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SURVEY OF ABUNDANCE AND DIVERSITY OF AVIAN SPECIES IN ASSOP FOREST RESERVE AND SURROUNDING FARMLANDS IN JOS, NIGERIA

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ABSTRACT
A survey of avian species abundance and diversity was carried out in Assop Forest Reserve and surrounding farmlands in Plateau State, Central Nigeria. A total of 57.6 kilometers transect used to survey birds and vegetation in the forest reserve and farmlands between the wet season of May to August 2007. A total of 175 bird species belonging to 49 families were recorded during the study. Avian species number and total count were higher in the farmlands (290.52 ± 14.122) than Assop Forest Reserve (135.52 ± 10.557). This is only an indication that many bird species especially grainvores and ominivores exploit landscapes transformed by human activities to expand their home ranges and therefore become dominant in numbers. The Shannon diversity indices showed a high avian diversity in Assop Forest Reserve (3.8) and low avian diversity in surrounding farmlands (2.4). This resulted from intensive farming activities and agricultural encroachment as most tree species have been cut down during farming. Similarly, tree density ($F_{1,22}$=4.528, P=0.041) , percentage canopy cover ($F_{1,22}$ =4.632, P=0.043) and density of tree sapling ($F_{1,22}$=4.903, P=0.037) positively affected avian species richness and composition recorded in Assop Forest Reserve, our findings suggest that any activity that leads to the reduction or clearing of vegetation will ultimately affect bird community structure of any given habitat.

KEY WORDS: Home range, Agricultural encroachment, avian species, Silvilculture practice and Habitat Fragmentation.

INTRODUCTION

Many countries in the developing world are experiencing rapid population growth, with associated pressure on natural habitat and their native flora and fauna (Sodersrom *et al*., 2003). Habitat loss, destruction and degradation are the major threat to avian species richness and diversity (Birdlife International, 2000). This loss of habitats can be as a result of human or natural causes. Human activities contribute more to habitat destruction. Newton, 1988 acknowledged the fact that, in the last 400 years, human actions alone has eliminated about 127 of approximate 9672 modern species of birds. Activities like fire wood collection, logging, agriculture, farming, drainage and fill-in of wetlands, human settlement, building of infrastructures and industries among others have altered lots of habitats (Birdlife International, 2000). Myer (1996) reported that, the loss of tropical ecosystem is of particular concern because the biome contains over half of the world species. Agricultural encroachment and unsustainable silvicultural practices has been implicated for these losses (Blockhus *et al*., 1992). Many studies have examined the impact of habitat loss and fragmentation due to agriculture on tropical bird communities (Hughes *et al.,* 2002, Naidoo, 2004, Marsden *et al*., 2006, Wang and Young 2003). Relatively few have focused on bird communities in Africa (E.g Soderstrom *et al.,* 2003; Mangnall and Crowe, 2003; Ratcliffe and Crowe 2001). The problem of forest fragmentation is extremely severe in West Africa due to rapid population growth and land use (Manu *et al.,* 2007).

The vegetation of West Africa is typically described as consisting of forest and savanna, nearly all of the forest vegetation within populated areas in Nigeria has now been largely converted in to savanna through cultivation and burning (Hopkins, 1962). NEST, 1991 reported that over 350,000 ha of forest and natural vegetation are being lost annually due to farming. The implication of these activities is the loss of biodiversity. Most Nigerians are not aware that many of our birds and other life forms are threatened by intense pressures from various human related activities such as farming, logging and wild fires. For example, the Bannerman's weaver (*Ploceus bannermani*) and the White-throated Mountain Babbler (*Kupeoruis gilberti*) are threatened by the loss of important forest patches in their highland forest habitat on the Obudu Plateau (Ezealor, 2002). Presently, about 37 of the bird species that occur in Nigeria are among the biological resources the world may lose as a result of threat from these activities (Ezealor, 2002). The study examines farming as a land use type around Assop Forest Reserve, its impact on the abundance and diversity of avian species. The objectives of this study were to determine the effect of habitat structure on avian community, to obtain a checklist of avian species in the

study site and to generate data that will provide baseline information necessary for conservation action.

