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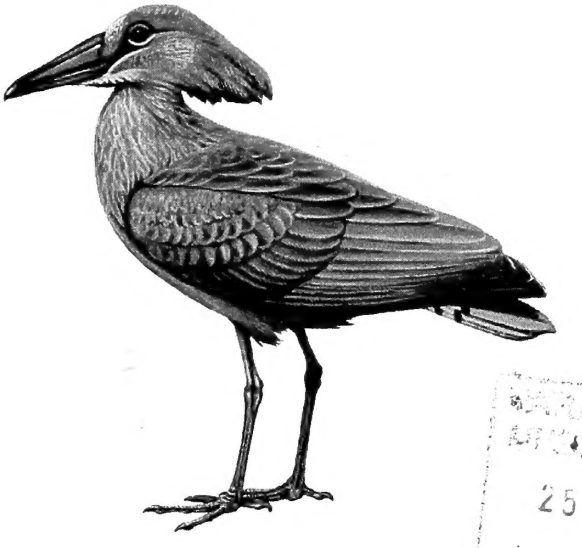

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The birds of Gongoni Forest Reserve, South Coast, Kenya

Maurice O. Ogoma, Broder Breckling, Hauke Reuter, Muchai Muchane and Mwangi Githiru

Summary

Between November 2007 and February 2008, bird species composition, richness and abundance were assessed at Gongoni Forest Reserve (classified as a Key Biodiversity Area) using transect and timed-species counts. A total of 140 bird species in 51 families were recorded with species accumulation curves indicating that a few more species could be discovered with additional search efforts. Four Near Threatened species—Southern Banded Snake Eagle *Circaetus fasciolatus*, Sooty Falcon *Falco concolor*, Martial Eagle *Polemaetus bellicocus* and Fischer's Turaco *Tauraco fischeri*, 15 East Africa Coast biome species and 13 regionally threatened species were recorded. Owing to the presence of these species of conservation concern both globally and regionally, and past and ongoing threats, this site merits more attention than previously accorded.

Introduction

The loss of tropical forests in Kenya has been dramatic. Over the last couple of decades the country has experienced intense reduction of forest cover, and today only less than 2% of the total land in Kenya is covered by forests (UNEP 2001). This area is below the internationally recommended minimum forest cover of 10% (IUCN 1995). Burgess *et al.* (2003) estimated that the coastal forests in Kenya have decreased in area since the early 1990s to about 650 km^2 currently, owing largely to human activities. While it is clear that this loss of forest cover and related threats to forest biodiversity should be stemmed, most of these coastal forests remain unstudied biologically, making prioritisation and drawing conservation recommendations difficult. Basic biodiversity surveys are necessary to provide this essential baseline information that can inform conservation and management interventions.

The coastal forests of Kenya are classified under the Coastal Forests of Eastern Africa biodiversity hotspot (Conservation International 2008; CEPF 2003; Myers *et al.* 2000) and host at least 105 globally threatened species, of which 64 are in the Kwale Forests (CEPF 2003). Overall, of the forest dependent and nationally threatened species in Kenya's forests, about 50% of the plants, 60 % of the birds and 65% of the mammals are found in the coastal forests, which shows the importance of this region despite its relatively small area and its overall lack of forest cover (less than 0.1% of the national total area)

(Wass 1995). Threats to the coastal forests include encroachment, logging, and replacement of indigenous vegetation, forest fires, firewood collection and charcoal burning (WWF-EARPO 2006).

Gongoni Forest Reserve is recognised as a Key Biodiversity Area (KBA) (Eken *et al.* 2004) in Kenya, but there is scarcity of biological information about its biota. The forest has received little scientific attention in the past since biological research in coastal forests in Kenya has been concentrated in the major coastal forests including Arabuko-Sokoke and Shimba Hills forests. However, Gongoni is known to harbour several endemic and near-endemic plants and animals (Waiyaki 1995, Burgess *et al.* 2003), making it important for conservation. Between November 2007 and February 2008 surveys of bird species abundance and composition were conducted in Gongoni Forest Reserve. This paper describes the avifauna of Gongoni with emphasis on the species composition and relative abundance of different species.

Methods

Study area

Gongoni Forest Reserve (04°23'S, 39°29'E) lies on the South Coast of Kenya in Msambweni District. The reserve is adjacent to Gazi Bay and situated on one side of the Mombasa-Lungalunga Highway (Fig. 1). It is a moist semi-deciduous forest rising to an altitude of 40 m and covering an area of 824 ha (Waiyaki 1995). On site observations revealed that the forest is composed of characteristic indigenous tree species including *Cynometra webberi, Melicia excelsia, Mannlikara zanzibarensis, Hymenia verrocosa* and *Jubanedia magnitipulata.* These species form a mosaic of habitats in Gongoni comprising of grasslands, deciduous woodlands and bushlands. The habitats are characterised by the presence of forest wetlands (Fig. 1), most of which are small seasonal swamps that are seasonally flooded depending on the intensity of rainfall. During this study, most of the forest swamps had dried up leaving muddy water beds with little water. The most important mammal species in the reserve is Buffalo *Syncerus caffer.*

The area surrounding the forest reserve is an agricultural zone inhabited by the Mijikenda people who practice subsistence agriculture, generally practicing smallholder crop farming with limited livestock rearing. Other livelihood activities include fisheries and tourism (GOK 2008). As a result of crop and livestock farming in the area, the surrounding farms are usually subjected to burning of vegetation that often strays into the forest.

Bird surveys

Ten line transects (Bibby *et al.* 1992, Pomeroy 1992) measuring approximately 1 km each, with an inter-transect distance of at least 500 m, were established in the forest for bird sampling (Fig. 1). Data were collected by walking slowly at a constant speed along transects in the mornings (between 08:00-11:00)

and evenings (between 16:00-18:00) when birds were active. All birds seen or heard up to 20 m on either sides of the transect lines were identified and their numbers counted. We used this cut-off point in order to minimise errors from inadequate bird identification, double counting and over-representation of conspicuous species. Two to three transects were surveyed on each day depending on the prevailing weather conditions. The transect counts were repeated four times along each transect over the entire study period, giving a total of 40 transect runs. Eight were found along three transects where waterbirds were counted.

In order to get a more complete species list, timed-species counts (TSC) (Bennun & Waiyaki 1993) were also conducted. A total of 27 TSCs were done during the study period throughout the entire reserve. One or two TSCs were conducted in the evenings (16:00-18:00) and in the mornings (08:00-11:00) by one or two observers. Each lasted 40 minutes and birds were recorded in 10-minute intervals, indicating the first time a bird species was seen or heard. Observers generally kept away from the transect lines in order to maximise the area surveyed.

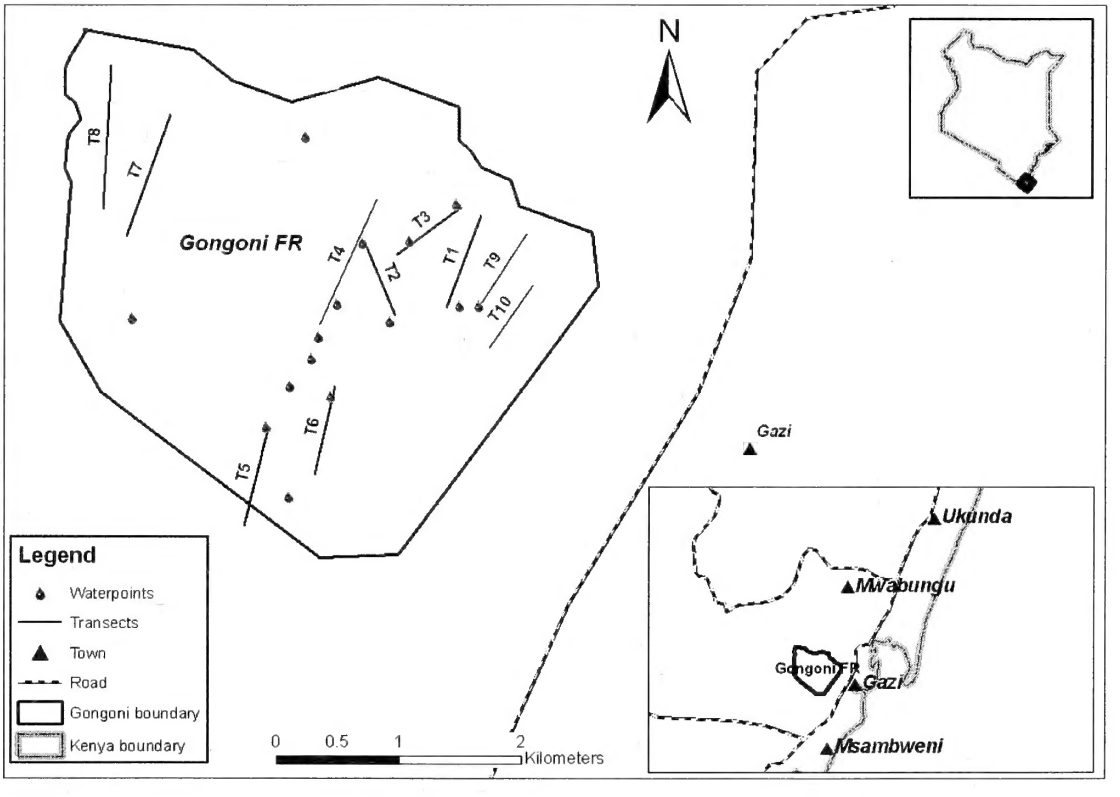

Figure 1. Map of study area showing the distribution of transects and other features in Gongoni Forest Reserve; top inset shows the position of Gongoni in Kenya, while bottom inset shows the towns neighbouring Gongoni in South Coast.

Data analysis

Records of new species in successive TSCs throughout the study period were used to draw a species accumulation curve. We used the TSC dataset only because we could easily construct a daily list based on it. We modelled the species accumulation curve by fitting an asymptotic model to our curve of observed data, using nonlinear regression procedures (Gaidet *et al.* 2005), adopting the exponential equation of the linear dependence model (Soberón & Llorente 1993).

All bird species recorded were categorised following Bennun *et al.* (1996) in terms of their known levels of forest dependence where: FF - forest specialists that are true forest birds characteristic of the interior of undisturbed forest; F - forest generalists that may occur in undisturbed forest but are regularly found in forest gaps, edges and strips; f - forest visitors that are often recorded in forests but are not dependent upon it; and s - birds associated with other habitats e.g. savannah/woodland and wetland areas. Relative abundance was calculated by dividing total number of each species recorded in the transect counts by the total birds recorded.

For TSCs species recorded in the first ten minutes received a score of 4; those recorded in the next ten minutes received a score of 3 and so on. TSC commonness index was calculated based on the assumption that common species are recorded earlier than the rare species during the survey. The index was calculated by averaging the mean scores for each count that varied between four (maximum value) and a minimum value of 1/n (where n is the number of repeated surveys) (Bibby *et al.* 1992). Statistical analyses were performed using STATISTICA 6.0 (StatSoft 2005).

Results

Bird species accumulation curve

A total of 140 species belonging to 51 families were recorded from the forest reserve (Appendix 1). These numbers included all species recorded during the field survey from the two methods, as well as species recorded during opportunistic observations. Transect counts recorded a total of 83 species, TSCs 84 species, while 32 species were opportunistic observations. Several species were recorded by both transect counts and TSCs, but 25 species were recorded by TSCs alone. The bird species accumulation curve (based on the TSC data) did not attain a plateau (Fig. 2). Our model seemed to approach asymptote at 149±15 species (Fig. 2). Thus, at 140, we probably recorded most of the species one would expect in Gongoni Forest Reserve except for a few.

Bird species composition and richness

Of the 140 species we recorded, 10 (or 7 %) were forest specialists (FF), 27 (19 %) forest generalists (F), 32 (23 %) forest visitors (f) and 71 (51 %) species associated with other habitats (e.g. savannah, woodland or wetlands). Four of

the species were listed as Near Threatened in the IUCN Red Data List (IUCN 2010): Southern Banded Snake Eagle *Circaetus fasciolatus*, Fischer's Turaco *Tauraco fischeri*, Sooty Falcon *Falco concolor* and Martial Eagle *Polemaetus bellicocus*. In addition, 13 were regionally threatened according to the East Africa Regional Red Data List (Bennun *et al.* 2000), 15 were East Africa Coast Biome species (Bennun & Njoroge 1999), 10 were Palaearctic migrants and 14 were Afrotropical migrants (Appendix 1).

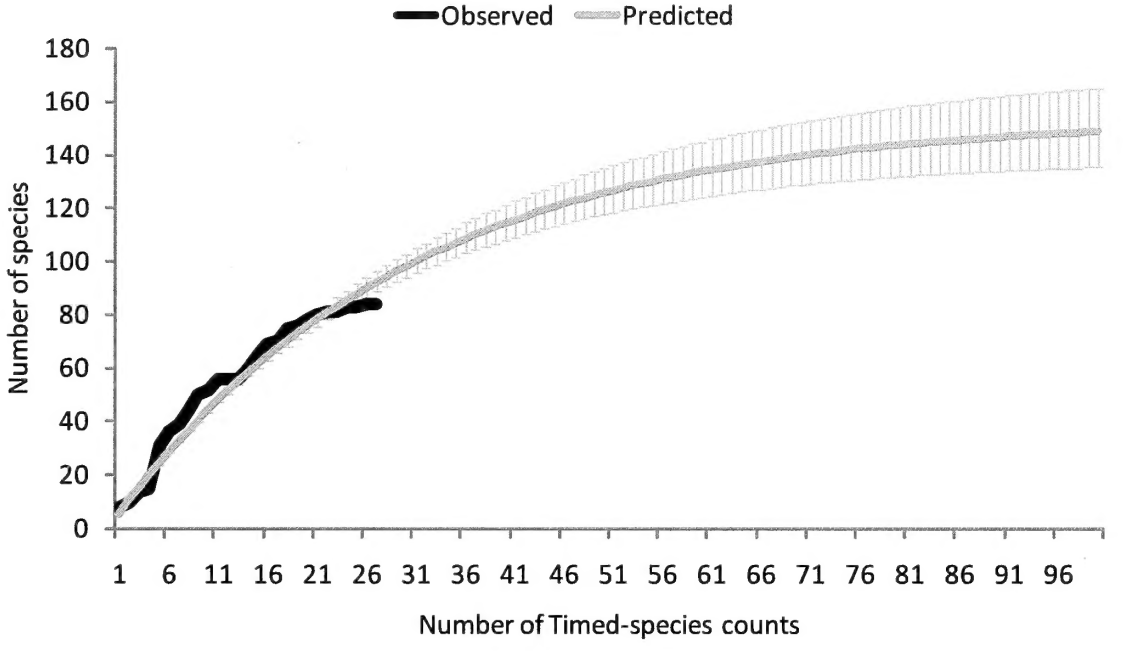

Figure 2. Species accumulation curve for Gongoni Forest Reserve calculated as the cumulative number of species against all the TSCs conducted, and the modelled species accumulation curve.

Bird species relative abundance and commonness

Commonness established by use of the TSC index revealed that the Collared Sunbird and Olive Sunbird were the most common species (Table 1). From the transects, 1720 individual birds were counted. Our data revealed that these two species were also the most abundant species in terms of numbers (Table 1). Considering the species of conservation interest, whilst the Southern-banded Snake Eagle and Malachite Kingfisher (both East African Coast Biome species) were among the least abundant, the Near-Threatened Fischer's Turaco was relatively common (Table 1).

Table 1. Common bird species in Gongoni Forest Reserve (based on TSC Index) with the mean number of individuals counted (per transect) and respective relative abundances (%).

Common name	Scientific name	TSC Index	Mean No. indls	Relative abundance
Collared Sunbird	*Hedydipna collaris*	4	40	9.2
Olive Sunbird	*Cyanomitra olivacea*	2.9	49	11.3
Common Bulbul	*Pycnonotus barbatus*	2.4	5	1.1
Black-bellied Starling	*Lamprotornis corruscus*	2.3	17	3.8
Crowned Hornbill	*Tockus nasutus*	2.2	12	2.9
Green Barbet	*Stactolaema olivacea*	2	36	8.3
Palm-nut Vulture	*Gypohierax angolensis*	2	10	2.3
African Palm Swift	*Cypsiurus parvus*	2	9	2.2
Silvery-cheeked Hornbill	*Bycanistes brevis*	2	20	4.7
Yellow-rumped Tinkerbird	*Pogoniulus bilineatus*	1.8	11	2.6
Tambourine Dove	*Turtur tympanistria*	1.6	5	1.2
White-throated Bee-eater	*Dendrocygna viduata*	1.6	34	7.9
Fischer's Turaco	*Tauraco fischeri*	1.3	9	2
Ring-necked Dove	*Streptopelia capicola*	1.3	1	0.2
Fischer's Greenbul	*Phyllastrephus fischeri*	1.2	31	7.1
Tropical Boubou	*Laniarius aethiopicus*	1.1	5	1.2
Black-and-white Mannikin	*Spermestes bicolour*	1	2	0.5
Eurasian Bee-eater	*Merops apiaster*	1	5	1.1
Emerald-spotted Wood Dove	*Turtur chalcospilos*	0.9	1	0.1
White-browed Coucal	*Centropus superciliosus*	0.9	3	0.6

Discussion

Like most tropical coastal forests (Bennun & Njoroge 1999), our results show that Gongoni Forest Reserve supports a fairly rich avifauna. The species accumulation curve indicates that we recorded most of the species expected for the reserve, suggesting that extra sampling was likely to reveal only a few extra species. Since it is clear that neither method recorded all the species, use of multiple survey methods is encouraged in order to capture complete species lists.

The results indicate that some noisy species such as Green Barbet and Fischer's Greenbul recorded high overall species abundance. This according to Waiyaki (1995) could be true because some undergrowth species are extremely noisy and therefore are easily detected. There was a high proportion of forest generalist species (19 % of total species) in our checklist compared to forest specialists (7 %). This could be attributed either to the ability of forest generalists to persist and predominantly occupy modified forests (Bennun *et al.* 1996) or to the location of our sampling transects (Fig. 1) many of which were near the edges. However, we still believe we comprehensively surveyed the interior as well because the TSCs were conducted away from the transect

lines wherever possible to ensure we covered most of the Reserve.

