



GUILDS, MIGRATORY AND CONSERVATION STATUS OF AVIAN COMMUNITY IN A NIGERIAN PROTECTED AREA

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Abstract

According to some studies conducted in Nigeria, human operations like cutting down trees, grazing, converting forests into farms, hunting, and other disturbances have resulted in habitat loss and a decrease in the populations of both resident and migratory birds. However, the reasons of many bird reductions in West Africa, including Nigeria, remain unknown due to a paucity of data on habitat usage and feeding ecology for both resident and migratory birds. In Zandama hills forest reserve, Jigawa Nigerian protected area, the study evaluated the guilds, migratory and conservation status of avian community. Line transect approach as was used to survey four transects (Transect A, Transect B, Transect C and Transect D). A total of 8583 individuals from 134 bird species and 47 families were recorded. 84% species recorded were resident birds; 7% intra-African migrant and 5% Palearctic migrant. Insectivores (34 species) account for about 25.4% of all feeding guilds, followed by Granivores (24 species) at 17.9% and Omnivores (20 species at 13.4%), some bird species have multiple feeding guilds. The bird species with the Population Trend categorized as Stable had the most bird species observed with 87 species (64.93%), followed by Decreasing with 27 species (20.15%). Based on the species recorded, Population Status of Least Concern (LC) has the most species recorded, 130 (97.01%), there are others with status Endangered (En) containing two species (1.49%), Near Threatened (NT) and Vulnerable (Vu) containing one species each (0.75%). The two endangered species are the Martial Eagle, *Polemaetus belliosus*, and the Bateleur, *Terathopius ecaudatus*, while the Tawny Eagle, *Aquila rapax*, are considered vulnerable and the Red-necked Falcon, *Falco chicquera* as Near Threatened. The high bird diversity recorded in Zandama hills, including 4 birds of conservation concern; highlight the importance of this area as a key bird habitat in the state.

Keywords: Feeding guild, Bird abundance and diversity, Migration, Residency

Introduction

Birds are important components of ecosystems in forests and are regarded as reliable markers of biodiversity (Şekercioğlu, 2006). They have thus been extensively employed in research contrasting the species richness and composition of natural forests

versus plantations (Stephens and Wagner, 2007). Food availability, vegetative cover, predators, and a number of other ecological variables that represent temporal fluctuations and diversity gradients control guilds (Kissling *et al.*, 2012; Katuwal *et al.*, 2016). Seasonal changes in resource availability are expected to influence varied responses according to feeding guild type (Mulwa *et al.*, 2013; Abdul *et al.*, 2024). Season and landscape factors (vegetation type and location) were revealed to be key drivers in the structure of Dutse bird assemblages, reported by Muhammad *et al.* (2018). Identification and analysis of ecological guilds have been critical in recognizing the mechanisms that determine the organization and structure of communities (González-Salazar *et al.*, 2014; Kornan and Kropil, 2014), and each species fits an ecological role based on its resource use within a community (Ricklefs, 2010).

