

Short communication

A SURVEY ON BIRDS OF THE YAYU FOREST IN SOUTHWEST ETHIOPIA

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**ABSTRACT:** A survey of birds in the Yayu forest, southwest Ethiopia, was conducted between August and December 2009. Timed Species Count (TSC) method was used. The survey was conducted in seven selected sampling blocks, each with an area of 0.5 km<sup>2</sup>. The blocks were representative of vegetation types (afromontane forest, transitional rain forest and riverine forest) and conservation zones (core, buffer and transition). A total of 112 bird species were recorded. Species composition of birds showed significantly higher number during the wet season than the dry season. The number of bird species records of the seven blocks also showed significant difference. The study reinforces the designation of the Yayu forest as a biodiversity hotspot and it is recommended that ongoing conservation and biodiversity documentation efforts should continue.

**Key words/phrases:** Birds, diversity, Ethiopia, survey, Yayu

INTRODUCTION

The Yayu forest is one of three intact forests in southwest Ethiopia proposed to serve as *in-situ* conservation sites for wild coffee (*Coffea arabica* L.) gene pool. The other two proposed forests are Birhane-Kontir and Boginda-Yeba (Demel Teketay *et al.*, 1998 cited in Tadesse Wolde-mariam, 2003). The conservation of wild coffee in the three natural forests mentioned above needs to be carried out as a comprehensive conservation endeavour of the entire ecosystem as a whole (Tadesse Woldemariam, 2003). As a first step in the conservation activity of wild coffee in the Yayu forest, a large-scale vegetation study of the forest has been conducted (Tadesse Wolde-mariam, 2003). The study documented 220 species of vascular plants from an area of 100 km<sup>2</sup> intact forest.

The present study can be considered as a phase in the overall conservation undertaking of the Yayu forest in general and wild coffee in

particular. It was aimed at surveying the avian diversity of the forest.

THE STUDY AREA AND METHODS

*The study area*

The Yayu forest is located about 560 km from Addis Ababa in southwest Ethiopia within the Illubabor Zone of Oromia Regional State. It lies between 8°21'–8°26'N latitude and 35°45'–36°3'E longitude within an altitudinal range of 1200–2000 masl. The study area is divided into three conservation zones, which differ in levels of conservation priority. In the core zone, no human activity is allowed; in the buffer zone some economic activities like collection of forest resources, including coffee, is allowed while the transition zone is the least restrictive and most accessible which allows free human activities including cultivation of crops (Tadesse Woldemariam, 2003).

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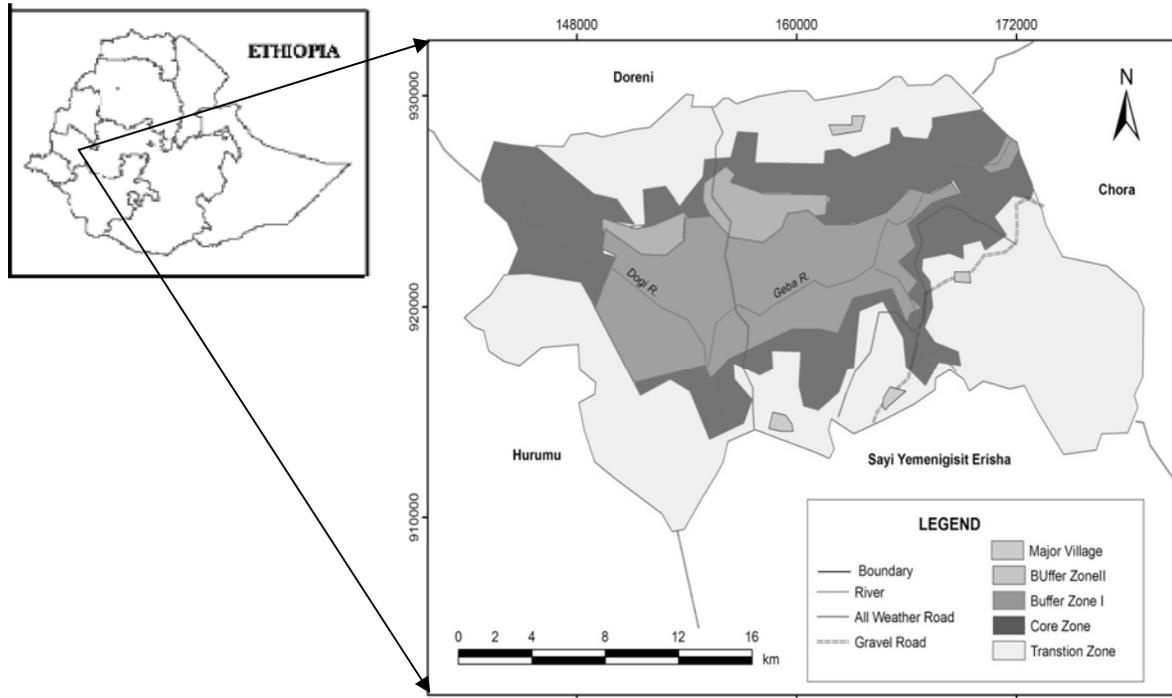


