

Avian Distribution and Abundance the Case of Mettu District, ILU ABA BOR Zone, Southwest Ethiopia

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Abstract:- Ecosystem health and functioning is determined by presence bird species diversity and abundance. Survey on avian variety and abundance was conducted from May –July 2019, a total eight point count method which represents the study area was systematically selected, birds were identified at species level using binocular, bird call, song and naked eye in the morning (6:00-10:10 a.m) and afternoon(4:00-6:00 p.m). Data were collected by using point count method techniques in the early morning (6:00-10:00 a.m.) and late afternoon (4:00-6:00 p.m.) During the study period, a total of 646 individual birds belonging to 65 species, 26 families and 11 Orders were recorded. Majority 47.7% of bird orders were Passeriformes. 11 species of Muscicapidae family representing 16.92% was recorded. From the 65 identified species of birds, 42 bird species were recorded from Boto wetland with diversity index of ($H' = 0.712$) and Evenness index of 0.072 on the other hand 15 bird species were identified from made wetland with Shannon Weiner index of diversity ($H' = 0.231$) and evenness index of 0.181. Furthermore 38 species of bird with Shannon weiner diversity index of ($H' = 0.029$) with Evenness index of 0.008 were recorded from Boto forest and 31 species with Shannon weiner diversity index of ($H' = 0.029$) and evenness index of (0.022). From total 9.2% of bird endemic bird species were identified. Majority were recorded from less disturbed forest of Boto forest. Majority of birds were recorded from less encroached area of Boto forest and wetland.

Keywords:- Avian; Deforestation; Diversity; Evenness; Ethiopia; Passeriformes; Point Count; Riverine.

I. INTRODUCTION

Ethiopia is a country with diverse flora and fauna known by 2,970 faunal described species. Among them majority 1,249 are arthropods with 11 endemic, 926 avian species with 24 endemic, 320 mammalian species with 36 endemics, 200 fish species with 40 endemic 202 reptile species with 17 endemic and 73 amphibians with 30 endemic are the major faunal species which found in different parts of the country. Ethiopian unique biological diversity is created due to diverse a biotic factor such as climate, topography variation and edaphic factors (1, 2).

In Southwest Ethiopia three Man and Biosphere reserves Majang, Yayo, Kafa Biosphere was recorded by UNESCO in 2018 and 2010 respectively. Furthermore Baroye control hunting area, Gambella national parks and Nonno Sale forest Priority area is some of protected area which is known by biodiversity hotspot area possessing diverse flora and fauna.

According to Sethy *et al.* (4) assessment of bird species diversity, distribution, abundance is crucial to determine the health status the local ecosystem and also serve for ecotourism, aesthetic, educational and scientific research. For this purpose check list on bird species information provide effective conservation strategy at local, regional, national and global scale.

In Ethiopia, study on bird species diversity, distribution was only conducted in protected area such as National parks (5). However bird species composition, distribution, abundances and the threats that affect them are poorly understood in many regions of the country including the present study area.

In our current study urbanization, eucalyptus tree plantation, road construction, agricultural expansion and deforestation are some of the most common threat that was observed. To determine the health status of the local ecosystem and for possible recommendation of conservation strategies it was important to survey bird species variety, abundance and status.

Therefore the current survey was conducted to survey bird species variety, abundance and endemism in forest and wetland found in Mettu town Southwest Ethiopia.

II. MATERIALS AND METHODS

A. Description of the Study Area

The study was carried out in Mettu district, Ilu Aba Bor Zone, Oromia regional state, located in Southwest part of Ethiopia and about 600km from Addis Ababa located in latitude and longitude of 8°18'N35°35'E latitude and an altitude of 1605 meters. The zone shares common frontier with East Wollega and Jimma zone in East, with West and East Buno Bedele in North, with South Nation Nationalities and Peoples Region in South with Gambella Regional state

in the West. Also Made kebele bounded with Geyi kebele in the East, Mettu town in the West, Kersa Gogilla in the South and Merdafa kebele in North while Boto bounded with Bishare kebele in the East, Tulube kebele in the west, Alebuya kebele in the South and Mettu University in the North.

