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## NESTLING BEHAVIOR AND PARENTAL CARE OF THE COMMON POTOO (*NYCTIBIUS GRISEUS*) IN SOUTHEASTERN BRAZIL

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**ABSTRACT.**—We recorded and quantified the nocturnal activity and parental care of a brooding Common Potoo (*Nyctibius griseus*) using an infrared camera in southeastern Brazil. Parents alternated care of the nestling and decreased their presence as the nestling grew. Nestling feeding on passing insects while sitting on the nest, movements on the nest, wing exercising, preening, and defecating were recorded primarily while it was alone. The frequency of begging calls per hour was higher when the nestling was accompanied by one of the parents. Nocturnal recordings of this species on the nest revealed behaviors that were not cited in past studies, including: feedings bouts on passing flies performed by the nestling and adults, nestling defecation, and nestling plumage maintenance. The well-known plus newly quantified behaviors of the Common Potoo reinforce their value to survival during the long nestling period. Received 24 May 2010. Accepted 14 September 2010.

Potoos are members of the Nyctibiidae, which is composed of seven species of a single genus (*Nyctibius*), all geographically restricted to the Neotropics (Cleere 1998, Cohn-Haft 1999, Holyoak 2001). Five species are considered resident in Brazil with the Common Potoo (*N. griseus*) being the most widespread (Sick 1993) inhabiting rain-forest areas as well as dry forests, *cerrado* savannas, mangroves, tall secondary growth forests, and partially disturbed areas (Cleere 1998, Cohn-Haft 1999, Holyoak 2001).

Potoos normally assume a motionless posture during the day, perched upright on horizontal branches or on top of a broken branch relying heavily on their cryptic coloration. Shortly before dusk, potoos initiate their nightly activities (Cohn-Haft 1999). Their secretive behavior and cryptic coloration makes them difficult to detect but, once found, detailed observations of their behavior are relatively easy, especially at the nest. Descriptive studies of the nesting behavior of the Common Potoo in neotropical regions have been reported by Goeldi (1896), Muir and Butler (1925), Haverschmidt (1958), Skutch (1970), Tate (1994), Cohn-Haft (1999), Lopes and Anjos (2005), and Corbo and Macarrão (2010).

Published data on the nesting behavior of the Common Potoo were opportunistically obtained by observers during the day or rarely during moonlit nights. These studies frequently over-

looked a sequence of behaviors during the main peak of activities in the first hours of the night. We describe and quantify the nocturnal activities of a nesting Common Potoo based on continuous observations using an infrared digital camera.

### METHODS

**Study Area.**—The study was conducted on the edge of the Universidade Estadual Paulista campus (22° 23' 57.7" S, 47° 32' 13.5" W), municipality of Rio Claro, southeastern Brazil. The nest site was in transitional vegetation among a small 0.5-km<sup>2</sup> fragment of disturbed scrub native savanna *cerrado* and a 25-km<sup>2</sup> fragment of secondary dry forest mixed with non native *Pinus* spp. and *Eucalyptus* spp. trees on the east side. The study site is considered an urban area as the closest populated area is <1 km to the west.

**Data Collection.**—Data were collected on 8, 12, 13, and 16 December 2008. We used an infrared digital Sony DSC H9 camera on a tripod hidden in a small bush ~1 m from the fence post where the Common Potoo nested. A wire frame and an additional infrared diode system were installed next to the camera to improve image quality during recordings.

Recording sessions were initiated at dusk and continued after 1900 hrs when the potoos started their nocturnal activities (Table 1). The maximum length of recordings was ~3 hrs. We used two batteries on some days with nearly 1.5 hrs of recording capacity on each. Immediately before the first battery quit, a person quietly approached the nest to change the batteries.

Digital recordings were analyzed in the laboratory and the following categories of behavior were recorded while the nestling was alone in the nest

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TABLE 1. Recording sessions at a Common Potoo nest in southeastern Brazil.

