

## COMMUNITY COMPOSITION, ABUNDANCE AND MAJOR CONSERVATION THREATS OF BIRD FAUNA OF SOUTH OF OMO NATIONAL PARK, ETHIOPIA

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### *Abstract*

*A research on the community composition, Abundance and major conservation threats of Bird Fauna of South of Omo National Park, Southern Ethiopia was conducted for dry and wet seasons at 2013. The study area was stratified based on vegetation (Riverine Forest land (RFL), Grass land (GL), and Bush land (BL)). To collect data systematic sampling was used. A total of 107 species were recorded in wet season and 97 in dry season these species belonging to 16 orders and 52 families. Both the number of species (85 species) and abundance (7882 birds) was found to be high in BL. There was a significant difference in the mean abundance of birds among various habitats ( $F_2, 181 = 3.419, P < 0.05$ ). The interference of local community has had the impact on avian species. Habitat based avifaunal management involving participation of Woreda and Zonal Government is recommended for sustainable conservation of the resources of Omo National Park avian.*

**Keywords:** *Species composition; Abundance; Threat; Riverine Forest land (RFL); Grass land (GL); Bush land (BL)*

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### **Introduction**

Ethiopia provides habitat for more than 800 species of birds [1]. There are more than 1850 avian species in Africa, of these 926 originate in Ethiopia, of which 16 are endemic [2]. According to [3], out of the 926 bird species listed for the country, 21 are endemic and 19 are globally threatened species. Ethiopia is one of the few countries in the world that possesses a unique and characteristic fauna with a high level of endemism [4]. There are thirteen species restricted to the geographical region of Ethiopian highlands and thus shared by Ethiopia and Eritrea [5].

About 214 Pale arctic migrants have been recorded from Ethiopia, and a large number of these have breeding populations in the country. Although tropical environments are sometimes assumed to be uniform throughout the year, seasonal changes in precipitation are common. For birds, rainfall regimes and associated environmental changes are of major importance in determining breeding seasons and annual cycles in many regions including Ethiopia [6-8]. Seventy-two species of diurnal raptors occur in Ethiopia, 68 of which are believed to migrate at least in part of their ranges [9, 10]. Furthermore, the extensive and unique conditions in the highlands of the country have contributed to the presence of the large number of endemic species.

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Even if many of avian are known, their habitat is not investigated. In terms of its avian fauna, Ethiopia is one of the most considerable countries in the mainland of Africa (World Conservation Monitoring Centre [4]. Since Ethiopia contains a wide diversity of habitats including high mountains, grasslands, deserts and lowlands, the distribution of avian in the country is somewhat difficult [1].

Most avian species occur in Important Bird Areas (IBAs). IBAs are selected based on categories. Some of the categories are: globally endangered restricted range and biome assemblages, and congregation. A total of 1228 IBAs are distributed among 58 countries or territories in Africa and its associated islands.

IBAs cover 7% of the land area of the African continent. Out Of 1228 IBAs, 597 are found in Africa (47%) [11]. In Ethiopia, IBAs cover an area of about 47,757km<sup>2</sup> (5%) of the country's area. There are 69 IBAs. Out of these, 39 are unprotected and three are globally recognized endemic bird areas (EBAs) [12]. EBAs are effective in identifying areas, which are important for the maintenance of avian diversity and the diversity of other flora and fauna [13].

Again in Ethiopia, 73 hot spots have been identified as Important Bird Areas (IBAs). Of these 30 sites (41% of the total) comprise wetlands, while the rest are representatives of other types of ecosystems. Nationally, Ethiopian IBA sites have been grouped into three conservation categories based on distribution and abundance as critical (19), urgent (23) and high (31) [14-16].

**Study area**

The study was conducted in protected area of ONP in south of the park. ONP is one of scenic area among Ethiopia protected areas. This beautiful National Park is situated in south west of Addis Ababa at 870km close to Ethio-Sudan and Kenya borders. ONP is found between two administrative zones (South Omo and Bench Maji). It is demarcated by Omo River in the east, by the foothills of the Maji Mountains in the North West and Neruth River in the South. The latitude and longitude location between the coordinate is 5°29'- 6°35'Nand 35°33'- 35°56'E. The total area of this national park is recently 3566 square kilometer. Also this national park area was demarcated in the South by the Nyangatom woredas, in the North by the Surima worda, in the East by the Mursi (Hana) woreda, Mui River in the North and Omo River in the south east.

