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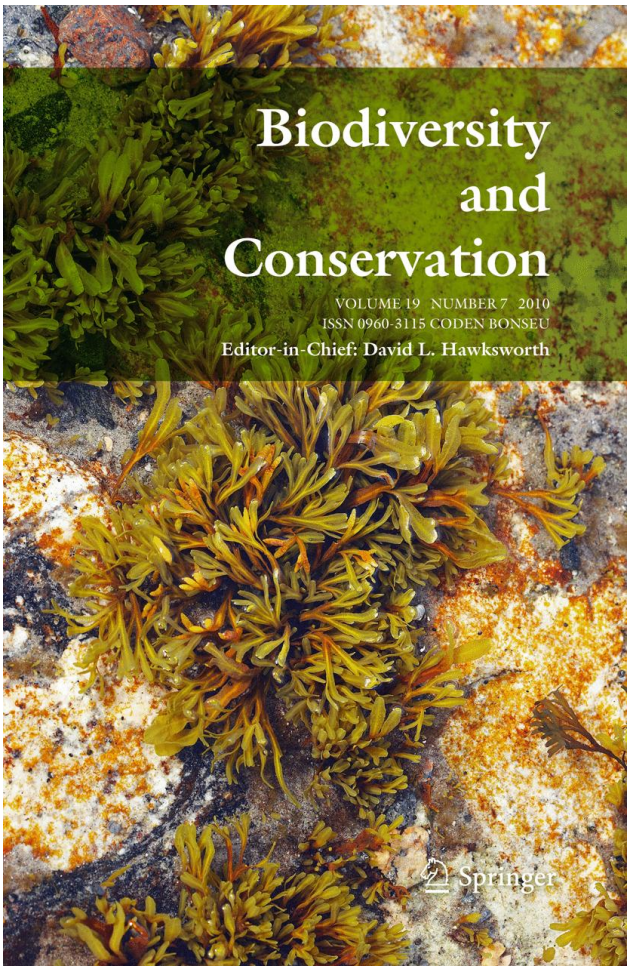

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ORIGINAL PAPER

Angola's central scarp forests: patterns of bird diversity and conservation threats

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Abstract Despite Angola's central scarp forests being recognised as a critical global priority for bird conservation, fine-scale information on threatened bird distributions and patterns of bird diversity are lacking. These data are essential to identify sites within the Western Angola Endemic Bird Area that should be targeted for conservation. First endemic and near-endemic species and subspecies, and species with isolated populations along the Angolan scarp were identified to highlight taxa of greatest priority for conservation and for use in studying the evolutionary origins of the region. Thereafter survey data collected during 2005 from 13 forest sites along the central scarp was analysed. These data show that there are three distinct bird communities across the width of the escarpment, each associated with a distinctive forest type. Of note is the finding that threatened and Near Threatened endemic species occur almost exclusively in the dry forests adjacent to the main escarpment, rather than in the moistest forests found on the main escarpment, which instead are richer in Congo Basin forest birds. Based on these data, summaries of ranges, populations and conservation threats are given for the seven most threatened bird species. Attention is drawn to threats to the habitats of greatest importance to these species. A conservation area network should be established that encompasses the full spectrum of bird diversity described, to ensure survival of current unique taxa and the future evolutionary potential of the area.

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Introduction

Identification of global priority areas for conservation can be achieved with broad-scale and even outdated knowledge of species' distributions (Fjeldså 2007). For example, the Western Angola Endemic Bird Area (EBA) is recognised as a 'critical' priority for bird conservation (Stattersfield et al. 1998), despite no new or fine-scale distributional data being collected between the early 1970s and 2003 (Dean 2000, 2001). However, while such data are sufficient to identify regions of high priority based on species' ranges, finer-scale data on ecological patterns, including local distribution patterns and habitat preferences, are required to identify key sites for conservation within priority areas (Fjeldså 2007).

The Western Angola EBA is home to 14 range-restricted bird species, including five Endangered, one Vulnerable, one Data Deficient and two Near Threatened species (Stattersfield et al. 1998; BirdLife International 2008; collectively, 'endemic species of global conservation concern'). Two key forest habitats form the core of the region: the tropical forests of the Angolan escarpment (hereafter 'scarp') and Afromontane forest of the Bailundu Highlands (Collar and Stuart 1988). The scarp itself is recognised as an important centre of bird speciation and endemism, as well as a biogeographic barrier driving bird speciation (Hall 1960), and is in critical need of conservation attention (Hawkins 1993; Stattersfield et al. 1998). Besides the range-restricted species that occur in this EBA, several near-endemic species, endemic subspecies and species with isolated populations occur here (Hall 1960). Near-endemic species are of interest because they may have evolved here despite their presently wider distribution. Subspecies can be regarded as incipient species, hence endemic subspecies have the potential to further differentiate into endemic species if barriers to interbreeding persist, most likely where subspecies are isolated from congeneric taxa (Kopp and Frank 2005). Finally, because geographic isolation (allopatry; Mayr 1942, 1963) is the mechanism for the most common mode of speciation (Coyne and Orr 2004), especially in birds (Price 2008), isolated populations hold further evolutionary potential. In summary, conservation of habitats associated with the scarp is important not only for preservation of current unique diversity, but also to ensure future evolutionary possibility (Mace and Purvis 2008).

Despite this, the scarp forests have been sparsely surveyed; the majority of bird records along the central scarp come from the area surrounding Gabela (previously Amboim; Dean 2000), and the ranges of all key bird species are poorly known. Some species, most notably Pulitzer's Longbill *Macrosphenus pulitzeri* and Grey-striped Francolin *Pternistis griseostriatus*, appear to have discontinuous distributions along the length of the scarp, but this could be an artefact of incomplete sampling. Political instability and war in Angola between 1974 and 2002, and subsequent difficulties with carrying out fieldwork here, halted collection of recent and fine-scale data required for identifying key sites within the Western Angola EBA, and stifled the execution of any conservation plans (Hawkins 1993). Recently some new information has been provided on threatened species (Ryan et al. 2004; Şekercioğlu and Riley 2005; Mills and Dean 2007), although the majority of these data come from only two sites along the Angolan scarp (Kumbira Forest and Bango). As yet, no part of the central scarp is formally protected, despite former proposals to do so (Huntley

1974a, b) and the current widespread threats of slash-and-burn agriculture and charcoal production to remaining habitat (Hawkins 1993; Ryan et al. 2004).

In order to draw attention to the central scarp forests and their significant bird taxa, and improve the conservation of these birds, this paper aims to: (i) identify key taxa associated with the Angolan scarp, (ii) investigate fine-scale patterns of diversity within the central scarp region, (iii) update knowledge of distributions, habitat preferences, abundances and threats facing endemic species of global conservation concern that occur along the scarp, and (iv) make conservation recommendations that encompass the full spectrum of diversity and evolutionary potential. Survey results from 2005 (details below), plus records from a visit in November 2008, other published data (e.g. Vaz Pinto 2002) and records based on skins in the Lubango Bird Skin Collection (Mills et al. 2009) are used to update ranges and abundances of threatened species.

Methods

Study area

The scarp of Angola runs north–south, parallel to the coast. To the north of the Kwanza River the coastal plain is broad and the slope of the scarp gradual, whereas south of the Kwanza River the coast is narrower (50–100 km in width) and the scarp steep and well-defined (Fig. 1; Hall 1960). The sudden rise in altitude and close proximity to the ocean results in moisture-laden, westerly winds from the cold Benguela current being trapped against the scarp, in the form of clouds, mist and light rain. Additional high summer rainfall from the east results in very mesic conditions, allowing forest and thickets to develop between the drier habitats of the coastal plain and woodland-covered inland plateau. These forests are an impoverished outlier of the Guinea-Congolian forests that extend southwards along the scarp and spill over to the coastal plain along some of the larger rivers, such as the Kwanza (Hall 1960; Huntley and Matos 1994).

