

The avifauna of the Lagoa Carumbo area, northeast Angola

by Michael S.L. MILLS^{1,2} & W. Richard J. DEAN²

¹A.P. Leventis Ornithological Research Institute, University of Jos, PO Box 13404, Jos, Plateau State, Nigeria. <birdsangola@gmail.com>

²DST/NRF Centre of Excellence at the Percy FitzPatrick Institute, University of Cape Town, Rondebosch 7701, South Africa

Received 3 April 2012; revised 14 May 2013.

Summary

The Lagoa Carumbo area of Lunda Norte province, northeast Angola, is an Important Bird Area that has been proposed as a new conservation area. However, the avifauna was poorly-known, with only 67 species recorded. During April–May 2011 MSLM conducted five days of field surveys in the area. In total, 175 bird species were recorded, including many new provincial records, range extensions and rare species, and two new country records. A further 21 species had previously been collected but were not found during the field study, bringing the total of species confirmed to 196, with another 12 seen near to the study area. The Lagoa Carumbo area is at the interface of the Guinea-Congo Forests and Zambebian biomes and 31 Guinea-Congo Forests biome-restricted species and 15 Zambebian species were found. However, the most conspicuous species were birds that are widespread and common in the central African savannas. This reflects the fact that most of the area is covered in mixed, fairly open savanna woodland, with other habitats such as gallery and dry forests and floodplain occupying relatively small areas.

Resumo

As aves da região da Lagoa de Carumbo, nordeste de Angola. A região da Lagoa de Carumbo, província da Lunda Norte, nordeste de Angola, está classificada como uma Área Importante para as Aves e foi proposta para integrar uma nova área de conservação. No entanto o conhecimento sobre aves na região era pobre, com apenas 67 espécies registadas. Durante Abril–Maio de 2011, MSLM realizou cinco dias de levantamentos na área. Foram registadas 175 espécies, incluindo muitas novas para a província, extensões da área de distribuição, espécies raras e duas novas espécies para o país. Para além disso, 21 espécies já tinham sido colhidas nesta área mas não foram agora observadas, o que eleva o total de espécies para 196. Há ainda que tomar em conta 12 espécies observadas na aproximação à área de estudo. A

região da Lagoa de Carumbo encontra-se entre dois biomas, o das Florestas Guineo-congolesas e o Zambeziano, apresentando 31 espécies das Florestas Guineo-congolesas e 15 Zambezianas. No entanto, as espécies mais conspicuas são espécies comuns e com uma ampla distribuição nas savanas da África central. Isto reflecte o facto da maior parte da área consistir em savana mista relativamente aberta, e de outros habitats, como floresta de galeria, floresta seca e planície alagadiça, ocuparem áreas reduzidas.

Introduction

Lagoa Carumbo (7°48'S, 19°57'E; 840 m altitude) is located in Lunda Norte province, northeast Angola. The area is biologically important and of high conservation value, and has been proposed as a protected area (Huntley 1974). Very little ornithological research has been conducted there, or in the province as a whole, with only 67 bird species recorded from the Lagoa Carumbo area, most of them from specimens collected by Heinrich (1958) in 1954–5, and the remainder (25 species) collected by the Museu Dundo (Pinto 1973). While the avifauna is expected to be far richer than this, Lagoa Carumbo already qualifies as an Important Bird Area (IBA) on criterion A1, by holding a population of the Data Deficient Grimwood's Longclaw *Macronyx grimwoodi*, and criterion A3, with nine Guinea-Congo Forests biome and seven Zambebian biome species present (Dean 2001).

As part of the Angolan national plan for the expansion of its conservation area network, B.J. Huntley organized a multidisciplinary biological survey of the area, to supplement the limited historical information, and to produce a science-based proposal for the creation of a new protected area. MSLM participated, and we present here the field data collected which, together with information on historical specimens (summarized in Dean 2001), produce a more up-to-date and complete summary of the avifauna for the area.

Study site

The province of Lunda Norte is situated on the gently tilted plateau of Angola (850–1050 m altitude) and is dissected by numerous northwards-draining rivers of the Cassai-Congo basin. Deep and extensive Tertiary Kalahari sands overlay diamondiferous gravels of the Cretaceous Calando group of the Karoo system, the latter exposed along the deeply incised rivers. The Kalahari sands are infertile and well-drained, and frequently contain bands of laterite, silcrete or calcrete at varying depths, which create in places perched water tables in the form of lakes and swamps.

The Lagoa Carumbo area is located at the interface of two of the major biogeographic regions of central Africa; the Guineo-Congolian forests and savannas,

and the Zambesian savannas, woodlands and grasslands. The lake itself (350 ha) lies on the Luele River, which cuts deeply into the sandy plateau and into deeper soil horizons, creating local conditions for the development of a rich diversity of habitats, including *Cryptosepalum/Marquestia* dry evergreen forests, swamp-forest with dominant *Raphia* palms, gallery forest, dry plateau grasslands, *Brachystegia*-dominated woodlands and various flood-plain habitats, including papyrus beds *Cyperus papyrus* and short-grass “dambos”. The entire area has a low human population, with the result that habitats are relatively pristine.

The climate is characterized by hot, wet summers (Sep–Apr) and warm, dry winters (Apr–Sep). Records for Dundo give the average annual rainfall as 1600 mm, with the winter months accounting for only 100 mm of this total (Silveira 1973). The mean annual temperature at Dundo is 24.2°C and varies little throughout the year. Relative humidity at midday ranges from 67 % in Nov–Mar, dropping to 35 % in July.