Fig. 1. Map of the study area.

### Methods

Seven sampling blocks, each having a total area of 0.5 km<sup>2</sup>, were selected. Selection was conducted in such a way that different elevation, vegetation and conservation zones could be included (Table 1).

Timed Species Count (TSC) method (Bibby *et al.*, 1998) was used with slight modifications. Surveys were conducted at selected hours of the day where activity of birds is maximum; 7:00–10:00 am (morning) and 3:00–6:00 pm (afternoon). The sampling blocks were surveyed once in the dry and wet season. The researcher walks randomly in the sampling block during each of the 6 hr data recording sessions of the morning and afternoon. A score of 6 was given to the bird species encountered first. Then an interval of 10 minutes was allowed before the second recording. The bird species encountered next was

given a score of 5. In a similar way, new recordings were made in 10 minute intervals for one hour giving 1 point less for consecutive encounters. Each species was scored only once in the one hour period. In the next hour the scoring started all over again giving maximum points to the first species. At the end, the mean hourly encounter score (mean hourly abundance index) of each species was calculated by dividing the sum of scores by the total number of hours of observation *i.e.*, 6. For each sampling block, the three most abundant species in each season were determined based on their mean hourly abundance index values. Birds were identified in part using local assistants (for local names) and a field guide book (Ian and Peter, 2003).

The research was carried out in two sampling phases representing the wet (August 2009) and dry (December 2009) season.

**Table 1. Sampling blocks and their elevations, geographic coordinates and vegetation type and conservation zone categories.**

Sampling block	Elevation (m)	Coordinates	Forest type	Conservation zone
Saki	1298–1325 m	08°21'N and 035°46'E	Riverine	Core
Geba	1476–1489 m	08°21'N and 035°47'E	Riverine	Core
Geba-Dureni	1335–1458 m	08°22'N and 035°47'E	Transitional rainforest	Core
Wotetie	1490–1534 m	08°23'N and 035°53'E	Transitional rainforest + Afromontane forest	Core
Megela	1260–1385 m	08°21'N and 035°49'E	Transitional rainforest	Buffer
Mesengo	1252–1271 m	08°23'N and 035°48'E	Transitional rainforest	Buffer
Wabo	1373–1486 m	08°22'N and 035°54'E	Transitional rainforest	Transition

**Statistical analysis**

Species diversity between vegetation types and conservation zones were compared using independent sample *t*-test while avian diversity between the sampling blocks was compared using one-way ANOVA. Post-hoc test was conducted using the least significant difference (LSD) analysis on SPSS version 17.0. The 95% level of significance was used.

**RESULTS**

A total of 112 species of birds, which belonged to 37 families, were recorded (Appendix 1). Of these, 15 and 11 were Palearctic and Intra-African migrants, respectively. One endemic species, thick-billed raven (*Corvus crassirostris*), was also recorded.

The number of species recorded during the wet season was significantly higher than the dry season ( $p < 0.05$ ) (Fig. 2).