The northern scarp forests are poor in endemic bird taxa (Braun's Bushshrike *Laniarius brauni* being the only endemic confined to this area) but relatively diverse in Congo forest species. This is probably a consequence of gene flow preventing differentiation between northern scarp and Congo Basin populations due to the higher geographic connectivity of these forests. Divergence in the face of gene flow is further prevented by the habitat similarities: the northern scarp forests are moister than those of the central scarp, thus being more suitable for Congo Basin species. Forests become drier and more fragmented as one moves southwards along the scarp (Airy Shaw 1947), with the forests south of the Kwanza River supporting less diverse forest bird communities but with a richer diversity of endemic taxa. Populations of Grey-striped Francolin, Pulitzer's Longbill and several other forest species are reported from as far south as the Chongoroi area (13°34′ S; Dean 2001). The highest diversity of endemics occurs on the central scarp, in the vicinity of Gabela (Dean 2001). This area stretching from the Kwanza River in Bengo Province in the north (9°30′ S) through the entire length of Cuanza Sul Province to the border with Benguela Province in the south (11°50′ S), and encompassing the Seles and Amboim forest types of Gossweiler and Mendonça (1939), is the region covered in this study.

Overlaid upon this southward increase in aridity along the scarp is a finer-scale moisture pattern that runs east–west across its width, probably a result of topography and altitude. At the foot of the scarp, and for c. 10–15 km west of this, the climate is much drier and warmer than on the scarp itself. On relatively flat, sandy terrain, between 250 and 300 m

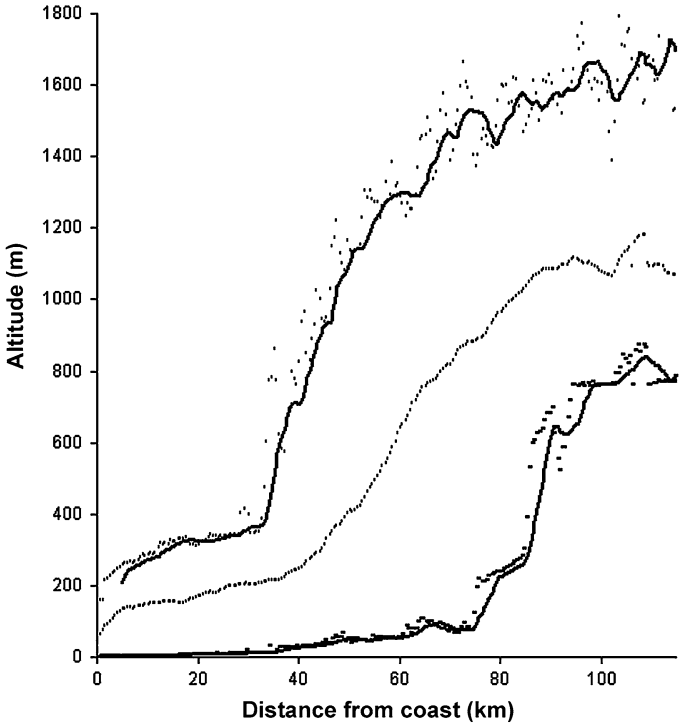


Fig. 1 Plot of altitude (m) eastwards from the coast, along the same line of latitude, for a 168 km section of the Angolan scarp between 10°34′ S and 12°06′ S. Sixteen 90 m pixels are amalgamated into 360 m pixels by averaging. Horizontal strips ($n = 465$) are taken spaced at 360 m intervals to calculate average (*middle line*), minimum (*bottom line*) and maximum (*top line*) altitudes at distances from the coast at 360 m intervals. A 10-point-interval moving average line is fit to minimum and maximum values. Source data come from the Shuttle Radar Topography Mission digital elevation model from the Global Land Cover Facility, www.landcover.org

altitude (locally up to 500 m altitude), there is a mosaic of dense thickets and patches of dry forest interspersed with patches of grassy savanna mostly along depressions. Baobabs *Adansonia digitata* and *Sterculia* sp. are dominant tree species, and other tropical savanna species such as knobthorn *Acacia nigrescens* and jackal berry *Diospyros mespiliformis* are common. To the east, the climate becomes moister and cooler. On the main, steepest part of the scarp, between 500 and 800 m altitude (in some areas up to 1000 m), the habitat consists of tall, very moist forest with a fairly open under-storey. It is these forests that appear to be of Congolian origin, with dominant tree species including *Celtis* sp. and *Albizia glaberrima* (Huntley and Matos 1994). The climate is particularly suitable for coffee production and large areas were converted into shade-coffee plantations before 1970; introduced South American shade trees (*Inga* and *Erythrina* spp.) are common and are sometimes locally dominant. Further east still, above and in hilly country to the east of the main scarp (mostly >1000 m altitude), the climate becomes drier and cooler. Forests here are more stunted and densely tangled than on the main scarp, although tree species composition appears to be similar, with *Albizia* being a common genus. These forests lack any of the dominant species found at the foot of the scarp. Due to variances in topography

along the length of the scarp, the exact altitude of transition from one forest type to another varies, so altitudes mentioned here should be regarded as guidelines.

I hypothesised that this east–west variability in moisture and associated structural and compositional differences in forest habitats influences the pattern of bird distribution and community composition (Crowe and Crowe 1982). Based on this, I predicted that forest bird communities from various sites along the scarp form distinct clusters based on similarity in species composition, which relate to the habitat differences outlined above. Understanding the distribution patterns and habitat preferences of the scarp-associated birds is vital for their conservation.

Bird communities: sampling and analysis

In order to identify key bird taxa of the Angolan scarp, all taxa occurring here were evaluated qualitatively, based on *The Birds of Africa* series, Dean (2000) and Sinclair and Ryan (2003), according to the following criteria: (i) degree of distributional association with the scarp, (ii) habitat preference: forest or non-forest, and (iii) endemism: Angolan endemic species, near-endemic species, endemic sub-species or isolated population. Nomenclature follows Gill et al. (2009). This was done to identify key taxa for conservation and for use in the study of the evolution of the biological origins of the region. While I recognise that country endemism has little biological meaning, the Western Angola EBA, which does hold biological significance, falls entirely within the political boundaries of the country. Furthermore, for conservation purposes, country endemism is important because conservation of endemic species relies on a single political system. Due to lack of fine-scale distributional information of both birds and habitats, assignment of taxa to categories of distributional association, habitat preference and endemism are somewhat qualitative.

To study finer-scale patterns of bird diversity along the central scarp, field surveys were conducted during Aug–Oct 2005. Bird species lists were compiled for 13 sites along the central scarp (Fig. 2), located between 09°37′ S and 11°49′ S and ranging in altitude from 290 to 1250 m (Table 1). All sites were visited for 1.5–3.0 days and were in a narrow altitudinal range (<200 m), except for Kumbira Forest, which ranged from 750 to 1250 m and was surveyed for 10 days. Total species lists were compiled for each site on a daily basis.

To test the prediction that bird communities from different forest sites form distinct clusters based on their similarity in species composition that are related forest habitat, these data were summarised into a presence/absence matrix of 13 sites and 91 forest bird species (Appendix A). Species not associated with forests or thickets are excluded, except where they are endemic or near-endemic to the Western Angola EBA, since forest degradation has allowed grassland and savanna species, which are not indicative of forest type, to penetrate many previously forested areas. Based on these data, a similarity matrix of standardised Euclidian distance was constructed using Primer 5 (Primer-E Ltd. 2001), thus taking into account both joint presence and absence, and controlling for species richness. A dendrogram was drawn by cluster analysis with 'group average' amalgamation (Fig. 3). The robustness of clusters of sites identified in the dendrogram was tested using Analysis of Similarities (ANISOM; Clarke 1993; Okasen 2009).