Depending on level of threat on the habitat two kebeles Made Kebele (urbanized) and Boto kebele (less disturbed) were systematically selected. (Figure 1).

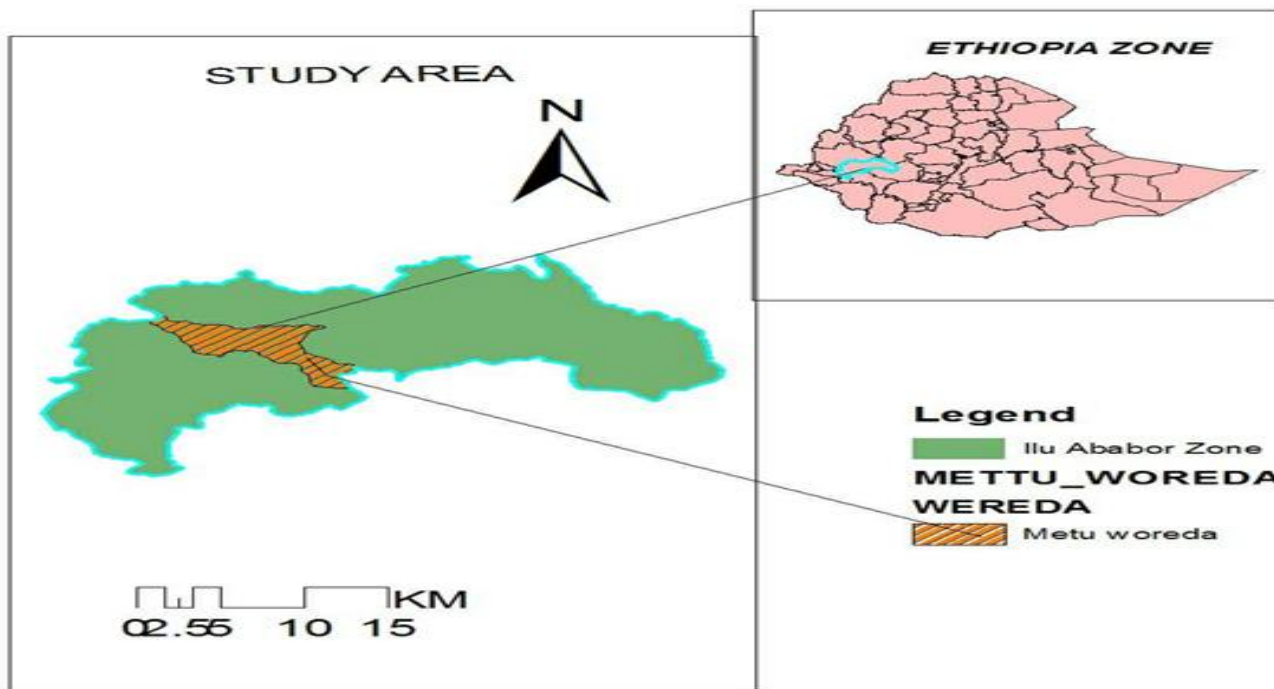


Fig 1:- Map of the study area

B. Study Design

Cross-sectional survey on bird species variety, abundance and endemism was conducted from April to June in 2019 in some selected kebele of Mettu district Southwest Ethiopia.

C. Method of data collection

To record bird species variety and, endemism and abundance point count method developed by Bibby *et al.* [6] was used. A total of eight point count station were selected based on habitats potential and sites which were conducive to birds for access food, water resources, nesting and roosting. The counts were conducted in the morning and afternoon where bird activity was increased. We used binocular and necked eye to record variety, abundance, endemism, and activities of bird with in fixed amount of time at each point count station. Count was performed in the early morning from 6:00 to 10:00 a.m. and in the late afternoon from 10:00 to 6:00 p.m, when the bird activity is high with in the radius of 20/25m for 20 minutes and rest for ten minutes. Field data sheet was used to record the identified species. We used guide book developed by Redman (7) and Tinklayer (8) to identify bird at species level.

To avoid double counting each point count station was 100 m far away from each other (9). 10 to 15 minute rest was used to avoid double counting.

