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MAJOR FAUNAL RESOURCES AND STATUS, OF NONO SALLE FOREST PRIORITY AREAS, SOUTHWEST ETHIOPIA

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Abstract

Knowledge's of the faunal diversity records, status and the preferred habitats are basis for the status determination and to propose appropriate conservation measures to the area. The survey was aimed to assess major faunal diversity in Nono Salle Forest priority areas. Fixed/Variable width line transect method with other indirect methods were used to count mammals in the study area while point count method with visual and auditory count was used to bird species. A total of 26 and114 species belonging to 13 and 53 families and 7 and 15 orders of mammals and birds were identified respectively. Out of 114 bird species identified the highest 57(47.5%) species were found in forest .The highest diversity of mammals was observed in the forest (H'=1.993) while highest species evenness of mammals was in riverine forest (J=0.646). About 3.8% and 7% of the mammals and birds are endemic to Ethiopia respectively. On the other hand 5.3% and 11.5% of the recorded birds and mammals are near threatened and above respectively. More fauna were observed around less disturbed area that is forest, the critically endangered, vulnerable and threatened species were also observed in these areas. Therefore, there is a need for urgent conservation strategies that involves local peoples through community based wildlife conservation to save the wildlife resources of the area.

Keywords*: Major fauna; Diversity; Forest; Endemism; mammals; birds*

Introduction

Ethiopia is one of the most biophysically diverse countries of the world. It has an area of over 1, 023, 050km^2. It comprises highland massive surrounded by arid lowlands and contains various wildlife and wildlife habitats ranging from alpine moorlands to lowland savannas, arid lands, and extensive wetlands. Ethiopia has high faunal biodiversity reflects the existence of large number of birds and other higher vertebrates species [1, 2]. This in turn reflects a diversity of habitats, created by differing combination of elevation, rainfall, geology, soil surface and ground water [1]. Ethiopia is among the world richest endemism of mammalian species [1, 3]. Of the over 300 species of mammals recorded from the country 31 are endemic [1, 3, 4] and the high level of endemicity is attributed to the large extent of highlands. Over sixty percent of the recorded mammals are medium and large sized [5, 6] and Ethiopia has rightly become one of Africa`s leading bird destinations. A remarkable 69 Important Bird Areas (IBAs) were defined by the Ethiopian Wildlife and Natural History Society [7-9].

Birds are often used as a proxy and bio-indicator group for many reasons: their ecology is well understood, they play large and important roles in the ecosystem covering multiple

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layers of the ecological hierarchy, while mammals are very essential for game, trophy and sport hunting, commercially important ointment such as musk and so on [10].

Birds and Mammals can be assessed within a landscape through a variety of methods, but point count surveys and line transect survey are a popular and frequently used form of assessment for birds and mammals respectively. More of Knowledge's of the faunal diversity records, their abundance and their preferred habitats are basics for the status determination and to propose appropriate conservation measures [11]. Surveying mammals and bird species composition, diversity, and richness tell us the status of human disturbances to biodiversity, and triggered to facilitate the major intervention program which is appropriate and mutual to the area. Therefore this survey intended to assess major faunal diversity in Nono Salle Woreda forest priority area, Ilubabor zone, Southwest Ethiopia.

Methods and materials

Study area and Period

The study was conducted in Nono Salle woreda forest priority area located in Ilubabor zone, Southwest Ethiopia. The survey was undertaken from October-December, 2018.

Preliminary survey

During preliminary survey the study area was stratified in to different blocks based on vegetation type, altitude, nearness to the community and presence of waters etc. Each blocks was divided in to sampling unites (transect line or Point count radius) then from each blocks sampling units was selected randomly.

Data sampling methods and units

Point count methods and Fixed/Variable width line transects method was employed in this study to survey birds and mammals respectively in the study area.

