

# The Namba mountains: new hope for Afromontane forest birds in Angola

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## Summary

Afromontane forest is the most localised and threatened habitat type in Angola. For the past 40 years the estimate of the area covered by this habitat in Angola has been c.200 ha. At present, 85 ha remain at Mt Moco, the most important known site to date. This habitat holds 20 bird taxa of conservation significance but some are now rare or absent at Mt Moco. Given the small extent of forest, its high conservation value and the severe human impacts on it, finding new areas of Afromontane forest is a high conservation priority. With this objective, we visited the Namba mountains in July 2010, where c.100 ha was thought to remain in the 1970s, to establish the extent and condition of forest there and to conduct bird surveys. We found closed-canopy Afromontane forest with an abundance of *Podocarpus latifolius* and little human disturbance. We recorded 89 bird species, 56 in or adjacent to forest and including all 20 priority taxa and a significant population of the Endangered Swierstra's Francolin *Pternistis swierstrai*. On-screen digitising of forest patches using Google Earth indicates that the larger patches are an order of magnitude larger than at Mt Moco and that there is currently > 590 ha of forest in the Namba mountains, more than trebling the previous national estimate. The site qualifies as a new Important Bird Area and is a high priority for inclusion in Angola's protected area network.

## Resumo

A floresta de montanha é o habitat mais localizado de Angola. Até ao presente estudo, estimava-se que apenas cerca de 200 ha permaneciam no país, com a maior área (85 ha) localizada no Monte Moco. Este tipo de floresta alberga populações de 20 espécies de aves prioritárias para a conservação, algumas das quais que parecem ser agora raras ou extintas no Monte Moco. Tendo em conta a sua reduzida área, a sua importância para a conservação e as enormes pressões humanas a que estão sujeitas, considerou-se uma prioridade esclarecer qual a situação das florestas de montanha em Angola e em particular na Serra de Namba onde, em 1970, julgava-se que ainda persistiam cerca de 100 ha. Com este objectivo, em Julho de 2010 fizemos levantamentos da extensão e tipo de florestas e das aves presentes na Serra de Namba. A nossa amostragem revelou a existência de floresta de montanha de copa fechada com a presença abundante de *Podocarpus latifolius* e com reduzida perturbação humana. No total foram registadas 89 espécies de aves, 56 das quais presentes na floresta ou nas suas margens. Estas incluem as 20 espécies prioritárias para a conservação, com destaque para uma população importante do Francolim de Swierstra *Pternistis swierstrai*, classificado como 'Em Perigo'. A digitalização dos fragmentos de floresta a partir das imagens do Google Earth permitem estimar em mais de 590 ha a área de floresta existente na Serra de Namba, valor este que mais do que triplica a área de floresta de montanha conhecida até hoje para Angola. Para além disso, os maiores fragmentos de floresta de Namba são dez vez maiores que os da floresta do Moco. As florestas de Namba reúnem os requisitos para serem classificadas como uma Área de Importância para as Aves (IBA: Important Bird Area) e constituem uma prioridade para inclusão no sistema de áreas protegidas de Angola.

## Introduction

Afromontane forest is the most localised habitat in Angola and a key habitat of the Western Angola Endemic Bird Area (EBA) (Huntley and Matos 1994, Stattersfield *et al.* 1998). It occurs in small patches above 1,800 m altitude in the highlands of west-central Angola (Barbosa 1970, Collar and Stuart 1988). By the early 1970s, only 200 ha of Afromontane forest was estimated to remain, mainly at Mount Moco (hereafter Moco and perhaps in the Namba mountains (hereafter Nambas) where most forest was thought to be degraded by logging (Barbosa 1970, Huntley 1974). Current forest cover at Moco is c.85 ha (Mills *et al.* 2011), but the situation in the Nambas is unknown. Despite the limited extent of Afromontane forest in Angola, threats to it from human activities and its high biodiversity value, none of it is formally protected, putting it at risk of becoming the first Afromontane centre of endemism to be lost (Huntley 1974, Dean 2001, Mills *et al.* 2011).

The Angolan Afromontane centre of endemism is the most isolated, being separated by > 2,000 km from other Afromontane centres (White 1981, 1983, Huntley 1974). Its isolation has led to the evolution of distinct biological communities. The avifauna includes 64 bird taxa that are endemic or near-endemic species, endemic subspecies or isolated populations (White 1978, Grimshaw 2001), 20 of which are associated with forest and thicket habitats (we add Thick-billed Seed-eater *Crithagra burtoni* to the list of Mills *et al.* [2011]).

