substantially edited the paper): C. Pérez-Granados, K.-L. Schuchmann. 4. Developed or designed methods: C. Pérez-Granados. 5. Analyzed the data: C. Pérez-Granados. 6. Contributed substantial materials, resources, or funding: K.-L. Schuchmann.

DATA ACCESSIBILITY

The data used in this study are archived on Figshare repository and can be accessed at: https://doi.org/10.6084/m9.figshare.11478330.v1

SUPPLEMENTARY MATERIAL

Supplemental data for this article can be accessed at https://doi.org/10.1080/03949370.2020.1753117.

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