Point count methods for avian survey

Point count method with visual and auditory count was used to register presence and abundance of bird species [12]. Location of points was randomly selected after it separated at each habitat type (Forest, Cultivated land, Riverine, Scrubby (Sub urban), that was typical representative of the area. The point count has 25/50m radius based on habitat type and average visibility range that ease for both visual and auditory sampling. Furthermore points were located at least 200 meters apart to avoid double-counting highly vocal species [13].Counts we carried out during the first hours after dawn (6:30-8:30) and before dusk from 16:00-18:00 respectively. One point count was undertaken for 20 minutes only after that other site was selected and employed again for 20 minutes as well, moreover 4 point counts was conducted per each section (i.e morning and before dusk respectively)/habitat type, 10 minutes rest was taken per each point counts. Totally (4×20min×2×2=320 minutes/each habitat/month) was used for point count survey. For the sake of similarity and reduction bias all survey was collected morning from 6:30-8:30 and before dusk from 16:00-18:00 respectively.

Binoculars (Bushnell 750, USA made) was used to record the observation from a distance to avoid any disturbance to the birds and photography was done by making use of Bushnell camera traps and Cannon T-70 camera with 210mm and 300mm lens. Activities of birds recorded during the survey period included calling, overflying, perching, walking, mobbing, and busy in the construction of nest, collection of grass materials, feeding and loafing.

Transect line survey for major mammals' survey

Fixed/variable width line transects method adopted by [14] was used in which observer walks through a fixed path counting the mammals seen or heard on both sides of the path. For

maximizing chance of sampling both visual/auditory and line transect method were applied for sampling of mammals' (large and medium sized) diversity. Census was carried out twice per month starting from October, 2018 to December, 2018. During the census a distance of 4km was covered with a fixed duration of 2 hours, i.e. covering 2km/hour and this sampling was maintained throughout the census. The width of transact was from 200m to 400m in either side considering thick and open country (habitat type) respectively.

Data Analysis

Species composition: *abundance* for each species was calculated by summing up the number of individuals recorded in all transect and point count method using Microsoft excel 2010.

The *abundance of fauna's species* in each habitat type was computed using the formula [15]:

$$Abundance = 100\times(Total\ number\ of\ individual\ al\ species)/(Total\ number\ in\ the\ sampled\ habitat) \quad (1)$$

Diversity: Shannon diversity is very widely used index for comparing diversity between various habitats [16]. It was calculated in order to know the species diversity in different habitat based on the abundance of the species by the following formula [17]:

$$H' = -\sum Pi \times lnPi \quad (2)$$

where: H´ = *Diversity Index*; Pi = *the proportion of each species* in the sample; lnPi = natural logarithm of this proportion.

Whereas the evenness (J) of the *faunal species* (Hmax) and S is the number of species. J was computed using the formula (3):

$$J = H'/Hmax, \quad (3)$$

where:

$$Hmax = in\ S \quad (4)$$

The value of *Shannon Weiner Diversity Index* usually falls between 1.5 and 3.5, only rarely it surpasses 4.5. A value near 4.6 would indicate that the numbers of individuals are evenly distributed between all the species.

Simpson similarities index (SI = x [nc/(a+b+c)]) was used to compare mammalian diversity and their similarities among habitats respectively.

Frequency of occurrence of mammal and bird

C = common: means it can be invariably be seen in that habitat where it occurs with the proviso of course that the reason is also appropriate.

F = Frequent: means that visiting appropriate habitat it will not be seen or heard invariably, perhaps only one visit out of three.

O = Occasional: means seen or heard only in one visit out of six.

R = Rare: means even less likelihood of occurrence

For describing frequency of occurrence and comparative abundance of birds, the terms described by [18]. The bird species found more than 1000 individuals per day in the locality were termed as very abundant, those between 200 to 1000 individuals were termed as abundant, and those found between 51 to 200 individuals were termed as very common, whereas those found between 21 to 50 individuals were considered as common species. Bird species, similarly, were termed as fairly common having population seven to 20 individuals per day, whereas those observed between one to six individuals were named as uncommon. Correspondingly, birds with one to six individuals per season were described as rare. On the other hand, bird species having infrequent occurrence were termed as very rare species.

The IUCN Red list 2018-1 was used to identify those mammals and birds that are near threatened, vulnerable, endangered, critically endangered and least concern.

