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Avifauna of Boni-Dodori National Reserves, Lamu and Garissa Counties, Kenya

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Summary

A comprehensive avian survey was conducted between April 2012 and November 2013 in Boni and Dodori National reserves, the connecting Aweer Community Conservancy corridor, and the adjacent forests. Survey methods were Timed Species Counts (TSCs), mist netting and opportunistic observations. Six different habitat types were identified and sampled: 1) grassland with *Hyphaene* palms 2) a mosaic of forest groves, grassland and *Hyphaene* palm savanna 3) dense thickets 4) wetlands 5) forest with dense undergrowth and 6) acacia woodlands. A total of 184 bird species was recorded, including two near threatened bird species (Southern Banded Snake Eagle *Circaetus fasciolatus* and Fischer's Turaco *Tauraco fischeri*), 19 Palaearctic migrants, two Afrotropical migrants and 14 East African coastal biome species. There were eight forest specialist and 29 forest generalist species. We recorded sightings of a form of Red-naped Bushshrike *Laniarius ruficeps* that is not illustrated in bird guidebooks for Africa, and presumed to be of the subspecies *kismayensis*. Data from this survey led to the upgrading of the Boni-Dodori area from a potential IBA to full IBA status. Even though these forests have species of conservation importance and sufficient habitats to conserve these species, immediate actions need to be taken to ensure their protection. We recommend comprehensive biodiversity surveys in these forests in order to obtain more scientific information such as population trends to enhance the conservation of these important, but neglected sites.

Introduction

Boni and Dodori National Reserves in Garissa and Lamu Counties respectively, and the corridor area between them, form the Boni-Dodori forest system on the northern coast of Kenya (Amin *et al*. 2015). They were gazetted in 1976 and their remote location and history of insecurity have resulted in a comparatively low human population density and minimal development. Five villages (Milimani, Bodhei, Basuba, Mangai and Mararani), occupied by the Aweer (Boni) people, are located along the dirt road from Hindi to Kiunga that runs between the two reserves (Fig. 1). Most of the indigenous coastal habitat in these forests has remained undisturbed and continues to support biodiversity that has been little studied.

As part of the Coastal Forests of Eastern Africa Biodiversity Hotspot, an area known for globally significant levels of species richness and endemism, the Boni-Dodori reserves are recognized as globally important for biodiversity conservation (Burgess & Clarke 2000, Burgess *et al*. 2003, Mittermeier *et al*. 2005). The largest population of the critically endangered Aders' Duiker *Cephalophus adersi* and a potentially new species

of giant sengi (elephant-shrew) have been recorded in these forests (Ngaruiya 2008, Mwenja 2009, KWS 2010, Andanje *et al*. 2010, Amin *et al*. 2015). Additionally, sightings of the endangered Wild Dog *Lycaon pictus* and critically endangered Hirola *Beatragus hunteri* have also been recorded in these reserves in the past (Githiru *et al*. 2008).

At the start of this study the two reserves were listed as potential Important Bird Areas (IBAs) (Bennun & Njoroge 1999). Bird species of conservation concern that had been previously recorded included the near threatened Southern Banded Snake Eagle *Circaetus fasciolatus* and Fischer's Turaco *Tauraco fischeri*, as well as many East African Coastal Biome bird species (Bennun & Njoroge 1999). Due to persistent insecurity in the area, there have been very few bird surveys conducted in the forests, and this lack of sufficient data hindered the re-evaluation of the IBA status of these reserves. This survey was part of a Conservation Leadership Programme (CLP) funded project titled *Avifauna survey in Boni-Dodori National Reserves, Adjacent Forests and Community Land, North Coast, Kenya* (Mwinami *et al* 2013). The objective of the survey was to produce a comprehensive checklist of bird species found in Boni-Dodori and to provide new information that would lead to the reassessment of the conservation status of these reserves.

Study Area

The two national reserves, Boni (1339 km^2) and Dodori (877 km^2), lie on the northeast coast near the Kenya-Somalia border (01°43'S, 41°10'E; 0–100 m). There are no clear boundaries between the community land and the reserves (Fig. 1). Habitats in the Boni–Dodori forest system consist of a mosaic of forest, thicket and savanna (Kuchar & Mwendwa 1982). We sampled six habitat types classified as: 1) grassland with *Hyphaene* palms 2) mosaic of forest groves, grassland and *Hyphaene* palm savanna 3) dense thicket 4) wetland 5) forest with dense undergrowth and 6) acacia woodland (Appendix 1).