D. Methods of Data Analysis

The gathered data was entered in to Microsoft word 2007 according to point count place, day, time of count (morning and afternoon), taxonomic category (order, family and species), abundance and variety of birds. Bird species diversity and evenness (E) was analyzed using Shannon Wiener diversity index (H') using the formula developed $H' = -\sum(P_i)(\log_{10}P_i)$ where H'=Shannon- Wiener index, P_i= Proportion of the ith bird species

Log₁₀= Natural Logarithm

Distribution of bird among the study area was determined by Evenness (J') index obtained by Dividing Shannon Wiener diversity index H' by Maximum species diversity $E = H'/H_{max}$

Relative abundance of bird species was determined by Billy (6) number of bird recorded with in total point count by the number of hours spent. Encounter rates have categories of <0.1, 0.1-2.00, 2.10-10.00, 10.10-40.00 and plus 40. Each categories are categorized as 1(rare species), 2 (Uncommon species), 3(frequent species), 4(Common species), and 5(abundant species).

Distribution of species in the community was determined by formula developed by Sorensen's coefficient $CC = 2C/A+B$; where CC=Sorensen's coefficient A= number of species that occur in site A, B= number of

species that occur in site B; C=Number of common Species that occur in site A and B.

III. RESULTS

A. Bird Species Composition

A total of 646 abundant bird species taxonomically categorized into 65 species, 26 families and 11 orders were recorded using aid binocular and bird call and sound and with naked eye. Among them majority of them was order Passeriformes with abundant of 47. % and 31 species.

The order Passeriformes recorded with 11 families and order Bucerotiformes, Coliiformes, Piciformes and

Gruiformes were have 2 families each. While order Anseriformes, Columbiformes and Coliiformes were represented by 2 species each (Figure 1). Muscicapidae family was numerically the dominant family represented with 11 species which accounts 16.92%, of the recorded species (Table 1). Little weaver (*Ploceus leteolus*), Village weaver (*Ploceus cucullatus*), Red billed fire finch (*Lagonostica senegala*), African stone chat (*Saxicola torquatus*) and Variable sunbird (*Cinnyris venustus*) were dominant species with 45,35,30,25 and 35 number of individuals birds respectively, which is 26.23% of the total bird of the study area in their abundance. Variable sun bird (*Cinnyris venustus*) and Swanison sparrow (*Passer swainsonii*) was commonly found in the study sites.

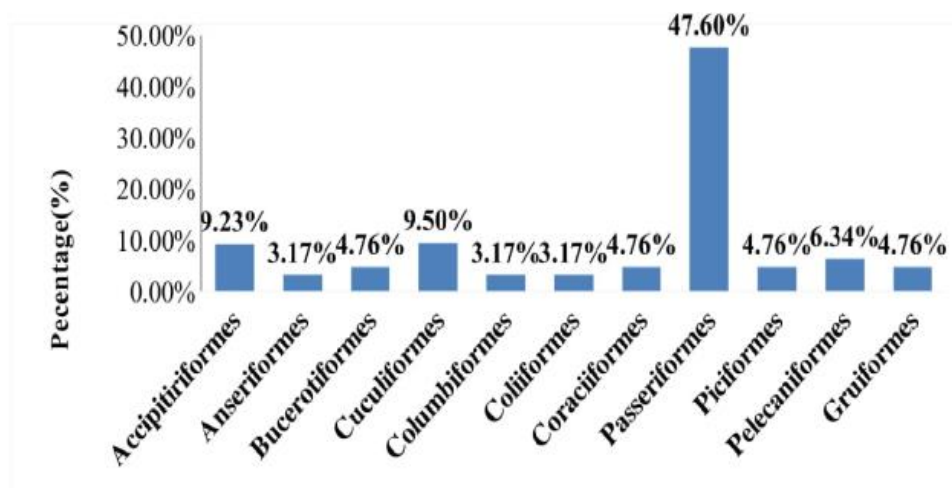


Fig 2:- Bird order Compositions in percentage for all study area.

B. Bird species Distribution and Abundance

From the total of 65 bird species identified majority of the species were recorded from Boto forest and wetland habitat 28 species, and the other least recorded 4 species only from Made forest and wetland and around 33 species were recorded common to both Made and Boto forest and wetland habitat.