Results

Mammals' survey

Mammalian Species Composition: A total of 26 species of mammals belonging to 7 orders and 13 families were identified through direct and indirect observations from Nono Salle Forest priority area (Table 1). Of these, Tree squirrel (*Sciurini Spp.*), Vervet monkey (*Chlorocebus aethiopis*), crested porcupine (*Hystix cristata*), Stark's hare (*Lepus starki)*, Bush hyrax *(Heterohyrax brucci* and Rock hyrax *(Procavia capensis)* were medium-sized mammals whereas the remaining were large-sized mammals. From all recorded families Cercopithecoidae was the most represented family (five species) followed by Felidae (four species) and Bovidae and Suide (each with three species). Procaviidae and Hyaenidae were represented by two species while the remaining families, Hystricidae, Sciuridae and Canidae were represented by one species each (Table 1).One endemic species (*Lepus starcki*) was observed and the other species are also found in other region of the world.

Table 1. Major mammalian species identified from Nono Salle Forest priority area

Order	**Family**	**Common name**	**Scientific name**	**Identification Methods**
Primate	Cercopithecoidae	Blue monkey	*Cercopithecus mitis*	Visual
		Vervet monkey	*Chlorocebus aethiops*	Visual
		Guereza colobus	*Colobus guereza*	Visual
		De Brazza's monkey	*Cercopithecus neglect*	Visual
		Olive baboon	*Papio anubis*	Visual
Rodentia	Hystricidae	Crested porcupine	*Hystrix cristata*	Visual, spine, fecal, burrow
	Sciuridae	Tree squirrel	*Sciurini Spp.*	Visual
Lagomorpha	Leporidae	Stark's hare	*Lepus starcki*	Visual
Hydracoidea	Procaviidae	Bush hyrax	*Heterohyrax brucei*	Visual
		Rock hyrax	*Procavia capensis*	Visual
Tubulidentata	Orycteropodidae	Aardvark	*Oryctero pusafer*	Hole/Burrows
Artidactyla	Bovidae	Bush duiker	*Sylvicapra grimmia*	Visual
		Common Bushbuck	*Traglaphus scriptus*	Visual/Footprint/Sound
		African buffalo	*Syncerus caffer*	Foot print/Faeces/Oral interview
	Suide	Warthog	*Phacochoerus africanus*	Visual
		Bushpig	*Potamochoerus larvatus*	Visual/Faeces
		Giant hog	*Hylochoerus meinertzhageni*	Visual/Foot print/Oral interview
Carnivora	Canidae	Side stripped jackal	*Canis adustus*	Visual/Sound
	Hyaenidae	Spotted hyena	*Crocuta crocuta*	Faeces/ sound/Footprint
		Striped hyena	*Hynae hynae*	Faeces/ sound/Footprint
	Viveridae	African Civet	*Civettictis civetta*	Visual/ scent marks
	Mustelidae	Honey badger	*Mellivora capensis*	Visual
	Felidae	Wildcat	*Felis sylvestris*	Visual
		Serval cat	*Felis serval*	Visual
		Leopard	*Panthers pardus*	Foot print
		Lion	*Panthera leo*	Foot print /Oral interview

Mammalian species richness and evenness

Diversity index (H') and evenness (J) of mammals recorded were varied among the three habitat types during the study. Among the three habitat types highest diversity of mammals was observed in the natural forest (H'= 1.993) followed by agro-forestry (H'= 1.675) and riverine forest (H'= 1.658) respectively. The species evenness was highest in riverine forest (J = 0.646) followed by forest (J = 0.645) while agro-forest (H = 0.579) was the least (Table 2).

Table 2. Diversity indices (H') and evenness (J) of major mammalian species

Habitat	**Number of species**	**Number of individuals**	**H'**	**H'max**	**J=** H'/H'max
Forest Habitat	22	316	1.993	3.091	0.645
Riverine forest Habitat	13	286	1.658	2.565	0.646
Agro-forestry Habitat	18	323	1.675	2.890	0.579

Relative abundance of Mammalian species

A total of 925 individuals of mammals were recorded during the study. Among these Vervet monkey was the most abundant comprising 32.54% of the recorded individuals followed, by Olive baboon (31.78%), Guereza colobus (14.38%), and Blue monkey (6.05%) respectively. But Tree squirrel and Lion were the least abundant mammalian species contributed 0.10% each (Table 2).