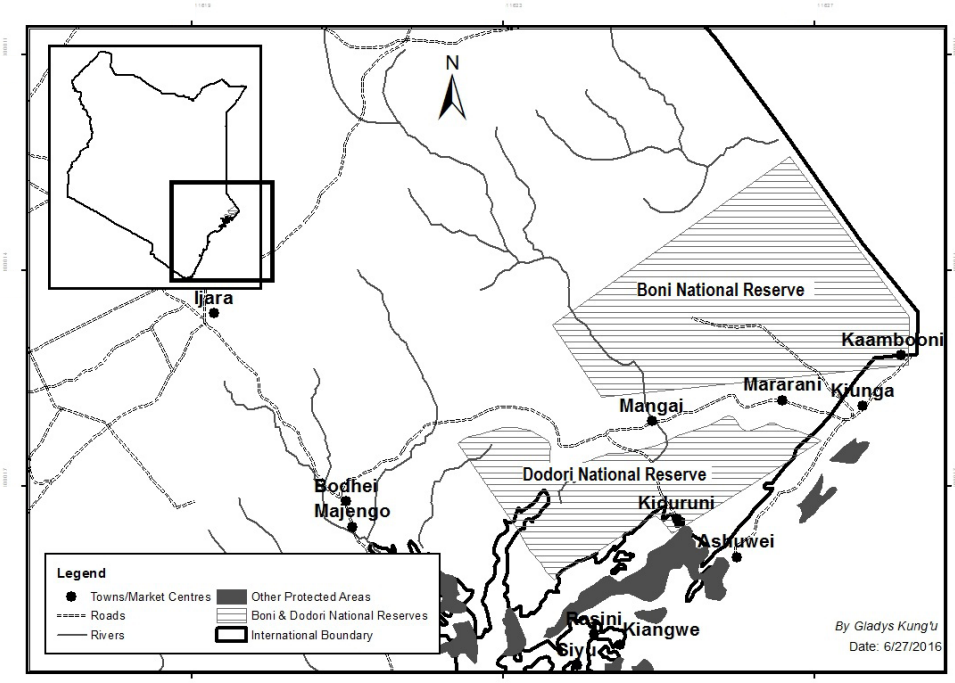

Figure 1. Map of Boni and Dodori National Reserves. Map courtesy of G. Kung'u.

Vegetation communities were classified as distinct if they had, 1) a suite of trees distinct from others 2) grassland cover, or 3) differed from other habitat types in terms of their degree of denseness or openness. Threats to the conservation of each habitat were assessed (Appendix 1).

Bird surveys were conducted in habitats near or around human settlements in Basuba, Mangai and Mararani, in the palm savanna west of Basuba, at Sankuri Ridge, in an acacia woodland area between Mararani and Kiunga towns, and between the main road and Dodori Creek in the Dodori National Reserve. Surveys were only undertaken within about 4 km from the main road to Boni National Reserve, on community lands, and to over 30 km from the main road into Dodori reserve.

Methods

Bird surveys of the Boni-Dodori area were conducted during two separate field surveys, in April 2012 and in October–November 2013. The study employed combinations of three different techniques: timed species counts, mist netting and opportunistic observations. All surveyed sites were geo-referenced for future monitoring and re-survey purposes.

Timed Species Counts

Timed Species Counts (TSCs) are repeated species lists where observers record the first time that each species is first positively identified (Pomeroy & Tengecho 1986, Pomeroy & Dranzoa 1997). They provide an effective and rapid method of counting birds in the mid and upper canopy in large areas (Bennun & Waiyaki 1993, Bennun & Howell 2002). TSCs were undertaken during 27 October to 10 November. Five observers conducted a 60 min walk along a designated path in open habitats at a bird watcher's pace, stopping frequently to identify and record all birds seen or heard and the time (Waiyaki 1995, Bennun & Howell 2002). Counts started by 06:00 and ended at 10:00 or 11:00 when bird activity dropped dramatically. Observers used available paths where possible, but in dense vegetation such as near Mararani and Sankuri Ridge, the observers had to clear their own paths. A total of 40 TSC were done each lasting for one hr.

Mist netting

Mist netting was used on three different days to target species of the forest understorey, which are poorly recorded using other techniques (Bibby *et al*. 1998). Three mist nets, one 18 m long and two 12 m long, were erected at two locations near Mangai village and at one location in acacia woodland near Kiunga. These were operated from 0600 to 1100. Birds trapped were identified, fitted with a metal ring, measured (wing length, head, tarsus, and body weight) and then released. Mangrove Kingfisher *Halcyon senegaloides* and Scaly-throated Honeyguide *Indicator variegatus* were photographed, but not ringed as their tarsi are very short and suitable rings were unavailable.

Opportunistic surveys

Opportunistic records of any bird seen or heard before or after the surveys were noted in order to compile a comprehensive list of the avifauna of Boni-Dodori. This included all species seen or heard at night.

Data analysis

Bird species were classified according to their migratory and conservation status, and were grouped into three other categories according to their forest habitat

niche dependence: forest specialist (FF), generalist (F) and visitors (f) following classifications by Bennun *et al*. (1996).

Relative abundance of each species was calculated from TSCs (Bennun & Howell 2002). Species receive a cumulative score according to when they are first recorded on each count, with species observed more frequently receiving higher mean scores as they tend to occur early within counts as well as in a higher proportion of counts (Bennun & Howell 2002). For each count, each species is assigned an index number ranging from 0–6, depending on whether it was recorded during the first 10 min (= 6), or second 10 min (= 5) down to the last 10 min (= 0). An average score is then taken over all the counts and species with scores closest to 6 being the most abundant species and those with an average score closer to 0 being least abundant.

A discovery curve was derived for species observed during the October–November 2013 survey.

Results

Bird species richness and relative abundance

A total of 184 bird species was recorded which included 19 Palaearctic migrants, two Afrotropical migrants and 14 East African Coastal Biome species (Table 1). The species discovery curve (Fig. 2) indicated an asymptote (maximum) level on day eight, indicating that few new species were likely to be recorded on additional survey days. Relative abundance of each species is indicated by the TSC scores.

