



Bird Species Diversity and Abundance of Oluwa Forest Reserve Southwest Nigeria

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Abstract

Abundance and Diversity of avian species was studied in Oluwa Forest Reserve, Southwest Nigeria. The study area was divided into three compartments based on their different land use types. A total of 30 transect lines were randomly laid out and 10 transect lines per a compartment. The minimum distance between two transect lines was 200m. The number of transect lines was determined by the site size. Data were collected for six months (Dry and Wet seasons) in 20014. Fifty-five (55) bird species were recorded in the Farmland, Seventy (70) bird species in the Fallow Area and one hundred and fifteen (115) species encountered in the Undisturbed forest area. In all, a total of 136 bird species belonging to 43 families and 18 orders were recorded in the three study sites, The Order Passeriformes had the highest frequency (51 %) of the entire number of birds recorded, while the dominant families were Bucerotidae and Pycnonotidae, comprising (7.4 %) of the total species One endangered bird species, African Grey Parrot and 10 species Hornbills were encountered in the study area.

Key Words: Home range, agricultural intensification, avian species, conservation.

Introduction

The increasing disappearance of fauna and flora resources over the years, especially as a result of the anthropogenic activities, is a great challenge that conservation authorities are facing worldwide. Tropical forests are under threat from large-scale forest clearance, mineral extraction, and industrialization. For example in Nigeria alone, 184 animal and plant species, as well as valuable natural spaces, including old growth forests and wetlands, are known to be at risk (Ikemeh, 2009). Furthermore, each year, around 20.4 million hectares (50.4 million acres) of tropical forest are being destroyed or seriously damaged in areas such as Amazonia, Central America, Malaysia, Indonesia, and Borneo (Boo,1990). Nigerian rainforests have not been spared from these quantum destructions. In Nigeria at present, the destruction of natural habitats continues rapidly, resulting in the depletion of the country's biodiversity). However, South Western Nigeria is the region of high population densities and intense agricultural land-use area (Agbelusi, 1994).

For this reason, perhaps biodiversity depletion may be occurring at much higher rate than elsewhere in Nigeria. NEA,(2002) reported that increased export demands for primates and birds for research and trade in timber and non-timber species are indirect causes of biodiversity loss in various parts of the country. Agricultural intensification, logging, and poaching within and around Oluwa Forest Reserve have resulted in sharp decline of bird species in recent times, avian species are becoming intolerant of pressures on their habitats (Manu, 2000). , An assessment of the abundance and diversity of bird species in Oluwa Forest Reserve, therefore, serve as a good indication of the health of the environment.

Materials and Method

Study Area

The study was conducted in Oluwa Forest Reserve, with coordinates of (6 55'-7 20' N and 3 45'-4 32' E) with an area of 678.06km² (Ogunjemite et al., 2006). Most rivers and streams draining this forest rise from the northern part of the forest. Notable among the rivers are

Oni, Oluwa, and Ominla. The rainy season in the tropical rainforest characterized by emergent with reserves occurs from March till November while the dry multiple canopies and lianas. Some of the most season, is from December till February. Annual rainfall commonly found trees in the area include *Melicia excelsa*, *Azelia bipindensis*, *Antiaris africana*, temperature in Oluwa is 26 C. Soils are predominantly *Brachystegia nigerica*, *Lophira alata*, *Lovoa trichilodes*, ferruginous tropical, typical of the variety found in *Terminalia ivorensis*, *Terminalia superba*, and intensively weathered areas of basement complex *Triplochiton scleroxylon*. However, the natural formations in the rainforest zone of south-western vegetation of the area except for the areas devoted to Nigeria. The soils are well-drained, mature, red, stony forest reserve has now been reduced to secondary and gravely in upper parts of the sequence. The texture regrowth forest thickets and fallow regrowth at varying of topsoil in the reserves is mainly sandy loam (stages of development or replaced by perennial and Adeduntan, 2009). The natural vegetation of the area is annual crops (Osunade, 1991).