The number of species recorded in each sampling block showed significant difference when data were combined for both seasons ( $F = 4.784$ ;  $p < 0.05$ ). The highest mean number of species was recorded for Wabo and the least for Wotetie block (Fig. 3).

The mean  $\pm$  SD number of species per sampling block in the core and buffer zones was  $21.25 \pm 5.49$  and  $27 \pm 3.91$ , respectively and the difference was not statistically significant ( $F = 0.632$ ;  $P > 0.05$ ). Similarly, the mean  $\pm$  SD number of species per sampling block in the riverine and transitional rainforest was  $25 \pm 3.69$  and  $26.25 \pm 6.22$ , respectively and the difference was not statistically significant ( $F = 1.905$ ;  $p > 0.05$ ).

The three most abundant species for each habitat type are given in Table 2.

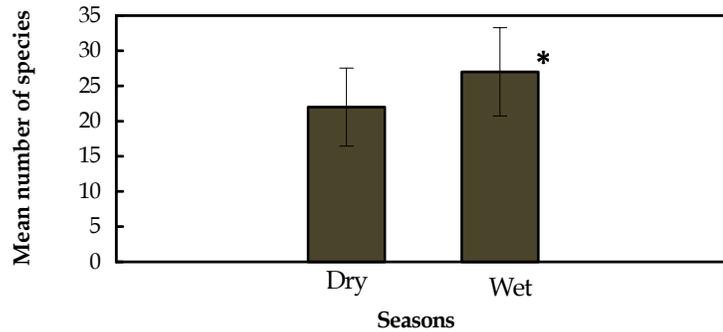


Fig. 2. Number of bird species (mean  $\pm$  SD) recorded in the dry and wet seasons (\*=values significantly different,  $p < 0.05$ ).

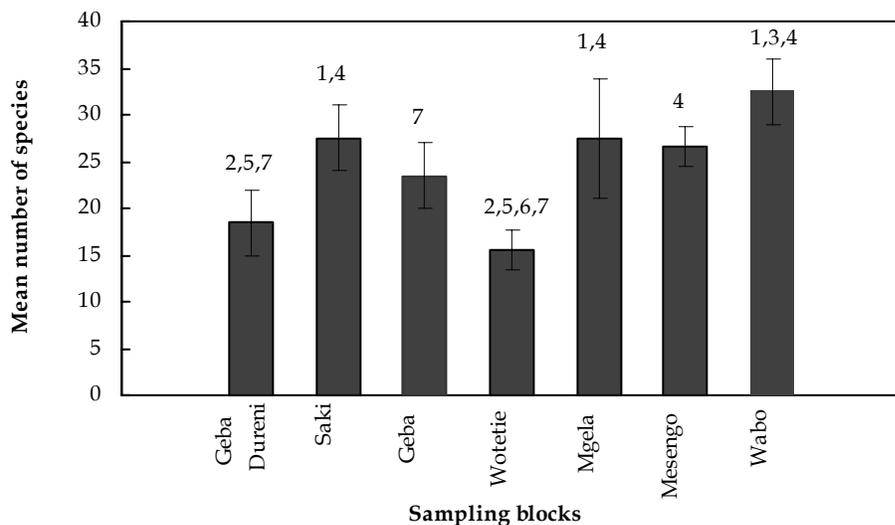


Fig. 3. Number of bird species (mean  $\pm$  SD) recorded for each sampling block (Numbers on top of bars indicate the particular block with which there is significant difference;  $p < 0.05$ ); 1 = Geba Dureni, 2 = Saki, 3 = Geba, 4 = Wotetie, 5 = Megela, 6 = Mesengo, 7 = Wabo).

Table 2. Three most abundant bird species for each habitat type (abundance index values in parenthesis).

