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A survey of the birds of Ol Donyo Sabuk National Park, Kenya

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Summary

A survey of bird species of the Ol Donyo Sabuk National Park was carried out between 24 October and 2 November 2007. From 14 1-km transects distributed across the three habitat categories—forest, woodland and grassland—dominant in this park, 913 individual birds comprising 72 species were recorded. An additional 53 species were recorded from opportunistic observations bringing the total to 125 species from 48 families. Besides the Grey Crowned Crane *Balearica regulorum*, which is listed as Vulnerable in the IUCN Red Data List, seven Palaearctic migrants and five Afrotropical migrants were recorded. There were clear differences amongst transects in the three habitat categories in terms of species richness but not abundance. The proximity of the park to Nairobi, being only 65 km away, as well as its considerable avian diversity, makes it a close-to-ideal weekend getaway and great bird watching spot.

Introduction

The world has just below 4 billion hectares of forest, covering about 30 percent of the land area; between 1990 and 2005, about 3% of total forest area was lost globally, about 0.2 % annually (FAO 2007). Forest loss and conversion is considered the most important form of habitat loss in terms of potential for adversely diminishing biodiversity (Laurance & Bierregaard 1997). Given this, studies focusing on forest birds are considered useful for several reasons. First, the richness and composition of a forest's avifauna can give an indication of its overall value for the conservation of biological diversity (Bennun *et al*. 1996). Though not perfect, birds do fulfil most of the criteria for a good indicator group of biological diversity as well as the state of the environment (Furness & Greenwood 1993, Brooks *et al.* 2001). When a forest is modified, forest-dependent birds normally respond in a predictable and detectable way (see Lens *et al.* 2002). While some forest species can persist in modified habitats, those that are most specialised in one way or another are often negatively affected (Thiollay 1992, Svein *et al*. 2000). Birds also play a significant role in pollination, while fruit-eating birds may assist in natural regeneration by dispersing seeds (Holl *et al*. 2000, Sutherland 2000, Cordeiro & Howe 2003).

Forested land in Kenya exists as natural (indigenous) forests, dryland forests (also called woodlands), or forest plantations (usually exotic). Only about 2 % of Kenya's land area is under forest cover, most of which (about 98 %) is either state-owned or managed by local authorities as trust land. Since the gazetting of Ol Donyo Sabuk National Park in 1967, no avifaunal

(or biodiversity) survey had been carried out. To address this, the avifaunal survey we report here was carried out between 24 October and 2 November 2007, as part of a larger team from Kenya Wildlife Service and National Museums of Kenya that carried out an inventory of the biodiversity in and around the park. For birds, we estimated bird species abundance and diversity in addition to generating a preliminary species checklist for the park. Besides the usefulness of this type of data for conservation purposes, it is also useful for birdwatchers by indicating which species can be easily seen in this park given its proximity to Nairobi.

Study site

The survey was carried out in Ol Donyo Sabuk National Park, which is 65 km away from Nairobi and southeast of Thika Town (1°04′ S, 37 14′ E) in Kenya. The park comprises mountain slopes and ravines and is entirely forested except for a small area at the top and rises to 2144 m. On clear days, from the top, one gets excellent views of Mt. Kenya, Mt. Kilimanjaro and the surrounding lowlands including Nairobi City. Within the halo of primal forest at the summit, some of the giant plants more commonly associated with the Afro-alpine zones of Mt. Kenya and Mt. Elgon (particularly giant lobelia *Lobelia deckenii*) are conspicuous. A residual hump of metamorphic rock, the mountain is surrounded by the monotonous lava plateau of the Athi Plains, which formed around the mountain when lava escaped from fissures in the earth's crust, gradually filling the valleys and smoothing the contours of the original landscape. The lower slopes of the hill are dominated by acacia bushland and thickets. The upper forest is a remnant of a once common montane forest type dominated by *Olea*, *Croton*, *Podocarpus* and *Ficus* spp. Ol Donyo Sabuk gives the impression of a densely forested mountain known to the local Kikuyu as "The Mountain of the Buffalo", and to the Maasai as "The Big Mountain". In terms of weather, January-March is hot and dry, April-June is hot and wet, July-October is very warm and dry while November and December are warm and wet.