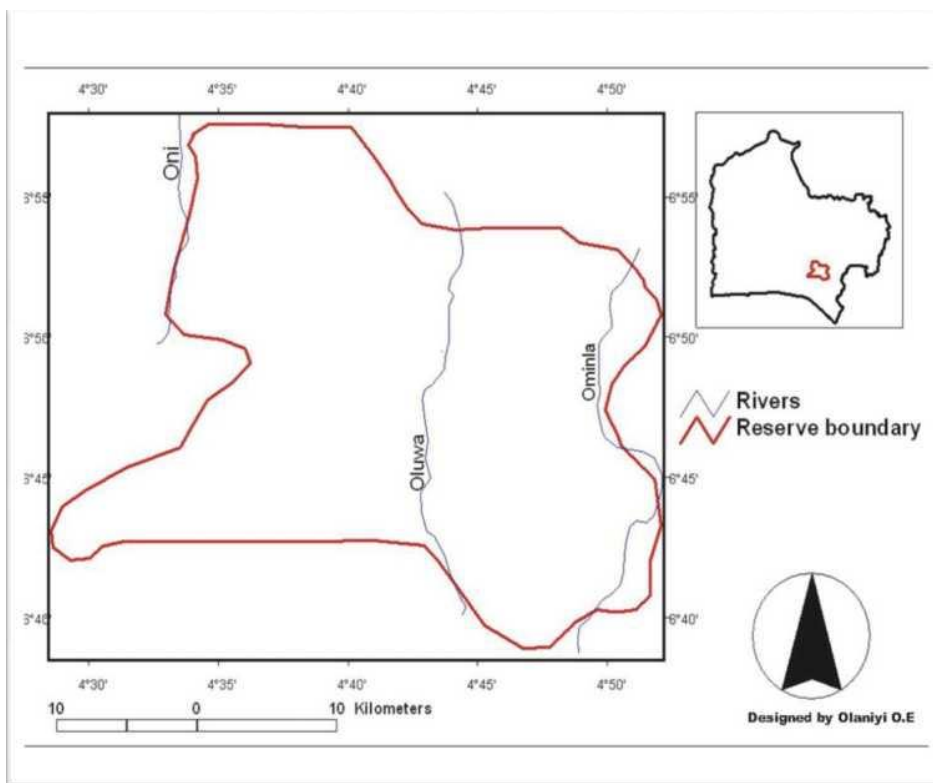


Figure 1, Map of the Study Area
Source: (Ogunjemite and Olaniyi 2012)

Data Collection

The study area was divided into three compartments which include the undisturbed forest area, farmland and Fallow Area for the purpose of this study. Line transects method according to (Sutherland, 2009) was used to collect data on bird species diversity, and abundance in the study area. In all an of 30 transect lines were randomly placed measuring 1000 m each transect was divided into 200 m sections with each compartment having 10

transects randomly placed. Transect lines were walked three times a week for three months in both seasons (May, July and September for wet season and November, January, and March for dry season) of the year. Survey was conducted between 0.600hours and 10.00hours and 1600 hours to 1800 hours, the survey was not conducted beyond 10.00hours in the morning in other to reduce day light effect. Transects were walked at an average speed of 1.5 kilometre per hour, depending on the

terrain and the number of bird species recorded. All birds viewed on the ground or in the vegetation, as well as birds that are flying ahead, were identified and the number in the group recorded. Birds of the same species within 10m of each other were counted in the same group. A pair of binoculars with a magnification 7x 50 was used in the identification of bird species. Physical features of birds sighted but could not be identified immediately were taken and field guide book of West African birds (Burrow and Demey, 2011) was used to identify the bird species and bird calls was used to confirmed the presence of nocturnal bird species within the study sites. Data was collected for six months three months in the dry season (November, February and March) and three months in the wet season (June, August, and September) in 2018

From the data collected, avian species diversity was calculated using Shannon diversity index, (Usher, 1991) which is given as:

$$H^i = - \sum P_i \ln P_i$$

Where: H^i = diversity index

P_i = is the proportion of the i th species in the sample

$\ln P_i$ = is the natural logarithm of the species proportion.

Species Relative Population Density

The relative population density of bird species at various sites and seasons were determined as outlined by Bibby *et al.*,(1992) as follows:

$$D = \frac{n_1 + n_2 \log \left[\frac{n_1 + n_2}{r^2 m} \right]}{n_2}$$

where: D = density

r = radius of the first zone

n_1 = number of birds counted within zone

n_2 = number of birds counted beyond zone and m

= number of replicate count in such area.