Survey methods

MSLM visited the area from 29 Apr to 5 May 2011. During the period 30 Apr to 4 May, four days of bird surveys were conducted from the base camp (7°45'11"S, 19°57'24"E; 790 m altitude) on the banks of the Luele River, to surrounding areas within 6 km of the camp. In addition, two visits were made to survey the Capaia area (8°20'S, 20°14'E, 950 m altitude: the coordinates given by Dean 2000 for this area are incorrect) c. 70 km to the south, where extensive gallery forests and floodplains exist along the Lovua River; the plateau grasslands and miombo woodlands between Lagoa Carumbo and Capaia were surveyed en route. The timing of the field work coincided with the end of the warm, wet summer when most birds have finished breeding and many migrants may have departed.

As many habitat types as possible were surveyed during this time, although access to swamp forests, swamps and floodplains was difficult due to high water levels at the end of the rains. The most suitable habitat for Grimwood's Longclaw, on the western side of the lake, could also not be reached during the time available. Observations and sound recordings of birds were made throughout the visit. Daily species lists were compiled, and in order to record some measure of relative abundance, x-species lists (n = 44) were compiled throughout the area with 15 species per list (McKinnon & Phillips 1993, Bibby *et al.* 2000). These lists are composed of the first 15 different species detected; after 15 species have been recorded, a new list is started which may include birds from the previous list. The more conspicuous a bird is, the more lists it should occur on. Although the best results are achieved with this method when surveying a single habitat, rather than several different habitat types as was the case here, this method was chosen rather than time-limited, fixed-radius point counts, because x-species lists can be compiled throughout the day, even during periods of low bird activity, making them efficient when time to conduct surveys is limited

(Fjeldså 1999, Bibby *et al.* 2000). Based on the 15-species lists compiled, we predict species richness for the area using the Chao 2 index $S_2^* = S_{\text{obs}} + (L^2/2M)$, where S_{obs} is the observed number of species, L is the number of species recorded in only one sample and M the number of species in exactly two samples (Colwell & Coddington 1994), and its variance $\text{var}(S_2^*) = M [\{(L/M)/4\}^4 + (L/M)^3 + \{(L/M)/2\}^2]$ (Chao 1987).

The data collected by MSLM are compiled with historical data collated by WRJD, to give a complete summary of the avifauna of the Lagoa Carumbo area. Species collected at Lagoa Carumbo by G. Heinrich (hereafter GH) or the Museu Dundo (MD), summarised by Dean (2001) but not found during the field surveys, are included in square brackets. We also include in square brackets a further 12 species that were recorded outside of the study area *en route* to it from Saurimo (9°40'S, 20°24'E) and Lucapa (8°27'S, 20°43'E); these species are likely to occur within the Lagoa Carumbo area. Abundance categories follow Morel & Tye (1995) and start with capital letters (*i.e.* Common, Abundant *etc.*). Species restricted to the Guinea–Congo Forests biome and Zambesian biome are indicated by GCFB and ZB respectively; first records for the province are indicated with an asterisk; range extensions (of species previously recorded elsewhere in the province) or rare species are also discussed.

Results

In total, 175 bird species were recorded during the five days of the field study, and are listed below. An additional 21 species not found during the field surveys were collected at Lagoa Carumbo by GH or MD, bringing the total of confirmed species to 196.

Phalacrocoracidae

Phalacrocorax africanus Reed Cormorant. Two seen along the Luele River and on Lagoa Carumbo. Collected at Lagoa Carumbo by GH.

Anhingidae

Anhinga rufa African Darter. Two were seen along the Luele River and on Lagoa Carumbo. Collected at Lagoa Carumbo by GH.

Ardeidae

Ixobrychus minutus Little Bittern. One seen along the Luele River.

Bubulcus ibis Cattle Egret. A flock seen on several occasions along the Luele River.

[*Egretta intermedia* Intermediate Egret. Collected at Lagoa Carumbo by GH.]

Accipitridae

**Macheiramphus alcinus* Bat Hawk. One hunting along the Lovua River at Capaia shortly before sunrise.

Milvus migrans Yellow-billed Kite. Ssp. *parasitus* Common to Abundant between Capaia and Carumbo, especially at bush fires. A few seen at Lagoa Carumbo.

Gypohierax angolensis Palm-nut Vulture. Common along the Luele River; a group of 15 seen flying away from the river in the late evening, probably to roost. Two seen at Capaia.

Circaetus cinereus Brown Snake Eagle. One seen near the Luele River.

[*Terathopius ecaudatus* Bateleur. A few seen on the Lucapa-Capaia road.]

Polyboroides typus African Harrier-Hawk. A few seen in the Lagoa Carumbo area.

[*Melierax metabates* Dark Chanting Goshawk. One seen between Lucapa and Saurimo.]

**Accipiter tachiro* African Goshawk. Displaying birds seen in the early morning along the Luele River and at Capaia.

Buteo auguralis Red-necked Buzzard. A few seen on the Capaia–Carumbo road.

Polemaetus bellicosus Martial Eagle. Two seen between Carumbo and Capaia.

Phasianidae

Francolinus coqui Coqui Francolin. Three seen in lightly wooded plateau grassland between Capaia and Lagoa Carumbo.

F. afer Red-necked Spurfowl. Commonly heard and also seen in the Lagoa Carumbo area.

Rallidae

Sarothrura pulchra White-spotted Flufftail (GCFB). Heard in swamp forest along the Luele River and the Lovua River at Capaia. Collected at Lagoa Carumbo by MD.