Habitat type (Sampling block)	Season	Three most abundant species	Scientific name
Saki	Wet	1 <sup>st</sup> Scarlet-chested sun bird (2.3) 2 <sup>nd</sup> Common swift (1.7) 3 <sup>rd</sup> Fan-tailed raven (1.5)	<i>Nectarina senegalensis</i> <i>Apus apus</i> <i>Corvus rhipidurus</i>
	Dry	1 <sup>st</sup> Glossy ibis (3.5) 2 <sup>nd</sup> White wag-tail (1.3) 3 <sup>rd</sup> Fan-tailed raven (1.2)	<i>Plegadis falcinellus</i> <i>Motacilla alba</i> <i>Corvus rhipidurus</i>
Geba	Wet	1 <sup>st</sup> Glossy ibis (2.0) 1 <sup>st</sup> Semi-collard flycatcher (2.0) 3 <sup>rd</sup> Black cuckoo (1.8)	<i>Plegadis falcinellus</i> <i>Ficedula semitorquata</i> <i>Cuculus clamosus</i>
	Dry	1 <sup>st</sup> Tawny pipit (3.3) 2 <sup>nd</sup> Erlanger's lark (3.0) 3 <sup>rd</sup> Semi-collard flycatcher (1.7)	<i>Anthus campestris</i> <i>Calandrella erlangeri</i> <i>Ficedula semitorquata</i>
Geba Dureni	Wet	1 <sup>st</sup> Garden bulbul (4) 2 <sup>nd</sup> Spectacled weaver (3.2) 3 <sup>rd</sup> Richard's pipit (1.5)	<i>Pycnonotus barbatus</i> <i>Ploceus ocularis</i> <i>Anthus richardi</i>
	Dry	1 <sup>st</sup> Tree pipit (2.5) 1 <sup>st</sup> Icterine warbler (2.5) 3 <sup>rd</sup> Ruppel's weaver (2.3) 3 <sup>rd</sup> Common fiscal shrike (2.3)	<i>Anthus trivialis</i> <i>Hippolais icterina</i> <i>Ploceusgalbula</i> <i>Lanius collaris</i>
Wotetie	Wet	1 <sup>st</sup> Tawny pipit (3.7) 2 <sup>nd</sup> Red throated pipit (2.3) 3 <sup>rd</sup> Common fiscal shrike (2.7)	<i>Anthus campestris</i> <i>Anthus cervinus</i> <i>Lanius collaris</i>
	Dry	1 <sup>st</sup> Black bulbul (4.5) 2 <sup>nd</sup> Icterine warbler (2.8) 3 <sup>rd</sup> Common fiscal shrike (2.7)	<i>Hypsipetes leucocephalus</i> <i>Hippolais icterina</i> <i>Lanius collaris</i>
Megela	Wet	1 <sup>st</sup> Red-throated pipit (1.8) 2 <sup>nd</sup> Tawny pipit (1.5) 2 <sup>nd</sup> Fan-tailed raven (1.5)	<i>Anthus cervinus</i> <i>Anthus campestris</i> <i>Corvus rhipidurus</i>
	Dry	1 <sup>st</sup> White-necked raven (2.2) 2 <sup>nd</sup> Thick-billed raven (1.7) 3 <sup>rd</sup> Long-tailed cormorant (1.5)	<i>Corvus albicollis</i> <i>Corvus crassirostris</i> <i>Phalacrocorax africanus</i>
Mesengo	Wet	1 <sup>st</sup> Fan-tailed raven (2.2) 2 <sup>nd</sup> African fish eagle (2.0) 3 <sup>rd</sup> Woolly-necked stork (1.8)	<i>Corvus rhipidurus</i> <i>Haliaeetus vocifer</i> <i>Ciconia episcopus</i>
	Dry	1 <sup>st</sup> Kittlitz's plover (2.3) 2 <sup>nd</sup> African black crow (2.2) 3 <sup>rd</sup> Woolly-necked stork (1.7)	<i>Charadrius pecuarius</i> <i>Corvus capensis capensis</i> <i>Ciconia episcopus</i>
Wabo	Wet	1 <sup>st</sup> Red-eyed dove (2.0) 2 <sup>nd</sup> Tawny eagle (1.7) 2 <sup>nd</sup> Lappet-faced vulture (1.7)	<i>Streptopelia semitorquata</i> <i>Aquila rapax</i> <i>Aegyptius tracheliotus</i>
	Dry	1 <sup>st</sup> African paradise flycatcher (1.8) 2 <sup>nd</sup> African mourning dove (1.5) 2 <sup>nd</sup> Cape-turtled dove (1.5) 2 <sup>nd</sup> Spectacled pigeon (1.5)	<i>Terpsiphone viridi</i> <i>Streptopelia decipiens</i> <i>Streptopelia turtur</i> <i>Columba guinea</i>