All 20 of these taxa were recorded at Moco prior to 1970, but several are now rare or absent, including Orange Ground Thrush *Zoothera gurneyi* (no records), Bar-tailed Trogon *Apaloderma vittatum* (one record, MSLM unpublished data), Laura's Woodland Warbler *Phylloscopus laurae* (one record) and Naked-faced Barbet *Gymnobucco calvus vernayi* (no records). The most threatened species is the 'Endangered' Swierstra's Francolin *Pternistis swierstrai*, with > 75 pairs at Moco (Mills *et al.* 2011). In addition, Margaret's Batis *Batis margaritae*, Bar-tailed Trogon and Orange Ground Thrush are known in Angola only from Moco, Laura's Woodland Warbler only from Moco and Chipepe, and Ruwenzori Nightjar *Caprimulgus ruwenzorii*, Evergreen Forest Warbler *Bradypterus lopezi* and Thick-billed Seed-eater from Moco and two other sites each (Dean 2000, Mills and Dean 2007, Mills *et al.* 2011). These species face a serious threat of extinction in Angola.

Confirming the current extent and condition of forest in the Nambas and finding new Afromontane forest with intact bird communities is a high conservation priority. Newly available Google Earth (2010) satellite imagery revealed significant patches of potential Afromontane forest on the north-western side of the Nambas (Mills *et al.* 2011). Our aims here are to provide a preliminary but up-to-date description of the forest type, quantity, distribution and condition in the Nambas, and the associated bird communities.

## Methods

### *Study area*

The Nambas (2,100–2,390 m) are located in the south of the Cuanza Sul province of west-central Angola between c.11.834°S and 11.911°S, and 14.710°E and 14.869°E, 30 km west of Cassongue town (11.854°S 15.049°E) and immediately north-west of Namba town (11.912°S 14.874°E) (Fig. 1). They form part of the Marginal Mountain Chain (mostly 1,600–1,850 m) which rises above the extensive Old Plateau to the east (Huntley 1974), the highest points of which are formed by residual land surfaces of Gondwana age (King 1963 in Huntley 1974) and may include the Nambas. The Nambas rise c.300–550 m above the surrounding areas.

We visited the Nambas from 23 to 26 July 2010, reaching them from the village of Kanhala (Kanhara) (11.829°S 14.750°E; 1,890 m) on their north-western flank. From here it was a 2.2 km walk to the edge of the most accessible forest patch (Patch 7; see Table 1) on top of the plateau at c.2,100 m. Due to the difficulty of traversing the terrain – dense undergrowth, steep slopes and an abundance of large boulders – we were confined to exploring this single forest patch and surrounding grasslands and mountain slopes, an area of c.24 ha (Fig. 1).