Table 3.Number of individual species and their relative abundance of major mammals in the study area

Family	**Common name**	**Scientific name**	**No. of individuals**	**Relative Abundance (%)**
Cercopithecoidae	Blue monkey	*Cercopithecus mitis*	56	6.05
	Vervet monkey	*Chlorocebus aethiops*	301	32.54
	Guereza colobus	*Colobus guereza*	133	14.38
	De Brazza's monkey	*Cercopithecus neglect*	26	2.81
	Olive baboon	*Papio Anubis*	294	31.78
Hystricidae	Crested porcupine	*Hystrix cristata*	18	1.94
Sciuridae	Tree squirrel	*Sciurini Spp.*	1	0.10
Leporidae	Stark's hare	*Lepus starcki*	6	0.65
Procaviidae	Bush hyrax	*Heterohyrax brucei*	18	1.94
	Rock hyrax	*Procavia capensis*	8	0.86
Orycteropodidae	Aardvark	*Oryctero pusafer*	8	0.86
Bovidae	Bush duiker	*Sylvicapra grimmia*	7	0.76
	Common bushbuck	*Traglaphus scriptus*	4	0.43
	African buffalo	*Syncerus caffer*	8	0.86
Suide	Warthog	*Phacochoerus africanus*	5	0.54
	Bushpig	*Potamochoerus larvatus*	3	0.32
	Giant hog	*Hylochoerus meinertzhageni*	2	0.22
Canidae	Side stripped jackal	*Canis adustus*	2	0.22
Hyaenidae	Spotted hyena	*Crocuta crocuta*	5	0.54
	Striped hyena	*Hynae hynae*	2	0.22
Viveridae	African Civet	*Civettictis civetta*	5	0.54
Mustelidae	Honey badger	*Mellivora capensis*	4	0.43
Felidae	Wildcat	*Felis sylvestris*	3	0.32
	Serval cat	*Felis serval*	2	0.22
	Leopard	*Panthers pardus*	3	0.32
	Lion	*Panthera leo*	1	0.10
	Total		925	100

Simpson similarity index (SI) of mammal species among three habitats in the study area was 0.566. This indicated that more than half (56.6%) of the recorded species were common for all three habitats (Table 4).

Table 4. Simpson's similarity index (SI) for mammals among the three habitats type in Nono Salle woreda, Ilu Ababor zone, Southwest Ethiopia 2018.

Forest (I)	Riverine Forest (II)	Agro-forest (III)	Species common to all habitat type	Similarity index SI = 3C/I+II+III
Blue monkey	Blue monkey	Blue monkey	Blue monkey	
Vervet monkey	Vervet monkey	Vervet monkey	Vervet monkey	
Guereza colobus	Guereza colobus	Guereza colobus	Guereza colobus	
De Brazza's monkey	De Brazza's monkey	De Brazza's monkey	De Brazza's monkey	
Olive baboon	Olive baboon	Olive baboon	Olive baboon	
Crested porcupine	Crested porcupine	Crested porcupine	Crested porcupine	
Stark's hare	Stark's hare	Tree squirrel	Stark's hare	
Bush hyrax	Bush hyrax	Stark's hare	Bush hyrax	
Rock hyrax	Rock hyrax	Bush hyrax	Rock hyrax	
Aardvark	Bush duiker	Rock hyrax	Bush duiker	
Bush duiker	Warthog	Aardvark		
Common bushbuck	Bush pig	Bush duiker		
African buffalo	Giant hog	Common bushbuck		
Side stripped jackal		Side stripped jackal		
Spotted hyena		Spotted hyena		
Striped hyena		Striped hyena		
African Civet		African Civet		
Honey badger		Honey badger		
Wildcat				
Serval cat				
Leopard				
Lion				
∑S= 22	∑S = 13	∑S = 18	∑S = 10	0.566

The study showed that the highest species similarity occurrence between the forest and agro-forest, followed by riverine forest and agro-forest, whereas the lowest similarity occurrence was between forest and riverine forest (Table 5).