Date (sampling day)	Estimated nestling age (days)	Total recording time (hrs, min)	Recording periods (hrs)
8 Dec	14	2, 35	1920–2210
12 Dec	18	2, 57	1832–2138
13 Dec	19	2, 02	1823–2028
16 Dec	22	1, 31	1844–2015

or accompanied by one of the parents: (1) feeding bouts on passing insects, (2) defecations, (3) movements in the nest, (4) wing exercising, (5) plumage maintenance, and (6) calling. Feeding bouts to capture insects were used by the nestling and adults while they were perched on the nest (on the top of the fence post) and attacked flies that were passing. Defecation behavior was perceived when the nestling raised the tail and ejected feces from the nest. Movements on the nest were used by the nestling to move short distances (several centimeters) from border to border of the stump. Wing exercising was used by the nestling apparently to exercise without flying. Plumage maintenance with the beak was used by the nestling and adults. Calls were used in a parental interaction and included begging notes uttered by the nestling and advertisement calls uttered by adults. We quantified the frequency per hour of each of these categories.

We verified the amount of time the nestling and each parent remained in alert posture, the frequency and times that each parent left the nest, and the number of times they alternated care and fed the nestling through regurgitation. The alert posture was adopted when nestling or adults raised their beak, compressed the plumage, and kept the neck outstretched (Fig. 1).

Common Potoos do not show any sexual dimorphism (Cohn-Haft 1999). However, we noted a difference in the pattern of dark blotches on the breast of the two adults (hereafter, indicated as individuals A and B) that enabled us to identify shared parental care.

## RESULTS

*Description of the Nest, Egg, Nestling, and Parents.*—A Common Potoo responded to a playback of its call by vocalizing during a nocturnal bird survey and perched on a fence post on 4 November 2008. The potoo could be closely approached and another visit to the site was made 2 days later to confirm the existence of a nest. The simple and unlined nest contained a

single dull white egg with lilac and brown spots ( $40.95 \times 31.55$  mm). It was directly placed on top of a 1.25-m tall abandoned fence post. The top of the post had an irregular surface that measured  $5 \times 19$  cm (Fig. 1).

Presence of the nestling with an egg tooth and eggshell fragments in the nest indicated hatching occurred between 22 and 24 November. The nestling was covered by creamy-white down plumage marked with fine gray brown stripes on the first recording day (8 Dec). It was  $\sim$  one-third of the size of an adult at this time and could stay completely hidden among the ventral feathers of the parent (Fig. 1). The nestling was slightly more than half the size of an adult on the last day of recording (16 Dec), and remained almost completely exposed even when among the ventral feathers of the adult. Adults had a buff plumage with light gray and black blotches. The same gray-brown stripes of the nestling were also apparent along the adult's body. A visit to the nesting site on 21 December revealed the nestling had probably been predated and the adults were no longer present.

*Quantitative Aspect of Categories of Behavior.*—Digital recordings (9 hrs and 6 min) were made when the nestling was  $\sim$ 14–16 days until 22–24 days of age (Table 1). Adults stayed with the nestling during nearly 5 hrs and 54 min (64.8% of total recording time) and the time the parents brooded the nestling decreased as it became older (Fig. 2).

The adult present gradually relaxed to a less motionless posture and slowly opened its eyes at nightfall. It completely opened its eyes at  $\sim$ 1854 to 1908 hrs and initiated nocturnal activities, flying from the nest between 1904 to 1909 hrs. Generally, the nestling became active from the motionless posture similarly to the adult.

The nestling engaged in feeding bouts on passing flies and flapped its wings only when alone after the first day of recording. Frequencies of short movements on the nest and plumage maintenance were also higher when the nestling



FIG. 1. Nest of Common Potoo (*Nyctibius griseus*) with adult (on the left) and nestling covered by creamy-white down plumage (on the right) in a typical alert posture. Lower right corner = frame taken with the infrared camera showing the nestling (on the left) being fed by adult B (on the right) on 12 December. Note the eye and beak of the adult.