Despite the clear importance of the site for bird (and biodiversity) conservation (e.g., from the presence of Near Threatened and regionally threatened bird species, as well as numerous biome characteristic species), human encroachment and other threats were common. For instance, there were many fresh tree stumps indicating ongoing logging activities, active saw-pits for timber processing, and forest fires were not uncommon. These activities could have explained the bird species composition we found, especially the low proportion of true forest specialists.

In conclusion, on the basis of the presence of species listed under the IUCN Red List and East Africa Regional Red List, Gongoni Forest Reserve deserves improved management. This could be both through enhancing the capacity of Kenya Forest Service (KFS) staff on the ground to help reduce the illegal activities, and building a positive perception of the local community towards forest conservation. In terms of research, more thorough avian scientific surveys including mistnetting may be necessary across different seasons, in order to get the entire checklist for Gongoni, and especially to ascertain the presence or absence of other bird species of conservation interest such as the Spotted Ground Thrush *Zoothera guttata.*

Acknowledgements

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Appendix 1. Taxonomic checklist of the birds recorded at Gongoni forest reserve showing forest dependence categories. The table shows all the bird species encountered in Gongoni Forest irrespective of the method of detection. Forest dependency status categories include: f- forest visitor species; F- forest generalist species; FF- forest specialist species; s- species associated with other habitats e.g. savannah, woodland and wetland. Other categories include NT- Near Threatened, RT – regionally threatended, AM- Afrotropical migrant, PM- Palaearctic migrant and MM-Malagasy migrant species with lowercase abbreviations representing migrants that occur alongside resident or non-migratory individuals (OS-c 2009). * EACB is the East Africa Coastal Biome.

Family	Common name	Scientific name	Status
Podicipedidae	Little Grebe	*Tachybaptus ruficollis*	s
Pelecanidae	Great White Pelican	*Pelecanus onocrotalus*	s, RT
Phalacrocoracidae	Reed Cormorant	*Phalacrocorax africanus*	s
Ardeidae	Dwarf Bittern	*Ixobrychus sturmii*	s, am
	Striated Heron	*Butorides striatus*	s, RT
	Cattle Egret	*Bubulcus ibis*	s, am
	Great White Egret	*Ardea alba*	s, RT
	Yellow-billed Egret	*Egretta intermedia*	s
Ciconiidae	Woolly-necked Stork	*Ciconia episcopus*	s, RT
Anatidae	White-backed Duck	*Thalassornis leuconotus*	s, RT
	White-faced Whistling Duck	*Dendrocygna viduata*	s
	African Pygmy Goose	*Nettapus auritus*	s
Accipitridae	Southern Banded Snake Eagle	*Circaetus fasciolatus*	F, NT*
	African Harrier Hawk	*Polyboroides typus*	f
	African Goshawk	*Accipiter tachiro*	F
	Shikra	*Accipiter badius*	f
	Great Sparrowhawk	*Accipiter melanoleucus*	F
	Little Sparrowhawk	*Accipiter minullus*	f
	Lizard Buzzard	*Kaupifalco monogrammicus*	f
	Ayre's Hawk Eagle	*Hieraaetus ayresii*	F, RT
	Eastern Chanting Goshawk	*Melierax poliopterus*	s
	Gabar Goshawk	*Micronisus gabar*	s
	Palm-nut Vulture	*Gypohierax angolensis*	s
	Crowned Eagle	*Stephanoaetus coronatus*	FF, RT
	African Fish Eagle	*Haliaeetus vocifer*	s
	Eurasian Sparrowhawk	*Accipiter n. nisus*	s, PM
	Tawny Eagle	*Aquila rapax*	s
	Wahlberg's Eagle	*Aquila wahlbergi*	s, am
	Martial Eagle	*Polemaetus bellicocus*	s, NT, RT
	Black Kite	*Milvus migrans*	s, am, pm
Falconidae	Sooty Falcon	*Falco concolor*	s, PM, NT
Phasianidae	Harlequin Quail	*Coturnix delegorguei*	s, am
Numinidae	Crested Guineafowl	*Guttera pucherani*	F
	Helmeted Guineafowl	*Numida meleagris*	s
Rallidae	Black Crake	*Amaurornis flavirostra*	s
Jacanidae	African Jacana	*Actophilornis africanus*	s
Charadriidae	Senegal Plover	*Vanellus lugubris*	s
Scolopacidae	Common Greenshank	*Tringa nebularia*	s, PM
Columbidae	African Green Pigeon	*Treron calvus*	F
	Tambourine Dove	*Turtur tympanistria*	F
	Emerald-spotted Wood Dove	*Turtur chalcospilos*	f

Family	Common name	Scientific name	Status
	Red-eyed Dove	*Streptopelia semitorquata*	f
	Ring-necked Dove	*Streptopelia capicola*	f
Psittacidae	Brown-headed Parrot	*Poicephalus cryptoxanthus*	F*
Musophagidae	Fischer's Turaco	*Tauraco fischeri*	F, NT*
Cuculidae	Klaas's Cuckoo	*Chrysococcyx klaas*	f
	Yellowbill	*Ceuthmochares aereus*	F, am
	White-browed Coucal	*Centropus superciliosus*	s
Apodidae	African Palm Swift	*Cypsiurus parvus*	s
	Little Swift	*Apus a. affinis*	s
	Mottled Spinetail	*Telacanthura ussheri*	F
Coliidae	Blue-naped Mousebird	*Urocolius macrourus*	s
	Speckled Mousebird	*Colius striatus*	s
Trogonidae	Narina Trogon	*Apaloderma narina*	F
Alcedinidae	Grey-headed Kingfisher	*Halcyon leucocephala*	f, am
	Mangrove Kingfisher	*Halcyon senegaloides*	s
	Striped Kingfisher	*Halcyon chelicuti*	s
	Malachite Kingfisher	*Alcedo cristatagalerita*	s*
Meropidae	Eurasian Bee-eater	*Merops apiaster*	f, PM
	Northern Carmine Bee-eater	*Merops nubicus*	s, AM*
	White-throated Bee-eater	*Merops albicollis*	s, AM
	Little Bee-eater	*Merops pusillus*	s
Coraciidae	Broad-billed Roller	*Eurystomus glaucurus*	f, am, mm
	Lilac-breasted Roller	*Coracias caudata*	s, am
Phoeniculidae	Green Wood Hoopoe	*Phoeniculus purpureus*	s
	Common Scmitarbill	*Rhinopomastus cyanomelas*	s
Bucerotidae	Crowned Hornbill	*Tockus nasutus*	f
	Trumpeter Hornbill	*Bycanistes bucinator*	F
	Silvery-cheeked Hornbill	*Bycanistes brevis*	F, am
	Black-and-white Casqued Hornbill	*Bycanistes subcylindricus*	F
Capitonidae	White-eared Barbet	*Stactolaema leucotis*	F
	Red-fronted Tinkerbird	*Pogoniulus pusillus*	s
	Black-collared Barbet	*Lybius torquatus*	f
	Brown-breasted Barbet	*Lybius melanopterus*	f*
	Green Barbet	*Stactolaema olivacea*	FF, RT
	Green Tinkerbird	*Pogoniulus simplex*	FF, RT*
	Yellow-rumped Tinkerbird	*Pogoniulus bilineatus*	F
Indicatoridae	Lesser Honeyguide	*Indicator minor*	f
	Pallid Honeyguide	*Indicator meliphilus*	f
	Scaly-throated Honeyguide	*Indicator veriegatus*	f
Picidae	Mombasa Woodpecker	*Campethera mombassica*	F, RT*
Eurylaimidae	African Broadbill	*Smithornis capensis*	FF
Alaudidae	Flappet Lark	*Mirafra rufocinnamomea*	s
Hirundinidae	Sand Martin	*Riparia riparia*	s, PM
	Barn Swallow	*Hirundo rustica*	s, PM
	Wire-tailed Swallow	*Hirundo smithii*	s
Motacillidae	African Pied Wagtail	*Motacilla aguimp vidua*	s
	Yellow-throated Longclaw	*Macronyx croceus*	s
Pycnonotidae	Zanzibar Greenbul	*Andropadus importunus*	s
	Fischer's Greenbul	*Phyllastrephus fischeri*	FF, RT*
	Yellow-bellied Greenbul	*Chlorocichla flaviventris*	F

Family	Common name	Scientific name	Status
	Common Bulbul	*Pycnonotus barbatus*	f
	Eastern Nicator	*Nicator gularis*	F
Timaliidae	Rufous Chatterer	*Turdoides rubiginosus*	s
Turdidae	Red-tailed Ant Thrush	*Neocossyphus rufus*	FF*
	African Bare-eyed Thrush	*Turdus tephronotus*	s
Muscicapidae	Red-capped Robin Chat	*Cossypha natalensis*	F, am
	White-browed Robin Chat	*Cossypha heuglini*	f
	White-browed Scrub Robin	*Cercotrichas leucophrys*	s
	Bearded Scrub Robin	*Cercotrichas quadrivirgata*	f
	Collared Palm Thrush	*Cichladusa arquata*	s
	Isabelline Wheatear	*Oenanthe isabellina*	S, PM
	Ashy Flycatcher	*Muscicapa caerulescens*	F, am
	Pale Flycatcher	*Bradornis pallidus*	s
	Southern Black Flycatcher	*Melaenornis pammelaina*	s
	Spotted Flycatcher	*Muscicapa striata*	s, PM
Cisticolidae	Tawny-flanked Prinia	*Prinia subflava*	f
	Grey-backed Camaroptera	*Camaroptera brachyura*	f
	Black-headed Apalis	*Apalis melanocephala*	FF
Monarchidae	Blue-mantled Crested Flycatcher	*Trochocercus cyanomelas bivittatus*	FF*
	African Paradise Flycatcher	*Terpsiphone viridis*	f, am
Platysteiridae	Forest Batis	*Batis mixta*	FF*
	Black-headed Batis	*Batis minor*	s
Malaconotidae	Black-crowned Tchagra	*Tchagra senegalus*	s
	Grey-headed Bushshrike	*Malaconotus blanchoti*	s
	Tropical Boubou	*Laniarius aethiopicus*	f
	Black-backed Puffback	*Dryoscopus cubla*	F
	Slate-coloured Boubou	*Laniarius funebris*	s
Dicruridae	Common Drongo	*Dicrurus adsimilis*	s
Oriolidae	Black-headed Oriole	*Oriolus larvatus rolleti*	f
	Eurasian Golden Oriole	*Oriolus oriolus*	f, PM
	African Golden Oriole	*Oriolus auratus*	f, AM
Corvidae	Pied Crow	*Corvus albus*	s
Sturnidae	Black-bellied Starling	*Lamprotornis corruscus*	F*
Nectariniidae	Collared Sunbird	*Hedydipna collaris*	F
	Olive Sunbird	*Cyanomitra olivacea*	FF
	Amethyst Sunbird	*Chalcomitra amethystina*	f
	Mouse-coloured Sunbird	*Cyanomitra veroxiii*	f*
	Scarlet-chested Sunbird	*Chalcomitra senegalensis*	s
Passeridae	Grey-headed Sparrow	*Passer griseus*	s
Ploceidae	Village Weaver	*Ploceus cucullatus*	s
	Dark-backed Weaver	*Ploceus bicolor*	F
	Grosbeak Weaver	*Amblyospiza albifrons*	f
	Lesser Masked Weaver	*Ploceus intermedius*	s
	Zanzibar Red Bishop	*Euplectes nigroventris*	f, RT
Estrildidae	Peter's Twinspot	*Hypargos niveoguttatus*	F
	Black-and-white Mannikin	*Spermestes bicolor*	f
	Bronze Mannikin	*Spermestes cucullatus*	s
Viduidae	Pin-tailed Whydah	*Vidua macroura*	s
Fringillidae	Yellow-fronted Canary	*Crithagra mozambica*	s

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The birds of Uaso Narok Forest Reserve, Central Kenya

Wanyoike Wamiti, Philista Malaki, Kamau Kimani, Nicodemus Nalianya, Chege Kariuki and Lawrence Wagura

Summary

The birds of the Uaso Narok Forest, Central Kenya, were surveyed between June 2008 and April 2009. We recorded 161 species representing 49 families in total. Of these species, 34 were representative of the Afrotropical Highland Biome, representing 51% of all Kenyan species of this biome; two species were representative of the Somali-Masai biome. In addition to the Lesser Kestrel *Falco naumanni* (listed as Vulnerable in the IUCN Red List), there were 27 species of regional conservation concern. Breeding activity was recorded for 39 species, while a new population of Black-billed Weaver *Ploceus melanogaster* was discovered here, thus extending the species' known range. The main human activities recorded in this forest included firewood collection, illegal logging and charcoal burning. This survey revealed that Uaso Narok Forest is important for the conservation of Kenya's montane forest avifauna and deserves immediate official protection, as well as further biological research.

Introduction

Uaso Narok Forest Reserve (N 00° 02′, E 036° 22′) is located in West Laikipia District and lies northeast of Nyahururu Town (Fig. 1) on the eastern escarpment of the Rift Valley. At 1973 ha it is the smallest amongst the five constituent and almost continuous forest blocks forming the larger Marmanet Forests (Fig. 1): Marmanet (20,446 ha), Ol'Arabel (9629 ha), Lariak (4957 ha) and Rumuruti (6519 ha) (Anonymous 2008). These forests are a mixture of exotic plantations and indigenous forests. The forests are an important water catchment for four main rivers that drain into two Rift Valley Lakes and to a major swamp i.e. Sandai River (Lake Bogoria), rivers Ol'Arabel & Mukutan (Lake Baringo) and Ewaso Nyiro River (North) draining into Lorian Swamp (Anonymous 2008). Uaso Narok Forest falls within the Kenyan Mountain Endemic Bird Area (Stattersfield *et al.* 1998). It is worth noting that the drainage basins into which the above rivers flow are key national conservation areas hosting a diversity of scenic beauty, gallery riverine forests, and plant and animal diversity. Notable among these are Lake Bogoria, Samburu, Buffalo Springs and Shaba National Reserves as well as Lake Baringo, all designated as Important Bird Areas (Bennun & Njoroge 1999, 2001).

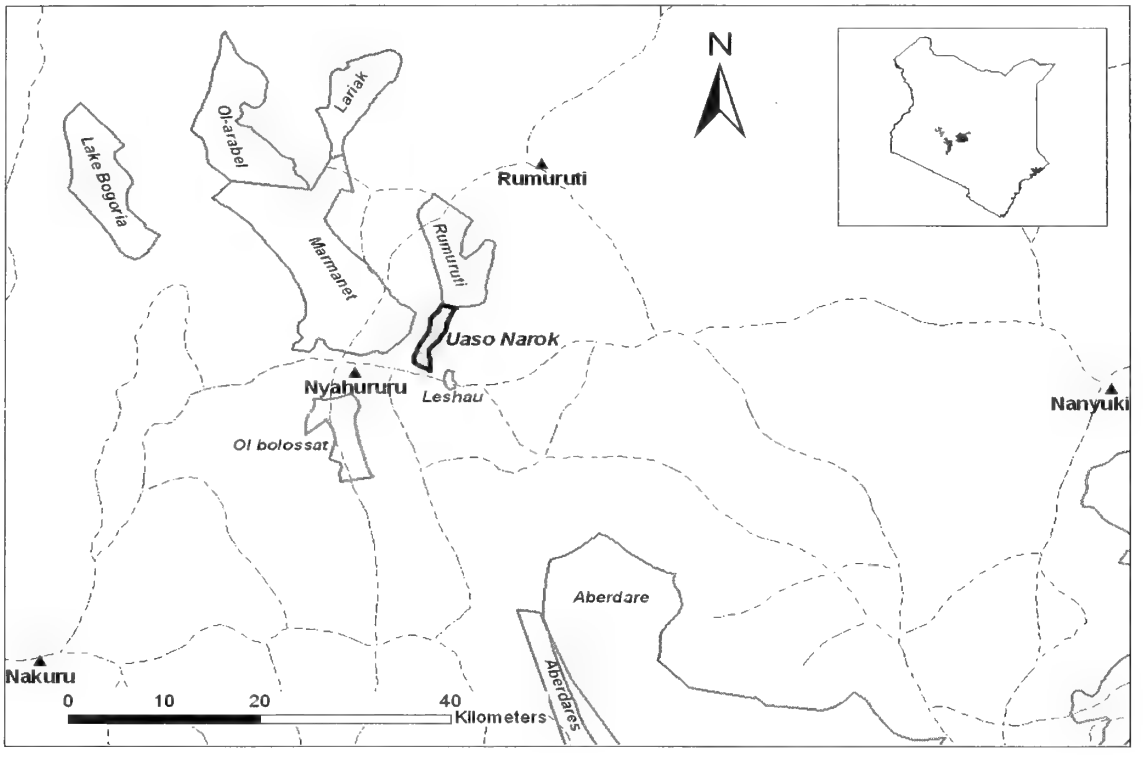

Figure 1. Location of Uaso Narok with respect to other forests of the Marmanet complex and neighbouring forests.

Uaso Narok Forest lies at an altitude ranging from 2200 m to 2450 m.Woody vegetation is dominated by trees such as Red Cedar *Juniperus procera*, Strangler Fig *Ficus thoningii*, East African Olive *Olea capensis* and Pillarwood *Cassipourea malosana*. There are also numerous herbs covering the forest floor and shrubs such as *Rhus natalensis* and *Scutia myrtina*. Scattered all over the forest are stumps of red cedar and olive, evidence of illegal logging which, alongside charcoal burning, are the main threats to avifauna. Some uses of the forest by the local community are licensed including harvesting of soil for tree nurseries, firewood collection and livestock grazing, but they are not well controlled or regulated. There is a need for long-term data on the status of bird species in the Uaso Narok Forest in order to assess the impact (if any) of these activities. This survey was designed as a starting point in order to collect baseline information on which future work can be planned and monitoring based on.