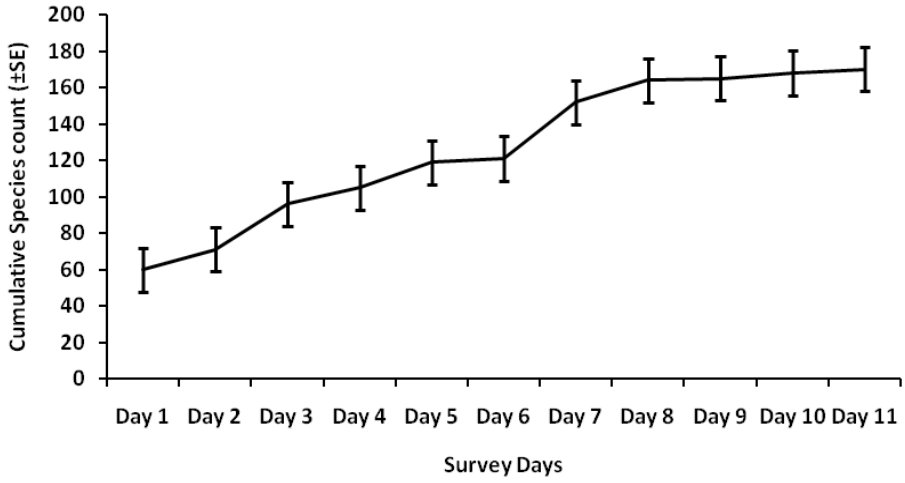

Figure 2. Species discovery curve of birds observed in the Boni-Dodori area over 11 days in October–November 2013.

Two globally threatened species were recorded, Southern Banded Snake Eagle *Circaaetus fasciolatus* and Fischer's Turaco *Tauraco fischeri*, both near threatened (IUCN 2012). Ostrich *Struthio camelus*, Forest Batis *Batis mixta* and Gorgeous Bushshrike *Chlorophoneus viridis* were recorded in the Boni-Dodori area for the first time.

The most abundant species from TSC scores were Tropical Boubou *Laniarius aethiopicus* (5.18), Zanzibar Greenbul *Andropadus importunus* (3.48), Yellow-bellied Green-

bul *Chlorocichla flaviventris* (3.30), Collared Sunbird *Hedydipna collaris* (2.75), Common Bulbul *Pycnonotus barbatus* (2.70), Grey-backed Camaroptera *Camaroptera brevicaudata* (2.65), African Paradise Flycatcher *Terpsiphone viridis* (2.63), Emerald-spotted Wood Dove *Turtur chalcospilos* (2.60), Black-backed Puffback *Dryoscopus cubla* (2.58) and Red-fronted Tinkerbird *Pogoniulus pusillus* (2.25). Scores for globally threatened species were: Fischer's Turaco *Tauraco fischeri* (0.65) and Southern Banded Snake Eagle *Circaetus fasciolatus* (0.35).

There were 19 Palaearctic migrants (Table 1) of which Barn Swallow *Hirundo rustica* was the most common (score 1.04). The April 2012 survey recorded the best selection of migrants, many undoubtedly on northward passage. These included migrating Eurasian Rollers *Coracias garrulus* and large flocks of Amur Falcons *Falco amurensis* foraging on insects in the palm savanna. The least common of these migrants was the Yellow Wagtail *Motacilla flava*, recorded on only two TSC counts.

There were two Afrotropical migrants. White-throated Bee-eater *Merops albicollis* was often seen (TSC score 1.30), while Northern Carmine Bee-eater *Merops nubicus* was less frequently recorded (score 0.18). Southern migrants with presumed resident races that were still fairly common in November included Yellowbill *Ceuthmochares aereus* (0.68) and Red-capped Robin Chat *Cossypha natalensis* (0.90).

A total of 14 East African Coastal Biome (EAC) species was recorded (Table 1). Most of these species, especially Mangrove Kingfisher, Mombasa Woodpecker *Campethera mombassica*, Little Yellow Flycatcher *Erythrocercus holochlorus*, Northern Brownbul *Phyllastrephus strepitans*, Fischer's Greenbul *Phyllastrephus fischeri* and Black-bellied Starling *Lamprotornis corruscus* were seen or heard on most survey days and across all habitats except in acacia woodland. Coastal biome sunbirds were concentrated in flowering bushes or trees, especially in *Combretum constrictum* bushes near the river pools. Little Yellow Flycatcher *Erythrocercus holochlorus* was the most common EAC bird with a TSC score of 1.78 closely followed by Northern Brownbul *Phyllastrephus strepitans* (1.73) and Gorgeous (Four-coloured) Bush-shrike *Telophorus viridis* (1.50). The least recorded was the Southern Banded Snake Eagle with a score of 0.35. However, several Southern Banded Snake Eagles were seen opportunistically along the road.

Table 1. Checklist of bird species recorded in and around Boni and Dodori National Reserves Names and sequence according to the Checklist of the Birds of Kenya, 4th Ed, Bird Committee of EANHS, 2009. Habitats types: M = mosaic of forest groves, grassland, and *Hyphaene* palm savanna, sometimes flooded, on white or grey sand; F = dry forest with a few tall trees and dense shrub understory on white or grey sand; T = dense thicket on red sands; A = acacia woodland, coastal scrub, scattered baobabs and small seasonal wetlands on white sand; W = wetlands, including pools in river channel. * indicates East African Coastal Biome species, FF = forest specialist, F = forest generalist, f = forest visitor, AM = Afrotropical migrant, PM = Palaearctic migrant, am/pm = Afrotropical or Palaearctic migrants occuring alongside resident birds, R = resident.