Table 5. Similarity in distribution of mammal species between habitats

Habitats	Simpson similarity index (SI)
F vs RF	0.571
F vs AF	0.850
RF vs AF	0.645

F = Forest, RF = Riverine Forest, AF = Agro-forest

From a total 26 species of mammals recorded in Nono Salle forest priority area 6 species (23.08%) were common, 11 species (42.31%) were frequent, 7 species (26.92%) were occasional and 2 species (7.69%) were rare (Table 6). On the other hand, out of 26 species recorded during study period about 2(7.75%) species are vulnerable and 1(3.8%) near threatened and the rest 23(88.45) species where least concern (Table 6).

Bird species composition

A total 114 species belonging to 56 families and 15 orders of birds were recorded. Among these Order Passeriformes 56(46.66%) was dominant in the study area followed by

order Accipitri-formes 13 (10.83%), furthermore about 1387 individual birds were counted during the study period (Figs. 1 and 2).

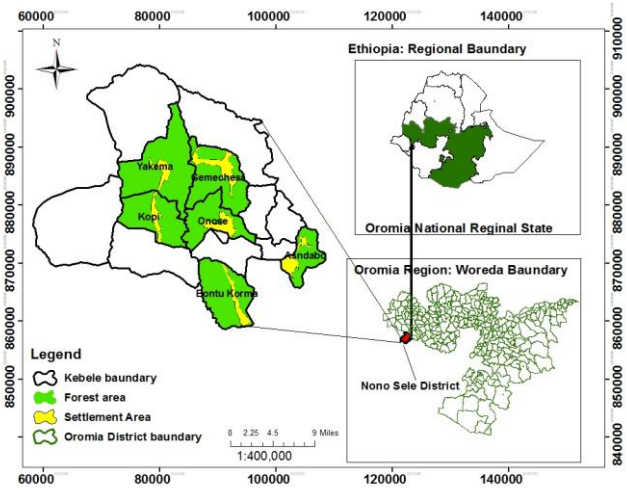

Fig. 1. Map of the study area

Table 6. Occurrence of mammals in the study area Nono Salle woreda, Ilu Ababor zone, South west Ethiopia

No	Common name	Category	IUCN status
1	Blue monkey	C	LC
2	Vervet monkey	C	LC
3	Guereza colobus	C	LC
4	De Brazza's monkey	F	LC
5	Olive baboon	C	LC
6	Crested porcupine	F	LC
7	Tree squirrel	Oc	LC
8	Stark's hare	F	LC
9	Bush hyrax	F	LC
10	Rock hyrax	F	LC
11	Aardvark	F	LC
12	Bush duiker	C	LC
13	Common bushbuck	C	LC
14	African buffalo	R	LC
15	Warthog	Oc	LC
16	Bush pig	Oc	LC
17	Giant hog	Oc	LC
18	Side stripped jackal	Oc	LC
19	Spotted hyena	F	LC
20	Striped hyena	F	NT
21	African Civet	F	LC
22	Honey badger	Oc	LC
23	Wildcat	F	LC
24	Serval cat	F	LC
25	Leopard	Oc	VU
26	Lion	R	VU

Bird Species diversity and Abundance

The highest Shannon-Weiner diversity index (H' = 3.71) and evenness index (J' = 0.92) were observed from the forest habitats while the lowest diversity index (H' = 2.92) and evenness index (J' = 0.89) were from the riverine (Table 2). Furthermore the highest (9.4) and lowest (6.12) mean abundance of birds was observed from cultivated land and riverine respectively (Table 7).

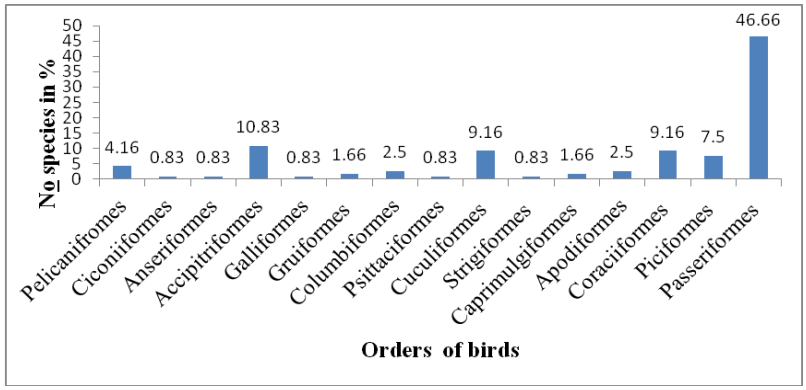

Fig. 2. Percentage species composition of different Orders of birds of Nonno Salle Woreda, Southwest Ethiopia 2018