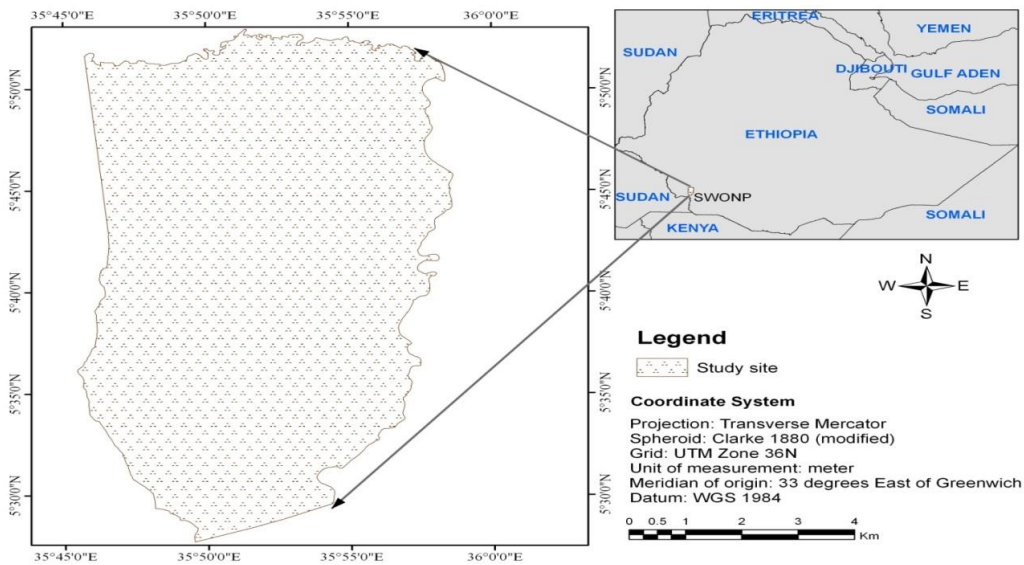


Fig. 1. Location of the study area

## Methodology

### *Sampling Design*

Systematic sampling methods were selected for all the study area. A number of 38 sampling units representing each habitat type (BL, GL and RFL) were selected based on systematic random sampling method. The technique involved dividing the study area into sample units by choosing the location of each habitat with random numbers [17]. Sample units were selected by systematic random to make sure that the results were generally representatives of the whole study area [18].

For counting birds point count method was employed in the RFL and BL while line transects method were employed in the GL. Systematic random sampling methods were employed for point and line transects methods.

Point count method was undertaken from a fixed location within the sample unit of radius 15 m for 5 minutes. To minimize disturbance during count, a waiting period of 3 minutes were applied. Where point count technique was employed, the radial distance from which the avian species occurred was estimated and the type and group number of species were recorded using binoculars. Large numbers of point count locations (more than 15) were identified from each study plot. There were 9 sample unit in RFL and 15 sample unit in BL. In each sample unit (1×1km), a total of 20 point count stations were allocated. In each point count station, a minimum distance of 150-200m was employed using GPS to avoid double counting [17].

In GL, a total of 14 sample units were selected. In each sample unit, a total of 3 transect lines with a length of 1km were located. A bird heard and seen were recorded within 50-100m on either side of the transect line making a total width of 200-300m. Transect lines within a sample unit were 250-300m apart from each other to avoid double counting [18, 19].