Species	Habitat	Migratory Status	Forest Bird Category
Ostrich *Struthio camelus*	M	R	
Crested Guineafowl *Guttera pucherani*	M,F,T	R	F
Crested Francolin *Francolinus coqui*	M,T,A	R	
Red-necked Spurfowl *Francolinus afer*	M,T	R	
Harlequin Quail *Coturnix delegorguei*	M	am	
Egyptian Goose *Alopochen aegyptiaca*	W	R	
Spur-Winged Goose *Plectropterus gambensis*	W	R	

Species	Habitat	Migratory Status	Forest Bird Category
White-faced Whistling Duck *Dendrocygna viduata*	W	R	
African Open-billed Stork *Anastomus lamelligerus*	W	am	
Woolly-necked Stork *Ciconia episcopus*	W	R	
Saddle-billed Stork *Ephippiorhynchus senegalensis*	W	R	
Marabou Stork *Leptoptilos crumeniferus*		R	
Sacred Ibis *Threskiornis aethiopicus*	W	R	
Hadada Ibis *Bostrychia hagedash*	M,A,W	R	
African Spoonbill *Platalea alba*	W	R	
Black-crowned Night Heron *Nycticorax nycticorax*	W	am, pm	
Striated Heron *Butorides striata*	W	R	
Squacco Heron *Ardeola ralloides*	W	am, pm	
Grey Heron *Ardea cinerea*	W	am, pm	
Black-headed Heron *Ardea melanocephala*	W	R	
Great White Egret *Ardea alba*	W	R	
Yellow-billed Egret *Egretta intermedia*	W	R	
Little Egret *Egretta garzetta*	W	R	
Hamerkop *Scopus umbretta*	W	R	
African Darter *Anhinga rufa*	W	R	
Amur Falcon *Falco amurensis* (April 2012)	M	PM	
Common Kestrel *Falco tinnunculus* (April 2012)	M	PM	
Osprey *Pandion haliaetus*	W	PM	
Black Kite *Milvus migrans*	W	am, pm	
African Fish Eagle *Haliaeetus vocifer*	W,M	R	
Black-chested Snake Eagle *Circaetus pectoralis*	A	R	
Brown Snake Eagle *Circaetus cinereus*	M	R	
Southern Banded Snake Eagle *Circaetus fasciolatus* *	M,F	R	F
Bateleur *Terathopius ecaudatus*	M,A	R	
African Harrier Hawk *Polyboroides typus*	M,F	R	f
African Goshawk *Accipiter tachiro*	F	R	F
Little Sparrowhawk *Accipiter minullus*	M	R	f
Great Sparrowhawk *Accipiter melanoleucus*	M	R	F
Lizard Buzzard *Kaupifalco monogrammicus*	M	R	f
Wahlberg's Eagle *Aquila wahlbergi*	M	am	
Booted Eagle *Aquila pennata*	A	PM	
Ayres's Hawk Eagle *Aquila ayresii*	M	R	F
Black Crake *Amaurornis flavirostra*	W	R	
Water Thick-knee *Burhinus vermiculatus*	W	R	
Black-winged Stilt *Himantopus himantopus*	W	am, pm	
Spur-winged Plover *Vanellus spinosus*	W	R	
Black-headed Plover *Vanellus tectus*	A,W	R	
Common Ringed Plover *Charadrius hiaticula*	W	PM	
Three-banded Plover *Charadrius tricollaris*	W	R	
White-fronted Plover *Charadrius marginatus*	W	R	
Lesser Sand Plover *Charadrius mongolus*	W	PM	
Greater Painted-snipe *Rostratula benghalensis*	W	R	
African Jacana *Actophilornis africanus*	W	R	
Common Greenshank *Tringa nebularia*	W	PM	
Green Sandpiper *Tringa ochropus*	W	PM	

