



Ostrich

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Short Note

Nightjar diversity and microhabitat use in Nechisar National Park, Ethiopia

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Knowledge of the distribution and ecology of East African nightjars is, to a large extent, unknown. We collected ecological information on the diversity and microhabitat use of nightjars in Nechisar National Park in January 2015 by executing field captures and observations. We also attempted to find a live specimen of the Nechisar Nightjar *Caprimulgus solala*. During the course of 18 nights we observed five nightjar species, captured 49 individuals and observed that nightjars were closely associated with protective landscape elements. In spite of the intensity of our survey, we were not able to find a living specimen of the Nechisar Nightjar, which could indicate the species is either migratory or extinct.

Diversité des Engoulevents et micro-habitats utilisés au sein du Parc National Nechisar, Ethiopie

La distribution et l'écologie des Engoulevents d'Afrique de l'Est sont en grande partie inconnues. Nous avons collecté des informations écologiques sur la diversité et les micro-habitats utilisés par les Engoulevents au sein du Parc National Nechisar en Janvier 2015 en effectuant des captures et des observations sur le terrain. Nous avons également tenté de trouver un spécimen vivant d'Engoulevent du Nechisar *Caprimulgus solala*. Au cours de 18 nuits, nous avons observé cinq espèces d'Engoulevents, capturé 49 individus et noté que les Engoulevents étaient fortement associés à des éléments protégés du paysage. En dépit de l'intensité de nos recherches, nous n'avons pas trouvé d'Engoulevent du Nechisar ce qui pourrait indiquer que cette espèce est soit migrante soit éteinte.

Keywords: *Caprimulgus solala*, conservation, grassland, Nechisar Nightjar

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Introduction

Conservation actions aiming to rescue or restore vulnerable animal populations are vitally important to maintain diverse functioning ecosystems (Stanton et al. 2016). In order to define a species' conservation status and relative extinction risk it is essential to assess this species' rarity, rates of decline and population trends (Hartley and Kunin 2003). Unfortunately, information on rare and cryptic species with local distributions are seldom available (Hartley and Kunin 2003; Snäll et al. 2011). In the case of African nightjars, the lack of knowledge is so striking that even the distribution of some species is uncertain and their biology unknown (Cleere 2010).

Apart from occasional observations, little is known about nightjars' diversity in Nechisar National Park (NNP). This national park is located within the Great Rift Valley of

southern Ethiopia, in the Horn of Africa. The NNP (Figure 1) encompasses 514 km² of grassland, bushland, ground water and riverine forests from 1 108 m to 1 650 m above sea level. The centre of the park, 1 200 m above sea level, is called the 'Nechisar Plains' and consists of 270 km² of almost-treeless grasslands on calcareous black clay of lacustrine origin (Duckworth et al. 1992; Safford et al. 1993). This unique habitat is isolated from other grasslands by the Amaro Mountains (east), Arba Minch (west), Lake Abaya (north) and Lake Chamo (south) (Butchart 2007). The NNP receives an annual bimodal rainfall pattern with rainy seasons from March to May and from September to October (annual rainfall 800–1 000 mm) (Workeneh et al. 2011), which, in combination with bad roads, makes the Nechisar Plains very difficult to reach for most of the year.