## DISCUSSION

The present study surveyed the diversity of birds in one of the intact forest fragments of southwest Ethiopia. The Yayu forest is valued for its wealth of biodiversity that is evident by its designation as a bio-sphere reserve by UNESCO (2010). The forest also has agronomical significance due to its high wild coffee (*Coffea arabica*) gene pool. As a result, it has received high level conservation priority (Hindorf *et al.*, 2010). The present study aimed to contribute towards the overall conservation of the forest biodiversity.

The results showed that the avian diversity within vegetation types (transitional rainforest vs. riverine forest) and conservation zones (buffer vs. core zones) did not show significant differences. This indicates that the different vegetation and conservation categories of the Yayu forest have comparable diversity of birds. Therefore, they should be given equivalent conservation attention. On the other hand, avian species composition within the seven sampling blocks showed significant differences. This could be due to floristic diversity of the sampling blocks. Fleishman *et al.* (2003) reported a correlation between vegetation and avian species diversity. It should be particularly noted that Wabo block, which is located within the transitional conservation zone (with the least conservation priority), had the highest records of avian species. As these results indicate, further conservation planning of the forest should give due consideration to such parts of the forest.

The study also documented the three most common and abundant avian species for each sampling area. The data will have practical importance in monitoring of biodiversity. Birds are known to be bio-indicators of the overall ecological status of a given wildlife reserve. The most common and abundant species (focal species) are used to monitor any significant disturbance of the ecological balance of a natural area. This is why knowledge in population size is valued for its importance in conservation practices (Johnson, 1980; Padoa-Schioppa *et al.*, 2006). Therefore, biodiversity monitoring of the Yayu forest should also include the distribution and abundance of the three most common and abundant focal species determined for each sampling block in the present study.

The number of bird species recorded during the wet season was significantly higher than the dry season. The wet season coincides with the

summer of the northern hemisphere where Palearctic migrants return to their breeding sites. In this regard the number of species is expected to show the opposite pattern (*i.e.*, low during the wet season and high during the dry). A possible explanation to this contradiction could be the occurrence of an increased local migration to the study area during the wet season. It has been reported that seasonal variation in the availability of food governs bird species composition (Malizia, 2001). Therefore, it could be possible that the Yayu forest food resources become plenty and attractive during the wet season resulting in substantial local migration of birds.

In conclusion, the present study indicates that the Yayu forest has rich avian diversity and that its conservation and biodiversity documentation efforts should continue uninterrupted.

## ACKNOWLEDGEMENTS

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**Appendix 1. Species of birds recorded during both seasons: ♠ Palearctic migrant, ▣ Intra-African migrant, ♥ Endemic**