Statistical Analysis

Data obtained from the field survey were entered into excel (version 15) spread sheet prior to both descriptive (tables, frequency and percentage frequency, graph, pie and bar charts) and analytical statistics. Variables. Test of homogeneity for the effect of farming on the bird diversity was carried out using one way ANOVA.

Result

A total of 136 bird species belonging to 43 families and 18 orders were recorded in the study area. The Order Passeriformes had the highest frequency (51 %) of the entire number of birds encountered, while the dominant family are Bucerotidae and Pycnonotidae, comprising (7.4 %) of the total species (Figure 1). The record of the bird species in the three land use type revealed that the Undisturbed Forest has a total of 115 bird species belonging to 36 families and 16 orders, Fallow Land has 70 bird species belonging to 27 families and 12 orders while, the Farmland has 55 bird species belonging to 29 families and 12 orders as shown in Table 1. The result of the relative abundance of bird species in the study area revealed that Farmland has 0.26 and 0.22 for both seasons of the year, Fallow Area has 0.19 and 0.12 and Disturbed Area has 0.17 and 0.21. From the result obtained on the bird species diversity index Undisturbed Area had the highest diversity index in both seasons of 4.64 while Fallow area has 4.02 and Farmland 3.75 (Table 2).

Table 1 Bird Species Composition in the Study Area

Location	Species	Family	Order
Farmland	55	29	12
Fallow Area	70	27	12
Undisturbed Forest Area	115	36	16