Thirty three species (50.7%) common species were recorded both from Made forest and wetland and Boto forest and wetland habitats (Table 2). Furthermore, from the total 646, 403 of individual bird species were recorded from Boto forest and wetland habitats and 245 birds from Made forest and wetland forest habitats. The highest bird abundance was recorded from Boto forest habitat 214 birds and the least from Made wetland around 55 birds (Figure 2)

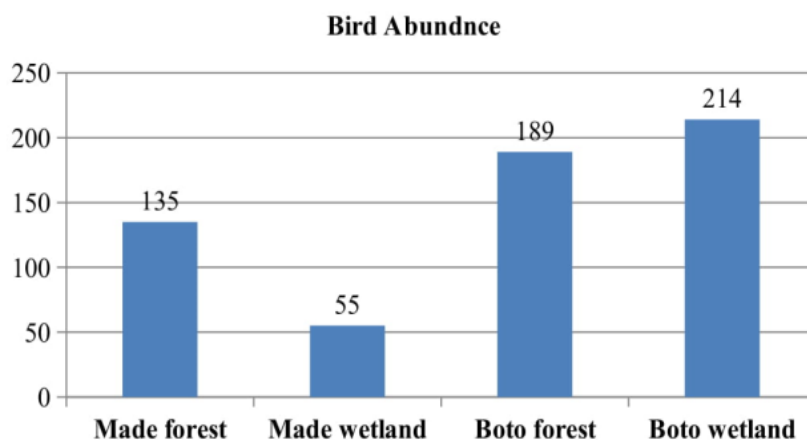


Fig 3:- Show the abundance of birds in Made and Boto forest and wetland habitats.

C. Species diversity

From the 65 identified species of birds, 42 bird species were recorded from Boto wetland with diversity index of ($H' = 0.712$) and Evenness index of 0.072 on the other hand 15 bird species were identified form made wetland with

Shannon Weiner index of diversity ($H' = 0.231$) and evenness index of 0.181. Furthermore 38 species of bird with Shannon weiner diversity index of ($H' = 0.029$) with Evenness index of 0.008 were recorded from Boto forest

and 31 species with Shannon weiner diversity index of (H'=0.029) and evenness index of (0.022) (Table 2).

Habitat		S	N	H'	E
Made	Forest	31	135	0.022	0.005
	Wetland	15	55	0.231	0.072
Boto	Forest	38	189	0.029	0.008
	Wetland	42	214	0.712	0.181

Table 1:- Index of diversity (H'), Evenness (E) and species richness(S) of bird's species of the study sites.

D. Community similarities

The Made Forest V wetland have a high community similarity with 33% of Sorensen's coefficient it indicates there is high species overlap while Boto Forest versus wetland have a great community difference this is 3.3% by

Sorensen's community similarity, so it indicates this habitat has less community overlap.

The overall community similarity of Sorensen's coefficient indicates 2.06 % of both Made and Boto forest and wetland habitat.

Habitat		Sorensen's coefficient(s)
Made	Forest V Wetland	33
Boto	Forest V Wetland	3.3

Table 2:- community similarity showed by Sorensen's coefficient of both study areas.

The community similarity of the two study sites was high (S = 2.06).

E. Endemic of birds of the study area

From the 65 species identified species 9.2% of them were endemic and near endemic in Ethiopia of them, one species; Abyssinian Woodpecker (*Dendropicos abyssinicus*)

is endemic to Ethiopia and five species are shared with Eretria; Thick billed raven (*Corvus crassirostris*), white winged widowbird (*Eupletes capensis*), African citril (*Crithagra citrinellides*), Rouget's rail (*Rougetius rougetii*) and White winged cliff chat (*Myrmecocichala melaena*) (Tsefahunegny, 2016). (Table 3),

No	Common Name	Scientific name	Endemism
1	Abyssinian wood pecker	<i>Dendropicos abyssinicus</i>	Endemic
2	Thick billed raven	<i>Corvus crassirostris</i>	Near endemic
3	African citril	<i>Crithagra citrinellides</i>	Near endemic
4	Rouget's	<i>Rougetius rougetii</i>	Near endemic
5	White winged cliff chat	<i>Myrmecocichala melaena</i>	Near endemic
6	White winged widow	<i>Eupletes capensis</i>	Near endemic

Table 3:- Endemic and near endemic birds of Ethiopia in the study area.