Methods

We systematically surveyed the birds of Uaso Narok Forest from June 2008 to December 2008, spending one week each month during this period. Sporadic birding visits to the forest were made between January and April 2009, which sometimes lasted only a few hours each month. During the intensive survey

period of 2008, we conducted various assessments of the bird communities as part of a broader exercise that assessed the avi-tourism potential for the area. Field surveys were coupled with training of nine bird guides from the local community, selected from around the forest reserve and the neighbouring Lake Ol'Bolossat Important Bird Area (Fig. 1). The locals were intensively trained in bird identification and professional guiding.

Two survey methods were used to assess the bird communities, namely general observations (through organised bird walks) and mist-netting. Bird walks involved splitting the group into two, each going in different directions using the existing forest trails. Additional observations were made while checking the mist nets and at the base camp. Mist netting is a suitable method for sampling skulking understorey species that may otherwise be overlooked (Gibbons *et al.* 1996). We ringed for two mornings during each fieldwork period, employing 90 meters of mistnet operated for 6 hours per day (06:30-12:30), producing a total of 540 metre-net-hours per monthly session and 3780 meter-net-hours over the entire study period. Nets were moved to a different micro-habitat during each session in order to maximise the species caught at different sites that included forest interior, forest edge and bush-scrub. All birds caught in the nets were ringed using uniquely numbered aluminium metal rings from the East African Ringing Scheme. Standard morphological measurements were taken in addition to assessments of moult status and brood patch. Ageing of birds followed Jackson (2001), while identification and taxonomy followed Zimmermann *et al.* (1996) and Ornithological Sub-committee (2009), respectively.

The forest-dependent characteristics of all species observed were determined following Bennun *et al.* (1996) where forest specialists (FF) are species that are dependent on an undisturbed and intact indigenous forest structure and are the true forest birds, indicative of a healthy forest; forest generalists may occur in undisturbed forests but are able to exist in modified and fragmented forests, while forest visitors (f) occur in forests but are typical of other habitats.

Breeding activities were recorded opportunistically. Breeding was inferred from observations of at least one of the following: (i) an active nest, i.e., contents seen, (ii) young seen accompanying adult and begging for food, (iii) brood patch observed in captured individuals, (iv) adult seen carrying food or nesting material to unknown nest, young or mate, and (v) juveniles, immature and sub-adults observed and/or captured.

Results

Mistnetting

Three hundred and seventy-eight (378) individuals representing 53 bird species were captured from the six netting locations that we set up across

the study area. Only four individuals were recaptured; three of them were recaptured at the same net positions as the original capture, while a Yellow-whiskered Greenbul *Andropadus latirostris* was recaptured approximately 300 m from the initial capture site. Sampling effort was evenly distributed across forest interior, forest edge and bush-scrub habitats, with the latter two producing most of the birds caught (87 %). The majority of the birds captured (85 %) were adults; 9 % were sub-adults/full-grown, 2 % immature and 4 % juvenile. The Yellow-whiskered Greenbul was the commonest bird caught in nets, accounting for almost 16 % of all captures (Fig. 2).

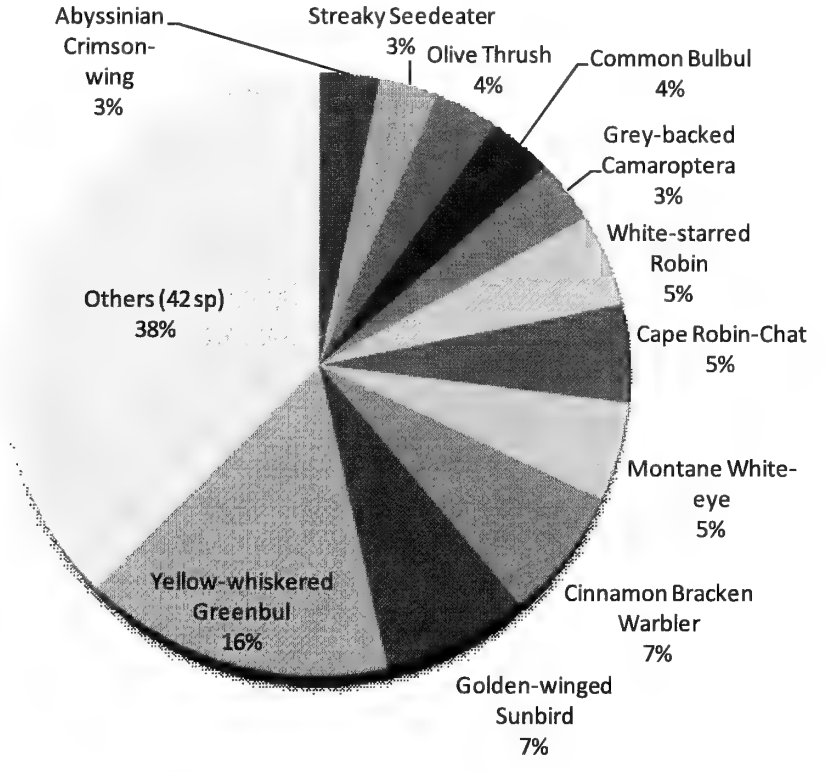

Figure 2. Most common birds captured in mist nets.

Species Richness and Composition

One hundred and sixty-one (161) species from 59 families were recorded during the entire sampling period. This included 12 species that are new for the Quarter Square Degree 50c (Lewis & Pomeroy 1989) bringing the total QSD's list to 532 species. In addition, 16 species listed in East Africa's Regional Red Data List (Bennun & Njoroge 1996) were recorded (Table 1). The forest dependency analysis revealed that 21 species were forest specialists (FF), 37 (24 %) were forest generalists (F) while 39 were forest visitors (f) (Appendix 1).

Table 1. Species observed in Uaso Narok Forest that are listed in East Africa's Regional Red Data List.

Common Name	Scientific Name	Red List Category
African Black Duck	*Anas sparsa*	Regionally Near-threatened
Giant Kingfisher	*Megaceryle maxima*	Regionally Near-threatened
Lesser Kestrel	*Falco naumanni*	Vulnerable
Crowned Eagle	*Stephanoaetus coronatus*	Regionally Threatened
Red-throated Wryneck	*Jynx ruficollis*	Regionally Near-threatened
Cinnamon-chested Bee-eater	*Merops oreobates*	Regional Responsibility
Moustached Tinkerbird	*Pogoniulus leucomystax*	Regional Responsibility
White-eyed Slaty Flycatcher	*Melaenornis fischeri*	Regional Responsibility
Hunter's Cisticola	*Cisticola hunteri*	Regional Responsibility
Chestnut-throated Apalis	*Apalis porphyrolaema*	Regional Responsibility
Hunter's Cisticola	*Cisticola hunteri*	Regional Responsibility
Grey-capped Warbler	*Eminia lepida*	Regional Responsibility
Mountain Yellow Warbler	*Chloropeta similis*	Regional Responsibility
Eastern Double-collared Sunbird	*Cinnyris mediocris*	Regional Responsibility
Kenya Rufous Sparrow	*Passer rufocinctus*	Regional Responsibility
Black-billed Weaver	*Ploceus melanogaster*	Least Concern
Golden-winged Sunbird	*Drepanorhynchus reichenowi*	Regional Responsibility

Breeding records

Thirty-nine (24 %) of these species were confirmed as breeding in the forest reserve during the period of this study. The majority of records were between November and December. The following list shows the species, type of breeding record, and age and dates of observations. Observations include records in the immediate neighbourhood of the forest as long as these species were also recorded in the forest.

Key to abbreviations used: Ad - Adult; SAd – Sub-adult; Imm – immature; Juv - juvenile; ♂ - male; ♀ - female; BP – brood patch

Helmeted Guineafowl *Numida meleagris* – nest observed with 7 eggs at AIC compound by the forest edge 18 December 2008. **Red-eyed Dove** *Streptopelia semitorquata* – Ad sitting on 2 eggs 17 December 2008. **Hartlaub's Turaco** *Tauraco hartlaubi* – pair seen building nest among a dense climber entangling a tree canopy 8-10m high, 4 December 2008. **Narina Trogon** *Apaloderma narina* – Imm ♂ observed in the forest interior, early January 2009. **Yellow-rumped Tinkerbird** *Pogoniulus bilineatus* – Ad BP 1 ringed 4 November 2008. **Yellow-whiskered Greenbul** *Andropadus latirostris* – Juv ringed 26.8.08; SAd ringed 26 June 2008; 3 SAd ringed 5 November 2008, 3 Imm ringed 30 December 2008, 18 September 2008 and 6 December 2008. **Common Bulbul** *Pycnonotus barbatus* – 2 Ads ringed BP 3 on 5 November 2008 and 6 December 2008; nest with 2 pullus at AIC on the forest edge 19 December 2008. **White-starred Robin** *Pogonocichla stellata* – 2 Juv observed in the forest Jun-Oct; 2 SAd ringed 23-24 August 2008; SAd ringed 6 December 2008. **Cape Robin Chat** *Cossypha caffra* – SAd ringed 26 June 2008; 2 Juv ringed 26 June 2008; Ad BP 2 26 June 2008; SAd ringed 31 July 2008. **Olive Thrush** *Turdus olivaceus* – SAd ringed 23 August 2008; 3 Ads BP 3 on 4-5 November 2008; Ad incubating

17 December 2008; Ad actively nest building at AIC 18 December 2008. **African Dusky Flycatcher** *Muscicapa adusta* – 2 Juv observed in June 2008; SAd ringed 26 August 2008; Juv observed 17 December 2008. **White-eyed Slaty Flycatcher** *Melaenornis fischeri* – Juv ringed 26 June 2008; SAd ringed 23 August 2008. **Brown Woodland Warbler** *Phylloscopus umbrovirens* – Ad BP 3 ringed 29 October 2008. **Cinnamon Bracken Warbler** *Bradypterus cinnamomeus* – SAd ringed 30 July 2008; Ad BP 2 5 December 2008; Juv ringed 6 December 2008. **Hunter's Cisticola** *Cisticola hunteri* – 2 Ads both with BP 3 ringed at AIC 15 December 2008, their nest had 3 eggs. **Montane White-eye** *Zosterops poliogaster* – 2 Ads BP 1 and 2 on 30 October 2008; Ad BP 3 ringed 5 November 2008. **Common Fiscal** *Lanius collaris* - SAd ringed 23 August 2008; Ad feeding Juv 15 February 2009; Ad feeding at nest AIC February 2009. **Tropical Boubou** *Laniarius aethiopicus* – Ad BP 3 ringed 5 December 2008. **Grey Cuckooshrike** *Coracina caesia* – Juv seen following Ad and begging for food inside the forest close to fire tower 13 April 2009. **Slender-billed Starling** *Onychognathus tenuirostris* – 2 Ads (probably a pair) seen taking nesting material to a hole nest on a Red Cedar *Juniperus procera* on 17 December 2008. **Superb Starling** *Lamprotornis superbus* – 2 Imm feeding among Ads flock near forest station Dec. 2008, young birds observed at town sewage ponds same period. **Sharpe's Starling** *Cinnyricinclus sharpie* – Imm ♂ ringed 5 December 2008; Pair seen entering hole nest on a dry but standing Red Cedar 17 December 2008 at gorge's edge near waterfalls. **Amethyst Sunbird** *Nectarinia amethystina* – SAd ♀ ringed 5 November 2008. **Northern Double-collared Sunbird** *Cinnyris reichenowi* – pair seen attending to a nest with both food and nesting materials near waterfall on the gorge's edge 17 December 2008. **Eastern Double-collared Sunbird** *C. mediocris* – 2 Imm ♂ ringed 4-5 November 2008; Ads entering nest near falls 17 December 2008. **Golden-winged Sunbird** *D. reichenowi* – SAd ♂ ringed 4 November 2008; SAd ♀ ringed 4 November 2008; Ad ♀ BP 1 4 November 2008; 2 pairs attending nest near falls 17 December 2008. **Malachite Sunbird** *N. famosa* – Imm ringed 26 June 2008. **Kenya Rufous Sparrow** *Passer motitensis* – pair actively building nest near the forest station in December 2008. **Grosbeak Weaver** *Amblyospiza albifrons* – pair building a nest in the papyrus swamp near the falls' footbridge 17 December 2008. **Baglafecht Weaver** *Ploceus baglafecht* – 2 Juv ringed 4-5 November 2008. **Black-billed Weaver** *P. melanogaster* – pair building nest on the tip of *Scutia myrtina* (family Rhamnaceae) shrub at altitude 2349m 27 October 2008. **Abyssinian Crimsonwing** *Cryptospiza salvadorii* – Imm ringed 18 September2008; 3 Juv ♂ ringed 5 November 2008. **Red-cheeked Cordon-bleu** *Uraeginthus bengalus* – Ad incubating (contents not seen), Dec 2008. **Bronze Mannikin** *Lonchura cucullata* – 3 Juv ringed 4-5 November 2008. **Black-and-white Mannikin** *L. bicolour* – Ad with nesting materials attending nest; Juv observed in the field Nov-Dec 2008. **Pin-tailed Whydah** *Vidua macroura* – Imm ♂ ringed 5 November 2008. **Streaky Seedeater** *Serinus striolatus* - 2 Ads BP 3 on 5th and 15th November 2008; 2

Ads BP 2 at AIC 15 December 2008. **Thick-billed Seedeater** *S. burtoni* – SAd ringed 30 July 2008; 2 SAd ringed 17 September 2008; Ad BP 2 on 4 November 2008; Ad BP 3 on 5 November 2008.

Discussion and Conclusion

The avifauna of Uaso Narok Forest demonstrates a strong resemblance to the (not-too-distant) mountain forests of the Aberdares and Mt. Kenya. This is not surprising because of the 161 species recorded at Uaso Narok, 34 were characteristic of the Afrotropical highland biome, which represents 51 % of all Kenyan species from this biome (see Bennun & Njoroge 1999, 2001). Albeit lower than the number recorded in the Aberdares (n = 52) and Mt. Kenya (n = 53) (Bennun & Njoroge 1999, 2001), these two forests are much larger than the Uaso Narok.

Marmanet complex including Uaso Narok has not been spared from the indigenous forests' destruction that has been ongoing in many parts of the country (e.g., KIFCON 1992, Anonymous 2008). Furthermore, as the population of communities living adjacent to forest continues to increase, the forest birds come under increasing threat due to intensified human activities. The presence of a large number of remnant stumps of brown olive and red cedar over most of the forest testifies that it has suffered destruction in the past. The illegal activities observed during the study such as charcoal burning and logging place further pressure on the forest resources. Communities living around the reserve should not only be encouraged to plant on-farm woodlots, but facilitated to do so in order to ease pressure on the forest. Alternatively, regulated buffer zones in other larger blocks of Marmanet (Fig. 1) could be considered with woodlots for fuel supplementation as suggested by Cordeiro & Githiru (2000) for woodlands and mixed dry forests in northeast Tanzania.

Further research should not only focus on building upon this species list, but also assessing the relative abundance of species as well as finer scale analysis including the variation in feeding guild structure between different habitats. Such studies will require an even distribution of effort across all the forest blocks depending on the sizes and habitat types to allow comparisons e.g. species diversity and densitiy. More (monitoring) data are also needed for selected forest specialist bird species that could act as indicators of the state of these forests. Lastly, conservation planning for these forests would also benefit from detailed ecological studies of particular species and their habitat requirements.

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Appendix 1. Complete list of the birds and their status recorded at Uaso Narok Forest Reserve during 2008-2009. Abbreviations used: AftH- Afrotropical Highland Biome species; QSD- Quarter Square Degree; FF- Forest specialist; F- Forest generalist; f- Forest visitor; AM- Afrotropical Migrant; PM- Palaearctic 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.

Common Name	Scientific Name	Forest Category	Migration Status	Breeding	AftH Biome	New QSD	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-Apr-09
Helmeted Guineafowl	*Numida meleagris*			Br				†	†		†		†	
Scaly Francolin	*Francolinus squamatus*	F					†	†	†					
Common Quail	*Coturnix coturnix*		pm									†		
Harlequin Quail	*Coturnix delegorguei*		am											†
Egyptian Goose	*Alopochen aegyptius*							†	†			†	†	†
African Black Duck	*Anas sparsa*							†	†	†	†	†	†	†
Yellow-billed Duck	*Anas undulata*		am					†	†	†		†	†	
Marabou Stork	*Leptoptilos crumeniferus*									†				
Hadada Ibis	*Bostrychia hagedash*						†	†	†	†		†	†	†
Black-headed Heron	*Ardea melanocephala*									†			†	
Hamerkop	*Scopus umbretta*							†	†			†	†	†
Lesser Kestrel	*Falco naumanni*		PM										†	
Black Kite	*Milvus migrans*		am, pm									†	†	†
Black-chested Snake Eagle	*Circaetus pectoralis*									†				
African Harrier Hawk	*Polyboroides typus*	f							†		†		†	†
African Goshawk	*Accipiter tachiro*	F						†		†				
Little Sparrowhawk	*Accipiter minullus*	FF							†		†			
Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	F					†		†	†				
Great Sparrowhawk	*Accipiter melanoleucus*	F						†	†		†	†		
Mountain Buzzard	*Buteo oreophilus*	FF			†	QSD			†	†				
Augur Buzzard	*Buteo augur*						†	†	†	†	†		†	†
Long-crested Eagle	*Lophaetus occipitalis*	f					†		†					†
Crowned Eagle	*Stephanoaetus coronatus*	FF					†		†	†	†	†	†	