Family	Common name	Scientific name
<b>Zosteropidae</b>	Abyssinian (White-Breasted) Eye	<i>Zosterops abyssinicus</i>
	African Yellow White-Eye	<i>Zosterops senegalensis</i>
	Montane White-Eye	<i>Zosterops polioastris</i>
<b>Pittidae</b>	African (Grassveld) Pipit ▣	<i>Anthus cinnamomeus</i>
	Plain-Backed Pipit	<i>Anthus leucophrys</i>
	Red-Throated Pipit ♠	<i>Anthus cervinus</i>
	Richard's Pipit	<i>Anthus richardi</i>
	Tawny Pipit ♠	<i>Anthus campestris</i>
<b>Corvidae</b>	African Black Crow	<i>Corvus capensis</i>
	White-Necked Raven	<i>capensis</i>
	Cape (Black) Crow	<i>Corvus albicollis</i>
	Thick-Billed Raven ♥	<i>Corvus capensis</i>
	Fan-Tailed Raven	<i>Corvus crassirostris</i>
Pied Crow	<i>Corvus rhipidurus</i>	
Rallidae	Common Moorhen	<i>Rougetius rougetii</i>
Fringillidae	Streaky Seedeater	<i>Serinus striolatus</i>
Malaconotidae	Tropical Boubou	<i>Laniarius aethiopicus</i>
Oriolidae	African Black Headed Oriole	<i>Oriolus larvatus</i>
<b>Muscicapidae</b>	African Hill Babbler	<i>Pseudoalcippe abyssinica</i>
	Eurasian Reed-Warbler	<i>Acrocephalus scirpaceus</i>
	(European) Marsh-Warbler ♠	<i>Acrocephalus palustris</i>
	Icterine Warbler ♠	<i>Hippolais icterina</i>
	Sedge-Warbler ♠	<i>Acrocephalus schoenobaenus</i>
	Semi-Collared Flycatcher ♠	<i>Ficedula semitorquata</i>
	Ruppell's Robin-Chat	<i>Cossypha semirufa</i>
African Paradise-Flycatcher ▣	<i>Terpsiphone viridi</i>	
<b>Motacillidae</b>	African Pied Wagtail	<i>Motacilla aguimp</i>
	White Wagtail ♠	<i>Motacilla alba</i>
	Grey Wagtail ♠	<i>Motacilla cinerea</i>
	Yellow Wagtail	<i>Motacilla flava</i>
<b>Hirundinidae</b>	Brown-Throated (Plain) Martin	<i>Riparia paludicola</i>
	Lesser Striped Swallow ▣	<i>Hirundo abyssinica</i>
	Sand Martin (Bank Swallow) ♠	<i>Riparia riparia</i>
	Wire-Tailed Swallow	<i>Hirundo smithii</i>
<b>Pycnonotidae</b>	Common Bulbul	<i>Pycnonotus barbatus</i>
	Dark-Capped (Black-Eyed) Bulbul	<i>Pycnonotus tricolor</i>
	Black Bulbul	<i>Hypsipetes leucocephalus</i>
	Garden Bulbul	<i>Pycnonotus barbatus</i>
<b>Ploceidae</b>	Yellow-billed waxbill	<i>Ploceus melanocephalus</i>
	Lesser Masked Weaver	<i>Ploceus intermedius</i>
	Ruppell's Weaver	<i>Ploceus galbula</i>
	Spectacled Weaver	<i>Ploceus ocularis</i>
	Village Weaver	<i>Ploceus cucullatus</i>
<b>Campephagidae</b>	Common Fiscal Shrike	<i>Lanius collaris</i>
	Gray-Backed Fiscal Shrike	<i>Lanius excubitoroides</i>
<b>Paridae</b>	White-Winged Black Tit	<i>Parus leucomelas</i>
	Red-Eyed Dove	<i>Streptopelia semitorquata</i>
<b>Columbidae</b>	African Mourning Dove	<i>Streptopelia decipiens</i>
	European Turtle-Dove ♠	<i>Streptopelia turtur</i>
	Cape Turtle-Dove	<i>Streptopelia turtur</i>
	Emerald-Spotted Wood-Dove	<i>Turtur chalcospilos</i>
	Ring-Necked Dove	<i>Streptopelia capicola</i>
Speckled Pigeon	<i>Columba guinea</i>	
<b>Remizidae</b>	White-Shouldered Black Tit	<i>Parus guineensis</i>
	African Open-Billed Stork ▣	<i>Anastomus lamelligerus</i>
<b>Ciconiidae</b>	Red-Billed Teal (R-B Duck)	<i>Anas erythrorhyncha</i>
	Black Stork ♠	<i>Ciconia nigra</i>
	Woolly-Necked Stork ▣	<i>Ciconia episcopus</i>
	Yellow-Billed Stork ▣	<i>Mycteria ibis</i>