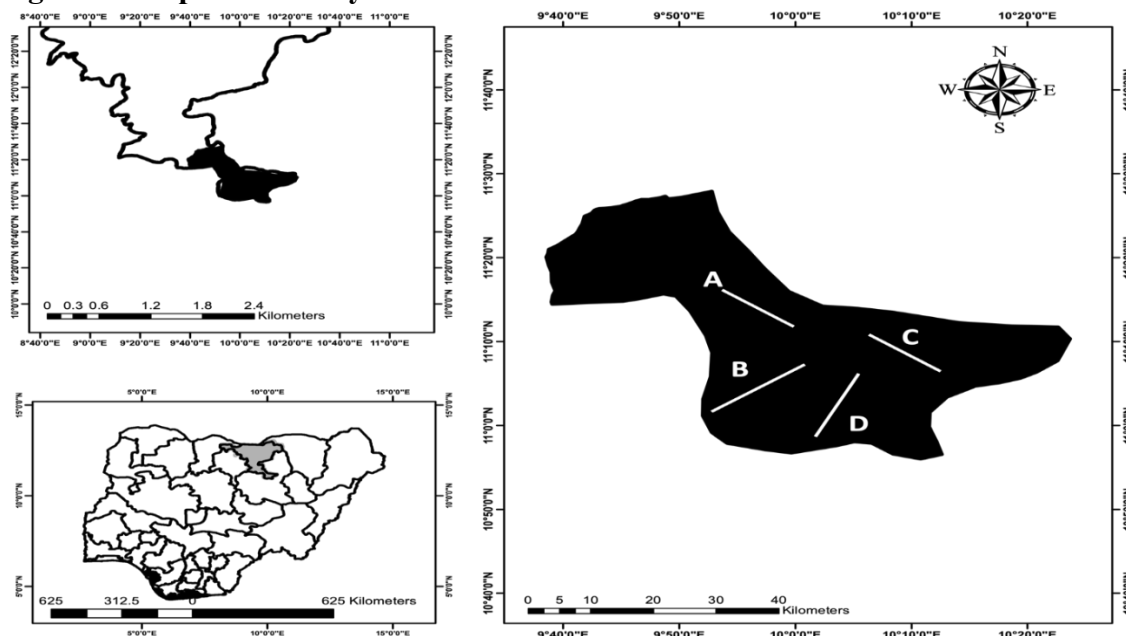
Many birds in Nigeria are showing decreasing population trends, according to data from the International Union for Conservation of Nature (IUCN) Red List and Birdlife International (e.g., Crested Lark *Galerida cristata*, Green-backed Heron *Butorides striata*, Blue-naped Mousebird *Urocolius macrourus*, and Bruce's Green Pigeon *Treron waalia*) (Birdlife International 2016, IUCN 2016).

According to some studies conducted in Nigeria, human operations like cutting down trees, grazing, converting forests into farms, hunting, and other disturbances have resulted in habitat loss and a decrease in the populations of both resident (like the imperilled Beaudouin's Snake Eagle *Circaetus beaudouini*, according to BirdLife International 2017a) and migratory birds (e.g the near threatened Pallid Harrier *Circus macrourus*, BirdLife International 2017b). However, the reasons of many bird reductions in West Africa, including Nigeria, remain unknown due to a paucity of data on habitat usage and feeding ecology for both resident and migratory birds (Vickery *et al.*, 2014; Mallord *et al.*, 2016). The forest specialists depend upon plant kind and structure (Gabbe *et al.*, 2002) for substrate for both nourishment and shelter (Lee and Rotenberry 2005). Generalists are favoured throughout the recolonization process (Newbold *et al.*, 2014b), whereas specialists are more vulnerable to extinction in fragments of forest (Henle *et al.*, 2004).

Materials And Methods

Study Area

This study was conducted in Zandama hills forest reserve on Latitude: 11°18'34.45" Longitude: 9°43'49.55" (Figure 1). It is located 5 kilometers northeast of Kila, 6 kilometres southeast of Kafin Doki, and 4.5 kilometers north of Kafin Fulani in Jigawa state, Nigeria, with an elevation of 672 meters. It was classified as a national forest reserve and has total area of 23.16 square kilometers (UNEP-WCMC and IUCN, 2021). It has 24.9°C mean temperature with a NE wind of 14 km/h and a humidity of 14%. The highest precipitation is recorded in August with 274.56 mm. The vegetation type is Sudan savanna. Just like many reserves in Nigeria, the Zandama Hills forest reserve is poorly managed with high level of deforestation and other anthropogenic disturbances which might have a negative effect on other species especially the bird community.

Figure 1: Map of the study area

Study design and Birds count

A line transect approach was used to survey birds at Zandama hills forest reserve according to Bibby *et al.* (2000). A single transect line of 2000m (2 km) length was put up and the breadth on both sides (strip) was 200 m. Within transects, all birds seen and heard were documented (starting from 06:30 am). The time spent on each transect varied depending on the number of birds sighted, but it was never less than 20 minutes, which was long enough to conduct a comprehensive search for the species. Across the research location, four different transects were marked. Each of the four transects was visited on Saturday, Sunday, and Monday.