**S. lugens* Chestnut-headed Flufftail. Four birds in different territories were sound recorded in the Carumbo area, and another two groups heard at Capaia, all in tall, rank grassland associated with rivers and swamps. One seen briefly in flight at the latter locality. Only one previous record for Angola: a specimen collected at Chitau, Bié Province (11°15'S, 17°08'E) in 1925 (Pinto 1983).

Otididae

Neotis denhami Denham's Bustard. One in the floodplain grasslands adjacent to the Lovua River at Capaia.

Eupodotis senegalensis White-bellied Bustard. B.J. Huntley (pers. comm.) saw one in the Carumbo–Capaia grasslands. Collected at Lagoa Carumbo by GH and MD.

[*E. melanogaster* Black-bellied Bustard. Collected at Lagoa Carumbo by GH.]

Glareolidae

Rhinoptilus chalcopterus Bronze-winged Courser. One seen along the Carumbo-Capaia road.

Scolopacidae

Actitis hypoleucos Common Sandpiper. One seen along the Luele River.

Columbidae

Treron calva African Green Pigeon. A few in the Carumbo area. Collected at Lagoa Carumbo by GH.

Turtur afer Blue-spotted Wood Dove. Several seen in the Carumbo and Capaia areas.

Columba iriditorques Western Bronze-naped Pigeon (GCFB). Several heard in the Carumbo area.

C. uncinata Afep Pigeon (GCFB). Several seen along the Luele River and one at the Lovua River at Capaia.

Streptopelia semitorquata Red-eyed Dove. Common in the Carumbo and Capaia areas.

S. capicola Ring-necked Dove. A few seen along the Carumbo-Capaia road.

Psittacidae

[*Poicephalus meyeri* Meyer's Parrot. Heard in the woodlands between Capaia and Lucapa, and seen between Lucapa and Saurimo.]

Musophagidae

Musophaga rossae Ross's Turaco. Heard in the Carumbo area and seen once along the Lovua River at Capaia.

Cuculidae

Cuculus solitarius Red-chested Cuckoo. A few heard in the Carumbo area.

Chrysococcyx klaas Klaas's Cuckoo. One heard in the Carumbo area.

Ceuthmochares aereus Green Malkoha. A few seen in the Carumbo area. Collected at Lagoa Carumbo by MD.

Strigidae

Strix woodfordii African Wood Owl. One heard at night along the Luele River.

Caprimulgidae

**Caprimulgus natalensis* Swamp Nightjar. At least ten seen and heard in the floodplain grasslands of the Lovua River at Capaia.

Apodidae

Cypsiurus parvus African Palm Swift. A few seen around a village on the Carumbo-Capaia Road.

[*Apus affinis* Little Swift. Several seen around the airport at Saurimo.]

Trogonidae

Alaloderma narina Narina Trogon. A few heard along the Lovua River at Capaia.

Alcedinidae

Halcyon malimbica Blue-breasted Kingfisher. Several heard in the Carumbo area, and one at Capaia.

H. helicuti Striped Kingfisher. One seen in the Carumbo area. Collected at Lagoa Carumbo by GH and MD.

Ceyx pictus African Pygmy Kingfisher. A few seen in the Carumbo area.

**Alcedo leucogaster* White-bellied Kingfisher (GCFB). A juvenile mist netted at the Lovua River at Capaia. Based on its blue superciliary area, it was identified as belonging to ssp. *leopoldi* (Fry *et al.* 1992). The first record of this subspecies in Angola.

A. cristata Malachite Kingfisher. One along the Luele River and one on the floodplain of the Lovua River at Capaia.

**Megaceryle maxima* Giant Kingfisher. One along the Luele River.

Ceryle rudis Pied Kingfisher. One along the Luele River.

Meropidae

Merops gularis Black Bee-eater (GCFB). Several groups heard in the Carumbo area. Seen by P. vaz Pinto (pers. comm.). Collected at Lagoa Carumbo by MD.

M. pusillus Little Bee-eater. One group in a tall-grass dambo in the Carumbo area.

M. variegatus Blue-breasted Bee-eater. Common on floodplain grasslands in the Capaia and Carumbo areas. Collected by MD on the Luele River.

M. nubicoides Southern Carmine Bee-eater. Small numbers seen in the Carumbo and Capaia areas. Collected at Lagoa Carumbo by MD.

Coraciidae

Coracias caudatus Lilac-breasted Roller. One seen in the grasslands on the Capaia–Carumbo road. Collected at Lagoa Carumbo by GH.

Eurystomus gularis Blue-throated Roller (GCFB). One perched in gallery forest along the Lovua River at Capaia.

Bucerotidae

Tockus fasciatus African Pied Hornbill (GCFB). One flock near the Luele River.

[*T. alboterminatus* Crowned Hornbill. Collected at Lagoa Carumbo by GH].

T. pallidirostris Pale-billed Hornbill (ZB). Seen once in the Carumbo area.

Bycanistes bucinator Trumpeter Hornbill. About 20 seen near the Luele River, and more heard along the Lovua River at Capaia.

Capitonidae

Pogoniulus bilineatus Yellow-rumped Tinkerbird. Seen regularly in the Carumbo and Capaia areas.

P. chrysoconus Yellow-fronted Tinkerbird. A few heard in the Carumbo area.

[*Stactolaema anchietae* Anchieta's Barbet (ZB). Collected at Lagoa Carumbo by GH].