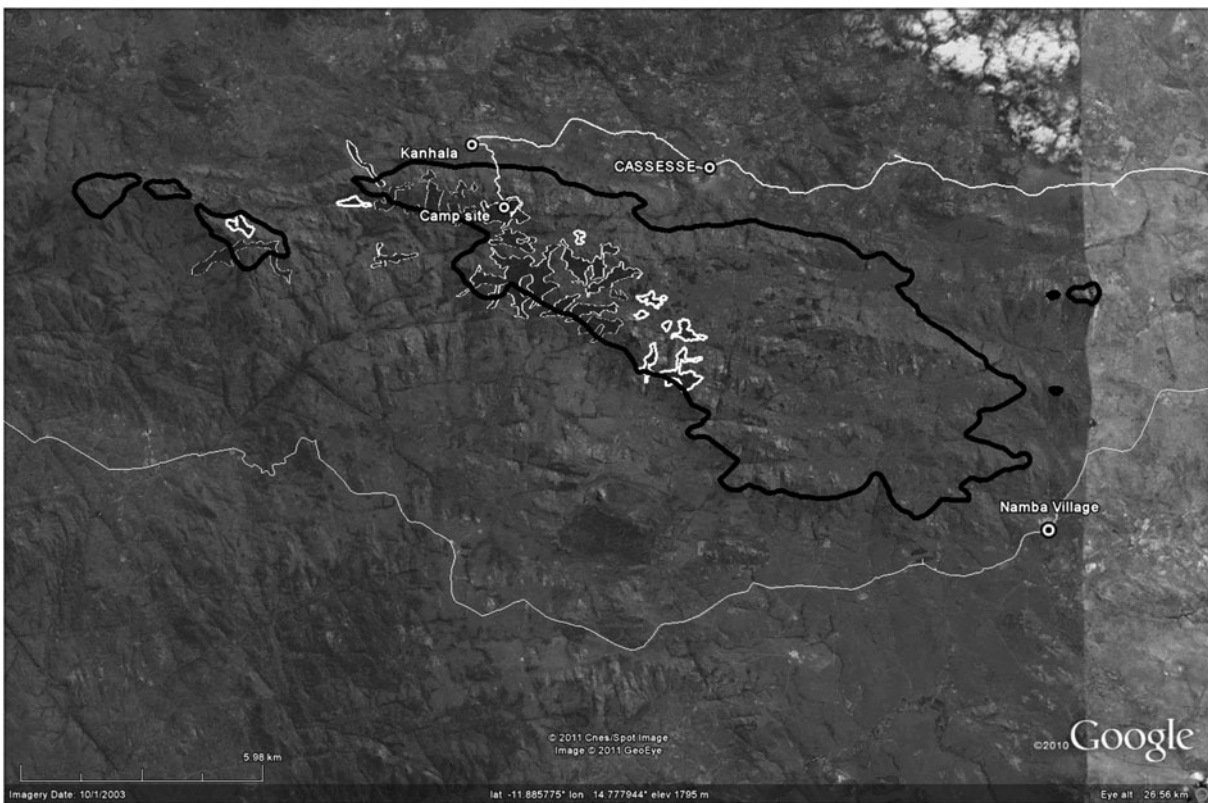


Figure 1. A Google Earth (2010) satellite image of the Namba mountains study area, showing all forest patches  $> 2.5$  ha in extent as white polygons, and the settlements of Kanhala, Cassesse and Namba, as well as the location of our camp site. White lines indicate our access route to the north, and the main Cassongue-Atome road to the south. The black polygons identify areas  $> 2,000$  m altitude.

Table 1. A list of the 24 forest patches in the Namba mountains larger than 2.5 ha, as measured from Google Earth (2010) imagery from 2003. Forest Patch 10 was found to be 2 ha in area and is hence excluded. "Perimeter (km)" and "Area (ha)" give, respectively, the length of the perimeter of and the area covered by each patch of forest. These measurements were calculated from polygon shape files (.kmz) created for each forest patch by on-screen digitising in Google Earth. "Area/Edge ratio" is calculated as "Area"/"Perimeter". "% forest" is the visually-estimated percentage of the polygon covered by closed-canopy forest, to the nearest 5%. "Area of forest" = "Area" x "% forest" / 100.

Patch	Perimeter (km)	Area (ha)	Area/Edge ratio	% forest	Area of forest (ha)
01	3	23	7.7	95	22
02	2	17	8.5	95	16
03	16	132	8.3	90	119
04	7	48	6.9	95	46
05	4	28	7.0	95	27
06	4	28	7.0	90	25
07	4	43	10.8	95	41
08	3	18	6.0	90	16
09	4	17	4.3	95	16
11	2	7	3.5	95	7
12	7	56	8.0	95	53
13	8	56	7.0	95	53
14	3	20	6.7	100	20
15	1	5	5.0	95	5
16	4	29	7.3	90	26
17	3	13	4.3	95	12
18	1	3	3.0	100	3
19	2	10	5.0	95	10
20	5	33	6.6	90	30
21	1	3	3.0	100	3
22	1	4	4.0	95	4
23	3	15	5.0	90	14
24	2	10	5.0	95	10
25	2	15	7.5	90	14
Total/Average	T = 92	T = 633	A = 6.14	A = 94.2	T = 592

### Forest cover and condition

In order to assess spatial distribution and characteristics of forest patches (area, perimeter, % forest) we used cloud-free, high-resolution images from 2003 available on Google Earth (2010). We traced the perimeter of each forest patch larger than 2.5 ha to create a .kml polygon file and calculate its perimeter length (km), area (ha) and area/edge ratio. Perimeter length and area were measured to one decimal place, but are reported as rounded to whole numbers due to an unknown level of accuracy in our methods. The percentage of closed-canopy forest cover (as opposed to scattered trees, shrubbery or bracken beds) within each patch was visually estimated to the nearest 5%, to calculate the amount of forest in each patch. Methods are identical to those used at Moco (Mills *et al.* 2011) and results are compared using Student's t-Tests (Zar 1999).