Birds Identification

In order to identify birds, Borrow and Demey (2014) field guide was used. Birds that were difficult to identify in the field were photographed with a Canon DSLR (4000D+18-135mm lens and sigma 70-300mm), and their calls was recorded using Merlin and Bird Net for subsequent identification.

Guild classification

Following Gray *et al.* (2006) and Hassan *et al.* (2013), bird species were classified into mutually exclusive feeding guilds based on their dietary preferences. These include insectivorous (species that feed on insects, earthworms, small crustaceans, arthropods, and so on), carnivorous (species that feed on large animals, their dead bodies/carcasses, and so on), omnivorous (species that feed on both animals and plants), granivorous (species that eat seeds and grains), nectivorous (species that feed on nectar), and frugivorous (fruit-eating species).

Assessment of Species Population Trend and Population status

The International Union for Conservation of Nature Red List of Threatened Species version 3.1 (IUCN, 2016) and the Bird Life International website were used to assess species population trends along with the status of conservation concern.

Species Resident status

Borrow and Demey (2014) field guide and the International Union for Conservation of Nature Red List of Threatened Species version 3.1 (IUCN, 2016) website were consulted to establish the residence status of bird species.

Data analyses

The observational data was recorded, and the frequency of visits was analysed using Microsoft Excel (Pivot table function was used to analyze the data). Using PAST software (version 4.03). Diversity indices were used to determine the abundance and diversity of birds across sites, months and seasons.

Results

Composition and seasonal variation of bird species at Zandama Hills

Throughout the course of the research, a total of 8583 individuals from 134 bird species and 47 families were counted. Two endangered bird species (Martial Eagle, *Polemaetus belliosus*, and the Bateleur, *Terathopius ecaudatus*), and one Vulnerable (Tawny Eagle, *Aquila rapax*) were among the recorded bird species. The findings indicated that Red-cheeked Cordon-bleu (*Uraeginthus bengalus*), Scarlet-chested Sunbird (*Chalcomitra senegalensis*), and Grey-backed Camaroptera (*Camaroptera brachyura*) were the three most prevalent bird species, each with 557 sightings (6.49%), 537 (6.26%), and 504 (5.87%), respectively.

Spatiotemporal utilization of habitats according to feeding guilds

Insectivores (34 species) account for about 25.4% of all feeding guilds, followed by Granivores (24 species) at 17.9% and Omnivores (20 species at 13.4%). It was also discovered that certain bird species use multiple feeding guilds (Table 2)

Table 2: Feeding guilds of birds recorded at Zandama hills

Guilds	Number of species	Percentage (%)
Insectivore	34	25.4
Granivore	24	17.9
Omnivore	20	14.9
Carnivore	18	13.4
Granivore, Insectivore	9	6.7
Carnivore, Insectivore	9	6.7

Nectarivore	5	3.7
Frugivore	3	2.2
Frugivore, Insectivore	3	2.2
Granivore, Frugivore, Insectivore	2	1.5
Insectivore, Piscivore, Carnivore	1	0.7
Granivore, Nectarivore, Insectivore	2	1.5
Insectivore, Frugivore, Nectarivore	2	1.5
Granivore, Frugivore	1	0.7
Piscivore	1	0.7
TOTAL	134	100.0

Spatiotemporal utilization of habitats according to population trend

The bird species with the Population Trend (PT) categorized as stable had the most bird species observed with 87 species (64.93%), followed by Decreasing with 27 species (20.15%) (Table 3).