[*Tricholaema frontata* Miombo Pied Barbet (ZB). Collected at Lagoa Carumbo by GH.]

Indicatoridae

Indicator indicator Greater Honeyguide. One seen in the Carumbo area.

Picidae

[*Campethera cailliautii* Green-backed Woodpecker. Collected at Lagoa Carumbo by MD.]

[*C. nivosa* Buff-spotted Woodpecker (GCFB). Collected at Lagoa Carumbo by GH.]

Dendropicos fuscescens Cardinal Woodpecker. Two seen in the Carumbo area. Collected at Lagoa Carumbo by GH and MD.

Eurylaimidae

Smithornis capensis African Broadbill. A few heard along the Luele River.

Alaudidae

Mirafraga africana Rufous-naped Lark. Common in grasslands on the Carumbo–Capaia Road.

M. rufocinnamomea Flappet Lark. Two heard along the Capaia–Carumbo road.

Hirundinidae

Psalidoprocne pristoptera Black Saw-wing. Common in the Carumbo and Capaia areas.

Riparia cincta Banded Martin. Many in the Carumbo–Capaia grasslands; a few seen over floodplain grasslands of the Lovua River at Capaia.

**Hirundo cucullata* Greater Striped Swallow. Common throughout the Capaia and Carumbo areas, with at least 50 seen in grasslands at the Lovua River at Capaia and in the Capaia–Carumbo grasslands.

H. abyssinica Lesser Striped Swallow. A few seen in the Carumbo area.

H. rufigula Red-throated Cliff Swallow (ZB). A small flock seen in grasslands along the Lovua River at Capaia.

**H. spilodera* South African Cliff Swallow. Two seen drinking over the Luele River; one with Greater Striped Swallows on the Capaia–Carumbo road. The first records for Angola (Mills *et al.* 2013).

H. nigrita White-bibbed Swallow (GCFB). At least two seen along the Luele River. Collected at Lagoa Carumbo by GH.

H. nigrorufa Black-and-rufous Swallow (ZB). Two over floodplain grasslands adjacent to the Luele River; one along the Lovua River at Capaia. These constitute the most northerly Angolan records, although it reaches Kibobo Matari (5°41'S, 19°17'E) in the Democratic Republic of Congo (Schouteden 1965).

[*H. angolensis* Angola Swallow. A few seen on the Luachimo River near Lucapa.]

Motacillidae

[*Motacilla capensis* Cape Wagtail. Collected at Lagoa Carumbo by GH.]

Anthus leucophrys Plain-backed Pipit. At least ten on short-grass dambos near the Luele River, with plain, dark-brown backs and orange bill bases.

[*A. vaalensis* Buffy Pipit. Collected at Lagoa Carumbo by GH.]

A. brachyurus Short-tailed Pipit. One seen and heard in flight on a short-grass dambo adjacent to the Luele River.

Macronyx fuellebornii Fülleborn's Longclaw (ZB). Three seen on a short-grass dambo adjacent to the Luele River; at least four on the Lovua River floodplain at Capaia. Collected at Lagoa Carumbo by GH.

[*M. grimwoodi* Grimwood's Longclaw (ZB). Collected at Lagoa Carumbo by GH.]

Campephagidae

Campephaga flava Black Cuckoo-shrike. A female seen along the Luele River.

Pycnonotidae

Andropadus virens Little Greenbul. Common to Abundant in the Carumbo and Capaia areas; three mist-netted.

[*A. gracilis* Little Grey Greenbul (GCFB). Collected at Lagoa Carumbo by GH.]

A. gracilirostris Slender-billed Greenbul. Two seen along the Luele River. Collected at Lagoa Carumbo by MD.

Baeopogon indicator Honeyguide Greenbul (GCFB). One heard along the Luele River.

Chlorocichla simplex Simple Leaflove (GCFB). One seen in the Carumbo area. Collected at Lagoa Carumbo by GH.

C. flavicollis Yellow-throated Leaflove. Common along the Luele River and the Lovua River at Capaia. Collected at Lagoa Carumbo by MD.

Phyllastrephus cabanisi Cabanis's Greenbul. One group seen and heard in dry forest near the Luele River.

**Pyrrhurus scandens* Red-tailed Leaflove (GCFB). Commonly heard in swamp forest along the Luele and Lovua River; one mist-netted on the Lovua River at Capaia. First record for the country (Mills *et al.* 2013). Known in the Democratic Republic of Congo as near as Tshisika (6°24'S, 20°48'E: Schouteden 1964).

Bleda syndactyla Red-tailed Bristlebill (GCFB). Several heard and two mist-netted in the Carumbo area.

Pycnonotus tricolor Dark-capped Bulbul. Common to Abundant in the Carumbo area. Collected by MD on the Luele River.

Neolestes torquatus Black-collared Bulbul. One seen in the Carumbo area; one on the Lovua River floodplain at Capaia. Collected at Lagoa Carumbo by GH.

Nicator chloris Western Nicator (GCFB). Common in dense vegetation in the Carumbo area. Collected at Lagoa Carumbo by GH.

Turdidae

Cossypha heuglini White-browed Robin-Chat. One heard at Lagoa Carumbo.

C. natalensis Red-capped Robin-Chat. One seen in dry forest near the Luele River.

Alethe diademata Fire-crested Alethe (GCFB). Two heard in swamp forest near the Luele River; one netted on the Lovua River at Capaia. A range extension south from the Luachimo River, where collected by GH.