### Avifauna

Bird communities were sampled by (i) general observations summarised in daily lists, (ii) compiling x-species lists (McKinnon and Phillips 1993, Bibby *et al.* 2000) and (iii) mist-netting birds. We follow the nomenclature of Gill *et al.* (2009).

We compiled 26 x-species lists during exploratory walks in and immediately adjacent to the forest, avoiding overlap as much as possible and following the recommendations of c.30 lists

(Fjeldså 1999) and of 15 species per list for montane forests of Africa (Bibby *et al.* 2000). This method was favoured over time-limited, fixed-radius point counts because of the difficulty in reaching different independent points within the forest and because they can be compiled throughout the day, even during periods of low bird activity, making them efficient when survey time is limited (Fjeldså 1999, Bibby *et al.* 2000).

## Results

### *Forest cover and condition*

The densely vegetated habitat of the Nambas was found to consist of mature, closed-canopy Afromontane forest with *Podocarpus latifolius* as the dominant tree. The forest appeared to be in near-pristine condition and had limited trail access, although a few large trees had recently been felled. Our local guides also reported that mammals were trapped and hunted. A grassland fire had burned right to the edge of the forest and entered the margin of the forest at a few places.

We identified 24 forest patches > 2.5 ha (Table 1), 19 of which held 10 ha or more of forest and nine > 25 ha. These forests are all situated on the western half of the Nambas (Fig. 1). In total we estimate that there is 592 ha of forest in patches > 2.5 ha, with a cumulative perimeter of 92 km, an area of 633 ha, an average percentage forest cover of 94.2 and an average area/edge ratio of 6.14 ha/km.

Compared with the 30 largest patches at Moco (> 0.5 ha), the 24 largest patches in the Nambas (> 2.5 ha; Table 1) were significantly larger, on average (26.4 ha), than those at Moco (2.9 ha) (t-test:  $t = 3.867$ ,  $df = 52$ ,  $P < 0.0005$ ). Compared with the single patch > 10 ha at Moco, the Nambas held 17 patches > 10 ha in size. Forest patches in the Nambas (6.14 ha/km) also had significantly larger area/edge ratios ( $t = 8.535$ ,  $df = 52$ ,  $P < 0.00001$ ) than those at Moco (2.13 ha/km).

### *Avifauna*

A total of 89 bird species was recorded (Table 2), 56 of which in and adjacent to the forest during x-species counts. All 20 Angolan Afromontane forest-associated taxa were recorded during the surveys, 15 of which were among the 20 most often recorded species (Table 2). These included several that are now rare or absent at Moco, such as Bar-tailed Trogon, Orange Ground Thrush, Laura's Woodland Warbler and Naked-faced Barbet. Swierstra's Francolin was also found to be fairly common at the forest edge and in adjacent thickets, with seven different groups located within 1 km of our camp site. Unlike at Moco where forest patches are much narrower, they were never recorded from the forest interior.

Other montane specialists recorded include Margaret's Batis, African Hill Babbler *Pseudoalcippe abyssinica*, Evergreen Forest Warbler, Angola Slaty Flycatcher *Dioptornis brunneus*, Thick-billed Seedeater, Ruwenzori Nightjar, Rock-loving Cisticola *Cisticola emini bailunduensis*, Angola Cave Chat *Xenopsychus ansorgei*, Mountain Wheatear *Oenanthe monticola nigricauda* and Dusky Twinspot *Euschistospiza cinereovinacea cinereovinacea*. Other records of note include the following. Lemon Dove *Aplopelia larvata* was both heard and seen, and recordings made of its calls; this is only the third record from the country, and the first away from Kumbira Forest (Mills and Dowd 2007). Grey-striped Francolin *Pternistis griseostriatus* was recorded well above its previous altitudinal limit and to the east of its previously-known distribution (Mills *et al.* in press). Hartert's Camaroptera *Camaroptera harterti* was recorded away from the escarpment forests for the first time, as were Red-faced Crimsonwing *Cryptospiza reichenovii*, Pink-footed Puffback *Dryoscopus angolensis* and Black-throated Apalis *Apalis jacksoni* (Dean 2000). The entry "Kumbira Swift" refers to the unidentified swifts that look similar to African Swift *Apus barbatus* but call like Little Swift *A. affinis* (Mills 2009); this was the first record of these birds away from Kumbira Forest.