Common Name	Scientific Name	Forest Category	Migration Status	Breeding	AftH Biome	New QSD	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-Apr-09
Black Crake	*Amaurornis flavirostris*							†	†	†				
Common Moorhen	*Gallinula chloropus*							†	†	†			†	
Tambourine Dove	*Turtur tympanistria*	F								†	†		†	
African Green Pigeon	*Treron calva*	F								†			†	
Speckled Pigeon	*Columba guinea*						†		†	†	†	†	†	†
African Olive Pigeon	*Columba arquatrix*	FF							†				†	
Dusky Turtle Dove	*Streptopelia lugens*	f					†			†	†	†	†	†
Red-eyed Dove	*Streptopelia semitorquata*	f		Br			†	†	†	†	†	†	†	†
Ring-necked Dove	*Streptopelia capicola*	f						†	†	†	†	†	†	†
Red-fronted Parrot	*Poicephalus gulielmi*	FF					†	†	†	†	†	†	†	†
Hartlaub's Turaco	*Tauraco hartlaubi*	FF		Br	†		†	†	†	†	†	†	†	†
Red-chested Cuckoo	*Cuculus solitarius*	F					†							
African Emerald Cuckoo	*Chrysococcyx cupreus*	F				QSD				†	†	†	†	
Klaas's Cuckoo	*Chrysococcyx klaas*	f					†	†	†	†	†	†		
Diederik Cuckoo	*Chrysococcyx caprius*													
Verreaux's Eagle Owl	*Bubo lacteus*								†	†				
African Wood Owl	*Ciccaba woodfordii*	F				QSD			†	†				
Montane Nightjar	*Caprimulgus poliocephalus*	F			†		†				†	†	†	†
Mottled Swift	*Apus aequatorialis*								†					
Nyanza Swift	*Apus niansae*				†		†							
Little Swift	*Apus affinis*							†						
Speckled Mousebird	*Colius striatus*						†		†	†	†	†	†	†
Narina Trogon	*Apaloderma narina*	F		Br						†	†	†	†	†
Malachite Kingfisher	*Alcedo cristata*							†						
Giant Kingfisher	*Megaceryle maxima*								†					†
Pied Kingfisher	*Ceryle rudis*							†	†	†				†
Eurasian Bee-eater	*Merops apiaster*	f	PM							†			†	†
Cinnamon-chested Bee-eater	*Merops oreobates*	F			†		†	†	†	†	†	†	†	†

Common Name	Scientific Name	Forest Category	Migration Status	Breeding	AftH Biome	New QSD	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-Apr-09
White-headed Wood-hoopoe	*Phoeniculus bollei*	FF							†				†	
Crowned Hornbill	*Tockus alboterminatus*	f					†	†	†	†	†	†	†	†
Silvery-cheeked Hornbill	*Bycanistes brevis*	F					†	†	†	†	†	†	†	†
Moustached Tinkerbird	*Pogoniulus leucomystax*	FF			†				†					
Yellow-rumped Tinkerbird	*Pogoniulus bilineatus*	F		Br			†	†	†	†	†	†	†	
Red-fronted Barbet	*Tricholaema diadematus*									†				
Spot-flanked Barbet	*Tricholaema lacrymosa*									†		†		
Lesser Honeyguide	*Indicator minor*	f							†		†			
Greater Honeyguide	*Indicator indicator*	f										†		
Red-throated Wryneck	*Jynx ruficollis*	f								†				
Fine-banded Woodpecker	*Campethera tullbergi*	FF			†			†		†			†	
Cardinal Woodpecker	*Dendropicos fuscescens*	f											†	
Bearded Woodpecker	*Dendropicos namaquus*	f						†						
African Grey Woodpecker	*Dendropicos goertae*	f					†							
African Paradise Flycatcher	*Terpsiphone viridis*	f	am						†					
White-tailed Crested Flycatcher	*Trochocercus albonotatus*	FF			†		†		†	†	†		†	
Chin-spot Batis	*Batis molitor*						†		†	†				
Black-throated Wattle-eye	*Platysteira peltata*	F						†	†		†		†	
Brown-crowned Tchagra	*Tchagra australis*													†
Black-backed Puffback	*Dryoscopus cubla*	F				QSD	†			†				
Northern Puffback	*Dryoscopus gambensis*	F								†	†	†	†	
Tropical Boubou	*Laniarius aethiopicus*	f		Br			†	†	†	†	†	†	†	†
Grey Cuckooshrike	*Coracina caesia*	FF		Br	†		†		†	†	†		†	
Black Cuckooshrike	*Campephaga flava*	f	am					†	†	†	†			
Isabelline Shrike	*Lanius isabellinus*		PM											†
Common Fiscal	*Lanius collaris*			Br				†	†	†	†	†	†	†
Pied Crow	*Corvus albus*						†		†	†	†	†	†	
White-bellied Tit	*Parus albiventris*	f					†	†	†	†	†	†		

Common Name	Scientific Name	Forest Category	Migration Status	Breeding	AftH Biome	New QSD	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-Apr-09
Black Saw-wing	*Psalidoprocne holomelas*	f					†		†	†	†	†	†	†
Plain Martin	*Riparia paludicola*								†	†			†	
Banded Martin	*Riparia cincta*								†					
Barn Swallow	*Hirundo rustica*		PM							†			†	†
Rock Martin	*Hirundo fuligula*												†	†
Red-rumped Swallow	*Hirundo daurica*									†			†	
Hunter's Cisticola	*Cisticola hunteri*	F		Br	†		†	†	†	†	†	†	†	
Buff-bellied Warbler	*Phyllolais pulchella*													†
Yellow-breasted Apalis	*Apalis flavida*	f			†		†		†	†	†	†	†	
Chestnut-throated Apalis	*Apalis porphyrolaema*	F			†						†			
Grey Apalis	*Apalis cinerea*	FF					†	†	†	†	†	†		†
Grey-capped Warbler	*Eminia lepida*	f										†	†	†
Grey-backed Camaroptera	*Camaroptera brachyura*	f					†	†	†	†	†	†	†	†
Common Bulbul	*Pycnonotus barbatus*	f		Br			†	†	†	†	†	†	†	†
Mountain Greenbul	*Andropadus nigriceps*	FF			†									†
Yellow-whiskered Greenbul	*Andropadus latirostris*	F		Br			†	†	†	†	†	†	†	†
Cabanis's Greenbul	*Phyllastrephus cabanisi*	FF		Br						†		†		
Little Rush Warbler	*Bradypterus baboecala*									†				
Cinnamon Bracken Warbler	*Bradypterus cinnamomeus*	F		Br			†	†	†	†	†	†	†	†
Lesser Swamp Warbler	*Acrocephalus gracilirostris*								†	†				
Dark-capped Yellow Warbler	*Chloropeta natalensis*					QSD	†							
Mountain Yellow Warbler	*Chloropeta similis*	F			†	QSD	†		†					
Brown Woodland Warbler	*Phylloscopus umbrovirens*	F		Br	†		†		†	†	†	†	†	†
Willow Warbler	*Phylloscopus trochilus*	f	PM											†
Blackcap	*Sylvia atricapilla*	F	PM									†	†	
Garden Warbler	*Sylvia borin*	f	PM			QSD						†	†	
African Hill Babbler	*Pseudoalcippe abyssinica*	FF			†		†	†	†	†	†	†	†	
Montane White-eye	*Zosterops poliogaster*	F		Br	†		†	†	†	†	†	†	†	†

Common Name	Scientific Name	Forest Category	Migration Status	Breeding	AfrH Biome	New QSD	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-Apr-09
Greater Blue-eared Starling	*Lamprotornis chalybaeus*												†	
Superb Starling	*Lamprotornis superbus*			Br									†	
Red-winged Starling	*Onychognathus morio*	f							†			†		†
Waller's Starling	*Onychognathus walleri*	FF			†	QSD			†					
Slender-billed Starling	*Onychognathus tenuirostris*	F		Br	†				†	†	†	†	†	
Sharpe's Starling	*Cinnyricinclus sharpii*	FF		Br	†		†		†	†	†	†	†	†
Olive Thrush	*Turdus olivaceus*	F		Br			†	†	†	†	†	†	†	†
White-starred Robin	*Pogonocichla stellata*	F		Br	†			†	†	†	†	†	†	†
Cape Robin Chat	*Cossypha caffra*	f		Br			†	†	†	†	†	†	†	†
Common Stonechat	*Saxicola torquatus*							†	†	†	†	†	†	
Northern Anteater Chat	*Myrmecocichla aethiops*							†		†	†	†	†	
Little Rock Thrush	*Monticola rufocinereus*				†	QSD								†
White-eyed Slaty Flycatcher	*Melaenornis fischeri*	F		Br	†		†	†	†	†	†	†	†	†
African Grey Flycatcher	*Bradornis microrhynchus*													†
African Dusky Flycatcher	*Muscicapa adusta*	F		Br			†		†	†	†	†	†	
Collared Sunbird	*Anthreptes collaris*	F					†		†	†	†		†	
Olive Sunbird	*Nectarinia olivacea*	FF				QSD	†	†						
Amethyst Sunbird	*Nectarinia amethystina*	f		Br					†	†	†	†		
Tacazze Sunbird	*Nectarinia tacazze*	f			†		†	†			†	†	†	
Bronze Sunbird	*Nectarinia kilimensis*	f			†		†	†	†	†	†	†	†	
Malachite Sunbird	*Nectarinia famosa*	F		Br			†							
Golden-winged Sunbird	*Nectarinia reichenowi*	f	am	Br	†		†	†	†	†	†	†	†	†
Northern Double-collared Sunbird	*Cinnyris reichenowi*	F		Br	†	QSD	†	†	†	†	†	†	†	
Eastern Double-collared Sunbird	*Cinnyris mediocris*	F		Br	†		†	†		†	†	†	†	†
Variable Sunbird	*Nectarinia venusta*	f					†	†		†	†	†	†	
Kenya Rufous Sparrow	*Passer rufocinctus*			Br			†	†	†	†	†	†	†	†
Grey-headed Sparrow	*Passer griseus*								†					
Grosbeak Weaver	*Amblyospiza albifrons*	f		Br									†	

Common Name	Scientific Name	Forest Category	Migration Status	Breeding	AfH Biome	New QSD	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-Apr-09
Baglafecht Weaver	*Ploceus baglafect*	f		Br	†		†	†	†	†	†	†	†	†
Black-billed Weaver	*Ploceus melanogaster*	FF		Br	†					†	†			
Speke's Weaver	*Ploceus spekei*										†		†	
Chestnut Weaver	*Ploceus rubiginosus*		am									†		
Brown-capped Weaver	*Ploceus insignis*	FF			†				†					
Yellow Bishop	*Euplectes capensis*									†		†		
Grey-headed Negrofinch	*Nigrita canicapilla*	F							†					
Abyssinian Crimsonwing	*Cryptospiza salvadorii*	F		Br	†		†	†	†	†	†	†	†	†
Yellow-bellied Waxbill	*Coccopygia quartinia*	f		Br		QSD	†			†				
Common Waxbill	*Estrilda astrild*								†	†	†			
Red-cheeked Cordon-bleu	*Uraeginthus bengalus*			Br			†		†	†	†		†	
Purple Grenadier	*Uraeginthus ianthinogaster*								†	†			†	
Red-billed Firefinch	*Lagonosticta senegala*									†				
Bronze Mannikin	*Lonchura cucullata*							†	†	†	†	†	†	
Black-and-white Mannikin	*Lonchura bicolor*	f		Br							†		†	
Pin-tailed Whydah	*Vidua macroura*			Br					†	†		†	†	
Yellow Wagtail	*Motacilla flava*		PM								†	†	†	
Cape Wagtail	*Motacilla capensis*							†	†					
African Pied Wagtail	*Motacilla aguimp*						†	†			†	†	†	
Mountain Wagtail	*Motacilla clara*	F						†						
Tree Pipit	*Anthus trivialis*	f	PM										†	
African Citril	*Serinus citrinelloides*	f			†		†	†	†	†	†	†	†	†
Reichenow's Seedeater	*Serinus reichenowi*										†	†		
Brimstone Canary	*Serinus sulphuratus*											†	†	
Streaky Seedeater	*Serinus striolatus*	f		Br			†	†	†	†	†	†	†	†
Thick-billed Seedeater	*Serinus burtoni*	FF		Br	†			†	†	†	†	†	†	†
			Total	39	34	12	63	62	92	95	77	77	93	58

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Scavenging birds of Kampala: 1973–2009

Richard Ssemmanda and Derek Pomeroy

Summary

Scavenging birds are very conspicuous in Kampala and a number of counts have been made of their numbers since the 1970s. Between the 1970s and mid-2000s the breeding population of Marabou Storks *Leptoptilos crumeniferus* increased from about 100 pairs to nearly a thousand, whilst roost counts of Black Kites *Milvus migrans* also showed large increases. Numbers of Pied Crows *Corvus albus* and Hooded Vultures *Necrosyrtes monachus*, also counted as they came into communal roosts, showed lower rates of increase; from mid to late 2000s however, Hooded Vultures seem to be decreasing. These increases perhaps reflect the four-fold increase in the human population over the same period, considerably adding to the refuse upon which these birds mainly feed. In view of alarming declines of scavengers elsewhere, especially vultures, we plan to continue monitoring these Kampala birds.

Introduction

Scavenging birds are a conspicuous feature of Kampala, where they live very close to people, who, most of the time, simply accept them as part of life. Their abundance and closeness to man make them an obvious subject of study. Many scavenging birds have adapted to living in harmony with man, even where the environment has been greatly altered through a multiplicity of human activities (Pomeroy 1975). The area of this study, Kampala City, is located in the heart of southern Uganda and its human population increased from about 331,000 in 1969 to 1,300,000 in 2002 (www.UBOS.org) and is probably now approaching two million. Different City Council regimes have taken over responsibility of cleaning the city but the size of the population and the impact of increasing incomes on the production of garbage create a good source of food for scavengers. During the 1970s, the largest numbers of scavenging birds in Kampala were at the rubbish tips near Lugogo and Natete, and the abattoir in the Industrial Area. Changing procedures in the 2000s reduced the availability of offal at the abattoir; the biggest concentrations of birds are now at the Kitezi rubbish tip, 12 km north of the city centre.

The main scavenging birds in Kampala, which are the ones considered in this study, are the Marabou Stork *Leptoptilos crumeniferus*, Pied Crow *Corvus albus*, Hooded Vulture *Necrosyrtes monachus* and Black Kite *Milvus migrans*. The latter are mainly *M. m. parasitus*, sometimes called African Yellow-billed Kites, but the nominate race also occasionally occurs (Carswell 1986). This contrasts markedly with the situation in Kenya where the Marabou Stork, Black Kite and Pied Crow are common in Nairobi, but not in Mombasa where the Indian House Crow *Corvus splendens* is the major scavenger; Sacred Ibis *Threskiornis aethiopicus* occurs at some sites in both cities (M. Reid and F.Ng'weno, *pers. comm.*). As urban birds, Hooded Vultures in Kenya are

confined to a few western towns such as Kisumu (D.A. Turner, *pers. comm.*).

Pomeroy (1975) classified scavenging birds into obligate and facultative scavengers. Obligate scavengers feed exclusively on dead animal matter and examples include the Hooded Vulture. Facultative scavengers have a more catholic diet and among these are the Black Kites, Pied Crows and Marabou Storks. As integral parts of a complex ecosystem, they all play an important ecological role in consuming organic matter within urban centres that would otherwise rot and harbour disease-causing pathogens (Sekercioglu 2006). Scavenging birds occur all over East Africa in a variety of habitats. In urban areas, they almost always roost communally, sometimes as mixed species, although in isolated cases Hooded Vultures have been found to roost individually (Ssemmanda 2005). Pomeroy (1975) counted the principal bird scavengers inhabiting Kampala and its suburbs. Another census was carried out by Chemonges (1991), who identified the communal roost sites for all species. In 2005-06 we repeated the roost counts to record the changes in populations over this period. Another count of Hooded Vultures was made in 2009, following observations that seemed to suggest a decline in their numbers.

All these scavengers frequently occur in close proximity to man, especially at feeding sites, with none seemingly directly affected by the presence of the other. However, the demise in India of urban vulture populations (Prakash *et al.* 2003) and the Marabou Stork's Asian congeners—the Adjutant Storks *Leptoptilos dubius*—highlight the value of periodic monitoring of scavengers. Like other animals in the city, urban scavengers have fallen prey to poisons either directly or indirectly (e.g., through stray dogs poisoning). Moreover, with tall trees being cut down for construction and other purposes, scavenging birds are gradually losing an important part of their habitat, and hence the monitoring of these species is useful. We begin by reviewing the individual species occurring in Kampala before assessing trends in their numbers between 1973 and 2009.

Some background information on the focal species

Black Kites

Brown *et al.* (1982) recorded three sub-species of Black Kites in tropical Africa, namely *Milvus m. migrans, M. m. parisitus* and *M. m. aegyptius*. Only *M. m. parasitus* is common in Kampala where *M. m .aegyptius* has not been recorded (Carswell *et al.* 2005). Black Kites are valuable scavengers and are extremely agile and highly manoeuvrable in catching live prey. They are carrion feeders found frequently around towns and villages (Mackworth-Praed & Grant 1952). During his counts, Chemonges (1991) did not find any marked seasonal changes in Black Kite numbers at feeding sites. He recorded several roosting sites, all of which were still in use in 2005. They sometimes move in flocks of 10 to 30 birds when coming to roost, and either rest on buildings and trees, or circle at varying heights, before eventually converging to their roosts.

Pied Crows

This species is described as resident (Mackworth-Praed & Grant 1952) and is

therefore not expected to show any marked seasonal changes. Pied Crows are widespread and versatile scavengers in Africa, eating any animal of suitable size, as well as fruits, grains, seeds and any kind of insects, and have been recorded feeding on offal at abattoirs (Chemonges 1991). Benson & Benson (1971) recorded that in Malawi they are rare or absent where there are no human dwellings but locally very abundant in townships; the same is true in Uganda (Carswell *et al.* 2005). Like Black Kites, Pied Crows do not show any marked seasonal changes in numbers at feeding sites in Kampala, though Chemonges (1991) recorded the highest numbers in June and July and the lowest numbers in April. Smaller numbers are found at feeding sites compared to roosts, since they feed in widely dispersed areas. They generally fly high during their return to roosts while flying low near to feeding sites. Only one roosting site was recorded for this species in Kampala, which was exclusively on *Eucalyptus* spp. near Wandegeya Post Office.

Hooded Vultures

Hooded Vultures are widespread in East Africa (Mackworth-Pread & Grant 1952) and like other scavengers, they occur in appropriate habitats all over Uganda, although they may now be declining here as well as elsewhere in Africa (Thiollay 2007). They have been observed to roost in close proximity to their feeding sites, differing from other scavengers that fly considerably longer distances to feed (Ssemmanda 2005). They congregate at carcasses during feeding and parties of nearly 70 have been recorded at the same site. Little information is available about their breeding in Uganda. However, their numbers clearly increased significantly over the years up to 2005, but a suspected decline led us to making a new census in 2009.