In order to identify individual species that were indicative of clusters, observed frequencies of species (i.e. number of sites at which present) in each cluster were compared to expected frequencies assuming an even distribution across all clusters. For each species, expected frequencies for each cluster were computed as [the mean rate of occurrence

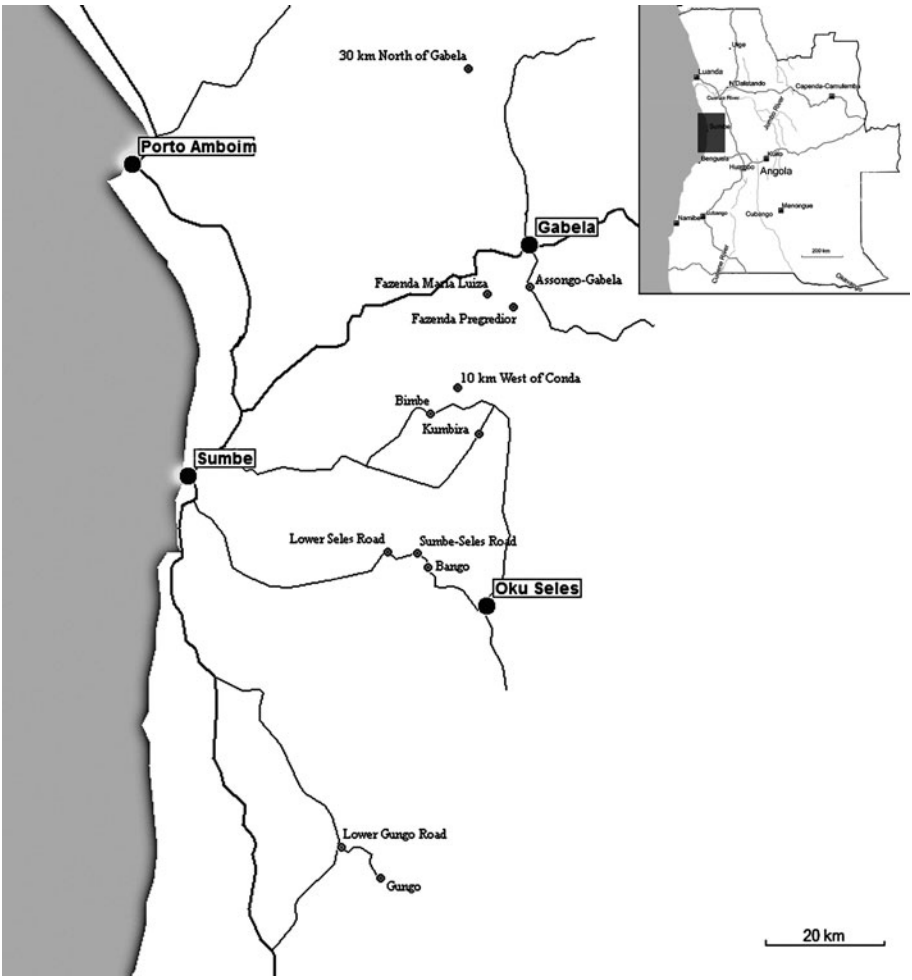


Fig. 2 A map of the study area, showing 12 of the 13 sites surveyed during Aug–Oct 2005, along with the larger towns and roads of the area. The last site is Kissama, to the north of the area (see Table 1 for details). Placement of the study area within Angola is indicated by the shaded area on the map in the *top right corner*

across all sites] * [number of sites in cluster]. A Chi-squared Goodness of Fit test was used to identify species with biased distributions. Because of small sample size ($n = 12$ sites) I tested for goodness of fit at the 75% significance level, in order to draw attention to species potentially defining communities. Because Kumbira falls outside the three main clusters identified, only 12 sites are used in these analyses.

Results

Key bird taxa

Forty-seven key bird taxa meet the criteria of being endemic to, being near-endemic to, or having isolated populations along the Angolan scarp (Table 2). Due to scarcity of

Table 1 Geographic position (degrees and minutes, south and east), altitude (m), habitat description and threats to habitats for the 13 forest sites surveyed during this study, arranged according to geographic position (north–south)

Locality	Habitat	Threats
Kissama (09°37′, 13°45′, 300 m)	Thickets of dry *Adansonia/Sterculia*-dominated forest, interspersed with grassy savanna patches	Some small-scale agricultural plots and charcoal production
30 km North of Gabela (10°35′, 14°17′, 700–800 m)	Fairly tall, moist forest	Slash-and-burn agriculture; most of under-storey removed by coffee farming
Assango-Gabela (10°56′, 14°24′, 900–1050 m)	Dry, stunted and very dense forest	Some slash-and-burn agriculture and previous coffee farming
Fazenda Maria Luiza (10°56′, 14°18′, 600–700 m)	Tall, very moist forest	Highly converted: subsistence agriculture and old coffee plantations
Fazenda Pregredior (10°57′, 14°20′, 750–800 m)	Tall, moist forest	Highly converted: subsistence agriculture and old coffee plantations
10 km West of Conda (11°04′, 14°15′, 850–900 m)	Tall, very moist forest	Highly converted: subsistence agriculture and old coffee plantations
Bimbe (11°07′, 14°13′, 290–370 m)	As for Kissama	Some subsistence agriculture; charcoal production a big threat currently
Kumbira (11°08′, 13°17′, 750–1250 m)	Varied: from tall, very moist forest to drier, stunted and very densely tangled forest	Varied: largely under subsistence agriculture and old, overgrowth coffee plantations; some pristine forest
Sumbe-Seles Road (11°19′, 14°12′, 600–800 m)	Tall, moist forest	Some subsistence agriculture and old coffee farms
Lower Seles Road (11°19′, 14°12′, 300–500 m)	As for Kissama, but moister and denser thicket, but many large trees removed	Heavily impacted by agriculture, both subsistence and old commercial
Bango (11°21′, 14°11′, 950–1060 m)	As for Assango-Gabela, although slightly moister and taller forest	Highly converted: subsistence agriculture and old coffee plantations
Lower Gungo Road (11°46′, 14°08′, 300–350 m)	As for Kissama	Little human disturbance, although intense charcoal production nearby
Gungo (11°49′, 14°08′, 900–1050 m)	As for Assango-Gabela	Highly converted: subsistence agriculture and old coffee plantations

information of bird distributions along the length of the scarp, some species that might occur continuously to the Congo Basin may appear to have isolated populations on the scarp; further, the validity of certain sub-species is questionable and warrants further investigation. Attention is drawn to these taxa in Table 2.

Of the 47 key bird taxa identified, Gabela Akalat *Sheppardia gabela*, Pulitzer's Longbill, Braun's Bushshrike, Gabela Bushshrike *Laniarius amboimensis* and Gabela Helmetshrike *Prionops gabela* are currently classified as Endangered, whereas Monteiro's Bushshrike *Malaconotus monteiri* is Data Deficient, and Grey-striped Francolin and

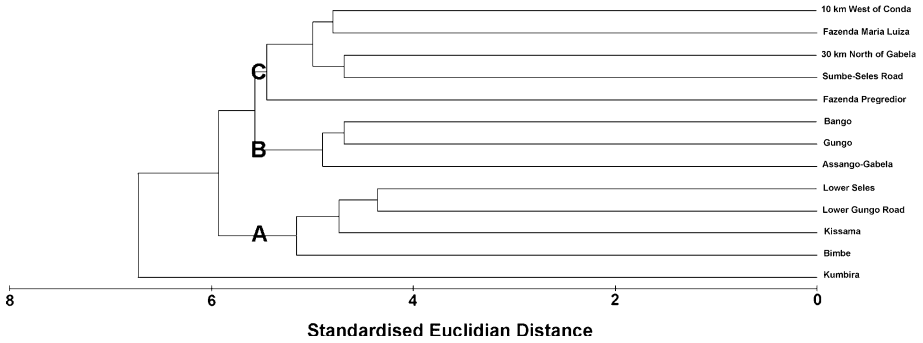


Fig. 3 A dendrogram of the 13 sites surveyed, based on cluster analysis of bird communities. Presence/absence data were used to calculate standardised Euclidian distance, and sites joined by 'group average' amalgamation. Kumbira was basal to all other sites, probably because it was surveyed for longer and covers a wider range of altitudes and habitats than other sites. The identification of the three clusters (A, B and C), excluding Kumbira, was statistically significant (ANISOM: $R = 0.566$, $P < 0.003$)

White-fronted Wattle-eye *Platysteira albifrons* are Near Threatened (BirdLife International 2008). Other endemic and near-endemic species are also partly dependent on these forests for their conservation. These are Red-crested Turaco *Tauraco erythrolophus*, Hartert's Camaroptera *Camaroptera harterti*, Pale-Olive Greenbul *Phyllastrephus fulviventris*, Angola Batis *Batis minulla*, Ludwig's Double-collared Sunbird *Cinnyris ludovicensis*, Landana Firefinch *Lagonosticta landanae* and Red-backed Mousebird *Colius castanotus*. The endemic Golden-backed Bishop *Euplectes aureus*, Angola Slaty Flycatcher *Dioptrornis brunneus* and the Near Threatened Angola Cave Chat *Xenocopsychus ansorgei* also occur along the scarp (Ryan et al. 2004), although do not depend on the scarp forests for their conservation. The latter two are montane species, whereas the bishop occurs mostly on the coastal plain (Dean 2000).