Table 2. The list of the 89 bird species recorded in the Namba mountains 23–26 July 2010, giving the number of 15-species lists from which each species was recorded (out of a total of 26), the rank order of the 20 species recorded on most 15-species lists, and approximate daily totals of each species recorded on 24 July, 25 July and 26 July, respectively. “h” denotes heard only. The 20 endemic or near-endemic species, endemic subspecies or isolated populations associated with the highlands of western Angola and associated with forest and thicket habitats, are highlighted with “\*” (Mills *et al.* 2011). Biome-restricted species are denoted by “<sup>af</sup>” for Afrotropical Highlands biome species and “<sup>z</sup>” for Zambebian biome species. Nomenclature follows Gill *et al.* (2009).

	Common Name	Scientific Name	15-sp lists	15-sp rank	Daily lists
1	Grey-striped Francolin	<i>Pternistis griseostriatus</i>	0		h, 0, 0
2 <sup>*a</sup>	Swierstra's Francolin	<i>Pternistis swierstrai</i>	10	14	1+h, h, h
3	Red-necked Spurfowl	<i>Pternistis afer</i>	0		h, 0, 0
4	African Goshawk	<i>Accipiter tachiro</i>	1		1, 1, h
5	Augur Buzzard	<i>Buteo augur</i>	1		0, 1, 3
6	Crowned Eagle	<i>Stephanoaetus coronatus</i>	0		0, h, 2
7 <sup>*</sup>	African Olive Pigeon	<i>Columba arquatrix</i>	16	6	20, 50, 100
8	Lemon Dove	<i>Columba larvata</i>	1		1, h, 0
9	Red-eyed Dove	<i>Streptopelia semitorquata</i>	0		h, 0, 0
10	Blue-spotted Wood Dove	<i>Turtur afer</i>	0		0, 0, h
11 <sup>*</sup>	Schalow's Turaco	<i>Tauraco schalowi</i>	16	6	20, 20, 20
12	Klaas's Cuckoo	<i>Chrysococcyx klaas</i>	2		0, h, 0
13	African Wood Owl	<i>Strix woodfordii</i>	0		h, h, 0
14 <sup>*a</sup>	Ruwenzori Nightjar	<i>Caprimulgus ruwenzorii koesteri</i>	0		1, 1, 0
15	Freckled Nightjar	<i>Caprimulgus tristigma</i>	0		h, h, 0
16	"Kumbira Swift"	<i>Swift sp.</i>	0		0, 0, 20
17 <sup>*a</sup>	Bar-tailed Trogon	<i>Apaloderma vittatum</i>	16	6	6, 6, h
18	Crowned Hornbill	<i>Tockus alboterminatus</i>	0		h, 0, 0
19	Trumpeter Hornbill	<i>Bycanistes bucinator</i>	2		0, 0, h
20 <sup>*</sup>	Naked-faced Barbet	<i>Gymnobucco calvus vernayi</i>	7	18	4, 8, 8
21 <sup>*a</sup>	Western Tinkerbird	<i>Pogoniulus coryphaeus angolensis</i>	9	16	h, 1, h
22	Yellow-fronted Tinkerbird	<i>Pogoniulus chrysoconus</i>	3		h, h, h
23	Black-collared Barbet	<i>Lybius torquatus</i>	0		h, h, 0
24	Cardinal Woodpecker	<i>Dendropicus fuscescens</i>	0		h, 0, 0
25 <sup>*</sup>	Olive Woodpecker	<i>Dendropicus griseocephalus</i>	10	14	12, 10, 6
26 <sup>*z</sup>	Margaret's Batis	<i>Batis margaritae margaritae</i>	5		h, 8, h
27	Black-throated Wattle-eye	<i>Platysteira peltata</i>	2		4, 4, 0
28	Gorgeous Bushshrike	<i>Chlorophoneus viridis</i>	9	16	6, h, h
29	Brown-crowned Tchagra	<i>Tchagra australis</i>	0		0, 0, h
30	Pink-footed Puffback	<i>Dryoscopus angolensis</i>	1		0, h, 0
31	Black-backed Puffback	<i>Dryoscopus cubla</i>	6		10, 12, 6
32	Tropical Boubou	<i>Laniarius aethiopicus</i>	22	3	h, h, h
33	Black-headed Oriole	<i>Oriolus larvatus</i>	7	18	h, h, h
34	Fork-tailed Drongo	<i>Dicrurus adsimilis</i>	1		0, 0, 1
35	African Paradise Flycatcher	<i>Terpsiphone viridis</i>	20	4	10, 15, 8
36 <sup>a</sup>	White-tailed Blue Flycatcher	<i>Elminia albicauda</i>	0		h, 0, h
37 <sup>z</sup>	Rufous-bellied Tit	<i>Parus rufiventris</i>	3		0, 1, h
38 <sup>z</sup>	Angola Lark	<i>Mirafraga angolensis</i>	0		h, 0, 0
39	Dark-capped Bulbul	<i>Pycnonotus tricolor</i>	23	2	50, 50, 50
40 <sup>*</sup>	Cabanis's Greenbul	<i>Phyllastrephus cabanisi</i>	7	18	8, 10, h
41	Black Saw-wing	<i>Psalidoprocne pristoptera</i>	0		1, 0, 0
42	Grey-rumped Swallow	<i>Pseudhirundo griseopyga</i>	0		0, 0, 12
43	Rock Martin	<i>Ptyonoprogne fuligula</i>	1		0, 0, 1
44	Lesser Striped Swallow	<i>Cecropis abyssinica</i>	0		10, 4, 10
45 <sup>*z</sup>	Laura's Woodland Warbler	<i>Phylloscopus laurae laurae</i>	15	9	8, 10, h
46	Dark-capped Yellow Warbler	<i>Chloropeta natalensis</i>	0		h, 0, h
47 <sup>*</sup>	Evergreen Forest Warbler	<i>Bradypterus lopezi boultoni</i>	18	5	10, 15, h
48	Lepe Cisticola	<i>Cisticola lepe</i>	1		h, h, h