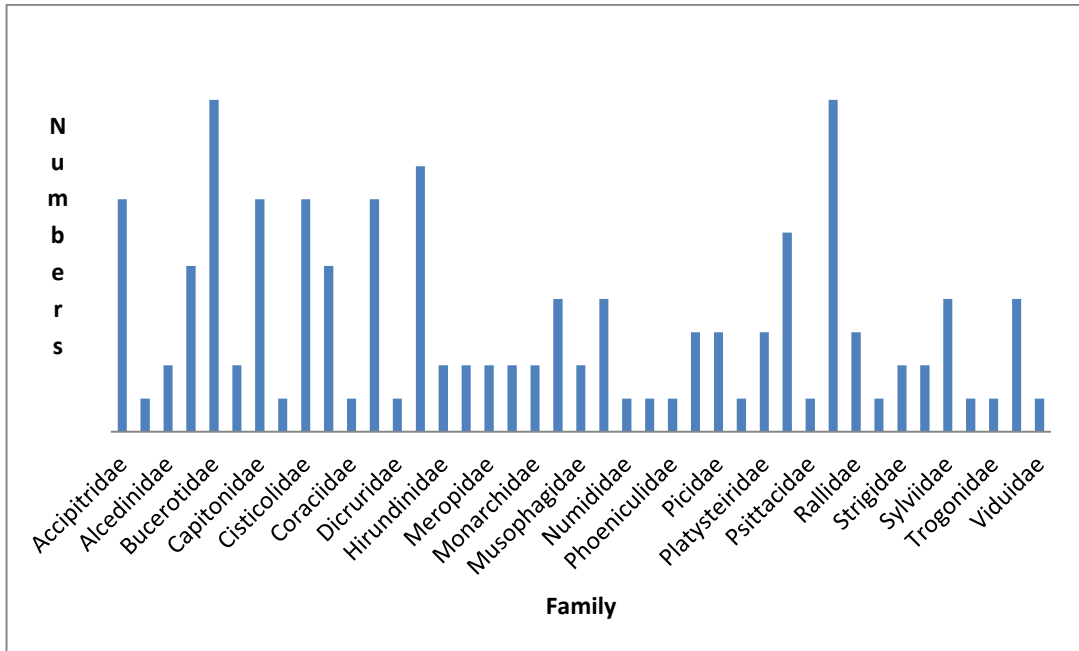


Figure 1 Family Composition of bird species in the Study Area

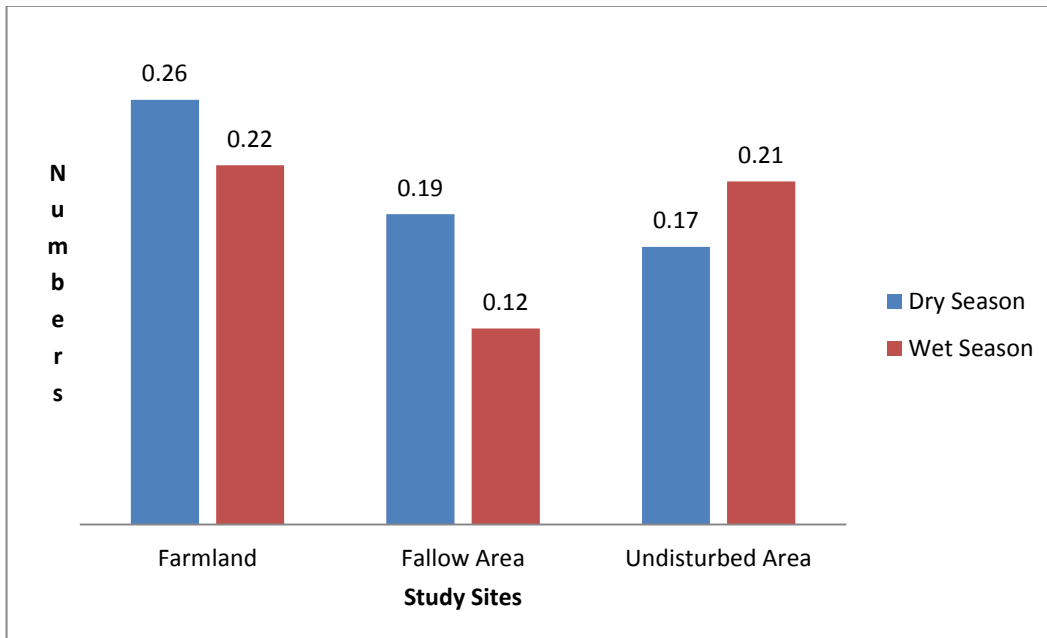


Figure 2 Relative Abundance of Bird Species in the Study Area

Table 2, Diversity index of bird Species in the Study Area

Plots	Birds Mean freq.	Taxa	Individual	Shannon	Dominance	Evenness	Mangalef
FL	4.71±0.56 ^a	56	264	3.75	0.04	0.76	9.86
FA	3.44±0.32 ^b	70	241	4.02	0.02	0.80	12.58
UP	2.10±0.08 ^c	115	242	4.64	0.10	0.93	20.77

DISCUSSION

Our study showed that species diversity and richness of bird species in the study area were adversely affected by forest modification and land use. From the result obtained bird species recorded in the undisturbed forest were higher than the rest two compartments Fallow Area and the Farmland. The observed change in the species richness of several bird groups along the habitat gradient is remarkable because influences farms and deforestation in the study were large in size compared to the undisturbed area. This is consistent with (Petit and Petit 2003) that understory dwelling rather than canopy or edge-dwelling habit, specialized foraging strategies and restricted geographic range could be responsible for this observation. (Waltert et al. 2004) identified general characteristics of forest species sensitive to deforestation and land use, in addition, he suggested that resident birds in contrast to nonbreeding visitors particularly prefer forest habitats. Lindell et al. (2004) reported that resident forest species are often behaviorally inhibited to enter the open agricultural land, functioning as a barrier for dispersal. The Fallow have fewer bird species than the undisturbed forest which is The relative abundance of avian species in the study area was higher in the farmland than the rest study sites. This agrees with previous work by Kormar (2006) who also reported a high abundance of bird species in cultivated areas, which could be due to food availability. The result of bird species diversity index in the study sites indicates that it was highest in the Undisturbed Area (4.64) than the rest two other compartments Fallow Area (4.65) and Farmland (3.65). This findings is supported by the previous work were (Kangah-Kesse et al (2008) who surveyed bird diversity in Abiriw sacred grove in Eastern Ghana and used Shannon diversity index recorded a value of 4.46 for the grove a near primary forest and 3.36 for the surrounding cultivated areas. The Undisturbed Area is a primary forest with three strata layers, bird species that utilizes tall emergence trees such the (Black and White Casqued Hornbill and Great Blue Turaco) were encountered and bird species that utilizes under story such as the (Little Greenbull,