Methods

Bird surveys were conducted in Ol Donyo Sabuk National Park between 24 October and 2 November 2007. Birds were censused along transects; this method was chosen mainly because it covers large areas quickly and hence ideal for initial surveys such as this one (Bibby *et al.* 2000, Davies 2002). The study area was stratified into three major habitat types (forest, woodland and grassland) and 14 1-km transects were laid randomly. The forested area had eight transects, the woodland five and the open grassland had one (Fig. 1). Each transect was surveyed once during the study period, either in the morning or evening. Transects were walked slowly and all bird species seen or heard on either side up to 20 m were recorded. Birds flying overhead were included if they were specifically associated with the habitat (e.g. swallows and raptors that were foraging in the area). Finally, an extra 10 km transect was surveyed twice at night (by car) in order to sample nocturnal species within the park, while extra observations in and around the park helped increase our species list.

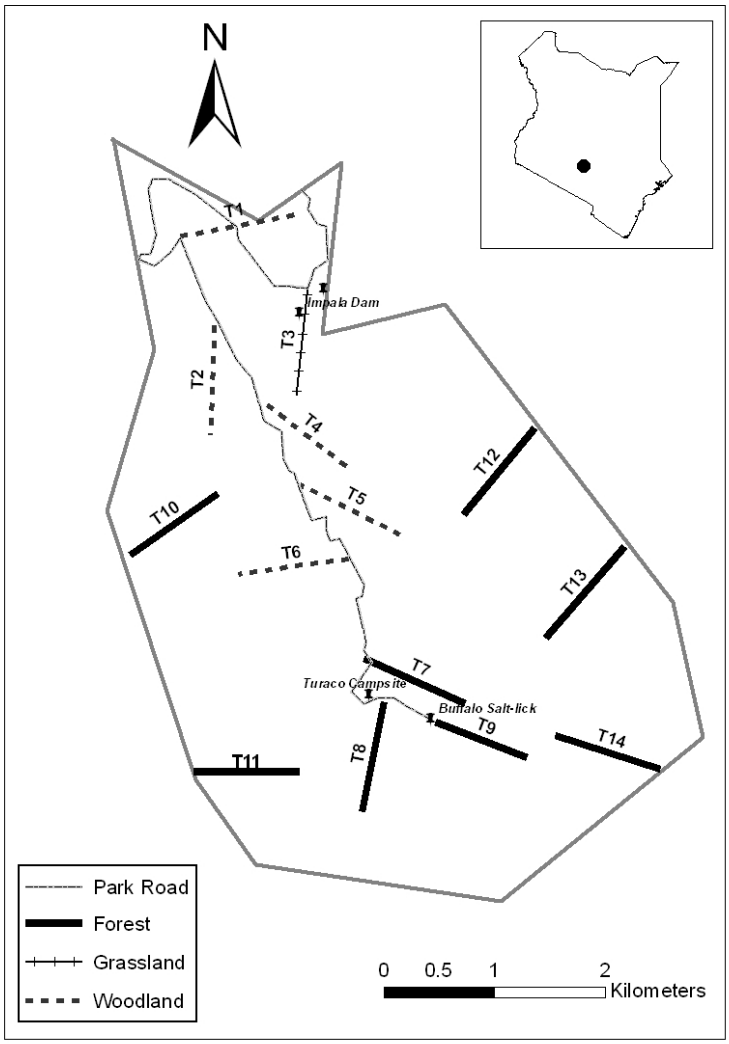

Figure 1. Map of the study site showing the distribution of transects and their associated habitats.