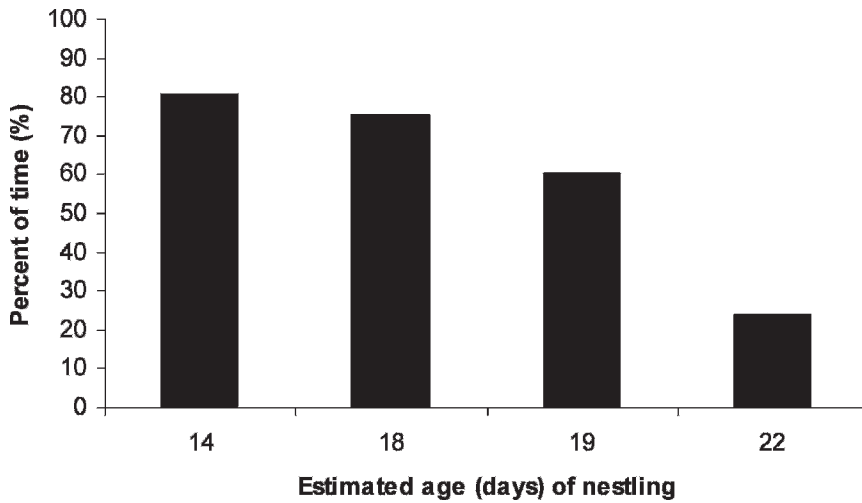


FIG. 2. Brooding (% of time) of the nestling Common Potoo by an adult as a function of age.

TABLE 2. Frequency per hour (total recording time = 9 hrs and 6 min) of behavioral activities by Common Potoo nestling when alone at the nest and when accompanied by an adult.

	Feeding on passing flies	Defecation	Brief movements	Wing flapping	Plumage maintenance	Vocalization (calls)
Alone	1.87	0.31	6.25	4.06	4.37	4.37
Accompanied	0	0.34	2.38	0	1.70	647.1

was alone. The nestling vocalized much more frequently while accompanied by one of the parents than when alone (Table 2).

Adults A and B stayed in the nest for 1 hr and 59 min (17.5% of total recording time), and 4 hrs and 17 min (47.2% of total recording time), respectively. A change-over between adults at the nest was recorded four times: day 1 at 2028 hrs; day 2 at 2135 hrs; and day 3 at 1919, and 2115 hrs. Both adults left the nest six and 13 times during the sampled period: adult A (day 1 at 2030 hrs; day 2 at 1957 and 2056 hrs; day 3 at 1919 and 2115 hrs; and day 4 at 1927 hrs), and adult B (day 1 at 1931, 1935, 2008, and 2209 hrs; day 2 at 1905, 1940, and 2137 hrs; day 3 at 1909, 1919, 1942, and 2131 hrs; and day 4 at 1904 and 1923 hrs). Adults also fed on passing insects while perched in the nest, but only adult B called once. The frequency of food regurgitation to the nestling was similar between adults (Table 3). The nestling, adult A, and adult B adopted the alert posture during nearly 5 min and 24 sec (1.0% of total sampled time), 2 min and 24 sec (0.4%), and 1 hr and 48 min (19.8%) of video recording, respectively.

### DISCUSSION

The infrared recording sessions enabled us to analyze and quantify behaviors of nestling and adult Common Potoos during the darkest nights. Parental attendance at the nest decreased as the nestling grew. Skutch (1970) and Tate (1994) reported that 25 days after hatching, adults were no longer staying with the nestling at the nest. They also reported that until nearly 50 days of age, the fledgling moved frequently with short flights, and the adults fed it in surrounding areas.

Some behaviors of Common Potoo recorded in

our study were also reported elsewhere, but rarely quantified, including: brief movements of the nestling in the nest (Tate 1994); wing exercising (Skutch 1970); alert posture (Muir and Butler 1925, Skutch 1970, Tate 1994); calling of the nestling and adults at the nest (Muir and Butler 1925, Skutch 1970, Corbo and Macarrão 2010); adults feeding the nestling by regurgitation (Skutch 1970, Corbo and Macarrão 2010); and alternation of adults at the nest (Lopes and Anjos 2005). Other behaviors of the potoos we observed are described for the first time, including: feeding bouts on passing insects by both the nestling and adults while sitting in the nest; defecation, and plumage maintenance by the nestling.