Description of the Study Site

The study was conducted in Assop falls and Hills Forest Reserve, 70km Southwest of Jos, Nigeria, located at 09˚32'N and 08˚32'E. The forest comprises of Guinea savanna vegetation, interspersed with gallery forest and surrounded by grasslands. The forest covers a total area of about 3,000 hectares on the slope and top of a mid-altitude ridge with elevation ranging from about 600-1,100 meters above sea level. The area is characterized by Assop River, which feeds the picturesque rapids and falls, drains part of the Jos Plateau (Ezealor, 2002). The forest is an Important Bird Area (IBA, Category A3), it holds a significant component of group of avian species whose distribution are largely confined to the area (Fishpool & Evans, 2001). The area still holds some of the best natural vegetation of the Jos Plateau and also a habitat to two out of four bird species endemic to Nigeria. These species include, the rock Firefinch (*Lagonosticta sanguinodorsalis*) and its brood parasite, Jos Plateau indigo bird (*Vidua maryae*), other important species that occur in the area are, Gambaga flycatcher (*Muscicapa gambagae*), apparently a common breeder, Dybowski's twinspot (*Euschistospiza dybowski*), double toothed barbet (*Lybius bidentatus*), Wilson indigo bird (*Vidua wilsoni)*.

Some of the common tree species found in the area includes, *Danielia olivera, Parkia biglobosa, Lophira lanceolata, Khaya senegalensis, Vitex doniana, Piliostigma thonningii* and *ficus spp.* The waterfall and its immediate environment are legally protected and managed by Plateau State Tourism Corporation. The river also provides the domestic water-supply for villagers in the surrounding area. Wood cutting and livestock grazing are major threats to the forest. The area immediately behind the waterfall is being farmed.

MATERIALS AND METHODS

Bird survey

Assop Forest Reserve and surrounding farmlands were surveyed between May to August 2007, using line transects method (Bibby *et al.,* 2001). All birds sighted or heard, including those in flight were counted and recorded. 2000m to 1,600m length of line transect were randomly placed and in each study site, each transect was visited twice, in the morning between 06:30 and 10:30 hours and 16:00 to 18:00 hours in the evenings. A total 57.6 kilometers was surveyed in the entire study sites.

Transects were walked slowly along predetermined routes, that is, already existing forest trail, tracts and farm paths. Bird counts and vegetation data (below) were recorded separately for each 200 meter section of each transect.

Vegetation Measurement

Vegetation variables were measured within every 200m section of each transects. A 10x10 m quadrat was chosen randomly within each 200 m section and the following vegetation parameters were recorded in each location.

1. Number of large trees
2. Number of trees with circumference <1cm (Sapling)
3. Percentage canopy cover estimated(to the nearest 5%) by viewing through the wrong side of the canopy (Vickery *et al.,* 2006)

Data analysis

SPSS (version 11.0) software packages were used for statistical analyses. **The total number of all bird species for each site was calculated as:** The number of birds seen + The number of birds heard.

Bird species diversity was computed using the Shannon- Weaner diversity index (H) , and was calculated for each site as:

H= - (Total bird species)/ (total birds) *[I_n (total bird species)/ (total birds)

Which indicate that the higher the index, the higher the bird species diversity.

Analyses of Co-variance (ANCOVA) were used to determine the effect of vegetation variables on avian species diversity and abundance. Kruskal-Wallis One-way ANOVA was used to analyze rank abundance between sites.

RESULTS

A total of 175 bird species of 49 families were recorded during the study. One hundred and seventy two of 175 (98.3%) bird species were recorded on transect, while three of 175 species (1.7%) were recorded outside the transect (Appendix 1). Mean number of birds were higher in the farmland 190.52(± 14.122) compared to the forest 175.52 (± 10.557) Table 1. In terms of species richness, Assop Forest Reserve have higher diversity index than the farmland Table1

TABLE 1: Mean number of birds species, total number and diversity of birds species recorded in the sites

s/no	Study sites	Mean number of bird species	Total number of birds observed	Diversity index
1	Assop Forest Reserve	135.52 (± 10.557)	3813	3.8
2	Farmland	290.52 (± 14.122)	6461	2.4

Analysis of covariance between avian diversity and vegetation variable showed that bird community diversity at Assop Forest Reserve was strongly affected by tree density ($F_{1,22}$=4.528, P=0.041), sapling density ($F_{1,22}$=4.903, P=0.037) and canopy cover ($F_{1,22}$ =4.632, P=0.043).