Data analysis

A species cumulative curve was also plotted to determine whether most species within the study site were recorded. We fitted an asymptotic model to our species accumulation curves of observed data, using nonlinear regression procedures (Gaidet *et al.* 2005), adopting the exponential equation of the linear dependence model (Soberón & Llorente 1993). This is practical for relatively less diverse assemblages of well known groups such as mammals, some tropical insects (Moreno & Halffter 2000; Soberón & Llorente 1993; Willott 2001), or birds as in our study. In this model, the predicted number of species S(p) added to the list decreases linearly as number of point count stations sampled (p) increases:

$$S(p) = a/b\ [1-\exp(-b*p)]$$

where the parameter *a* represents the increase rate at the beginning of the

sampling period, which was computed as the mean increase rate of species over the initial 4 transect counts; *a/b* is the asymptote (Gaidet *et al*. 2005; Soberón & Llorente 1993). The standard error of this predicted number of species was calculated as the square root of the variance (Soberón & Llorente 1993) as follows:

$$V(p) = S(p) \exp(-b*p)$$

Next, the Shannon-index of diversity H′ was used to estimate bird diversity along different transects. The test statistic H′, was derived according to Zar (1996) as:

$$H' = - \sum_{i=1}^{s} pi \log pi$$

Where, H′ = Index of species diversity
s = number of different species found in a given forest type
P*i* = proportion of the observations of a given species found on a given transect.

Species which were recorded outside the standardised transects were included in the final species list, but excluded from these analyses. A species diversity index for the whole study area was also calculated. The abundance and relative abundance of each species per transect was also calculated.

Results

Species accumulation curve

We recorded 913 individual birds, comprising 72 species during transect observations, while an extra 53 species were recorded opportunistically in and around the park.. Thus, a total of 125 bird species from 48 families were recorded during this study (Appendix 1). This is within the range expected from our model, which predicted 152 species for the park (ranging between 126 and 189) (Fig. 2).

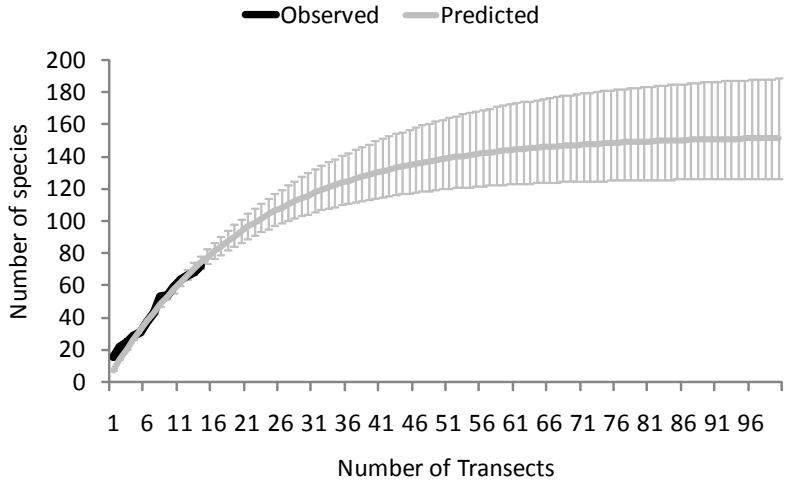

Figure 2. Species cumulative curve showing the number of species observed in the transects sampled in Ol Donyo Sabuk NP and those predicted from our model (±SE).

Species composition, abundance and diversity

The overall diversity index score for the park was 2.1. However, this should be treated only as provisional because the species accumulation curve showed that it was unlikely that all species in the park were recorded during this study, which is an important assumption for this index (Zar 1996). In addition to the globally threatened Grey Crowned Crane *Balearica regulorum* (listed as Vulnerable in the IUCN Red Data List), we recorded seven Palaearctic migrants and five Afrotropical migrants (Appendix 1).

With a mean of 19.5±1.11 species, forest transects had, on average, more species than those in woodlands (13.8±1.02) and grassland (13.0) ($F_{2,13}$ = 7.1, p = 0.011). However, while there was no significant difference in abundance across the three habitat types ($F_{2,13}$ = 2.9, p = 0.10), the relative abundance scores for some forest transects such as 13 (Table 1) was high because of the presence of flocking species like the Eurasian Bee-eater *Merops apiaster* and Montane White-eye *Zosterops poliogaster*.