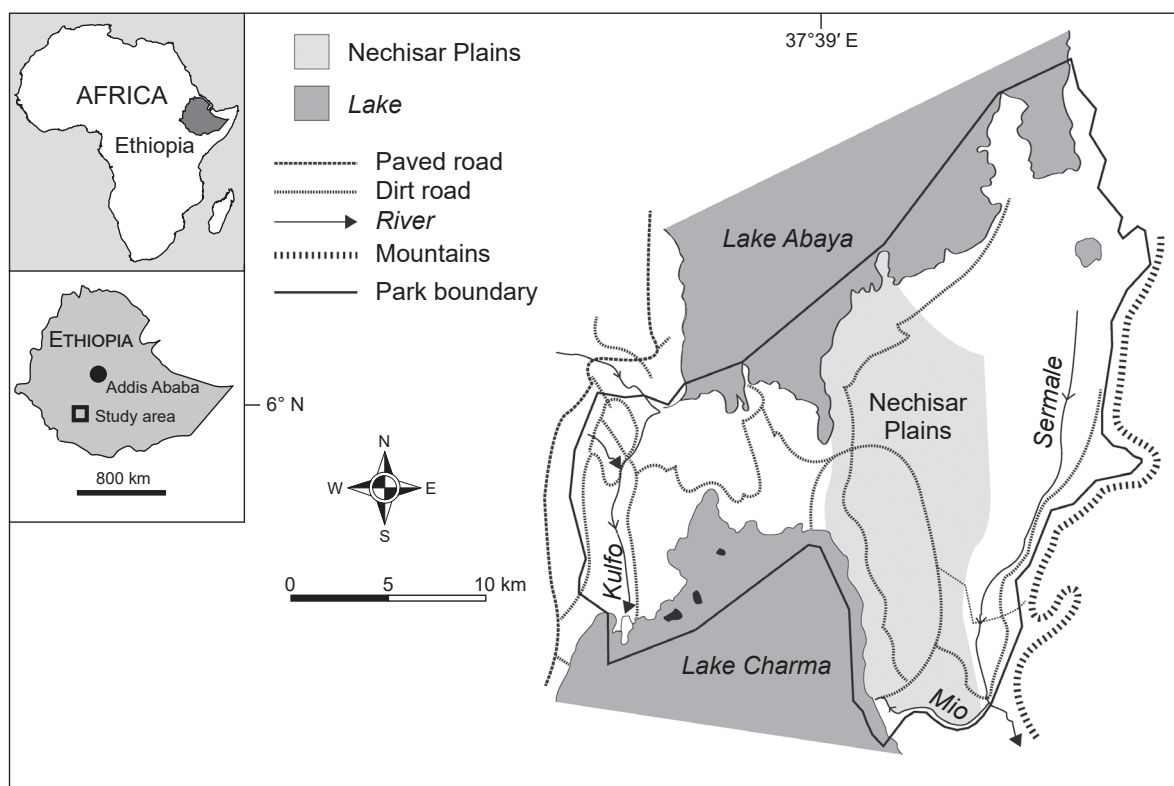


Figure 1: Left: location of Nechisar National Park relative to Ethiopia's capital, Addis Ababa. Right: schematic overview of Nechisar National Park, based on Duckworth et al. (1992)

The Nechisar Plains are expected to hold a population of the Nechisar Nightjar *Caprimulgus solala* (endemic to the Nechisar Plains; IUCN Red List Category and Criteria: Vulnerable). This bird was described from a single wing, salvaged from a partly submerged road kill in NNP (Safford et al. 1995). The wing was found in 1990 during a multi-disciplinary survey of the park. Despite many efforts, no trustworthy observations of this bird have been made so far and knowledge of this cryptic species remains absent.

In order to contribute to the knowledge concerning East African nightjars, in this study, we (1) surveyed nightjar diversity in Nechisar National Park, (2) examined micro-habitat selection of nightjars and (3) searched for the Nechisar Nightjar to assess its possible presence in the park.

Materials and methods

To facilitate the identification of nightjars during fieldwork, we examined the extensive nightjar collections of the Natural History Museum in Tring and the Royal Museum for Central Africa in Tervuren. Altogether, both collections comprise 14 Afrotropical species (Supplementary Table S1).

Nightjar diversity and foraging behaviour was studied in January 2015 at the Nechisar Plains during 18 nocturnal surveys that covered 120 fieldwork hours. We conducted field observations between 18:00 and 04:00 by repeatedly (1) driving transects along roads, (2) walking where no roads were available (Figure 2) and (3) recording singing nightjars using a Telinga Parabolic Microphone Dish and

Marantz PMD661 MKII recorder. Using powerful torches (LedLens H14R.2 and P7.2) we detected nightjars' eye shine from up to 200 m. Following methods as described by Jackson (1984), we immobilised the bird in a strong beam of light, approached it without making too much noise and caught it using a large modified fish net (for more information see <https://vimeo.com/150047998>). Upon capture, all individuals were identified, individually marked with an alphanumeric colour ring (Supplementary Table S2) and biometrics were measured as described by Jackson (2000) (Supplementary Table S3).