Stizorhina fraseri Fraser's Rufous Thrush (GCFB). One heard along the Lovua River at Capaia.

Cercotrichas barbata Miombo Scrub Robin (ZB). Three heard in the Carumbo area. Collected at Lagoa Carumbo by MD.

C. leucophrys White-browed Scrub Robin. Common in woodland in the Carumbo area.

Saxicola torquatus African Stonechat. Several seen in floodplain grasslands along the Luele River and the Lovua River at Capaia. Collected at Lagoa Carumbo by GH.

Myrmecocichla tholloni Congo Moor Chat. Abundant in grasslands between Carumbo and Capaia, with at least 50 birds seen.

M. nigra Sooty Chat. Abundant in grasslands between Carumbo and Capaia, outnumbering Congo Moor Chat in the more wooded areas. One pair on a short-grass dambo near the Luele River.

[*Psophocichla litsitsirupa* Groundscraper Thrush. One seen between Lucapa and Saurimo.]

Turdus pelios African Thrush. One seen in the Carumbo area.

Sylviidae

Melocichla mentalis Moustached Grass Warbler. One seen in the Carumbo area. Collected at Lagoa Carumbo by GH.

Schoenicola brevirostris Fan-tailed Grassbird. One seen in grassland on the Luele River floodplain, and at least ten on the Lovua River floodplain at Capaia.

Acrocephalus schoenobaenus Sedge Warbler. One seen in tall grassland along the Luele River.

**Cisticola cantans* Singing Cisticola. Three groups seen and sound-recorded in lightly wooded grassland near Lagoa Carumbo. Previously known only from Lunda Sul and Huambo provinces (Dean *et al.* 2003).

C. lateralis Whistling Cisticola. Common in woodland with rank grass in the Carumbo area.

**C. rufilatus* Tinkling Cisticola. One heard in grasslands on the Capaia–Carumbo road.

C. galactotes Winding Cisticola. Common on floodplain grasslands of the Luele River.

**C. robustus* Stout Cisticola. At least ten seen and heard on the floodplain grasslands of the Lovua River at Capaia.

C. brachypterus Short-winged Cisticola. Common throughout the area.

[*C. juncidis* Zitting Cisticola. One heard between Lucapa and Saurimo. Collected at Capaia (Dean 2000).]

C. dambo Dambo Cisticola (ZB). A few seen, including in display, on the Capaia–Carumbo road. Hundreds of small cisticolas seen in these grasslands were probably mostly this species.

Prinia subflava Tawny-flanked Prinia. Common throughout the Carumbo and Capaia areas.

Schistolais leucopogon White-chinned Prinia. Two groups seen in the Carumbo area.

Apalis rufogularis Buff-throated Apalis (GCFB). A pair seen along the Lovua River at Capaia.

Camaroptera brachyuran Grey-backed Camaroptera. Several (ssp. *brevicaudata*) heard in the Carumbo area.

Calamonastes undosus Miombo Wren-Warbler (ZB). One seen in the Carumbo area.

Eremomela scotops Green-capped Eremomela. Several groups seen in the Carumbo area. Collected at Lagoa Carumbo by GH.

E. atricollis Black-necked Eremomela (ZB). One group seen and sound-recorded in woodland in the Carumbo area.

Sylvietta ruficapilla Red-capped Crombec (ZB). Two heard in the Carumbo area.

S. virens Green Crombec (GCFB). Several heard in the Carumbo and Capaia areas.

S. denti Lemon-bellied Crombec (GCFB). One sound-recorded along the Lovua River at Capaia. The second record for Angola and a southward range extension from the other record at Dundo (Dean 2000).

[*Hylia flavigaster* Yellow-bellied Hylia. Collected at Lagoa Carumbo by GH and MD.]

Hylia prasina Green Hylia (GCFB). At least two heard in the Carumbo area.

Muscicapidae

[*Melaenornis pammelaina* Southern Black Flycatcher. Collected at Lagoa Carumbo by GH.]

M. pallidus Pale Flycatcher. Four seen in the Carumbo area. Collected at Lagoa Carumbo by MD.

Muscicapa caerulescens Ashy Flycatcher. Two seen near the Luele River. Collected at Lagoa Carumbo by MD.

M. cassini Cassin's Flycatcher (GCFB). Several seen along the Luele River.

Myioparus plumbeus Grey Tit-Flycatcher. One seen in the Carumbo area. Collected at Lagoa Carumbo by GH.

Monarchidae

Terpsiphone viridis African Paradise Flycatcher. Several seen in the Carumbo area.

T. rufiventer Red-bellied Paradise Flycatcher (GCFB). One in dry forest near the Luele River; two netted on the Lovua River at Capaia.

Platysteiridae

Bias musicus Black-and-white Flycatcher. Heard twice along the Lovua River at Capaia.

Dyaphorophya castanea Chestnut Wattle-eye (GCFB). A few seen in the Carumbo area; one netted along the Lovua River at Capaia.

Platysteira peltata Black-throated Wattle-eye. A pair in dry forest near the Luele River; one heard at the Lovua River at Capaia.

Batis molitor Chinspot Batis. Two seen in the Carumbo area; one heard in woodland adjacent to the Lovua River at Capaia.

B. minor Western Black-headed Batis. Two in the Carumbo area.

Timaliidae

Illadopsis fulvescens Brown Illadopsis (GCFB). Heard once in swamp forest near the Luele River.

Ptyrticus turdinus Spotted Thrush-Babbler. One group seen and sound-recorded in dry forest near the Luele River. A range extension west from Dundo, where collected by GH.