**Appendix 1. (contd).**

Family	Common name	Scientific name
<b>Pteroclididae</b>	Yellow-Throated Sandgrouse	<i>Pterocles gutturalis</i>
	Egyptian Plover	<i>Pluvianus aegyptius</i>
<b>Charadriidae</b>	Kittlitz's Plover	<i>Charadrius pecuarius</i>
	Three-Banded Plover	<i>Charadrius tricollaris</i>
	Black Kite ♠	<i>Milvus migrans</i>
<b>Accipitridae</b>	Black-Chested Snake-Eagle	<i>Circaetus pectoralis</i>
	Black Shouldered Kite	<i>Elanus caeruleus</i>
	Brown Snake Eagle	<i>Circaetus cinereus</i>
	Lappet-Faced Vulture	<i>Aegypius tracheliotus</i>
	Long-Crested Eagle	<i>Lophaelix occipitalis</i>
<b>Phalacrocoracidae</b>	Tawny Eagle	<i>Aquila rapax</i>
	Yellow-Billed Kite ▣	<i>Milvus aegyptius</i>
	African Fish-Eagle	<i>Haliaeetus vocifer</i>
	African Harrier Hawk	<i>Polyboroides typus</i>
	White-Breasted Cormorant	<i>Phalacrocorax lucidus</i>
<b>Emberizidae</b>	Long-Tailed Cormorant	<i>Phalacrocorax africanus</i>
	African Citril Canary	<i>Serinus citrinelloides</i>
<b>Coliidae</b>	Blue-Naped Mousebird	<i>Urocolius macrourus</i>
	Speckled Mouse Bird	<i>Colius striatus</i>
<b>Meropidae</b>	Blue-Breasted Bee-Eater	<i>Merops variegates</i>
	Carmine Bee-Eater	<i>Merops nubicus</i>
	Little Bee-Eater	<i>Merops pusillus</i>
	Northern Carmine Bee-Eater	<i>Merops nubicus</i>
	Red-Throated Bee-Eater	<i>Merops bulocki</i>
White-Throated Bee-Eater ▣	<i>Merops albicollis</i>	
<b>Trogonidae</b>	Narina's Trogon	<i>Apaloderma narina</i>
<b>Bucerotidae</b>	Silvery-Cheeked Hornbill	<i>Bycanistes brevis</i>
	Common Swift ♠	<i>Apus apus</i>
<b>Apodidae</b>	Pallid Swift ♠	<i>Apus pallidus</i>
	Green-Backed Honey Bird	<i>Prodotiscus</i>
<b>Indicatoridae</b>	Cassin's Honeybird	<i>Prodotiscus insignis</i>
	Lesser Honeyguide	<i>Indicator minor</i>
	Scaly-Throated Honeyguide	<i>Indicator variegates</i>
<b>Coraciidae</b>	Greater Honeyguide	<i>Indicator indicator</i>
	Broad-Billed Roller ▣	<i>Eurystomus glaucurus</i>
<b>Threskiornithidae</b>	Hadada Ibis	<i>Bostrychia hagedash</i>
	Glossy ibis	<i>Plegadis falcinellus</i>
<b>Ardeidae</b>	Grey Heron	<i>Ardea cinerea</i>
	Black-Headed Heron	<i>Ardea melanocephala</i>
<b>Cuculidae</b>	Blue-Headed Coucal	<i>Centropus monachus</i>
	Senegal Coucal ♠	<i>Centropus senegalensis</i>
	White-Browed Coucal	<i>Centropus superciliosus</i>
<b>Strigidae</b>	Black Coucal ▣	<i>Centropus grillii</i>
	Black Cuckoo ▣	<i>Cuculus clamosus</i>
	African Wood-Owl	<i>Strix woodfordii</i>
<b>Nectariniidae</b>	Variable Sunbird	<i>Cinnyris venustus</i>
	Scarlet Chested Sunbird	<i>Nectarinia senegalensis</i>
	Tacazze Sunbird	<i>Nectarinia Tacazze</i>
<b>Alaudidae</b>	Erlanger's Lark	<i>Calandrella erlangeri</i>
	Red-Winged Lark	<i>Mirafra hypermetra</i>
	Flappet Lark	<i>Mirafra rufocinnamomea</i>
<b>Dicruridae</b>	Fork-Tailed Drongo	<i>Dicrurus adsimilis</i>