Fine-scale patterns in bird communities

As predicted, surveyed sites formed distinct clusters based on their similarity in bird community composition and related to habitat (Fig. 3). In the cluster analysis, Kumbira forest was basal to all other sites, probably because it spans a greater range of altitudes (750–1250 m) than any other site and is consequently not typical of any one forest bird community. Excluding Kumbira, three statistically significant clusters of sites were identified based on their bird species assemblages; dissimilarity of sites within the each cluster was lower than dissimilarity of sites between clusters (ANISOM: $R = 0.566$, $P < 0.003$). Cluster A is composed of four low-altitude sites (<500 m) situated at the base of and below the scarp. Cluster B is composed of three high-altitude sites (>1000 m) above the main scarp, and Cluster C is composed of five mid-altitude (500–1000 m) sites on the main scarp. Each cluster is associated with one of the habitat types outlined in 'Study area'. The bird communities of Cluster A were the most distinctive.

Twenty-four species showed biased distributions across the three clusters ($\chi^2 > 2.77$, df = 2, $P < 0.25$; Table 3). Cluster A is characterised by the presence of Gabela Helmetshrike, Blue-breasted Kingfisher *Halcyon malimbica* and African Barred Owlet *Glaucidium capense*, with the co-occurrence of the endemic Golden-backed Bishop in adjacent savanna patches (Table 2). Elliot's Woodpecker *Dendropicos elliotii*, Olive

Table 2 Bird taxa for conservation and research along the Angolan scarp, listed in order of priority

Species name	D	H	T
Gabela Akalat *Sheppardia gabela* EN	V	F	E
Pulitzer's Longbill *Macrosphenus pulitzeri* EN	V	F	E
Gabela Bushshrike *Laniarius amboimensis* EN*	V	F	E
Gabela Helmetshrike *Prionops gabela* EN	V	F	E
[Braun's (Orange-breasted) Bushshrike *Laniarius brauni*] EN*	V	F	E
Monteiro's Bushshrike *Malaconotus monteiri* DD	V	F	E
Grey-striped Francolin *Pternistis griseostriatus* NT	V	F	E
White-fronted Wattle-eye *Platysteira albifrons* NT	V	F	N
Red-crested Turaco *Tauraco erythrolophus*	V	F	E
Hartert's Camaroptera *Camaroptera harterti*	V	F	E
Naked-faced Barbet *Gymnobucco calvus vernayi*	V	F	S
[White-throated Greenbul *Phyllastrephus albigularis viridiceps*]*	V	F	S
Brown-chested Alethe *Pseudalethe poliocephala hallae*	V	F	S
Forest Scrub Robin *Erythropygia leucosticta reichenowi*	V	F	S
[Banded Prinia *Prinia bairdii heinrichi*]*	V	F	S
Black-throated Apalis *Apalis jacksoni albimentalis*	V	F	S
[Buff-throated Apalis *Apalis rufogularis angolensis*]*	V	F	S
Buff-throated Apalis *Apalis rufogularis brauni**	V	F	S
Yellow-bellied Wattle-eye *Dyaphorophyia concreta ansorgei*	V	F	S
Brown Illadopsis *Illadopsis fulvescens dilutior*	V	F	S
Dusky Tit *Parus funereus gabela*	V	F	S
Red-headed Malimbe *Malimbus rubricollis praedi*	V	F	S
Lowland Masked Apalis *Apalis binotata*	V	F	P
[Black-necked Wattle-eye *Dyaphorophyia chalybea*]	V	F	P
[Scaly-breasted Illadopsis *Illadopsis albipectus*]**	V	F	P
Mackinnon's Shrike *Lanius mackinnoni*	V	F	P
[Many-coloured Bushshrike *Chlorophoneus multicolour batesi*]	V	F	P
Brown-capped Weaver *Ploceus insignis*	V	F	P
Red-faced Crimsonwing *Cryptospiza reichenovii reichnovii*	V	F	P
Green Twinspot *Mandingoa nitidula schlegeli*	V	F	P
Pale-olive Greenbul *Phyllastrephus fulviventris*	H	F	N
Angola Batis *Batis minulla*	H	F	N
Elliot's Woodpecker *Dendropicos elliotii gabela*	H	F	S
African Yellow White-eye *Zosterops senegalensis heinrichi**	H	F	S
Pink-footed Puffback *Dryoscopus angolensis angolensis*	H	F	S
Grey-headed Nigrita *Nigrita canicapillus angolensis***	H	F	S
Crested Guineafowl *Guttera pucherani verreauxi*	H	F	P
Olive Long-tailed Cuckoo *Cercococcyx olivinus***	H	F	P
Dusky Long-tailed Cuckoo *Cercococcyx mechowi***	H	F	P
African Broadbill *Smithornis capensis albigularis***	H	F	P
Dark-backed Weaver *Ploceus bicolour amaurocephalus*	H	F	S
Red-headed Bluebill *Spermophaga ruficapilla ruficapilla***	H	F	P
Red-backed Mousebird *Colius castanotus*	H	N	E

Table 2 continued

Species name	D	H	T
Bubbling Cisticola *Cisticola bulliens**	H	N	N
Ludwig's Double-collared Sunbird *Cinnyris ludovicensis**	H	N	S
Landana (Pale-billed) Firefinch *Lagonosticta landanae**	H	N	N

Species names are followed by IUCN status. Taxa in square parentheses were not recorded during surveys; most are recorded only in the northern scarp forests. Column headings as follows: D = distributional association with scarp: V = very high, H = high; H = habitat: F = forest, N = non-forest; T = taxonomy: E = species endemic to Western Angola EBA, N = near-endemic species, S = endemic or near-endemic subspecies, P = isolated population

* Validity of taxon requires examination, as current treatment may be questionable

** Putative isolation of population likely to be an artefact of incomplete sampling

Woodpecker *Dendropicos griseocephalus*, Lowland Masked Apalis *Apalis binotata*, Pulitzer's Longbill, Ludwig's Double-collared Sunbird and Red-faced Crimsonwing *Cryptospiza reichenovii* occurred more often in Cluster B than could be expected by chance. Gabela Bushshrike and Gabela Akalat were also recorded only above 730 m, although both occurred in Clusters B & C. The following species occurred more often in the drier forest types (Clusters A & B): Monteiro's Bushshrike, White-fronted Wattle-eye, Rufous-tailed Palm Thrush *Cichladusa ruficauda* and Square-tailed Drongo *Dicrurus ludwigii*. Cluster C was characterised by the more regular occurrence of wide-spread Afrotropical species such as Great Blue Turaco *Corythaeola cristata*, Yellow-throated Tinkerbird *Pogoniulus subsulphureus*, Brown-chested Alethe *Pseudalethe poliocephala* and Buff-spotted Woodpecker *Campethera nivosa*. Combined, the seven endemic species of global conservation concern occurred significantly more often in drier forests (Clusters A & B) than in wet forests (Cluster C) ($\chi^2 = 4.58$, df = 1, $P < 0.05$).

Distributions and abundance of select species

The distributions of most of the endemic species of global conservation concern, the species of greatest conservation priority, are poorly known with little data collected between the early 1970s and 2003 (Dean 2000, 2001). Here I outline current ranges based on new and old data, and revised range estimates. The English and scientific name of each species is followed by its status, according to International Union for Conservation of Nature (IUCN), and previous range and population size as estimated by BirdLife International (2008).