At night, the location of sitting nightjars was determined using a Garmin GPS (error ± 10 m). Next, we measured nightjars' distance to road and distance to the closest protective element (<0.5 m, >0.5 m, >1 m) (Camacho 2014). Furthermore, we calculated their body orientation relative to the protective element (0° = facing open space, $90/270^\circ$ = parallel to cover, 180° = facing cover) and measured the height and width in case the protective element was a bush (measured to the nearest 0.1 m) (Camacho 2014).

During our study, we surveyed nightjar diversity over a large part of the approximately 75% of the surface area of the Nechisar Plains (Figure 2), the areas missed being relatively inaccessible during our visit. Two habitat types dominate the Nechisar Plains: the central treeless area and the surrounding grasslands with shrub and scattered acacia trees. The unexplored terrain included intensively grazed grassland with scattered acacia trees in the north-east, and a treeless grassland in the south-east (Figure 1).

Results

We detected five nightjar species. We captured 49 individuals of three species (Figure 2, Supplementary Table S2): Sombre Nightjar *Caprimulgus fraenatus* ($n = 17$), Slender-tailed Nightjar *Caprimulgus clarus* ($n = 22$) and Star-spotted Nightjar *Caprimulgus stellatus* ($n = 10$) and recaptured 14 individuals at least once: Sombre Nightjar ($n = 4$), Slender-tailed Nightjar ($n = 7$) and Star-spotted Nightjar ($n = 3$) (Figure 2, Supplementary Table S2). We observed one Freckled Nightjar *Caprimulgus tristigma* and recorded one singing Nubian Nightjar *Caprimulgus nubicus* (identification confirmed by Yoav Perlman, pers. comm.). Nine nightjars flew away before we were able to catch them: Sombre Nightjar ($n = 5$) and Slender-tailed Nightjar ($n = 4$). We were not able to determine if these birds were new individuals or not. We recorded singing Sombre Nightjars and Slender-tailed Nightjars starting from the third week of January.

We explicitly calculated the following biometrics (n , average $\pm$ SD, range; measurements in mm) from Sombre Nightjars in order to compare with those collected by Safford et al. (1995) on museum specimens: length P9 (A; 17, 164.1 ± 4.6 , 156–173), patch position P9 (B; 17, 57.7 ± 2.6 , 51.6–62.7), emargination P9 (C; 60.4 ± 3.3 , 56.1–67.1), B/A (16, 35.2 ± 1.4 , 32.9–38), C/A (17, 36.8 ± 1.7 , 34.4–40.8), B/C (16, 95.3 ± 6.2 , 85.5–107.3).

Information on microhabitat use was collected for 70 nightjars (Supplementary Table S4): Slender-tailed Nightjar (39), Sombre Nightjar (21) and Star-spotted Nightjar (10). We found 11.4% of all birds (Slender-tailed Nightjar [2], Sombre Nightjar [5] and Star-spotted Nightjar [1]) on the treeless plains, whereas 88.6% (Slender-tailed Nightjar [37], Sombre Nightjar [16] and Star-spotted Nightjar [9]) were found in the surrounding grasslands with scattered acacia and *Commiphora* trees (Table 1). We found 55.7% of all nightjars sitting on the road (Table 1). All observed nightjars orientated their backs towards protective elements, facing the open space (0° orientation). Most individuals (98.6%) sat within less than 50 cm from these elements, which consisted of grass or shrub vegetation (77.1%; average height = 2.33 ± 1.81 m; average width = 2.26 ± 2.21 m) or rock cover (22.9%).

Discussion

Scientific information on the distribution and migratory behaviour of nightjars in the Horn of Africa is to a large extent speculative and unknown (Cleere 2010). Fifteen nightjar species have been observed in Ethiopia (Redman et al. 2009) from which eight have been seen in NNP (Table 2) (Duckworth et al. 1992; Safford et al. 1995; Mills and Spottiswoode 2000; Yilma Dellelegn Abebe pers. comm.; pictures from Josep del Hoyo and Per Smitterberg). Nevertheless, we do not know exactly which function NNP has within the life history of most species. We observed singing Slender-tailed Nightjar, Sombre Nightjar and Nubian Nightjar, indicating that those species potentially breed within the national park. Three other species, Abyssinian Nightjar *Caprimulgus poliocephalus*, Plain Nightjar *Caprimulgus inornatus* and Donaldson

