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ARTICLE

The habitat preference of the endemic Pygmy Nightjar *Nyctipolus hirundinaceus* (Caprimulgidae) of Brazil

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ABSTRACT: We discuss the choice of habitats for roosting and breeding by the Pygmy Nightjar (*Nyctipolus hirundinaceus*), a Brazilian endemic from the eastern part of the country. We observed that the choice of nesting and roosting sites of this nightjar is closely connected to open gravelly and stony areas (*lajeiros*) in the Caatinga and to rocky outcrops (*pedras*) in the Atlantic Forest, which allows us to conclude that the Pygmy Nightjar is a rupicolous nightjar, preferring rocky substrates for roosting and breeding.

KEY-WORDS: Caprimulgidae, habitat choice, nesting sites, rocky substrate, roosting sites.

INTRODUCTION

The Pygmy Nightjar (*Nyctipolus hirundinaceus*) is one of the smallest Neotropical nightjars (16-20 cm, Cleere 1998; 16.5-19 cm, Holyoak 2001), endemic to eastern Brazil, where it is found east of approximately 46°W (Cleere 1998, Holyoak 2001). Until recently, this nightjar was considered a species typical of the Caatinga in north-eastern Brazil, where two subspecies occur: nominate *hirundinaceus* from southern Piauí south-eastwards to central Bahia and northern Minas Gerais, and *cearae* from Ceará to extreme northern Bahia. Both are found in open areas in the xerophytic, deciduous and spiny shrub and tree formations, often on or near more or less extensive, low granite-quartz outcrops called *lajeiros* (Sick 1993, Cleere 1998, Holyoak 2001, Sigrist 2009).

In 1995, a third subspecies *vielliardi* was described from a specimen collected on a granite-gneiss outcrop near Colatina in Espírito Santo (Ribon 1995). Later it was also discovered in extreme eastern Minas Gerais, close to Espírito Santo (Vasconcelos & Lins 1998, 1999). On these granite-gneiss outcrops or inselbergs in the Atlantic Forest called *pedras*, it is mostly found among xeric vegetation resembling the north-eastern Brazilian Caatinga (Ribon 1995, Vasconcelos & Lins 1998, 1999).

The dorsal plumage color of nightjars is well adapted to the habitats in which they live (see pp. 306-307 in Cleere 1999). The upperparts of the nominate form *hirundinaceus* are described as light grayish brown, while *cearae* has a somewhat paler and *vielliardi* a darker plumage (Ribon 1995, Cleere 1998, Holyoak 2001). These differences in general plumage color of the three subspecies are well illustrated by photos in Cleere (2010, see pp. 180-181).

We document and discuss the apparent preference of the Pygmy Nightjar for open gravelly and stony areas in the Caatinga and rocky outcrops in the Atlantic Forest.

MATERIALS AND METHODS

Roosting and nesting Pygmy Nightjars were found by random searching during the day at eight localities in eastern Brazil. Observations at night were made at two localities. Details about these localities are given in Appendix 1. An individual is described as roosting when it is sitting crouched down with eyes (almost) closed and we consider roosting as a daytime activity. Observations made at four localities have already been published. At four other localities we made previously unpublished observations.

Furthermore, we checked 209 photos of Pygmy Nightjars made during daytime and published on the Brazilian site WikiAves (2013) for the environment in which they were photographed and for the substrate

they were roosting or breeding on: plant litter, bare soil, gravel or rock. These photos were made in the following Brazilian states: Ceará (83), Bahia (60), Paraíba (14), Rio Grande do Norte (6), Piauí (5), Pernambuco (5) and Alagoas (2) in the Caatinga, and Espírito Santo (23) and Minas Gerais (11) in the Atlantic Forest. WA voucher numbers of photographs with an egg or a chick can be found in Mazar Barnett *et al.* (this volume, Table 1).

RESULTS

Choice of habitat by each subspecies

Nyctipolus hirundinaceus cearae

Between 13 and 17 June 1995, M. F. V. studied this nightjar at the Estação Ecológica de Aiuaba near Aiuaba in south-western Ceará (Vasconcelos & Figueiredo 1996). The region is covered by Caatinga, with large areas of bare soil. Pygmy Nightjars were found roosting during daytime in open areas with bare soil, along dirt roads and on rocky areas in the grounds of the ecological station. At night, they were seen hunting for insects by sallying from the ground in open areas, from dirt roads and from the paved roads around the headquarters.

On 20 October 2008, A. Grosset and C. Albano (Grosset 2005) found a dozen individuals of this subspecies among xeric vegetation on a rather flat, stony outcrop or *lajeiro* called Morada Nova in northern Ceará (Figure 1). They also found two nests, depressions in the rock filled with vegetal litter, gravel and/or rock debris, each with one egg incubated by an individual (Figures 2 & 3).