Marabou Storks

Pomeroy (1975) recorded a monthly average of 277 Marabous in Kampala while Chemonges (1991) had a monthly average of 324. Although these birds have been targets of poisoning and nest destruction, they exhibit high tolerance and success in surviving in urban areas and their numbers have continued to increase up to the present (DP, *unpubl. data*).

Methods

The number of all scavenging birds was recorded by making total counts. Marabous nest colonially and their breeding populations in Kampala have been estimated since 1970 by counting occupied nests (Nansikombi & Pomeroy 2002). The method used for counting the other scavengers was adapted from that used by Gwahaba (1971) and Dranzoa (1986). The other species in this study nest singly but they all roost communally as well and their roosts in Kampala are conspicuous and well-known. Repeat counts were made of birds arriving to roost. In 2004-5, the counts lasted for a period of about two months from early November to mid-January for the Black Kites and Pied Crows and were conducted by F. Okiror and M. Akoko respectively, while RS conducted those of the Hooded Vultures between 5 November and 12 December 2004 and again from 10 - 21 June 2009. Each roost was visited thrice for both Pied Crows and Black Kites, while the different roosts for the vultures were visited between two and four times, depending on the number of vultures at the site.

The roosts were visited from the time birds began arriving until all had settled. Counts were conducted using a pair of binoculars (8x42). In the cases where numerous birds that were not easily countable by one person were encountered, the tree was divided into several sections and several people conducted the counts, in some cases with the unaided eye. All small-sized roosts were counted by a single person to increase accuracy and reduce repetition. However, the counts were conducted with some difficulty, especially in the case of Pied Crows, which do not settle at the roosts until it is almost dark. As the Black Kites approached their roosts close to those of the Pied Crows, the crows would sometimes scatter necessitating a repeat count.

Results

Counts of populations of roosting Pied Crows, Black Kites and Hooded Vultures are shown in Table 1 and Figure 1. The Marabou Stork was not counted in 2004/05, but as the nest counts in Table 1 show, this species has also increased rapidly. From 2005 to 2009, the average number of nests in Kampala was about 900 and, since Marabous are about six years old when they first breed, there is a large non-breeding population too. By 2004, the total number of Marabous in Kampala was at least 2000 (R. Katebaka, *pers. comm.*) and it continued to increase given that the average number of young fledged per nest is 1.6 (Nansinkombi & Pomeroy 2002), and many of the fledglings remain around the natal area. The main refuse dump for Kampala (Kireka) can attract over a thousand Marabous at any one time (but less than ten Hooded Vultures).

Table 1. Population changes of four scavenger species in Kampala. Estimates are of total populations, except for Marabou Storks, which were counted at the nest.

Species	1973-4*	1991-2	2004-6	2008-09	% increase: 1973-2006/9
Marabou Stork	60[a]	350[a]	741[b]	986	1543
Black Kite	212	608	2889		1262
Pied Crow	735	907	1800		145
Hooded Vulture	212	298	430	276	30

[a]Pomeroy (1975), Chemonges (1991); [b]R. Katebaka (*pers. comm.*) – data for 2005-6; *Pomeroy (1975) used a different census technique for the 1973-4 counts

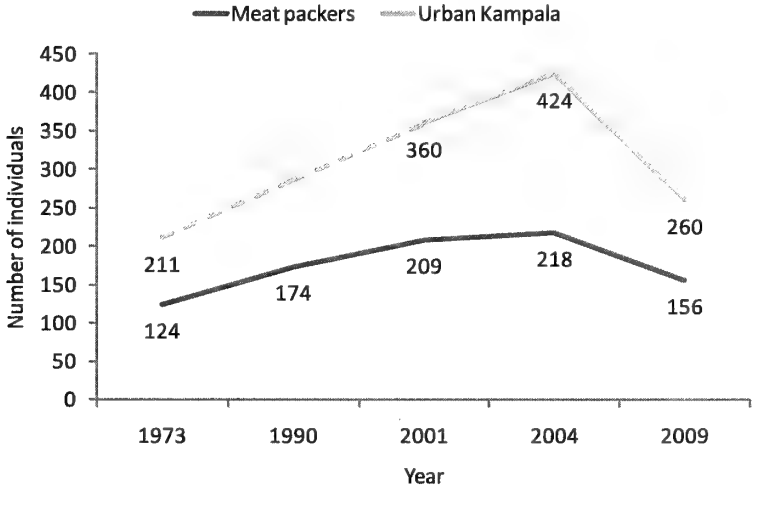

Figure 1. Numbers of Hooded Vulture at Kampala Meat Packers and urban Kampala in various years between 1972 and 2009.

Discussion

All the species included in this study are widely distributed throughout Kampala, scavenging from abattoirs to the smallest refuse tips, and frequently using taller buildings as perches. Our data show a considerable increase in the numbers of scavenging birds as a whole in Kampala over the past three decades, despite some differences in methods and periods of censusing. The number of roost sites has also significantly increased. Chemonges (1991) recorded only one roost site at the Wandegeya area while we found seven roosting sites in 2009, four within Makerere University and others at Mulago, Katanga and Wandegeya. The Wandegeya site still holds large numbers of Pied Crows, although the biggest population was recorded at the new site at Makerere University.

Black Kites increased more than tenfold between 1973 and 2005. None of the five kite roosts recorded by Chemonges in 1991 were still in use in 2005. We recorded two new sites, Makerere University and Lubiri. The old roosting sites were visited and most of these gave suggestive clues as to the cause of their abandonment such as extensive defoliation due to branch cutting and tree felling for building sites. Like the Pied Crows, Black Kites also shared roosts with other scavengers although they preferred trees with dense foliage.

Roost sites have differed between years and it is possible that some smaller ones may have been missed, particularly for Hooded Vultures, which now forage more widely than in the 1970s (DP, *pers. obs.*). However, the upward trend in numbers is reasonably clear until 2005 with approximately 450 vultures at four major roosting sites and with the prime roost at Celtel House occasionally holding up to 280 birds. But in June 2009, this species showed a sizeable decrease in numbers to about 280, a total previously recorded at a single site in 2005. This reduction in numbers can probably be attributed to habitat modification, particularly caused by the ever-growing construction industry. Though other smaller abattoirs have been opened in the suburbs of Kampala, with over 50 vultures already in these areas, this does not account for the large fall in the total number recorded since 2005. The numbers of birds roosting behind the abattoir and those at Celtel House appeared to fluctuate, which should be investigated in more detail. Unlike Black Kites and Pied Crows, Hooded Vultures appeared not to move long distances between feeding and roosting sites with many birds seen roosting within 100 m of their feeding sites. Uganda-wide counts also suggest a decline in Hooded Vultures from the 1960s to the 2000s (DP & M. Virani, *unpubl. data*). There is no evidence of Hooded Vultures being poisoned in Kampla. In National Parks and some pastoral areas, vultures are indirect victims of lion and other predator poisonings, but Hooded Vultures are uncommon in these areas and hence unlikely to be greatly affected by this.

All the scavenging birds in this study seemingly enjoy a good relationship with man, both at feeding and roosting sites, with none reacting to the presence of the other. The human population increase in Kampala provides more refuse and dumping sites despite the City Council's efforts to clean up the city. Thus enormous amounts of food are available to the scavenger population and its removal is an advantage to the human population since the avenue

for pathogenic multiplication is greatly reduced by these birds consuming rotting material. Nevertheless, the growing quest for land is impacting on the roosting sites of these birds with pruning of trees near power lines and felling for construction being key factors in the reduction of available roosting sites.

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A preliminary assessment of the potential risks from electrical infrastructure to large birds in Kenya

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Summary

A rapid risk assessment of the interactions between Kenya's large birds and electrical infrastructure was conducted around Magadi and Naivasha in Kenya in January 2009. Six out of the seven <132 kV distribution pole designs assessed pose an electrocution risk to medium and large-sized birds. Several sites of high bird collision risk were identified. Several of the observed >132 kV transmission tower structures were vulnerable to electrical faulting caused by birds. Of approximately 24 relevant bird species that are of conservation concern in Kenya, 17 (71 %) face a high risk of direct interactions with electrical infrastructure. Priority species for attention include the Egyptian Vulture *Neophron percnopterus*, White-headed Vulture *Trigonoceps occipitalis*, Lappet-faced Vulture *Torgos tracheliotos*, Grey-crowned Crane *Balearica regulorum*, Lesser Flamingo *Phoeniconaias minor*, White-backed Vulture *Gyps africanus*, Rüppell's Vulture *Gyps rueppellii*, Martial Eagle *Polemaetus bellicosus*, White Stork *Ciconia ciconia*, Secretarybird *Sagittarius serpentarius*, and various sit-and-wait raptors. These preliminary findings have national relevance given plans (already underway) for a rapid expansion of electrical infrastructure in Kenya; recommendations are made for a national response to this matter.

Introduction

Due to its size and prominence in the landscape, electrical infrastructure constitutes an important interface between wildlife and man. Direct interactions between electrical infrastructure and wildlife include electrocution, collision with power lines, and short circuiting of the electricity supply. Indirect interactions include destruction of wildlife habitat and disturbance of wildlife as a result of infrastructure construction and maintenance activities. This paper focuses on the direct interactions only.

Electrocution of birds on overhead lines is an important cause of unnatural mortality of raptors, storks and other species in South Africa (Eskom-EWT Strategic Partnership's Central Incident Register, *unpubl. data*), and has attracted plenty of attention in Europe and the USA (APLIC 1994, van Rooyen & Ledger 1999, Bevanger 1998). Electrocution occurs when a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). Species such as vultures, eagles, hawks, storks, and owls are the ones most commonly killed through electrocution (Bevanger 1998). Mitigation of existing infrastructure is achieved

through insulating certain components on the poles, whilst new infrastructure can be designed safely from the start (van Rooyen & Smallie 2006).

Collisions with overhead cables are the biggest single threat posed by the larger transmission (>132kV) power lines to birds in southern Africa (van Rooyen 2004). Collisions are caused by the inability of the bird to see the cables until it is too late to take evasive action; they affect heavy-bodied birds with limited manoeuvrability the most (Anderson 2001, van Rooyen 2004). Species such as the cranes, flamingos, storks, bustards, waterfowl, shorebirds and falcons are frequent collision victims. For existing power lines, mitigation involves marking the line with anti-collision marking devices to increase its visibility to birds (van Rooyen & Smallie 2006), whilst new power lines should be carefully routed to avoid major flight paths.

Birds can cause electrical faults through streamers, pollution or nesting. Though birds are seldom injured or killed, these faults can adversely affect the quality of electrical supply to customers. A bird streamer is a long spurt of excrement, which when produced by a bird perching on an electrical pole or pylon, may bridge the "air gap" between live and grounded hardware, thereby resulting in a short circuit (Taylor *et al.* 1999). Bird pollution refers to the accumulation of bird excrement on insulator strings—the device insulating the conductor cable from the pole or pylon—which weakens the insulation properties of the string. Birds also sometimes nest on electrical structures, potentially bridging the air gap with nest material (particularly conductive material, such as wire used by crows). Problems associated with streamers and pollution are mitigated by preventing the birds from perching on high risk areas of towers or poles, or by constructing perch deterrents (van Rooyen & Smallie 2006), while those associated with nesting are managed by relocating problematic nests to safer areas of the tower.

Methodology

Study sites and risk assessment

A rapid preliminary risk assessment of electrical infrastructure was conducted in two areas of Kenya: i) along the Nairobi-Magadi-Elangata-Wuas-Kajiado-Nairobi circuit (hereafter the Magadi Circuit), and ii) along the Nairobi-Longonot-Naivasha-Hell's Gate-Nairobi circuit (hereafter the Naivasha Circuit). These sites were chosen for their accessibility, known existence of extensive power line networks, and presence of the relevant bird species. Each circuit was visited and driven for two days, amounting to a total of 250 and 220 km for the Magadi and Naivasha circuits, respectively. During this time, all relevant electrical structures were assessed for the risk that they pose to birds or the potential for birds to cause electrical faults on this infrastructure, based on experience of similar structures and species in South Africa. In addition, the potential for interactions between birds and likely future infrastructure was assessed, based on identifying nodes of likely future development requiring electrification.

Bird species likely to interact directly with electrical infrastructure

A rapid assessment of the bird species at highest risk of direct interaction

with electrical infrastructure throughout Kenya was conducted. Species were selected based on two qualities: their perceived risk using the South African experience; and their conservation importance, based on classifications like the IUCN Red Data List (2009) and the Bonn Convention on Migratory Species (Bonn 1979) amongst others. Each species was assessed for its vulnerability to direct interaction with electrical infrastructure, i.e. electrocution, collision and electrical faulting. The overall significance of this risk was assessed on a scale of high, medium and low, as was the overall priority for addressing interactions for the species. This prioritisation took into account the species conservation status/importance, endemism, and likely scale or volume of interactions. Factors such as the species social behaviour are particularly important, since gregarious species such as vultures are more vulnerable to electrocution than solitary eagles for example.

Results and Discussion

Electrocution risk

Across both circuits, a total of seven different distribution (<132 kV) pole configurations were observed. This excludes various permutations of "in line strain" (bend) and "terminal" (transformer) structures, and the apparent large diversity of structures used in urban areas. Of the seven, six were considered to pose a high risk to medium to large perching birds, such as the "T-pole" (Fig. 1a). A bird with a wingspan greater than about 110 cm, perched on the cross arm, can touch two conductors simultaneously and get electrocuted. The "inverted T" (Fig. 1b) is considered safe because suspension of the outer conductors below the cross arm places them out of reach of a perching bird. Though we did not undertake any formal quantification of the length of line with each pole configuration in each circuit, it appears that unsafe pole structure represents the vast majority of power line by length in both circuits. All transmission structures (>132 kV) were considered to pose low electrocution risk by virtue of the large clearances between live hardware. The extent of electrification was lower in the Magadi circuit compared to the Naivasha one, suggesting that, all other factors being equal, the Naivasha Circuit may be expected to pose a greater risk of interaction to birds in the area. A more detailed risk assessment would relate power line density to bird species abundance more formally.

Figure 1a & b. 1a (on the left) shows the typical "T-structure" which poses an electrocution risk to birds perching on the cross arm. 1b shows the "inverted T" pole structure which is safer for perching birds since the outer conductors are suspended below the cross arm out of reach of birds.

Collision risk

For bird collision, the risk is determined less by the design of the electrical structure than by the surrounding habitat and species present. On the Magadi Circuit, habitat likely to attract collision-susceptible species such as bustards and storks was observed in several places. This is mainly open vegetation and areas where open water may stand after heavy rain. On the Naivasha Circuit, the potential for collision is far greater, because water bodies around the lake and in the associated agricultural areas support collision-vulnerable species such as flamingos, storks and cranes. Also, intensive human occupation and agriculture has led to greater electrification in this area, further increasing the risk.

Electrical faulting risk

Electrical faulting occurs mainly on transmission lines (>132 kV). In total, three transmission tower structures were observed on both circuits. Without access to tower design diagrams and dimensions, a definite assessment was not possible.

Bird species likely to interact directly with electrical infrastructure

A total of 24 species were assessed individually, while 'waterfowl and shorebirds', and 'sit-and-wait' raptors were assessed collectively. Of the 24 species, 18 (or 75 %) are judged to face a high risk of direct interaction with electrical infrastructure, 5 (21 %) a medium risk, and one species a low risk (Table 1). High risk species, typically the larger ones, were those which have established high vulnerability to interactions in South Africa. The following 10 species emerged as highest priority for conservation attention: Egyptian Vulture, White-headed Vulture, Lappet-faced Vulture, Grey-crowned Crane, Lesser Flamingo, White-backed Vulture, Rüppell's Vulture, Martial Eagle, White Stork, and Secretarybird. Various sit-and-wait raptors were also high risk, whilst waterfowl and shorebirds were medium risk. Sit-and-wait raptors such as Augur Buzzard *Buteo Augur* and Long-crested Eagle *Lophaetus occipitalis* are particularly vulnerable due to the frequency and duration with which they sit on electrical poles. The Augur Buzzard has already shown a 55 % decline at Lake Naivasha, with electrocution being a suspected contributing factor (Virani 2006).

While management efforts could initially focus on the high risk species, species such as Heuglin's Bustard *Neotis heuglinii* and Black-crowned Crane *Balearica pavonina* have been assigned medium priority (Table 1) due to their relatively localised distribution in Kenya. This does not mean that impacts on these species are less important, but rather that it would be better to focus initial efforts on more widespread, frequently-impacted species. Besides, it is likely that if infrastructure designs are made safe for the high risk species (e.g., large vultures), benefits will accrue to the smaller ones too.

Table 1. Preliminary assessment of the vulnerability of the relevant bird species to interactions with electrical infrastructure (EN: Endangered; VU: Vulnerable; NT: Near-threatened; E: Electrocution; C: Collision; F: Electrical faulting).