Paridae

[*Parus leucomelas* White-winged Black Tit. Collected at Lagoa Carumbo by GH.]

[*P. griseiventris* Miombo Tit (ZB). Collected at Lagoa Carumbo by GH.]

Remizidae

Anthoscopus caroli Grey Penduline Tit. Seen twice in the Carumbo area.

Nectariniidae

Anthreptes longuemarei Western Violet-backed Sunbird. Several seen in woodlands of the Carumbo area. Collected there by GH.

A. rectirostris Grey-chinned Sunbird (GCFB). One pair near the Luele River.

A. seimundi Little Green Sunbird (GCFB). One seen feeding in a flowering tree in the Carumbo area.

Anabathmis reichenbachii Reichenbach's Sunbird (GCFB). Two seen along the Luele River. Collected at Lagoa Carumbo by GH. Cabinda is its only other known locality in Angola.

[*Cyanomitra bannermani* Bannerman's Sunbird (ZB). Collected at Lagoa Carumbo by GH.]

C. cyanolaema Blue-throated Brown Sunbird (GCFB). Commonly heard and a few seen in the Carumbo area.

C. olivacea Olive Sunbird. Common in forest in the Carumbo and Capaia areas; three mist-netted.

Chalcomitra rubescens Green-throated Sunbird (GCFB). At least three seen near the Luele River. Collected at Lagoa Carumbo by GH and MD.

C. amethystina Amethyst Sunbird. One male seen in the Carumbo area.

C. senegalensis Scarlet-chested Sunbird. Several in woodland in the Carumbo and Capaia areas.

Anthodiaeta collaris Collared Sunbird. At least four seen in the Carumbo area.

Cinnyris chloropygius Olive-bellied Sunbird. One male seen near the Luele River; two on the Lovua River at Capaia. Collected at Lagoa Carumbo by MD.

C. bouvieri Orange-tufted Sunbird. Common in woodlands of the Carumbo area. Collected at Lagoa Carumbo by GH.

C. cupreus Copper Sunbird. At least ten seen in woodland in the Carumbo and Capaia areas. Collected at Lagoa Carumbo by MD.

Zosteropidae

Zosterops senegalensis African Yellow White-eye. At least two heard in dry forest near the Luele River. Collected at Lagoa

Laniidae

Lanius collaris Northern Fiscal. Common in grasslands between Capaia and Carumbo.

Malaconotidae

Malaconotus sulfureopectus Orange-breasted Bushshrike. One heard at Lagoa Carumbo.

**Telophorus viridis* Gorgeous Bushshrike. Four were heard in the Carumbo area. The nearest record appears to be from Mungindu (5°26'S, 19°2'E), Democratic Republic of Congo (Schouteden 1965).

Antichromus minuta Marsh Tchagra. One pair in floodplain grasslands of the Lovua River at Capaia; several heard in tall grassland in the Carumbo area. Collected at Lagoa Carumbo by GH.

Tchagra australis Brown-crowned Tchagra. Three heard in the Carumbo area. Collected at Lagoa Carumbo by GH.

T. senegala Black-crowned Tchagra. Several seen in the Carumbo and Capaia areas.

Dryoscopus cubla Black-backed Puffback. Common in the Carumbo and Capaia areas.

Laniarius aethiopicus Tropical Boubou. Several heard in the Carumbo and Capaia areas.

Prionopidae

Prionops plumatus White-crested Helmet-shrike. A flock of c. 20 seen in the Carumbo area.

Oriolidae

Oriolus larvatus Black-headed Oriole. Several heard in the Carumbo area.

Corvidae

Corvus capensis Cape Crow. At least ten seen in grasslands in the Capaia area. Collected by GH at Lagoa Carumbo.

[*C. albus* Pied Crow. Seen between Lucapa and Saurimo.]

Carumbo by GH.

Sturnidae

Cinnyricinclus leucogaster Violet-backed Starling. Common to Abundant in the Carumbo area.

Passeridae

[*Passer griseus* Northern Grey-headed Sparrow. Several seen at Lucapa.]

Petronia supercilii Yellow-throated Petronia. At least six seen in the Carumbo area.

Ploceidae

**Ploceus nigrimentus* Black-chinned Weaver. One female in sparsely wooded grassland c. 30 km south of Capaia; two females and one male along the Capaia–Carumbo road. First records in Angola outside of the Huambo highlands, several hundred km to the south.

**P. ocularis* Spectacled Weaver. One heard at Lagoa Carumbo and another at Capaia.

[*P. nigerrimus* Vieillot's Black Weaver (GCFB). Collected at Lagoa Carumbo by GH.]

[*P. cucullatus* Village Weaver. One breeding colony at Lucapa.]

P. superciliosus Compact Weaver. Seen twice in floodplain grasslands along the Luele River; at least 30 seen in floodplain grasslands on the Lovua River at Capaia. Collected at Lagoa Carumbo by GH.

P. bicolor Dark-backed Weaver. Two seen in dry forest near the Luele River. Collected at Lagoa Carumbo by GH.

**Quelea erythrops* Red-headed Quelea. Two breeding-plumage males in tall, damp grassland near the Luele River.

Euplectes hordeaceus Black-winged Red Bishop. Two males in breeding plumage in the Carumbo area. Collected at Lagoa Carumbo by GH.

[*E. capensis* Yellow Bishop. Collected at Lagoa Carumbo by GH.]