Table 1. Number of species and relative abundance scores for 14 transects sampled at Ol Donyo Sabuk NP.

Transect	Habitat	Number of species	Abundance	Relative abundance
13	Forest	20	174	19.1
12	Forest	24	92	10.1
11	Forest	18	90	9.9
14	Forest	23	73	8.0
5	Woodland	14	68	7.4
8	Forest	21	68	7.4
1	Woodland	16	64	7.0
10	Forest	19	64	7.0
9	Forest	15	57	6.2
7	Forest	16	52	5.7
6	Woodland	16	37	4.1
3	Grassland	13	29	3.2
4	Woodland	11	23	2.5
2	Woodland	12	22	2.4

Discussion

This rapid survey of Ol Donyo Sabuk National Park suggests that the park contains a relatively diverse avifauna reflecting the wide range of habitats in the park. Indeed, the species recorded in this survey were representative of almost all the major bird families (see Appendix 1). Our species accumulation curves suggest that we may have missed some birds species during our survey, returning a high of 152 species for the park whereas we counted a combined total 125 species from transects and opportunistic observations. This is likely because we only used a single sampling technique; future surveys should incorporate point counts and mist netting especially in the forested habitats in order to assess species not easily recorded in transects (Davies 2002).

Also, there were clear differences amongst transects in terms of species richness with transects in forested areas having a significantly higher number of species on average that those in woodlands and the one in grassland. This

could be attributable to the differences in the complexity of the vegetation (with forest being the most complex), which affects food resources, food accessibility, and the ability of the species to partition space more effectively (see also Arnold 2003). Indeed, some species like Hartlaub's Turaco *Tauraco hartlaubi* and Olive Thrush *Turdus olivaceus* were only recorded in specific forested transects. Other species like the Tropical Boubou *Laniarius aethiopicus* and Common Bulbul *Pycnonotus barbatus* were much more common, occurring on all the transects surveyed. On the other hand, abundance was not found to vary as significantly as species richness, with the notable deviation being two forested transects where large flocks of Eurasian Bee-eaters and Montane White-eyes were found.

The results of this survey are an important first step in quantifying the value of Ol Donyo Sabuk National Park both in terms of biodiversity conservation as well as its economic value. The relatively high bird diversity we found, coupled with the scenic landscape formations accentuates the park as both a suitable bird watching site as well as great resource for hikers, photographers and nature lovers in general. The proximity of the park to Nairobi, being only 65 km away, makes it a close-to-ideal weekend getaway spot. These aspects should be promoted as they will help boost the economic income generated from the park and its environs. Research-wise, a follow up survey to document the more elusive species as well as surveys of habitats not surveyed during this study is required.

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Appendix 1. List of all bird species observed in Ol Donyo Sabuk NP during the survey period and their status following the latest Checklist of the Birds of Kenya (OS-c 2009). Abbreviations used: AM- Afrotropical migrant and PM- Palearctic migrant. When these letters are in lower case, migrants of that category may occur alongside resident, non-migratory individuals of one of the other migrant categories.