Common name	Scientific name	IUCN conservation status (2009)	Bonn Convention	Likely interactions	Overall risk of interaction	Overall priority for management action
Egyptian Vulture	*Neophron percnopterus*	EN	Appendix 1	E	High	High
Saker Falcon	*Falco cherrug*	EN		C	Medium	Medium
White-headed Vulture	*Trigonoceps occipitalis*	VU		E, F	High	High
Lappet-faced Vulture	*Torgos tracheliotos*	VU		E, F	High	High
Grey Crowned Crane	*Balearica regulorum*	VU		C	High	High
Maccoa Duck	*Oxyura maccoa*	NT		C	Low	Low
Lesser Flamingo	*Phoeniconaias minor*	NT	Appendix 2	C	High	High
Red-footed Falcon	*Falco vespertinus*	NT		C	Medium	Medium
Sooty Falcon	*Falco concolor*	NT		C	Medium	Medium
Taita Falcon	*Falco fasciinucha*	NT		C	Medium	Medium
White-backed Vulture	*Gyps africanus*	NT		E, F	High	High
Ruppell's Vulture	*Gyps rueppelli*	NT		E, F	High	High
Southern Banded Snake Eagle	*Circaetus fasciolatus*	NT		E	High	Medium
Bateleur	*Terathopius eccudatus*	NT		C	Medium	Medium
Martial Eagle	*Polemaetus bellicosus*	NT		E	High	High
Eastern Imperial Eagle	*Aquila heliaca*	NT		E	High	Medium
Greater Spotted Eagle	*Aquila clanga*	NT	Appendix1/2	E	High	Medium
Denham's Bustard	*Neotis denhami*	NT		C	High	Medium
Black-crowned Crane	*Balearica pavonina*	NT		C	High	Medium
White Stork	*Ciconia ciconia ciconia*		Appendix 2	C	High	High
Woolly-necked Stork	*Ciconia episcopus microscelis*		Appendix 2	C	High	Medium
Black Stork	*Ciconia nigra*		Appendix 2	C	High	Medium
Yellow-billed Stork	*Mycteria ibis*		Appendix 2	C	High	Medium
Heuglin's Bustard	*Neotis heuglinii*					Medium
Various sit-and-wait raptors				E	High	High
Various waterfowl & shorebirds			Appendix 2	C	Medium	Low

Conclusion and Recommendations

There is considerable risk of direct interaction between large birds and the current state of electrical infrastructure in Kenya, with several key species of conservation concern at risk. It is important that this issue be approached comprehensively in the near future especially with growing electrification around the country. Kenya can learn a few lessons from South Africa, a country with far greater extent of electrification. In response to bird-power line interactions, a strategic partnership was initiated in 1996 between Eskom, South Africa's national electricity supplier, and the Endangered Wildlife Trust (EWT), a non-profit organisation dedicated to the conservation of biodiversity in southern Africa (van Rooyen & Smallie 2006). This partnership has employed a co-operative, non-confrontational approach to the problem. It runs through several programmes including: information and advocacy; incident reporting and investigating; mitigation; research; and impact assessment for new infrastructure. Unfortunately, vast lengths of power line were constructed in South Africa prior to awareness and understanding of the aforementioned interactions. The Eskom-EWT Strategic Partnership is now addressing this backlog of unsafe infrastructure in addition to ensuring that new infrastructure is built in a bird-friendly manner. While we cannot go into a detailed description of these actions here, the overriding lesson is that it is imperative that the relevant authorities join hands early on in Kenya. Various leaders, organisations, and forums have agreed that increasing the electrification of Kenya is a top priority (NEC 2008). The timing is therefore critical if Kenya is to ensure that the electrification takes place in an environmentally friendly manner from the outset. The national response requires a combination of applying mitigation to existing infrastructure in priority areas and ensuring that new infrastructure is safely built. We propose the following five actions as a start:

1. A Kenyan conservation organisation (e.g., the National Museums of Kenya NMK) takes the lead in addressing this issue by developing a formal, working relationship with the key players in the electrical industry, specifically Kenya Power & Lighting Company (KPLC) and Kenya Electricity Generation Company Limited (KenGen).
2. This partnership jointly conducts a thorough national risk assessment of the interactions between birds and existing (and planned) electrical infrastructure in Kenya, from which a central database is developed and maintained by the conservation organisation in order to collate all reported information on bird interactions with electrical infrastructure.
3. The partnership also holds regular workshops across the country to enhance public awareness and understanding of these matters. This will also encourage reporting of interactions and inter-sectoral collaborations.
4. Capacity in this specialised field should be developed within the staff of the relevant organisations in the partnership (e.g., NMK and Kenya Wildlife Service). They can learn a lot from sharing experiences with the EWT, e.g., through staff exchange programmes.

5. Finally, funding will be necessary for all of these activities; KPLC and KenGen ought to take a lead in financing some initial activities, both because it is a good business move (through reduction of losses associated with interactions with birds) and it will lessen the impact of their activities on the environment.

Conservationists and the electrical industry in Kenya are faced with both a daunting challenge and a huge opportunity of ensuring that current and future electrical infrastructure in Kenya is managed and constructed in an environmentally-friendly manner. Success in this regard will mean both economic benefits to the relevant companies and the economy, as well as a huge contribution to the conservation of biodiversity, especially birds. We hope that this paper flags some important issues and provides basic information that will contribute to developing the required response to this matter in Kenya.

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

Fred B. Munyekenye and Mwangi Githiru

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.

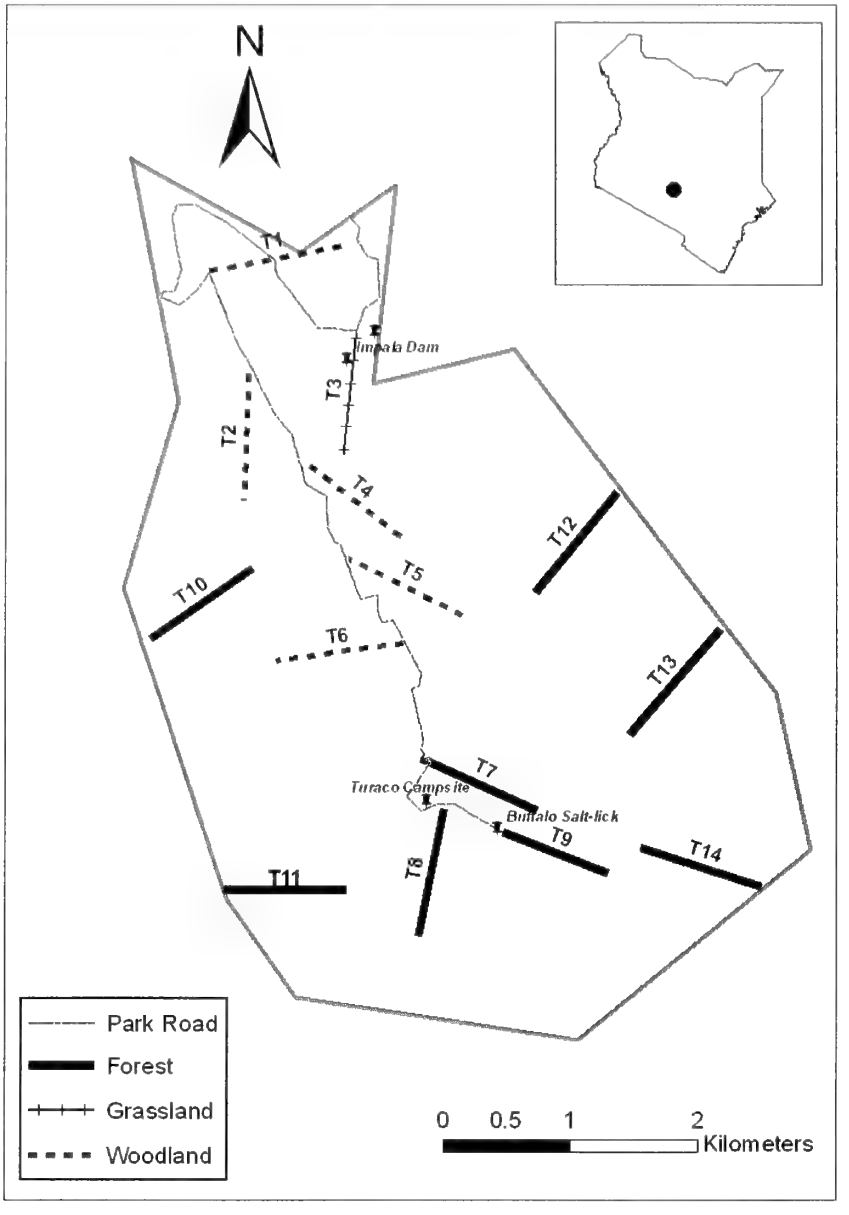

Figure 1. Map of the study site showing the distribution of transects and their associated habitats.

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).

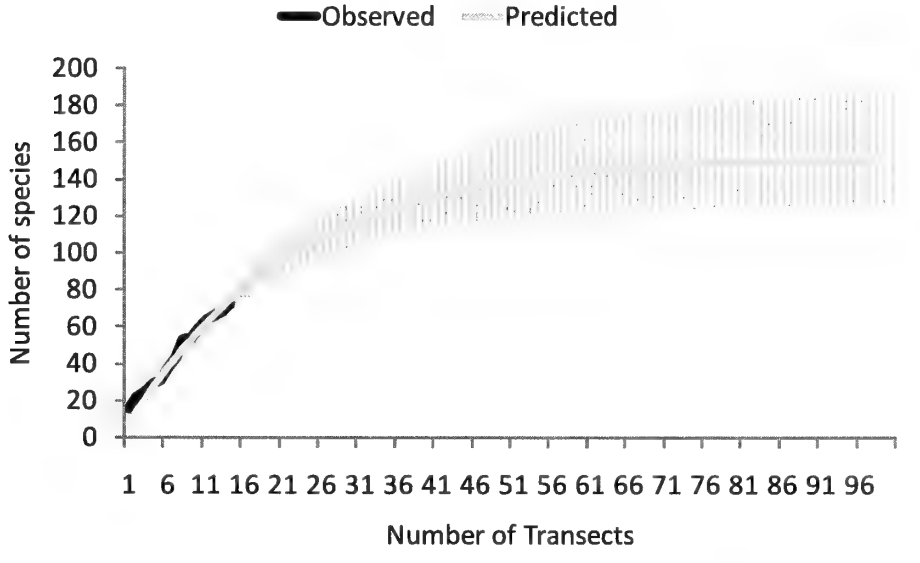

Figure 2. Species cumulative curve showing the number of species observed in the transects sampled in Ol Donyo Sabuk NP and those predicted from our model (±SE).

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*	

Short communications

The status and habitats of two closely related and sympatric greenbuls: Ansorge's *Andropadus ansorgei* and Little Grey *Andropadus gracilis*

Ansorge's and Little Grey greenbuls are two very similar looking species occurring in the equatorial forests of Africa from Guinea and Liberia east to Uganda and western Kenya. *Andropadus a. ansorgei* ranges in the West African lowland forests, and *A. a. kavirondensis* in western Kenya. *Andropadus g. gracilis* similarly occupies the West African region, with *A. g. ugandae* in Uganda and western Kenya (White 1962, Keith *et al.* 1992, Dickinson 2003).

Fishpool *et al.* (1994) describe *ansorgei* as being less widespread than *gracilis* in West Africa, and being more restricted to mature forest, and *gracilis* as a common bird of forest edge, secondary habitats and gallery forest. Also, that both inhabit the upper middle stratum, being most frequent in the crowns of low trees, with *ansorgei* more often seen at greater heights than *gracilis*.

In East Africa it would appear that the situation is somewhat reversed, at least for *ansorgei* which is fairly common and easily seen in pairs or mixed flocks at forest edges, and in areas of secondary growth in the Kakamega Forest of western Kenya. Furthermore despite extensive collecting in all Uganda forests *ansorgei* remained unrecorded there until recent sight records from the Impenetrable Forest of Bwindi National Park (Borrow & Demey 2002). On the other hand, *gracilis* is a common resident of Ugandan forests up to 1550 m (Carswell *et al.* 2005), yet is only rarely recorded with any degree of certainty from western Kenya. To date it is known only from eight specimen records collected between 1959 and 1967, besides a handful of unsubstantiated sight records (1981-1992) at medium and lower levels between 8 and 12 m above the ground in more mature parts of the Kakamega Forest (Zimmerman 1972).

That *ansorgei* and *gracilis* represented two separate species was at one time questioned by several authorities, with Jackson & Sclater (1938) and later Mackworth-Praed & Grant (1955) both treating Van Someren's *kavirondensis* as a race of *gracilis*. Chapin (1953) asserted that both he and others had been unable to find anything in the haunts, behaviour or voice that would distinguish *A. ansorgei* from *A. gracilis*. Similarly Zimmerman (1972) following his extensive studies in the Kakamega Forest from 1963 to 1966 felt that it was difficult to understand how two such similar species as *gracilis* and *ansorgei* could co-exist in the same stratum, with no apparent food differences, and with very similar calls.

When observed carefully and at close range *ansorgei* is best distinguished by its warm rufous-olive or ginger-brown flanks with little or no trace of yellow on the underparts. This is in contrast with *gracilis* which at all times will show distinctly pale olive-grey underparts becoming pure yellow on the belly. Head colour is greyish olive in *gracilis* but more olive-brown in *ansorgei*. A narrow white eye-ring is present in both and is generally easily visible. Tail

and upper tail-coverts are generally brownish washed with rufous in both species.

Greenbuls however are generally notoriously difficult to obtain good views of, and with light conditions in forested habitats seldom ideal, it has become essential to obtain quality sound recordings of both in order to safely and confidently separate the two in the field. Fishpool *et al.* 1994 describe the call of *gracilis* (in West Africa) as consisting of five rapid, jaunty notes, that may be transcribed as "wheet wu-wheet wu-wheet"; they also describe a second short "tyuc" call. They describe *ansorgei* also having two calls, one that resembles the first of *gracilis* in quality but lacks its sprightliness and consists of only three notes that may be transcribed as "wheet whuut whit" or "tiu wheet tweet", although the final syllable may be dropped. Its second call is a rapid trill—"rititititit" or tchitchitchitchitchi", which is harsh and flat in tone. Zimmerman *et al.* (1996) describe the call of *ansorgei* from Kakamega as an infrequent thin three-note whistle—"weet-wurt-eet", the last note highest; the species also has a descending chatter or rattle. Borrow & Demey (2002) described hearing a dry rattling call in the mid-canopy of the Bwindi Forest, Uganda. Both observers were familiar with the calls of both *ansorgei* and *gracilis* in the Ivory Coast and elsewhere in West Africa, and reported that in their experience the dry rattle call is never made by *gracilis*. The Bwindi birds did however respond vigorously to playback of a distinctive three-note whistle (of *ansorgei*) recorded by Chappuis (2000) in West Africa.

Why their niches are reversed in Kakamega remains unknown. It is also puzzling why *gracilis* remained undetected there until 1959, as well as why *ansorgei* was not recorded by the numerous collecting expeditions that worked in the Ugandan forests during the 1960's. Clearly where one is relatively common, the other is scarce and rarely recorded. It would be of interest to know is whether they ever come in contact with one another in East Africa. If so, it would then be interesting to document the vocal responses of each species towards the other. With both the Kakamega and Bwindi Forests now regularly visited by both resident and visiting ornithologists, it is hoped that more detailed information will be forthcoming concerning these two very similar species whose habits and ecological preferences still remain largely unknown.

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Comments concerning Ostrich *Struthio camelus* populations in Kenya

The Ostrich *Struthio camelus* is currently regarded as comprising four subspecies largely confined to sub-Saharan Africa. This distribution is disrupted by a belt of miombo woodland in south-central Africa that effectively divides the species into northern and southern populations with the former incorporating *S. c. camelus, S. c. molybdophanes* and *S. c. masaicus,* while *S. c. australis* is confined to southern Africa (Freitag & Robinson 1993).

Molecular work based on mitochondrial DNA has revealed that *molybdophanes* appears to have diverged from the common ancestor to the other three subspecies approximately 3.6 to 4.1 million years ago (Freitag & Robinson 1993). This, coupled with morphological and ecological differences, in addition to reported interbreeding difficulties, suggests that separate species status may possibly be warranted for *molybdophanes* (Zimmerman *et al.* 1996). However, without conclusive evidence, opinions are divided, and so it remains the most distinct of the four subspecies.

Given that the three forms of the northern population occur in Kenya, a closer look at their status and distribution is worthwhile. *S. c. massaicus* extends from central and northern Tanzania north to the Masai Mara National Reserve, Amboseli, Nairobi and Tsavo West National Parks and along the main

Mombasa-Nairobi road and railway line. *S. c. molybdophanes* ranges widely throughout much of northern and northeastern Kenya (east of Lake Turkana), south through Samburu, Buffalo Springs and Shaba National Reserves, to Meru and Tsavo East National Parks and the same railway line. *S. c. camelus* is confined to extreme northwestern areas astride the Sudan border. Meanwhile a largely disjunct population of what is considered *S. c. massaicus* occurs in an area of central Kenya from Naro Moru, Timau, and the Laikipia Plateau west to Baringo and Maralal Districts. Occasional sightings from below the Kongelai Escarpment (north of Kitale) have never been satisfactorily racially assigned. At the same time, atypical males (without the white neck ring) in Nairobi National Park may reflect some interbreeding between *massaicus* and *molybdophanes*, following the disastrous introduction of the latter in that park in the early 1970's.

The impact of early ostrich farming in Kenya following its success in South Africa at the turn of the last century is also noteworthy. By 1909, Kenya's domesticated ostrich population numbered several thousand, with approximately 40% of the settler farmers at that time "running ostriches". Successful ostrich farms were operating on the Athi-Kapiti plains as well as at Molo and in other parts of the Rift Valley. The stock, acquired locally as well as imported (initially from Egypt and later from German East Africa), may well have 'contaminated' the genetic purity of modern wild stocks in the Kenya highlands (Parker 1992). Similarly in South Africa, importations of birds from North Africa ostensibly to improve the feather quality of domesticated birds had raised fears about such widespread introgression to the point where several conservation agencies expressed concern about the genetic integrity of the southern African *australis* (Freitag & Robinson 1993). As such, some Kenyan ostrich populations, particularly in some Rift Valley areas may include in their ancestry birds representing extralimital subspecies that were part of the extensive stocks of domesticated birds released following the collapse of the early ostrich farming operations (Zimmerman *et al.* 1996). Such genetic contamination and introgression could threaten the genetic integrity of the natural (wild) populations as has been shown in plants (Whelan *et al.* 2006), fish (Gausen & Moen 1991, Roberge *et al.* 2008) and birds (Peterson & Brisbin 1999), resulting in problems such as reduced breeding success.

Today almost a century after the first ostrich farming boom, another is re-emerging not only in sub-Saharan Africa but also in Europe, North and South America and Australia. As a result, ostrich farming is now open to international competition, and with the attendant legal and illegal export of both eggs and live birds to all corners of the world, we may soon see the emergence of a new breeding stock of ostrich. Ostrich products are already popular: advanced tanning techniques have ensured that the ostrich has a place among the world's most luxurious leathers, while the demand for its low-cholesterol meat is growing in Europe, North America and Japan. It is likely that should demand outstrip supply, pressures will mount on all existing wild populations in Africa.