*Endemic to Ethiopia

**Endemic to Ethiopia and Eretria

F. Relative abundance of birds

Result determined from encounter showed that from the total of 65 identified bird species majority 53 (81.5%) of bird species were uncommon to all habitat, 8(12.3%) of them were frequently found in all habitat others 3 (4.61%) were rare species (Appendix 2). Majority of the species had low population sizes as a result they were grouped under rare and uncommon species.

IV. DISCUSSION

During the present study a total of six hundred forty six individual birds belonging to sixty five species twenty six Families and eleven Orders were recorded from the study area. Among them Order Passeriformes was the dominant order which is thirty one species which accounts forty seven percent of the recorded species. This result is in accord with study conducted in Angereb forest and Kafa biosphere reserves Southwest Ethiopia (10).

The six species are very abundant from both the study area, little weaver (*Ploceus leteolus*), Village weaver (*Ploceus cucullatus*), Red billed fire finch (*Lagonostica senegala*), African stone chat (*Saxicola torquatus*) and variable sunbird (*Cinnyris venustus*) were numerically the

dominant species contributing twenty two of the total bird abundance of the study area. According to Padoa-Schioppa et al. (11) those species are focal species which serve to monitor ecological balance of the natural area.

From the 65 identified species of birds, 42 bird species were recorded from Boto wetland. Less habitat fragmentations and destruction was observed in Boto wetland which makes the area having high species diversity and evenness. From this finding we understand that birds prefer to habit in area where appropriate breeding site, resting and foraging place while in Made forest Eucalyptus tree plantation, agricultural practice, and human settlement was the most common. The presence of low species richness and abundance in the Made forest might be associated with presence of homogeneous plant species which are selected only by few bird species. Study conducted by Girma *et al* (9) said that natural forest which is dominated by few tree species is not suitable to different bird species, because it does not fulfilled the feeding or nest building preferences of most species coupled with risk of predation and thus, it is preferred by few forest specialist bird species alone as they obtained sufficient cover and food requirements. Furthermore (10,12) has reported highest avian species diversity was found in riverine woodland habitat in Alatish National Park, this variation might be associated with type of plant species found and feeding habit of the presented bird species.

Moreover, the variation in species abundance, endemism among different habitats could also be credited to the presence food availability, suitable cover and nesting sites, adaptation or tolerance level of the species and the degree of the threats presented in the habitats. Regarding relative abundance score majority of birds were categorized under locally rare and uncommon species. From the sixty five species identified in the study area, one species; Abyssinian Woodpecker (*Dendropicos abyssinicus*) is endemic to Ethiopia and five species are shared with Eritria (13); Thick billed raven (*Corvus crassirostris*), white winged widowbird (*Eupletes capensis*), African citril (*Crithagra citrinellides*), Rouget's rail (*Rougetius rougetii*) and White winged cliff chat (*Myrmecocichala melaena*) which contributing nine point two percent of the identified species.

V. CONCLUSION

The survey showed that bird species variety was relatively found in less disturbed wetland and forest of Boto where less human activity was observed, on the other hand Made wetland and forest support less variety, abundance and endemism of bird species this may be due to intense human activities such as single tree like Eucalyptus tree plantation which locally used for house construction, road and house construction and expansion of irrigation in wetland are some of the threat that was currently observed.

AUTHORS' CONTRIBUTIONS

The work was equipped by AD. The field study and data entry were performed by AD, AZ, and GW and analyses were done by AD. AD contributed to write the

paper and prepare the manuscript and select a fitting journal. All authors read and approved the final version of the manuscript.

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APPENDIX 1.