Species	Habitat	Migratory Status	Forest Bird Category
Wood Sandpiper *Tringa glareola*	W	PM	
Common Sandpiper *Actitis hypoleucos*	W	PM	
Little Stint *Calidris minuta*	W	PM	
Curlew Sandpiper *Calidris ferruginea*	W	PM	
Black-faced Sandgrouse *Pterocles decoratus*		R	
Red-eyed Dove *Streptopelia semitorquata*	M,A,W	R	f
Ring-necked Dove *Streptopelia capicola*	M,A	R	f
Emerald-spotted Wood Dove *Turtur chalcospilos*	M,F,T,A	R	f
Tambourine Dove *Turtur tympanistria*	M	R	F
Namaqua Dove *Oena capensis*	A	R	
African Green Pigeon *Treron calvus*	M,W	R	F
Fischer's Turaco *Tauraco fischeri* *	M, F	R	F
White-bellied Go-away-bird *Corythaixoides leucogaster*	A	R	
Klaas's Cuckoo *Chrysococcyx klaas*	M	R	f
Diederik Cuckoo *Chrysococcyx caprius*	M	am	
Yellowbill *Ceuthmochares aereus*	M,F	am	F
White-Browed Coucal *Centropus superciliosus*	M,W	R	
African Wood Owl *Strix woodfordii*	M	R	F
African Barred Owlet *Glaucidium capense*	M	R	F
Eurasian Nightjar *Caprimulgus europaeus*	M	PM	
Fiery-necked Nightjar *Caprimulgus pectoralis*	M	R	F
Slender-tailed Nightjar *Caprimulgus clarus*	M	R	
African Palm Swift *Cypsiurus parvus*	M	R	
Little Swift *Apus affinis*	M	R	
Speckled Mousebird *Colius striatus*	M	R	
Blue-naped Mousebird *Urocolius macrourus*	A	R	
Narina Trogon *Apaloderma narina*	M	R	F
Lilac-breasted Roller *Coracias caudatus lorti* (Lilac-throated race)	M	am	
Broad-billed Roller *Eurystomus glaucurus*	M	am	f
Grey-headed Kingfisher *Halcyon leucocephala*	M	am	f
Striped Kingfisher *Halcyon chelicuti*	M,W		
Mangrove Kingfisher *Halcyon senegaloides* *	M,F,A,W		
Malachite Kingfisher *Alcedo cristata*	W		
Pied Kingfisher *Ceryle rudis*	W	W	
Little Bee-eater *Merops pusillus*	M	R	
White-throated Bee-eater *Merops albicollis*	M,W	AM	f
Northern Carmine Bee-eater *Merops nubicus*	M,W	AM	
Green Wood-hoopoe *Phoeniculus purpureus*	M	R	
Common Scimitarbill *Rhinopomastus cyanomelas*	M,F,T	R	
Crowned Hornbill *Tockus alboterminatus*	M,F	R	f
African Grey Hornbill *Tockus nasutus*	M	R	
Trumpeter Hornbill *Bycanistes bucanitor*	M	R	F
Red-fronted Tinkerbird *Pogoniulus pusillus*	M,T,A	R	
Black-collared Barbet *Lybius torquatus*	M	R	f
Scaly-throated Honeyguide *Indicator variegatus*	M,T	R	f
Greater Honeyguide *Indicator indicator*	M	R	f
Nubian Woodpecker *Campethera nubica*	M,T	R	
Mombasa Woodpecker *Campethera mombassica* *	M,F	R	F

Species	Habitat	Migratory Status	Forest Bird Category
Cardinal Woodpecker *Dendropicos fuscescens*	M	R	
Forest Batis *Batis mixta*	F	R	FF
Black-headed Batis *Batis minor*	M,F,T	R	
Retz's Helmetshrike *Prionops retzii*	M	R	f
Chestnut-fronted Helmetshrike *Prionops scopifrons* *	M	R	F
Grey-headed Bushshrike *Malaconotus blanchoti*	M,T,A	R	
Sulphur-breasted Bushshrike *Chlorophoneus sulfureopectus*	M,T,A	R	f
Gorgeous Bushshrike *Chlorophoneus viridis* *	M,F,T	R	F
Three-streaked Tchagra *Tchagra jamesi*	A	R	
Black-crowned Tchagra *Tchagra senegalus*	M,T	R	
Black-backed Puffback *Dryoscopus cubla*	M,F,T,A	R	F
Slate-coloured Boubou *Laniarius funebris*	T,A	R	
Red-naped Bushshrike *Laniarius ruficeps kismayensis*	A	R	
Tropical Boubou *Laniarius aethiopicus*	M,F,T,A	R	f
Black Cuckooshrike *Campephaga flava*	M	am	f
Red-backed Shrike *Lanius collurio*	M	PM	
Long-tailed Fiscal *Lanius cabanisi*	M	R	
Black-headed Oriole *Oriolus larvatus*	M,T	R	f
Common Drongo *Dicrurus adsimilis*	M,A	R	
Square-tailed Drongo *Dicrurus ludwigii*	M,F,T	R	F
African Paradise Flycatcher *Terpsiphone viridis*	M,F,T,A	am	f
Blue-mantled Crested Flycatcher *Trochocercus cyanomelas*	M,F,T	R	FF
Little Yellow Flycatcher *Erythrocercus holochlorus* *	M,F,T	R	FF
Pied Crow *Corvus albus*		R	
Barn Swallow *Hirundo rustica*	M,T,A,W	PM	
Lesser Striped Swallow *Cecropis abyssinica*	M	R	
Flappet Lark *Mirafra rufocinnamomea*	M	R	
Siffling Cisticola *Cisticola brachypterus*	M,A	R	
Tawny-flanked Prinia *Prinia subflava*	M,A	R	f
Yellow-breasted Apalis *Apalis flavida*	M,T,A	R	f
Black-headed Apalis *Apalis melanocephala*	M,F	R	FF
Grey-backed Camaroptera *Camaroptera brachyura*	M,F,T,A	R	f
Grey Wren Warbler *Calamonastes simplex*	A	R	
Common Bulbul *Pycnonotus barbatus dodsoni*	M,F,T,A	R	f
Zanzibar Greenbul *Andropadus importunus*	M,F,T,A	R	
Yellow-bellied Greenbul *Chlorocichla flaviventris*	M,T,A	R	F
Terrestrial Brownbul *Phyllastrephus terrestris*	T	R	F
Northern Brownbul *Phyllastrephus strepitans* *	M,F,A	R	f
Fischer's Greenbul *Phyllastrephus fischeri* *	M,F,T	R	FF
Tiny Greenbul *Phyllastrephus debilis* *	F	R	FF
Eastern Nicator *Nicator gularis*	M,F	R	F
Northern Crombec *Sylvietta brachyura*	M,A	R	
Scaly Babbler *Turdoides squamulata* *	M,T	R	
Rufous Chatterer *Turdoides rubiginosa*	T,A	R	
Wattled Starling *Creatophora cinerea*	A	am	
Rüppell's Starling *Lamprotornis purpuroptera*	M	R	
Black-bellied Starling *Lamprotornis corruscus* *	M		F
Red-tailed Ant Thrush *Neocossyphus rufus*	M	R	FF