Nyctipolus hirundinaceus hirundinaceus

Between 2 January and 3 February 1997, J. M. B. studied Pygmy Nightjars on Fazenda Concórdia, *c.*30 km from Curaçá in northern Bahia, a region of semi-desert scrubland and dry woodland. The fazenda presents open xeric vegetation, locally called *sertão*, dominated by several species of cacti (Cactaceae: *Cereus jamacaru, Pilosocereus gounellei*), and bushes and small trees (Euphorbiaceae: *Cnidoscolus phyllacanthus*, *Jatropha mollissima*; Caesalpinoideae: *Caesalpinia pyramidalis*), on soil with abundant gravel, pebbles and rocks. The vegetation was subject to heavy grazing by goats and cattle. Pygmy Nightjars were fairly common around the fazenda. Four nests, each with one egg, were found in an area of open Caatinga with sparse low vegetation and large areas of bare soil and stony ground. Eggs were laid directly on the substrate. Three nests were found at the side of a dirt road, a fourth one *c.*15 m away from this dirt road and a few meters from a rocky outcrop (Mazar Barnett *et al.* this volume).

On 4 December 2006 during daytime, M. F. V. observed one individual roosting on a rocky outcrop intermixed with arboreal caatinga in the margins of Cachoeira do Pajeú, Monte Azul, northern Minas Gerais. This bird was flushed three times and it always alighted on the rocky outcrop. The observation of this subspecies is the second for this Brazilian state (Kirwan *et al.* 2004).

FIGURE 1. *Lajeiro* Morada Nova (Ceará, 04°50'S, 38°37'W) where Pygmy Nightjars (*Nyctipolus hirundinaceus cearae*) were breeding. Photo by A. Grosset.

FIGURE 2. Nest site of Pygmy Nightjar (*Nyctipolus hirundinaceus cearae*) with an egg (arrow), found near vegetation on *lajeiro* Morada Nova (Ceará, 04°50'S, 38°37'W). Photo by A. Grosset.

FIGURE 3. Close-up of the egg of Pygmy Nightjar (*Nytipolus hirundinaceus cearae*) of Figure 2, laid among fallen cactus thorns on a layer of fine gravel and vegetal litter on *lajeiro* Morada Nova (Ceará, 04°50'S, 38°37'W). Surprising how well the color pattern of the egg blends with its surroundings. Photo by A. Grosset.

On 5 May 2008 at night, M. F. V. observed at least three individuals foraging for insects along a gravel road at the base of the massif of Morro do Chapéu in Jacaraci, southern Bahia. This road was adjacent to a quartzite outcrop.

On 25 and 26 September 2010, A. Grosset (pers. comm.) found Pygmy Nightjars on a *lajeiro* near Boa Nova in northern Bahia. This rocky outcrop was partly covered with low xeric vegetation, e.g. cacti (Cactaceae: *Melocactus* spp.) (Figure 4).

Nyctipolus hirundinaceus vielliardi

On 19 September 1993, Ribon (1995) collected the first specimen of this subspecies on a *pedra* near Colatina in Espírito Santo. The region of Colatina is characterized by relatively dry vegetation, quite different from the surrounding Atlantic Forest. The region has a remarkable extent of rocky outcrops, providing a particular habitat where Pygmy Nightjars are found (Figure 5) (R. Ribon pers. comm.).

FIGURE 4. *Lajeiro* Boa Nova (Bahia, 14°22'S, 40°10'W) where Pygmy Nightjars (*Nyctipolus hirundinaceus hirundinaceus*) were found. Photo by A. Grosset.

FIGURE 5. A *pedra* at Fazenda Bernardina (19°32'S, 40°36'W) between Colatina and Barbados, Espírito Santo, with its particular xeric vegetation forming the typical habitat of the subspecies *Nyctipolus hirundinaceus veilliardi* of the Pygmy Nightjar. Photo by R. Ribon.

During 7-8 July and 12-14 September 1997, M. F. V. studied Pygmy Nightjars on two *pedras*, Pedra do Resplendor and Pedra Lorena, near Aimorés in eastern Minais Gerais. Although situated in the Atlantic Forest, they were covered by xeric vegetation that resembles the north-eastern Brazilian Caatinga, with the occurrence of cacti (Cactaceae: *Opuntia brasiliensis*, *Pereskia aculeata*, *Coleocephalocerus fluminensis*), bromeliads (Bromeliaceae: *Encholirium horridum*), low shrubs (Velloziaceae: *Nanuza plicata*; Euphorbiaceae: *Jatropha* sp., *Euphorbia phosphorea*), ferns (Pteridaceae: *Notholaena eriophora*; Selaginellaceae: *Selaginella sellowi*), and other species of shrubs and trees of the families Anacardiaceae, Bignoniaceae, Malvaceae, Clusiaceae, Fabaceae and Myrtaceae.

Choice of nesting and roosting sites

On 25 November 2013, WikiAves (2013) had 209 photos published related to the Pygmy Nightjar.

Nesting sites

Five photos show a single egg, and one photo an egg in front of an adult. Two of these eggs are seen to be simply laid in a small, shallow depression in rock. The other five are laid on a mixed layer of gravelly material and vegetal litter, mostly among rock debris (Figure 6).