## Results

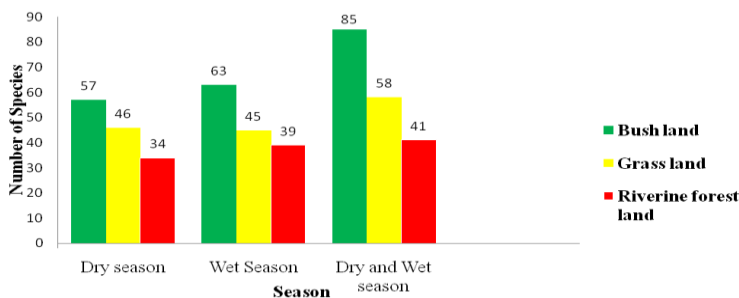
### *Community composition*

A total number of 129 species belonging to 16 orders and 52 families were identified in the study area during dry and wet seasons. The highest species richness was recorded in the family's Accipitridae (13 species) followed by Alcedinidae and Columbidae (6 species), Cuculidae, Malaconotidae, Nectariniidae and Musophagidae (5 species) and Ardeidae, Capitonidae, Ciconiidae and Hirundinidae (4 species). Fourth two percent of the families were belonged one species. The highest number of birds was recorded in Hirundinidae (23.91%) and Accipitridae (7.56%) followed by Ploceidae (4.22%), Coliidae (4.19%), and Ploceidae (4.07%). The lowest number of birds was recorded in Sylviidae (0.09%) and Prionopidae (0.17%). The families with the highest number of species were Accipitridea but with highest number of individual birds was Hirundinidae. Of all order Passeriformes is the most dominant and largest order with the highest number of families (21) and species (45). The smallest order with the lowest number of families (1) and species (1) was Falconiformes (Table 1)

Of three habitats, the BL (85 species) supported highest number of bird species followed by GL (58 species) and RFL (41 species). Of total bird species, 107species (82.94 %) were recorded in wet season and 97species (75.19%) were recorded in dry season. The BL with 85 species was the habitat found to have the highest number of species. During dry and wet season, 57 and 63 species was recorded in this habitat respectively. The GL with 58 species was habitat found to have the second highest number of species. During dry and wet season 46 and 45 species was recorded in this habitat respectively. The RFL with 41 species was habitat found to have the lowest number of species. During dry and wet season 34 and 39 species was recorded in this habitat respectively (Fig. 2). Fluctuation of species was recorded in the three habitats between seasons. In BL 57 species in dry season increased to 63 in wet season. In GL 46 species in dry season decreased to 45 in wet season. In RFL 34 in dry season increased to 39 in wet season (Fig. 2).

**Table 1.** Avian families, their abundances and species richness composition data from SONP

No	Family	Richness	% of Richness	Abundance	% of Abundance
1	Accipitridae	13	10.08	993	7.56
2	Alcedinidae	6	4.65	450	3.44
3	Anatidae	1	0.77	33	0.25
4	Anhingidae	1	0.77	80	0.6
5	Ardeidae	4	3.1	458	3.5
6	Bucerotidae	3	2.3	255	1.95
7	Bucorvidae	1	0.77	35	0.26
8	Burhidae	2	1.55	122	0.93
9	Capitonidae	4	3.1	134	1.1
10	Charadriidae	1	0.77	77	0.59
11	Ciconiidae	4	3.1	234	1.79
12	Cisticolidae	1	0.77	80	0.6
13	Coliidae	2	1.55	549	4.19
14	Columbidae	6	4.65	552	4.22
15	Coraciidae	2	1.55	306	2.3
16	Cuculidae	5	3.87	230	1.75
17	Dicruridae	1	0.77	102	0.78
18	Estrildidae	3	2.3	313	2.39
19	Hirundinidae	4	3.1	3129	23.91
20	Indicatoridae	2	1.55	137	1.04
21	Laniidae	2	1.55	67	0.51
22	Malaconotidae	5	3.87	263	2.01
23	Meropidae	3	2.3	186	1.42
24	Monarchidae	1	0.77	232	1.78
25	Motacillidae	2	1.55	233	1.78
26	Muscicapidae	3	2.3	280	2.14
27	Musophagidae	2	1.55	196	1.49
28	Nectariniidae	5	3.87	226	1.73
29	Numididae	1	0.77	211	1.61
30	Otididae	2	1.55	56	0.42
31	Oriolidae	1	0.77	93	0.71
32	Passeridae	2	1.55	234	1.79
33	Phalacrocoracida	1	0.77	88	0.67
34	Phasianidae	2	1.55	124	0.95
35	Phoeniculidae	1	0.77	101	0.77
36	Picidae	3	2.3	155	1.18
37	Ploceidae	5	3.87	533	4.07
38	Podicipedidae	1	0.77	33	0.25
39	Prionopidae	1	0.77	23	0.17
40	Psittacidae	2	1.55	74	0.56
41	Pycnonotidae	1	0.77	449	3.4
42	Recurvirostridae	1	0.77	146	1.11
43	Sagittariidae	1	0.77	13	0.09
44	Scolopacidae	1	0.77	24	0.18
45	Scopidae	1	0.77	66	0.5
46	Strigidae	2	1.55	108	0.82
47	Struthionidae	1	0.77	56	0.43
48	Sturnidae	5	3.87	377	2.88
49	Sylviidae	1	0.77	13	0.09
50	Threskiornithidae	2	1.55	38	0.29
51	Timaliidae	1	0.77	48	0.37
52	Turdidae	1	0.77	73	0.56