Table 2. Continued.

	Common Name	Scientific Name	15-sp lists	15-sp rank	Daily lists
49*	Rock-loving Cisticola	<i>Cisticola emini bailunduensis</i>	11	13	h, h, 6
50	Wailing Cisticola	<i>Cisticola lais</i>	0		0, h, 0
51	Tawny-flanked Prinia	<i>Prinia subflava</i>	5		h, 6, 12
52	Black-throated Apalis	<i>Apalis jacksoni</i>	12	11	4, h, h
53*	Grey Apalis	<i>Apalis cinerea grandis</i>	26	1	30, 30, 20
54	Hartert's Camaroptera	<i>Camaroptera harterti</i>	4		2, 4, 0
55	Salvadori's Eremomela	<i>Eremomela salvadorii</i>	0		h, 0, h
56 <sup>a</sup>	African Hill Babbler	<i>Pseudoalcippe abyssinica ansorgei</i>	7	18	10, 12, 0
57	African Yellow White-eye	<i>Zosterops senegalensis</i>	6		8, 6, 6
58	Spotted Creeper	<i>Salpornis spilonotus</i>	1		2, 0, 0
59	Violet-backed Starling	<i>Cinnyricinclus leucogaster</i>	7	18	10, 20, 20
60 <sup>a</sup>	Orange Ground Thrush	<i>Zoothera gurneyi</i>	6		3, 4, h
61	African Thrush	<i>Turdus pelios</i>	2		H, h, 0
62*	Bocage's Akalat	<i>Sheppardia bocagei bocagei</i>	12	11	8, 12, 6
63	White-browed Robin-Chat	<i>Cossypha heuglini</i>	0		h, 0, 0
64 <sup>a</sup>	Angola Cave Chat	<i>Xenocopsychus ansorgei</i>	0		0, 0, h
65	White-browed Scrub Robin	<i>Erythropygia leucophrys</i>	0		h, 0, 0
66	Mountain Wheatear	<i>Oenanthe monticola nigricauda</i>	0		0, 0, 3
67	Familiar Chat	<i>Cercomela familiaris</i>	1		0, 0, 1
68 <sup>a</sup>	Angola Slaty Flycatcher	<i>Dioptornis brunneus</i>	3		h, 6, 6
69	Grey Tit-Flycatcher	<i>Myioparus plumbeus</i>	1		0, h, 0
70	Olive Sunbird	<i>Cyanomitra olivacea</i>	4		3, 5, 0
71 <sup>a</sup>	Bronzy Sunbird	<i>Nectarinia kilimensis gadowi</i>	0		1, 0, 0
72 <sup>a</sup>	Ludwig's Double-collared Sunbird	<i>Cinnyris ludovicensis ludovicensis</i>	15	9	15, 20, 15
73 <sup>z</sup>	Oustalet's Sunbird	<i>Cinnyris oustaleti</i>	0		0, 0, 4
74	Variable Sunbird	<i>Cinnyris venustus</i>	4		3, 1, 2
75	Spectacled Weaver	<i>Ploceus ocularis</i>	0		h, 0, 0
76	African Golden Weaver	<i>Ploceus xanthops</i>	0		3, 0, 0
77	Dark-backed Weaver	<i>Ploceus bicolor</i>	2		h, h, 0
78	Yellow Bishop	<i>Euplectes capensis angolensis</i>	0		4, 0, 0
79	Yellow-mantled Widowbird	<i>Euplectes macrourus</i>	0		2, 0, 0
80 <sup>a</sup>	Red-faced Crimsonwing	<i>Cryptospiza reichenovii</i>	3		0, 2, 1
81 <sup>a</sup>	Dusky Twinspot	<i>Euschistospiza c. cinereovinacea</i>	5		2, 2, 12
82	Grey Waxbill	<i>Estrilda perreini</i>	0		0, 0, 1
83 <sup>a</sup>	Swee Waxbill	<i>Estrilda melanotis bocagei</i>	0		0, 0, 10
84	Striped Pipit	<i>Anthus lineiventris</i>	4		h, h, 2
85	Yellow-crowned Canary	<i>Serinus flavivertex huilae</i>	4		15, 6, 20
86	Black-faced Canary	<i>Crithagra capistrata</i>	3		4, h, h
87	Brimstone Canary	<i>Crithagra sulphurata</i>	2		h, 2, 10
88 <sup>a</sup>	Thick-billed Seedeater	<i>Crithagra burtoni tanganjicae</i>	1		1, 0, 0
89	Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>	0		h, 0, 0