Grey-striped Francolin Pternistis griseostriatus (Near Threatened, 17300 km^2; 10,000–19,999)

The only endemic species of global conservation concern to be found throughout the scarp zone, in all three bird community clusters. Previously this species was thought to occur in several isolated pockets, one in the Chongoroi area, Benguela Province, another around Gabela, and a third on the Kwanza River. Records from this study and from Kissama National Park (Vaz Pinto 2002) show that the species has a continuous range of c. 45000 km^2 (Fig. 4), larger than previously thought. The species is thought to occur in gallery forest, moist forest along the scarp and thickets associated with mountainous areas

Table 3 Species with an uneven distribution among the three clusters of bird communities (Chi-square: $\chi^2 > 2.77$, df = 2, $P < 0.25$)

Species	Cluster			χ^2
	A	B	C	
Great Blue Turaco *Corythaeola cristata*	0	0	2	2.80
Brown-chested Alethe *Pseudalethe poliocephala*	0	0	2	2.80
Buff-spotted Woodpecker *Campethera nivosa*	0	0	3	4.20
Elliot's Woodpecker *Dendropicos elliotii*	0	2	0	6.00
Olive Woodpecker *Dendropicos griseocephalus*	0	2	0	6.00
Lowland Masked Apalis *Apalis binotata*	0	2	0	6.00
Pulitzer's Longbill *Macrosphenus pulitzeri*	0	2	0	6.00
Red-faced Crimsonwing *Cryptospiza reichenovii*	0	2	0	6.00
Gabela Akalat *Sheppardia gabela*	0	2	1	3.13
Blue-headed Crested Flycatcher *Trochocercus nitens*	0	2	1	3.13
Yellow-billed Barbet *Trachyphonus purpuratus*	0	2	5	3.86
Gabela Bushshrike *Laniarius amboimensis*	0	3	2	4.12
African Blue Flycatcher *Elminia longicauda*	0	3	3	3.60
Black-throated Apalis *Apalis jacksoni*	0	3	5	4.00
Yellow-throated Tinkerbird *Pogoniulus subsulphureus*	1	0	4	3.28
Hairy-breasted Barbet *Tricholaema hirsute*	1	0	4	3.28
Square-tailed Drongo *Dicrurus ludwigii*	1	3	0	5.75
Yellow-bellied Wattle-eye *Dyaphorophyia concreta*	1	3	1	3.28
African Barred Owlet *Glaucidium capense*	2	0	0	4.00
Blue-breasted Kingfisher *Halcyon malimbica*	2	0	0	4.00
Gabela Helmetshrike *Prionops gabela*	3	0	0	6.00
Golden-backed Bishop *Euplectes aureus*	3	0	0	6.00
Rufous-tailed Palm Thrush *Cichladusa ruficauda*	3	0	1	3.35
White-fronted Wattle-eye *Platysteira albifrons*	4	2	0	4.67

Values in columns A–C give the number of forest sites within each cluster from which the species was recorded

throughout its range. Although it was recorded only three times during transects, it was observed to be locally fairly common. The species is very hard to see and is best detected by call, which it often delivers after dusk and before dawn.

Gabela Helmetshrike Prionops gabela (Endangered; 4600 km^2; 1,000–2,499)

Previously known to occur in the drier, higher-altitude forests above the main scarp near Assango, from where several specimens were collected in the 1950s (Rand 1957; Heinrich 1958; Hall 1960), and from a single specimen (Hall 1960) and two sight records between Chio and 40 miles south of Mumbondo at c. 300 m altitude (Dean 1974, P. vaz Pinto, pers. comm.). There are no records from between 300 and 1000 m altitude on the main scarp, despite new knowledge of its calls (Mills 2007, 2009) and more detailed surveys in this study. During this study the species was recorded on ten occasions, always in undisturbed, dry forest at the foot of the scarp (Cluster A). There are no recent records from near Assango, or anywhere above 300 m altitude. Records from this study shows that it occurs

Fig. 4 Localities from which threatened endemic birds have been recorded from before 1974 (*triangles*) and after 2002 (*circles*). **a** Grey-striped Francolin (Near Threatened) occurs continuously along the length of the scarp, and occurs in all forest types. **b** All recent records of Gabela Helmetshrike (Endangered) come from dry forest at 250–300 m altitude along the base of the scarp, with a few old records in the Gabela/Assango area above 1000 m altitude. **c** Monteiro's Bushshrike (Data Deficient) occurs along a 400 km stretch of scarp forests, favouring drier forest on either side (>800 and 250–300 m) of the main scarp. **d** The range of Gabela Bushshrike (Endangered) is larger than previously thought, although it is restricted to the drier, higher-altitude forests

in a narrow belt of dry forest below the main scarp at about 300 m altitude, which is c. 10 km in width, from the Minguenge River in Kissama National Park in the north to at least the Gungo area in the south, a stretch c. 250 km long. Based on this, its current range size is estimated to be c. 2500 km^2 (Fig. 4), smaller than estimated by BirdLife International (2008). Importantly, it should be noted that the habitats it needs are being altered by human activity and are currently damaged at a rapid rate by charcoal production and small-scale agriculture, even within the boundaries of Kissama National Park. Furthermore, even within prime habitat, the species is uncommon to rare; the population estimate of BirdLife International (2008) seems appropriate.

Monteiro's Bushshrike Malaconotus monteiri (Data Deficient; no estimate)

Previously very poorly known and currently treated as Data Deficient, largely due to problems with differentiating from the very similar Grey-headed Bushshrike *M. blanchoti*. For example, of 14 specimens listed under *monteiri* in the American Museum of Natural History database, inspection of skins revealed that only one specimen actually belonged to *monteiri*, and the other 13 to *blanchoti* (T. Trombone and P. Sweet 2009, in litt.). Locations of correctly identified specimens are from between the Dande River (probably near Caxito) in the north and Canjala (Egito) in the south, a stretch of c. 400 km (Fig. 4; Mills, unpublished data). There are also sight records from Kumbira Forest (Ryan et al. 2004). Records from Mount Moco, Quipeio and Chitau all belong to Grey-headed Bushshrike (unpublished data), and recent Cameroonian records (Andrews 1994; Williams 1998) should be considered as unconfirmed (Fry et al. 2000). During this study, Monteiro's Bushshrike was found at eight of 13 sites visited. It occurs only in drier forest above (>800 m) and below (<300 m) the main scarp, but not in the moister forest on the main scarp. The species can be locally fairly common, although territories appear to be quite large. Currently, it is known to occur along a c. 400 km stretch of scarp. Assuming an average width of suitable habitat of 20 km throughout its range, this gives an estimated range size of c. 8000 km^2.

Gabela Bushshrike Laniarius amboimensis (Endangered; 310 km^2; 250–999)

Gabela Bushshrike was previously thought to occur in a small area around Gabela. During this study it was found from 30 km north of Gabela to as far south as Gungo, with a further specimen from Egito in the Lubango Bird Skin Collection (pers. obs.) (Fig. 4). All records of this species come from drier forest above the main scarp (>730 m altitude). Assuming a width of 10 km of suitable habitat, this species has a range of c. 1800 km^2, almost six times larger than previously thought. Within its range it can be fairly common, and it is tolerant of a moderate degree of forest disturbance, being quite common in old, overgrown coffee plantations and secondary thicket provided there is a dense under-storey and lower canopy. However, large parts of its range are being converted by slash-and-burn agriculture, where the entire under-storey is removed, making the habitat completely unsuitable.