**Fig. 2.** The number of individual bird difference among habitat in dry and wet season

**Abundance**

A total of 13541 individual birds were counted in SWONP in both season. Of all bird 7484 individual were counted in wet season and 6057 individual were counted in dry season. A total of 7882, 2468 and 3191 birds were recorded in BL, GL and RFL habitat in both season respectively. BL with 7882 bird was found to have the highest abundance of birds followed by RFL with 3191 bird. GL with 2468 bird was found to have the lowest number of bird. In dry season, a total number of 3516, 1092 and 1449 birds were recorded in BL, GL and RFL respectively whereas in wet season the counts of total birds were 4366, 1376 and 1742 (Fig. 3). In dry season the highest number of bird was recorded in BL, RFL and GL habitat respectively and the same pattern was noticed in wet season. In all habitats the number of birds in wet season increased (Fig. 3).

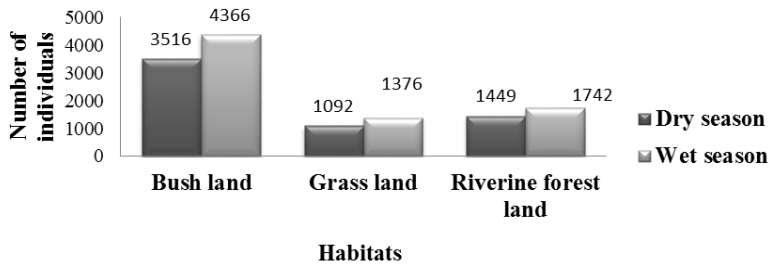


Fig. 3. The number of individual bird difference among habitat in dry and wet Season

Among the habitat there was significant difference in the mean number of birds. The total numbers of individual birds were significantly affected by the types of habitats (Table 2).

Table 2. Mean values for the total number of birds in three study site. Results of one way analysis of variance were as indicated.

Habitat	Bush land	Grass land	Riverine forest land	ANOVA
Mean number of birds per Count	(N = 85) 89.02 ± 143.06	(N = 58) 43.14 ± 23.13	(N = 41) 42.62 ± 37.41	F <sub>2,181</sub> =3.419 p<0.05
Mean number of birds per count in dry season	(N = 57) 62.98 ± 99.02	(N = 46) 23.74 ± 10.59	(N = 34) 42.62 ± 37.41	F <sub>2,134</sub> =4.39 P<0.05
Mean number of birds per count in wet season	(N = 63) 62.25 ± 82.83	(N = 45) 30.1 ± 31.85	(N = 39) 44.66 ± 34.31	F <sub>2,144</sub> =4.046 P< 0.05

The average number of birds per count was highest in BL followed by GL. The lowest average count was in RFL (p < 0.05). In dry season the total numbers of birds were significantly affected by types of habitats. There was significant difference in the mean number of birds among habitat. The average number of count per species was highest in BL followed by RFL. The least count was in GL (p < 0.05). In wet season also there is significant difference in the mean number of birds among habitat. The average number of count was highest in BL and RFL. The least average number of birds was in GL. There was significant difference in average number of birds (p < 0.05) (Table 2).

**Major conservation threats identified for Birds in Omo National Park**

The outcome of focus group discussion with local people of Surma, Nyangatom, Dizi and Mursi ethnic groups have revealed that the local communities and the concern government officials of local woreda support the establishment of this area as a National Park, in suspense that they will have benefited from the activities which will be conducted in related to the development of the Park. The governmental office has exaggerated hope to encompass jobless youth in developmental activities of ONP. During the study period the major wildlife threats identified in ONP were wild fire set, domestic animal grazing, illegal hunting, cultivation, and

mining. The local community has strong historical, cultural and economic relationship with the birds of ONP. The Greater and Lesser honey guide bird serves as important locator of wild honey for the local people during cattle keeping and finding wild honey. The local people also interpret the sound produced by different bird species such as Ostrich sound with rain season approaching and consume as food.