## Discussion

The Nambas hold > 590 ha of Afromontane forest, making them home of the largest area of Afromontane forest in Angola, previously thought to be Moco with c.85 ha (Mills *et al.* 2011). This brings the national estimate to c.700 ha, 3.5 times the previous estimate of 200 ha (Huntley 1974). Compared with the forest at Moco, individual forest patches in the Nambas are larger and have greater area/edge ratios, making these patches less susceptible to edge effects and human impacts. Besides this, the forest patches in the Nambas are in better condition, showing fewer signs of human disturbance. This is likely to be a consequence of the ruggedness of the terrain, and its unsuitability for establishment of human communities.

Previously the only site in Angola at which all 20 forest-associated Afromontane taxa had been recorded was Moco. However, during brief surveys at the Nambas we found all 20 species, including several species that are now rare or extinct at Moco, many of them common. While we make no estimates of the densities or population sizes of these birds in the Nambas, based on their general abundance and the nearly seven-fold greater area of forest compared with Moco, it is likely that the Nambas hold the largest populations of each of these 20 species, including the 'Endangered' Swierstra's Francolin. This makes the Nambas the most important site for Afromontane forest bird conservation in Angola.

The Nambas deserve national and international recognition for their conservation importance, and along with Moco are among the highest priorities for the establishment of new conservation areas in Angola. The Nambas qualify as a new Important Bird Area (IBA), satisfying the following global criteria for selection of an IBA (Fishpool and Evans 2001): A1 *Species of global conservation concern*, by holding a significant population of the Endangered Swierstra's Francolin, A2 *Assemblage of restricted-range species*, by holding populations of the Grey-striped Francolin, Swierstra's Francolin, Angola Cave Chat, Angola Slaty Flycatcher and Ludwig's Double-collared Sunbird *Cinnyris ludovicensis*, range-restricted species of the Western Angola EBA (Stattersfield *et al.* 1998), and A3 *Assemblage of biome-restricted species*, by holding 15 of 17 Afrotropical Highlands biome species and five of 49 Zambezi biome species found in Angola (see Table 1).

Further field surveys are required to establish the population sizes of key bird taxa, especially for Swierstra's Francolin, and the overall bird diversity, and to determine the importance of the area for the conservation of other taxonomic groups. A survey of human populations and activities in surrounding areas would be useful in guiding conservation recommendations for the establishment of a new protected area, and to identify main threats to the area biodiversity of the area.

## Acknowledgements

Funding for this field trip came from the generosity of Mr. Tasso Leventis of the A. P. Leventis Ornithological Research Institute and The Clancey Fund of the Percy FitzPatrick Institute of African Ornithology. We would like to thank the Environment Ministry of Angola and Brian Huntley for their continued support for this work. John Mendelsohn kindly produced a polygon of areas in Angola > 2,000 m altitude, which aided in searching for these forests. Robert Dowsett and Françoise Dowsett-Lemaire provided a rigorous review of the manuscript; their comments helped to improve it greatly.