TABLE 2: Effect of vegetation variables on avian species diversity Dependent Variable: Species diversity

Source	Type III Sum Of Squares	Df	F	P	B
Intercept	6.44	1	50.4	0.000	
Density of trees	0.11	1	4.5	0.369	0.014
Canopy cover (%)	0.59	1	4.6	0.043	0.009
Density saplings	0.63	1	4.9	0.037	-1.718
Total	483.96	27			
Error	2.81	22			
	Adjusted R^2 = .325				

Similarly, Analysis of covariance between avian abundance and vegetation variables showed that tree density ($F_{1,22}$=0.024, P=0.878), density of sapling ($F_{1,22}$=0.284, P=0.284) and canopy cover ($F_{1,22}$=3.34, P=0.080) were not significant in determining species abundance in Assop Forest Reserve.

TABLE 3: Effect of vegetation variables on avian species abundance Dependent Variable: Species abundance

Source	Type III Sum Of Squares	Df	F	P	B
Intercept	73.07	1	50.4	0.000	
Density of trees	0.98	1	0.0	0.878	0.039
Canopy cover (%)	0.18	1	3.3	0.080	0.024
Density saplings	0.91	1	0.2	0.284	0.043
Total	349.51	27			
Error	2.42	22			
	Adjusted R^2 = .454				

Relative Abundance of Bird Species in Study sites

The distribution of bird species based on relative abundance in studied sites showed that, there was no significant difference in rank abundances of species in the Assop Forest Reserve and surrounding farmlands (Kruskal-Wallis 1-way ANOVA, χ^2 =1.314, df=1,P=0.252; Figure 6). However, Assop Forest Reserve had a higher mean value (N=149,139.34±0.1009) than farmlands (N=119,128.44±0.2180), though this only indicates that Assop Forest Reserve had more species than the farmland.

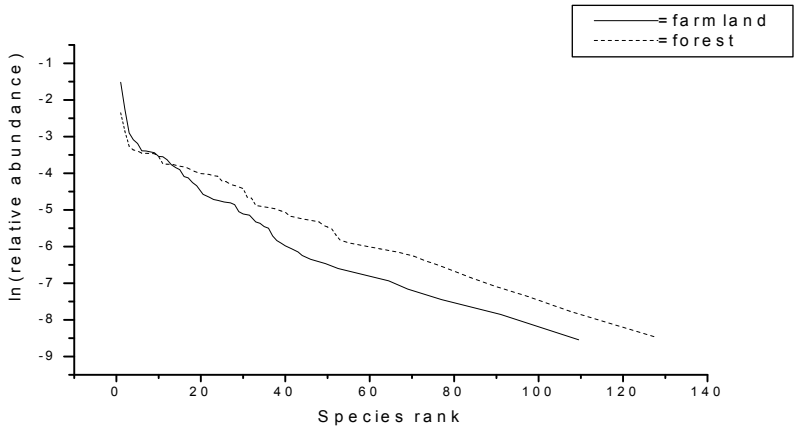

FIGURE1: Rank abundance of species in the study sites

DISCUSSION

Avian species abundance

Many bird species have expanded their home ranges because of their ability to exploit landscape transformed by humans and thus have become more widespread and abundant (Ratliffe and Crow, 2001). This pattern of avian community distribution was observed in this study by the difference in species abundance between assop Forest Reserve and surrounding farmlands. The farmlands were intensively cultivated, thus accounting for high number of generalist species encountered, which are known to thrive in most human disturbed landscape but not of any particular conservation concern.(Soderstrom *et al*., 2003) (See table 1). Field observation showed that high population of granivores and omnivores were mostly recorded on transects in the farmlands. This is in line with

the findings of (Usher, 1997), who reported that under an intensive agricultural system, granivores and omnivores persist, while specialist tend to decline in abundance and range. Similarly, several number of African thrush, Village weaver, Flocks of bishop species and Cattle egret were the predominant bird species encountered in farmlands. This may be as a result of the growth of secondary species, such as succession plants which are known to provide insects and other food and shelter for a variety of vertebrates. Thus, great abundance of farmland species may be attributed to these well vegetated edges and contours providing additional resources such as food and cover (Soule, 1989). It is known that bird community structure in the farmlands varies with yearly change in crop type and production, and also with seasonal crop-cycle succession (Mangnal and Crowe, 2002). Although, crop type cultivated at surrounding farmlands in Assop Forest reserve was not taken in to account in this study, however, would have played a role in large number of bird species recorded in the farmlands compared to the Forest Reserve.