Order	Family	Scientific name	Comm name
Accipitriformes	Accipitridae	<i>Aviceda cuculoides</i>	African cuckoo hawk
		<i>Buteo agur</i>	Augar buzzard
		<i>Milvus migrans</i>	Black kite
		<i>Circaetus cinereus</i>	Brown snake eagle
		<i>Gyps africanus</i>	White backed vulture
		<i>Aquila pomarina</i>	Lesser spotted eagle
Anseriformes	Anatidae	<i>Alopochan aeginea</i>	Egyptian goose
		<i>Dendrocygna bicolor</i>	Fulvous whistling duck
Bucerotiformes	Bucerotidae	<i>Bocoruius abyssinicus</i>	Abyssinian ground hornbill
	Upupidae	<i>Bycanistes brevis</i>	Silvery cheeked hornbill
		<i>Upupa Africana</i>	African hoopoe
Cuculiformes	Cuculidae	<i>Centropus senegalensis</i>	Blueheaded coucal
		<i>Centropus skillii</i>	Black coucal
		<i>Cuculus clamosus</i>	Black cuckoo
		<i>Cuculus gularis</i>	African cuckoo
		<i>Cuculus solitaries</i>	Red chested cuckoo
		<i>Streptopelia semitroquata</i>	Red-eyed dove
Columbiformes	Columbidae	<i>Streptopelia capicola</i>	Ring necked dove
		<i>Turtur abyssinicus</i>	Blue billed wood dove
Coliiformes	Coliidae	<i>Turtur tympanistria</i>	Tambourine dove
	Meropidae	<i>COolius striatus</i>	Speckled mouse bird
Coraciiformes	Alcedinidae	<i>Merops pusillus</i>	Little bee eater
		<i>Ispidina picta</i>	African pigmy kingfisher
		<i>Corvus crassiostris</i>	Thick billed raven
Passeriformes	Corvidae	<i>Corvus ruficollis</i>	Brown nacked raven
	Estriididae	<i>Spermestes cucullatus</i>	Bronze mannikini
		<i>Lagonostica senegala</i>	Red billed fiirefinch
	Buphagidae	<i>Buphagus africanus</i>	Red-billed oxpeker
		<i>Serinus flavivertex</i>	Yellow crowned canary
	Fringillidae	<i>Crithagra mozambica</i>	Yellow fronted canary
		<i>Crithagra citrinelloides</i>	African citril
	Malaconotiae	<i>Crithagra striolata</i>	Streaky seed eater
		<i>Laniarius aethiopicus</i>	Ethiopian boubou
	Muscicapidae	<i>Turdus perios</i>	African thrush
		<i>Saxicola torquatus</i>	African stonechat
		<i>Cercomela melanura</i>	Black start
		<i>Monticola rufocinereus</i>	Blue rock thrush
		<i>Cercomela familiaris</i>	Brown tailed chat
		<i>Melaenornis edolioides</i>	Northern black flycatcher
		<i>Cossypha semirufa</i>	Ruppell's robin chat
		<i>Irufa cossyphasemi</i>	White crowned robbinchat
		<i>Myrmecocichala melaena</i>	White winged cliff chat
		<i>Rufa irania gutturalis</i>	White throated robin

	Nectariidae	<i>Turdus pelios</i> <i>Nectarinia famosa</i> <i>Cinnyris venustus</i>	Song thrush Malachite sunbird Variable sunbird
	Platysteiridae	<i>Batis perko</i> <i>Batis minor</i>	Pigmy batis Blach headed batis
	Ploceidae	<i>Quelea quelea</i> <i>Ploceus luteolus</i> <i>Ploceus cucullatus</i> <i>Eupletes capensis</i>	Red billed quelea Little weaver Village weaver White winged widow bird
	Passeridae	<i>Pycnonotus barbatus</i> <i>Passer swainsonii</i>	Common bulbul Swainson's sparrow
	Pycmonotidae	<i>Dendropicos abyssinicus</i>	Abyssinian Woodpecker
Piciformes	Indicatoridae	<i>Indicator indicator</i> <i>Trachyphonus magritatus</i>	Greater honey guide Yellow-breasted barbet
	Lybiidae	<i>Bubulus ibis</i>	Cattle egret
Pelecaniformes	Ardeidae	<i>Ardea melanocephala</i> <i>Bostriychia hagedash</i> <i>Ardeola ralloides</i>	Blach headed heron Hadada ibis Squacco heron
	Threskionithidae	<i>Threskiornis aethiopicus</i>	Sacred ibs
Gruiformes	Gruidae	<i>Balearica pavonina</i> <i>Grus carunculata</i>	Black crowned crane Wattled crane
	Rellidae	<i>Rougetius rougetii</i>	Rouget's rail

Table 3:- List of bird species identified from the study area.