Common Bulbul, White Tailed Alethe etc.) were also sighted. This is consistent with Pearson (2001) reported that tropical wet evergreen forest supports more rare bird species than other habitats. Manu (2000) reported that birds select vegetation variables according to the manner by which an individual habitat affects access to food, mates or its vulnerability to predators. This is also in agreement with the report that altering habitats and changing population structure affects avian population. The result also revealed the values for Shannon diversity index, showed that there was no significant difference in bird species diversity between Farmland and Fallow Area, this is expected presumably because of the edge effect in farm land area. This is supported by previous studies, edge effects are described to be remarkably diverse, ranging from changes in species abundance (Manu et al., 2007). Bird species are important indicators of environmental quality and ecological functionality

Conclusion and Recommendation

Bird species diversity was higher in the Undisturbed forest Area than Fallow area and Farmland within the study area which suggests that land use change between the three blocks was responsible for this. Large settlement camps are springing up within the study area and these people are involved in logging, majorly cutting down commercial timber species such as *Ceiba pentandra*, *Alstonia congensis* *Cola gigantea*, *Daniella ogea*, Farming intensification is ongoing in the area and compartments are been cleaved for the cultivation of cocoa and plantain farms. Government official allocate blocks to timber loggers without proper monitoring, and poaching is ongoing too. Sustainable harvest of tree species in this area should be properly managed so that avian habitats can be supported. Land conversion for agricultural purposes is very high in this region, since most of the communities are agrarian. However, this may increase extinction risk for many threatened and endangered birds in the area, such as African Grey parrot and Black Casqued Hornbill.

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Appendix 1 Checklist of Bird Species in the Study Area

Family	Scientific Name	Common Name
Accipitridae	<i>Polyboroides types</i>	African Harrier Hawk
	<i>Aviceda cuculoides</i>	African Cuckoo Hawk
	<i>Gypohierax angolensis</i>	Palm -Nut Vulture
	<i>Spizaetus africanus</i>	Cassin's Hawk Eagle
	<i>Kaupifalco monogrammicus</i>	Lizard Buzard
	<i>Lophaetus occipitalis</i>	Long Crested Eagle
	<i>Urotriorchis macrourus</i>	Long Tailed Hawk
Anatidae	<i>Dendrocygna viduta</i>	White Faced Whistling Duck
Alcedinidae	<i>Ispidina lecontei</i>	African Dwarf Kingfisher
	<i>Halcyon badia</i>	Chocolate Backed Kingfisher
Apodidae	<i>Cypsiurus parvus</i>	African Palm Swift
	<i>Apus batesi</i>	Bates Swift
	<i>Telacanthura melanopygia</i>	Black Spinetail
	<i>Neafrapus cassini</i>	Cassin's Spinetail
	<i>Rhaphidura sabini</i>	Sabines's Spinetail
Bucerotidae	<i>Ocyrceros griseus</i>	African Dwarf Hornbill
	<i>Tockus nasutus</i>	Africa Grey Hornbill
	<i>Tockus fasciatus</i>	African Pied Hornbill
	<i>Ceratogymna subcylindricus</i>	Black And White Casqued Hornbill
	<i>Ceratogymna atrata</i>	Black Casqued Hornbill
	<i>Tockus hartlaubi</i>	Blck Dwarf Hornbill
	<i>Ceratogymna fistulator</i>	Pipping Hornbill
	<i>Tockus camurus</i>	Red Billd Dwarf Hornbill
	<i>Ceratogymna albotibialis</i>	White Thinghed Hornbill
	<i>Ceratogymna elata</i>	Yellow Casqued Hornbill
Campephagidae	<i>Coracina azurea</i>	Blue Cuckoo Shrike
	<i>Coracina pectoralis</i>	Western Wattle Cuckoo Strike
Capitonidae	<i>Gymnobucco peli</i>	Bristle-Nosed Barbet
	<i>Tricholaema hirsuta</i>	Hairy Barbet
	<i>Pogoniulus atroflavus</i>	Red Rumped Tinkerbird
	<i>Gymnobucco calvus</i>	Naked Faced Barbet
	<i>Pogoniulus chrysoconus</i>	Yellow Fronted Tinkerbird
	<i>Pogoniulus bilineatus</i>	Yellow Rumped Tinkerbird
Caprimulgidae	<i>Pogoniulus subsulphureus</i>	Yellow Throated Tinkerbird
	<i>Macrodipteryx longipennis</i>	Standard Winged Nightjar