Ten photos show a single chick, and one photo a chick next to an adult. Chicks are estimated to be between 2 and 15 days old. They are nearly always found among pebbles and/or rock debris in gravelly or rocky areas.

Roosting sites

Eleven photos each show a pair roosting on rock near vegetation, sometimes among plant litter, mostly among gravel and rock debris.

FIGURE 6. Incubating Pygmy Nightjar *Nyctipolus hirundinaceus cearae* on *lajeiro* Morada Nova (04°50'S, 38°37'W). The crouched nightjar with its cryptic colors blends perfectly well with the rocky surroundings.

A single roosting adult is seen on 181 photos. In the Caatinga, Pygmy Nightjars are mainly found in open areas with *lajeiros*, and in the Atlantic Forest, this nightjar is only found on *pedras*. They mostly roost on bare parts of these rocky outcrops, away from any vegetation (77 photos) or near vegetation (64 photos). To a lesser extent, they roost among gravel, pebbles and rock debris on rock (26 photos). And rarely, they roost on vegetal litter accumulated in depressions on a rocky substrate (8 photos), or among gravel on a sandy substrate (6 photos).

DISCUSSION

Only two nightjars in the world, the Freckled Nightjar (*Caprimulgus tristigma*) of the Afrotropics and the Blackish Nightjar (*Nyctipolus nigrescens*) of the Neotropics, have previously been found to be rupicolous in their choice of substrate for roosting and breeding (Jackson & Ingels 2010). It was implied by Dowsett-Lemaire & Dowsett (2006) that the Golden Nightjar (*Caprimulgus eximius*) of Africa may also be rupicolous, but investigation showed that only the Mali deme of this species has a preference for rocks (Jackson 2011).

Despite the possibility that field observations of nightjars may be biased by the accessibility of the areas visited by observers, and the fact that this nightjar is also found in open gravelly areas or on bare soil, it is obvious from our observations and the many photos on WikiAves that Pygmy Nightjars have a preference for rocky areas (*lajeiros*) in the Caatinga and inselbergs (*pedras*) in the Atlantic Forest.

Clutch size of the Pygmy Nightjar is one egg. On WikiAves (2013), 18 photos show one egg (7) or one chick (11). The origin of the statement that clutch size is one or two eggs (Cleere 2010), or even two eggs (WikiAves 2013) is unclear, and most probably in error. Although eggs are sometimes laid in a small, shallow depression on bare rock, they are more often laid among rock debris on a mixed layer of vegetal litter and gravel near vegetation on *lajeiros* and *pedras* (Figures 2 & 3). These surroundings help greatly to camouflage the egg.

Chicks are usually found among pebbles and/or rock debris in gravelly or rocky areas, where their crouched form and cryptic grayish dorsal plumage helps greatly to mislead predators relying on vision to find prey. As chicks of ground-breeding nightjars are semi-precocial (Cleere 1998, Holyoak 2001), we suppose that chicks which did not hatch in such surroundings, can find more suitable habitat within a day or two of hatching.

Both Caatinga subspecies (nominate and *cearae*) living on the lighter coloured substrates of the *lajeiros* (Figures 1 & 4) show a paler plumage, while the subspecies *veilliardi* living on the darker granite-gneiss substrate (Figure 5) of the *pedras* presents a darker plumage.

From our observations, it is clear that roosting and breeding of Pygmy Nightjars are closely connected with *lajeiros* in the Caatinga and *pedras* in the Atlantic Forest. This preference for rocky habitats within which to roost and breed allows us to recognise the Pygmy Nightjar (*Nyctipolus hirundinaceus*) as one of only three nightjar species in the world that are rupicolous.

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APPENDIX 1:

Eight localities in eastern Brazil where detailed information about the choice of roosting and/or nesting sites of Pygmy Nightjars (*Nyctipolus hirundinaceus*) were obtained.

Locality	State	Coordinates	Subspecies	Reference
Aiuaba	Ceará	06°40'S, 40°14'W	*cearae*	Vasconcelos & Figueiredo 1996
Morada Nova	Ceará	05°07'S, 38°23'W	*cearae*	Grosset 2005
Curaçá	Bahia	09°09'S, 39°45'W	*hirundinaceus*	J. M. B. pers. obs.
Monte Azul	Minas Gerais	15°15'S, 42°51'W	*hirundinaceus*	M. F. V. pers. obs.
Jacaraci	Bahia	14°52'S, 42°30'W	*hirundinaceus*	M. F. V. pers. obs.
Boa Nova	Bahia	14°22'S, 40°10'W	*hirundinaceus*	A. Grosset pers. comm.
Colatina	Espírito Santo	19°32'S, 40°36'W	*vielliardi*	Ribon 1995, R. Ribon pers. comm.
Aimorés	Minas Gerais	19°29'S, 41°03'W	*vielliardi*	Vasconcelos & Lins 1998