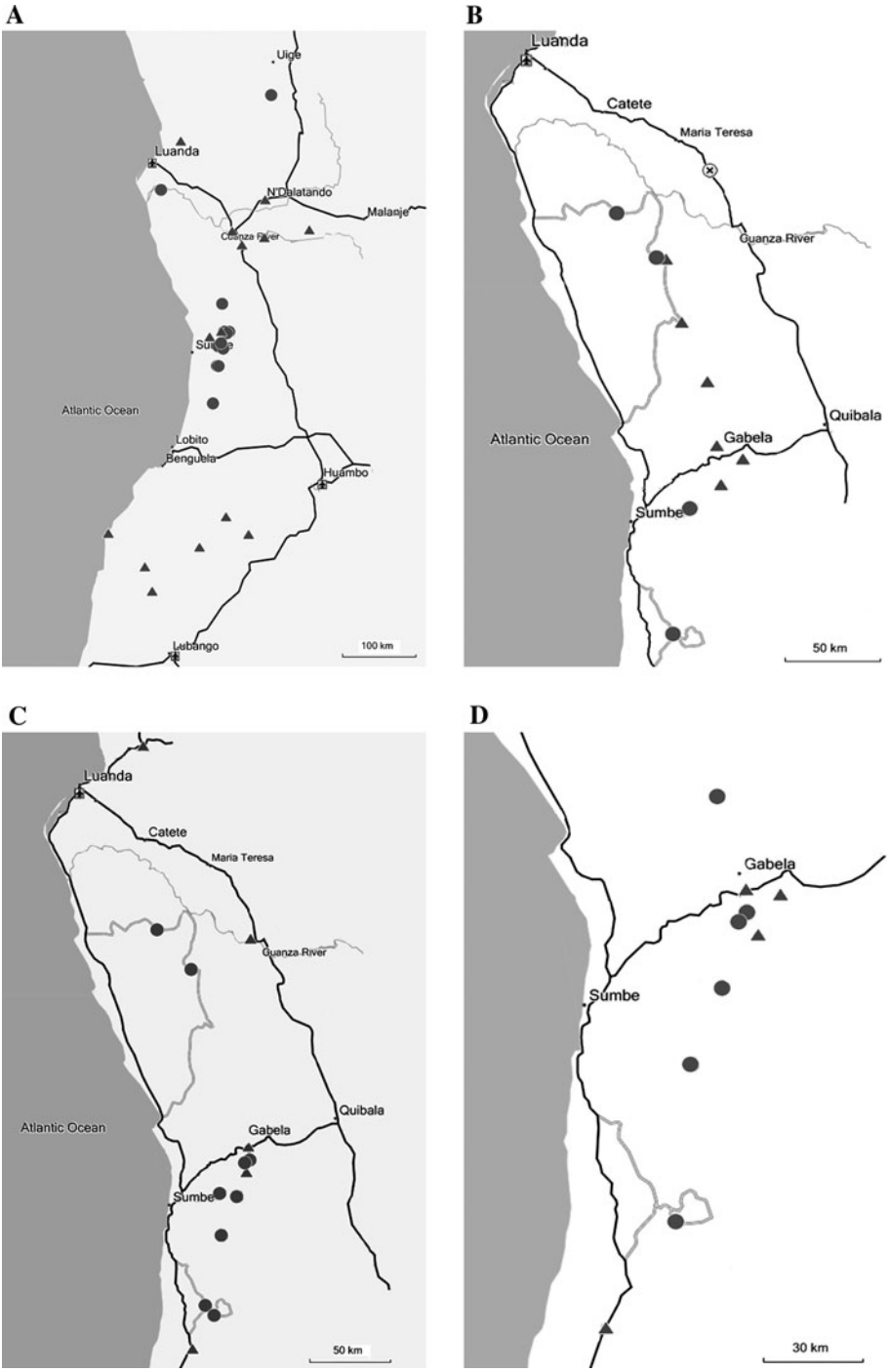


Fig. 5 Localities from which threatened and Near Threatened endemic birds have been recorded from before 1974 (*triangles*) and after 2002 (*circles*). **a** Pulitzer's Longbill (Endangered) occurs continuous along a 370 km stretch of the scarp, favouring dry forest and dense thickets above 800 m altitude. **b** Gabela Akalat (Endangered) has the smallest range of all endemics. **c** White-fronted Wattle-eye (Near Threatened) has a fairly wide distribution, from Soyo at the mouth of the Congo River to at least as far south as the Gungo area near the Cuanza Sul/Benguela boundary ▶

Pulitzer's Longbill Macrosphenus pulitzeri (Endangered; 1400 km^2; 250–999)

According to Dean (2000) this species was known from only near Seles and Chongoroi, although the locality Camucuio, listed in Dean (2000), is 100 km south of Chongoroi. In 2003 it was discovered at Kumbira Forest (Ryan et al. 2004), where during this study seven pairs were found during 10 days of surveys. In Nov 2008 four records from near Conda village extended the range another 5 km northwards. The species was common in dry forest and secondary growth at Bango and Gungo, with 13 pairs recorded along a 4.16 km long and 100 m wide transect at Bango. It is likely that its distribution is more-or-less continuous within its range, although it is restricted to the higher, drier thickets and forests, including secondary forest and old, abandoned coffee plantations, over the main scarp (>800 m altitude). It occurs over a length of c. 370 km of scarp, in a width of c. 10 km, giving it a range size of c. 3700 km^2 (Fig. 5), larger than the estimate of BirdLife International (2008). Fortunately it can be common in secondary growth, and is probably less under threat of extinction than previously thought. Given its local abundance, we can safely assume that there are more than 1,000 individuals.

Gabela Akalat Sheppardia gabela (Endangered; 1100 km^2; 21,800)

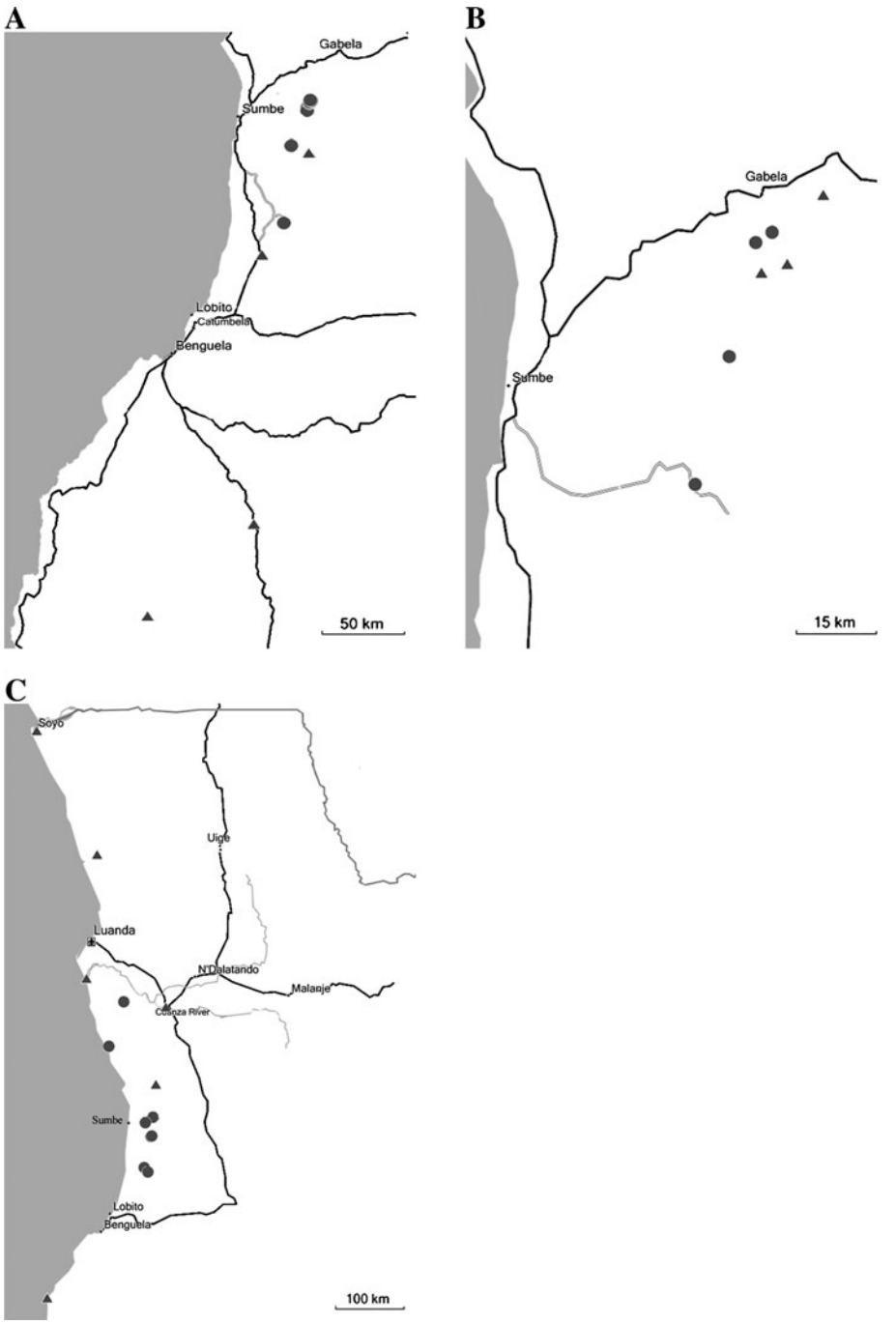
Before 2004, known from a tiny area between Londa and Assango, near Gabela, but more recently found at Kumbira Forest and near Bango (Ryan et al. 2004). This study found the bird at two additional sites, although within the previously-known range (Fig. 5). It occurs along a stretch of c. 65 km of scarp and, assuming a width of 10 km, has a range of c. 650 km^2. Within its range it can be fairly common, although only c. 10% of it range has suitable habitat. Assuming a density of 2 pairs/ha, this would give a population estimate of 13,000 pairs, in the same range as the estimate of Şekercioğlu and Riley (2005).