Cisticolidae	<i>Prinia bairdii</i>	Banded Prinia	
	<i>Apalis flavida</i>	Yellow Breasted Apalis	
	<i>Apalis jacksoni</i>	Black Throated Apalis	
	<i>Cisticola erythrops</i>	Red Faced Cisticola	
	<i>Camaroptera chloronota</i>	Olive Green Camaroptera	
	<i>Prinia subflava</i>	Twany Flanked Prinia	
	<i>Camaroptera superciliaris</i>	Grey Backed Cammaroptera	
Columbidae	<i>Treron calva</i>	African Green Pigeon	
	<i>Streptopelia semitorqata</i>	Red Eyed Dove	
	<i>Turtur afer</i>	Blue Spotted Wood Dove	
	<i>Streptopelia senegalensis</i>	Laughing Dove	
	<i>Turtur brehmeri</i>	Blue Headed Wood Dove	
Coraciidae	<i>Eurystomus glaucurus</i>	Broad Billed Roller	
Cuculidae	<i>Chrysococcyx cupreus</i>	African Emerald Cuckoo	
	<i>Cuculus clamosus</i>	Black Cuckoo	
	<i>Chrysococcyx caprius</i>	Dideric Cuckoo	
	<i>Cercococcyx mechowi</i>	Dusky Long Tailed Cuckoo	
	<i>Chrysococcyx klaas</i>	Klaas Cuckoo	
	<i>Centropus senegalensis</i>	Senegal Coucal	
	<i>Ceuthmochares aereus</i>	Yellowwbill	
	<i>Dicrurus adsimilis</i>	Fork Tailed Drongo	
Dicruridae	<i>Dicrurus adsimilis</i>	Fork Tailed Drongo	
	<i>Spermestes bicolor</i>	Black And White Mannikin	
Estrildidae	<i>Nigrita bicolor</i>	Chestnut Breasted Negrofinchh	
	<i>Spermestes cucullatus</i>	Bronze Maannikin	
	<i>Nigrita canicapilla</i>	Grey Headed Negrofinch	
	<i>Nigrita luteifrons</i>	Pale Fronted Negrofinch	
	<i>Spermophaga haematina</i>	Western Bluebill	
	<i>Parmoptila rubrifrons</i>	Red Fronted Antpecker	
	<i>Parmoptila woodhousei</i>	Woodhouse's Red Headed Antpecker	
	Hirundinidae	<i>Psalidoprocne obscura</i>	Fanti Saw Wing
		<i>Cecropis semirufa</i>	Rufous Chested Swallow
	Indicatoridae	<i>Prodotiscus insignis</i>	Cassin's Honeyguide
<i>Indicator minor</i>		Lesser Honeyguide	
Meropidae	<i>Malaconotus legdeni</i>	Lagden's Bush Shrike	
	<i>Merops pusillus</i>	Little Bee Eater	
	<i>Merops albicollis</i>	White Throated Bee Eater	
Motacillidae	<i>Motacilla flav</i>	Yellow Wagtail	
	<i>Motacilla aguimp</i>	African Pied Wagtail	
Monarchidae	<i>Erythrocercus mccallii</i>	Chestnut -Capped Flycatcher	
	<i>Elminia nigromittrata</i>	Dusky Blue Flycatcher	
Muscicapidae	<i>Fraseria ocreata</i>	African Forest Flycatcher	
	<i>Stiphornis erythrothorax</i>	Forest Robin	