**Fig. 4.** Group discussion with local people about human activity in national park (February, 2013, Photo by: Debebe Dana)

### ***Fire***

In ONP history, wild fire set is common illegal activities done by local communities. This illegal activity was carried out mostly on those months of December, January, February and March. The purpose of fire set is different. Some set fire to get new shoot grass for their domestic animals, the other to driving way wild animals and to keep grass height low for better visibility of their enemy. The fire set is deliberately done mostly in open grass land habitat in dry season (Plate 4). Some of the interviewer said that we did not set fire purposely in to protected area. But the fire we set in our boundary for new shoot grass finding was extending to the park area and damaging the habitat and the wild animals. A few interviewers said that we came across park boundary in dry season for water finding for our domestic animals and for honey collection in hungry time for ourselves. In that time unknowingly fire set would happen. In one or in another fire set is serious impact on the biodiversity of Omo ecology for a year. Most of the fire accidents occur in the dry season. Lack of firefighting equipment and enough man power is hardly impossible to control except in few occasions.



**Fig. 5.** Open grass land habitat burned for new shout grass finding by local community (January, 2013, Photo by: Debebe Dana)

### ***Illegal Hunting***

From focus group discussion illegal hunting is the most serious threat to the park since its establishment. There is two type of poaching in the park. The subsistence form of poaching

which is the one conducted by local people in the height of the dry season to supplement their diet. The commonly hunting animals are Eland, Lesser kudu, Buffalo, water buck, Giraffe and Tiang. The commercial types of poaching are the one which commonly conducted for economic gain. The commonly killed species are Elephant, Leopard, Lion and Giraffe and the buyers' are local merchant round Bench Maji and South Omo zone. In the SWONP those local ethnic group people are highly involved in avian species hunting for feeding and to take their feathers for ornamental purpose. The avian Species commonly consumed for food purpose are Ostrich, Guinea fowl, Francolin and Egyptian Goose. The Ostrich feather and its egg are highly required for ornamental value. This activity was mostly taking place in dry season when they intrude to the park to feed and water their domestic animals. The other wild animal poaching is very serious when hunger comes rather than avian species. These illegal activities were not new life for this people. Because this people had been living for a century in this life style. Due to this fact illegal hunting of avian and other animal is common. According to group discussion with different class of people killing and taking wild animals' product is common throughout their life in omo valley area. Know a day also people are illegally killing the animal and taking their product for different purpose.

#### ***Domestic Animal Grazing***

The local people regularly bring their cattle inside the Park area to get better grass and water (hot spring and river) for their domestic animal particularly in dry season. They believe that the hot spring water has medicinal value for them and for their domestic animals. They also believe that it increases the appetite of their livestock and resulting in high yield of milk and meat. Due to this reason hundreds of cattle, goats, sheep, and donkeys were intrude in to the national park in both seasons. In dry season all the domestic animals were stayed inside the park in order to survive dry weather. During long time stay the habitat were degraded by densely populated domestic animals (individual has more than 300 cattle). This illegal activity degraded the habitat of avian and other wild animals by affected the diversity, abundance and distribution of bird species community and other wild animals. The other problem with these domestic animals is the densely populated number of cattle, goats and sheep which degrade the given habitat with in short period. As result the ecology and the wild animals were face different challenges such as disease, habitat degradation and food and water loss.

#### ***Cultivation***

In the SONP near to Omo River and round Diriga hill cultivation of Maize and Sorghum by Mursi and Nyagatom ethnic group people respectively was done in a few areas. During this time cutting of vegetation were done. As result different habitat of the avian species were degraded. This has negative effect on diversity, abundance and distribution as the field observation study revealed.

#### ***Mining***

In SWONP round Suri and Dizi ethnic group people, gold is highly mining by this local people. Mining in this area were done for earning a lot of money for their livelihood. To conduct this activities cutting of vegetation and digging of soil was done. These activities also have negative impact on the habitat of avian and it affects their life style.

#### ***Honey collection***

Local people living near the park boundary are collecting honey throughout the year inside the park. These people are Surma, Dize, Mursi, Nyangatom and Bodi. For honey collection they had driven out the bee by smoking them from the hives and this affect bee-eater birds. These activities were carried out mostly from the month of October up to January in dry season and April up to July in wet season. As the different level focus group discussion indicated the honey collection has been the great threat to the park by causing fire and encouraging subsistence poaching.