Family	Common name	Scientific name	Status
Phasianidae	Yellow-necked Spurfowl	*Francolinus leucoscepus*	
Podicipedidae	Little Grebe	*Tachybaptus ruficollis*	
Threskiornithidae	Sacred Ibis	*Threskiornis aethiopicus*	
	Hadada Ibis	*Bostrychia hagedash*	
	African Spoonbill	*Platalea alba*	
Ardeidae	Cattle Egret	*Bubulcus ibis*	am
Scopidae	Hamerkop	*Scopus umbretta*	
Phalarcrocoracidae	Reed Cormorant	*Phalacrocorax africanus*	
	Great Cormorant	*Phalacrocorax carbo*	
Accipitridae	Black Kite	*Milvus migrans*	am, pm
	Black-chested Snake Eagle	*Circaetus pectoralis*	
	Western Marsh Harier	*Circus aeruginosus*	PM
	African Harrier Hawk	*Polyboroides typus*	
	Great Sparrowhawk	*Accipiter melanoleucus*	
	Common Buzzard	*Buteo buteo*	PM
	Augur Buzzard	*Buteo augur*	
	Steppe Eagle	*Aquila nipalensis*	PM
Gruidae	Grey Crowned Crane	*Balearica regulorum*	Vulnerable
Recurvirostridae	Pied Avocet	*Recurvirostra avosetta*	am
Scolopacidae	Common Sandpiper	*Actitis hypoleucos*	PM
Columbidae	Dusky Turtle Dove	*Streptopelia lugens*	
	Red-eyed Dove	*Streptopelia semitorquata*	
	Ring-necked Dove	*Streptopelia capicola*	
	Laughing Dove	*Streptopelia senegalensis*	
	Emerald-spotted Wood Dove	*Turtur chalcospilos*	
	Tambourine Dove	*Turtur tympanistria*	
Musophagidae	Hartlaub's Turaco	*Tauraco hartlaubi*	
Cuculidae	Red-chested Cuckoo	*Cuculus s. solitarius*	am
	Klaas's Cuckoo	*Chrysococcyx klaas*	
	African Emerald Cuckoo	*Chrysococcyx cupreus*	
	Diederik Cuckoo	*Chrysococcyx caprius*	am
	White-browed Coucal	*Centropus superciliosus*	
Tytonidae	Barn Owl	*Tyto alba*	
Strigidae	African Scops Owl	*Otus senegalensis*	
Caprimulgidae	Dusky Nightjar	*Caprimulgus fraenatus*	
Apodidae	Little Swift	*Apus affinis*	
Collidae	Speckled Mousebird	*Colius striatus*	
Coraciidae	Lilac-breasted Roller	*Coracias caudatus*	am

Family	Common name	Scientific name	Status
Alcedinidae	Malachite Kingfisher	*Alcedo cristata*	
Meropidae	Little Bee-eater	*Merops pusillus*	
	Cinnamon-chested Bee-eater	*Merops oreobates*	
	Eurasian Bee-eater	*Merops apiaster*	PM
Bucerotidae	Crowned Hornbill	*Tockus alboterminatus*	
	Von der Decken's Hornbill	*Tockus deckeni*	
Capitonidae	Yellow-rumped Tinkerbird	*Pogoniulus bilineatus*	
	Yellow-spotted Barbet	*Buccanodon duchaillui*	
	Spot-flanked Barbet	*Tricholaema lacrymosa*	
	D'Arnaud's Barbet	*Trachyphonus darnaudii*	
Indicatoridae	Lesser Honeyguide	*Indicator minor*	
Picidae	Cardinal Woodpecker	*Dendropicos fuscescens*	
Platysteiridae	Chin-spot Batis	*Batis molitor*	
Malaconotidae	Sulphur-breasted Bushshrike	*Chlorophoneus sulfureopectus*	
	Black-crowned Tchagra	*Tchagra senegalus*	
	Black-backed Puffback	*Dryoscopus cubla*	
	Slate-coloured Boubou	*Laniarius funebris*	
	Tropical Boubou	*Laniarius aethiopicus*	
Campephagidae	Black Cuckooshrike	*Campephaga flava*	am
Laniidae	Common Fiscal	*Lanius collaris*	
Dicruridae	Common Drongo	*Dicrurus adsimilis*	
Monarchidae	African Paradise Flycatcher	*Terpsiphone viridis*	am
Corvidae	Pied Crow	*Corvus albus*	
Paridae	White-bellied Tit	*Parus albiventris*	
Hirundinidae	Plain Martin	*Riparia paludicola*	am
	Wire-tailed Swallow	*Hirundo smithii*	
	Lesser Striped Swallow	*Cecropis abyssinica*	
Alaudidae	Rufous-naped Lark	*Mirafra africana*	
Cisticolidae	Singing Cisticola	*Cisticola cantans*	
	Rattling Cisticola	*Cisticola chiniana*	
	Winding Cisticola	*Cisticola galactotes*	
	Croaking Cisticola	*Cisticola natalensis*	
	Siffling Cisticola	*Cisticola brachypterus*	
	Tawny-flanked Prinia	*Prinia subflava*	
	Yellow-breasted Apalis	*Apalis flavida*	
	Grey-backed Camaroptera	*Camaroptera brachyura*	
	Grey Wren Warbler	*Calamonastes simplex*	
Pycnonotidae	Common Bulbul	*Pycnonotus barbatus*	
	Yellow-whiskered Greenbul	*Andropadus latirostris*	
	Northern Brownbul	*Phyllastrephus strepitans*	
	Cabanis's Greenbul	*Phyllastrephus cabanisi*	
Sylviidae	Red-faced Crombec	*Sylvietta whytii*	
	Blackcap	*Sylvia atricapilla*	PM