Species	Habitat	Migratory Status	Forest Bird Category
African Bare-eyed Thrush *Turdus tephronotus*	A	R	
Common Nightingale *Luscinia megarhynchos*	M	PM	
White-browed Robin Chat *Cossypha heuglini*	M	R	f
Red-capped Robin Chat *Cossypha natalensis*	M,F	am	F
Spotted Palm Thrush *Cichladusa guttata*	M,T,A	R	
Bearded Scrub Robin *Cercotrichas quadrivirgata*	M,F,T,A	R	f
White-browed Scrub Robin *Cercotrichas leucophrys*	A	R	
Pale Flycatcher *Bradornis pallidus*	M,T	R	
Spotted Flycatcher *Muscicapa striata*	M	PM	
Ashy Flycatcher *Muscicapa caerulescens*	M	R	F
Lead-coloured Flycatcher *Myioparus plumbeus*	M	R	f
Eastern Violet-backed Sunbird *Anthreptes orientalis*	A	R	
Collared Sunbird *Hedydipna collaris*	M,F,T	R	F
Olive Sunbird *Cyanomitra olivacea*	M,F,T,W	R	FF
Mouse-coloured Sunbird *Cyanomitra veroxii* *	M,T,W	R	f
Amethyst Sunbird *Chalcomitra amethystina*	M	R	f
Violet-breasted Sunbird *Cinnyris chalcomelas* *	M	R	
Black-necked Weaver *Ploceus nigricollis*	T,A	R	f
Golden Palm Weaver *Ploceus bojeri*	M,A,W	R	
Lesser Masked Weaver *Ploceus intermedius*	A	R	
Village (Black-headed) Weaver *Ploceus cucullatus*	A	R	
Dark-backed Weaver *Ploceus bicolor*	M,F,T	R	F
Red-headed Weaver *Anaplectes melanotis jubaensis* (red Juba race)	M	R	
Red-billed Quelea *Quelea quelea*	A	am	
Fire-fronted Bishop *Euplectes diadematus*	A	R	
Red-cheeked Cordon-bleu *Uraeginthus bengalus*	M	R	
Peters's Twinspot *Hypargos niveoguttatus*	M	R	F
Yellow Wagtail *Motacilla flava*	W	PM	
Grey Wagtail *Motacilla cinerea*	T	PM	F
Golden Pipit *Tmetothylacus tenellus*	A	R	
Yellow-throated Longclaw *Macronyx croceus*	M	R	
Yellow-fronted Canary *Crithagra mozambica*	M	R	
Reichenow's Seedeater *Crithagra reichenowi*	A	R	

Forest-dependent birds

Eight forest specialists (FF) and 29 forest generalists (F) were recorded. Blue-mantled Crested Flycatcher *Trochocercus cyanomelas*, Little Yellow Flycatcher *Erythrocercus holochlorus*, Fischer's Greenbul *Phyllastrephus fischeri*, Black-headed Apalis *Apalis melanocephala* and Olive Sunbird *Cyanomitra olivacea* were regularly recorded. The least observed of the forest specialists were Red–tailed Ant Thrush *Neocossyphus rufus*, Tiny Greenbul *Phyllastrephus debilis* and Forest Batis *Batis mixta*.

Apparently aberrant Red-naped Bush-shrikes

During the November 2013 survey, an apparently aberrant form of Red-naped Bushshrike *Laniarius ruficeps*, race *kismayensis,* was observed at Banahalisi (01°44'S, 41°26'E). The area, characterized by low acacia woodland interspersed with patches of dense scrub on white sand, was located between Mangai village and Kiunga town. Several birds were observed in this habitat. They were black above and white below,

with a prominent white stripe above the eye and a long white patch along the wing. The crown was edged in black, but grey in the centre, with the grey extending to the nape and upper part of the mantle. One bird had a dull rufous area on the grey nape, but the others did not. It seems that the grey of the back typical of *kismayensis* extended in these birds onto the nape in place of the expected red patch (Fig. 3). These birds foraged in bushes, on the ground with Rufous Chatterers *Turdoides rubiginosa*, and in the mid-canopy of acacias. They made several sounds, including a loud crackling, a tac-tac similar to a boubou, and a few musical notes usually answered by a crackling call.

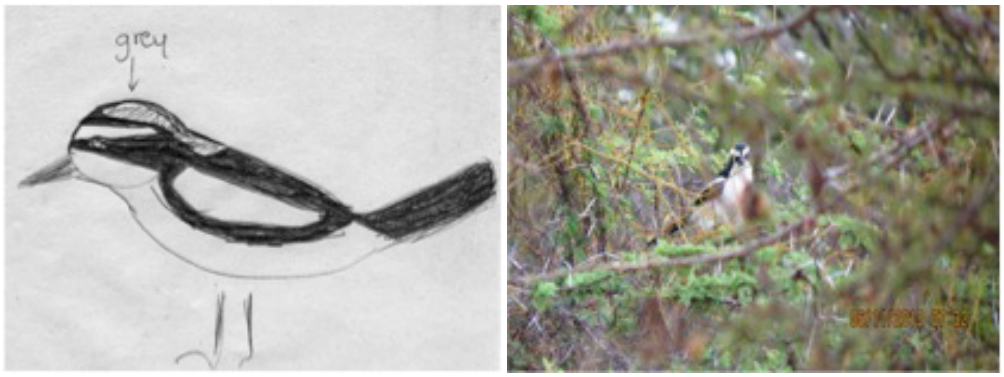

Figure 3. Rough sketch and photograph of Red-naped Bushshrike *Laniarius ruficeps* race *kismayensis* observed at Banahalisi, in acacia woodland between Mangai village and Kiunga town.