Table 7. Bird species diversity in Nonno Salle Woreda Southwest Ethiopia, 2018

Diversity measures	Habitat			
	Forest	Cultivated	Scrubby	Riverine
Shannon-Weiner (H')	3.71	3.54	3.41	2.92
Evenness J	0.92	0.91	0.90	0.89
Mean Abundance	7.54	9.40	8.55	6.12
St Deviation	±7.31	±8.9	±7.25	±5.03

Bird species Distribution and relative abundance

From 114 species identified 57 (47.5%) species were found in forest the rest 49 (40.83%), 40 (33.33%) and 26 (21.55%) were found in cultivated, scrubby, and riverine habitat type respectively. Similarly about 1, 387 individual birds were recorded from these highest percentage of individuals 46 (33.30%) were observed in cultivated land followed by 430 (31%) in forest habitat (Fig. 3).

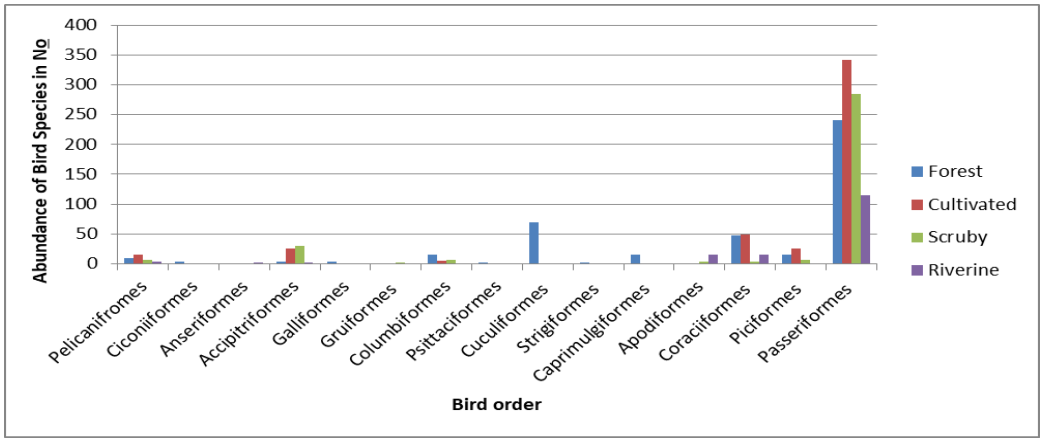

Fig. 3. Distributions and abundance of bird orders in different habitats located in Nonno Salle Woreda forest priority area Ilubabor Zone Southwest Ethiopia, 2018.

When each habitat type compared regardless of their order and family, Common Bulbul (*P.barbatusschoanus*) 84 (5.97%), Rüppell's Robin Chat (*Cossyphasemirufa*) 70 (4.97%), Dark Capped Bulbul (*P. tricolor spurius*) 57 (4.05%) and Grey Tit-Flycatcher (*Myioparu splumbeus)* 57 (4.05%) were the highest abundantly occurred bird species in all habitat types respectively (Table 8).

Table 8. Bird Species relative abundance in Nonno Salle Woreda Ilu Ababor zone, Southwest Ethiopia, 2018

Common Name	Scientific name	Habitat				
		Forest n (RA%)	Cultivated n (RA%)	Scrub-land n (RA%)	Riverine n (RA%)	Total
Common Bulbul	*P.barbatusschoanus*	21(5.05)	34(7.2)	12(3.4)	17(10.55)	84(5.97)
Rüppell's Robin Chat	*Cossyphasemirufa*	9(2.3)	30(6.4)	24(6.8)	7(4.34)	70(4.97)
Yellow Billed Waxbell	*Estrildaquartinia*	7(1.7)	7(1.5)	7(2)	4(2.48)	23(1.77)
Grey Tit-Flycatcher	*Myioparusplumbeus*	3(0.72)	4(0.85)	3(0.8)	4(2.48)	14(0.99)
Dark Capped Bulbul	*P.tricolor spurious*	17(4.1)	21(4.5)	12(3.4)	7(4.34)	57(4.05)