Avian species diversity

This study showed that the value of Shannon-Weaner diversity indices for avian species was higher in the Assop Forest Reserve (3.8) when compared to the surrounding farmlands (2.4). This varying value may attribute to the intensive farming around the reserve. Continuous clearing of vegetation for food and cash crop production may lead to loss of biodiversity. This agrees with the findings of (Fishpool and Evans, 2001), who reported that agricultural encroachment or habitat clearance is the major threat to important bird areas (IBA).

Also, avian behavioural pattern was found to play a big role in bird diversity in the reserve, African paradise flycatcher (*Terpsiphone viridis*), African blue flycatcher (*Elminia longicauda*) and Lead coloured flycatcher (*Myioparus plumbeus*) were more or less restricted to the Assop Forest, and forest edges despite the availability of food resources in the surrounding farmlands. Habitat selection probably was not based on food alone but also on behavioural functioning (Cody, 1985)

Similarly, the distribution of nectarivorous species was positively correlated with habitat of complex vegetation, particularly in the Assop Forest that had higher plant diversity. Whereas Variable sunbird (*Cinnyris venustus*), Scarlet-chested sunbird (*Chalcomitra senegalensis*), Copper sunbird (*Cinnyris cupreus*) and splendid sunbirds (*Cinnyris coccinigastrus*) were observed in both habitats, Green headed sunbird (*Cyanomitra verticalis*), Collared sunbirds (*Hedydipna collaris*) and Western violet-backed sunbirds (*Anthreptes longuemarei*) were exclusively recorded in the forest reserve. This level of distribution could be as a result of a synchrony of plant species that support their population. It could also be due to variation in species-specific requirements in the choice of habitat. nectarivorous birds have close association with habitats in terms of the sorts of nectar resources and plant species that habitat provides (Cody 1985). Also, higher diversity of starlings and Green wood hoopoe were observed in farmlands compared to forest. Similarly, other hole nesting species such as Broad-billed roller (*Eurystomus glaucurus*), Blue-bellied roller (*Coracias cyanogaster*), Rufous-crowned roller (Coracias naevius), African grey hornbill (*Tockus nasutus*) and Red-billed Hornbill (*Tockus erythrorhynchus*), were commonly observed in the farmlands during this study. This suggests that the availability of nesting site is one of the principal factors that determine the structure of bird community in agricultural landscape (Soderstrom *et al*., 2003).

Effects of vegetation structure on bird abundance and diversity

The number and diversity of bird's species are strongly positively correlated with aspects of vegetation structure (MacArthur and MacArthur, 1961; Karr and Roth, 1971) that is, the more complex the structure or composition of the vegetation, the more likely that habitat will contain more bird species. In this study, tree density, percentage canopy cover and sapling density were important vegetation characteristics responsible for the high bird species richness recorded in assop Forest Reserve compared to the surrounding farmlands, this implies that any activity that leads to the reduction or clearing of vegetation will ultimately impact on avian species evenness and diversity(see table 2 and 3)

CONCLUSION AND RECOMMENDATION

Avian species diversity was higher in the Forest Reserve compared to the surrounding farmlands. Difference in vegetation characteristics between these two habitats was responsible for the observed pattern. Forest clearing as a result of pressure from farming activities was observed to have influenced the difference in vegetation structure of the studied sites. However, higher species abundance in the farmland is a product of disturbance. The following recommendations are hereby made to improve avian species richness and evenness in Assop Forest Reserve and to further sustain its IBA status.

1. Conservation site support groups should be constituted as a matter of priority to check indiscriminate clearing and farming around the forest reserve. Also, other activities such livestock grazing, poaching, logging and firewood collection should be minimized.
2. Existing laws in the reserve should be strengthened to regulate the use of forest resources by the locals
3. The Plateau State government should as a matter of urgency initiate poverty alleviation programmes and should as well inculcate good farming methods that will make farmers less dependent on extensive farming practices. In fact, integrated farming system should be adopted where by farming practices are incorporated in tree planting.
4. Other stakeholders in conservation such as the Nigeria Conservation Foundation, research institutes, universities and conservation agencies should put more concerted effort on biodiversity monitoring studies in reserve and should come up with technical assistance that will further impact on the management of the reserve.