We were unable to find an illustration in bird identification guides that exactly matched these birds. *Birds of Africa*, (Fry *et al.* 2000), reveals that whereas the nominate race *ruficeps* from northwest Somalia has a red crown and nape, the other two races, *rufinuchalis* and *kismayensis,* have the crown black and only the nape and hind neck orange-rufous. Most of the birds we observed lacked even this red nape patch.

Discussion

Our study presents the first comprehensive bird survey conducted at Boni-Dodori and highlights the importance of the Boni and Dodori National Reserves for designation as a full IBA. The criteria for designating an IBA include the presence of globally threatened species, or significant bird congregations, or biome-restricted or endemic species (Fishpool & Evans 2001). We confirmed the presence of two globally threatened species in Boni-Dodori, the Southern Banded Snake Eagle and Fischer's Turaco. These species have been recorded in other IBAs along the Kenyan coast (Bennun & Njoroge 1999). Additionally, the Boni-Dodori area recorded 14 East African Coastal Biome species, nearly half of the 30 species of this biome that occur in Kenya (Bennun and Njoroge 1999). Ostrich, Forest Batis and Gorgeous Bushshrike had not been recorded in the Boni-Dodori area in the past and this therefore,represents an extension of their Kenyan range. Data collected during this project (Mwinami *et al*. 2013) has since been used to lift the Boni-Dodori area to full IBA status (Barasa *et al*. 2015), which confirms the importance of these sites for bird conservation.

This survey was conducted in a small section of the Boni-Dodori area, within a period of less than two months in total. A more detailed survey of the interior of this conservation area would yield a more comprehensive checklist of the area's biodiver-

sity. Dodori National Reserve contains important grassland habitat with dense palm trees, which is not found in any other protected area in Kenya. The diverse habitats of Boni-Dodori, though still largely pristine, currently face increasing threats such as habitat burning, which if controlled could safeguard the existing biodiversity. Conservation efforts for these forests should be enhanced to save these threatened and biome-restricted bird species and their ecologically important habitats.

Recommendations

1. Conduct a detailed biodiversity inventory of different habitats within Boni and Dodori National Reserves, Boni and Lungi forests, and the Aweer community land. This would provide more scientific data about the area's biodiversity, cultural information, and local people's utilization of natural resources. This information is crucial for lobbying the government to enhance the protection of these areas.

2. Undertake a comprehensive land tenure and land use mapping of the Boni-Dodori area. Though Boni and Dodori are gazetted as national reserves their boundaries are not clearly defined. Therefore this would include delineating boundaries, defining community areas, and clearly defining biodiversity conservation areas. This could also include mapping the extent of different habitat types.

3. Stakeholders must collaborate to lobby for legal protection of Boni-Dodori and Lungi forests, and Aweer community land. Interested stakeholders include Kenya Wildlife Service, Kenya Forest Service, Zoological Society of London,, Nature Kenya (the East Africa Natural History Society), National Museums of Kenya, World Wide Fund for Nature,, Northern Rangelands Trust, Lamu County, Garissa County and many community livelihood NGOs. These stakeholders should collaborate to focus their efforts on lobbying the government of Kenya to legally protect these sites. Further collaborative fundraising and conservation efforts to save these important coastal forests will likely secure the Boni-Dodori forest system.

4. Improvement of the security situation in the Boni-Dodori area. Research in the Boni-Dodori area and other interventions to ensure that the local community benefits from conservation are dependent on security being improved. At the moment, the area has been declared a danger zone and is under the control of Kenya Defence Forces as they seek to drive Somali militia from the area. It is critical that after the security operation is completed, the Boni-Dodori area reverts to its protected status.

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Appendix 1. Habitat types and identified threats.

Habitat types

We identified five main habitat categories during our survey in Boni and Dodori National Reserves and the Aweer Community Conservancy. The following is a brief description of each and the threats facing these habitats as observed during our survey.

1) ***Mosaic of forest groves, grassland, and Hyphaene palm savanna (M)***

A mosaic of forest groves, grassland, and *Hyphaene* palm savanna, sometimes flooded, on white or grey sand was the most extensive habitat from Hindi to Sankuri Ridge. It can be subdivided into:

(a) Grassland dominated by *Hyphaene* palms and *Andropogon* grass species, with occasional thickets of shrubs or small groves of trees. This grassland is seasonally flooded and the shells of *Bulinus* snails and fresh-water crabs were found in the grassland. This is the most extensive habitat along the road from Hindi to Basuba.

(b) Grasslands without palms, found in patches along the road from Hindi to Kiunga.This grassland is also seasonally flooded.

(c) Mosaic of seasonally flooded grassland interspersed with forest groves, shrub thickets and palm savanna. This was the dominant habitat from Basuba to Sankuri Ridge. In Dodori National Reserve between Basuba and Kiungwe the forest groves were relatively small, whereas east of Mangai village the forest groves were extensive, with some large trees. Trees in the forest groves included *Tamarindus indica, Manilkara sulcata, Afzelia quanzensis, Brachylaena huillensis, Terminalia spinosa, Croton megalocarpoides, Mimusops* sp., *Ficus* sp., *Euphorbia* sp. and large *Acacia* sp.