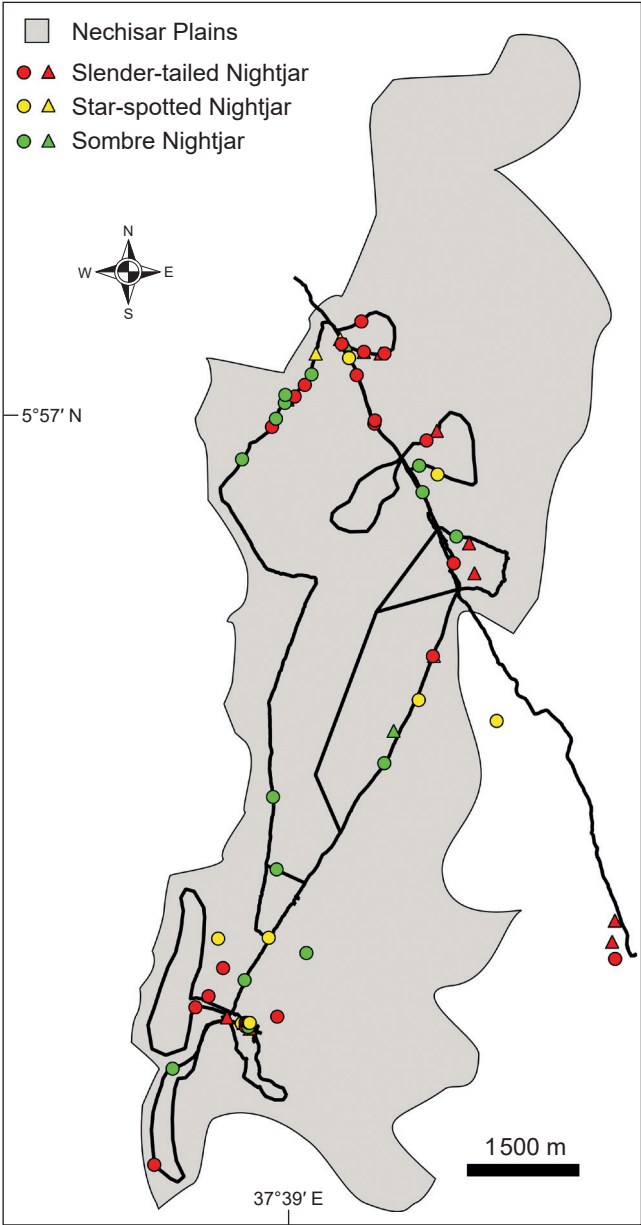


Figure 2: Overview of all captured and recaptured nightjars. Grey area = Nechisar Plains, black lines = surveyed tracks, circles = captures, triangles = recaptures. Each colour represents one species: red = Slender-tailed Nightjar *Caprimulgus clarus*, green = Sombre Nightjar *Caprimulgus fraenatus*, yellow = Star-spotted nightjar *Caprimulgus stellatus*

Table 1: Overview of microhabitat use per species. Total = the number of observed individuals per species; Habitat = where the birds were found, on the treeless plains or in shrub vegetation; Position = where these birds were positioned, on the road or in the fields

Species	Total	Habitat		Position	
		Plains	Shrub	Road	Field
Slender-tailed Nightjar	39	2	37	17	22
Sombre Nightjar	21	5	16	14	7
Star-spotted Nightjar	10	1	9	8	2

Table 2: List of nightjar species observed in Ethiopia, following Redman et al. (2009). The righthand column indicates which species have been observed or collected in Nechisar National Park and in which period. Summer = March–October, Winter = November–February, Resident = observed in summer and winter, ‘–’ = never observed in Nechisar National Park