APPENDIX 2

African cuckoo hawk	+	++	++	+++	Uncommon
Augar buzzard	+	-	++	-	Uncommon
Black kite	+	++	++	+++	Uncommon
Brown snake eagle	+	-	++	-	Uncommon
White backed vulture	+	++	++	+++	Uncommon
Lesser spotted eagle	+	-	++	-	Uncommon
Egyptian goose	-	-	-	+	Uncommon
Fulvous whistling duck	-	-	-	+	Uncommon
Abyssinian ground hornbill	-	+	++	-	Uncommon
Silvery cheeked hornbill	+	-	++	+++	Uncommon
African hoopoe	-	-	+	++	Uncommon
Blue headed coucal	+	-	++	+++	Uncommon
Black coucal	-	-	-	++	Uncommon
Black cuckoo	+	-	-	-	Rare
African cuckoo	-	-	+	++	Uncommon
Red chested cuckoo	+	+	++	-	Uncommon
Red-eyed dove	-	-	+	-	Uncommon
Ring necked dove	+	+	++	+++	Uncommon
Blue billed wood dove	+	-	++	-	Uncommon
Tambourine dove	+	-	++	+++	Uncommon

Speckled mouse bird	+	+	++	+++	Uncommon
Little bee eater	+	+	++	+++	Frequent
African pigmy kingfisher	+	+	++	+++	Uncommon
Thick billed raven	+	-	+	-	Uncommon
Brown necked raven	-	-	-	+	Uncommon
Bronze manikin	+	+	++	+++	Uncommon
Red billed fire finch	+	-	++	+++	Frequent
Red-billed oxpecker	-	-	++	++	Uncommon
Yellow crowned canary	-	-	-	+	Uncommon
Yellow fronted canary	-	-	-	+	Uncommon
African citril	-	-	-	+	Uncommon
Streaky seed eater	+	-	-	++	Uncommon
Ethiopian boubou	+	-	-	++	Uncommon
African thrush	-	-	-	+	Uncommon
African stonechat	-	-	+	++	Uncommon
Black start	+	-	-	-	Uncommon
Blue rock thrush	-	-	-	+	Rare
Brown tailed chat	-	-	-	+	Uncommon
Northern black fly catcher	+	-	-	+	Uncommon
Ruppell's robin chat	+	+	++	+++	Frequent
White crowned robbin chat	+	+	-	-	Uncommon
White winged cliff chat	+	-	+	-	Uncommon
white throated robin	+	+	-	++	Uncommon
Song thrush	+	-	+	++	Uncommon
Malachite sunbird	-	-	+	++	Uncommon
Variable sunbird	+	+	++	+++	Frequent
Pigmy batis	-	-	+	++	Uncommon
Black headed batis	-	-	+	-	Uncommon
Red billed quelea	-	-	+	++	Frequent
Little weaver	+	-	+	++	Frequent
Village weaver	+	+	++	+++	Frequent
White winged widow bird	+	-	-	-	Uncommon
Common bulbul	+	+	-	+	Uncommon
Swainson's sparrow	+	+	++	+++	Frequent
Abyssinian Woodpecker	+	-	++	-	Uncommon
Greater honey guide	-	-	+	-	Uncommon
Yellow-breasted barbet	-	-	+	--	Uncommon
Cattle egrets	-	-	-	+	Uncommon
Black headed heron	-	-	-	+	Uncommon
Hadada ibis	-	+	++	+++	Frequent
Squacco heron	-	-	+	-	Rare
Sacred ibis	-	-	-	+	Uncommon
Black crowned crane	-	-	-	+	Uncommon
Wattled crane	-	-	+	-	Uncommon
Rouget's rail	-	-	+	-	Uncommon

Table 4:- Relative abundance of birds