Table 3: Population trend of recorded birds' species

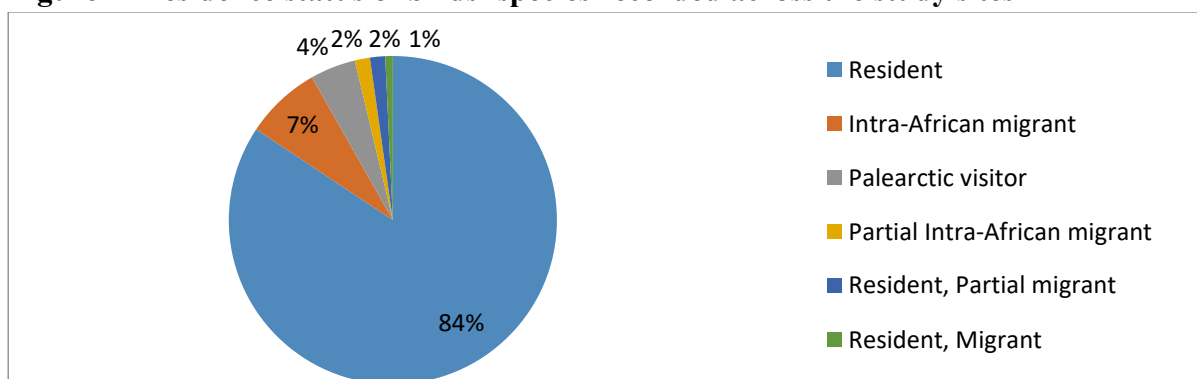
Population trend	Number of Species	Percentage (%)
Stable	87	64.9
Decreasing	27	20.2
Increasing	15	11.2
Unknown	5	3.7
TOTAL	134	100

Spatiotemporal utilization of habitats according to population status

Based on the species recorded, Population Status (PS) of Least Concern (LC) has the most species recorded, 130 (97.01%), there are others with status Endangered (En) containing two species (1.49%), Near Threatened (NT) containing one species (0.75%), and Vulnerable (Vu) containing one species each (0.75%). The two endangered species are the Martial Eagle, *Polemaetus belliosus*, and the Bateleur, *Terathopius ecaudatus*, while the Tawny Eagle, *Aquila rapax*, are considered vulnerable and the Red-necked Falcon, *Falco chicquera* as Near Threatened.

Spatiotemporal utilization of habitats according to residence status

Based on the bird species observed, 112 bird species (or 84%) were local residents, 10 species (7%) were intra-African migrants, and 7 species (5%) were Palearctic visitors (Figure 2).

Figure 2: Residence status of birds' species recorded across the study sites

Discussions

Spatiotemporal utilization of habitats according to feeding guilds, residence status, population trends and status

During the research, insectivores were the most common feeding guild, followed by granivores, omnivores, and carnivores. Grey-backed Camaroptera (*C. brachyura*) and Tawny-flanked Prinia (*Prinia subplava*) were the most frequently encountered insectivores during the investigation. This was consistent with the findings of Muhammad *et al.* (2018), who identified insectivorous bird species as the most prominent eating guild in his research. He believes that the larger number of insectivorous bird species identified might be attributed to the availability of farmlands, which supply supplemental food (insects), especially while doing cultivation and harvest. This study agrees with the findings of Sohil and Sharma (2020), who performed research in India and found insectivorous bird species to be the most prominent guild. It also aligns with the findings of Buba *et al.*, 2021, who found higher insectivorous species in the Ngel Nyaki forest reserve. According to Bonilla *et al.* (2012), and Ding *et al.* (2019), insectivores are the most species-rich feeding guild. These are common in insect-rich habitats such as streamside regions, woods, and informal settlements (Gatesire *et al.*, 2014). Increased plant production indicates an increase in insect population, and hence an increase in insectivores (Pettorelli *et al.*, 2011). Increased shrub canopy in urban settings provides a good habitat for food and shelter while also increasing insectivore guild richness (Perera *et al.*, 2017).

Granivores were the second most abundant guild. Granivores with a large number of observations were *Uraeginthus bengalus*, *Emberiza goslingi*, *Spilopelia senegalensis*, and *Streptopelia vinacea*. This large quantity might be due to the existence of farmlands, trees, and grasses, all of which generate seeds required by birds. This is consistent with the findings of Ringim and Shafi'u (2019), who found granivores to be the second most abundant guilds in Kafin gana and Warwade, owing to considerable agricultural operations in the two locations. The presence of Accipitridae in high abundance at Zandama Hills showed good ecological production and intactness (Jamwal *et al.*, 2017). According to Sohil and Sharma (2020), the existence of a variety of invertebrates, tiny

rodents, and plants may be responsible for a greater proportion of carnivores and omnivores.

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