Scientific name	English name	Status at Nechisar
<i>Caprimulgus europaeus</i>	Eurasian Nightjar	–
<i>Caprimulgus fraenatus</i>	Sombre Nightjar	Resident
<i>Caprimulgus aegyptius</i>	Egyptian Nightjar	–
<i>Caprimulgus nubicus</i>	Nubian Nightjar	Winter
<i>Caprimulgus donaldsoni</i>	Donaldson-Smith's Nightjar	Summer
<i>Caprimulgus pectoralis</i>	Fiery-necked Nightjar	–
<i>Caprimulgus poliocephalus</i>	Abyssinian Nightjar	Summer
<i>Caprimulgus natalensis</i>	Swamp Nightjar	–
<i>Caprimulgus inornatus</i>	Plain Nightjar	Summer
<i>Caprimulgus stellatus</i>	Star-spotted Nightjar	Resident
<i>Caprimulgus solala</i>	Nechisar Nightjar	Summer
<i>Caprimulgus tristigma</i>	Freckled Nightjar	Winter
<i>Caprimulgus climacurus</i>	Long-tailed Nightjar	–
<i>Caprimulgus clarus</i>	Slender-tailed Nightjar	Resident
<i>Caprimulgus longipennis</i>	Standard-winged Nightjar	–

Smith's Nightjar *Caprimulgus donaldsoni*, which are assumed to breed in NNP (Duckworth et al. 1992; Safford et al. 1995; Yilma Dellelegn Abebe pers. comm.), were unrecorded, and possibly absent in January, but their breeding seasons are expected to start later (Cleere 2010). Furthermore, we captured new individuals on each trip and only a few individuals were recaptured (14 recaptures out of 49 captures). This may mean that NNP could also serve as an important stopover site for intra-African migrating nightjars.

The present data show that, in the Nechisar Plains, nightjars were closely associated with protective elements such as rocks, tall grasses, shrub and acacia trees. On regular occasions, we observed nightjars hawking for insects from a perch on the ground. Our observations could therefore indicate that this foraging behaviour is applicable to a wider range of nightjar species, as was suggested by Camacho (2014). The observed tight association between foraging nightjars and protective landscape elements suggests that these nightjars experience high predation pressure from ground predators such as genets, foxes or mongooses (Lima 1992). When using protective elements while foraging, nightjars can reduce the number of attack routes for predators and ensure themselves a head-start in case a predator would jump over these protective elements (Camacho 2014).

A number of factors contribute to the uncertainty of the existence of the Nechisar Nightjar, such as nightjars' crepuscular lifestyle, the small numbers of nightjar observations during short-term inventories of NNP and difficulties of identifying nightjars even in the hand. In spite of the intensity of our survey, we did not find any evidence of the presence of the Nechisar Nightjar in NNP. Assuming the specimen of the Nechisar Nightjar has been identified correctly and is not an aberrant Sombre Nightjar (Supplementary Table S5) or any other species, two non-mutually exclusive causes could explain its absence during our survey. First, the Nechisar Nightjar might be a scarce intra-African or inter-continental migrant that uses NNP as a breeding site

or stopover location. The former could explain its absence during our survey in January (i.e. its non-breeding season as a migrant); the latter could explain its temporal presence, at the time of its discovery, in September (i.e. when NNP serves a stopover site during migration). Second, during the last decade severe habitat degradation (Yusuf et al. 2011) may have caused the Nechisar Nightjar population to decline dramatically or disappear.

Nechisar National Park potentially serves as an important hotspot for migrating and breeding nightjars. Unfortunately, NNP currently suffers from high anthropogenic pressures. Settlements in and around the park facilitate illegal exploitation of wood and grass and an estimated 12 500 cows illegally graze the Nechisar plains, accelerating bush encroachment (Datiko and Bekele 2011). During the last decades, surface area and habitat quality has dramatically decreased, jeopardising the biological value of the Nechisar Plains (Yusuf et al. 2011) and diminishing populations of rare species such as White-tailed Bush Lark *Mirafra albicauda* and Swayne's Hartebeest *Alcelaphus buselaphus swaynei*. Nechisar National Park faces critical challenges in order to find a balance between biodiversity conservation, tribal settlements and community participation. Given the large scale and rapid pace of habitat loss, it is essential to stress the uniqueness of NNP's ecosystem and we argue that immediate action is required to conserve the biological values of this national park. NNP can serve as an ideal research area to start collaborative monitoring schemes on nightjar diversity and has the potential to elucidate fundamental aspects of African nightjars' ecology.

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