White-fronted Wattle-eye Platysteira albifrons (Near Threatened; not estimated)

Poorly-known, with records from scattered localities from Soyo at the mouth of the Congo River in the north to Gungo in the south (Fig. 5). Occurs in dry thickets along rivers and associated with mountains. Within the study area, this species was rarely found, only occurring in drier habitats above the main scarp and in the dry *Adansonia*-dominated forests and thickets on flatter areas below the scarp at c. 250–300 m altitude. It occurs sparsely within its range.

Discussion

This paper demonstrates differences in bird community composition across the central Angolan scarp. Importantly, three distinctive bird communities were identified, associated with distinctive forest types. More extensive sampling from a greater number of forest sites, and combined with detailed vegetation surveys, should provide a more exact



description of the generalised pattern outlined here. Furthermore, endemic species of global conservation concern were found to occur primarily in dry forest at the foot of the scarp (c. 300 m altitude) and above the main scarp (mainly >1000 m altitude). The moist

forests on the main scarp, even in the vicinity of Gabela, do not harbour any of the threatened endemics, although Grey-striped Francolin and Red-crested Turaco occur throughout the area.

Since most speciation occurs in allopatry/isolation (Price 2008) and because the current habitat preferences of endemic taxa are likely to be similar to the habitats in which they evolved (Crisp et al. 2009), it would appear that endemic bird taxa studied here may have evolved during glacial maxima when the moistest habitats along the central scarp were (i) most reduced in extent, (ii) most isolated from their source forests in the Congo Basin, and (iii) similar to the forests now found on the periphery of the scarp. Further, I infer that the endemic taxa moved to the periphery of the scarp as the habitat on the main scarp (500–800 m) became moister, being better-connected with and more similar in nature to the Congo Basin forest, and resettled by Congo Basin forest species.

These hypotheses are challenging to test, but DNA sequence data may shed light on questions of evolutionary origins and areas of potential evolutionary 'hotspots' (Fjeldså and Bowie 2008). This evidence may enable us to measure the period at which the endemic taxa diverged, which can be expected to coincide with periods of greatest aridity. In addition, climatic modelling and creation of forest-type climatic envelopes could be used to confirm predictions of habitat distribution in different climatic phases, and identify potential refugia for endemic taxa (Hall 1960).

Conservation recommendations

Currently the most significant gap in our knowledge of this region is the quantity and distribution of remaining forest. The situation could be effectively remedied by the use of satellite imagery combined with ground-truthing to train and refine computer models to identify habitats from imagery and to test model accuracy. Regardless of exact forest cover and distribution, however, key taxa for conservation have previously been clearly identified and their distributions are updated here. These data show that only two forest sites hold all of the threatened endemic taxa (Gabela Helmet-shrike excepted), namely Kumbira Forest and the Bango area near Seles. Gabela Akalat, although locally fairly common, is the most range-restricted species, while Pulitzer's Longbill is relatively scarce at Kumbira. Future conservation efforts should focus on the Kumbira and Bango areas, which are c. 25 km apart and could be managed as a single conservation area.

In addition to the correct placement of a conservation area along the scarp, special attention should be paid to the distribution of different forest types and their associated bird communities altitudinally across the scarp. No single forest area can conserve the three main bird communities identified, and ensure future evolutionary potential of the communities. Consequently, conservation plans should aim to establish a contiguous network across the scarp, incorporating all three forest types. Besides conserving the full set of forest bird communities, this strategy will add to the conservation network resilience against future climate change, allowing forest distributions and their bird communities to shift within the region (Hole et al. 2009).

Currently, the main threats to the scarp forests are habitat clearance for subsistence agriculture and charcoal production, the latter only at sites around 300 m altitude. Due to the disruption caused by the Angolan Civil War (1973–2002), old shade coffee plantations became densely overgrown, providing suitable habitat for all endemics (Ryan et al. 2004). Now, subsistence farming with sun-loving species such as bananas, maize, beans and cassava, is resulting not only in the entire clearing of the forest under-storey, by slash-and-burn, but also the ring-barking of large, canopy trees. This is occurring at an alarming but

currently unknown rate. A multi-faceted approach will be required to conserve this area, including implementation of more bird-friendly agricultural methods, as has been successfully used elsewhere (e.g. Perfecto et al. 1996; Calvo and Blake 1998; Greenberg et al. 1997; Mas and Dietsch 2004).

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Appendix

Appendix A The complete site-by-species matrix of (forest and Western Angola EBA near-endemic) bird species recorded at the 13 forest sites surveyed during this study

Common name	Scientific name	1	2	3	4	5	6	7	8	9	10	11	12	13
Black Sparrowhawk	*Accipiter melanoleucus*	0	0	0	0	0	0	0	0	1	1	0	0	0
Crowned Eagle	*Stephanoaetus coronatus*	0	0	0	0	1	0	0	0	1	1	0	0	1
Crested Guineafowl	*Guttera pucherani*	1	0	1	0	1	0	0	0	0	0	0	0	1
Grey-striped Francolin	*Pternistis griseostriatus*	1	1	1	0	1	1	1	1	1	1	1	1	1
Buff-spotted Flufftail	*Sarothrura elegans*	0	0	0	0	0	0	0	1	0	0	0	0	1
Tambourine Dove	*Turtur tympanistria*	1	0	1	1	0	1	0	1	1	1	1	0	1
Lemon Dove	*Columba larvata*	0	0	0	0	0	0	0	0	0	1	0	0	0
Great Blue Turaco	*Corythaeola cristata*	0	0	0	0	1	0	1	0	0	0	0	0	0
Red-crested Turaco	*Tauraco erythrolophus*	1	1	1	0	1	1	1	1	1	1	1	1	1
Dusky Long-tailed Cuckoo	*Cercococcyx mechowi*	0	0	0	0	0	0	0	0	0	1	0	0	0
Olive Long-tailed Cuckoo	*Cercococcyx olivinus*	0	0	0	0	0	0	0	0	0	1	0	0	0
African Emerald Cuckoo	*Chrysococcyx cupreus*	0	0	0	0	1	0	0	0	0	1	0	0	0
Green Malkoha	*Ceuthmochares australis*	1	0	1	1	1	1	0	1	1	1	0	0	0
Gabon Coucal	*Centropus anselli*	1	0	0	1	1	1	1	1	1	1	1	0	1
African Barred Owlet	*Glaucidium capense*	1	0	1	0	0	0	0	0	0	0	0	0	0
African Wood Owl	*Strix woodfordii*	1	0	0	0	1	0	1	1	0	1	1	0	0
Red-backed Mousebird	*Colius castanotus*	1	1	1	1	0	1	1	1	0	1	1	0	0
Narina Trogon	*Apaloderma narina*	1	1	1	1	0	0	1	0	1	0	1	1	0
Blue-breasted Kingfisher	*Halcyon malimbica*	1	1	0	0	0	0	0	0	0	0	0	0	0
Trumpeter Hornbill	*Bycanistes bucinator*	0	0	0	0	0	0	0	1	0	1	0	0	0
Naked-faced Barbet	*Gymnobucco calvus*	0	0	0	0	1	0	0	1	1	1	0	1	1
Yellow-throated Tinkerbird	*Pogoniulus subsulphureus*	1	0	0	0	1	1	0	1	1	0	0	0	0
Yellow-rumped Tinkerbird	*Pogoniulus bilineatus*	1	0	0	0	1	1	1	1	1	1	1	1	1
Hairy-breasted Barbet	*Tricholaema hirsuta*	1	0	0	0	1	0	1	1	1	1	0	0	0