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Comments concerning the status of the White-bellied Bustard race *Eupodotis senegalensis erlangeri*

Much confusion has existed concerning the status of the *Eupodotis senegalensis erlangeri* race of the White-bellied Bustard, originally named by Reichenow (1905) in his *Die Vogel Afrikas*, and its subsequent treatment by later authorities.

Erlanger (1905) concluded that there were two distinct races of *E. Canicollis*: a northern rufescent one, and a southern paler form. He considered the type of *canicollis* from Bardera, Juba River, southern Somalia as the southern bird, and named the northern one *Otis canicollis somaliensis* from Gallaland (actually near Harrar, Ethiopia). Shortly afterwards Reichenow (1905) utterly confused the issue by mistaking Bardera in South Somalia for Berbera in North Somalia. He felt the type of *canicollis* (from Bardera) was in fact the northern form and therefore Erlanger's *somaliensis* was simply a synonym. He then named southern birds *erlangeri* as occurring from Machakos to Iringa in Kenya, probably after seeing specimens collected by Sir Frederick Jackson from Machakos, as well as others from Tanganyika collected by various fellow German collectors. Neumann (1907) corrected Reichenow's error and showed that *erlangeri* was no more than a synonym of *canicollis*, while Erlanger's *somaliensis* was indeed distinct. Zedlitz (1914), Sclater (1924) and Friedmann (1930) subsequently confirmed this arrangement. Later however, Grant & Mackworth-Praed (1935) re-muddied the waters by concluding (wrongly) that *canicollis* and Erlanger's *somaliensis* were indistinguishable, while birds from southwestern Kenya and central Tanganyika were darker and less tawny, and so attributed these as *erlangeri*. While this arrangement was not

followed by Jackson & Sclater (1938), it was adopted by White (1965), Britton (1980), Urban *et al.* (1986) and Dickinson (2003). However Zimmerman *et al.* (1996) treated birds in Kenya & northern Tanzania as *canicollis*, but without any further comment.

Paul Goriup (*pers. comm.*) recently confirmed that the type of *E. canicollis* held in Paris had been critically examined. This exercise indicated that two forms could indeed be distinguished: one rather pale with a rufous tone, and the other rather dark with a brown tone. The difference between the two can be traced chiefly to the degree of barring, a feature particularly apparent on the tertials, which can range from strongly barred to lightly vermiculated. This feature, however, is also a function of age. Juveniles have barred tertials while adults have vermiculated ones, with intermediate forms occurring during moult. In fact, the type specimen itself is just such an intermediate, exhibiting both types of tertial patterning. It seems probable that Erlanger's birds (collected in May) were breeding adults, while those examined by Grant & Mackworth-Praed in the British Museum collection were mostly juveniles or non-breeding adults of a single form. If this was the case, it would therefore appear that while *canicollis* may exhibit some colour variations within its range from north to south, and east to west, they are too gradual to warrant any subspecific separation.

As such the East and northeastern African populations of *Eupodotis senegalensis* can best be summarised as follows:

- *E. s. senegalensis* (Vieillot, 1820): West Africa to Central Sudan, NW Ethiopia and Eritrea
- *E. s. canicollis* (Reichenow, 1881): Ethiopia and Somalia south to NE Uganda, Kenya and Tanzania (includes *erlangeri, somaliensis and parva*)
- Two additional races *mackenziei* and *barrowii* occur throughout much of central and southern Africa.

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Typical Little Egrets *Egretta garzetta* mix with Dimorphic Egrets *Egretta dimorpha* on open coast in Tanzania

Summary

A mixed flock of Little and Dimorphic Egrets (*Egretta garzetta* and *Egretta dimorpha,* respectively) observed on a coral reef in southern Tanzania in August suggests that the Little Egret might occur on East African open coast more often than currently thought. One reason for this could be that the migrants join the resident Dimorphic Egret population. Examination of photographs for the subtle morphological differences between the two forms also suggests the occurrence of hybrids, which somewhat lends support to the idea of one species for the taxonomically controversial, Little-Egret-like birds that occur in Africa.

The Little Egret-like birds that occur in Africa are taxonomically very controversial (Hancock & Kushlan 1984; see a related article in this *Scopus* issue). They are variously ascribed to four forms in the genus *Egretta: garzetta* (the typical Little Egret), *gularis* (Western Reef Heron, western race), *schistacea* (Western Reef Heron, eastern race), and *dimorpha* (Dimorphic or Mascarene Egret). These taxa are also sometimes considered as species or subspecies; indeed, considerable morphological variability exists among assumed representatives of the same form (see Turner 2010). The existence of intermediate phenotypes, as well as occurrence of mixed pairs, e.g., *garzetta* with *gularis* and *garzetta* with *schistacea* (Hancock & Kushlan 1984, p. 132), suggests a case of interbreeding races within one species. Moreover, the assumed differences in geographical range, with *garzetta* being mainly inland and *gularis, schistacea,* and *dimorpha* mainly coastal, have been challenged by the finding of *schistacea* mixed with *garzetta* at Lake Turkana in Kenya's interior, besides individuals that looked like typical *garzetta* mixed with

apparent *dimorpha* and *schistacea* along the East African coast (Hancock & Kushlan 1984, p. 129). Kushlan & Hancock (2005, p. 192) regretted that the hypothesis in their previous book of there being one polytypic species has not been tested adequately.

During my stay close to a beach (S 08°54′, E 39°31′) near Kilwa Masoko, Tanzania, from 23 to 26 August 2008, I observed the birds that were foraging in the shallow water on the coral reef several times per day. The place was in the range of *dimorpha*, and while numerous coastal birds in Tanzania have been ascribed to this taxon (Kushlan & Hancock 2005, p. 195) some recent publications assume *garzetta* to be absent (Sinclair & Ryan 2003) or rarely occurring (Zimmerman *et al.* 2005) on open coast in East Africa. Egrets sparsely foraged among flocks of waders, but while resting in the middle of the day, or flying to roost at sunset, they formed one group, thus permitting reliable counts. Their maximum number was 33, of which 31 belonged to the white morph and only two to the dark morph. This obvious disproportion—Hancock & Kushlan (1984) found a predominance of dark individuals on a coral reef in Kenya, made me suspect that a proportion of the white birds may have been migrants, just like the many waders that were foraging in the same place. While *dimorpha* is generally seen as largely sedentary, *garzetta* is partly migratory, regularly moving between Europe and Africa. I took photographs to aid my search for the subtle morphological differences that distinguish *garzetta* from *dimorpha*. Unfortunately, while literature gives criteria to distinguish between *garzetta* and *gularis*, or *schistacea*, in the field (e.g., Dubois & Yésou 1995), *dimorpha* is a little investigated form and its white morph is considered very similar to *garzetta* (see also Turner 2010).

Therefore I searched the Internet for photographs of sure representatives of *dimorpha* from a region where only this form occurs, Madagascar. As far as body proportions are concerned, *dimorpha* is more similar to *gularis/schistacea* than to *garzetta*, whereas its largely black bill and boldly patterned black legs and yellow feet recall *garzetta*. Figure 1 permits direct comparison between the two forms I observed in Tanzania. The most evident difference is in bill thickness, *garzetta* (in the foreground) having a slimmer and straighter bill. As both the birds were facing the breeze while resting, their heads were oriented in the same direction, and due to the position of the photographer, both were in full profile. This permitted an approximate bill-to-tarsus ratio to be calculated, which was about 0.80 for *garzetta* (similar to Dubois & Yésou 1995) and more than 0.90 for *dimorpha*. A shorter neck and a seemingly more slender body due to a longer outer wing are additional suggested features of *garzetta*. The two birds in Figure 1 also differ in their resting postures: *garzetta* holds a more upright stance than *dimorpha*, the latter being more similar to *gularis/schistacea* in this respect (see Dubois & Yésou 1995). Figure 2 shows the intermediate traits of a possible hybrid: a slim, yet rather decurved, bill (in full profile again, as this bird was facing just the opposite direction from the breeze) and an intermediate bill-to-tarsus ratio. Soft-part colours may be less

valid field marks. Although more yellow often appears on the lores and feet (and tarsometatarsus to a varying degree) of *dimorpha*, which would agree with the ascription of the birds in my photographs, both *dimorpha* and *garzetta* do show the entire variation from dull greenish to bright red depending on season.

Figure 1. Typical Little Egret (left) and Dimorphic Egret resting on the coral reef at Kilwa Masoko, Tanzania on 25 August 2008.

Figure 2. Possible Little-Dimorphic Egret hybrid with migrant waders (Common Greenshank *Tringa nebularia* and Grey Plover *Pluvialis squatarola*) in the background at Kilwa Masoko, Tanzania on 25 August 2008.

My observations lend support to Hancock & Kushlan's (1984) hypothesis that the typical Little Egret, the Western Reef Heron and the Dimorphic Egret belong to a single polytypic species, though the actual existence of hybrids and their fertility remains to be ascertained. The fact that all the coastal egrets of Africa show substantial proportions of dark-plumaged birds, while on

the contrary, few traces of genes for dark plumage appear in the continent's interior suggests that interbreeding must have some limits. Different breeding cycles and behaviour of migratory and the resident birds, and the possibility of some selection against dark morphs could account for the limits. At the very least, the occurrence of migratory and resident populations together might offer an explanation for the confusing morphology, distribution, and taxonomy of these birds.

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The *Egretta garzetta* complex in East Africa: A case for one, two or three species

Egretta egrets within the *garzetta, schistacea* and *dimorpha* complex that occur in East Africa have presented identification and taxonomic problems for decades, and continue to do so. The relationship between what are referred to as Little Egret (comprising races *garzetta, nigriceps* and *immaculata*), the Dimorphic Heron (*dimorpha*) and Western Reef Heron (*gularis* and *schistacea*) has been a matter of great controversy (Hancock & Kushlan 1984; see a related article in this *Scopus* issue). Here, I review both the earlier treatment of these closely related birds, and the forms occurring in East Africa today, hoping that this will move us closer to the point where a consensus concerning the taxonomic status of all can be reached.

The following four forms comprise the *Egretta garzetta* complex:

i. *E. g. garzetta* is white plumaged with black bill and legs, yellow feet and blue-grey lores. When breeding, feet and lores become bright pink,

orange or red.

ii. *E. g. gularis* is dimorphic, but most individuals are blackish or slate-grey with a white chin and variable yellow to dark brown legs. The bill and legs turn black when breeding.
   - White plumaged *gularis* often have some dark feathers in the plumage. Bill always relatively thick and long.

iii. *E. gularis schistacea* is highly variable in bill size and colouration of soft parts. The bill tends to be thicker than in *garzetta*, particularly at the base.
   - Dark *schistacea* are blue-grey with a white throat and occasionally white wing patches, a greenish-yellow bill, olive-green legs, yellow feet and lores.

iv. *E. dimorpha* is also dimorphic with dark blackish birds often outnumbering white ones. Many dark-phase birds are lighter in colouration than *gularis*, while white and intermediate phases also occur, as well as individuals that are bluish-grey sometimes speckled with white.
   - Dark individuals usually have white throats and white wing patches, but again the amount of white present is variable. Bill and legs are black with feet yellow or olive sometimes extending to the tarsi. Lores generally bright yellow turning deep pink when breeding, as do the feet.
   - White phase individuals in both breeding and non-breeding plumage are extremely difficult to separate from nominate *garzetta*, though the seemingly longer and thicker-based bill can be a diagnostic feature.

All forms utilise a wide variety of habitats, including riverbanks, shallow lakes, pools, lagoons, irrigation canals, flooded grasslands and marshes, as well as coastal habitats such as mudflats, sandy beaches, rocky coastlines, coral reefs and mangroves. The typically coastal forms, *gularis, schistacea* and *dimorpha*, generally favour marine shorelines, but all have also been recorded inland: *dimorpha* in Madagascar; *schistacea* on several Rift Valley lakes; and *gularis* in mangrove-lined rivers well inland in several West African countries (Kushlan & Hafner 2000).

Taxonomic treatment has varied considerably over the years: while Chapin (1932) appeared to support the recognition of three species (*E. garzetta, E. gularis* and *E. schistacea*), Steinbacher (1936) argued that the multi-phased egret occurring on the East Coast of Africa and showing mixed traits of *gularis* and *dimorpha*, was a different race and even species to the typical white *garzetta*, and should be named *Egretta cineracea*. Grant & Mackworth-Praed (1938) reiterated their earlier views in support of *E. garzetta* (including *dimorpha*), *E. gularis* and *E. schistacea*, and considered *dimorpha* synonymous with *schistacea*. Later White (1965) lumped all of them into the one *garzetta*, a view that had been suggested earlier by Berlioz (1959). Payne & Risley (1976) and Payne (1979) nevertheless opted for three species, while Cramp & Simmons (1977) and Hancock & Elliott (1978) preferred just two (*E. garzetta*. and *E. gularis*). Britton (1980), recognising the complexities surrounding the southern Kenya coastal birds that appeared intermediate in size between the smaller *garzetta*

and the larger *dimorpha,* similarly preferred to list them under *garzetta* (*pro tem*). Meanwhile Brown *et al.* (1982) recognising only the nominate form of *E. garzetta* (Little Egret) in Africa, considered both *asha* (now *schistacea*) and *dimorpha* as races of *gularis* (Western Reef Heron). More recently however both Zimmerman *et al.* (1996) and Dickinson (2003) have supported the recognition of three species: Little Egret (*E. garzetta*), Dimorphic Egret (*E .dimorpha*) and the Western Reef Heron (*E. gularis schistacea*).

Thus, the current taxonomic options for East African birds are as follows:

i. A single polymorphic species: *Egretta garzetta,* comprising *garzetta, gularis, schistacea* and *dimorpha* (e.g., Hancock & Kushlan 1984, Dowsett & Dowsett-Lemaire 1993)

ii. Two species: *Egretta garzetta* (nominate form only) and *Egretta gularis* (including *schistacea* and *dimorpha*) (e.g., Brown *et al.* 1982)

iii. Three species: *Egretta garzetta, Egretta gularis* and *Egretta dimorpha* (e.g., Dickinson 2003)

While all forms (*garzetta, schistacea* and *dimorpha*) largely behave as separate species in Kenya and are generally easy to identify, a situation occurred at Lake Turkana, northern Kenya during the 1970s, whereby breeding was observed among individuals that appeared to be dark phase *schistacea* with those that appeared identical with the all-white *garzetta.* More recently, a mixed colony of egrets breeding on Sumuka Island, Lake Victoria, appeared to contain birds resembling white phase *dimorpha* alongside normal white phase *garzetta* (Byaruhanga & Ostergaard 2008). Elsewhere, observations of egrets in a coastal area of southern Tanzania suggested a mix of both *garzetta* and *dimorpha,* with possible hybrid birds present (Londei 2010). Since it is well known that *schistacea* and *garzetta* freely interbreed with one another in Israel (Ashkenazi 1993) and in India (Parasharya & Naik 1984), there would appear to be convincing evidence for considering all three forms as being members of one polymorphic species.

A particularly close relationship between *dimorpha* and *gularis* would in some way ease the identification problems that surround so many grey or light bluish-grey individuals that are periodically seen in coastal areas of southern Kenya from Mombasa south to Dar-es-Salaam and Zanzibar, and occasionally on some Rift Valley lakes. Pakenham (1979) clearly recognised a taxonomic problem surrounding the black-billed egrets occurring on Pemba and Zanzibar, and felt that consideration of the island's birds being *E. gularis dimorpha* a distinct possibility. The principal diagnostic characteristic of reef herons—a thicker bill—although highly variable, does suggest adaptation of these races to marine habitats and hard-bodied food (Hancock & Kushlan 1984). Whether this is sufficient to claim specific recognition remains questionable. Indeed, Little Egrets (*garzetta*) may occur alongside reef herons in many coastal areas from southern Somalia south to Dar-es-Salaam and beyond (e.g., see Londei 2010). Similarly, birds that look like typical *dimorpha* mix freely along the East African coast with a few individuals that appear to be *schistacea* as well as with those that look like typical *garzetta* (Hancock & Kushlan 1984).

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Quailfinches *Ortygospiza* spp. in East Africa

Quailfinches are characterised by their exclusively grass-dwelling habits, they are always difficult to see well, and equally difficult to catch and examine closely. They are widely distributed throughout sub-Saharan Africa and may be considered true grassland endemics. Gregarious in habits and exceedingly cryptically plumaged, they spend much of their lives on the ground, and are easily disturbed when approached. A single superspecies, the quailfinch comprises no less than eleven forms together with a complex and often confusing taxonomy. Traylor (1963) and Dickinson (2003) recognised two species, *Ortygospiza atricollis* and *O. gabonensis*, while White (1963) preferred *O. atricollis* and *O. fuscocrissa*.

Following the DNA sequencing of several taxa, which appeared to show that the forms *atricollis* and *ansorgei* were as closely allied to each other as were *fuscata* and *gabonensis*, yet *atricollis-ansorgei* and *fuscata-gabonensis-muelleri* were as distant from each other as were several other pairs of African waxbills. As a result Fry (2004) felt it best to separate *gabonensis* and to divide *atricollis* into two species (*O. atricollis* and *O. fuscocrissa*), thus recognising **three** species within the single superspecies of eleven forms.

East African populations can be defined as follows:

(a) The atricollis group: *ugandae* Van Someren 1921. Type locality Mumias, western Kenya. It was considered synonymous with *O. fuscocrissa muelleri* by White (1963), recognised by Paynter *et al.* (1968), but not by Britton (1980), Nikolaus (1987, 1989) or Zimmerman *et al.* (1996). Traylor (1963) felt that West African *atricollis* and East African *ugandae* 'composed a natural group', while more recently, *ugandae* was treated as a race of *atricollis* by Dickinson (2003). The atricollis group ranges from southern Sudan and northwestern Uganda down the Nile to Murchison Falls National Park. In addition, there are old specimen records from Entebbe (Grauer 1907) and Mumias, western Kenya (Van Someren 1917). Recent sight records close to Mumias (B. Finch, *pers. comm.*), together with sight records from the Kibinda Rice Scheme in eastern Uganda (attributed to *O. g. dorsostriata* by Carswell *et al.* 2005) may also refer to *ugandae*.