## References

- Barbosa, L. A. G. (1970) *Carta fitogeográfica de Angola*. Luanda: Instituto de Investigação Científica de Angola.
- Bibby, C. J., Burgess, N. D., Hill, D. A. and Mustoe, S. H. (2000) *Bird census techniques*. Second Edition. London: Academic Press.
- Collar, N. J. and Stuart, S. N. (1988) *Key forests for threatened birds in Africa*. Cambridge, UK: International Council for Bird Preservation. (ICBP Monograph No 3).
- Dean, W. R. J. (2000) *The birds of Angola*. Tring, UK: British Ornithologists' Union. (BOU Checklist series 18).
- Dean, W. R. J. (2001) Angola. Pages 71–91 in L. D. C. Fishpool and M. I. Evans, eds. *Important Bird Areas in Africa and associated islands: priority sites for conservation*. Newbury and Cambridge, UK: Pisces Publications and BirdLife International. (BirdLife Conservation Series No. 11).
- Fishpool, L. D. C. and Evans, M. I. (2001) *Important Bird Areas in Africa and associated islands: priority sites for conservation*. Newbury and Cambridge, UK: Pisces Publications and BirdLife International. (BirdLife Conservation Series No. 11).
- Fjeldså, J. (1999) The impact of human forest disturbance on the endemic avifauna of the Udzungwa Mountains, Tanzania. *Bird Conserv. Internatn.* 9: 47–62.



- Gill, F., Wright, M. and Donsker, D. (2009) *IOC world bird names* (version 2.0). <http://www.worldbirdnames.org>. Cited 20 Mar 2009.
- Google Earth (2010) *Google Earth* 5.1. <http://earth.google.com/>
- Grimshaw, J. M. (2001) What do we really know about the Afromontane archipelago? *Syst. Geogr. Pl.* 71: 949–957.
- Huntley, B. J. (1974) Outlines of wildlife conservation in Angola. *J. S. Afr. Wildl. Managet. Assoc.* 5: 157–166.
- Huntley, B. J. and Matos, E. M. (1994) Botanical diversity and its conservation in Angola. *Strelitzia* 7: 53–74.
- King, L. D. (1963). *South African scenery*. Third edition. London: Oliver & Boyd.
- McKinnon, J. and Phillips, K. (1993) *A field guide to the birds of Borneo, Sumatra, Java and Bali*. Oxford, UK: Oxford University Press.
- Mills, M. S. L. (2009) Vocalisations of Angolan birds: new descriptions and other notes. *Bull. ABC* 16: 150–166.
- Mills, M. S. L. and Dean, W. R. J. (2007) Notes on Angolan birds: new country records, range extensions and taxonomic questions. *Ostrich* 78: 55–63.
- Mills, M. S. L. and Dowd, A. D. (2007) First records of Lemon Dove *Aplopelia larvata* for Angola. *Bull. ABC* 14: 77–78.
- Mills, M. S. L., Olmos, F., Melo, M. and Dean, W. R. J. (2011) Mount Moco: its importance to the conservation of Swierstra's Francolin *Pternistis swierstrai* and the Afromontane avifauna of Angola. *Bird Conserv. Internatn.* 21: 119–133.
- Mills, M. S. L., Vaz Pinto, P. and Haber, S. (In press) Grey-striped Francolin *Pternistes griseostriatus*: specimens, distribution and morphometrics. *Bull. Afr. Bird Club*.
- Stattersfield, A. J., Crosby, M. J., Long, A. J. and Wege, D. C. (1998) *Endemic Bird Areas of the world*. Cambridge, UK: BirdLife International. (BirdLife Conservation Series No. 7).
- White, F. (1978) The Afromontane region. Pp. 463–513 in M. J. A. Werger, ed. *Biogeography and ecology of southern Africa*. The Hague: Junk.
- White, F. (1981) The history of the Afromontane archipelago and the scientific need for its conservation. *Afr. J. Ecol.* 19: 33–54.
- White, F. (1983) *The vegetation of Africa*. A descriptive memoir to accompany the UNESCO/AETFAT/UNSO Vegetation Map of Africa (3 Plates, Northwestern Africa, Northeastern Africa, and Southern Africa, 1:5,000,000). Paris: UNESCO.
- Zar, J. H. (1999) *Biostatistical analysis*. Fourth edition. London: Prentice-Hall.

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Received 30 October 2011; revision accepted 9 April 2012;

Published online 12 June 2012