2) Dry forest with a few tall trees and dense shrub understorey (F)

The dry forest was comprised of a few tall trees and a dense shrub understorey on white or grey sand. The tree species included *Brachylaena huillensis* (Muhugu), *Manilkara sulcata, Oldfieldia somalensis, Afzelia quanzensis*, among others. Dry forest occurred in the following forests and fragments: Pichankwenge forest, Chuka fragment, Tambaya fragment, Humbi fragment and Jilokonadhi. At Jilokonadhi the forest extended further north, but because of the slow progress through the dense understorey we could not survey it all. Overall the habitat structure consisted of trees whose average height was about 30 m and interlaced with lianas. The canopy cover was about 40% with light penetration of about 60%.

3) Dense thicket habitat on red sands

This habitat had shrubs less than 3 m high and scattered trees among bushes growing to 5 m or more. The undergrowth of intertwined shrubs and lianas was thick and difficult to penetrate. It is found on red soils on Sankuri Ridge, which runs north to south. *Fernandoa magnifica* trees with large red flowers and *Ochna* shrubs with yellow flowers grew on the edge of the thicket on Sankuri Ridge.

4) ***Acacia woodland habitats with coastal scrub and scattered baobabs***

An acacia-dominated thicket about 4 m high, with ground either bare or covered with short dry grass. People and animals can easily walk through it. The habitat extends about 7 km along the Hindi-Kiunga road starting from Kiunga. The acacia woodland/ thicket alternates with areas of dense coastal scrub, small circular seasonal wetlands and scattered baobabs *Adansonia digitata*.

5) ***Wetlands, including pools in river channel***

This habitat consisted of both seasonal and permanent wetlands. Wetlands were found in Kibokoni fragment at 01°80′S, 041°17′E and 01°79′S, 041°18′E. These two wetlands were separated by an accumulation of sand and animal grazing fields. Other sites were in Abdimfale fragment, Gogo Fragment and Humbi swamp. In the acacia woodland there were several small circular seasonal wetlands, tapped for water by the local people, but dry at the time of our survey.

Threats to habitats and biodiversity

The main habitat threats during the time of our survey included shifting cultivation, which involves uncontrolled vegetation burning, selective pit sawing, and a lack of a clear formal conservation strategy for these forests. In the ensuing years new threats have emerged, including a land rush triggered by the LAPSSET (Lamu Port South Sudan Ethiopia Transport Corridor) project and the security situation.

1) ***Expanding farming and vegetation burning***

The Aweer or Boni people are mainly of Cushitic origin and in the past subsisted on forest products such as honey, bushmeat, wild plants and fruits for consumption and medicinal purposes. However, they are changing their traditional livelihoods to crop production, and use fire to clear farming areas. Because most of the soils in this area are infertile and mostly sandy, they lose their fertility after a few years leading to the opening of more areas. Cultivated areas were found mostly along the road, especially in Baragoni, Milimani, Basuba, Mangai, Mararani and Kiungwe. Others were encountered in Baure fragment and Basuba fragment. Slash and burn to clear the land for agriculture is increasing in the Boni-Dodori area as people from other ethnic groups move into the area. The community also uses fire to control ticks and to scare away animals such as snakes, mostly within the grassland habitat.

2) ***Illegal logging and pit-sawing***

Cut trees, mainly large hardwoods, were encountered in the forest. The main tool used by loggers was a saw. It was not possible to verify the extent of this threat to dry forests, but most likely it is increasing due to an influx of people from Kilifi and Lamu counties.

3) Overgrazing

The grassland habitats without palms, between Baragoni and Milimani on the Hindi to Kiunga road, were the grazing area for a lot of livestock. Hence, the habitat was heavily grazed and grasses in most portions were also burned as a means of controlling ticks. This habitat had large populations of wild mammals, which must be facing both competition for forage from livestock and the risk of poaching.

Gazetteer

TSC Site name	Reserve	Coordinates
Abdimafale	Dodori	1°75′S, 41°18′E
Acacia woodland/thicket	Boni and Dodori	1°44′S, 41°28′E
Bana Halisi	Boni	1°44′S, 41°06′E
Basuba farms	Boni	1°46′S, 41°02′E
Bauri	Dodori	1°43′S, 40°58′E
Chuka	Dodori	1°47′S, 41°02′E
Dodori grassland	Dodori	1°46′S, 41°02′E
Elwango	Boni	1°45′S, 41°02′E
Gogo	Boni	1°73′S, 41°17′E
Hindi	outside reserves	1°46′S, 41°02′E
Humbi-Boni	Boni	1°45′S, 41°10′E
Humbi-Dodori	Dodori	1°73′S, 41°21′E
Humbi Dried Swamp	Boni	0°66′S, 38°84′E
Humbi Forest	Boni	1°43′S, 41°13′E
Kibokoni A	Dodori	0°18′S, 41°17′E
Kibokoni B	Dodori	1°79′S, 41°18′E
Kilagoni	Dodori	1°45′S, 41°02′E
Mbili Mbili Makame	Dodori	1°83′S, 41°03′E
Mixed thicket	Dodori	1°43′S, 41°22′E
Pichanikwenge	Boni	1°45′S, 41°09′E
Sankari Ridge	Boni and Dodori	1°42′S, 41°22′E
Tambaya	Boni	1°73′S, 41°14′E