E. macrourus Yellow-mantled Widowbird. Common in dry grassland in the Carumbo area and especially on the Carumbo-Capaia Road.

E. ardens Red-collared Widowbird. Common in tall grassland in the Carumbo area, with many males in full breeding dress. Collected at Lagoa Carumbo by GH.

E. hartlaubi Marsh Widowbird. At least ten males in breeding plumage on the Lovua River floodplain at Capaia. Some birds were losing their breeding dress.

[*Anomalospiza imberbis* Cuckoo-Finch. Collected at Lagoa Carumbo by GH.]

Estrildidae

Nigrita canicapilla Grey-headed Negro-finch. Two heard in the Carumbo area.

[*Clytospiza monteiri* Brown Twinspot. Heard along the Luachimo River near Lucapa.]

[*Lagonosticta senegala* Red-billed Firefinch. Two seen at Lucapa.]

L. rubricata African Firefinch. One seen in the Carumbo area. Collected at Lagoa Carumbo by GH.

Estrilda paludicola Fawn-breasted Waxbill. Seen in tall grassland in the Carumbo area and at the Lovua River at Capaia, with *c.* 50 and 200 birds respectively. Collected at Lagoa Carumbo by GH.

*E. melpod*a Orange-cheeked Waxbill. About 20 seen in the Carumbo area. Collected at Lagoa Carumbo by GH.

Uraeginthus bengalus Red-cheeked Cordon-bleu. Four seen in the Carumbo area. Collected at Lagoa Carumbo by GH.

**Amandava subflava* Orange-breasted Waxbill. Two seen near the Luele River.

**Ortygospiza gabonensis* Black-chinned Quail-Finch. Four seen on a short grass dambo near the Luele River; four on the Lovua River floodplain at Capaia.

Lonchura cucullata Bronze Mannikin. Small numbers seen throughout the Carumbo and Capaia areas.

L. bicolor Black-and-white Mannikin. Two seen adjacent to a village in the Carumbo area. Collected at Lagoa Carumbo by GH.

Viduidae

Vidua funerea Dusky Indigobird. One mimicking African Firefinch was observed, sound-recorded and captured in the Carumbo area. Collected at Lagoa Carumbo by GH.

V. macroura Pin-tailed Whydah. Small numbers seen throughout the area, including along the Carumbo-Capaia Road.

V. obtusa Broad-tailed Paradise Whydah (ZB). At least three males in breeding plumage in the Carumbo area.

Fringillidae

[*Serinus capistratus* Black-faced Canary. Collected at Lagoa Carumbo by GH.]

S. mozambicus Yellow-fronted Canary. About five seen in the Carumbo area.

Emberizidae

Emberiza flaviventris Golden-breasted Bunting. Two seen in the Carumbo area.

[*E. cabanisi* Cabanis's Bunting. Collected at Lagoa Carumbo by GH.]

During the 15-species counts, 149 species were recorded, with 48 species recorded once (L) and 28 species recorded twice (M). This gives a Chao 2 index $S_2^* = 190$, with variance $\text{var}(S_2^*) = 163$. Thus actual bird diversity is estimated to be within the range 196 (actual number recorded) and 353 ($S_2^* + \text{var}(S_2^*)$) species. The species recorded most during the 15-species counts are listed in Table 1.

Table 1. The species recorded in nine or more (20 %) of the 15-species counts, listed in decreasing order of frequency, with the number and percentage of counts in which they were recorded.

	Counts	%
<i>Andropadus virens</i> Little Greenbul	34	77
<i>Pycnonotus tricolor</i> Dark-capped Bulbul	25	57
<i>Euplectes ardens</i> Red-collared Widowbird	21	48
<i>Cinnyricinclus leucogaster</i> Violet-backed Starling	20	45
<i>Cinnyris bouvieri</i> Orange-tufted Sunbird	19	43
<i>Pogoniulus bilineatus</i> Yellow-rumped Tinkerbird	18	41
<i>Cercotrichas leucophrys</i> White-browed Scrub Robin	17	39
<i>Nicator chloris</i> Western Nicator	15	34
<i>Sylvietta virens</i> Green Crombec	14	32
<i>Prinia subflava</i> Tawny-flanked Prinia	14	32
<i>Francolinus afer</i> Red-necked Spurfowl	13	30
<i>Turtur afer</i> Blue-spotted Wood Dove	12	27
<i>Saxicola torquatus</i> African Stonechat	12	27
<i>Chlorocichla flavicollis</i> Yellow-throated Leaflove	12	27
<i>Merops variegatus</i> Blue-breasted Bee-eater	11	25
<i>Bycanistes bucinator</i> Trumpeter Hornbill	11	25
<i>Gypohierax angolensis</i> Palm-nut Vulture	10	23
<i>Anthus leucophrys</i> Plain-backed Pipit	10	23
<i>Petronia supercilii</i> Yellow-throated Petronia	10	23
<i>Hirundo cucullata</i> Greater Striped Swallow	9	20
<i>Cyanomitra cyanolaema</i> Blue-throated Brown Sunbird	9	20
<i>Cyanomitra olivacea</i> Olive Sunbird	9	20

Discussion

The diversity of habitats in the Lagoa Carumbo area provides conditions suitable for many bird species, including several that are localized or rare in Angola, and two recorded for the first time in the country: South African Cliff Swallow and Red-tailed Leaflove. Lagoa Carumbo occurs at the interface of the Guinea-Congo Forests and Zambebian biomes, and 31 species restricted to the Guinea-Congo Forests biome and 15 to the Zambebian biome were found. This gives Lagoa Carumbo the highest number of Zambebian biome species known for any IBA in Angola (Dean 2001). However, most of the most conspicuous species (Table 1) are widespread and common central African savanna birds. This reflects the fact that most of the area is covered in mixed, fairly open, savanna woodland, with the most specialist habitats (gallery and dry forests, floodplain) occupying relatively small areas.