(b) The 'black-chinned' gabonensis group: *dorsostriata* Van Someren 1921. Type locality Ankole, southwest Uganda. It was considered as a

race of *O. a. atricollis* by Jackson (1938), Chapin (1954) and White (1963), but treated as a race of *gabonensis* by Traylor (1963), Britton (1980) and Dickinson (2003). They are widespread and at times common in many parts of Burundi and Rwanda north to southern and southwestern Uganda and northwestern Tanzania. The closely related *fuscata* of northern Zambia may extend into extreme southwestern Tanzania.

(c) **The 'white-chinned' fuscocrissa group**: *muelleri* Zedlitz 1911.Type locality Sibiti River, Wembere, Tanzania. It was recognised by White (1963), but treated as a race of *atricollis* by Jackson (1938), Traylor (1963), Britton (1980), Zimmerman *et al.* (1996) and Dickinson (2003). It is common and widespread throughout interior Tanzania north to southern and central Kenya.

Given that *dorsostriata* meets and possibly overlaps with *ugandae*, and that *fuscata* overlaps with *muelleri*, two species could be involved, assuming that this apparent overlap relates to actual breeding populations and not merely wandering birds. Meanwhile in Uganda, *gabonensis* is parapatric with *atricollis* and closely resembles it; both are separated by Lake Victoria from the rather dissimilar *fuscocrissa*.

However, several neighbouring populations appear to intergrade morphologically, and some groups have even been recorded breeding as little as 50 km apart from one another. In addition, given the general overall uniformity in plumage as well as in both the mouth-colour and patterns of all nestlings across all quailfinch taxa, it becomes difficult to separate any group with any degree of certainty. This, coupled with the consistency of song patterns across all groups, makes visual separation at the species level almost impossible. After all, any subtle variation in plumage patterns and colour between the black- and white-chinned forms may be no greater than variation between subspecies. Taking these points into consideration, together with their genetic data, Payne & Sorenson (2007) felt that with seasonal movements and such similarity in the vocalisations of all three groups, gene flow between adjacent populations would be inevitable. As a result they concluded that African quailfinches would best be recognised as a single, geographically variable species *Ortygospiza atricollis*.

Such an arrangement would necessitate the removal of Black-chinned Quailfinch *O. gabonensis* from the East African list, whilst the African Quailfinch reverts back to *Ortygospiza atricollis* in the Kenya Checklist.

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Recommendation to remove the Somali Bee-eater *Merops revoilii* from the Tanzania list

Britton (1980) admitted the Somali Bee-eater to the Tanzania list on the basis of a single record *"One seen 10 km north of Dar es Salaam on 22 November 1970".* Although not referenced this surely refers to Harvey (1970) who claimed a single bird at salt pans north of Dar es Salaam in November 1970 (cited again in Harvey & Howell 1987).

There have been no further records from Tanzania despite considerable fieldwork in Mkomazi National Park during the early 1990s (Lack *et al.* 1999) and many occasional visits by birdwatchers since. There are 4,821 bird records for Mkomazi from the 882,000 on the Tanzania Bird Atlas database covering every month of the year (www.tanzaniabirdatlas.com). Although Archer (1979) documented a southward expansion of range in the Tsavo area of Kenya in the late 1960s and early 1970s there is no evidence that this has continued (Brian Finch, *pers. comm.*): *"In April 2008, I found a pair [of Somali Bee-eaters] behaving as if nesting on the road in Tsavo West National Park, about 20 km from Maktau Gate on to the Taveta-Voi Road. I would imagine that this is barely 40*

km in a direct line to the [Tanzanian] border, and probably quite a bit less..... Apart from these odd records towards the Tanzania border, there is no evidence that the bird has any post-breeding dispersal."

There are two suggested possibilities regarding the origin of Harvey's claim of the species in Dar es Salaam. One is that it was an escaped or released bird from holding grounds of the nefarious bird trade, some of which were situated north of Dar es Salaam in the early 1970s. However, this seems unlikely as there are no records of trade in this species, and no indication that trappers were operating in the north-eastern part of the country. The second (more likely) possibility is that this was simply an identification error for a pale washed-out immature Swallow-tailed Bee-eater *Merops hirundineus*, especially because both show a pale blue rump. This dry area to the north of Dar es Salaam is on the northern edge of the range of *M. hirundineus* and post breeding dispersal of immature birds could be expected in this part of the country. The Somali Bee-eater is not illustrated in the only field guide available in 1970 (Williams 1963) and Swallow-tailed Bee-eater is not illustrated in the handbook (Mackworth-Praed & Grant 1952).

It is most unlikely that this semi-desert species could occur naturally near Dar es Salaam, some 350 km south of its known range. This species is not migratory, it is not known to wander extensively, and it would have had to cross hundreds of kilometres of unfamiliar and seemingly unsuitable habitat as well as negotiate the West and East Usambara Mountains. Thus, it is recommended that this species is removed from the Tanzania list for now.

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The Rock Pratincole *Glareola nuchalis* in Tanzania: the first breeding record, a summary of past records and new distributional data

The Rock Pratincole *Glareola nuchalis* is a resident and intra-African migrant in central and western Africa with Tanzania on the eastern fringe of the population (Delany *et al.* 2009). Britton (1980) mentions only Siguri Falls in the Selous Game Reserve for Tanzania and while suggesting that it breeds there, no breeding records were admitted in Brown & Britton (1980). Over the last three decades, a number of new observations—including the first breeding record—of this species have been made in Tanzania. These records are shown in Figure 1, and summarised briefly below as numbered.

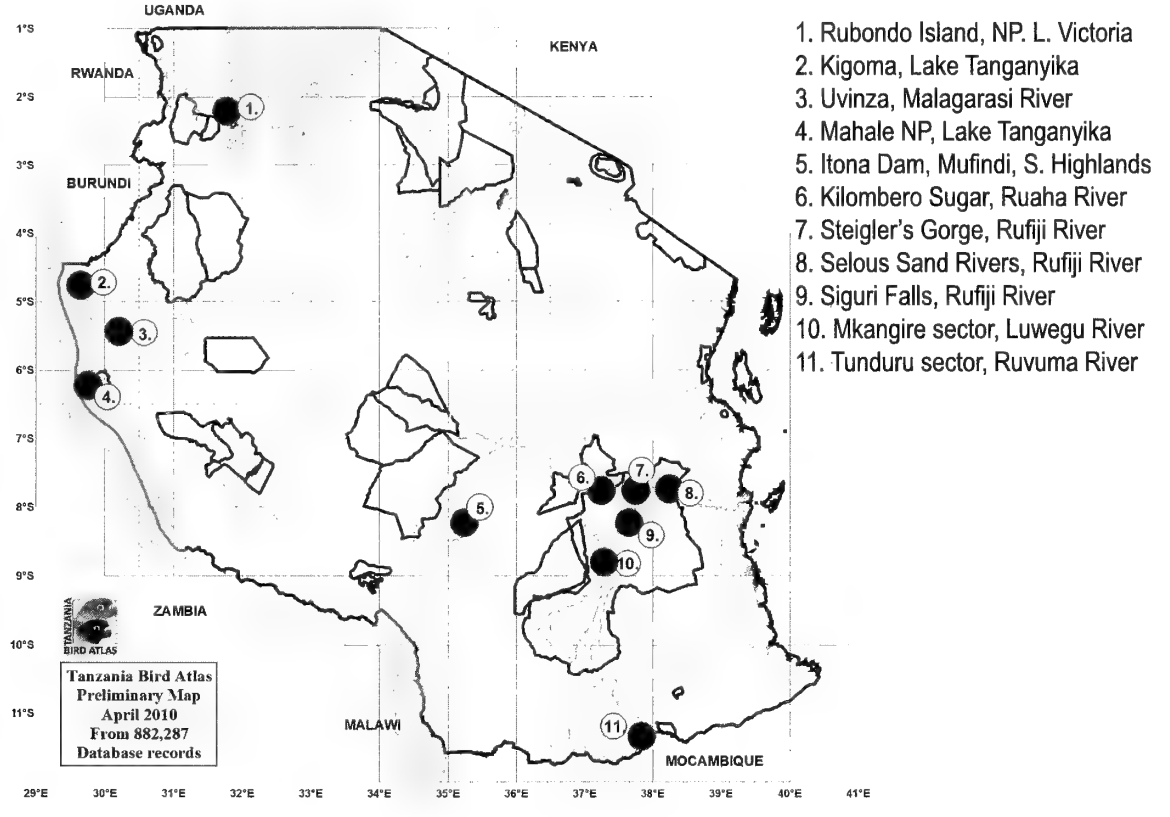

Figure 1. Map showing all Tanzanian records of Rock Pratincole *Glareola nuchalis.* Refer to text for further details about each of the 11 locations where the species was observed.

1. In January 1995 I located three separate birds on rocks off the NW corner of Rubondo National Park in Lake Victoria at 2° 13′ 13″ S, 31° 43′ 54″ E (Baker 1997). Although well known from the Ugandan sector of the lake (Britton 1980), these were the first records from Tanzanian waters and while there have been no new records since, these outlying rocks are not a well-visited area on Rubondo Island.
2. Archer (1994) located two birds off-shore on Lake Tanganyika in Kigoma Bay on 20 September 1993.

3. On 6 October 1992 I located a sitting bird on rocks on the eastern, upstream, side of the road bridge crossing the Malagarasi River at Uvinza in western Tanzania at 5° 07′ 06″ S, 35° 22′ 48″ E at an altitude of 980 m. I swam out to the rocks and disturbed the sitting bird from two eggs laid on the bare rock. This was the ***first confirmed breeding record*** for this bird from Tanzania and a new locality record.
4. Archer (1994) saw a single bird in Mahale National Park on 23 September 1993. Ben Jackson (*pers. comm.*) also recorded this species in Mahale NP in September 2000.
5. On 5 December 2008 Liz Baker photographed an immature bird (Fig. 2) at Itona Lower Dam (8° 28′ 27″ S, 35° 24′ 23″ E) in Mufindi District of the Southern Highlands at an altitude of 1900 m. This record, quite far from any known suitable breeding habitat, could also suggest extensive post-breeding dispersal.

Figure 2. An immature Rock Pratincole *Glareola nuchalis* at Itona Lower Dam, Mufindi District, Southern Highlands (photograph: Liz Baker).

6. In March and September 2003 and again in January 2005 Cindy Coster (*pers. comm.*) found "low numbers" on the Ruaha River alongside Kilombero Sugar Estate east of the road bridge below Kidatu Dam close to 7° 48′ S, 36° 59′ E.
7. Records from the Selous Game Reserve include those made in December 2002 by Jo Anderson (*pers. comm.*) of a single bird at Steigler's Gorge on the Rufiji River (~ 7° 48′ S, 37° 51′ E).
8. In late September 2003, Paul Oliver (*pers. comm.*) also recorded a single bird close to the Selous Sand Rivers tourist camp on the Rufiji River downstream of Steigler's Gorge.
9. Britton (1980) mentioned Siguri Falls in the Selous Game Reserve for Tanzania as the only confirmed locality for this species in Tanzania at the time, also suggesting that it might breed there although this was not reflected in Brown & Britton (1980).

10. Neil Stronach (*pers. comm.*) located birds probably breeding on the Luwegu River within the Mkangira sector of the Selous GR in September 1992. This site is some 70 km upstream (south) of the Siguri Falls and may constitute a second breeding site along this river.
11. Brooke (1984) gives details of an undated specimen from the Tunduru sector of the Ruvuma River that was probably taken in November 1936. This remains the only record from this river, most likely due to the general paucity of data from this part of Tanzania.

In summary the Rock Pratincole has a more extensive range in Tanzania than suggested from both old and recent literature. There can be no doubt that the paucity of records is due to the remoteness of suitable habitat and the general lack of observers in Tanzania. The lengthy shorelines of lakes Victoria and Tanganyika provide much suitable habitat, even where these shores are populated by fishermen. The Malagarasi, Ruvuma and Rufiji river systems are other extensive potential sites, but are seldom visited by bird watchers. There are records from the Malawi shoreline of Lake Nyasa (Dowsett-Lemaire & Dowsett 2006) so it is likely that this species also occurs in Tanzanian waters on this lake, the shoreline of which remains largely ornithologically unknown.

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Items of interest from recent ornithological literature

Editorial note: With various ornithological advances (e.g., taxonomic, molecular, ecological etc.) appearing in the literature at ever increasing rates, it is becoming ever more daunting for many of us to keep abreast of crucial developments. Interesting and pertinent articles commonly slip off the radars of even the most up-to-date ornithologists. In order to try and bring such items to the attention of our readers, we hereby introduce a new feature for *Scopus*: ***Items of interest from recent ornithological literature***. We hope to have this feature in all forthcoming issues of *Scopus*, switching between topics based on interest and articles received. Besides the Editorial Board occasionally soliciting articles, we welcome pieces from interested persons on topics they are familiar with and that are of interest to the general *Scopus'* readership.

Raptor taxonomy: Highlights from two recent papers

With taxonomic recommendations appearing in the literature at an ever increasing rate, our perceptions of some familiar bird species and their relationship to others are likely to be constantly under review. Taxonomic changes or recommendations are useful for those readers who may be engaged in formulating (and implementing) conservation priority documents and other research material. Here, I highlight some aspects concerning the taxonomy of birds of prey (Family Accipitridae) that have appeared in the following two fairly recent publications:

i) Lerner, H. R. L. & D. P. Mindell 2005. Phylogeny of eagles, Old World vultures, and other Accipitridae based on nuclear and mitochondrial DNA. *Molecular Phylogenetics and Evolution* 37: 327-346.

ii) Helbig, A.J., Kocum, A., Seibold, I. & Braun, M.J. 2005. A multi-gene phylogeny of aquiline eagles (Aves: Accipitriformes) reveals extensive paraphyly at the genus level. *Molecular Phylogenetics and Evolution* 35:147-164.

In the first paper, Lerner & Mindell give a detailed analysis of all bird of prey families and sub-families, and in doing so make it so much easier for everyone to see just where our birds of prey fit into a vast and often complex arrangement within the Accipitriformes.

Families: Sagittariidae (Secretarybird), Pandionidae (Osprey) and Accipitridae (Kites, Old World Vultures, Eagles and other birds of prey).

Sub-Families within Accipitridae: No less than 14 sub-families are recognised, of which the following 13 occur in East Africa:

i. ***Elaninae:*** Kites noted for having a bony shield above the eye
- African Genera: *Elanus* and *Chelictinia*. (Black-shouldered and Swallow-tailed Kites)

ii. ***Polyboroidinae:*** One New World and one Old World species that seek out food found in tree cavities. Both have relatively weak bills, but

possess increased tarsus mobility and length.
- African Genera: *Polyboroides* (African Harrier Hawk)

iii. ***Gypaetinae:*** Largely small vulture-type birds with specialised feeding behaviours and vocalisations. *Gypohierax* and *Neophron* similar to each other in plumage colouration and moult stages
- African Genera: *Gypohierax, Neophron* and *Gypaetus* (Palm-nut and Egyptian Vultures and Lammergeier)

iv. ***Perninae:*** Kites that specialise on insects, bees or wasp larvae. All lack the bony eye shield in *Elaninae*
- African Genera: *Pernis, Aviceda* and probably *Macheiramphus* (Honey Buzzard, Cuckoo Hawk and probably also Bat Hawk)

v. ***Circaetinae:*** Old World species that feed on snakes, other reptiles and small mammals. All possess a reticulate pattern of heavy scales on the tarsi
- African Genera: *Circaetus, Dryotriorchis* and *Terathopius* (Snake Eagles, Congo Serpent Eagle and Bateleur)

vi. ***Aegypinae:*** Large Old World Vultures. All scavengers, most with long necks and lightly feathered to bare heads
- African Genera: *Necrosyrtes, Gyps, Torgos* and *Trigonoceps* (Hooded, White-backed, Rüppell's, Lappet-faced and White-headed Vultures)

vii. ***Aquilinae:*** Large eagles with feathered tarsi. Several possess short or longish crests
- African Genera: *Aquila, Lophaetus, Hieraaetus, Stephanoaetus* and *Polemaetus* (Tawny, Long- crested, Cassin's, Crowned, Martial, Verreaux's, Booted, Ayres's, Wahlberg's and all migratory eagles)

viii. ***Melieraxinae***: Open country accipiters, mostly larger than the *Accipiter* species
- African Genera: *Melierax* and *Micronisus* (Chanting Goshawks and the Gabar Goshawk)

ix. ***Circinae***: Broad and long-winged birds with facial feather disks and specialized outer ears, all occurring in open habitats
- African Genera: *Circus* (Pallid, Montagu's and Marsh Harriers)

x. ***Accipitrinae***: Fast fliers, specialising on small birds for food. Long and slim tarsometatarsus and toes. Occurring largely in forest and woodland habitats
- African Genera: *Accipiter* and *Urotriorchis* (African Goshawk, Shikra, all Sparrowhawks and the Long-tailed Hawk)

xi. ***Milvinae***: New and Old World kites with fusion of joints of the second and third toes
- African Genera: *Milvus* (Black Kite)

xii. ***Haliaeetinae:*** Large eagles found in wetlands and coastal habitats. All have a fused basal joint of the middle toe
- African Genera: *Haliaeetus* (African Fish Eagle)

xiii. ***Buteoninae***: Largely broad-winged soaring birds with relatively short tails and legs

- African Genera: *Buteo, Butastur* and *Kaupifalco* (All Buzzards and the Lizard Buzzard).

The second article works at the species level where Helbig and colleagues established and recommended that:

i. The African Hawk Eagle, being close to Verreaux's Eagle, should be placed in the genus *Aquila,* and be known as *Aquila spilogaster.*

ii. Wahlberg's Eagle is part of a clade that includes two small eagles (*Hieraaetus pennatus* and *H. ayresii*), and should be known as *Hieraaetus wahlbergi.*

iii. The generic placement of Cassin's Hawk Eagle (currently placed in *Aquila*) remains to be determined. The genus *Spizaetus* is now restricted to South America, while Asian members of that group are now placed in *Nisaetus.*

Finally, they also informed us that:

- The African Tawny Eagle is NOT closely related to the migratory Steppe Eagle.
- The migratory Greater and Lesser Spotted Eagles are closely related to the African Long-crested Eagle, and should be placed in the genus *Lophaetus.*

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