IUCN status list of bird's species

According to IUCN RED data list of 2018 – 1, one species Hooded vulture (*Necrosyrtes monachus*)) is critically endangered while two species (Greater spotted eagle (*Clangaclanga*) and Woolly-necked Stork (*Ciconiae piscopus*)) are listed as vulnerable, and two species (Rouget's Rail (*Rougetius rougetii*), Bateleur(*Terathopiusecaudatus*)) listed as near threatened whereas the rest 109 species of birds are listed as least concern.

Bird species endemism

Seven endemic species that shared with Eretria (*Lybius undatus*, *Corvus crassirostris*, *Bostrychia carunculata*, *Agapornistaranta*, *Rougetius rougetii*, *Columba albitorques*, and *Oriolus monacha*) were recorded with 5.3% of endemism percentage (Appendix 2).

Local occurrence status of avian diversity

According to local occurrence status there were 5 species ranked as very common, 13 species common, 49species fairly common and 47species were uncommon respectively (Fig. 4 and Appendix1).

The local community interview result: Community opinion

From the community that interviewed during survey about three fourth of them witnessed that before five and 10 years ago more wildlife variety observed in our area including large mammals carnivorous such as Lion and Mega herbivorous like African buffalo's and others which are not exist in the mean time in our area. **For the question asked what is the main factor for this wildlife reduction**: Most of the interviewee said we ourselves are the main factors due to we don't know about their importance, activities such as livestock grazing, agricultural expansions particularly coffee plantation and illegal wildlife encroachments are among key anthropological activities that affected wildlife resources as per their suggestion. **For the questions what do you suggest to save these wildlife resources?** Just the government or other responsible body should care and start conservation and protection with immense involvement of the local community in the conservation.

Discussion

Mammals Fauna survey

A total of 26 species of mammals were identified from Nono Salle forest priority areas. The number of mammalian species recorded during the study was relatively high compared

with other studies conducted in Ethiopia.18 species of medium and large mammals was reported in and around Wondo Genet Forest patch [19], 16 large mammals from Yayo forest biosphere reserve [20] 15 species of medium and large mammals from Menagesha Communal forest East Gojjam, Ethiopia [21], 15 species of mammals from Wacha Protected Area, Western Ethiopia [22]. Moreover, a comparable result, 28 species of mammals was also reported from Dati Wolel National park, Western Ethiopia [23].

The study revealed that the highest diversity of mammalian species recorded in the forest habitat (H'= 1.993) and followed by Agro-forestry (H'= 1.675). This high diversity of mammalian species in forest may be due to the greater vegetation richness and greater canopy height, which increases the potential niches and provides more food resources, shelter, protection and escape opportunities to mammals [24]. Agro-forestry also holds relatively high diversity of mammals. This probably reflects their dense and diverse tree canopies (which provide fruits and other resources), their small size and proximity to forest, and their organic cultivation. Although the vegetation in agro-forestry (coffee plantation) is less dense and diverse than that of forest patches, the overall vegetative structure is quite similar to that of forests, with similar canopy heights, trees of varying diameters and several strata[25]. Other studies have similarly reported that agro-forestry systems (coffee plantation) close to natural forest or occurring in landscapes with high forest cover may have a greater diversity of forest birds, mammals and insects than those occurring in areas with little remaining forest [26, 27].

Vervet monkey (*Chlorocebus aethiops)*, Olive baboon (*Papio anubis*) and Guereza colobus (*Colobus guereza*) were the most abundant species in the study arearespectively. This might be attributed to their feeding behavior that they are adapted to feed on variety of food items and their diurnal feeding behavior [28]. The species are known to be widely distributed in Africa in a wide variety of habitats from savanna grassland to up land Afro-montane forest. It is known that primates particularly families Cercopithecoidae and Colobidae need forested areas with tall trees [29]. The highest species similarity recorded between the forest and agro-forestry (coffee plantation) might be due to the high similarity of vegetation between the two habitats [30].Similar result was reported for the Alatish National park, Ethiopia. *Lepus starck*is the only endemic mammal recorded [4]. All over about 3.8% of the mammals of the area endemic to the country it is low rate of endeminism as compared to central, northern and south east highlands where Baleand Semen mountains national park are found, however as compared to Gambella national park and other lowland protected area it better [31]. From the recorded species Leopard and Lion are categorized under vulnerable status of IUCN Red Data list 2018 while striped hyena was categorized as nearly threatened species. These may be due to shrinkage of home range and availability of prey because both lion and leopard need large home ranges.