Brief movements on the nest by the nestling were performed when it was alone. Tate (1994) also observed nestling movements on a nest in Venezuela. We observed the nestling moved mainly to empty space left by the adult when it flew from the nest. One explanation for brief movements might be the improvement of blood circulation considering the great motionless period of the nestling during the day (Cohn-Haft 1999). The nestling flapped its wings at times for a few seconds after or before moving, probably as a way to exercise its pectoral muscles. This wing exercising started when the nestling was 14 days of age, 2 days earlier than mentioned by Skutch (1970) in Costa Rica.

The adults and nestling relied on the motionless alert posture during most of the day and in threatening situations during the night (Skutch 1970). We noted that a noise caused by a person near the nest site immediately modified the relaxed posture to an alert posture. We also observed the adult slowly turning its head to keep the intruder in focus in agreement with Muir and Butler (1925), Skutch (1970), and Tate

TABLE 3. Frequency per hour (total recording time = 9 hrs and 6 min) of behavioral activities by adult Common Potoos (A and B) at the nest.

	Nest leaving	Feeding on passing insects	Calling	Feeding of nestling
Adult A	3.77	8.18	0	2.52
Adult B	1.86	0.70	0.93	2.10



(1994). The nestling and adult gradually returned to the relaxed position, if left undisturbed for ~10 min.

During relaxed situations, and when the nestling was on its own in the nest, it frequently engaged in feeding on passing flies and in maintaining its plumage. We did not perceive if the nestling captured prey during the faster feeding bouts, but this foraging behavior may be important in the early stages of species maturation as it optimizes food intake by the nestling in periods of absence of adults. Preening is also important to get rid of mites and lice (Cohn-Haft 1999). Adults performed the same behaviors when they were sitting in the nest. Feeding bouts of adults while perched are a way to supplement their diet without flying and abandoning its primary defense of inconspicuousness.

Defecation was another observed care behavior of the nestling. This occurred when the nestling raised its tail and ejected feces 30 to 50 cm from the nest. The absence of feces in and near Common Potoo nests has been reported (Skutch 1970, Sick 1993, Cohn-Haft 1999, and Lopes and Anjos 2005). This behavior should reduce the risk of predation and presence of parasites.

The nestling uttered a soft song while alone and on occasions that it was accompanied by one of the adults. This behavior has been reported in the literature prior to the arrival of an adult at the nest (Skutch 1970, Corbo and Macarrão 2010). Stronger calls in our study were also uttered by an adult when it approached the nest, probably to inform the nestling of its presence. The nestling increased the frequency of begging for food calls when an adult arrived at the nest, and when the adult fed it by regurgitation. Adults came to the nest three to 10 times to feed the nestling by regurgitation before midnight, similar to the observations of Skutch (1970) and Lopes and Anjos (2005). One of the parents (adult B) came more frequently to the nest, but we were not able to identify if it was male or female.

Cryptic plumage, inconspicuous behavior, and reduced activities around the nest are all adaptations to reduce attention to nesting potoos (Cohn-Haft 1999). The 51 days of the nestling period of the Common Potoo from hatching to young departure from the nest (Skutch 1970) is considered very long among birds (Sick 1993). The lower height of the nest in our study, in comparison with the interval from 3 to 15 m reported in other studies (Muir and Butler 1925, Haverschmidt 1958, Borrero 1970, Skutch 1970, Lopes and Anjos

2005, Greeney et al. 2008, Corbo and Macarrão 2010), possibly facilitated a predation event. However, several behaviors of the species led to the inconspicuousness during this time, and the long time of parental investment attest to their protective value for survival (Skutch 1970, Cohn-Haft 1999). New methods and technology to precisely study behaviors are needed. The use of infrared cameras in future studies would allow obtaining better insight of the nightly activities at the nest. Identification of the gender of adults would allow better study of how males and females share incubation and brooding duties.

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