	<i>Cercotrichas leucosticta</i>	Forest Scrub Robin
	<i>Sheppardia cyornithopsis</i>	Lowland Akalat
Musophagidae	<i>Corythaeola cristata</i>	Great Blue Turaco
	<i>Tauraco persa</i>	Green Crested Turaco
Nectariniidae	<i>Chalcomitra adelberti</i>	Buff Throated Sunbird
	<i>Hedydipna collaris</i>	Collard Sunbird
	<i>Cinnyris coccinigaster</i>	Splendid Sunbird
	<i>Cinnyris venustus</i>	Variable Sunbird
Numididae	<i>Guttera pucherani</i>	Crested Guinea Fowl
Oriolidae	<i>oriolus hosii</i>	Black Winged Oriole
Phoeniculidae	<i>Phoeniculus castaneiceps</i>	Forest Wood Hoopoe
Phasianidae	<i>Francolinus lathamii</i>	Latam's Forest Francolins
	<i>Ptiopachus petrosus</i>	Stone Partridge
	<i>Francolinus bicalcaratus</i>	Double Spurred Francolin
Picidae	<i>Campethera caroli</i>	Brown -Eared Woodpecker
	<i>Campethera nivosus</i>	Buff Throated Woodpecker
	<i>Dendropicops pyrrhogaster</i>	Fire-Bellied Woodpecker
Pittidae	<i>Pitta angolensis</i>	African Pitta
Platysteiridae	<i>Platysteira castanea</i>	Chestnut Wattle Eye
	<i>Platysteira cyanea</i>	Common Wattle Eye
	<i>Platysteira concreta</i>	
Ploceidae	<i>Ploceus melanocephalus</i>	Black Headed Weaver
	<i>Ploceus cucullatus</i>	Village Weaver
	<i>Malimbus scutalus</i>	Red Vented Malimbe
	<i>Ploceus nigricollis</i>	Black Neck Weaver
	<i>Malimbus erythrogaster</i>	Red Headed Malimbe
	<i>Ploceus tricolor</i>	Yellow Mantled Weaver
Psittacidae	<i>Psittacus erithacus</i>	Grey Parrot
Pycnonotidae	<i>Andropadus ansorgei</i>	Anssorges Greenbull
	<i>Bleda syndactyla</i>	Common Bristlebill
	<i>Pycnonotus barbatus</i>	Common Bulbul
	<i>Bleda eximius</i>	Green Tailed Bristlebill
	<i>Bleda canicapilla</i>	Grey Headed Bristlebill
	<i>Phyllastrephus icterinus</i>	Icterine Greenbull
	<i>Andropadus virens</i>	Little Greenbull
	<i>Chlorocichla simplex</i>	Simple Greenbull
	<i>Chlorocichla simplex</i>	Simple Leave Love
	<i>Nicator chloris</i>	Western Nicator
Rallidae	<i>Canirallus oculus</i>	Grey Throated Rail
	<i>Crex egregia</i>	African Crake
	<i>Himantornis haematopus</i>	Nkulengu Rail
	<i>Sarothrura pulchra</i>	White Spotted Flutail
Recurvirostridae	<i>Himantopus himantopus</i>	Black Winged Stilt

Strigidae	<i>Strix woodfordii</i>	African Wood Owl
	<i>Bubo shelleyi</i>	Shelley's Eagle Owl
Sturnidae	<i>Poeoptera lugubris</i>	Narrow Tailed Starling
	<i>Lamprotornis purpureiceps</i>	Purple Headed Starling
Sylviidae	<i>Sylvietta virens</i>	Green Combec
	<i>Hylia prasina</i>	Green Hylia
	<i>Macrosphenus concolor</i>	Grey Longbill
	<i>Eremomela badiceps</i>	Rufous Crowned Eremomela
Timaliidae	<i>Illadopsis cleaveri</i>	Black- Capped Illadopsis
Trogonidae	<i>Apaloderma narina</i>	Narina's Trogon
Turdidae	<i>Alethe castanea</i>	Fire Tailed Alethe
	<i>Zoothera princei</i>	Grey Ground Thrush
	<i>Alethe diademata</i>	White Tailed Alethe
	<i>Neocossyphus poensis</i>	White Tailed Ant Thrush
Viduidae	<i>Vidua macroura</i>	Pin Tail Whaydah