The field surveys coincided with the end of the rainy season, when vocal and breeding activity was relatively low. Early wet-season (Oct–Nov) surveys are likely to reveal more species, and mid-summer (Nov–Feb) surveys should reveal more migrants, which were relatively scarce during the present survey. Furthermore, the end of the dry season would allow easier access to certain floodplain habitats. The open floodplain grasslands west of Lagoa Carumbo merit special attention, as these appeared to be the most suitable habitat in the area for Grimwood's Longclaw, a little-known species collected here during the 1950s but not recorded during the present survey.

Acknowledgments

MSLM is very grateful to Brian Huntley for inviting him to join this biodiversity expedition. The project was made possible by the generous support of various individuals and organizations, including Dr Fatima Jardim, Dr Paula Francisco and Dr Soki Kuendikuenda of the Ministry for Environment of Angola, Dr Moises Chingongo and the Vice Governor of Lunda Norte, and Augusto Lupatchi, the Administrator of Comuna da Capaia. Logistical support was provided by De Beers Angola Prospecting; special thanks to Charles Skinner, Dr Gleuber Alves, Adriano Brito, Valdemar Mateus, Cecilia Canzamba, João (Balas) Gongá, Facatino Mateus, Canga Xiaquivuila, Toni Gaspar, Mario Fernando Muhunga, Amorim Francisco Lamba, João Miudo, and Mr Baptista. Financial support came from grant 8911-11 from the National Geographic Society's Research, Conservation and Expeditions Committee. Mist-netting was conducted mainly by Pedro vaz Pinto, Jorge Palmeirim, Sendi Baptista and Ninda Baptista. Bill Branch and Brian Huntley shared some of their own bird observations. Martim Melo translated the summary into Portuguese. Robert Dowsett commented extensively on the manuscript and greatly helped to improve its contents.

References

- BIBBY, C.J., BURGESS, N.D., HILL, D.A. & MUSTOE, S.H. (2000) *Bird Census Techniques*, 2nd ed. Academic Press, London.
- CHAO, A. (1987) Estimating the population size for capture-recapture data with unequal catchability. *Biometrics* 43: 783–791.
- COLWELL, R.K. & CODDINGTON, J.A. (1994) Estimating terrestrial biodiversity through extrapolation. *Phil. Trans. R. Soc. Lond. B* 345: 101–118.
- DEAN, W.R.J. (2000) *The Birds of Angola*. Checklist 18, British Ornithologist's Union, Tring.
- DEAN, W.R.J. (2001) Angola. Pp. 71–91 in FISHPOOL, L.D.C & EVANS, M.I. (eds) *Important Bird Areas in Africa and Associated Islands: priority sites for conservation*. Pisces, Newbury.
- DEAN, W.R.J., IRWIN, M.P.S. & PEARSON, D.J. (2003) An isolated population of Singing Cisticola, *Cisticola cantans*, in Angola. *Ostrich* 74: 231–232.
- FIELDSÁ, J. (1999) The impact of human forest disturbance on the endemic avifauna of the Udzungwa Mountains, Tanzania. *Bird Conserv. Int.* 9: 47–62.
- FRY, C.H., FRY, K. & HARRIS, A. (1992) *Kingfishers, Bee-eaters and Rollers*. Russel Friedman, Halfway House.
- HEINRICH, G. (1958) Zur Verbreitung und Lebensweise der Vögel von Angola. Systematischer Teil III (Hirundinidae–Fringillidae). *J. Orn* 99: 399–421.
- HUNTLEY, B.J. (1974) Outlines of wildlife conservation in Angola. *S. Afr. J. Wildl. Res.* 4: 157–166.
- MCKINNON, J. & PHILLIPS, K. (1993) *A Field Guide to the Birds of Borneo, Sumatra, Java and Bali*. Oxford University Press, Oxford.
- MILLS, M.S.L., PINTO, P. VAZ & PALMEIRIM, J.M. (2013) First records of Yellow-throated Cuckoo *Chrysococcyx flavigularis*, South African Cliff Swallow *Petrochelidon spilodera* and Red-tailed Leaflove *Phyllastrephus scandens* for Angola. *Bull. Afr. Bird Club* 20: 200–204.
- MOREL, G.J. & TYE, A. (1995) Guidelines for avifaunal papers in *Malimbus*. *Malimbus* 17: 35–39.
- PINTO, A.A. da R. (1973) Aves da colecao do Museu do Dundo. *Publ. cult. Companhia Diamantes de Angola* 87: 129–178.
- PINTO, A.A. da R. 1983. *Ornitologia de Angola, vol.1*. Instituto de Investigação Científica Tropical, Lisbon.
- SCHOUTEDEN, H. (1964) La faune ornithologique de la Province du Kasai. *Mus. Roy. Afr. Centr., Doc. Zool.* 6: 1–212.
- SCHOUTEDEN, H. (1965) La faune ornithologique de la Province du Kwango. *Mus. Roy. Afr. Centr., Doc. Zool.* 8: 1–60.
- SILVEIRA, M. (1973) *Estudo Climático dos Distritos da Lunda, Angola*. Unpublished mimeograph report.