### **Discussion**

Species composition and abundance were affected by season and habitat factors. In dry and wet season the number of individual birds and species variation was observed. This may be



due to biotic and a biotic factor which provided optimal survival conditions for birds in the park than adjacent area. In BL in both seasons the species number and abundance was found to be high as compared to other habitats. This may be due to the micro habitats resource availability which probably fulfilled their basic survival needs. While in GL even though their species richness is greater than RFL the species abundance variation is less. This is probably due to less heterogeneity of the habitat and less resource availability. In RFL the abundance composition is high because of the vegetation structure complexity. This is supported by differences in bird abundance and composition among habitat within a landscape and among a biotic environment. Environmental heterogeneity in the form of spatial variation in habitat and local climate can affect species composition and abundance distribution [20, 21].

In different habitat, vegetation structure complexity, amount of food availability and the quality of habitat was different and this may matter the composition and abundance of avian species. In this study the BL and RFL habitats were with the highest number of avian abundance while GL was with less abundance. This is may be due to the quality of habitat and high abundance of food availability with relation to complex vegetation structure. This is supported by food abundance varies through time and space, but may directly influence abundance and composition of organisms present [22, 23]. The distribution of these resources will condition habitat quality, resulting in source – sink relationships [24, 25] among other relationships. The highest number of avian individual species was recorded in RFL throughout both season study time survey next to BL. This is probably due to the habitat condition (habitat quality and available food) and adaptive nature of the species to the given habitat. This explanation is supported by [26, 27] where avian species can choice different vegetation structure and show different adaptation ability.

The number of avian species and their abundance in wet season is completely different than that of dry season. This is probably due to the seasonal temperature and rain fall difference in the given survey site and as result the productivity of the habitat and availability of important basic needs are matter the difference in the wet season and less illegal activity pressure in the site. As result the highest species richness was recorded. This work is agreed with the work of [28] where in wet season additional avian species will dweller the habitat for different purpose. But this work was opposed with the work of [29] who concluded season has no effect on avian species richness.

During the study period, discussion with the local people helped to assess the view of the community and major wildlife threats of the area. Unlike other parts of the conservation areas of the country, people living around the park area are cooperative and supportive of the activities concerning the establishment of the Park. This is mainly due to the development of awareness created by continuous provision of training and education for local community by concerned governmental (ONP staff) and nongovernmental officials (African park international NGO). ONP is relatively undisturbed compared to other Parks of the country because of its remoteness. However, this does not mean that it is free of human intervention. There was local people intrusion in to the national park with their domestic animal in dry and wet season. Unless further conservation measures are taken, similar problems are likely to occur as seen in other Parks like Awash national park.

Unlike large mammals, it is very difficult to assess the extent of poaching of birds in the area. Like any other wild animals, killing birds for different reasons has negative effect on the abundance and diversity of the species. Some bird species are uncommon and will rapidly respond to poaching. Even though such effect is not clear on the study area, it will have a declining effect on the abundance of some species and will eventually result in the extermination of such species from the area.

Grazing especially by cattle can influence the structure and composition of vegetation. The long term grazing affects the regeneration and composition of tree and shrub structure. The effect of grazing depends on the density and herbivores involved. High density of large herbivores reduces the density of vegetation within reach of whichever animals are being used and encourage low grass growing. The number of domestic animal population which intrudes in to national park is extremely high and as a result the amount of damage and degradation in GL



habitat and water points (permanent hot springs) is high. This gradually affects the forage activities of birds and deteriorates the nest and roost site of the species. This work is compromise with [29] which finds that grazing has effect on the habitats and the resource as well.

### Conclusion and Recommendation

This present study revealed that South of Omo National Park supported a Variety of avifauna. The variation in the species and numbers among habitat and between seasons is observed. BL supported the highest number of avifauna among habitats because of mixed habitat and resource availability and wet season was with highest number of species richness and abundance throughout the habitats. A large number of avian species in the study area were recorded as frequent. This implies that the ONP provides optimal habitats for birds.

The present study provides the following recommendations which if given due attention may prove helpful for wildlife conservation especially avifauna.

Therefore the Park boundary near to local people (Nyangagatom, Surma and Murisi ethnic groups) should be given attention to minimize illegal activities by working together with local administrative. Findings of this study identified important sites holding bird abundance, conservation priority species and major threats which hold value for planning management plan for wildlife in general and birds in particular.

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