Appendix A continued

Common name	Scientific name	1	2	3	4	5	6	7	8	9	10	11	12	13
Yellow-billed Barbet	*Trachyphonus purpuratus*	0	0	0	0	1	1	1	1	1	1	1	0	1
Scaly-throated Honeyguide	*Indicator variegatus*	0	0	0	0	0	0	0	0	1	1	1	0	0
Least Honeyguide	*Indicator exilis*	0	0	0	0	0	0	0	0	1	1	0	0	0
Green-backed Woodpecker	*Campethera cailliautii*	0	0	0	0	0	0	0	0	0	1	0	0	0
Buff-spotted Woodpecker	*Campethera nivosa*	0	0	0	0	0	0	1	1	1	1	0	0	0
Brown-eared Woodpecker	*Campethera caroli*	0	0	0	1	0	0	1	0	0	1	1	0	1
Elliot's Woodpecker	*Dendropicos elliotii*	0	0	0	0	0	0	0	0	0	1	1	0	1
Olive Woodpecker	*Dendropicos griseocephalus*	0	0	0	0	0	0	0	0	0	1	0	1	1
African Broadbill	*Smithornis capensis*	0	0	0	1	0	0	0	0	1	1	0	0	1
African Pitta	*Pitta angolensis*	0	0	1	1	0	1	0	0	0	0	0	0	0
Petit's Cuckooshrike	*Campephaga petiti*	0	0	0	0	0	1	0	1	0	1	1	0	0
Purple-throated Cuckooshrike	*Campephaga quiscalina*	0	0	0	0	0	0	0	1	1	1	1	0	0
Pale-olive Greenbul	*Phyllastrephus fulviventris*	1	1	1	1	0	1	0	0	1	1	1	1	1
Yellow-whiskered Greenbul	*Andropadus latirostris*	1	0	0	0	1	0	0	0	1	1	0	0	0
Falkenstein's Greenbul	*Chlorocichla falkensteini*	1	0	1	1	1	1	1	1	1	1	1	1	1
Red-tailed Bristlebill	*Bleda syndactylus*	1	0	0	0	0	0	1	0	0	1	0	0	0
Gabela Akalat	*Sheppardia gabela*	0	0	0	0	0	0	0	0	1	1	0	1	1
Brown-chested Alethe	*Pseudalethe poliocephala*	0	0	0	0	0	0	1	0	1	1	0	0	0
Fraser's Rufous Thrush	*Stizorhina fraseri*	1	0	1	1	1	1	1	0	1	1	0	0	0
Rufous-tailed Palm Thrush	*Cichladusa ruficauda*	1	1	0	1	1	0	0	0	0	0	0	0	0
Forest Scrub Robin	*Erythropygia leucosticta*	0	1	1	1	1	1	1	1	1	1	1	1	1
Bubbling Cisticola	*Cisticola bulliens*	1	1	1	1	1	1	1	1	1	1	1	1	1
Lowland Masked Apalis	*Apalis binotata*	0	0	0	0	0	0	0	0	0	1	1	0	1
Black-throated Apalis	*Apalis jacksoni*	0	0	0	0	1	1	1	1	1	0	1	1	1
Buff-throated Apalis	*Apalis rufogularis*	1	0	1	0	0	1	1	1	1	1	0	1	1
Hartert's Camaroptera	*Camaroptera harterti*	1	1	1	1	1	1	1	1	1	1	1	1	1
Pulitzer's Longbill	*Macrosphenus pulitzeri*	0	0	0	0	0	0	0	0	0	1	1	0	1
Green Crombec	*Sylvietta virens*	1	1	1	1	1	0	1	1	1	1	1	1	1
Southern Hyliota	*Hyliota australis*	1	0	1	1	1	1	1	1	1	1	1	1	1
Green Hylia	*Hylia prasina*	0	0	0	0	0	0	0	0	1	1	0	0	0
Ashy Flycatcher	*Muscicapa caerulescens*	1	1	1	1	1	1	0	1	1	1	0	1	1
African Blue Flycatcher	*Elminia longicauda*	0	0	0	0	1	0	1	0	1	1	1	1	1
Blue-headed Crested Flycatcher	*Trochocercus nitens*	0	0	0	0	0	0	0	0	1	1	1	0	1
Rufous-vented Paradise Flycatcher	*Terpsiphone rufocinerea*	0	0	0	0	0	0	0	0	0	1	0	1	0
Chestnut Wattle-eye	*Dyaphorophyia castanea*	1	0	0	0	0	0	1	1	1	0	0	0	0
Yellow-bellied Wattle-eye	*Dyaphorophyia concreta*	0	1	0	0	0	0	1	0	0	1	1	1	1
White-fronted Wattle-eye	*Platysteira albifrons*	1	1	1	1	0	0	0	0	0	0	1	0	1
Black-throated Wattle-eye	*Platysteira peltata*	0	0	0	0	0	0	0	0	0	1	0	0	0
Angola Batis	*Batis minulla*	1	1	1	1	1	1	1	1	1	1	1	1	1
Brown Illadopsis	*Illadopsis fulvescens*	1	0	0	0	1	0	1	1	1	1	1	0	1
Dusky Tit	*Parus funereus*	1	0	1	1	1	1	0	0	0	1	0	0	0
Little Green Sunbird	*Anthreptes seimundi*	0	0	1	0	0	1	0	0	1	0	0	0	0

Appendix A continued

Common name	Scientific name	1	2	3	4	5	6	7	8	9	10	11	12	13
Olive Sunbird	*Cyanomitra olivacea*	0	0	1	0	1	1	1	1	1	1	1	1	1
Green-headed Sunbird	*Cyanomitra verticalis*	0	1	0	0	1	0	1	0	1	1	1	1	1
Carmelite Sunbird	*Chalcomitra fuliginosa*	1	1	1	0	1	1	1	1	1	1	1	1	0
Olive-bellied Sunbird	*Cinnyris chloropygius*	1	0	0	0	1	1	1	1	1	1	1	1	1
Ludwig's Double-collared Sunbird	*Cinnyris ludovicensis*	0	0	0	0	0	1	0	0	1	1	1	1	0
Superb Sunbird	*Cinnyris superbus*	1	0	0	0	1	1	1	1	0	1	1	1	1
African Yellow White-eye	*Zosterops senegalensis*	0	0	1	0	1	1	1	0	1	1	1	1	1
Mackinnon's Shrike	*Lanius mackinnoni*	0	0	0	0	0	0	0	0	0	1	0	0	1
Pink-footed Puffback	*Dryoscopus angolensis*	0	0	1	0	0	1	1	1	1	1	1	1	1
Gabela Bushshrike	*Laniarius amboimensis*	0	0	0	0	0	0	0	1	1	1	1	1	1
Gorgeous Bushshrike	*Chlorophoneus viridis*	1	0	1	1	1	1	0	1	1	1	1	1	1
Monteiro's Bushshrike	*Malaconotus monteiri*	1	1	1	0	0	0	0	0	1	1	1	1	1
Yellow-throated Nicator	*Nicator vireo*	0	0	1	1	0	1	1	1	1	1	1	1	1
Gabela Helmetshrike	*Prionops gabela*	1	1	1	0	0	0	0	0	0	0	0	0	0
Square-tailed Drongo	*Dicrurus ludwigii*	0	0	1	0	0	0	0	0	0	0	1	1	1
Dark-backed Weaver	*Ploceus bicolor*	0	1	1	1	1	1	1	1	1	1	1	1	1
Brown-capped Weaver	*Ploceus insignis*	0	0	0	0	0	0	0	0	1	1	0	0	1
Red-headed Malimbe	*Malimbus rubricollis*	0	0	0	0	0	0	0	0	0	1	0	0	0
Golden-backed Bishop	*Euplectes aureus*	1	1	0	1	0	0	0	0	0	1	0	0	0
Grey-headed Nigrita	*Nigrita canicapillus*	1	0	0	0	1	1	1	1	1	1	0	1	1
Red-faced Crimsonwing	*Cryptospiza reichenovii*	0	0	0	0	0	0	0	0	0	1	1	0	1
Red-headed Bluebill	*Spermophaga ruficapilla*	0	0	0	0	0	0	0	1	1	0	0	0	1
Green Twinspot	*Mandingoa nitidula*	0	0	0	0	0	0	0	1	0	0	0	1	0
Landana Firefinch	*Lagonosticta landanae*	1	0	1	0	0	1	0	0	0	1	1	1	0
Black-faced Canary	*Crithagra capistrata*	0	0	1	1	1	0	0	1	1	1	1	1	1

Column headings as follow: 1 = Bimbe, 2 = Kissama, 3 = Lower Gungo Road, 4 = Lower Seles Road, 5 = Fazenda Maria Luiza, 6 = Sumbe-Seles Road, 7 = 10 km West of Conda, 8 = 30 km North of Gabela, 9 = Fazenda Pregredior, 10 = Kumbira, 11 = Gungo, 12 = Assango-Gabela, 13 = Bango

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