Avian fauna survey

To understand the health of unprotected biodiversity of an area exploring bird species composition and abundance is essential tools that indicate the status of the ecosystem [10] and it is essential to undertake effective and sustainable bird conservation strategies and managements measures [32].

As the finding showed a total of 15 orders, 53 families and 114 species were recorded in the study area this indicated that the area has good potential reserves of bird biodiversity even though the time of study was short survey. Furthermore about 1347 individual of birds were recorded in the study period among this about majority of them belong to single order Passeriformes, this finding in agreement with [33] in Wabe fragmented forests around Gubre subcity and Wolkite town southwest Ethiopia and [34] in Kafa biosphere reserve. On the other hand the highest species composition of birds were observed in forest while abundance are

found in cultivated land this may be due to majority of birds to nest in large trees and search their foods from croplands where grains and other food found; often birds are aggregately found where excess food is found hence cultivated land have high tendency of abundance than diversity while forest have high tendency to diversity than abundance [35]. Conversely counting birds in forest more difficult than cultivated area because they easily shade/hide themselves in tree canopy and in to the jungle this may have an impact on the abundance of birds in forest. Studies indicated that the distribution pattern of bird species normally follow the spatial structures of the environment's and habitat requirement of the bird species [36] and other studied which support this idea stated that as vegetation changes along complex geographical and environmental gradients, a particular bird species may appear, increase or decrease in number, and disappear as the habitat changes [37]. Furthermore the shannon-weaver diversity index confirmed that the forest was highest in species diversity while the cultivated land was highest in relative abundance. Among the kebeles (the smallest administrative unite in Ethiopia) Yakkama has highest in species diversity and abundance this may be due to this kebele has both forest and cultivated land more as compared to other study kebeles.

According to IUCN red list threat categories 2018-1, among 114 species identified one species Hooded Vulture (*Necrosyrtes monachus*) is critically endangered while two species (Greater spotted eagle (*Clanga clanga*) and Woolly-necked Stork (*Ciconia episcopus*) are listed as vulnerable, and two species Rouget's Rail (*Rougetius rougetii*), Bateleur (*Terathopiuse caudatus*) listed as near threatened. The threat may be intensified by habitat destruction and disturbances for grazing of livestock, selective lodging of kerero tree for makingtraditional honey hives, encroachment of land near and scrubby area for small scale agricultureand expansion of coffee plantation.This finding was supported by Green and [38]stated that human activities threaten the existence of many birds by destroying their habitat or directly affecting their survival and reproductive success. Studies conducted in Niger showed that the most important threat for White Storks (*Ciconiaciconia*) was the degradation of wetlands which are ideal habitats for roosting and thermoregulation [39, 40]. Moreover finding confirmed the presence of eight endemic species (*Tauraco leucotis, Lybius undatus, Corvus crassirostris, Bostrychia carunculata, Agapornistaranta, Rougetius rougetii, Columba albitorques,* and *Oriolus monacha*) with rate of endemism of 7% even though some of species shared with Eretria.

Conclusion and Recommendation

The finding confirmed that Forest and reverine forests are the main sites for Wildlife faunal resources of the study area whereas endemic species and threaten species are also made home in this forest priority area. More fauna were observed around less disturbed area that is forest, the critically endangered, vulnerable and threatened species were also observed in these areas. In the study area livestock grazing, agriculture expansion especially coffee plantation and cutting of larger trees for traditional hive making are very evident, has potential for putting enormous pressure on the flora and fauna. Therefore, there is a need for urgent conservation measure that involves local community through community-based wildlife conservation to save the wildlife resources of the area. In general, this study is a baseline survey hence we would like to further recommend that detail investigation that envisage and speculate all the potential resources and factors on Nono Salle forest priority area.

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