Family	Common name	Scientific name	Status
Timalidae	Rufous Chatterer	*Turdoides rubiginosa*	
	Northern Pied-babbler	*Turdoides hypoleuca*	
Zosteropidae	Montane White-eye	*Zosterops poliogaster*	
Sturnidae	Greater Blue-eared Starling	*Lamprotornis chalybaeus*	
	Superb Starling	*Lamprotornis superbus*	
	Hildebrandt's Starling	*Lamprotornis hildebrandti*	
Turdidae	Olive Thrush	*Turdus olivaceus*	
Muscicapidae	Cape Robin-Chat	*Cossypha caffra*	
	Ruppell's Robin Chat	*Cossypha semirufa*	
	Isabelline Wheatear	*Oenanthe isabellina*	PM
	White-eyed Slaty Flycatcher	*Melaenornis fischeri*	
	Pale Flycatcher	*Bradornis pallidus*	
	African Grey Flycatcher	*Bradornis microrhynchus*	
Nectariniidae	Collared Sunbird	*Hedydipna collaris*	
	Amethyst Sunbird	*Chalcomitra amethystina*	
	Scarlet-chested Sunbird	*Chalcomitra senegalensis*	
	Bronze Sunbird	*Nectarinia kilimensis*	
	Eastern Double-collared Sunbird	*Cinnyris mediocris*	
	Variable Sunbird	*Cinnyris venustus*	
Passeridae	White-browed Sparrow Weaver	*Plocepasser mahali*	
	House Sparrow	*Passer domesticus*	
	Grey-headed Sparrow	*Passer griseus*	
Ploceidae	Grosbeak Weaver	*Amblyospiza albifrons*	
	Baglafecht Weaver	*Ploceus baglafecht*	
	Spectacled Weaver	*Ploceus ocularis*	
	Esatern Golden Weaver	*Ploceus subaureus*	
	Holub's Golden Weaver	*Ploceus xanthops*	
	Lesser Masked Weaver	*Ploceus intermedius*	
	Brown-capped Weaver	*Ploceus insignis*	
	Red-headed Weaver	*Anaplectes melanotis*	
Estrildidae	Yellow-bellied Waxbill	*Coccopygia quartinia*	
	Common Waxbill	*Estrilda astrild*	
	Red-cheeked Cordon-bleu	*Uraeginthus bengalus*	
	Purple Grenadier	*Uraeginthus ianthinogaster*	
	Peters's Twinspot	*Hypargos niveoguttatus*	
	Red-billed Firefinch	*Lagonosticta senegala*	
	African Firefinch	*Lagonosticta rubricata*	
Viduidae	Pin-tailed Whydah	*Vidua macroura*	
	Village Indigobird	*Vidua chalybeata*	
Motacillidae	African Pied Wagtail	*Motacilla aguimp*	
	Yellow-throated Longclaw	*Macronyx croceus*	
Fringillidae	Reichenow's Seedeater	*Crithagra reichenowi*	
	Streaky Seedeater	*Crithagra striolata*	