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APPENDIX1: Bird species list of study sites

SPECIES	Scientific Name	Number Observed
PHALACROCORACIDAE		
Long-Tailed Comorant	*Phalacrocorax africanus*	2
ARDEIDAE		
Cattle Egret	*Bubulcus ibis*	1207
Intermediate Egret	*Egreta intermedia*	2
Green-backed Heron	*Butorides striata*	2
Hamerkop	*Scopus umbretta*	14
Little Egret	*Egreta garzetta*	8
Black-Headed Heron	*Ardea cinerea*	1
ACCIPITRIDAE		
Hooded Vulture	*Necrosyrtes monachus*	2
Black kite	*Milvus migrans*	17
Black-Shouldered Kite	*Elanus caeruleus*	11
Shikra	*Accipiter badius*	44
Lizzard Buzzard	*Kaupifalco monogrammicus*	12
Red-Necked Buzzard	*Buteo auguralis*	2
Martial Eagle	*Polemaetus bellicosus*	1
Black Sparrow Hawk	*Accipiter melanoleucus*	1
Pallid Harrier	*Circus macrourus*	7
FALCONIDAE		
Lanner Falcon	*Falco biarmicus*	6
Common Kestrel	*Falco tinnunculus*	1

Grey Kestrel	*Falco ardosiaceus*	1
African Hobby	*Falco cuvierii*	1
NUMIDIDAE		
Helmeted Guineafowl	*Numida meleagris*	8
PHASIANIDAE		
Double-Spurred Francolin	*Francolin francolinus*	73
Stone Partridge	*Ptilopachus petrosus*	135
BURHINIDAE		
Spotted Thick-Knee	*Burhinus capensis*	1
COLUMBIDAE		
Bruce's Green Pigeon	*Treron waalia*	41
African Green Pigeon	*Treron calvus*	125
Tambourine Dove	*Turtur tympanistria*	1
African Mourning Dove	*Streptopelia decipiens*	1
Red-Eyed Dove	*Streptopelia semitorquata*	200
Vinaceous Dove	*Streptopelia vinacea*	10
Laughing Dove	*Streptopelia Senegalensis*	46
Blue-Spotted Wood Dove	*Turtur afer*	16
Black-Billed Wood Dove	*Turtur abyssinicus*	18
PSITTACIDAE		
Senegal Parrot	*Poicephalus senegalus*	185
Red-Headed Lovebird	*Agapornis pullarius*	2
MUSOPHAGIDAE		
Green Turaco	*Tauraco persa*	194
Violet Turaco	*Musophaga violacea*	36
Western Grey Plaintain-Eater	*Crinifer piscator*	261
CUCULIDAE		
Red-Chested Cuckoo	*Cuculus solitaries*	1
African Cuckoo	*Cuculus gularis*	47
Senegal Coucal	*Centropus senegalensis*	254
Didric Cuckoo	*Chrysococcyx caprius*	1
Jacobin Cuckoo	*Oxylophus jacobinus*	7
TYTONIDAE		
Barm Owl	*Tyto alba*	1
APOGIDAE		
African Palm Swift	*Cypsiurus parvus*	36
Little Swift	*Apus affinis*	23
COLIIDAE		
Specked Mousebird	*Colius striatus*	33
TROGONIDAE		
Narina's Trogon	*Apaloderma narina*	1
ALCEDINIDAE		
African Pygmy Kingfisher	*Ceyx pictus*	9
Grey-Headed Kingfisher	*Halcyon leucocephala*	2
Giant Kingfisher	*Megaceryle maxima*	1
Blue-Breasted Kingfisher	*Halcyon malimbica*	7
MEROPIDAE		
Red-Throated Bee-Eater	*Merops bulocki*	8
CORACIIDAE		
Broad-Billed Roller	*Eurystomus glaucurus*	290
Rufous-Crowned Roller	*Coracias naevius*	19
Blue-Bellied Roller	*Coracias cyanogaster*	240
European Roller	*Coracias garrulous*	1
Abyssinian Roller	*Coracias abyssinicus*	1
UPAPIDAE		
Green Wood-Hoopoe	*Phoeniculus purpureus*	88
Black Wood-Hoopoe	*Rhinopomastus aterrimus*	3
BUCEROTIDAE		
African Pied Hornbill	*Tockus fasciatus*	1
African Grey Hornbill	*Tockus nasutus*	251
Red-Billed Hornbill	*Tockus erythrorhynchus*	14
CAPITONIDAE		

Yellow-Fronted Tinkerbird	*Pogoniulus chrysoconus*	212
Yellow-Rumped Tinkerbird	*Pogoniulus bilineatus*	69
Bearded Barbet	*Lybius dubius*	83
Double-Toothed Barbet	*Lybius bidentatus*	1
Vieillot Barbet	*Lybius vieilloti*	22
INDICATORIDAE		
Greater Honeyguide	*Indicator indicator*	15
PICIDAE		
Grey Woodpecker	*Dendropilos goertae*	15
Cardinal Woodpecker	*Dendropilos fuscescens*	18
Fine-Spotted Woodpecker	*Campethera abingoni*	5
HIRUNDINIDAE		
Rock Martin	*Hirundo fuligula*	3
Ethiopean Swallow	*Hirundo angolensis*	3
Red-Rumped Swallow	*Hirundo daurica*	10
Preuss's Cliff Swallow	*Hirundo preussi*	4
Fanti Saw-Wing	*Psalidoprocne obscura*	289
MOTACILLIDAE		
Yellow Wagtail	*Motacilla flava*	3
Yellow-Throated Longclaw	*Macronyx croceus*	7
Red-Throated Pipit	*Anthus cervinus*	12
Plain-Blacked Pipit	*Anthus leucophrys*	4
Long-Billed Pipit	*Anthus similis*	2
CAMPEPHAGIDAE		
White-Breasted Cuckoo-Shrike	*Coracina pectoralis*	1
Red-Shouldered Cuckoo-Shrike	*Campephaga phoenicea*	16
PYCNONOTIDAE		
Common Bulbul	*Pycononotus barbatus*	646
Little Greenbul	*Andropadus virens*	3
Yellow-Throated Leaflove	*Chlorocichla flavicolli*	51
TURDIDAE		
African Thrush	*Turdus pelios*	397
Snowy-Crowned Robin Chat	*Cossypha niveicapilla*	53
White-Crowned Robin Chat	*Cossypha albicapilla*	3
Whinchat	*Saxicola rubetra*	2
Familiar Chat	*Cercomela familiaris*	158
Northern Anteater Chat	*Myrmecocichla aethiops*	2
Cliff Chat	*Myrmecocichla cinnamomeiventris*	3
White-Fronted Black Chat	*Myrmecocichla albifrons*	2
SYLVIIDAE		
African Moutached Warbler	*Melocichla mentalis*	2
Common Whitethroat	*Sylvia communis*	1
Senegal Eremomela	*Eremomela pusilla*	88
Yellow-Bellied Hyliota	*Hyliota brachyuran*	4
Northern Crombec	*Sylvietta brachyuran*	13
Grey-Backed Camaroptera	*Camaroptera brachyura*	146
Red-Winged Warbler	*Heliolais erythropterus*	13
Short-Winged Cisticola	*Cisticola branchypterus*	1
Croaking Cisticola	*Cisticola natalensis*	2
Singing Cisticola	*Cisticola cantans*	19
Tawny-Flanked Prinia	*Prinia subflava*	180
MUSCICAPIDAE		
Northern Black Flycatcher	*Melaenornis edolioides*	74
Gambaga Flycatcher	*Muscicapa gambagae*	1
Pale Flycatcher	*Melaenornis pallidus*	2
Swamp Flycatcher	*Muscicapa aquatic*	1
Lead-Coloured Flycatcher	*Myioparus plumbeus*	1
MONARCHIDAE		
African Blue Flycatcher	*Elminia longicauda*	114
African Paradise Flycatcher	*Terpsiphone viridis*	85
PLATYSTEIRIDAE		
Senegal Batis	*Batis senegalensis*	41

Common Wattle-Eye	*Platysteira cyanea*	72
TAMALIIDAE		
Brown Babbler	*Turdiodes reinwardtii*	290
PARIDAE		
White-Shouldered Black Tit	*Parus guineensis*	7
NECTARINIDAE		
Western Violet-Backed Sunbird	*Anthreptes longuemarei*	4
Green-Headed Sunbird	*Cyanomitra verticalis*	78
Scarlet-Chested Sunbird	*Chalcomitra senegalensis*	224
Variable Sunbird	*Cinnyris venustus*	42
Copper Sunbird	*Cinnyris cupreus*	7
Splendid Sunbird	*Cinnyris coccinigastrus*	47
Olive Sunbird	*Cyanomitra olivaceus*	5
Collared Sunbird	*Hedydiphna collaris*	4
ZOSTEROPIDAE		
Yellow White-Eye	*Zosterops senegalensis*	16
LANIDAE		
Yellow-Billed Shrike	*Corvinella corvine*	134
MALACONOTIDAE		
Sulphur-Breasted Bush-Shrike	*Malaconotus sulfureopectus*	34
Grey-Headed Bush-Shrike	*Malaconotus blanchoti*	16
Northern Puffback	*Dryoscopus gambensis*	68
Tropical Boubou	*Laniarius aethiopicus*	188
Yellow-Crowned Gonolek	*Laniarius barbarous*	15
Brubru	*Nilaus afer*	1
Black-Crowned Tchagra	*Tchagra senegalus*	202
PRIONOPIDAE		
White Helmet-Shrike	*Prionops plumatus*	37
ORIOLIDAE		
African Golden Oriole	*Oriolus auratus*	14
DICRURIDAE		
Forked-Tailed Drongo	*Dicrurus adsimilis*	92
Square-Tailed Drongo	*Dicrurus ludwigii*	2
CORVIDAE		
Piapiac	*Ptilostomus afer*	234
Pied Crow	*Corvus albus*	3
STURNIDAE		
Neumann's Starling	*Onychognathus neumanni*	22
Splendid Glossy Starling	*Lamprotornis splendidus*	74
Purple Glossy Starling	*Lamprotornis purpureus*	610
Violet-Backed Starling	*Cinnyricinclus leucogaster*	121
Bronze-Tailed Glossy Starling	*Lamprotornis chalcurus*	9
Lesser Blue-Eared Starling	*Lamprotornis chloropterus*	33
Greater Blue-Eared Starling	*Lamprotornis chalybaeus*	7
PASSERRIDAE		
Northern Grey-Headed Sparrow	*Passer griseus*	2
PLOCEIDAE		
Little Weaver	*Ploceus luteolus*	16
Vitelline Masked Weaver	*Ploceus vitellinus*	5
Heuglin's Masked Weaver	*Ploceus heuglini*	4
Village Weaver	*Ploceus cucullatus*	522
Black-Necked Weaver	*Ploceus nigricollis*	3
Red-Headed Weaver	*Anaplectes rubriceps*	10
Red-Headed Quelea	*Quelea erythrops*	4
Northern Red Bishop	*Euplectes franciscanus*	100
ESTRILDIDAE		
Grey-Headed Oliveback	*Nesocharis capistrata*	4
Orange-Cheeked Waxbill	*Estrilda melpoda*	36
Lavender Waxbill	*Estrilda nonnula*	6
Black-Rumped Waxbill	*Estrilda troglodytes*	2
Red-Cheecked Cordon-Blue	*Uraeginthus bengalus*	79
Zebra Waxbill	*Sporaeginthus subflavus*	2

Bar-Breasted Firefinch	*Lagonosticta rufopicta*	7
Red-Billed Firefinch	*Lagonosticta senegala*	79
Rock Firefinch	*Lagonosticta sanguinodorsalis*	10
Blue-Billed Firefinch	*Lagonosticta rubricata*	2
Black-Faced Firefinch	*Lagonosticta larvata*	4
Black-Bellied Firefinch	*Lagonosticta rara*	36
Bronze Mannikin	*Spermestes cucullata*	109
VIDUIDAE		
Pin-Tailed Whydah	*Vidua macroura*	10
Village Indigobird	*Vidua chalybeata*	2
FRINGILLIDAE		
Yellow-Fronted canary	*Serinus mozambicus*	41
EMBERIZIDAE		
Cabanis's Bunting	*Emberiza Cabanisi*	1
Cinnanmon-Breasted Rock Bunting	*Emberiza tahapisi*	2